हरियाणा सरकार

भारत 2023 INDIA

आज़ादी का अमृत महोत्सव

Integrated Water Resources Plan of Haryana

2023-2026

Haryana Water Resources Authority

श्री मनोहर लाल,
Sh. Manohar Lal
मुख्यमंत्री, हरियाणा

MESSAGE

Water is at the very core of sustainable development, and critical to the survival of people and the planet. Groundwater ecosystems in Haryana are facing serious anthropogenic pressures. The State is witnessing sharp declines in groundwater levels. On the other hand, waterlogging and groundwater salinization is causing losses in productivity thereby threatening the sustainability of irrigated agriculture in many parts of Haryana. Thus, it is crucial to ensure water security in the State for inclusive socioeconomic development and high economic growth in order to bring prosperity and improved quality of life to its people.

The Haryana Government under the leadership of Prime Minister Narendra Modi is committed to achieving equitable, efficient, and environmentally sustainable water management in the State. The effort of the Haryana Water Resources (Conservation, Regulation and Management) Authority (HWRA) to come out with a comprehensive “Integrated Water Resources Plan (IWRP) 2023-26” for Haryana holds the potential to change the overall scenario prevailing in the water sector in Haryana. This plan replaces the traditional, fragmented sectoral approach to water resources and management with a cross-sectoral policy approach promoting coordinated development with the participation of multiple stakeholders.

I congratulate Smt. Keshni Anand Arora and her team for leading the mission of sustainable water management and improved water governance by initiating different solutions spanning policy, technology, economics, and behaviour change. I am hopeful that the efforts of HWRA will sensitize, motivate and equip the departments with knowledge of the current water situation and guide them in designing interventions required for the judicious use of water and its conservation. I am very confident that the district administration will take all the necessary steps to protect the water resources not only to ensure adequate availability for the current generation but to secure it for future generations as well.

Sh. Manohar Lal
Chief Minister, Haryana

D.S. Dhesi, IAS (Retd.)
CPS to Chief Minister
Government of Haryana

MESSAGE

I congratulate Haryana Water Resources (Conservation, Regulation and Management) Authority (HWRA) for their exemplary work in the formulation of the novel "Integrated Water Resources Plan (IWRP) 2023-26" for Haryana. Needless to say, this plan will be instrumental in facilitating better planning with regard to combating water scarcity and promoting sustainable use of water in Haryana.

Through this exercise, HWRA intends to serve the objective of drawing the attention of the policymakers, decision makers and the publictowards the current water challenges of the State and to motivatethem to contribute towards water conservation efforts and efficient water management for the well-being of Haryana.

I would like to acknowledge the key role ofSmt. Keshni Anand Arora, IAS (Retd.) Chairperson, HWRA has played in bringing out issues ofwater conservation to the table and coordinating the effortsof different departments for this purpose.

D.S. Dhesi, IAS (Retd.)

Keshni Anand Arora, IAS (Retd.)
Chairperson, HWRA

FOREWARD

Water plays a pivotal role in the overall growth of the State as well as the standard of living of the people. Ensuring Safe, Sustainable, and Affordable water with the growing population and demand is a real challenge. In an endeavour towards SustainableWater Management and Water Conservation, the Haryana Water Resources Authority has developed an “Integrated Water Resources Plan (IWRP) 2023-26” forHaryanato shift the focus from the conventional water management approach to an Integrated Water Resources Management.The main objective of the IWRP is to formulate an Integrated Water Resources Management strategy and approach to deal with the key water issues and challenges of the State.

In order to overcome limitations on water availability and rising demand for water, a block-level water action plan and strategy to reduce the water gap by 45% has been developed for the State using a decentralised approach by involving the District Water Resources Planning Committees. The action plan emphasises both supply-side water management interventions like groundwater recharge, pond rejuvenation, construction of surface water storages, reuse of treated wastewater, underground pipeline system for irrigation water supply and lining of canals/water courses and demand-side water management interventions like micro-irrigation, crop diversification, direct seeding of rice, conservation tillage, varietal interventions and water efficiency etc. for each block of Haryana. A separate action plan for controlling waterlogging has been prepared with multiple proposed measures like bio-drainage, vertical drainage, sub-surface drainage and saline water aquaculture.

The twin problems of the State of Haryana are groundwater depletion and waterlogging. The State's groundwater situation has already been categorized into seven categories by the Haryana Water Resources Authority. The first two categoriesi.e.,Severely Groundwater Stressed and Moderately Groundwater Stressed,portray the problem of groundwater depletion and the last two categories i.e. Severely Water-Logged and Potential Water-Logged bring out the problem of water logging.

This effort is the first of its kind in India where block-level water resource availability of surface and groundwater has been assessed and the demand and supply water gap has been determined systematically and scientifically. The block-specific interventions have been devised and the action plan for the next three years 2023-26 incorporating the demand and supply side interventions has been proposed which can be implemented at the village level.

The IWRP alongwith the above categorization of villages will go a long way in strategizing Government policies and planning for areas requiring high prioritization for optimum results. The plan takes into account the current water resources availability vis-à-vis the current needs and future demand for water. The overall water demand of the State for the year 2021 was estimated to be ~35BCM whereas the total water availability from all resources is only ~21BCM suggesting a huge water deficit of ~14 BCM.

More than 90% of Haryana's water resources are used for irrigation and with increasing demand for industry, infrastructure & urbanization; Haryana faces an importantwater resources management challenge. The Integrated Water Resources Plan would promote coordinated development and management of water-related resources in order to maximize economic and social welfare in an equitable manner. It is hoped that this approach to water management will replace the fragmented sectoral approach and lead to better coordination amongst stakeholders at the grassroots level.

I am personally grateful to Hon'ble Chief Minister Sh. Manohar Lal, who has a vision for water sustainability and conservation for the State of Haryana. His guidance & support has made it possible for HWRA to formulate the Integrated Water Resources Plan.

Crucial to this exercise was the contribution of a number of collegues. I would like to acknowledge the continuous support and guidance provided by Sh. D.S. Dhesi, Chief Principal Secreary to Hon'ble Chief Minister Haryana, Sh. Devender Singh, Advisor (Irrigation) to CM, Sh. Sanjeev Kaushal, Chief Secretary to Govt. Haryana, Sh. V Umashankar, Principal Secretary to CM& Sh. Pankaj Agarwal, Commissioner & Secretary, Irrigation & Water Resources Department.

I appreciate the mentorship of Sh. Sanjay Marwaha, Member, HWRA in leading and supervising the technical team. I would also like to appreciate the efforts put in by Ms. VinniMunjal and Mr. N.K. NIjhawan, Consultants at HWRA in coordinating and guiding the districts and compiling and developing this plan at the State level. I would like to thankSh. D.P.S. Beniwal& Sh. M.S. Lamba, Members of the HWRA for their valuable feedback.

I also thank Sh. Satbir Singh Kadian, CEO, HWRA and Sh. Harmail Singh, Advisor, HWRA for their contributionin stimulating suggestions and encouragement in preparing this report.

Equally noteworthy is the commendable job done by various Deputy Commissioners supported by Superintending Engineers and Executive Engineers of I&WRD at the district level who worked to compilethe data of various departments and developed the District Water Resources Plans.Without their hard work and dedication, thiswould not have been accomplished.

Through this plan, HWRA has tried to inspire and guide the departments and decision-makers to work together for achieving water security and a better future for Haryana.

Keshni Anand Arora
Chairperson, HWRA

DEVENDER SINGH, IAS (Retd.)
ADVISOR (IRRIGATION) TO CM I&WRD,
GOVERNMENT OF HARYANA

MESSAGE

I would like to congratulate Haryana Water Resources (Conservation, Regulation and Management) Authority (HWRA) for making a unique effort for developing the "Integrated Water Resources Plan (IWRP) 2023-26" for Haryana. In order to use water resources wisely and plan for their development, it is imperative to record accurate data and knowledge of existing water resources, whether surface or underground or TWW.

This plan outlines the current water availability vis-à-vis the current water demand at a block level setting clarity on the present situation of water and identifying key action areas that can be adapted to resolve the problems faced in each local context. This shift towards an integrated approach to water security management encourages flexible, decentralised approaches with an increased emphasis on stakeholder collaboration and incorporating innovative solutions on both supply-side and demand-side water management. I genuinely appreciate the participation of the line departments and all the deputy commissioners from the district administration in developing this plan.

I acknowledge the dedication of Smt. Keshni Anand Arora, Chairperson, HWRA and her team of experts for this effort which has compiled and collected excellent data to examine the water situation in each block leading to preparation of block level plans. I am sure that this present report will be of immense use to the decision makers to collaboratively decide the goals of sustainable water management and coordinate the use of different instruments to achieve them. I am very hopeful that implementing this plan can bring subsequent improvements in water governance and offer substantial, long-term benefits to water security and water management in the State.

DEVENDER SINGH, IAS (Retd.)

V. UMASHANKAR, IAS
Principal Secretary to Chief Minister,
Government of Haryana

MESSAGE

I would like to congratulate the Haryana Water Resources Authority (HWRA) for their ground-breaking work in creating the integrated block-level water plans. The plan estimates a water deficit of 14 billion cubic metres (BCM) and suggests a roadmap to minimize this water gap by adopting both demand-side and supply-side approaches and interventions in water management. It will help in meeting globally agreed-upon water conservation related goals and targets including those mentioned in the Agenda for Sustainable Development 2030.

I would like to applaud Smt. Keshni Anand Arora, Chairperson, HWRA, the other members of the Authority and her team for their strenuous efforts in carrying forward the mission of sustainable water management and preparing the comprehensive plan for the State. The plan will provide an evidence based impetus on water conservation, increase participation amongst stakeholders through a whole government approach.

I am confident that this study will give the State and its agencies the directions for water management and inspire them to enhance their interventions in a coordinated manner across the board. I am sure that the direction and guideline provided by the Haryana Water Resources Authority under the leadership of its chairperson will lead the State in creating a sustainable water economy and environment for further generations.

V. UMASHANKAR, IAS

PANKAJ AGARWAL, IAS
COMMISSIONER & SECRETARY, GOVT. OF HARYANA
IRRIGATION & WATER RESOURCES DEPARTMENT

MESSAGE

Freshwater availability has decreased over the last few decades as a result of unsustainable water use practices over time in Haryana. Unfortunately, there has been an ongoing increase in groundwater demand, particularly in vulnerable and overexploited regions of the State, which is aggravating the issue and making it irreversible.

I am happy to note that the Haryana Water Resources (Conservation, Regulation and Management) Authority (HWRA) has come out with this *"Integrated Water Resources Plan (IWRP) 2023-26"* for Haryana by involving insights from diverse stakeholders. The plan brings out significant information on the existing gap between the demand and supply of water resources. This in turn provides a direction in the formulation of water-saving policies and strategies for the management of existing water resources.

I am hopeful that this plan will motivate the decision-makers to join hands for the optimal development of water resources, so as to conserve water for future generations to come. This plan can be used as a tool for devising and implementing efficient, equitable and sustainable solutions towards achieving water security in the State. I compliment HWRA for executing this commendable effort.

PANKAJ AGARWAL, IAS

Abbreviations

A&FWD	Agriculture and Farmers Welfare Department
ADB	Asian Development Bank
ADO	Agriculture Development Officer
AERB	Atomic Energy Regulatory Board
AH&D	Animal Husbandry and Dairying
AMP	Aquifer Management Plan
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
APHA	American Public Health Association
ASI	Archaeological Survey of India
BARC	Bhabha Atomic Research Centre
BBMB	Bhakra Beas Management Board
BCB	Beas Construction Board
BIS	Bureau of Indian Standards
BMB	Bhakra Main Branch
BMB	Bhakra Management Board
BML	Bhakra Main Line
BOD	Biochemical Oxygen Demand
BWS	Bhakra Water Services
CADA	Command Area Development Authority
CADWM	Command Area Development and Water Management
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
CBO	Community-based Organization
CCA	Culturable Command Area
CCSHAU	Chaudhary Charan Singh Haryana Agricultural University
CEA	Central Electricity Authority
CETP	Common Effluent Treatment Plant
CGWA	Central Ground Water Authority
CGWB	Central Ground Water Board
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health Environmental Engineering Organisation
CSC	Common Service Centre
CSR	Corporate Social Responsibility
CSSRI	Central Soil Salinity Research Institute
CTR	Catch the Rain
CV	Coefficient of Variation
CWC	Central Water Commission
CWPRS	Central Water and Power Research Station
DoWR,RD&GR	Department of Water Resources, River Development & Ganga Rejuvenation
DADF	Department of Animal Husbandry Dairying and Fisheries

DCO	Divisional Canal Officer
DFO	District Forest Officer
DIP	District Implementation Partner
DLAMC	District Level Advisory and Monitoring Committee
DM	District Magistrate
DO	Demi Official
DPR	Detailed Project Report
DSR	Direct Seeded Rice
DWRP	District Water Resources Plan
EC	Electrical Conductivity
EJC	Eastern Jamuna Canal
ETP	Effluent Treatment Plant
FAO	Food and Agriculture Organisation
FCB	Flood Control Board
FMDA	Faridabad Metropolitan Development Authority
FRL	Full Reservoir Level
GCA	Gross Command Area
GDP	Gross Domestic Product
GEC	Ground Water Estimation Committee
GMDA	Gurugram Metropolitan Development Authority
GoI	Government of India
GP	Gram Panchayat
GPRS	General Packet Radio Service
GSC	Ghaggar Standing Committee
GSDP	Gross State Domestic Product
GSI	Geological Survey of India
GSM	Global Systems for Mobile
GSVA	Gross State Value Added
GVA	Gross Value Added
GWMR	Ground Water Management and Regulation
GWRE	Ground Water Resource Estimation
GWS	Gurugram Water Supply
HARCO	Haryana State Cooperative Apex Bank Limited
HARSAC	Haryana Space Applications Centre
HDO	Horticulture Development Officer
HDPE	High Density Polyethylene
HIRMI	Haryana Irrigation Research and Management Institute
HKB	Hathnikund Barrage
HMN	Hydrogeological Monitoring Network
HOPP	Haryana Operational Pilot Project
HPGCL	Haryana Power Generation Corporation Limited
HPPCL	Himachal Pradesh Power Corporation Limited
HPWWMA	Haryana Pond and Waste Water Management Authority
HSDR	Haryana State Drought Relief

HSIIDC	Haryana State Industrial and Infrastructure Development Corporation
HSPCB	Haryana State Pollution Control Board
HSSPP	Haryana School Shiksha Pariyojna Parishad
HSVP	Haryana Shehri Vikas Pradhikaran
HUDA	Haryana Urban Development Authority
HWRA	Haryana Water Resources Authority
I&WRD	Irrigation and Water Resources Department
IEC	Information, Education and Communication
IFA	Indian Forest Act
IFC	International Finance Corporation
IMD	India Meteorological Department
IOCL	Indian Oil Corporation Limited
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
ISRO	Indian Space Research Organization
IT	Information Technology
IWDMP	Integrated Watershed Management Development Project
IWRM	Integrated Water Resources Management
JJM	Jal Jeevan Mission
JLN	Jawahar Lal Nehru
JSA	Jal Shakti Abhiyan
KCB	Kultāna Chhudāni Bupania Drain
KML	Keyhole Markup Language
KVK	Krishi Vigyan Kendra
LCU	Lift Canal Unit
LPA	Land Preservation Act
MBBR	Moving Bed Biofilm Reactor
MCG	Municipal Corporation Gurugram
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MFMB	Meri Fasal Mera Byora
MICADA	Micro Irrigation and Command Area Development Authority
MIF	Micro Irrigation Fund
MIS	Management Information System
MLL	Main Line Lower
MoA&FW	Ministry of Agriculture & Farmers Welfare
MoEFCC	Ministry of Environment, Forest and Climate Change
MoU	Memorandum of Understanding
MPMV	Mera Pani Meri Virasat
MSP	Minimum Support Price
MSP	Multi-Stakeholder Process
MWL	Maximum Water Level
NABARD	National Bank for Agriculture and Rural Development

NABL	National Accreditation Board for Testing and Calibration Laboratories
NAQUIM	National Aquifer Mapping and Management
NBK	Narwana Branch Link
NBWL	National Board of Wildlife
NCR	National Capital Region
NCT	National Capital Territory
NFL	National Fertilizer Limited
NGT	National Green Tribunal
NHP	National Hydrology Project
NHS	National Hydrograph Network Stations
NMSA	National Mission on Sustainable Agriculture
NOC	No Objection Certificate
NSL	Natural Surface Level
NWC	National Working Committee
NYKS	Nehru Yuva Kendra Sangathan
O&M	Operation and Maintenance
O&M	Operations and Maintenance
ODF	Open Defecation Free
ONGC	Oil and Natural Gas Corporation
PAMS	Property Tax Management System
PEPSU	Patiala & East Punjab States Union
PGWM	Participatory Groundwater Management
PHED	Public Health & Engineering Department
PIM	Participatory Irrigation Management
PLC	Programmable Logic Controller
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana
PNCP	Panipat Naptha Creator Project
PPP	Public Private Partnership
PV	Photovoltaic
RBA	River Basin Authority
RCC	Reinforced Cement Concrete
RFA	Recorded Forest Area
RKVY	Rashtriya Krishi Vikas Yojana
RLB	Rural Local Bodies
RSC	Residual Sodium Carbonate
RTDAS	Real-time Data Acquisition Systems
RTU	Remote Terminal Unit
RWHS	Rain Water Harvesting Structure
SAR	Sodium Adsorption Ratio
SBR	Sequencing Batch Reactor
SCADA	Supervisory Control and Data Acquisition
SCI	Supreme Court of India
SCO	Superintending Canal Officer
SDG	Sustainable Development Goal

SPIS	Solar Powered Irrigation Systems
SSD	Sub Surface Drainage
STP	Sewage Treatment Plant
SW	Southwest
SWA	State Wetland Authority
SYL	Sutlej Yamuna Link Canal
T&CP	Town and Country Planning
TCM	Technical Committee Meeting
TDET	Technology Development Extension and Training
TDS	Total Dissolved Solids
TWW	Treated Waste Water
UFW	Unaccounted for Water
UGPL	Under Ground Pipe Line
UJVNL	Uttarakhand Jal Vidyut Nigam Limited
ULB	Urban Local Body
USAID	United States Agency for International Development
UYRB	Upper Yamuna River Board
VLE	Village Level Entrepreneur
VSAT	Very Small Aperture Terminal
VT	Vertical Turbine
VWSC	Village Water and Sanitation Committee
WHO	World Health Organisation
WJC	Western Jamuna Canal
WMC	Water Management Committees
WRD	Water Rights Division
WRIS	Water Resources Information System
WSP	Water Security Plan
WTP	Wastewater Treatment Plant
WUA	Water User Association
WYC	Western Yamuna Canal
YoY	Year Over Year
YWS	Yamuna Water Services
ZLD	Zero Liquid Discharge

Units Of Measurement

BCM	Billion Cubic Metre
Cr Ltr	Crore Litres
Cumec	Cubic Metre per Second
Cusec	Cubic Feet per Second
Ha	Hectare
Ham	Hectare Metre
KLD	Kilo Litres per Day
Km	Kilometre
LPA	Litres per Annum
LPCD	Litres per Capita per Day
m	Metre
MAF	Million Acre Foot
MBGL	Metres Below Ground Level
MCM	Million Cubic Metre
MLD	Million Litres per Day
mm	Millimetre
MU	Million Units
RD	Reduced Distance from Off-take Point
Sq. ft	Square Feet
Sq.km	Square Kilometre

Conversion Factor

1 BCM =	1000 MCM
1 MCM =	100 Hectare Metre
1 MCM =	100 Crore Litres
1 BCM =	100,000 Crore Litres
1 Cumec ≈	34.315 Cusec
1 MLD ≈	0.4087 Cusec
1 MAF ≈	1.23348 BCM
1 Sq.km =	100 Hectare
1 Hectare ≈	2.47 Acre
1 Acre ≈	4047 Sq.m

EXECUTIVE SUMMARY

1. Introduction

Water plays a pivotal role in the growth of any State. The State of Haryana is characterized as a water deficit State, particularly regarding Surface and Groundwater resources. Nevertheless, Haryana envisioned to overcome these issues and enacted the Haryana Water Authority in the year 2020 which has laid down the *“Integrated Water Resources Plan (IWRP) 2023-26”* for Haryana with the support of the Department of Irrigation and Water Resources (I&WRD) and District Administration. The IWRP approach as globally accepted combines water supply, water demand, water quality, environmental protection and enhancement, rate structures, financial planning, and public involvement. IWRM is a tool for achieving the three main goals of sustainable development; economic efficiency to make the best use of available water resources; social equity in the distribution of water amongst different social and economic groups; and environmental sustainability to safeguard the water resource base and related ecosystems. The plan replaces the conventional, fragmented sectoral approach to water resources and management that has resulted in unsustainable water resource use.

The IWRP 2023-26 is envisioned to bring about much-required improvements in water resources management in Haryana in a coherent and collaborative manner. The main aim of the plan is to enhance the management, control, and use of water resources sustainably. The IWRP is the first comprehensive block-level assessment and planning for the management of water resources of the State. It represents a major step towards creating a culture of data-based decision-making and forms a baseline for an action plan for water governance and management in Haryana.

The key objectives of the IWRP 2023-26 are hereunder:

- ❖ Water resources availability assessment including surface water, groundwater, treated wastewater and rainfall
- ❖ Determination of demand and supply water gap
- ❖ Identification of key water issues and threats
- ❖ Formulation of an IWRM strategy and approach suitable for Haryana
- ❖ Devising block-specific interventions and action plans for the next three years 2023-26

The formulation of an IWRP 2023-26 entails to provide a foundation for achieving short-term and long-term objectives of sustainable management of water resources in the State. This would require the formulation of major policy intervention, strengthening of institutions especially Water User Associations (WUAs) and Village Water and Sanitation Committees (VWSCs), stakeholders’ coordination and cooperation, effective regulatory and monitoring mechanisms and adequate funding support using diverse economic instruments for the sustainable development and management of water resources.

2. Surface Water Resources

The State of Haryana is a co-basin state to the Indus Basin and Yamuna River in Ganga-Brahmaputra- Meghana basin. Major water surface resources of the State are its share in Ravi-Beas, Sutlej and Yamuna water as allocated under various inter-state agreements. The share of Haryana from these external rivers varies on a pro-rata basis depending upon the availability of water in storage reservoirs. Long-term stream flow data series for river Ravi at Madhopur Headworks, river Beas at Mandi plains, Sutlej river at Bhakra dam and Yamuna river at Hathnikund head work and Okhla weir have been used for statistical and flow distribution analysis. These assessments are based on the agreed share of Haryana in interstate rivers.

The total availability of water from Sutlej river on the basis of flow series 1921-45 at Bhakra dam at 50% dependability has been estimated at 17,281 MCM (17,28,100 crore litres) with Haryana’s Share as 5,427 MCM (5,42,700 crore lires). However, the actual share varies from year-to-year pro-rata basis depending on the actual availability of water in the reservoir.

As per the flow series of 1921-60 at Madhopur Head works for the river Ravi and at Mandi plain for the river Beas, the mean annual availability of surplus water after deducting the pre-partition uses is 21,179 MCM (21,17,900 crore lires) and Haryana share as per the 1981 agreement is 4,317 MCM (4,31,700 crore litres). However, actual shares would be on a pro-rata basis depending on the actual availability of water. The Ravi-Beas Tribunal arrived at a total availability of 22,548 MCM (22,54,800 crore litres) with Haryana share as 4,724 MCM (4,72,400 crore litres), but the award of the Ravi-Beas Tribunal has not been notified by the Government of India. Haryana is presently receiving about 2000 MCM of Ravi-Beas water due to the non-construction of the Sutlej Yamuna Link (SYL) and others system constraints.

The allocation of Haryana in Yamuna River as per the Memorandum of Undertaking (MOU) signed between Haryana, Uttar Pradesh, Rajasthan, Himachal Pradesh and the National Capital Territory (NCT) of Delhi on 12.05.1994 is 5,730 MCM (5,73,000 crore litres) out of the mean assessed the availability of 13,000 MCM (13,00,000 crore litres) up to Okhla.

The Ghaggar River of the Indus River system originates in Shivalik Hills in Himachal Pradesh and enters Panchkula District in Haryana having Markanda and Tangri as its tributaries. The mean surface water availability of its water to Haryana at Otto Weir is 478 MCM (47,800 crore litres).

The share in Sutlej, Ravi-Beas and Yamuna Rivers along with actual deliveries to Haryana on a pro-rata basis have been tabulated below:

River	Share allocated to Haryana		Actual deliveries of Haryana *(12-year average)*		Actual deliveries in 2020-21	
	MCM	Crore Litres	MCM	Crore Litres	MCM	Crore Litres
Sutlej	5427	542700	4700	470000	4600	460000
Ravi-Beas	4317	431700	2130	213000	2190	219000
Yamuna	5730	573000	4380	438000	3520	352000
Ghaggar	478*	47800	478	47800	478	47800
Total	**15952**	**1595200**	**11688**	**1168800**	**10788**	**1078800**

**assumed as per mean availability*

Sahibi, Krishnavati and Dohan Nalla are the three seasonal rivers entering Haryana from Rajasthan in the districts of Rewari and Mahendragarh but no dependable water is being received due to the construction of many check dams/storages across the river by Rajasthan.

(i) Canal Water System and Supplies

Surface water is supplied through an efficient canal network consisting of 1,521 channels having a length of 14,125 Km covering the Cultural Command Area (CCA) of 72.38 lac acres of Haryana through four canal systems - Western Jamuna Canal System, Bhakra Canal System, Lift Canal System and Agra and Gurugram Canal system. However, due to less availability of water, the water is delivered in rotation by notifying Rotational Programme in the Canal systems i.e. WJC system, Bhakra System and lift canal system for equitable distribution.

a. Western Jamuna Canal System - After receiving supplies at Hathnikund Barrage from Yamuna river, these are distributed through the Western Jamuna Canal system in districts of Karnal, Kurukshetra, Sonipat, Jind, Rohtak and Hisar then irrigating CCA of 21.30 lac acres.
b. Bhakra Canal System- Bhakra water is received from three Haryana contact points i.e. Narwana Branch, BML Barwala Link Channel at Khanauri Head and Bhakra Main Branch at Baliyala Head and it is distributed in the districts of Ambala, Kurukshetra, Hisar, Fatehabad & Sirsa covering a CCA of 34.4 lac acres
c. Lift Canal System- Water is being supplied to the arid area with high elevation through 4 Lift Canal Systems i.e. Jui Lift Irrigation System, Siwani Lift Canal System, Loharu Canal System and JLN canal system in districts of Bhiwani, Charkhi Dadri, Rewari, Jhajjar and Mahendragarh, covering a CCA of 12.80 lac acres.

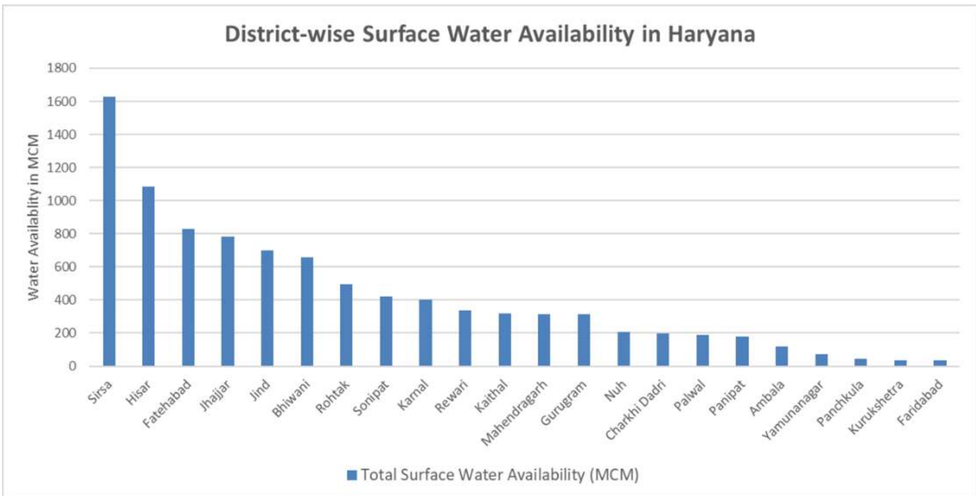
d. Agra and Gurugram Canal System- The Yamuna water is being utilized in the districts of Faridabad and Palwal through the Agra Canal System covering 64,750 acres and in districts of Nuh, Palwal, and Gurugram through the Gurgaon Canal system covering 3.24 lac acres.

The State of Haryana received only 10,310 MCM (10,31,000 crore litres) from Bhakra and Yamuna water against an average of 11,210 MCM (11,21,000 crore litres) at Haryana contact points in the year 2020-21. Out of the 10,310 MCM (10,31,000 crore litres) water received about 8,171.60 MCM (8,17,160 crore litres) was delivered to the users through channels as compiled from the information given by districts in the District Water Resources Plans, the abstract of which is given under:

Sr. No.	Deliveries of Entities	Supplies in 2020-21		Remarks
		MCM	Crore Litres	
1	To fields / domestic supplies	7635.71	763571	Data Compiled from DWRPs
2	Thermal plants	184.51	18451	
3	Industries through special channels	129.47	12947	
4	For paddy through rice Shoots	158.29	15829	
5	For ponds against special permission	63.62	6362	
	Total Deliveries	**8171.60**	**817160**	

Based on the actual data, losses in Canal System and water courses have been worked out to be 20.74% and 5% respectively in Chapter 2.

The Surface Water Availability from Bhakra and Yamuna water is 8,171.60 MCM (8,17,160 crore litres), as per information received in the DWRPs. The current reuse of Treated Waste Water is 221.24 MCM (22,124 crore litres) is being directly used by the consumers from the drains as reported in District Water Resources Plans. Availability from other sources i.e. Ghaggar, water drains, farm ponds etc. is only 963.12 MCM (96,312 crore litres).



3. Groundwater Resources

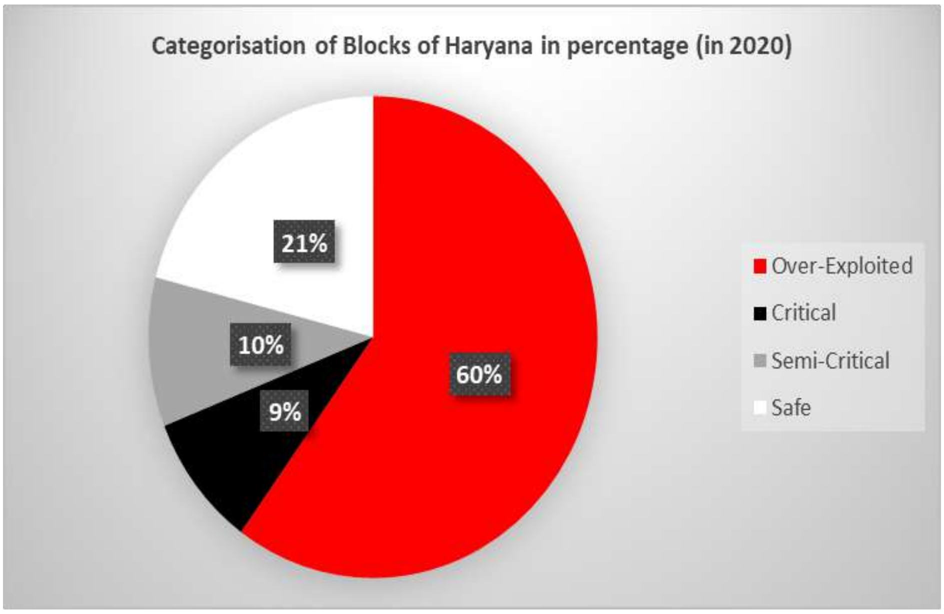
Haryana Water Resources Authority has categorized all the villages of Haryana State into 'seven' distinct categories based on the groundwater level. The depth of water level data as well as the declining rate for the last 10 years (June 2010 to June 2020) is available for all villages of the State. The villages having a water level of more than 30.00 meters are categorized as "Severely Groundwater Stressed" and represented by a 'Red' colour. The villages having a water level of 20.01 to 30.00 meters are categorized as "Moderately Groundwater Stressed" and represented by a 'Pink' colour.

Similarly, the villages having a water level of 1.51 to 3.00 meters are categorized as "Potential Waterlogged" and represented by a 'Purple' colour. The villages having a water level of 0.0 to

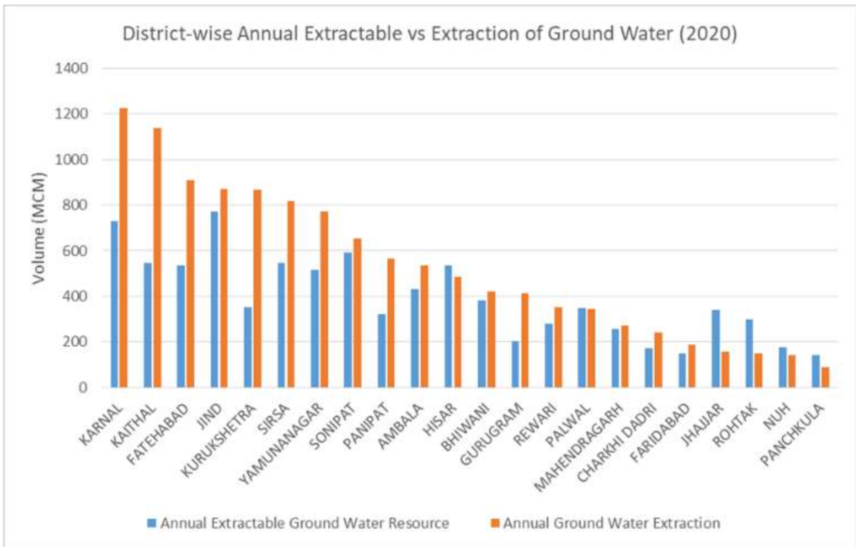
1.50 meters are categorized as "Severely Waterlogged" and represented by a 'Blue' colour. Details are covered in Chapter 3.

Sr. no.		Depth to Water Level Ranges (metre)	Categories	Colour	No. of Villages	No. of Villages of Rising Water Level (>0.01m/ Yr)	No. of Villages Declining Water Level	No. of Villages Showing no fluctuations
1	(i)	30.01 to more	Severely Groundwater stressed villages	Red	1948	24	1921	3
	(ii)	20.01 to 30.0	Moderately Groundwater stressed Villages	Pink	1093	45	1046	2
2	(iii)	10.01 to 20.0	Potential Groundwater stressed villages	Light green	1903	194	1695	14
	(iv)	5.01 to 10.0	Good Groundwater Potential villages	Green	1304	255	1029	20
3	(v)	3.01 to 5.0	Buffer Zone for water logging villages	Yellow	618	274	330	14
4	(vi)	1.51 to 3.0	Potential water-logged villages	Purple	333	212	116	5
	(vii)	0.0 to 1.5	Severely water-logged villages	Blue	88	75	13	0
		Total			**7287**	**1079**	**6150**	**58**

Groundwater resources were estimated for each of Haryana's 141 blocks according to the Dynamic Ground Water Resources of Haryana State (as of 31st March 2020) report, which was published by the Ground Water Cell, Department of Irrigation & Water Resources, Haryana, and Central Ground Water Board North Western Region Chandigarh. The 141 blocks (excluding the Morni block of Panchkula District) are divided into four groups for estimation

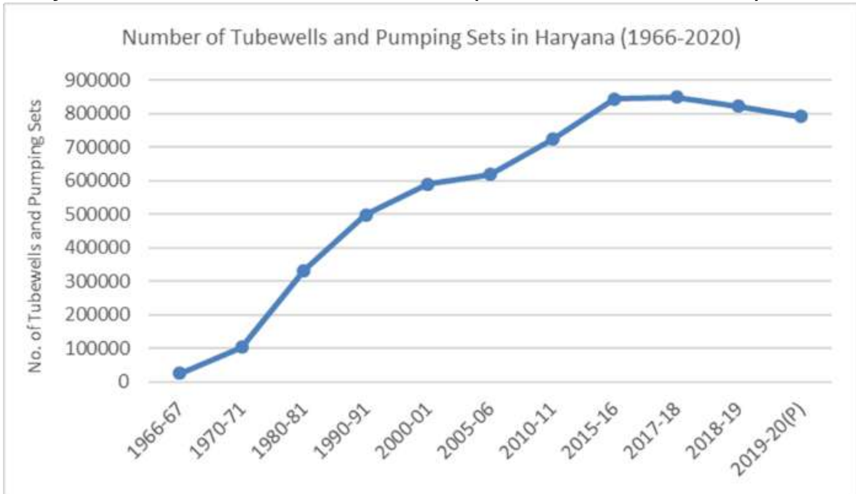


where 30 have been deemed "Safe," 12 as "Critical," 14 as "Semi-Critical," and 85 as "Over-exploited. It provides an overview of the availability and extraction of groundwater resources in Haryana. The district-level variation in groundwater extraction in the state is depicted in the given figure. The largest groundwater users are Karnal, Kaithal, Fatehabad, Kurukshetra, Jind, Sirsa, and Yamunanagar.



In the same report, the annual groundwater recharge of Haryana has been estimated at 9,527.02 MCM (9,52,702 crore litres). However, it doesn't include the recharges from seepages through water courses. Also, in the Dynamic Ground Water Resource report the seepages from the canals, tanks, ponds and shallow water bodies have been underestimated than the actual recharge assessed by Tahal Consultancy Engineers Ltd. of Israel for the Haryana State Water Plan and GoI reports. With this additional groundwater recharge of 2,053 MCM (2,05,300 crore litres), the total groundwater recharge/availability comes out to be 11,580 MCM (11,58,000 crore litres).

There are a total of 7,90,873 tube wells and pumping sets for irrigation reported in the State as per the Statistical Abstract of Haryana 2019-20. Out of which 2,64,472 are Diesel Sets and 5,26,401 are Electric Sets. The number of tube wells and pumping sets installed for irrigation in Haryana from the year 1966 to 2020 is shown in the figure.



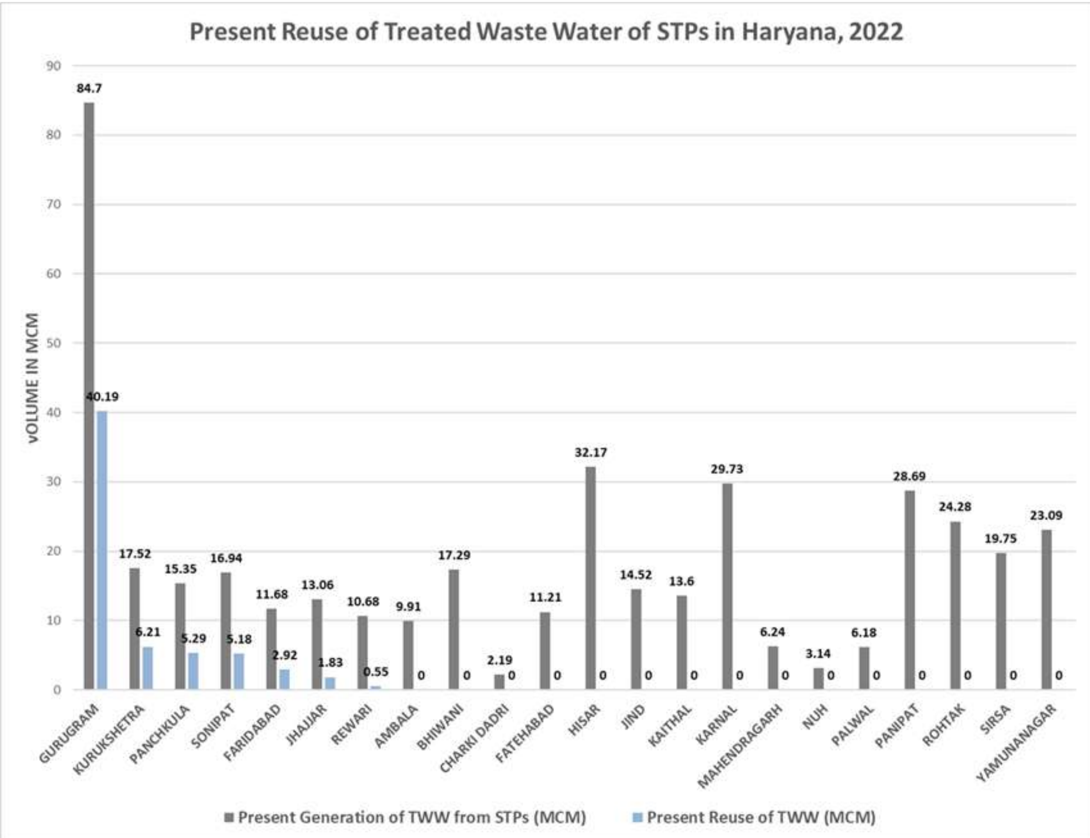
4. Treated Waste Water Availability and Present Reuse

(i) Domestic Waste Water Generation and its Reuse

The estimated amount of sewage produced in the State of Haryana is 1356.90 MLD, while the Sewage Treatment Plants' (STPs') present total treatment capacity is 1839.80 MLD. At present, 196 STPs have been installed by Public Health & Engineering Department (PHED), Haryana Shahari Vikas Pradhikaran (HSVP), Urban Local Bodies (ULB), Gurugram Metropolitan Development Authority (GMDA) and Municipal Corporation Gurugram (MCG) have a collective capacity of 671.53 MCM (67,153 crore litres or 1839.81 MLD). However, the actual utilized capacity is 411.89 MCM (41,189 crore litres or 1128.47 MLD) only, out of which only 15.09% (62.16 MCM or 6,216 crore litres or 170.30 MLD) is being reused for non-potable purposes in agriculture, horticulture, construction and industrial sectors.

Sr. No.	Name of Department	No. of STPs Constructed	Treatment Capacity (MCM)	Waste Water being Treated (MCM)	Present Reuse of TWW (MCM)
1	PHED	120	345.62	224.20	6.21
2	HSVP	17	84.24	42.49	8.11
3	ULB	12	99.28	64.86	7.67
4	GMDA	6	141.62	79.57	39.42
5	MCG *(decentralised STPs)*	41	0.77	0.77	0.77
	Total (MCM)	**196**	**671.53**	**411.89**	**62.16**
	Total (Crore Litres)		**67153**	**41189**	**6216**
	Total (MLD)		**1839.81**	**1128.47**	**170.30**

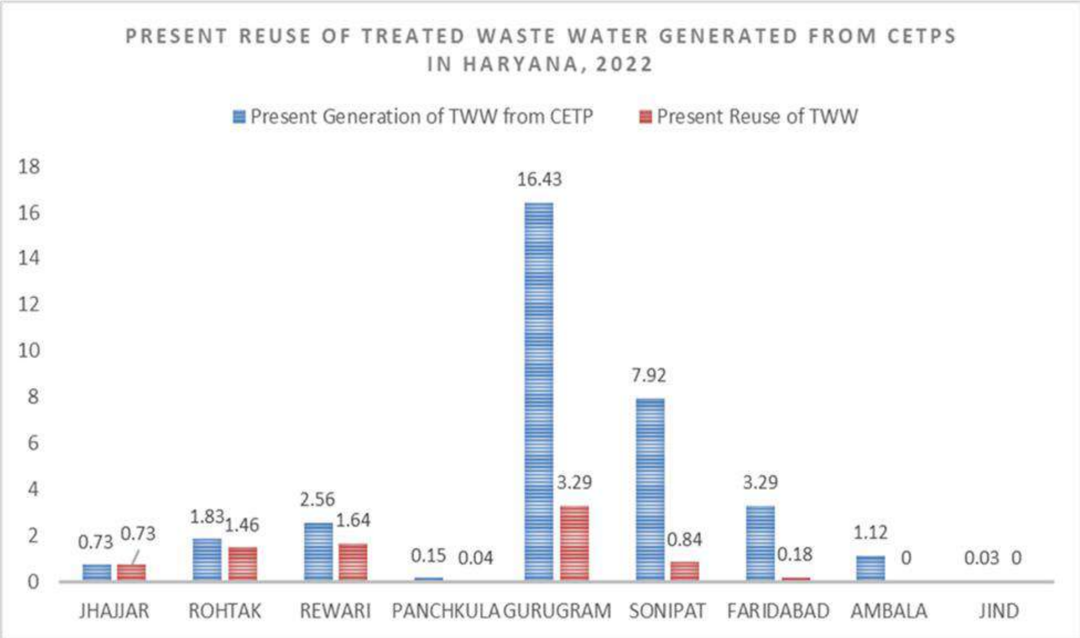
Only seven districts are reusing some of the Treated Waste Water (TWW) generated from the STPs. Gurugram is using the highest amount (~47%) of its TWW followed by Kurukshetra (~35%), Panchkula (~34%), Sonipat (~31%), Faridabad (~25), Jhajjar (~14) and Rewari (~5%). The remaining 15 districts are not utilizing any of its treated wastewater instead it is being discharged into the drains.



(ii) Industrial Waste Water Generation and its Reuse

Currently, Gurugram Metropolitan Development Authority (GMDA) has installed 1 CETP and Haryana State Industrial and Infrastructure Development Corporation (HSIIDC) has installed 13 CETPs with a total capacity of 52.85 MCM (5,285 crore litres). Only 24% (8.17 MCM/ 817 crore litres) of the current generation of TWW from CETPs is being used for horticultural and construction operations. The remaining TWW is being discharged either into the land, nearby river/drain.

Sr. No.	Name of Department	No. of CETPs Constructed	Treatment Capacity (MCM)	Present Generation of TWW (MCM)	Present Reuse of TWW (MCM)
1	HSIIDC	13	32.78	17.61	4.89
2	GMDA	1	20.8	16.43	3.29
	Total (MCM)		**52.85**	**34.03**	**8.17**
	Total (Crore Litres)	**14**	**5285**	**3403**	**817**
	Total (MLD)		**144.79**	**93.23**	**22.38**

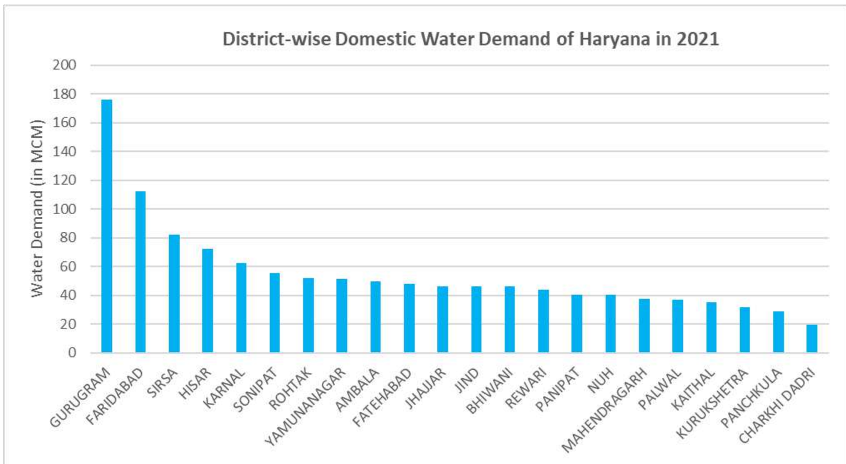


5. Water Demand

The present (2021) and future (2025) water demand for different sectors have been arrived at with the objective to know the actual requirement in each sector. The assessment and projections have been made by the districts as per norms adopted by the concerned line departments. The total water demand has been computed by adding the water demand of various sectors - Domestic, Agriculture, Horticulture, Livestock, Industrial & Infrastructure, Power, Fishery, Forest & Wildlife & Establishment and Institutions.

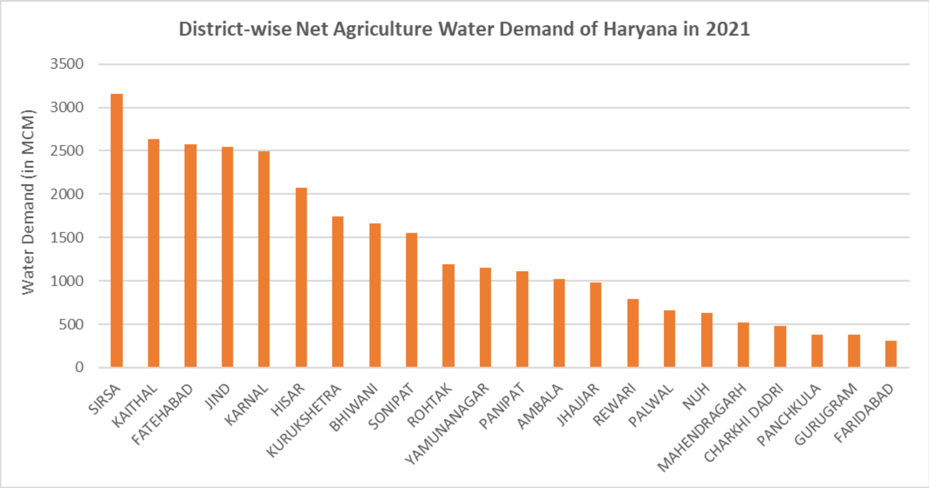
(i) Domestic Water Demand

Domestic water demand (drinking, bathing, cooking, washing, sanitation, gardening etc.) has been calculated as per norms of the Central Public Health Environment Engineering organisation (CPHEEO) for water supply in rural and urban areas for the population in 2021 and the future population in 2025. The domestic water demand of the state has been assessed as 1,212.90 MCM (1,21,290 crore litres) in the year 2021 which will increase to 1,356.25 MCM (1,35,625 crore litres) in 2025.



(ii) Agriculture Water Demand

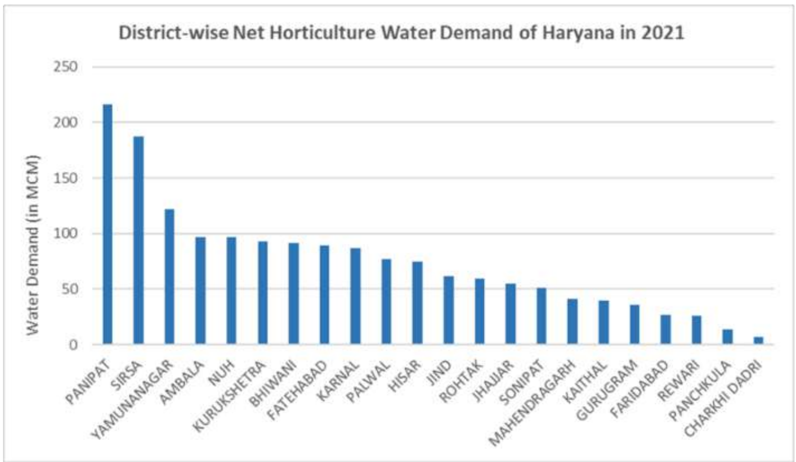
Agriculture is an important sector of the State's economy and the highest water-consuming sector. Agriculture water demand has been assessed as per norms provided by Choudhary Charan Singh Haryana Agriculture University (CCSHAU), Hisar. Net agriculture water demand has been calculated excluding the contribution of rainfall (Effective Rainfall) i.e. about 9,057 MCM (9,05,700 crore litres).



Net water requirement for Agriculture Sector in the year 2021 has been compiled as 30,055.14 MCM (30,05,514 crore litres) for the cropped area of 152 lac acres which will increase to 30,345.54 MCM (30,34,554 crore litres) in the year 2025. As effective rainfall consumed by Agriculture is 9,057 MCM (9,05,700 crore litres), the estimated water demand in the year 2021 is 39,112.14 MCM (39,11,214 crore litres) including effective rainfall.

(iii) Horticulture Water Demand

The net water demand for the horticulture sector has been calculated by Horticulture Department as per norms of CCHAU by Horticulture Department (both district-wise and block-wise) as 1,648.38 MCM (1,64,838 crore litres) in 2021 which will increase to 2,121.31 MCM (2,12,131 crore litres) in 2025. The estimated horticulture water demand for the year 2021 is 2,228.38 MCM (2,22,838 crore litres) including effective rainfall of 580 MCM (58,000 crore litres).

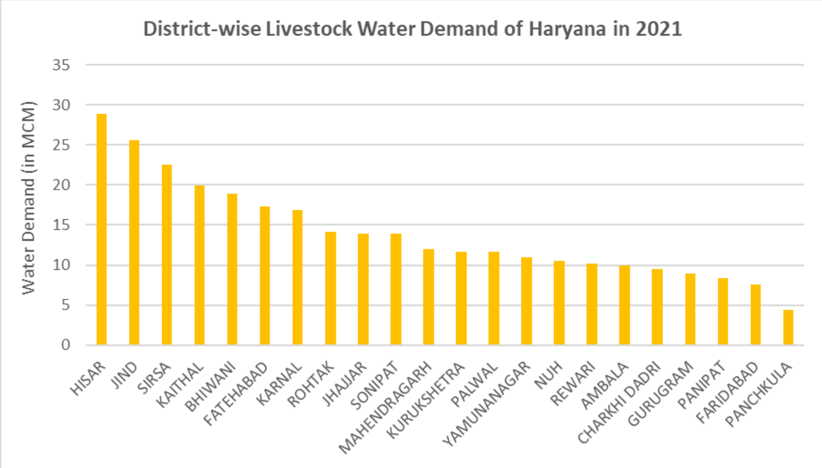


(iv) Agriculture and Horticulture Total Water Demand

The net Agriculture and Horticulture water demand for the year 2021 has arrived at 31,703.52 MCM (31,70,352 crore litres) which is about 90.67% of the total demand. However, the gross water demand including the effective rainfall in the year 2021 will be 41,340.52 MCM (41,34,052 crore litres).

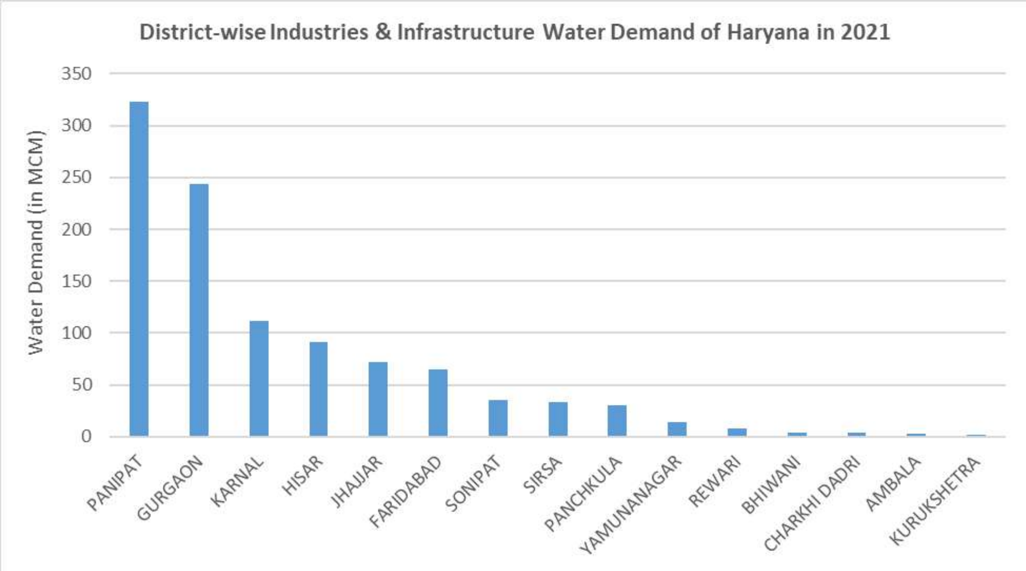
(v) Livestock Water Demand

Being a predominantly rural state, livestock is the major source of livelihood during the lean period. Livestock water demand has been calculated by districts as per set norms adopted by the department. The present (2021) and future (2025) water demands have been compiled as 307.75 MCM (30,775 crore litres) and 319.88 MCM (31,988 crore litres) respectively.

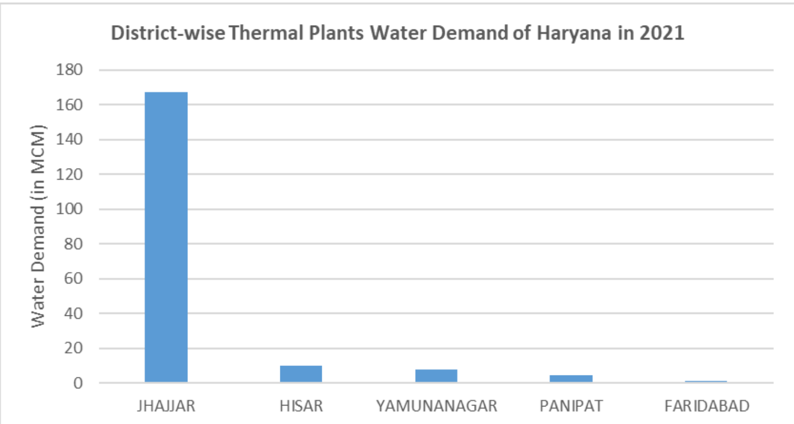


(vi) Industrial & Infrastructure Water Demand

Haryana is a leading State in social and economic advancement and its achievement in the development of industries has been quite significant. The water demand for industries & Infrastructure comprises the quantity of water required for factories, offices, industries hospitals etc. The present (2021) and the Projected (2025) Water Demand of the Industrial & Infrastructure sector has been compiled as calculated by the districts as per norms adopted by their department as 1044.18 MCM (1,04,418 crore litres) and 1465.18 MCM (1,46,518 crore litres) respectively.

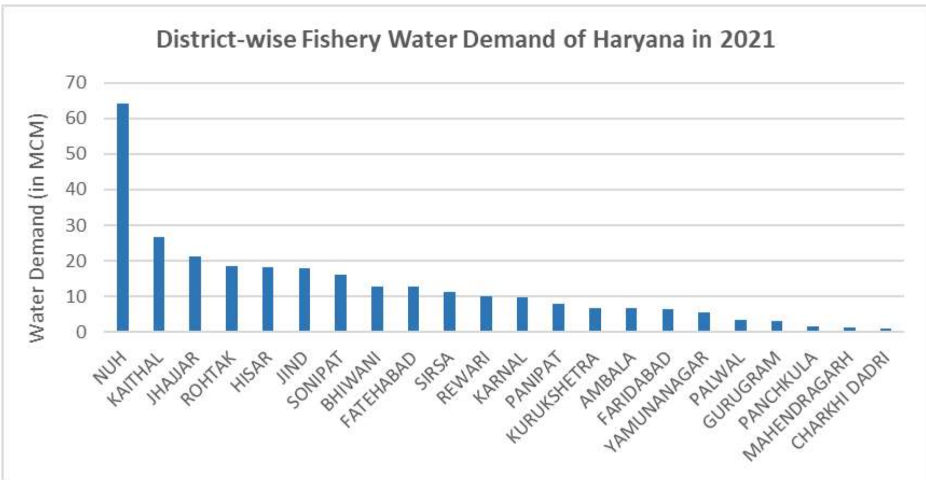


(vii) Power Generation Water Demand



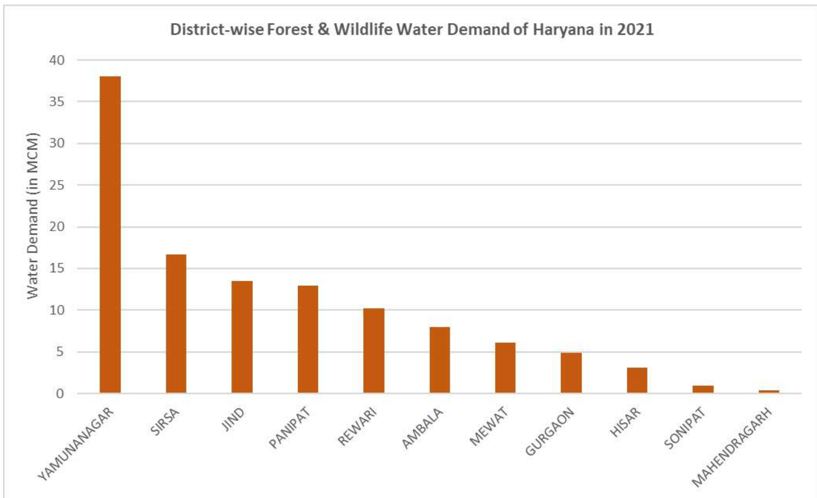
The present (2021) and the projected (2025) water demand for power generation of the State as given by the districts have been compiled as 191.27 MCM (19,127 crore litres) & 221.07 MCM (22,107 crore litres) respectively.

(viii) Fisheries Water Demand



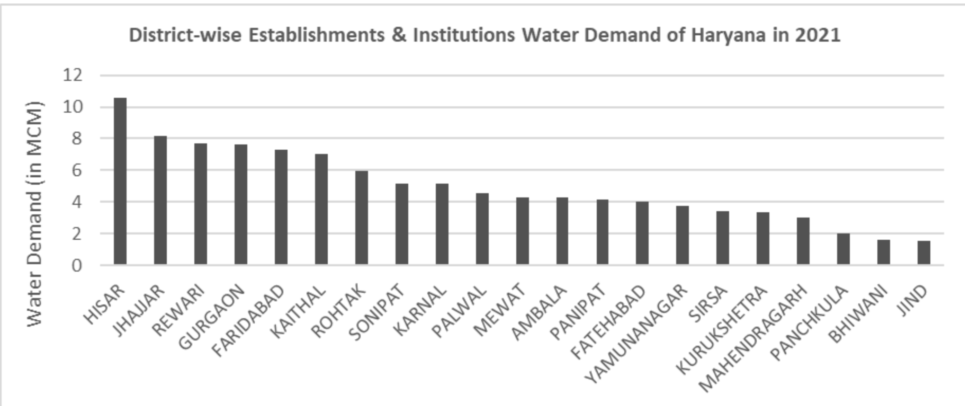
The implementation of various fisheries schemes in the State has made it a front-runner in aquaculture. Fish farming is been promoted in a waterlogged area on large scale. The present (2021) and the future (2025) water demand of fisheries has been compiled as 282.65 MCM (28,265 crore litre) and 322.51 MCM (32,251 crore litres) respectively.

(ix) Forest & Wildlife Water Demand



The water demand for Forest & wildlife has been compiled as calculated by the districts as per the norm of the department. The present (2021) and the projected (2025) water demand have arrived at 116.06 MCM (11,606 crore litres) and 121.61 MCM (12,161 crore litres) respectively.

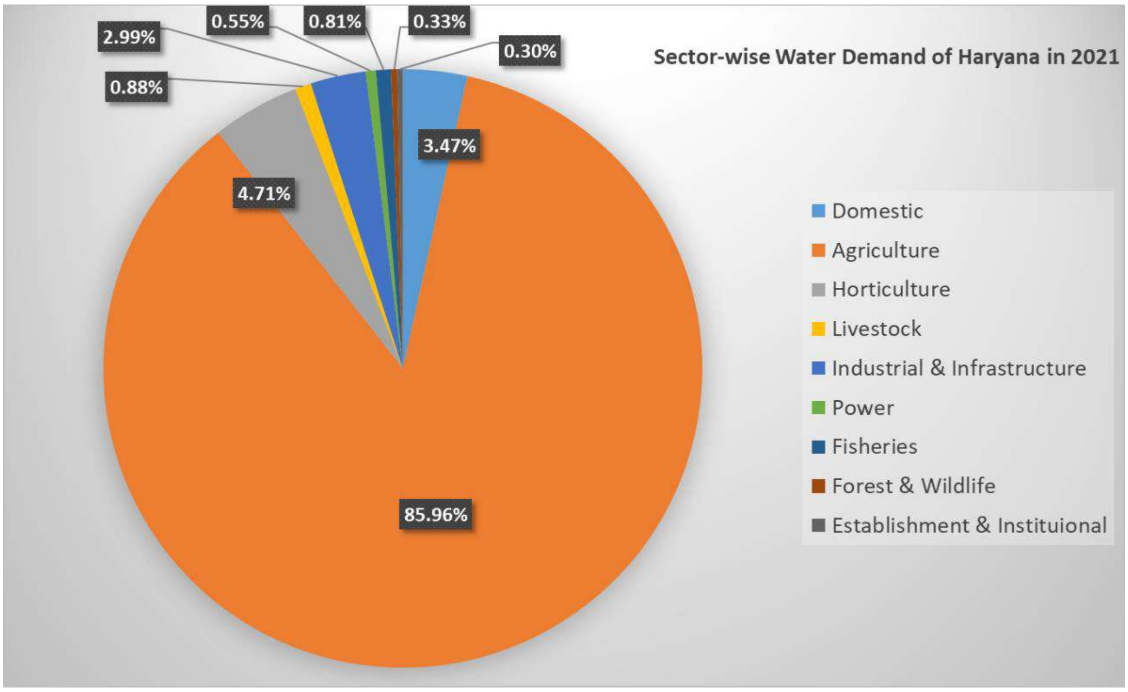
(x) Establishment & Institutional Water Demand



The present (2021) and the future (2025) water demand of the Establishment & Institutional sector has been compiled from the demands given by the districts as 104.43 MCM (10,443 crore litres) and 149.03 MCM (14,903 crore litres respectively.

(xi) Total Water Demand

Sector-wise annual water demand of 2021 for the State is summed up in the figure below:



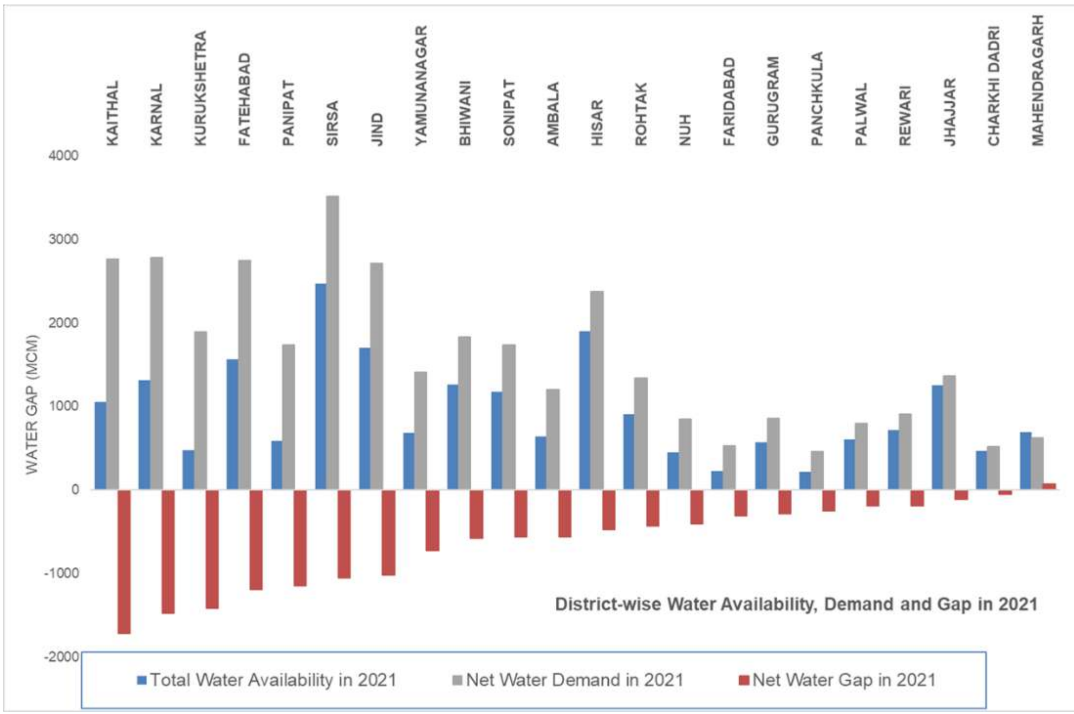
6. Water Availability, Demand and Gap in 2021

The abstract of Gross Water Availability, Demand and Gap for the year 2021 for the entire State of Haryana is given below. Details are covered in Chapter 7.

	MCM	Crore Litres
Surface Water	9355.96	935596
Groundwater Recharge as per field assessment	11580.02	1158002
Effective Rainfall considered for Crops	9637	963700
Total Water Availability	**30572.98**	**3057298**
Total Demand without Effective Rainfall	34962.76	3496276
Effective Rainfall considered for Crops	9637	963700
Total Water Demand	**44599.76**	**4459976**
State Water Gap	**-14026.78**	**-1402678**

However, this water gap will reduce to -12,416.78 MCM (-12,41,678 crore litres) excluding the requirement of 1,610 MCM (1,61,000 crore litres) for the unsown area.

District-wise present (2021) water availability, demand and gap have been summed up in the figure given below.



The water deficit is affecting the water balance of the State in two ways: -

A. Various water user sectors
   a. Due to scarcity of water about 10% deficient supply is given to Agriculture and Horticulture accounting for 3170 MCM (3,17,000 crore litres), but this results in less yield of crops.
   b. Even other sectors i.e. Domestic, Fishery, Industry etc. may be receiving 10% less supplies to the tune of 330 MCM (33,000 crore litres).
B. Over withdrawal from aquifers
   a. There is an over withdrawal of 8,917 MCM (8,91,700 crore litres) from aquifers.

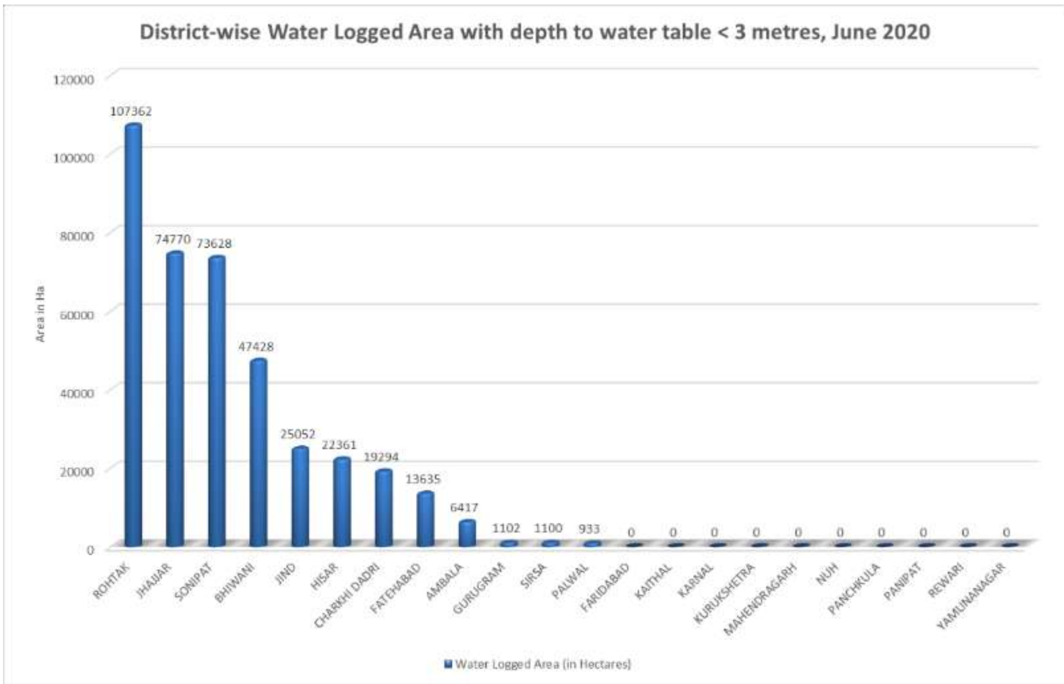
7. Major Water Issues and Challenges for Haryana

(i) Groundwater Depletion

Due to excessive groundwater extraction above the yearly groundwater recharge, the groundwater level in the State is rapidly decreasing, especially in the fresh groundwater zone. The State is dealing with a very significant issue as a result of the noticeable fall in water level. Since groundwater sources are used to irrigate the majority of the land, the subsurface water resource is under severe strain. According to groundwater level data for June 2020, a total of 1,948 no. of villages are severely groundwater stressed. These are villages with a depth range of groundwater level deeper than 30.00 mbgl. A total of 1,093 no. of villages are moderately groundwater stressed with a groundwater level in the range of 20.01 mbgl - 30.00 mbgl.

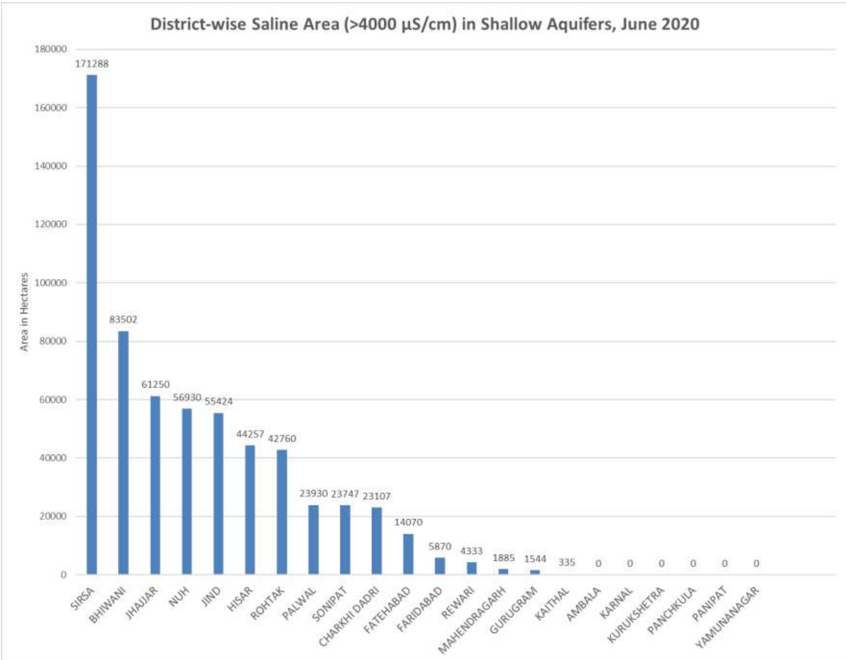
(ii) Water Logging

Waterlogging and secondary soil salinization has emerged as a result of the excessive use of irrigation water in poorly drained areas thereby endangering the long-term viability of irrigated agriculture in Haryana. 8.89% geographical area of the State is under waterlogging conditions (June 2020) where 7.31% area has a water level between 1.5 and 3 mbgl, while 1.58% area is under critical conditions with a shallow water level between 0 and 1.5 mbgl. The districts of Rohtak, Jhajjar, Sonipat, and Bhiwani have the most impacted areas, followed by Jind, Hisar, Charkhi Dadri and Fatehabad though the situation could vary depending on the rainfall.



(iii) Groundwater Salinity

According to data reported by GWC, I&WRD of June 2020, EC of > 4000 µS/cm is reported in 6,14,232 hectares (15,17,767 acres) area of Haryana. Districts like Sirsa, Bhiwani, Jhajjar, Nuh, Jind, Hisar, and Rohtak are highly affected by salinity. Five districts- Ambala, Panchkula, Yamunanagar, Karnal and Kurukshetra are not impacted by salinity.



(iv) Inadequate Availability of Water from Dams/Channels

The State of Haryana receives about 11,688 MCM (11,68,800 crore litres) of water from all the rivers against the share of 15,952 MCM (15,95,200 crore litres), out of which 9,356 MCM (9,35,600 crore litres) was delivered to the end users and this difference was partly due to non-construction of SYL Canal and system constraints. The total annual groundwater recharge is estimated at 11,580 MCM (11,58,000 crore litres)/year, thus total surface water and groundwater availability are 20,936 MCM (20,93,600 crore litres) in a year which is inadequate to meet the present demand of 34,963 MCM (34,96,300 crore litres). Efforts are required to be made to get more water from external sources and develop internal water resources by using water-saving techniques.

(v) Low Conveyance Efficiency in Canal Water Supply System

The modernization of the canal network, which is already in progress, should be completed in a holistic manner to further reduce canal and water course losses for proper regulation to have better efficiency. In some areas of the State, inadequate drainage and floods are still problems that must be addressed holistically.

(vi) Low Irrigation Efficiency

Irrigation efficiency at the agricultural field is still low because major irrigation application is still through flood irrigation. In almost all the regions of the State, water-intensive crops are being cultivated against the State's agro-climatic conditions. Though State has already taken a lead in popularizing micro irrigation, sustained efforts are needed to shift farmers from flood irrigation to micro irrigation. The present practice of levying irrigation charges as per the crop area also needs to be changed to volumetric charges.

(vii) Single Pipeline System for Storm Water and Sewerage

In a single pipe, wastewater from homes, companies, and industries is combined with runoff from roofs in a conventional sewer system. Stormwater and wastewater are both transported together to the sewage treatment facility during dry weather. However, the massive amounts of runoff and the increasingly regular severe rains could overwhelm a combined sewer system's capacity. The overflowing untreated water then drains into rivers or, worse, on the streets causing floods.

(viii) Inadequate Reuse of Treated Waste Water

Haryana State Government issued the Reuse of Treated Waste Water Policy 2019 with a goal to achieve 50% reuse of TWW by 2025 and 80% reuse of TWW by 2030. However, only 15.09% (62.16 MCM or 6,216 crore litres) TWW from the STPs and 24% (8.17 MCM or 817 crore litres) TWW from the CETPs is being reused for non-potable purposes in the State to date. The remaining TWW is being discharged either into the land, nearby rivers or drains. Taking an important step in this direction, the project on the reuse of TWW of 35 STPs with a combined treatment capacity of 338.85 MLD for micro irrigation has been sanctioned for INR 490.53 crores.

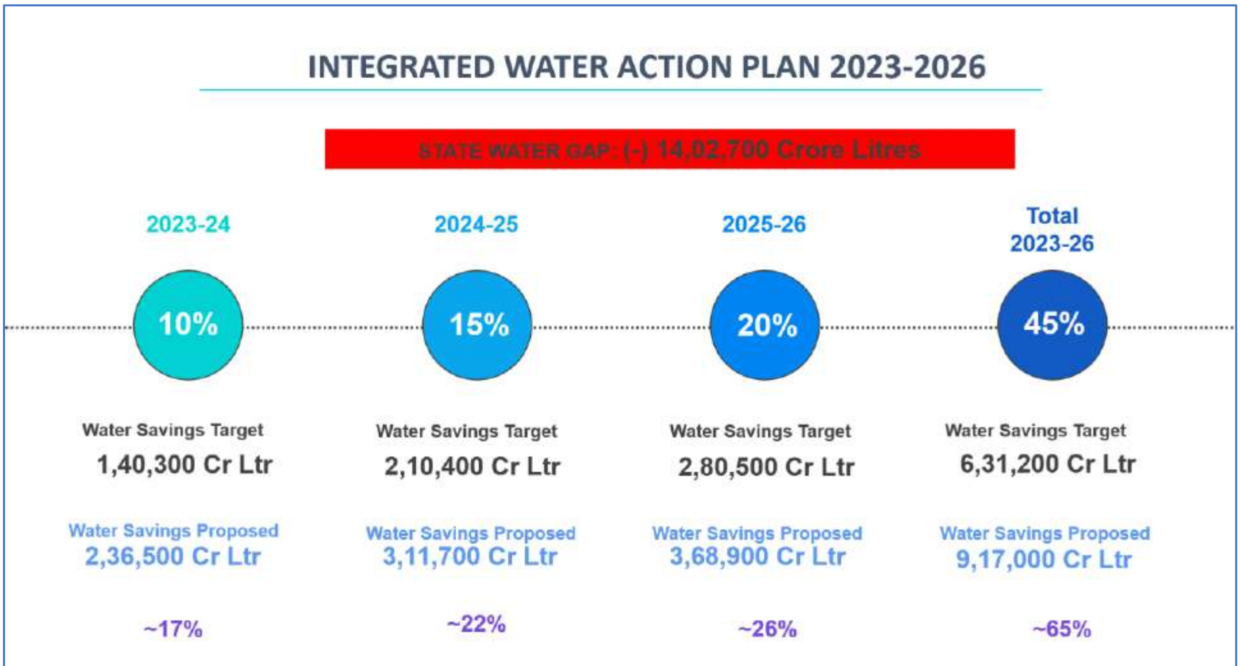
(ix) Lack of Storage Structures to Utilize Runoff for Reuse

The provision of sufficient storage capacity amid increasing water demands and rising climatic variability is one of the State's top priorities in the coming decades. It is projected that in the near future, storage space may need to be multiplied. Water can be kept in large quantities both above ground in reservoirs behind dams and beneath aquifers. Underground storage is regarded to be very environmentally safe and a sustainable approach to tackle any emergency crises under hydrological extremes caused by climatic variability, especially in arid to semiarid locations.

8. Integrated Water Action Plan 2023-26

(i) Action Plan for Water Savings and Conservation to reduce the Water Gap

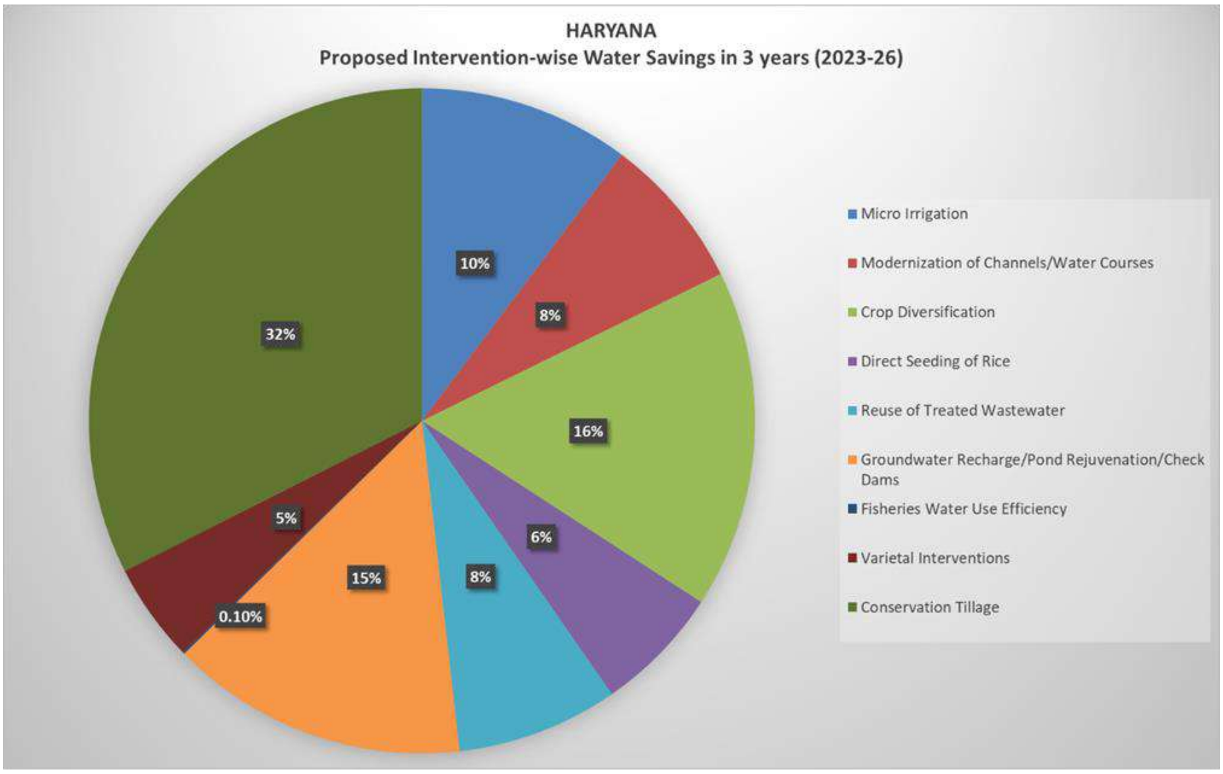
It is targeted to reduce the estimated water gap of -14,027 MCM (-14,02,700 crore litres) by 45% over the following three years, from 2023 to 2026. The target is to save 10% of water (1,402 MCM/1,40,200 crore litres) in 2023-24, 15% of water (2,104 MCM or 2,10,400 crore litres) in 2024-25 and 20% of water (2,805 MCM/2,80,500 crore litres) in 2025-26 accounting total of 45% of water savings of 6,312 MCM (6,31,200 crore litres) by 2025-26. The District Water Resources Planning Committees, chaired by Deputy Commissioners, have prepared an action plan for every block of all districts in the State to accomplish these goals. The State Water Action Plan has then been prepared by combining the proposed block-level water-saving interventions. Total water savings proposed by the districts are exceeding the set targets. Water savings of 2,365 MCM (2,36,500 crore litres) in the first year (2023-24), 3,117 MCM (3,11,700 crore litres) in the second year (2024-25) and 3,689 MCM (3,68,900 crore litres) in the third year (2025-26) with a total of 9,170 MCM (9,17,000 crore litres) in three years are proposed through the implementation of various activities.



Source: DWRPs

When it comes to supply-side water management, many strategies have been used, including reducing water supply losses, increasing storage capacity, recharging groundwater, water harvesting, and wastewater reuse. Rooftop rainwater harvesting, shaft pits, injection borewells, percolation tanks, and harvesting of surface runoff, recharge through ponds/lakes and trenches are various types of groundwater recharge techniques that are proposed by the districts. Demand-side water management, on the other hand, aims to minimize water demand by reducing the amount of water used for agricultural needs which may include activities like micro-irrigation, crop diversification, direct seeding of rice, conservation tillage etc.

The statistical breakdown and percentage share of each intervention for the entire State of Haryana have been given in the figure and table given below. The suggested interventions can be divided into nine main categories, along with the amount of water to be conserved under each and the designated area/number of structures. Both supply-side and demand-side water management initiatives have been taken into consideration in the action plan.



Proposed Interventions	2023-24		
	Water Savings		Target Area/No
	MCM	Crore Litres	
Micro Irrigation (Ha)	237	23700	93349 Ha (230665 Acres)
Modernization of Channels/Water Courses (Ha)	171	17100	285032 Ha (704314 Acres)
Crop Diversification (Ha)	382	38200	61688 Ha (152431 Acres)
Direct Seeding of Rice (Ha)	104	10400	42208 Ha (104296 Acres)
Reuse of Treated Wastewater (MCM)	179	17900	179 MCM (17900 Crore Litres)
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	388	38800	9369 No.
Fisheries Water Use Efficiency (Ha)	4	400	121 Ha (299 Acres)
Varietal Interventions (Ha)	94	9400	134468 Ha (332270 Acres)
Conservation Tillage (Ha)	806	80600	446590 Ha (1103524 acres)
Total	**2365**	**236500**	

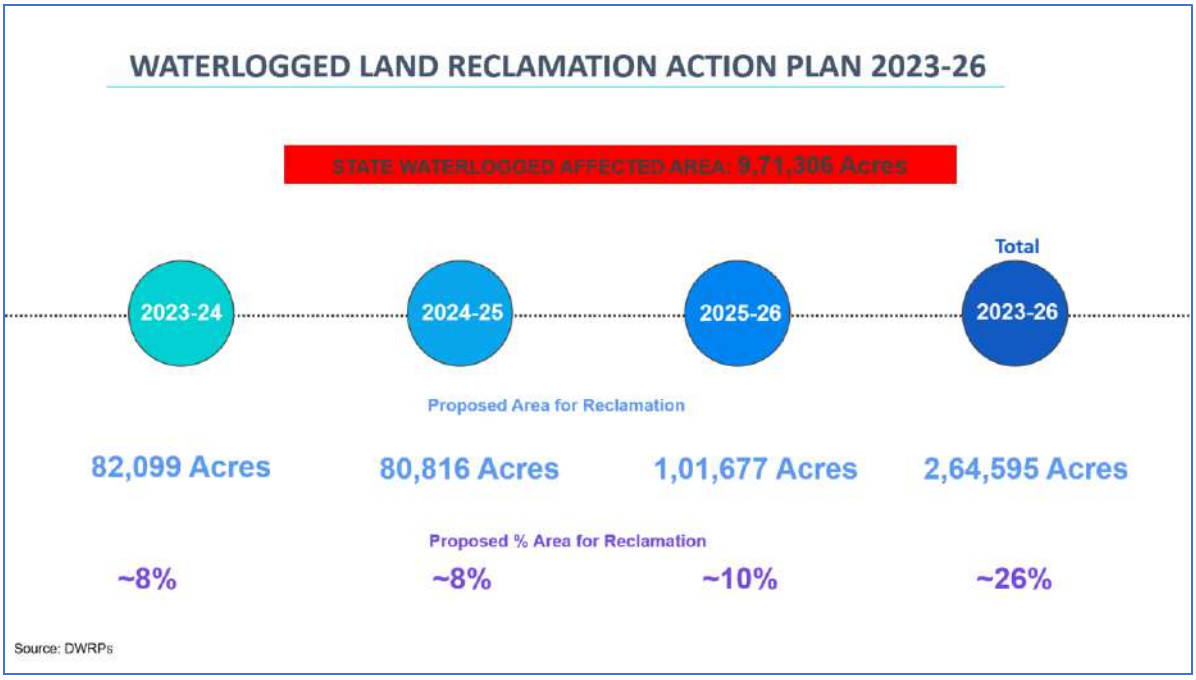
Proposed Interventions	2024-25		
	Water Savings		Target Area/No
	MCM	Crore Litres	
Micro Irrigation (Ha)	318	31800	113597 Ha (280698 Acres)
Modernization of Channels/Water Courses (Ha)	271	27100	196115 Ha (484600 Acres)
Crop Diversification (Ha)	511	51100	77947 Ha (192607 Acres)
Direct Seeding of Rice (Ha)	198	19800	78292 Ha (193460 Acres)
Reuse of Treated Wastewater (MCM)	249	24900	249 MCM (24900 Crore Litres)
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	451	45100	9274 No.
Fisheries Water Use Efficiency (Ha)	4	400	124 Ha (306 Acres)
Varietal Interventions (Ha)	135	13500	155600 Ha (384488 Acres)
Conservation Tillage (Ha)	979	97900	495394 Ha (1224119 Acres)
Total	**3117**	**311700**	

Proposed Interventions	2025-26		
	Water Savings		Target Area/No
	MCM	Crore Litres	
Micro Irrigation (Ha)	385	38500	128358 Ha (317173 Acres)
Modernization of Channels/Water Courses (Ha)	244	24400	173978 Ha (429900 Acres)
Crop Diversification (Ha)	616	61600	91423 Ha (225906 Acres)
Direct Seeding of Rice (Ha)	264	26400	103801 Ha (256492 Acres)
Reuse of Treated Wastewater (MCM)	291	29100	327 MCM (32700 Crore Litres)
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	486	48600	9655 No.
Fisheries Water Use Efficiency (Ha)	2	200	62 Ha (153 Acres)
Varietal Interventions (Ha)	210	21000	189137 Ha (467358 Acres)
Conservation Tillage (Ha)	1191	119100	564273 Ha (1394319 Acres)
Total	**3689**	**368900**	

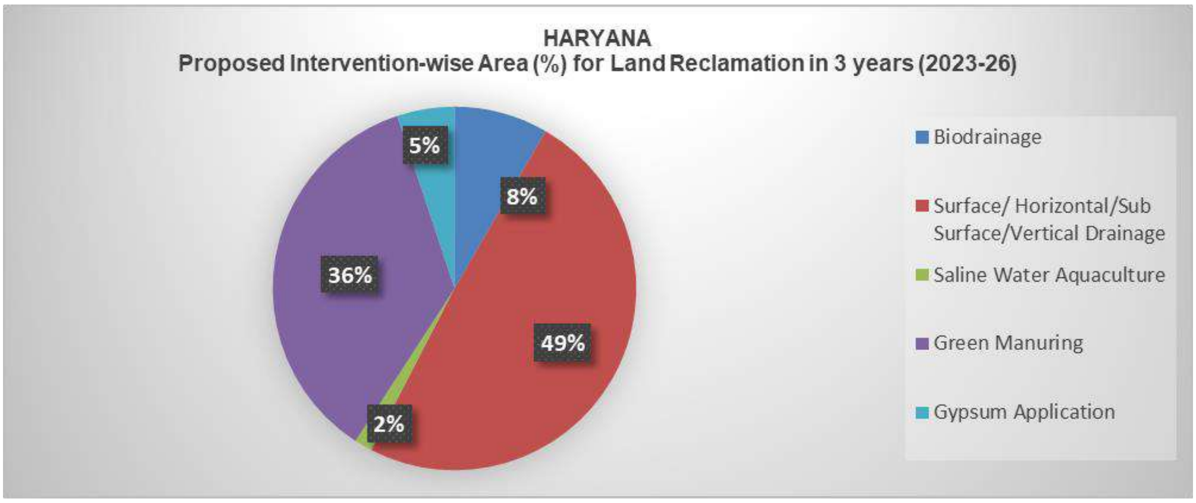
Proposed Interventions	Total in three years - 2023-26		
	Water Savings		Target Area/No
	MCM	Crore Litres	
Micro Irrigation (Ha)	940	94000	335304 Ha (828536 Acres)
Modernization of Channels/Water Courses (Ha)	685	68500	655125 Ha (1618814 Acres)
Crop Diversification (Ha)	1509	150900	231058 Ha (570944 Acres)
Direct Seeding of Rice (Ha)	566	56600	224301 Ha (554248 Acres)
Reuse of Treated Wastewater (MCM)	720	72000	720 MCM (72000 Crore Litres)
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	1326	132600	28298 No.
Fisheries Water Use Efficiency (Ha)	9	900	306 Ha (756 Acres)
Varietal Interventions (Ha)	439	43900	479204 Ha (1184113 Acres)
Conservation Tillage (Ha)	2976	297600	1506257 Ha (3721961 Acres)
Total	**9170**	**917000**	

(ii) Action Plan for Land Reclamation from Water Logging and Salinity

The problem of water logging and groundwater salinity is having a significant negative impact, rendering most of the otherwise useful land worthless. According to the report of GWC, I&WRD, there are waterlogging conditions across 8.89% of the State's territory in June 2020. The farmers have suffered significant losses as a result of waterlogging in their fields. A separate, three-year action plan for 2023-26 has been formulated to recapture the damaged area in recognition of the urgency of the situation. The figure illustrates the designated target area for land reclamation in the next three years.



For reducing waterlogging and groundwater salinity in the State, the districts have recommended a variety of strategies including bio-drainage, vertical drainage, sub-surface drainage, saline water aquaculture, and green manuring.



Proposed Interventions	Proposed Land Reclamation Area							
	2023-24		2024-25		2025-26		Total 2023-26	
	Ha	Acre	Ha	Acre	Ha	Acre	Ha	Acre
Bio Drainage	2637	6516	2904	7175	3418	8445	8958	22136
Surface/ Horizontal/ Sub-Surface/ Vertical Drainage	14262	35242	16596	41009	21850	53992	52709	130244
Saline Water Aquaculture	415	1025	566	1398	718	1774	1699	4197
Green Manuring	14334	35420	10841	26787	13084	32331	38259	94537
Gypsum Application	1577	3896	1800	4449	2078	5136	5455	13480
Total	**33225**	**82099**	**32706**	**80817**	**41149**	**101678**	**107080**	**264595**

9. Strategy and Approach to Achieve Water Security

The strategic intervention for sustainable development in the water sector would entail actions at the following levels: a) policy; b) legislation where necessary; c) institutional; d) infrastructural supported by technical innovation; and e) continuous scientific research. Chapter 11 explains these suggested actions in more detail with the goal of improving the water situation in the State of Haryana.

Effective Policy and Governance

Effective evidence-based policymaking and governance are essential for managing the limited supply of water resources. Water-related policies and laws need to be reviewed from the ground up in light of the most recent developments. The following are the key proposals for policy:

(i) Incentivizing Cultivation of Sugarcane using Drip Irrigation

In the State of Haryana, sugarcane is grown in a number of locations, including Yamunanagar, Charkhi Dadri, Ambala, Karnal, Kaithal, Sonipat, and Jind, among others. These locations are characterised by the prevalence of fresh groundwater in all strata, making the cultivation of sugarcane crops a very lucrative option. According to CCSHAU standards, sugarcane has the greatest crop water need at 1500–2500 mm.

Using drip irrigation lead to 50% of higher yields as compared to furrow irrigation and also uses up to 50% less water. It is highly recommended to formulate appropriate policy measures to cultivate sugarcane using drip irrigation throughout the State. It is required to be addressed through various measures such as incentivizing farmers through interest-free loans with budgetary support for specific regions of the State.

(ii) Incentivizing Direct Seeding of Rice on Drip Irrigation

The method of Direct Seeding of Rice (DSR) increases paddy productivity by 5–10% while using 15–20% less water for irrigation, improving percolation, reducing the need for agricultural labour, and enhancing soil health. Utilizing drip irrigation technology with this DSR is another development that saves more water and improves output due to little nitrogen loss during fertigation.

The farmers must be encouraged to plant paddy utilising drip irrigation in the DSR during the upcoming Kharif season. If the farmers continue to choose DSR utilising the drip method, they should receive incentives for at least three years. Planning should also include demonstration and training plots to help farmers implement systems. In order for the widespread adoption of these technologies to be reproduced, farmers should be recognised as champion farmers.

(iii) Incentivizing Crop Diversification

In order to encourage farmers to cultivate less water-intensive crops like maize, bajra, cotton, pulses, vegetables, and horticulture rather than water-intensive crops like rice, the Haryana government introduced the Mera Pani Meri Virasat Yojana in the year 2020. The years 2021 and 2022 saw the continuation of the plan.

It is recommended that Mera Pani Meri Virasat be expanded to include farmers who have been diversifying their crops for at least three years. In the NCR, specifically in the districts of Gurugram, Faridabad, Rewari, and Mahendragarh, at least 10% to 15% of the land should be developed for drip-irrigated horticulture.

(iv) Promoting and Incentivizing Conservation Tillage

One of the main benefits of conservation tillage over traditional tillage is water savings. It includes options like laser levelling, bed planting, and zero tillage. The conservation tillage can potentially save 20–25% of irrigation water, according to CCSHAU, Hisar.

A farmer's mindset can be a significant obstacle to the adoption and success of conservation tillage systems. Farmers will need to be made aware of various facets of conservation tillage methods. Technical assistance may be provided by professionals like extension agents, agricultural consultants, and researchers. The biggest challenge is putting new knowledge and methods into practice on farms. A key strategy is to test new techniques on a small area of the farm. Farmers must be assisted in establishing and maintaining conservation practises by a special programme/plan that includes education, and financial incentives.

(v) Incentivizing Natural Farming and providing Adequate Marketing Facilities

Natural farming uses a diversity of plants to cover the soil, support one another, and use less water by evaporating less water wastefully. A proposal to encourage natural farming on 50,000 acres of land has been developed by the Haryana government.

To promote the use of organic on-farm inputs for farming without chemicals, financial support should be offered for three years for a variety of products, including seeds, bio-fertilizers, bio-pesticides, organic manure, compost/vermicompost, herbal extracts, etc. The State government should also assist the farmers with marketing their produce, certification, and training.

(vi) Affordable Soil Moisture Sensors

To plan irrigation systems efficiently, farmers must be aware of the amount of soil moisture on their land. Farming operations can be substantially simplified and expenditures can be reduced by using soil moisture sensors to assess water levels. It works well for ensuring the best water supply. These field sensors offer accurate, real-time field data on the soil moisture state, indicating when irrigation should start and stop and when crops are at risk of stress.

This could enable the farmer to boost output while conserving water and other resources. Farmers should be able to afford this technology so they can grow more crop each drop.

(vii) Building Water Storage with Low Evaporation Rate

There is a significant amount of surface/rooftop runoff produced from building roofs, paved and unpaved areas, but it is not being utilised to the extent needed. Significant amounts of water can be stored either above ground, in reservoirs behind dams, or underground, in aquifers.

a. Utilizing Surface//Rooftop Runoff for Underground Storage or Aquifer Recharge

- Compulsory underground storage or groundwater recharge structures can be taken up by all the institutions, universities, tourism complexes, shopping malls, hospitals, hotels, banquet halls, service stations etc. having an area of more than one acre.
- Compulsory water harvesting in rural areas by the Panchayati Raj Department on a similar concept of Building Code for urban areas.
- O&M should be made mandatory along with a provision to systematically monitor these structures in the Building Code.
- Systematic Identification of open areas/grounds to construct artificial underground water storage tanks for saving evaporation losses. The top of such reservoirs can be used for cricket stadiums, parks, gardens, sports complexes etc.
- Utilization of unused/defunct tube wells for recharge to the groundwater using excess rainfall during the rainy season. This may be made compulsory for PHED, HSVP, GMDA, FMDA and Education Institutions, especially in areas where there is no scope for groundwater contamination

b. Storage in Palaeochannels

It has been established that palaeochannels in semiarid to arid areas provide favourable geohydrological conditions for replenishment by rainfall collection methods as well as imported water through the canal and its distributaries. The unsaturated region of palaeochannel deposits can serve as a reservoir for artificial recharge that will help supplement supplies of groundwater.

As per studies undertaken by the Government of India, large amounts of water can be artificially refilled in the State of Haryana by Palaeochannels by redirecting flood waters from non-committed surface water resources. These Palaeochannels need to be thoroughly studied using cutting-edge geophysical, hydro-geological, and geomorphological investigations. The Yamuna, Markanda, and Sarsuti rivulets, as well as any other relevant places of interest, should be the focus of potential inquiry. The recharge would restore the lost river and deteriorating ephemeral riverine features, increasing the area's groundwater supply while also allowing the disrupted and vulnerable natural system to recover.

c. Trees as Wind Breaker

Wind is one of the most significant variables influencing the rate of water surface evaporation loss. The amount of water lost through evaporation increases with air movement over the water's surface. It has been discovered that planting trees in a direction normal to the wind is a successful strategy for reducing evaporation loss.

Tree planting along the canals is advantageous on two fronts: first, it increases the state's green cover; second, it aids in lowering canal evaporation. It is suggested that the Forest Department should grow trees alongside canals so that they serve as windbreakers for the canals thereby lowering the evaporation rate.

d. Reduction of Exposed Water Surface

Shallow portions of the reservoirs are isolated/curtailed by the construction of dykes/bunds at suitable locations to accumulate water during the monsoon season and then diverted / pumped to an appropriate deeper pocket in the summer months. This reduces the exposure of shallow water surface area resulting in a reduction in evaporation. This approach has been used successfully to bring water to Surendranagar from the Nayka reservoir in Gujarat.

It is suggested that all water bodies be adequately deep in order to lower net evaporation. The PHED, HSVP, and HSIIDC should build water storage tanks with adequate depth for preservation in mind. This would be beneficial in two ways: first, relatively lesser land would be required, and second, evaporation losses would subsequently decrease.

e. Sub-surface Dams

In order to store groundwater and recharge the nearby limited aquifers, sub-surface dams /underground check dams have been built in Maharashtra, Andhra Pradesh, Gujarat, and even in the Morni area of Haryana. Following the brief monsoon, a considerable increase in water levels was seen in Talaja, Gujarat. The main benefit of this approach is that it can completely prevent the loss of valuable lands and forest areas due to surface submersion. It is suggested that similar sub-surface dams should be built in Shiwalik hill areas, including Aravalli, to meet the region's irrigation needs.

f. Integrated Operation of Reservoirs

This method is suitable for a system of reservoirs which can be operated in an integrated way. The method consists of operating the reservoirs in such a way that the total exposed water surface area is kept to the minimum for the system as a whole. Consequently, evaporation loss gets minimized. For achieving this objective water use should be planned in such a way that shallow reservoirs with large water spread areas are depleted first. This method has been successfully practised by Mumbai Municipal Corporation and Chennai Metropolitan Water Supply and Sewerage Board in their water supply scheme. It is recommended that PHED should use multiple reservoirs and initially empty the shallow reservoirs to reduce evaporation losses.

g. Treatment with Chemical Water Evapo-Retarders

Chemicals that can create a thin mono-molecular coating have been proven to be efficient at lowering water surface evaporation loss. Evaporation loss is decreased as a result of the film's ability to reflect energy from the atmosphere. Aquatic life is not harmed by the film since it allows sufficient air to circulate through it. The film created with fatty alcohols of various grades has been proven to be the most effective for regulating evaporation. This method may be tried on a pilot basis keeping in mind public safety first.

(viii) Reducing Dependence on Groundwater and replacing it with Surface Water for Irrigation Needs

Despite the fact that canal water supply systems run through the districts of Karnal, Kurukshetra, and Kaithal, the irrigation demands of these districts are largely met by groundwater. The main cause is that either there are no water channels/they are in poor shape in these places. Electricity supply costs are kept to an absolute minimum, which also encourages groundwater extraction. Groundwater levels in these three districts have been excessively depleted as a result of overexploitation. Therefore, it is crucial to entirely stop groundwater extraction in these areas and take the required steps to switch to a 100% canal water supply for irrigation needs.

(ix) Efficient Regulation and Distribution of Water in Command Areas

The water supplied and losses should be correctly accounted for among various head works to determine how it is distributed among channels. Field officers at the level of Sub Divisional Offices of I&WRD, A&FWD and other water user departments and research officers of agriculture universities should work together with farmers in villages to assess their requirement for water.

At the district level, a special cell in the office of the Deputy Director of A&FWD should be established where staff members would regularly evaluate the water needs of crops and submit requests for various canals to the Executive Engineer of I&WRD. Additionally, I&WRD should plan water deliveries in the channels in accordance with the information provided by A&FWD.

(x) Reclamation of Water Logging Affected Areas

A combination of the following short-term, medium-term and long-term measures are recommended by the high-level expert committee to deal with the twin problems of waterlogging and groundwater salinity.

- Reduce canal water supply by 25% from mid-July to mid-September and December-February in the districts of Rohtak, Jhajjar, Hisar, Sirsa and Jind. The canal water thus saved should be diverted to the water deficit area like Charkhi Dadri, Mahendargarh, and Nuh.
- Conjunctive use of canal water and saline water by mixing fresh water with marginal to sub marginally quality water from a shallow tube well and then irrigating the field through a micro-irrigation system.
- The effective and efficient lining of canals and watercourses and their periodic maintenance for checking seepage losses.
- Prohibit flood irrigation and promote micro-irrigation techniques
- Adopt crop diversification to shift from growing water-intensive crops.
- Installation of an appropriate surface and sub-surface drainage system.
- Use of bio drainage technology - crop types that may produce lucrative yields even in salt-affected soils have been produced by CSSRI and other institutions to a certain extent. In the first year of 2023 Kharif and 2023–2024 Rabi, an area of approximately 10%–15% may be planted with salt-tolerant crops. These seeds must be ordered in advance from CCSHAU (Hisar) and CSSRI (Karnal).
- Prominent steps should be taken to promote fish farming of saltwater species. Farmers would need financial aid and a necessary support system to adopt this alternate livelihood option. This could help the area's poor farmers to regain their lands and establish a stable income.

- A network of drains and ditch drains in the area should be created to the extent that the excessive rain/ flood water does not remain standing for a longer period.
- Constructing balancing/storage reservoirs at appropriate sites in canal command areas for storage of surplus canal and flood water for its subsequent use.

(xi) Urban Water Management

Urban Water Management requires equal attention, and specific plans for urban areas must be formulated. This would require a comprehensive and cross-sectoral strategy connecting urban water management with overall urban planning.

a. Comprehensive and Integrated Urban Water Planning

Plans for the complete and integrated management of urban water resources must be developed immediately to address issues with water availability and quality. In accordance with the GoI Scheme AMRUT 2.0, PHED should create water action plans for each of the 144 towns in Haryana in close collaboration with the other organisations in charge of the town's water supply, management, and treatment (ULB, T&CP, HSVP, GMDA, FMDA, & MCs). Priority should be given to municipalities with a population of greater than 100,000.

b. Introducing Block Tariff System based on Consumption of Water

Block Tariff System could be an important tool for improving water use efficiency, enhancing social fairness, increasing water use efficiency, and ensuring the financial viability of water utilities and operators. Increasing Block Tariff (IBT) as a type of step-wise volumetric charge is commonly used in many countries. This scheme categorises water use into blocks or tiers, with higher consumption resulting in higher prices per unit of water. The price of water is the lowest for the amount in the first block. Higher blocks would serve as an incentive to conserve water and compensate for the first block's price. The poor would benefit from the first block's subsidized price. Higher blocks would make up for the cost of the initial block and act as an incentive to conserve water. The subsidised pricing of the first block would help the poor. Higher blocks will cost more for those who consume more water, balancing out the first block's reduced price. However, deciding on the features of an IBT would require careful analysis. In conclusion, IBT is successful in encouraging households to use less water wastefully and to boost affordability.

c. Punitive Action to Prevent Misuse of Water

It is suggested to prohibit the following activities, especially during the lean season to prevent the wastage of water. The violation of the ban should attract a penalty and can lead to the water supply being cut off. The fine can be added to the water bills.

- Washing of vehicles, courtyards
- Watering of lawns
- Waste/misuse of water for any other reason
- Overflow from overhead/ underground water tanks
- Leakage from the water meter chamber and desert cooler
- Wastage of water due to non-installation of bib taps
- Installation and use of booster pump on the water supply line

d. Shift from Ground Water to Canal Water based Drinking/Domestic Water Supply

Urban townships', peri-urban areas and even industrial estates are heavily dependent on groundwater for their drinking and domestic water needs. To fulfil the expanding water needs of the urban population, it is necessary to switch from groundwater to canal-based drinking water supply systems to lessen the pressure on aquifers. Monsoon season brings surplus water which goes down the drains and gets wasted. Instead, that water might be effectively used to feed towns, peri-urban areas, and cities, at least during that rainy season.

(xii) Reuse of Treated Waste Water

An implementation plan for the utilisation of treated wastewater should be formulated in light of the enormous amount of unutilized treated wastewater that is available in big cities in order to lessen reliance on freshwater sources. The following policy actions are necessary:

- The addition of a Dual Pipeline System in Drainage (one for grey water and the other for sewage/black) for Industries should be made in the T&CP license conditions.
- Strict enforcement of the following mentioned T&CP conditions should be done:
    - reuse of TWW in construction/ infrastructure projects.
    - water from waste pipe (grey water) shall be treated in a treatment plant within the premises and reused within premises of group housing, commercial, institutional and industrial buildings.
- PHED can plan and implement access to the Dual Water Supply System (one for potable water and the other for TWW) in new Housing/Office Complexes/Business Establishments as per the TWW Policy 2019.
- Promote the reuse of Treated Waste Water in Agriculture in peri-urban areas.
- A large quantity of fresh water is being utilised by power plants. This water needs to be substituted by TWW of optimum water quality by December 2024.
- Decentralised STPs in villages with an existing population of over 10,000 should be administered by Gram Panchayat.

Institutional Strengthening

(i) Incentivizing Local-Level Participation

Village Water and Sanitation Committees (VWSC)/Pani Panchayats should have a legal status and should be recognised fully by the concerned administrative authorities. Special funds should be provided to ensure their continuous participation, functioning, and sustainability.

(ii) Assigning Responsibility and Accountability at Panchayat Level

Panchayats/local bodies should be assigned to take responsibility for judicious use, recharge, water conservation, and prevention of runoffs. The heads/*panchs* should be educated about different methods of water treatment, conservation, and recharge techniques that will then be put into practice on a local level in the village. There needs to be a mechanism for accountability for water conservation and a penalty for water wastage.

(iii) Effective Functioning of Water User Associations

Water Users' Association (WUA) has been formed and registered in Haryana for the purpose of Participatory Irrigation Management (PIM) for conserving and optimal utilization of resources. However, WUAs are not functioning properly due to a lack of funds/grant/administrative structure and legal sanctity.

It is necessary to provide an enabling environment through policy resolutions, particular programmes, projects, and activities that the government will undertake/promote. It is suggested that by establishing legal and administrative laws and procedures, the WUAs should be placed within a legal framework similar to what is done in the States of Tamil Nadu and Gujarat. To encourage widespread farmer engagement, massive awareness-raising and marketing campaigns must be launched.

(iv) Information, Education, and Communication

- To accomplish participatory water management, it is crucial to invest in bolstering local institutions' capacity. Planning recurrent Jal Samvad campaigns to raise awareness is necessary to engage the community.
- Regular training sessions at the Haryana Irrigation Research and Management Institute in Kurukshetra (HIRMI)/the Haryana Institute of Public Administration (HIPA) for officers/officials of various line departments to inform them of the serious condition of growing water scarcity.
- To ensure water-sensitive decision-making, it is also crucial to sensitize the MLAs and elected officials from Panchayati Raj Institutions.

(v) Interdepartmental Collaboration and Cooperation

To ensure openness, accountability, and agreement for all decisions on the management of water resources, it is also crucial to establish the required mechanisms for stakeholder participation and discussion. Furthermore, cooperation with numerous line departments is necessary to promote partnerships and the convergence of programmes and schemes.

(vi) Formation of Cross-Sectoral and Interdepartmental Committees

- Dwivarshik Jal Prabandhan Yojana Monitoring Committees one at the level of Hon'ble CM and another headed by the W/Chief Secretary to Government of Haryana should be formed to monitor the implementation of the action plan in the next two years.
- The constitution of the committee headed by the Hon'ble Chief Minister is suggested as follows:

1.	Hon'ble Chief Minister	Chairman
2.	Irrigation & Water Resources Minister	Member
3.	Finance and Planning Department Minister	Member
4.	Education Minister	Member
5.	Agriculture and Farmer Welfare Minister	Member
6.	Forests & Wildlife Minister	Member
7.	Cooperation Minister	Member
8.	Public Health Engineering Minister	Member
9.	Development & Panchayats Minister	Member
10.	Chief Secretary to Govt. Haryana	Member
11.	Chief Principal Secretary/Principal Secretary to Chief Minister, Haryana	Member
12.	Advisor (Irrigation) to. Hon'ble Chief Minister	Member
13.	Chairperson, Haryana Water Resources Authority	Member
14.	Administrative Secretary, Irrigation & Water Resources Department	Member
15.	Administrative Secretary, Finance and Planning Department	Member
16.	Administrative Secretary, Agriculture and Farmer Welfare Department	Member
17.	Administrative Secretary, Forests & Wildlife Department	Member
18.	Administrative Secretary, Cooperation Department	Member
19.	Administrative Secretary, Public Health Engineering Department	Member
20.	Administrative Secretary, Development & Panchayats Department	Member
21.	Administrative Secretary, School Department	Member
22.	Member(s), Haryana Water Resources Authority	Member
23.	Engineer-in-Chief, Irrigation & Water Resources Department, Haryana.	Member Secretary

- The constitution of the committee headed by the W/Chief Secretary to Govt. Haryana is suggested as follows:

1.	Chief Secretary to Govt. Haryana	Chairman
2.	Advisor (Irrigation) to Hon'ble Chief Minister	Member
3.	Chairperson, Haryana Water Resources Authority	Member
4.	Principal Secretary to Chief Minister, Haryana	Member
5.	Administrative Secretary, Irrigation & Water Resources Department	Member
6.	Administrative Secretary, Finance and Planning Department	Member
7.	Administrative Secretary, Agriculture and Farmer Welfare Department	Member
8.	Administrative Secretary, Forests & Wildlife Department	Member
9.	Administrative Secretary, Cooperation Department	Member
10.	Administrative Secretary, Development & Panchayats Department	Member
11.	Administrative Secretary, Public Health Engineering Department	Member
12.	Administrative Secretary, School Education Department	Member
13.	Member(s), Haryana Water Resources Authority	Member
14.	Special Secretary, Finance and Planning Department	Member
15.	Director, Agriculture and Farmer Welfare Department	Member
16.	Principal Chief Conservator, Forests & Wildlife Department	Member
17.	Registrar, Cooperation Department	Member
18.	Engineer-in-Chief, Public Health Engineering Department	Member
19.	Engineer-in-Chief, Irrigation & Water Resources Department, Haryana.	Member Secretary

- This committee will support the committee headed by the Hon'ble Chief Minister, Haryana and regularly review the functioning of various departments to achieve the ultimate objectives of the Dwivarshik Jal Prabandhan Yojana 2023-25.

(vii) Constitution of Advisory Board

As per the Draft "The Haryana Water Resources (Conservation, Regulation & Management) Authority, Rules, 2022", the Chairperson/the Authority may constitute the Advisory Board, with such experts, official or non-official, to render advice to the Chairperson/Authority in matters related to, however not limited to, groundwater and surface water, improving the quality and availability of water and any other issue referred to the Advisory Board by the Chairperson/Authority. The constitution of the board should consist of water experts from various national and international institutes and organizations.

(viii) Involvement of Hydrologists and Geohydrologists in Decision Making

To effectively safeguard and manage both surface and groundwater resources there is a need to involve and employ qualified geohydrologists and hydrologists in the design and implementation of initiatives and plans relating to water both at the district and headquarter level. The Ground Water Cell needs to be strengthened.

The youth can be effectively involved in the system by building their capacities through training programmes and support from Panchayats and other community institutions. They may be referred to as "Jal Sahyogi", they will have education and training in conventional water management methods and geohydrology. This could be achieved through effective institutional backing and funding.

(ix) Introducing System of Audit

To assess the effectiveness of government schemes and programmes, it is crucial to compare official records with the actual situation on the ground. Additionally, this will increase the system's accountability and openness. Also, to measure its actual impact on the ground, a third-party audit may be conducted to widen the scope of the social audit to cover all state-wide water conservation and saving programmes.

(x) Inter-state Water Issues

As the major water resources of Haryana state are external, the long pending issues need to be resolved by inter-state co-operation and co-ordination-

- The issue of completion of the SYL Canal is important as Haryana is utilizing only 2.0 BCM (2,00,000 crore litres) Ravi Beas water against the share of 4.72 BCM (4,72,000 crore litres).
- The award of the Ravi Beas Tribunal was given by the Tribunal in 1987 but it couldn't be notified because of the pendency of clarifications under section 5(3) of the interstate disputes act. The tribunal award is yet to be notified after the disposal of the pending clarifications by the Hon'ble Tribunal.
- Commissioning of BML Hansi-Butana Branch Multipurpose link Channel which is pending due to a stay of court due to objections raised by the State of Punjab.
- Transfer of control of headworks of Ropar, Harike & Firozpur to BBMB from Punjab for transparent water delivery and accounting.
- Recalibration of discharge tables of parent channels to receive indented supplies to the State.
- To speed up the construction of three up-storage dams i.e. Renuka Dam, Kishau Dam and Lakhawar-Vyasi Dam on the Yamuna River in Himachal Pradesh & Uttarakhand.
- Construction of three no. small dams i.e. Lohgarh, Dhanuara & Adi Badri Dam on the tributaries of Yamuna river in Himachal Pradesh.
- Clearance for construction of five no. dams i.e. Dewanwala dams, Dangarana Dam, Khetpurali Dam, Dudhgarh Dam and Bhud Dam on the tributaries of Ghaggar river in Ghaggar Standing Committee.

Infrastructure Development

The building of sustainable infrastructure with adequate financial support plays an important role in meeting the demands of multiple sectors in order to fulfil needs for flood water management, drought resilience, safe and adequate water supply, energy security and ecosystem services. This includes developing sustainable infrastructure for irrigation, energy, groundwater recovery, flood management, water supply, wastewater treatment, reclaiming saline soil and water, rainwater harvesting and natural systems (e.g. ponds, wetlands, floodplains and catchment restoration).

(i) Ground Water Monitoring using Piezometers

Piezometers are one of the essential elements in the monitoring of groundwater. Piezometers must be installed in both urban and rural locations to effectively monitor and manage this vital resource.

(ii) Enhancing the Efficiency of Channels

There are many channels in the districts of Yamunanagar. Ambala etc., which are still unlined channels. These should be repaired periodically to reduce seepage losses which are computed to be about 21% in the canal network. Reduction in seepage losses of channels will conserve water for other uses. I&WRD is already taking up the work of lining the Channels to reduce seepage losses, but it needs to be expedited.

(iii) IoT-Based Operation and Maintenance

HSVP, Haryana is using IoT based system in Panchkula for O&M of all groundwater extraction units. It helps in improving water management and bringing efficiency to the use of groundwater by enabling the utilities to detect water leakage, monitor water quality and bring transparency to consumption. Similar interventions are required to be introduced for other cities as well by the concerned departments.

(iv) Modernized Laboratories

For accurate assessment and monitoring of key water-related factors, laboratories need to be updated with cutting-edge geophysical and chemical equipment.

(v) Recharging Groundwater East of NH-44 from Gharaunda to Sonipat

Due to intensive paddy farming and insufficient canal water supplies, there has been groundwater depletion between NH-44 and the river Yamuna, from Gharaunda to Sonipat. Following the addition of 5,000 cusecs to the WJC system's capacity, enough water will be accessible throughout the monsoon season. If canal water is provided for paddy cultivation in the area during the Kharif season, the water level in this area can be stabilised. For this reason, the following Kharif channels can be built for this area:

- Gharaunda Kharif Channel- A Kharif channel of adequate capacity can be planned from the Augmentation canal opposite Madhuban up to Panipat town which can supply adequate canal water during the Kharif season to reduce pressure on the groundwater.

- Samalkha-Ganuar Kharif Channel- A Kharif channel can also be constructed from Parallel Delhi Branch opposite Panipat to run in the Samalkha and Ganuar areas for Kharif irrigation of the command area lying between NH-44 and river Yamuna.

(vi) Storage of Excess Rain/Flood Water

- The additional storage capacity can be created in the groundwater reservoir by allowing and arranging for bigger swings in water levels/ by allocating more room for surface water.
- In addition to the volume realised for storing peak rainfall in the water system, a volume of water must be kept for seasonal storage. The extra volume can be produced by planning and allowing for greater variations in the level of the water/by allotting more space for surface water.
- The State must properly store excess Yamuna water provided through canals during the monsoon season for direct usage and groundwater recharge. The state's existing bodies of water, including Khaparwas Lake, Bhindawas Lake, Sultanpur Lake, Badkhal Lake, Masani Barrage Lake, and storage made by bunds in the Gurugram, Rewari, and Narnaul districts, can all be used to store this water. Village ponds and other similar ponds can also be used to store this water.
- There are several drains that remove excess rainwater runoff from areas like Karnal, Kurukshetra, etc. that are water-scarce. To capture all the rainwater runoff leaving these districts, adequate recharge structures should be built in these drains. More groundwater structures are needed to be constructed in this area in consultation with CGWB.

(vii) Dams on River Yamuna

Presently no storage has so far been constructed on river Yamuna. However, three storages, namely Renuka dam, Kishau dam and Lakhwar dam have already been planned and are at various stages of approval and construction. Urgent action is needed to expedite their construction and resolve the pending matters.

(viii) Construction of Other Dams

The following mentioned proposed dams by I&WRD could increase the availability of water and thus will help to reduce the existing water gap.

- Construction of seven small dams- Hathnikund, Chikan, Kansali, Ambawali, Nagli, Khillanwalla and Darpur

- Construction of five dams - Dewanwalla, Dangrana, Khetpurali, Dudhgarh and Bhud dam
- Construction of three dams' tributaries of the Yamuna river in Himachal Pradesh – Lohgarh, Dhanaura and Adibadri
- There is also a scope of check dams in foot-hills to Shiwalik and Aravalli hills to store water to serve the local area

(ix) Interconnecting water channels and ponds

Potential sinks (such as other rivulets, ponds, percolation tanks, etc.) should be discovered after identifying watershed dynamics and surplus capacity in the current channels during the monsoon and for doing so quickest route to the sink should be chosen. Interlinking will reduce flooding by increasing percolation which will also boost groundwater recharging.

Research in New Vistas

By stepping up research efforts in a number of areas, such as the following, the frontiers of knowledge need to be advanced in multiple directions for tackling specific issues to achieve their long-term sustainability.

a) Tackling water logging and salinity in the affected areas to reclaim the land and improve soil and water salinity.

b) Adoption of appropriate agriculture practices, block-wise/district wise as per varied Agro-hydro Climatic Zones.

c) There is less knowledge regarding the behavioural patterns of deeper aquifers and their recharge capabilities. Extensive research is required to understand recharge mechanisms based on the aquifer geometries so that flood water can optimally recharge the deeper aquifers.

d) Analysis of total aquifer recharges with respect to the decline in groundwater levels.

e) Realistic estimation of groundwater draft and recharges.

f) Detailed studies need to be undertaken along the Palaeochannels to investigate areas around Markanda, Sarsuti, Yamuna rivulets and other similar areas of interest to ascertain their feasibility for artificial recharge.

g) Identification of new advanced techniques for catching/tapping flood waters, removing excessive silt content online/offline and creating additional adequate facilities for their storage.

h) Studies should be conducted regarding the quantum of unutilised water passing through the Hathnikund Barrage in Yamuna River, especially in monsoon season and the possibilities of its utilization in Haryana by creating storages along Yamuna River.

i) Assessment of water losses due to Evapotranspiration (ET) and identification of effective methods to minimize ET losses.

j) Practical ways to reduce evaporation losses from canals, waterbodies i.e. ponds, farm ponds etc.

k) Studies are required to estimate and calculate the quantum of virtual water which is being exported to other countries as well as within the country.

All these areas need to be well-researched. A Memorandum of Understanding (MoU) can be entered into with leading institutes of the country such as IITs, NITs and NIH etc.

SCOPE AND METHODOLOGY

1. SCOPE AND STRUCTURE

The Government of Haryana has established the Haryana Water Resources Authority (HWRA) for the conservation, regulation, and management of water resources under the provisions of the Haryana Water Resources (Conservation, Regulation and Management) Authority Act, 2020. It aims to consolidate interrelated functions pertaining to groundwater and surface water management within the State of Haryana for ensuring the judicious, equitable, and sustainable utilization, management, and regulation of water.

As per Section (11) of the HWRA Act, 2020, the Authority shall prepare an Integrated State Water Plan based on block-level planning every three years. This plan shall be placed before the Government or any authority authorized by the Government on this behalf, which may, with such modifications as deemed necessary, approve it within six months from the date of submission. Section 12 of the Act provides the power to the Authority issue directions with regard to the development, management and conservation of water resources of the State in accordance with the Integrated Water Resources Plan of the State with the prior approval of the Government.

As per the mandate of the provisions under Section (14) of the HWRA Act, 2020, a district level committee known as the District Water Resources Planning Committee has been constituted to prepare the District Water Resources Plan (DWRP). The Deputy Commissioner is the presiding officer, the Additional Deputy Commissioner is the chairperson and officials from various departments are members of this Committee. The State Plan of Haryana *“Integrated Water Resources Plan (IWRP) 2023-26”* is consolidated and prepared based on the data of 22 DWRPs received from the District Water Resources Planning Committees. A comprehensive self-guiding template was formulated for the district plans by the HWRA. The district plans are prepared with a collaborative interdepartmental approach under the technical guidance of the Authority.

The plan consists of the assessment of water availability from various water sources, the water demand of various sectors and the corresponding- demand and supply water gap at a block level. Accordingly, a three-year action plan to significantly reduce the water gap by at least 45% in the next three years (2023-

26) is prepared with specific demand-side and supply-side water management strategies and interventions for each of the 142 blocks of Haryana. The action plan emphasizes the optimal use of Groundwater and Surface Water Resources, Rain Water Harvesting, and Aquifer Recharge as well as on enhanced use of Treated Waste Water. The interventions given are focused on areas with high groundwater depletion. There is also a separate action plan for the areas affected by waterlogging and groundwater salinity. The plan consists of the following mentioned 11 Chapters-

Chapter 1. State Profile of Haryana

This chapter covers basic details on the State's demography, socio-economic profile, net sown and gross cropped area, irrigated area, crop production, livestock and fishery population, rivers and canal system, hydro-meteorological and hydro-geological conditions.

Chapter 2. Surface Water Resources Availability and its Challenges

This chapter includes an assessment of internal as well as external surface water resources covering rivers, dams, barrages, canals, and drains in the State. A detailed section on water share of Haryana under different inter-state agreements is also given. It also discusses major surface water issues and challenges.

Chapter 3. Ground Water Resources Availability and its Challenges

This chapter provides insights on groundwater resources availability, annual extraction, depletion over the years, the state of each village on the basis of depth to groundwater level, relevant parameters on the quality of groundwater and key challenges of groundwater management in the State.

Chapter 4. Waste Water Treatment, Reuse Status and its Challenges

This chapter consists of details on Domestic and Industrial Waste Water Generation and its current reuse in the State. It mentions the scope and opportunities of recycling and effective reuse of wastewater and provides the goals of the Reuse of Treated Waste Water Policy 2019. It also highlights the several challenges and risks which need to be countered in order to facilitate an effective mechanism for the maximum reuse of wastewater, especially for non-potable purposes.

Chapter 5. Rainfall and its Variability, Runoff and Recharge Potential

This chapter draws information on rainwater availability and its variability – annually for the past 4 years (2022-2019), decadal (2000-2020), 30 years (1989-2018) and 121 years (1901-2021) from the IMD data. District-wise analysis of monsoon rainfall and its departure from normal rainfall is shown. Rainfall-runoff estimation and potential for artificial recharge are also computed.

Chapter 6. Water Demand across Various Sectors in Haryana

This chapter provides details on the water requirement of various sectors like domestic, agriculture, horticulture, livestock, industries, infrastructure, forest and wildlife, establishment and institutions and an analysis of how the demand varies from sector to sector. The water demand for the year 2021 as well as projections of future water demand is given.

Chapter 7. Water Availability, Demand and Gap in Haryana

The significant imbalance between the water demand and water resource availability is given in this chapter highlighting the risk of increasing water insecurity in the State.

Chapter 8. Existing Policies, Laws and Institutions relating to Water

This chapter gives in-depth coverage of the legal, policy, and administrative or organizational factors governing the water sector in the State. It covers a wide range of water institutions that are currently operating at the state, district and village/local levels.

Chapter 9. Key Water Achievements in 2022-23

This chapter lists the key programmes and initiatives of the Government already being undertaken by the State Government of Haryana to improve the conservation and sustainable management of water resources.

Chapter 10. Integrated Water Action Plan of Haryana 2023-2026

The future action plan for the next three years 2023-26 to reduce the existing water gap as well as to reclaim the water-logged land is laid down in this chapter. It entails a combination of demand-side efficiency and supply-side augmentation interventions and projects proposed by the various line departments to improve the performance in the efficient management of water resources.

Chapter 11. Strategy and Approach to Achieve Water Security in Haryana

This chapter asserts a strategy centred on water security which requires high levels of collaboration, consensus-building, and collective action in four principal areas of policy and governance, institutional strengthening, sustainable infrastructure development and focused research to catalyze transformational change at scale.

2. METHODOLOGY

The entire plan has been designed and developed in-house by the team of experts of HWRA in close collaboration and support of the District Administration and State Line Departments especially the Department of Irrigation and Water Resources (I&WRD). This is done as a sincere effort to achieve data credibility and devise a realistic and implementable action plan to achieve the desired results rather than just producing an academic report. Another advantage of doing it in-house is that the plan can be improvised or modified in the course of implementation in case any improvements are required. Future updating of the State Plan after every three years is also to be done by HWRA.

STAGE 1: Development of District Water Resources Plan

In the first stage, the DWRP of 22 districts were prepared. The scope of the DWRP is to identify the water gap and prepare a three-year action plan for the development and management of the District's Water Resources, both surface water and groundwater. The following main tasks were performed in preparation for the DWRP:

1. Development of an exhaustive template for the DWRP by the HWRA covering important aspects related to water including but not limited to the following:
    - Hydrogeology, Geomorphology, Soil Profile, Climate and Rainfall
    - Status of Agriculture, Horticulture, Fishery, Livestock, Human Population

- Surface Water Availability
- Ground Water Availability
- Rainfall-runoff Estimation
- Treated Waste Water Availability and Reuse Status
- Estimation of District Water Demand and Water Balance
- Identification of Key Challenges
- Three-Year Strategy and Action Plan to Arrest the Water Issues

2. Issuance of the template to the District Water Resources Planning Committees of the 22 Districts of the State to develop the district plans.
3. Technical guidance and support of HWRA to the District Water Resources Planning Committees for preparation of the plans.
4. Detailed review and identification of gaps in the DWRP submitted to the Authority. Multiple iterations of the District Plans were reviewed by the Authority.
5. Compilation of data from the final DWRPs of 22 districts.
6. Data Validation and Verification from the concerned State Head Departments.
7. Review Meetings held by W/PS to CM, W/Chairperson, HWRA and ACSs of various concerned departments with the Deputy Commissioners.

STAGE 2: Development of Integrated Water Resources Plan Haryana

The following main tasks were performed in preparation for the "*Integrated Water Resources Plan (IWRP) 2023-26"*:

1. Preparation of the outline and layout of the State plan of Haryana.
2. Defining objectives, components and data requirements.
3. Compilation of the hydro-meteorological and hydro-geological background.
4. Assessment of surface water resources availability and supply, both internal and external.

5. Assessment of availability and exploitation of groundwater resources
6. Assessment of the capacity of wastewater treatment plants, current treatment and reuse potential.
7. Calculation and projection of water demand for Agriculture, Horticulture, Domestic, Industrial, Institutions, Power, Livestock, Fisheries, Forests and Wildlife sectors.
8. Assessment of demand vis-à-vis availability of water resources in the State.
9. Compilation and prioritisation of projects for three action plan 2023-26 to bridge the water deficit gap.
10. Identification of key issues and challenges of the water sector in Haryana.
11. Documentation of policies, laws, programmes and initiatives of the State Government.
12. Development of an integrated strategy and approach to achieve water security in the State.
13. Devising recommendations regarding Institutional, policy and legal, infrastructure, problems and research gaps identified.
14. Inclusion of external review and inputs from water experts.

Data Collection and Analysis

1. Consolidation of data received from the districts as per the DWRP.
2. Identification of additional data needs and collection of data from the State departments.
3. The state government policies, institutional framework and initiatives pertaining to the development, conservation, protection and management of its water resources.

The key computations in the plan are obtained using the following mentioned norms and formulas:

i. Surface Water Availability and Supply

Assessment of external as well as internal water resources at various dependabilities as well as supplies through various outlets is made based on the data received from the Irrigation and Water Resources Department, Haryana.

ii. Groundwater Availability and Extraction

Groundwater availability and extraction figures are taken from the Dynamic Groundwater Resources of the Haryana State as on 31st March 2020 published by GWC, I&WRD, Haryana and CGWB, NWR, Chandigarh in July 2021.

iii. Treatment of Waste Water and Reuse

Assessment of the present treatment of wastewater through STPs and CETPs and their current reuse has been made based on the data received from the PHED, Haryana and HSIIDC, Haryana.

iv. Rainfall-Runoff and Recharge Potential

Estimation of rainfall-runoff is made based on Binnie's empirical method and recharge potential is taken as 20% of the estimated rainfall runoff as guided by the report on the Master Plan of Artificial Recharge to Groundwater 2020 of CGWB.

v. Water Demand

The present (2021) water demand for the different uses and future projections for 2025 are made with the objective of adding it to the planning database. The block-wise assessments of present water demand are based on the set norms of water supply and requirements for domestic, agriculture, horticulture, livestock, forest and wildlife, establishment and institutions, industries, infrastructure, forest and wildlife and fisheries sector. Whereas, the future demand for 2025 is calculated based on the assumptions and trends of the past few years. The standard norms for calculating the water demand of various sectors were followed in the DWRPs which are listed in the table given below.

Sector	Norms Adopted as per	Details
Domestic Water Demand	Central Public Health Environmental Engineering Organization (CPHEEO) for water supply in rural and urban areas	Refer to sub-section 6.1.1 of Chapter 6
Agriculture Water Demand	Chaudhary Charan Singh Haryana Agricultural University (CCSHAU)	Refer to sub-section 6.1.2 of Chapter 6
Horticulture Water Demand	CCSHAU	Refer to sub-section 6.1.3 of Chapter 6
Livestock Water Demand	Animal Husbandry & Dairying Department, Haryana	Refer to sub-section 6.1.4 of Chapter 6
Fisheries Water Demand	Fisheries Department, Haryana	Refer to sub-section 6.1.6 of Chapter 6

Data Sources

- Data provided in the District Water Resources Plans submitted by the District Water Resources Committee(s) under the Chairpersonship of the Deputy Commissioner of each district.
- Data received from the various State line departments along with their declarations/authorized letters.
- Published data/information from various reports.

Review Methodology

- The data was checked for data entry, measurement units and calculation errors for the estimated figures given in the District Water Resources Plans.
- Data validation and verification from the various State head departments.
- Experts' reviews and opinions were also taken and considered on the methodology, approach and results/outcomes of the plan.

Data Limitations

There are some limitations to the data, as detailed below.

i. Time lag

There is a time lag between the latest data available and the year specified under the plan.

ii. Change in nodal officers at the state water resource department/ irrigation department

The assigned nodal officers appointed initially were changed in some districts, leading to information gaps, thereby delaying the process.

Gaps and Discrepancies

Given the data scarcity in the water sector and the fact that block-level data were being collected and compiled for the first time at the State level, there are certain data gaps that exist. These are expected to be assessed and plugged into future iterations of the plan, in close collaboration with the line departments.

CHAPTERS

Chapter 1

State Profile of Haryana

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

LIST OF ANNEXURES

1.1 HISTORICAL BACKGROUND

Haryana is a State located between 27°40'N to 30°55'N latitudes and 74°28'E to 77°36'E longitudes in the Northern part of India. The name originates from *Hari* (the Hindu God Vishnu) and *ayana* (home), which refers to "The abode of God." It was formed post the disintegration of the former State of East Punjab in 1966, into three States (namely Haryana, Himachal Pradesh and Punjab), Haryana being the smallest of them with an area of 44,212 km^2. The capital of Haryana is Chandigarh, which is shared with the adjoining State of Punjab. Besides Punjab, Haryana borders Himachal Pradesh in the North. In the South and West regions, it shares its boundary with Rajasthan. The river Yamuna defines its eastern border with Uttarakhand and Uttar Pradesh. Haryana also surrounds Delhi on three sides, forming the northern, western and southern borders of Delhi. Therefore, a large part of Haryana is included in the National Capital Region. The State is segregated into 6 divisions, 72 subdivisions, 22 districts, 93 tehsils, 50 sub-tehsils, and 142 development blocks.

The history of Haryana dates back to the Vedic era. The State has been home to the much-acclaimed Bharata Dynasty, which gave the name Bharat to India. The legendary and one of the oldest battles in the world- Mahabharata was fought between Pandavas and Kauravas in Kurukshetra. During the Vedic age, Haryana was the site of the Kuru Kingdom, one of India's great Mahajanapadas. The south of Haryana is the claimed location of the Vedic Brahmavarta region. The Bhirrana and Rakhigarhi villages of Fatehabad and Hisar districts respectively are the house of the largest and oldest civilizations in the world- the Indus Valley Civilization. In recent years, significant evidence was discovered that indicated that Rakhigarhi might be the origin of the Harappan civilisation, which arose in the Ghaggar basin in Haryana and gradually and slowly moved to the Indus Valley.

Haryana has four main geographical features.

- The Yamuna-Ghaggar plain forms the largest part of the State
- The Shivalik Hills to the northeast
- Semi-desert sandy plain to the southwest
- The Aravalli Range in the south

1.2 DEMOGRAPHY

The total population of the State is 2,53,51,462 out of which the population of females and males are 1,18,56,728 and 1,34,94,734. The district of Faridabad ranks first in the population at the State level and constitutes 7.1% of the State population whereas the district of Panchkula is the least populous with a population of 5,61,293. The rural population constitute 65.1% of the total population whereas the urban population is only 34.9%. District-wise demography details of Haryana are given in Table 1.1.

Table 1.1 District-wise Demography of Haryana (Census 2011)

Sr. No.	District	No. of Male	No. of Female	Urban Population	Rural Population	Total Population
1	AMBALA	598703	529647	500774	627576	1128350
2	BHIWANI	866672	767773	321322	1313123	1634445
3	FARIDABAD	966110	843623	1438855	370878	1809733
4	FATEHABAD	495360	446651	179588	762423	942011
5	GURUGRAM	816690	697742	1042253	472179	1514432
6	HISAR	931562	812369	553488	1190443	1743931
7	JHAJJAR	514667	443738	243339	715066	958405
8	JIND	713006	621146	305583	1028569	1334152
9	KAITHAL	571003	503301	236011	838293	1074304
10	KARNAL	797712	707612	454810	1050514	1505324
11	KURUKSHETRA	510976	453679	279225	685430	964655
12	MAHENDRAGARH	486665	435423	132855	789233	922088
13	NUH	571162	518101	124106	965157	1089263
14	PALWAL	554497	488211	236544	806164	1042708
15	PANCHKULA	299679	261614	313230	248063	561293
16	PANIPAT	646857	558580	555085	650352	1205437
17	REWARI	474335	425997	233430	666902	900332
18	ROHTAK	568479	492725	446164	615040	1061204
19	SIRSA	682582	612607	319248	975941	1295189
20	SONIPAT	781299	668702	453364	996637	1450001
21	YAMUNANAGAR	646718	567487	472829	741376	1214205
	HARYANA	**13494734**	**11856728**	**8842103**	**16509359**	**25351462**

Source: Statistical Abstract of Haryana (2019-20)

Figure 1.1 Male vs Female Population in Haryana (Census 2011)

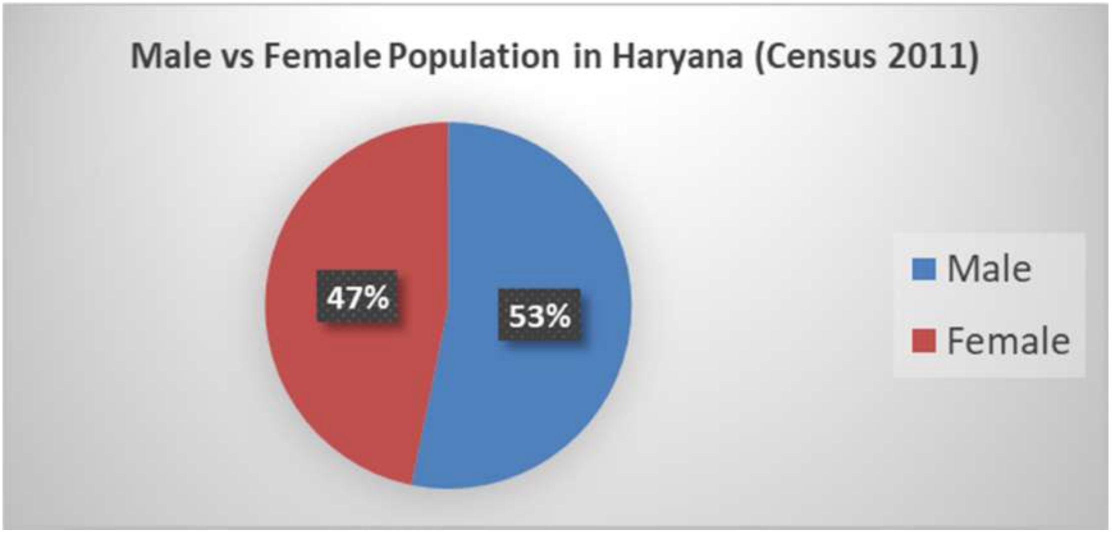
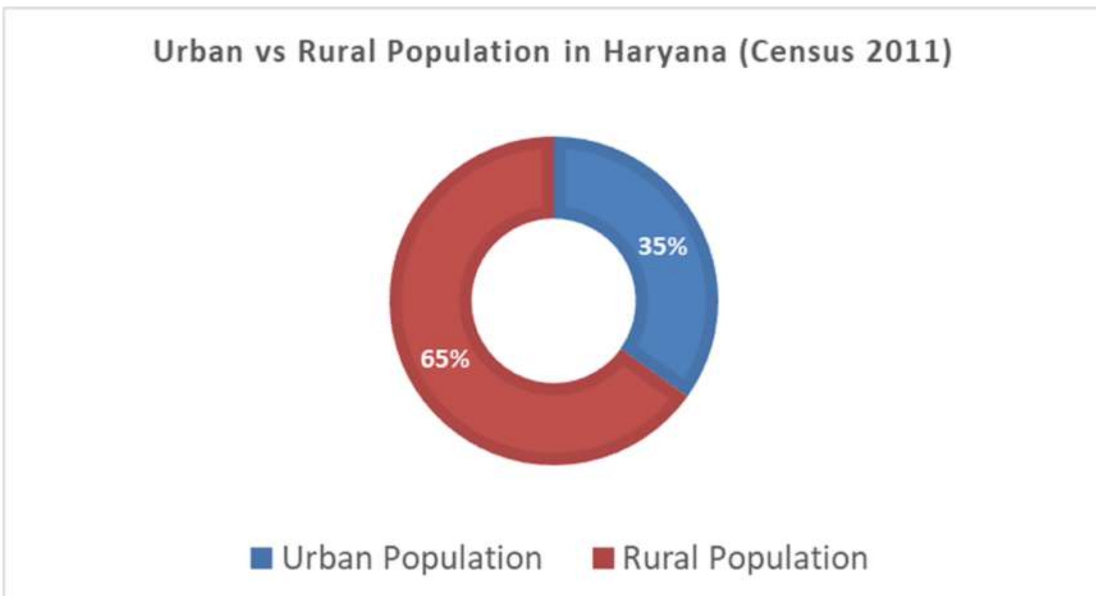


Figure 1.2 Urban vs Rural Population in Haryana (Census 2011)



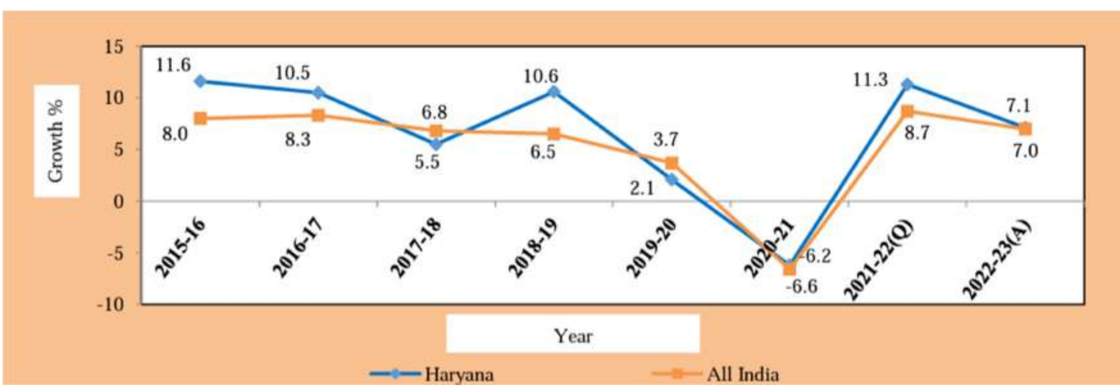
1.3 SOCIO-ECONOMIC PROFILE

Agriculture is the main occupation of Haryana, with as much as 70% of its population being employed in various farming activities, such as the cultivation of wheat, rice, maize, jawar, bajra, barley, pulses, cotton, sugarcane, potato, and oil seeds. The Green Revolution led by Haryana and Punjab has greatly revolutionized the agricultural sector of the State and currently, agriculture constitutes 31% of the Haryana GDP. Grain yields exceed the national average by nearly 30-40%. Even with a minuscule area, which is just 1.4% of the total area of the country, it has occupied one of the top spots for its significant contribution to the national pool of food grains, providing 30% of the national procurement of wheat and 10% of its rice. Haryana is also India's 4th largest producer of cotton.

Over the years, there has been a tremendous expansion in the industrial sector as well. Besides agriculture, other main industries in the State are automotive, IT, agriculture and petrochemicals. Over the years Haryana has attracted major auto players and auto-component manufacturers, thereby becoming the largest automobile hub in the country. IOCL, Panipat has emerged as the 2nd largest refinery in South Asia. Considering the current levels of progress, it would not be wrong to say that Haryana has transfigured from an agrarian State to an industrial State and the services sector is also recording robust growth.

The Gross State Domestic Product (GSDP) of the State has been anticipated by the Advance Estimates to be INR 9,94,154.08 crore for the fiscal year 2022–23, representing a rise of 14.2% compared to the growth of 17.4% seen in 2021–22. The GSDP is projected to expand by 7.1% in 2022–23 compared to the growth of 11.3% seen in 2021–22, to reach INR 6,08,420.26 crore at constant (2011–12) prices. Figure 1.3 shows the State's year-over-year (YoY) growth rates for GSDP.

Figure 1.3 Growth of GSDP of Haryana and India at Constant (2011-12) Prices



Source: Economic Survey of Haryana 2022-23; Department of Economic & Statistical Affairs, Haryana

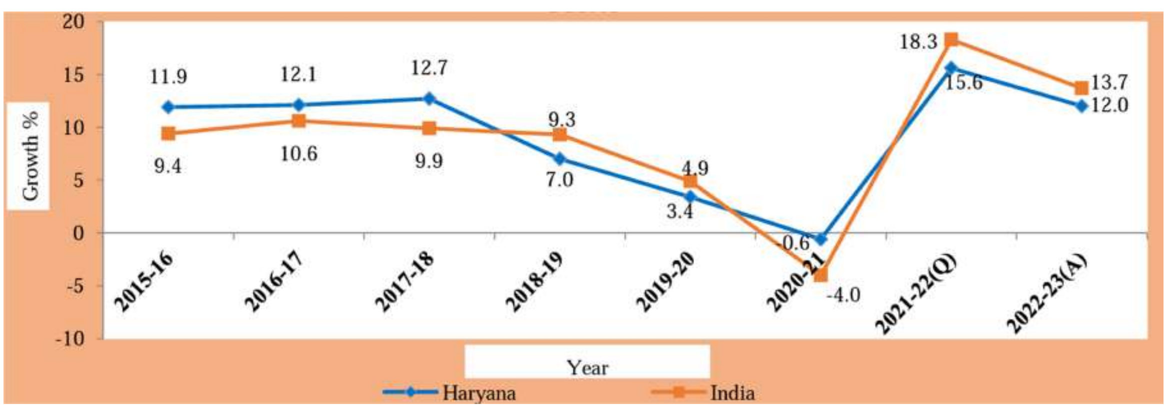
At constant prices (2011–12), the growth of the State's Gross State Value Added (GSVA) is predicted to reach 10.1% in 2021–22. The expected growth rate for GSVA in 2022–2023 is 7.1%. An overall growth of 7.1% was achieved in 2022–2023 thanks to increases of 6.3% in the industry sector and 8.4% in the service sector. Figure 1.4 displays the YoY growth in GSVA in actual terms.

Figure 1.4 Growth of GSVA of Haryana at Constant (2011-12) Prices

Source: Economic Survey of Haryana 2022-23; Department of Economic & Statistical Affairs, Haryana

When the State of Haryana was established in 1966, its per-capita income was only INR 608 at the time. The per capita income has multiplied since then. Figure 1.5 displays the State's per capita income as well as growth rates. At constant (2011–12) prices, the State's per capita income is predicted to increase by 5.4% from 2021–22 to 2022–23, reaching INR 1,81,961 per person. At current pricing, it will probably be INR 2,96,685 in 2022–2023 showing an increase of 12.0% over the 15.6% growth seen in 2021–2022 period. The State is maintaining the per capita income higher than the National per capita income of INR 1,70,620 and INR 96,522 at current and constant prices respectively during 2022-23 also.

Figure 1.5 Growth of Per Capita Net State Domestic Product of Haryana and India at Current Prices



Source: Economic Survey of Haryana 2022-23; Department of Economic & Statistical Affairs, Haryana

1.4 AGRICULTURE AND HORTICULTURE

The Green Revolution started in 1965-68 and has led to an increase in agricultural production, especially in Haryana, Punjab, and Uttar Pradesh. Under British rule, there had been rampant exploitation of resources and no emphasis was laid on the development and expansion of agriculture to sustain the rapidly growing population. Until 1967, the government majorly concentrated on expanding the farming areas. But the population explosion far exceeded the food production and this called for drastic and immediate action to increase yield which came in the form of the Green Revolution. The development of a high-yielding wheat variety and rust-resistant wheat strains were major accomplishments in this project. It was at this time that the country's agriculture was transformed into an industrial system with the employment of contemporary technologies and techniques such as high-yielding variety seeds, tractors, irrigation systems, pesticides, and fertilisers. Green Revolution focused on three elements: using seeds with improved genetics (High yielding variety of seeds), double cropping in the existing farmland, the continuing expansion of farming areas and use of mechanical equipment in farming and irrigation facilities.

1.4.1 Agriculture in Haryana

The total gross cropped area in Haryana under different crops is 66,17,300 ha while the net sown area is 35,51,696 ha. The district-wise area under agriculture is given in Table 1.2.

Table 1.2 District-wise Area under Agriculture in Haryana (2019-20)

Sr. No.	District	Total Geographical Area (Ha)	Gross Cropped Area (Ha)	Net Sown Area (Ha)
1	AMBALA	157400	208593	148518
2	BHIWANI	336300	524951	294253
3	CHARKI DADRI	141500	223065	111904
4	FARIDABAD	74300	63119	31893
5	FATEHABAD	253800	435147	220941
6	GURUGRAM	125300	109864	61892
7	HISAR	398300	652653	335150
8	JHAJJAR	183400	252893	130174
9	JIND	266000	467482	253791

Sr. No.	District	Total Geographical Area (Ha)	Gross Cropped Area (Ha)	Net Sown Area (Ha)
10	KAITHAL	235900	386071	197231
11	KARNAL	252000	395103	200442
12	KURUKSHETRA	153000	279506	144641
13	MAHENDRAGARH	189900	288886	152367
14	NUH	150100	182766	110279
15	PALWAL	136800	205113	104405
16	PANCHKULA	89800	45671	23031
17	PANIPAT	126800	192048	96683
18	REWARI	159400	207769	125627
19	ROHTAK	174500	226683	153793
20	SIRSA	427700	749985	391057
21	SONIPAT	212200	303063	152576
22	YAMUNANAGAR	176800	216869	111048
	HARYANA (Ha)	**4421200**	**6617300**	**3551696**
	HARYANA (Acre)	**10924785**	**16351348**	**8776241**

Source: Agriculture and Farmers Welfare Department, Haryana

Figure 1.6 District-wise Gross Cropped Area vs Net Sown Area (2019-20)

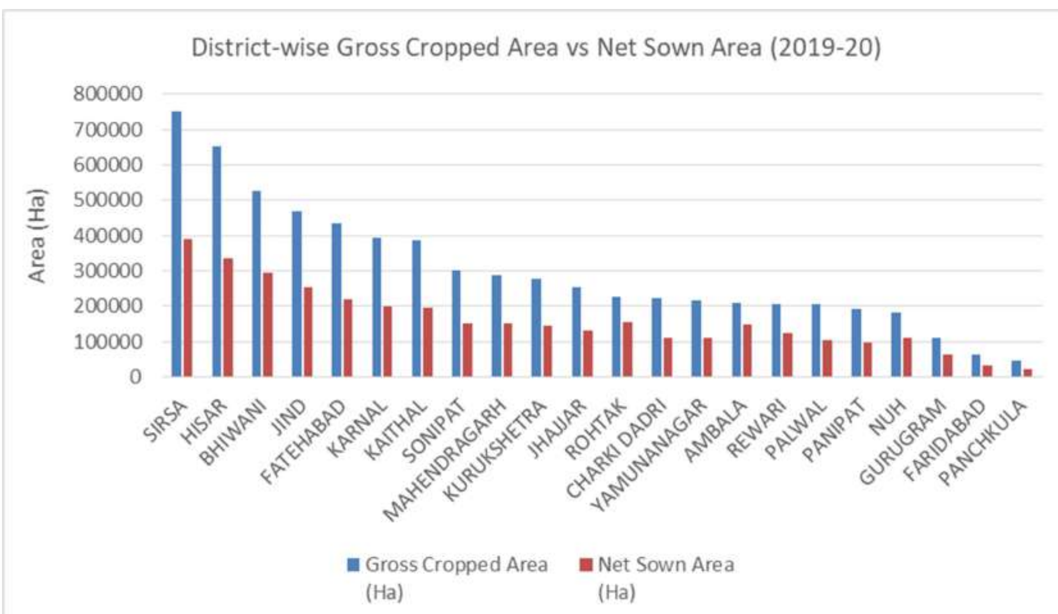
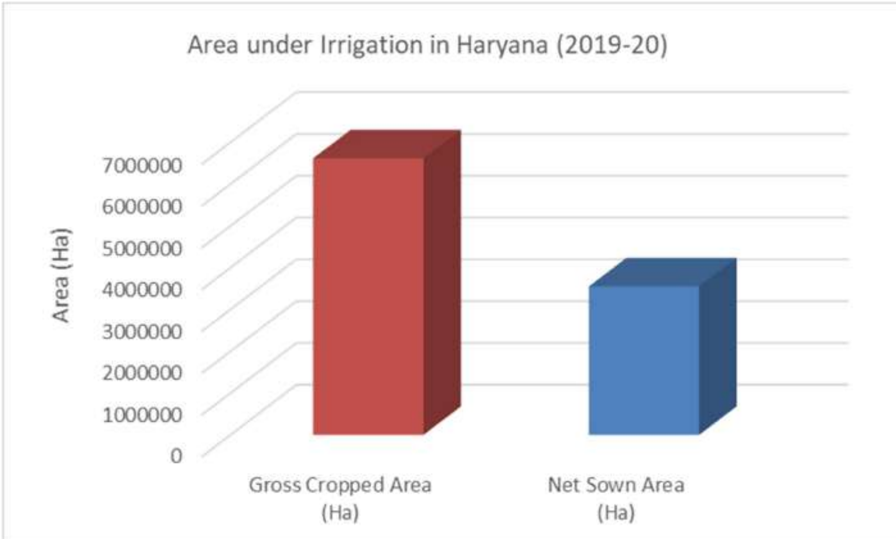


Figure 1.7 Area under Irrigation in Haryana (2019-20)



1.4.2 Production and Productivity of Major Crops

The production and productivity of different crops in the State of Haryana are given in Table 1.3. The block-wise data for the production and productivity of major crops is given in Annexure 1.1. The total productivity of Haryana of paddy is 66.57 tonne/ha. The productivity of wheat is 93.22 t/ha while under maize it is 66.61 t/ha. Paddy, Wheat, Sugarcane and Mustard are the major crops of the State. Paddy locally known as *Dhan* has become very popular with the farmers and it is the principal Kharif crop. Bajra constitutes an important item of food during the winter season. Jowar is an important fodder crop, when fed green is called *Chari* when harvested after ripening is called *Karbi*. Wheat is the principal Rabi crop of the district. The crop requires frequent irrigation. Sugarcane is an important cash crop of the State locally known as *Ganna*. It requires a wet climate and substantial irrigation. The details of the water requirement of each crop as per the norms of Chaudhary Charan Singh Haryana Agricultural University (CCSHAU) are given in Chapter 6.

Table 1.3 Production and Productivity of Major Crops in Haryana (2021-22)

Sr. No.	District	Major Crops	Area (Ha)	Productivity (Tonne/Ha)	Productivity (Kg/Ha)	Production (Tonne)
1	AMBALA	Rice	93944	4.11	4107	385828
		Cotton	0	0	0	0
		Bajra	95	2.32	2318	220
		Maize	218	3.95	3954	862
		Sugarcane	9951	81.18	81180	807819
		Wheat	87884	4.11	4108	361027
		Barley	13	3.24	3237	42

Sr. No.	District	Major Crops	Area (Ha)	Productivity (Tonne/Ha)	Productivity (Kg/Ha)	Production (Tonne)
		Gram	9	1.19	1194	11
		Mustard	7642	1.79	1790	13679
2	BHIWANI	Rice	22290	2.1	2099	46787
		Cotton	82054	0.24	244	20021
		Bajra	63406	1.76	1758	111468
		Maize	5	3.13	3133	16
		Sugarcane	2961	65.51	65509	193972
		Wheat	86914	4.27	4271	371210
		Barley	493	3.26	3258	1606
		Gram	16583	0.99	989	16401
		Mustard	169749	1.76	1756	298079
3	CHARKHI DADRI	Rice	4879	1.85	1849	9021
		Bajra	26408	0.31	314	8292
		Cotton	50608	2.01	2010	101722
		Maize	1	3.13	3133	3
		Sugarcane	1436	94.92	94920	136305
		Wheat	33188	4.12	4124	136867
		Barley	204	3.26	3258	665
		Gram	298	1.84	1844	550
		Mustard	77252	1.92	1918	148169
4	FARIDABAD	Rice	14913	2.22	2218	33077
		Cotton	780	0.26	261	204
		Bajra	4685	1.65	1649	7726
		Maize	30	3.13	3133	94
		Sugarcane	290	81.92	81918	23756
		Wheat	28646	3.92	3916	112178
		Barley	63	2.02	2022	127
		Gram	1	1.19	1194	1
		Mustard	1801	1.98	1978	3562
5	FATEHABAD	Rice	129196	4.06	4057	524148
		Cotton	63554	0.39	392	24913
		Bajra	2463	2.28	2281	5618
		Maize	37	1.63	1627	60
		Sugarcane	1196	77.03	77027	92124
		Wheat	184207	4.67	4665	859326
		Barley	129	2.88	2875	371
		Gram	731	1.65	1648	1205
		Mustard	23732	1.81	1810	42955
6	GURUGRAM	Rice	4845	2.78	2779	13464
		Cotton	2314	0.3	303	701
		Bajra	32536.5	2.71	2710	88174
		Maize	17	3.13	3133	53
		Sugarcane	6.5	0		0
		Wheat	30086	4.67	4673	140592
		Barley	78	3.71	3708	289
		Gram	12	1.06	1061	13
		Mustard	28620	1.99	1988	56897
7	HISAR	Rice	82677	2.88	2882	238275
		Cotton	127688	0.38	375	47883
		Bajra	29287	2.44	2438	71402
		Maize	23	4.08	4078	94
		Sugarcane	1989	83.55	83549	166178
		Wheat	206860	4.64	4644	960658
		Barley	791	3.39	3394	2685
		Gram	11035	1.38	1380	15228
		Mustard	107071	1.92	1922	205790

Sr. No.	District	Major Crops	Area (Ha)	Productivity (Tonne/Ha)	Productivity (Kg/Ha)	Production (Tonne)
8	JHAJJAR	Rice	38668	2.69	2685	103824
		Cotton	11712	0.43	426	4989
		Bajra	33912	2.07	2070	70198
		Maize	125	3.13	3133	392
		Sugarcane	3653	67.51	67510	246614
		Wheat	80897	4.4	4400	355947
		Barley	175	3.83	3825	669
		Gram	30	1.05	1047	31
		Mustard	48046	2	1999	96044
9	JIND	Rice	146152	3.33	3331	486832
		Cotton	56176	0.29	292	16403
		Bajra	6469	2.37	2369	15325
		Maize	9	3.13	3133	28
		Sugarcane	5753	73.09	73092	420497
		Wheat	204717	4.66	4660	953981
		Barley	41	4.52	4519	185
		Gram	20	1.19	1194	24
		Mustard	14243	2.15	2146	30565
10	KAITHAL	Rice	176094	4.03	4033	710187
		Cotton	5558	0.36	355	1973
		Bajra	439	2.14	2135	937
		Maize	24	3.13	3133	75
		Sugarcane	4553	91.7	91697	417495
		Wheat	176551	4.62	4622	816019
		Barley	6	3.24	3237	19
		Gram	23	1.19	1194	27
		Mustard	5889	1.85	1850	10895
11	KARNAL	Rice	175794	3.87	3868	679971
		Cotton	28	0.35	352	10
		Bajra	77	2.32	2318	178
		Maize	243	4.82	4816	1170
		Sugarcane	11188	91.76	91759	1026600
		Wheat	176594	5.11	5105	901512
		Barley	59	3.24	3237	191
		Gram	13	1.19	1194	16
		Mustard	5388	2.05	2050	11045
12	KURUKSHETRA	Rice	124572	4.77	4767	593835
		Cotton	0	0	0	0
		Bajra	1	2.32	2318	2
		Maize	72	2.87	2866	206
		Sugarcane	11607	87.25	87249	1012699
		Wheat	104134	4.26	4256	443194
		Barley	6	3.24	3237	19
		Gram	11	1.19	1194	13
		Mustard	9594	1.5	1502	14410
13	MAHENDRAGARH	Rice	0	0	0	0
		Cotton	16884	0.52	521	8797
		Bajra	108387	2.8	2802	303700
		Maize	5	3.13	3133	16
		Sugarcane	0	0		0
		Barley	144	3.5	3500	504
		Gram	5667	1.24	1243	7044
		Mustard	112580	2.04	2037	229325
14	NUH	Rice	8264	2.54	2544	21024
		Cotton	3592	0.58	578	2076
		Bajra	39879	2.67	2672	106557

Sr. No.	District	Major Crops	Area (Ha)	Productivity (Tonne/Ha)	Productivity (Kg/Ha)	Production (Tonne)
		Maize	4	3.13	3133	13
		Sugarcane	563	81.92	81918	46120
		Wheat	62170	4.26	4262	264969
		Barley	111	1.21	1212	135
		Gram	73	1.67	1673	122
		Mustard	40135	2.07	2065	82879
15	PALWAL	Rice	34230	2.83	2830	96871
		Cotton	23419	0.27	270	6323
		Bajra	14923	2.43	2434	36323
		Maize	67	3.13	3133	210
		Sugarcane	4015	79.7	79700	319997
		Wheat	94678	4.64	4641	439401
		Barley	92	3.39	3389	312
		Gram	0	0	0	0
		Mustard	6511	2.11	2105	13706
16	PANCHKULA	Rice	13603	4.01	4012	54575
		Cotton	0	0	0	0
		Bajra	276	2.56	2562	707
		Maize	3666	2.96	2963	10862
		Sugarcane	486	81.66	81660	39687
		Wheat	19266	3.77	3772	72671
		Barley	5	3.24	3237	16
		Gram	32	0.84	844	27
		Mustard	1765	1.16	1158	2044
17	PANIPAT	Rice	83318	3.02	3021	251704
		Cotton	77	0.63	628	48
		Bajra	567	2.21	2212	1254
		Maize	58	2.21	2213	128
		Sugarcane	7327	93.58	93576	685628
		Wheat	83977	4.63	4632	388981
		Barley	14	3.24	3237	45
		Gram	7	0.85	845	6
		Mustard	3844	2.24	2243	8622
18	REWARI	Rice	931	1.98	1981	1844
		Cotton	8798	0.21	208	1830
		Bajra	73944	2.04	2042	150994
		Maize	32	3.13	3133	100
		Sugarcane	7	0		0
		Wheat	27956	4.58	4579	128011
		Barley	22	4.93	4929	108
		Gram	5	0.74	744	4
		Mustard	85124	1.95	1949	165907
19	ROHTAK	Rice	67080	2.85	2850	191178
		Cotton	13411	0.34	341	4573
		Bajra	9296	1.82	1816	16882
		Maize	0	0	0	0
		Sugarcane	10175	68.57	68573	697729
		Wheat	101013	4.37	4373	441730
		Barley	256	2.2	2198	563
		Gram	65	1.47	1469	95
		Mustard	14943	1.76	1763	26345
20	SIRSA	Rice	105541	3.52	3524	371926
		Cotton	187543	0.39	386	72392
		Bajra	6247	2.84	2837	17723
		Maize	34	1.87	1870	64
		Sugarcane	40	0		0

Sr. No.	District	Major Crops	Area (Ha)	Productivity (Tonne/Ha)	Productivity (Kg/Ha)	Production (Tonne)
		Wheat	257738	4.29	4293	1106469
		Barley	529	3.66	3664	1938
		Gram	3315	1.35	1346	4462
		Mustard	103965	1.96	1958	203563
21	SONIPAT	Wheat	136834	4.72	4720	645856
		Barley	54	2.97	2973	161
		Gram	6	2.42	2419	15
		Mustard	7111	1.9	1899	13504
		Rice	114109	2.68	2676	305356
		Cotton	5629	0.41	412	2319
		Bajra	5372	2.23	2230	11980
		Maize	170	3.31	3305	562
		Sugarcane	10264	77.28	77284	793242
22	YAMUNANAGAR	Rice	88625	4.45	4454	394736
		Cotton	183	2.32	2318	424
		Maize	129	4.48	4477	578
		Sugarcane	20190	83.67	83668	1689254
		Wheat	94499	4.51	4510	426190
		Barley	5	3.24	3237	16
		Gram	53	1.19	1194	63
		Mustard	5379	1.26	1263	6794
	HARYANA		**5961494**	**1884.63**	**1884613**	**27756618**

Source: Agriculture and Farmers Welfare Department, Haryana

Figure 1.8 District-wise Area under Paddy (2021-22)

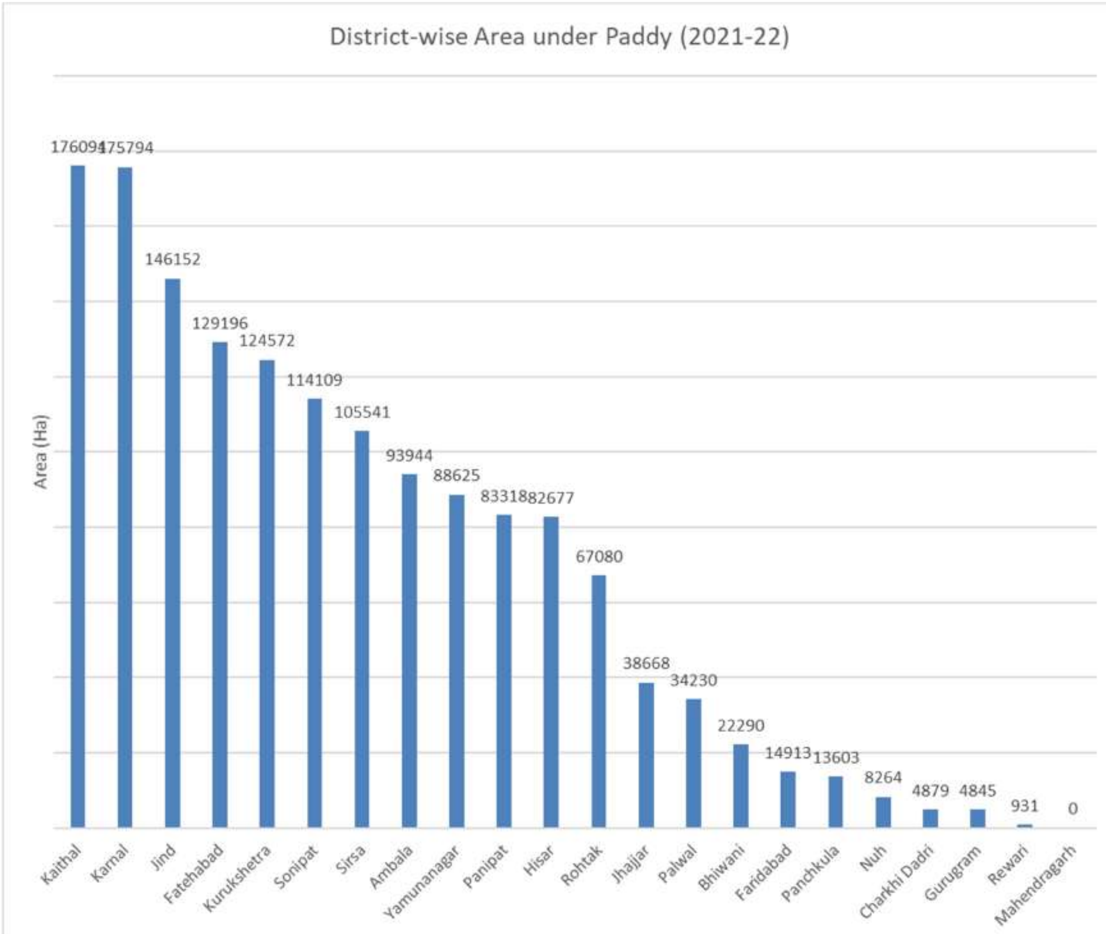


Figure 1.9 District-wise Area under Wheat (2021-22)

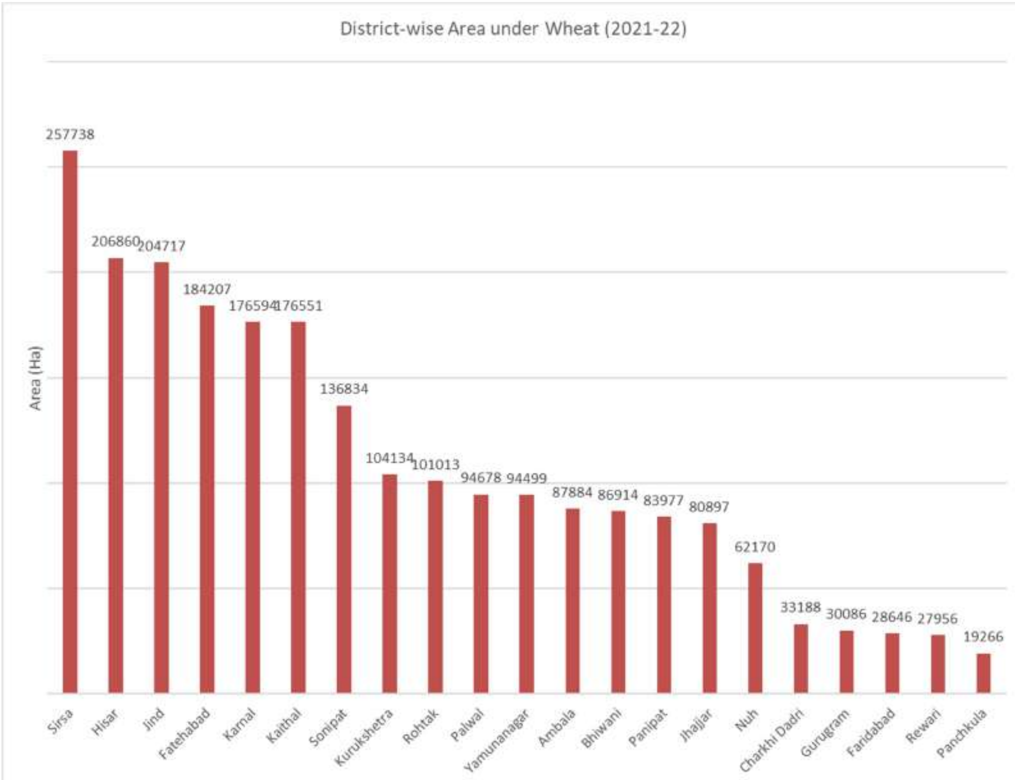


Figure 1.10 District-wise Area under Sugarcane (2021-22)

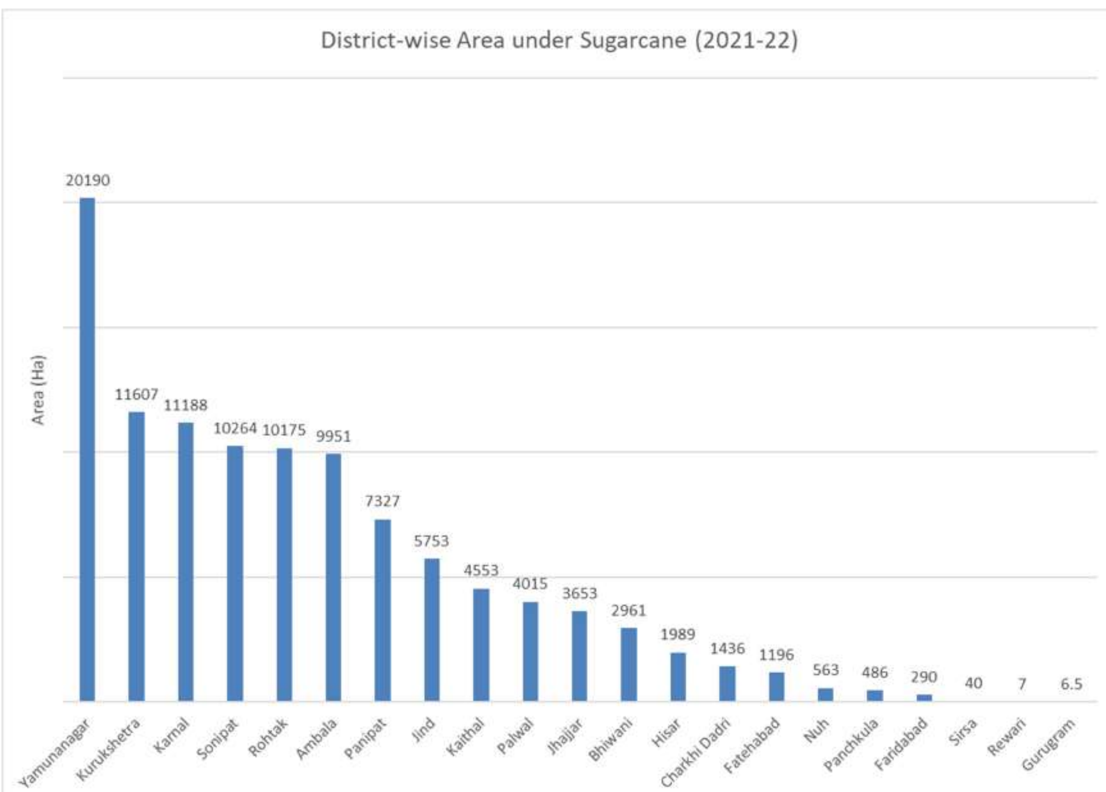


Figure 1.11 District-wise Area under Mustard (2021-22)

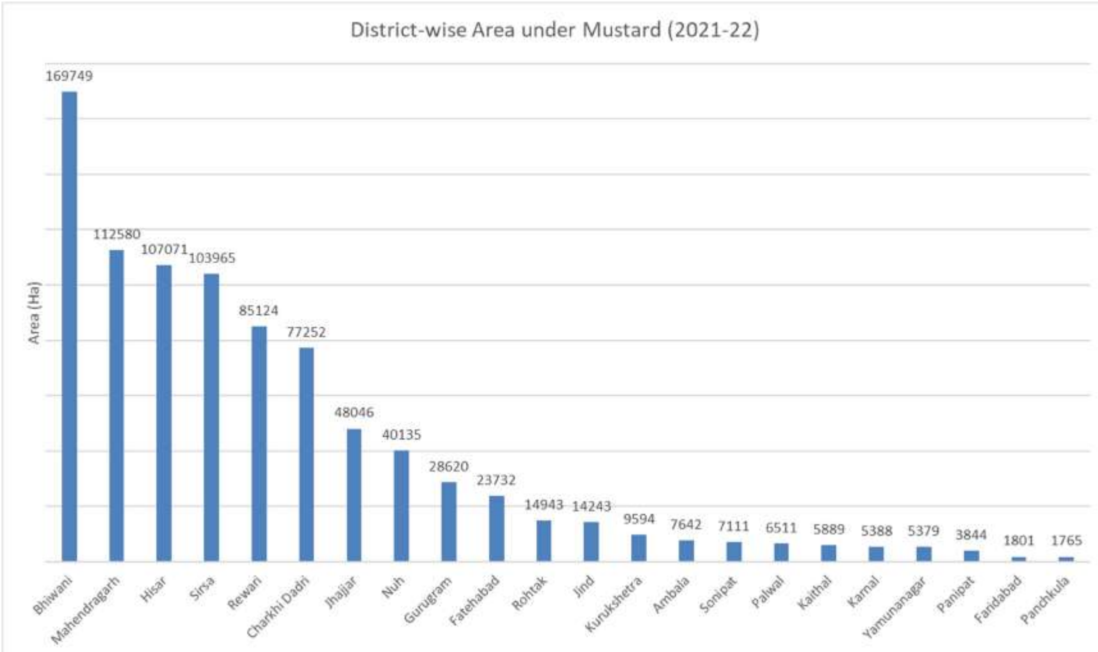


Figure 1.12 District-wise Area under Maize (2021-22)

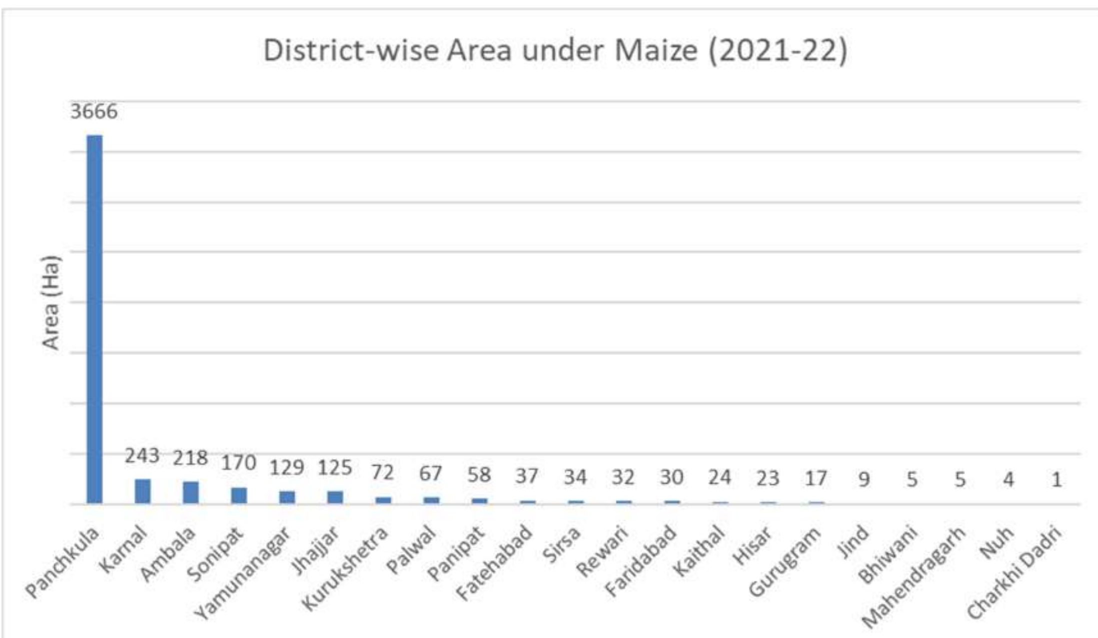


Figure 1.13 District-wise Area under Gram (2021-22)

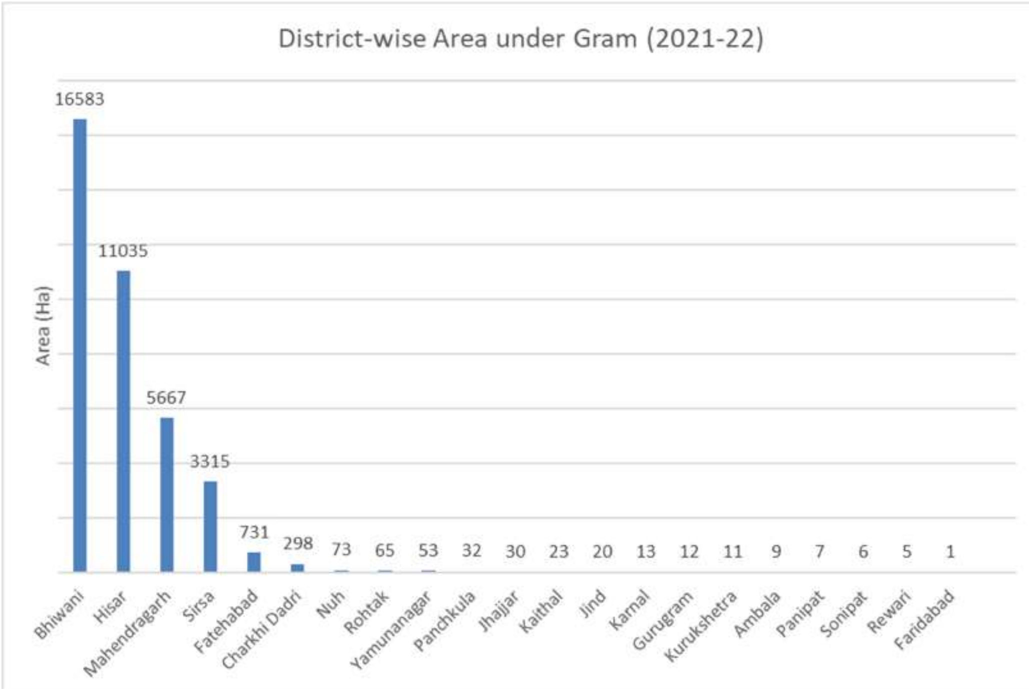


Figure 1.14 District-wise Area under Cotton (2021-22)

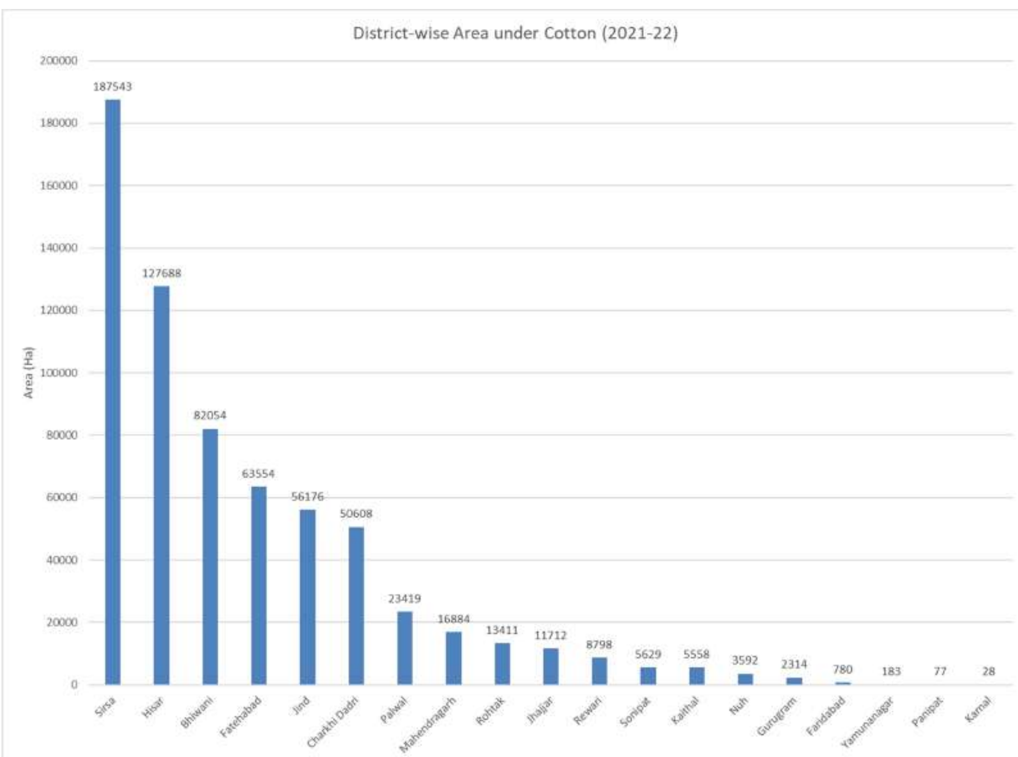


Figure 1.15 District-wise Area under Barley (2021-22)

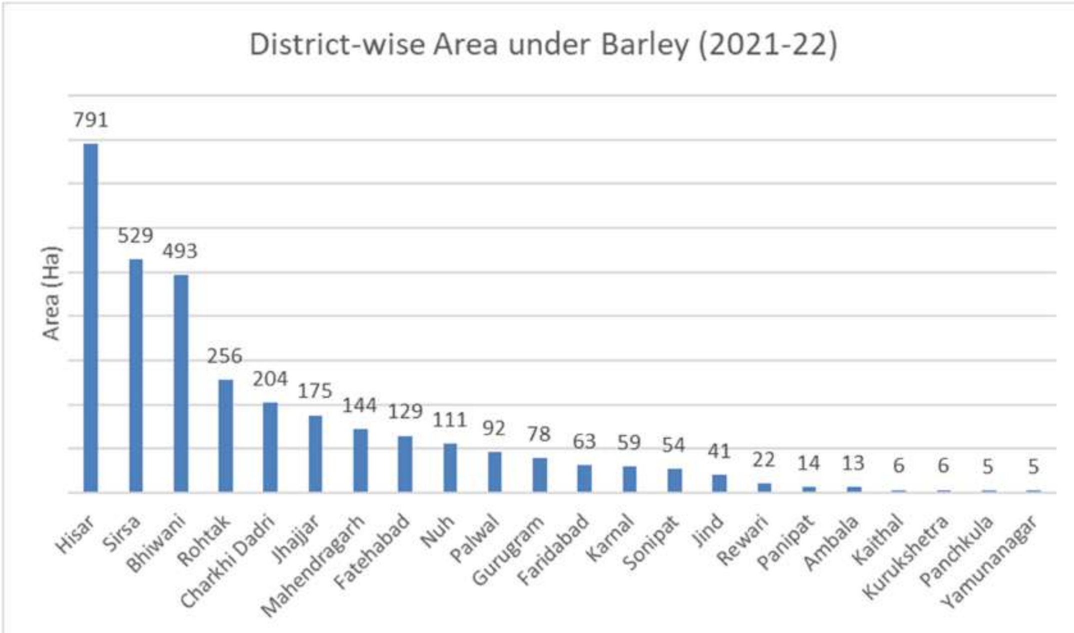
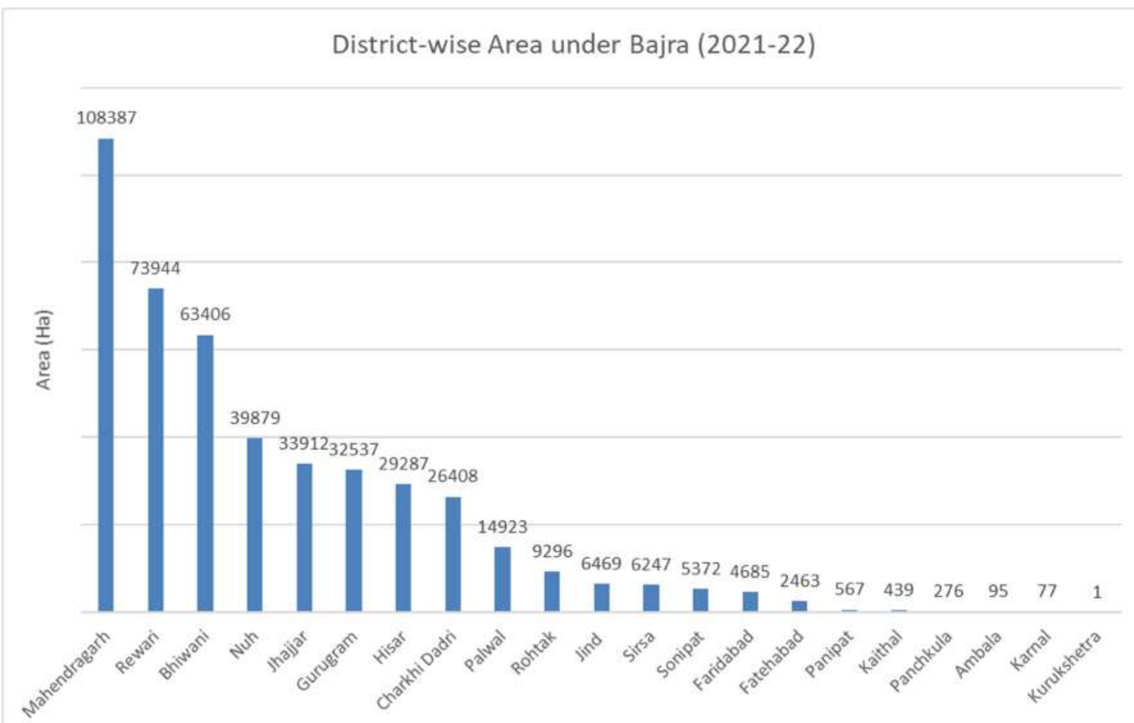


Figure 1.16 District-wise Area under Bajra (2021-22)



1.4.3 Horticulture in Haryana

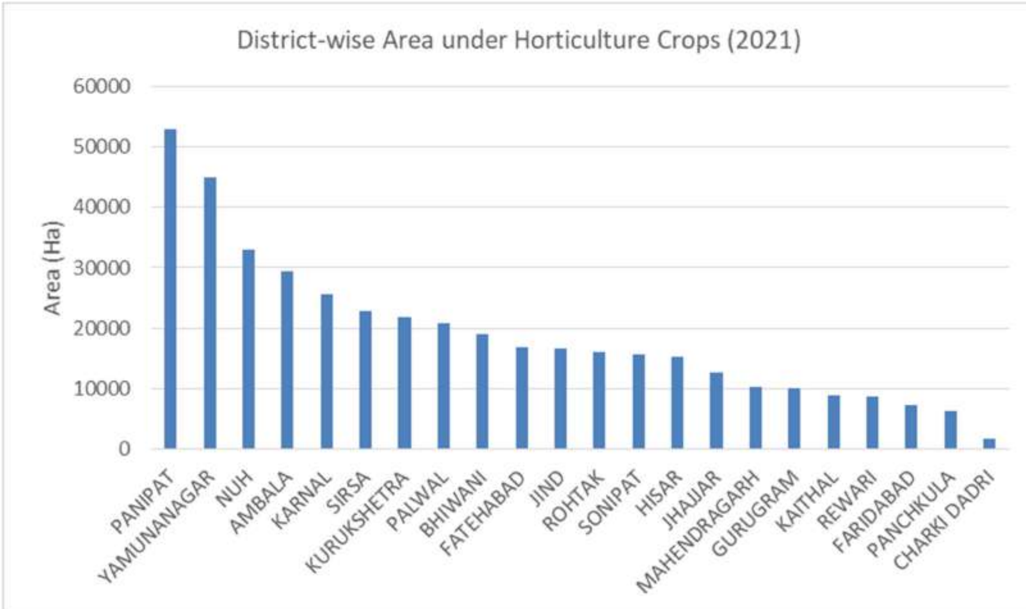
The horticulture crops include vegetables, fruit, flower and spices. The total area under horticulture in Haryana is 4,16,517.90 ha. Panipat District has the highest area of 53,014 ha whereas Charkhi Dadri district has the lowest area of 1,665 ha under Horticulture. The District wise area under different horticulture crops is given in Table 1.4.

Table 1.4 Crop-wise Horticulture Status in Haryana (2021)

Sr. No.	District	Total Horticulture Area (Ha)				
		Vegetable	Fruit	Flower	Spices	Total Area
1	AMBALA	26727.00	2632.00	20.40	105.00	29484.40
2	BHIWANI	14936.40	3931.00	20.00	207.60	19095.00
3	CHARKI DADRI	1266.00	356.00	0.00	43.40	1665.40
4	FARIDABAD	5550.00	1362.50	190.00	95.00	7197.50
5	FATEHABAD	12595.00	3968.00	2.00	177.00	16742.00
6	GURUGRAM	8220.50	1655.00	240.00	0.00	10115.50
7	HISAR	10288.00	4910.99	11.00	87.00	15296.99
8	JHAJJAR	8758.00	3769.00	10.00	0.00	12537.00
9	JIND	14215.00	1869.60	5.00	465.00	16554.60
10	KAITHAL	7862.00	659.00	1.15	410.00	8932.15
11	KARNAL	20890.00	3675.00	60.00	962.00	25587.00
12	KURUKSHETRA	19558.00	1701.00	302.00	160.00	21721.00
13	MAHENDRAGARH	7814.00	2123.00	20.00	180.00	10137.00
14	NUH	30015.80	2991.00	60.00	0.00	33066.80
15	PALWAL	17688.00	2453.00	346.40	293.00	20780.40
16	PANCHKULA	4163.40	1675.00	42.20	344.00	6224.60
17	PANIPAT	50781.00	1667.00	131.00	435.00	53014.00
18	REWARI	7532.00	1082.00	30.00	58.00	8702.00
19	ROHTAK	14507.40	1373.36	15.00	220.00	16115.76
20	SIRSA	9617.00	13038.20	3.00	185.00	22843.20
21	SONIPAT	10420.50	4823.20	316.20	80.00	15639.90
22	YAMUNANAGAR	33551.80	9336.30	93.60	2084.00	45065.70
	HARYANA (Ha)	**336956.8**	**71051.15**	**1918.95**	**6591.00**	**416517.90**
	HARYANA (Acre)	**832620.25**	**175567.39**	**4741.72**	**16286.36**	**1029215.73**

Source: Department of Horticulture, Haryana

Figure 1.17 District-wise Area under Horticulture Crops (2021)



1.4.4 Net Area Under Irrigation

According to the Statistical Abstract of Haryana 2019-20 about 12,15,000 ha of the area was irrigated from government canals and 20,67,000 ha from tubewells in 2018-19. 91.1% of the Net Sown Area is under Irrigation either through canal water or groundwater. Groundwater irrigation is the most dominant form of irrigation due to lesser variation in its supply and higher reliability in the irrigated water supply. As shown in Table 1.5, the percentage of Net Sown Area has increased from 37.8% in 1966-67 to 91.1% in 2018-19. Out of Government Canals, Tanks, Wells, Tube Wells and other sources, the maximum area is irrigated using Tube Wells. Table 1.6 represents District-wise Net Area under Irrigation from different sources. The maximum percentage to Net Sown Area has been recorded for Faridabad, Gurugram, Kaithal and Karnal at 100%.

Table 1.5 Net Area under Irrigation over the years (1966-2019) from different sources

Net Area Irrigated (000 Hectares)							
Year	Government Canals	Tanks	Wells	Tube Wells	Other sources	Total	Percentage to Net Area Sown
1966-67	991	4	289	—	9	1293	37.8
1970-71	952	1	574	—	5	1532	43
1980-81	1161	(a)	26	941	6	2134	59.2
1990-91	1337	1	(a)	1248	14	2600	72.7
2000-01	1476	1	(a)	1467	14	2958	83.9
2005-06	1331	(a)	(a)	1591	14	2936	82.3
2010-11	1236	—	(a)	1650	1	2887	82.1
2015-16	1162	—	—	1850	2	3014	85.6
2016-17	1181	—	—	1996	(a)	3177	90.8
2017-18	1208	—	—	2053	(a)	3261	93
2018-19(P)	1215	—	—	2067	—	3282	91.1

Source: Statistical Abstract of Haryana 2019-20
(a): Less than 500 hectares
P: Provisional

Table 1.6 District-wise Net area under Irrigation from different sources, 2018-19 (P)

Net Area Irrigated (000 Hectares) in 2018-19(P)							
Year	Government Canals	Tanks	Wells	Tube Wells	Other sources	Total	Percentage to Net Area Sown
AMBALA	3	—	—	139	—	142	95.9
BHIWANI	60	—	—	173	—	233	75.4
CHARKI DADRI	26	—	—	73	—	99	88.4
FARIDABAD	—	—	—	32	—	32	100
FATEHABAD	64	—	—	154	—	218	98.6
GURUGRAM	—	—	—	61	—	61	100
HISAR	206	—	—	132	—	338	89.9
JHAJJAR	53	—	—	76	—	129	92.1
JIND	178	—	—	65	—	243	99.6
KAITHAL	76	—	—	133	—	209	100
KARNAL	56	—	—	141	—	197	100
KURUKSHETRA	29	—	—	115	—	144	99.3
MAHENDRAGARH	1	—	—	88	—	89	57.4
PALWAL	14	—	—	81	—	95	79.8
PANCHKULA	21	—	—	78	—	99	98
PANIPAT	—	—	—	15	—	15	65.2
REWARI	54	—	—	39	—	93	100
PALWAL	—	—	—	84	—	84	66.7
ROHTAK	75	—	—	56	—	131	95.6
SIRSA	269	—	—	101	—	370	94.9
SONIPAT	28	—	—	123	—	151	99.3
YAMUNANAGAR	2	—	—	108	—	110	99.1
HARYANA (Ha)	**1215**	**—**	**—**	**2067**	**—**	**3282**	**91.1**
HARYANA (Acre)	**3002265**			**5107557**		**8109822**	

Source: Statistical Abstract of Haryana 2019-20
(a): Less than 500 hectares
P: Provisional

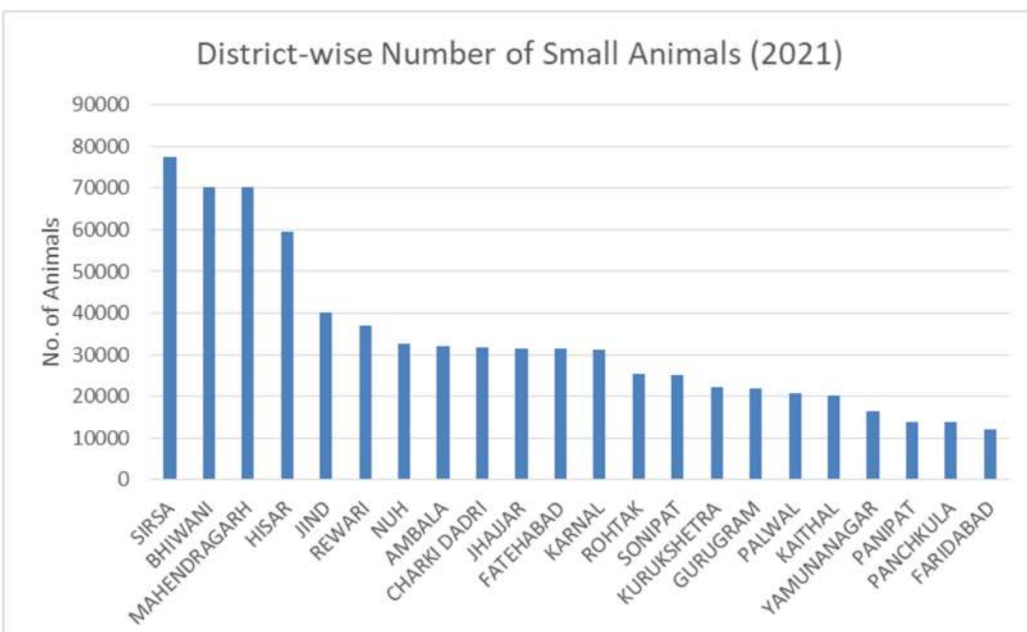
1.5 LIVESTOCK AND FISHERY

Livestock rearing is an important enterprise in the State. Cows, buffaloes, draft animals, sheep, goats, pigs, and poultry/ducks are the main commodities of the livestock enterprise. The population of the Large (cattle, buffalo, draft animals and camel) and Small animals (sheep, goat and pig) is given in Table 1.7. The block-wise data for livestock population is mentioned in Annexure 1.2.

The State possesses quite a good number of livestock, the proportions of cattle, buffaloes, sheep, goats and pigs are 4.53%, 10.47%, 0.7%, 0.8% and 0.27% respectively and poultry birds are 60.35% of the total livestock stocks in the State.

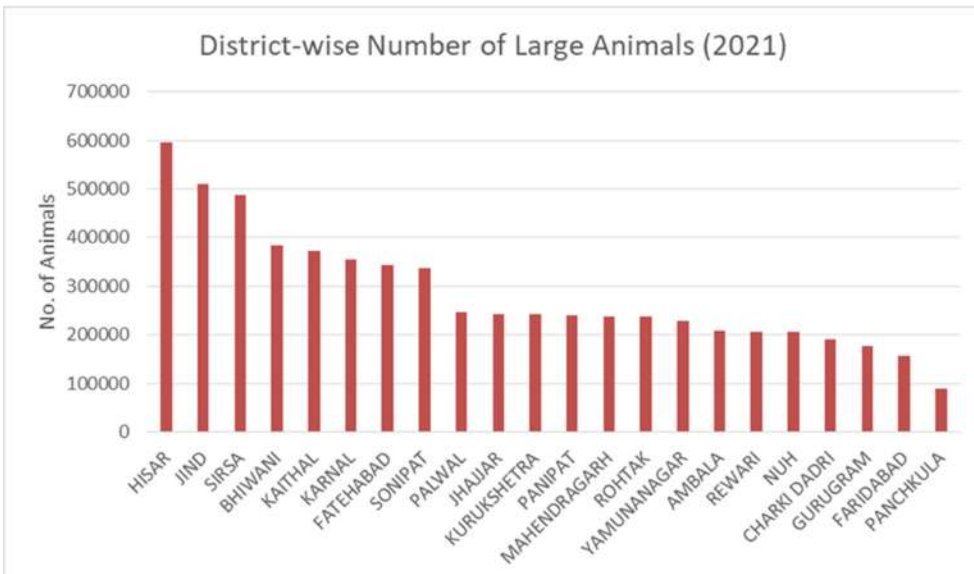
The small animals like sheep, goats and pigs have an important role in the sustenance and livelihood security of a section of farmers and landless rural population. Amongst small animals, the largest proportion is of goats; which have a total population of 3,33,307 followed by sheep with a total population of 2,90,753. There are 1,12,725 pigs reared in the State. The largest number of small animals are reared in Sirsa, Bhiwani and Mahendragarh Districts which constitute about 29.6% of the total small animal population in the district.

Figure 1.18 District-wise Number of Small Animals (2021)



The large animals include Cattle, Buffalos, draft animals and Camels. Cattle and Buffalos are instrumental in producing dairy products like milk, butter, cheese and ghee. Furthermore, they aid in farming by ploughing the field. Draft animals and camels are used for pulling heavy loads and the transportation of goods from one place to the other. The total population of large animals is 62,98,323, out of which the district of Hisar constitutes the largest population of large animals (9.44%) and the district of Panchkula possesses only 89,206.

Figure 1.19 District-wise Number of Large Animals (2021)



Poultry is highest in the district of Panchkula and lowest in the districts of Charkhi Dadri, Faridabad, Kurukshetra, Palwal and Nuh. There is a total population of 2,48,95,734 lakh poultry birds in Haryana.

Figure 1.20 Composition of Livestock Population in Haryana (2021)

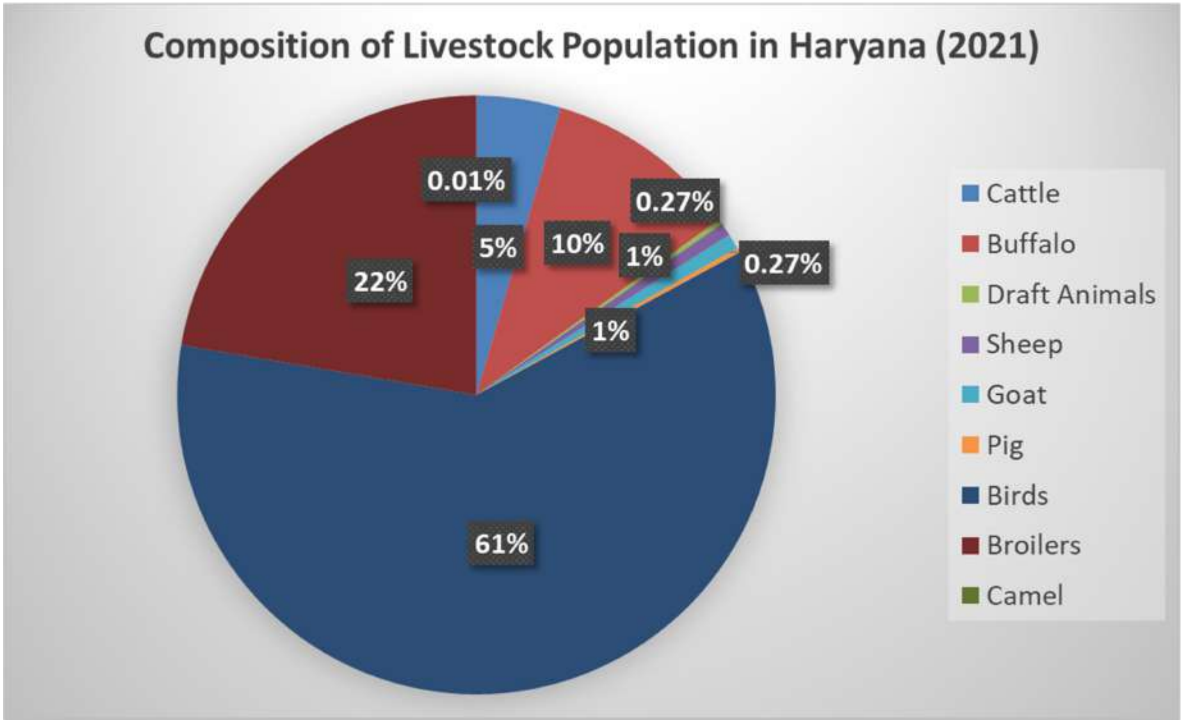


Table 1.7 Livestock Population in Haryana (2021)

Sr. No.	District	Cattle	Buffalo	Draft Animals	Sheep	Goat	Pig	Birds	Broilers	Camel	Small Animals	Large Animals
1	AMBALA	60047	137646	11031	19169	6843	6010	709304	0	0	32022	208724
2	BHIWANI	105436	277739	900	34573	32270	3517	111250	1770297	1001	70360	385076
3	CHARKI DADRI	38412	152521	0	12946	17075	1737	0	0	0	31758	190933
4	FARIDABAD	42988	114100	139	3721	6790	1562	0	0	0	12073	157227
5	FATEHABAD	108800	233837	1192	15309	13838	2297	788285	0	0	31444	343829
6	GURUGRAM	64055	103687	9274	3207	9752	8880	684400	1131000	0	21839	177016
7	HISAR	158613	432528	3754	35346	19359	4867	1048880	0	0	59572	594895
8	JHAJJAR	62274	180159	891	9920	8361	13202	403217	0	0	31483	243324
9	JIND	116624	393606	928	22805	11009	6308	5166391	0	0	40122	511158
10	KAITHAL	63593	234130	75165	10317	6129	3736	3586698	0	0	20182	372888
11	KARNAL	150885	201737	1102	10826	9112	11239	2237214	0	0	31177	353724
12	KURUKSHETRA	101941	139065	520	10955	7152	4082	0	0	0	22189	241526
13	MAHENDRAGARH	51113	187207	555	22995	45967	1354	1344101	0	0	70316	238875
14	NUH	30120	174758	244	5238	26630	787	0	0	290	32655	205412
15	PALWAL	46482	200474	407	7177	11477	1999	0	14500	0	20653	247363
16	PANCHKULA	32451	56027	728	4411	6413	2908	6300000	0	0	13732	89206
17	PANIPAT	74110	165116	478	5045	4440	4338	5413	4064835	0	13823	239704
18	REWARI	44310	160423	773	5384	24127	7457	784750	0	0	36968	205506
19	ROHTAK	63674	174158	538	9981	6660	8694	323000	380700	0	25335	238370

Sr. No.	District	Cattle	Buffalo	Draft Animals	Sheep	Goat	Pig	Birds	Broilers	Camel	Small Animals	Large Animals
20	SIRSA	236953	248050	741	27610	48085	1704	107720	226520	1264	77399	487008
21	SONIPAT	108620	227437	635	5782	5845	13544	797961	47000	0	25171	336692
22	YAMUNANAGAR	105845	123345	677	8036	5973	2503	497150	1544000	0	16512	229867
	HARYANA	**1867346**	**4317750**	**110672**	**290753**	**333307**	**112725**	**24895734**	**9178852**	**2555**	**736785**	**6298323**

Source: Department of Animal Husbandry and Dairying, Haryana

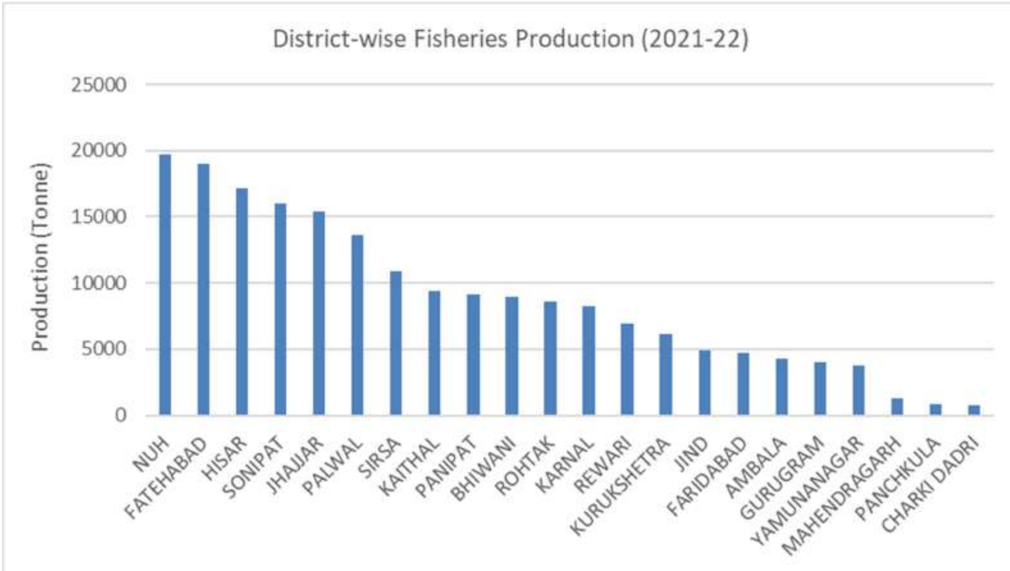
The fisheries sector has been recognized as a substantial income and employment generator as it stimulates the growth of several subsidiary industries. Haryana has a total area of 18,112 ha in the fisheries sector with an annual production of 1,93,987 tonnes. The district of Nuh has the largest production of 19,733 tonnes with an annual production area of 1,758 ha in the State; whereas the district of Charkhi Dadri has a minimum annual production of 795 tonnes with a production area of 285 ha. Annexure 1.3 may be referred for block-wise data on the area allocated under fisheries and its production values.

Table 1.8 Area under Fisheries and Annual Production (2021-22)

Sr. No.	District	Area (Ha)	Production (Tonne)
1	AMBALA	468	4272
2	BHIWANI	936	8963
3	CHARKI DADRI	285	795
4	FARIDABAD	438	4739
5	FATEHABAD	2061	18964
6	GURUGRAM	391	4065
7	HISAR	1426	17127
8	JHAJJAR	1288	15415
9	JIND	663	4886
10	KAITHAL	843	9360
11	KARNAL	836	8276
12	KURUKSHETRA	524	6180
13	MAHENDRAGARH	166	1309
14	NUH	1758	19733
15	PALWAL	1079	13671
16	PANCHKULA	120	864
17	PANIPAT	911	9142
18	REWARI	631	6971
19	ROHTAK	726	8604
20	SIRSA	1116	10862
21	SONIPAT	1090	16009
22	YAMUNANAGAR	357	3780
	HARYANA (Ha)	**18112**	**193987**
	HARYANA (Acre)	**44755**	**479342**

Source: Department of Fisheries, Haryana

Figure 1.21 District-wise Fisheries Production (2021-22)



1.6 RIVERS

The major rivers of Haryana are Yamuna, Ghaggar, Sarasvati, Markanda and Tangri. The Yamuna flows along the State's eastern boundary while the ancient Sarasvati River is said to have flowed from Yamuna Nagar, but has now disappeared. Haryana's main seasonal river, the Ghaggar rises in the outer Himalayas, between the Yamuna and the Sutlej and enters the State near Pinjore in the Panchkula district. Passing through Ambala and Fatehabad, it reaches Bikaner in Rajasthan and runs for 460 km before disappearing into the deserts of Rajasthan. Important tributaries include the Chautang and Tangri. The seasonal Markanda River is a stream, which in ancient times was known as the Aruna. It originates from the lower Siwaliks Hills of Himachal Pradesh and enters Haryana in the west of Ambala city. During monsoons, this stream swells into a raging torrent notorious for its devastating power. The surplus water is carried on to the Sanisar Lake where the Markanda joins the Sarasvati and later the Ghaggar. Shahbad Markanda town is situated on its bank. Among all these rivers, the major contribution to the surface water for the State is from the river Yamuna and State is receiving 4.38 BCM at present. This availability is likely to go up to 5.73 BCM after the construction of upstream storage dams.

Mentioned in the epic Shatapatha Brahmana as the Drishadwati, the Sahibi River originates in the Jaipur district in Rajasthan. However, before seismic activities some 7,500 years ago in the Aravalli Hills, the river brought water from as far as the Ajmer district. Gathering volume from about a hundred tributaries in Rajasthan and the Mewat (now known as Nuh) areas, it reaches voluminous proportions, forming a broad stream around Alwar and Patan. Further flowing via Rewari District near Dharuhera, it reaches Jhajjar and then splits into two smaller streams, finally reaching the outskirts of Delhi and flowing into the Najafgarh Lake that flows into the Yamuna through the Najafgarh drain. Recently hardly any water flows in Sahibi as most of the water is impounded in small check dams upstream in the Alwar district of Rajasthan and the Masani barrage in Rewari district, built on this river on NH 8 (Delhi-Jaipur highway). Three other rivulets in and around the Nuh hills, the Indori, Dohan and Krishnawati all flow from Southwest to Northeast.

1.7 OTHER WATER BODIES

The State of Haryana is home to several ancient water bodies that supplement its historical significance. The Brahma Sarovar in Kurukshetra is a large water tank dedicated to Lord Shiva. Lord Brahma is said to have created the universe from this land. The Birla Gita Mandir and Baba Nath's *'haveli'* are both located near this holy site. During the winter, the Sarovar comes alive with birds migrating from far away to take a dip in its waters. During the *'Deep Daan'* and *'Aarti'* on Gita Jayanti in late November and early December, this exquisite tank takes on a gleaming appearance. The ancient ponds *(Johads)* and lakes located in the State have a different history. A significant number of ponds are as old as the Indus Valley Civilization. The ancient ponds were once the identity of the State. These ponds were primarily used for bathing and other domestic activities. The names of these ponds were also placed on the shrines. Over the years, many ponds have deteriorated.

Popular lakes such as Damdama Lake, Bluebird Lake, and Badkhal Lake were constructed in 1947 to facilitate water supply to nearby farms and rainwater harvesting. The Karna Lake belongs to the era of the Mahabharata where Karna (mythological character) used to take bath and handed his protective armour to Indra (Godfather of Arjuna). This lake is also notable for giving the city of Karnal its name.

The *Jal Mahal* of Narnaul, also known as the Water Palace, is a late 16th-century palace, fortress, and man-made lake situated in Narnaul, Haryana. The building, which was built by a Mughal governor of Narnaul, is now a popular tourist destination. The Sohna block of Gurugram houses the ancient Shiva Temple dedicated to Lord Shiva- *Shiva Kund*. This temple is well renowned because it gets sulphur containing hot water naturally, which is assembled in a trough. Water is known to be an effective cure for skin diseases. In recent years, it has become a popular hot spring spot for tourists.

In addition to the above, Haryana Government has already constructed State Wetland Authority Haryana for the development and rejuvenation of existing water bodies and lakes. Haryana Irrigation Research and Management Institute (HIRMI) has been made the nodal agency for this purpose which has already initiated action in this regard.

1.8 CANAL SYSTEM

Haryana is now a leading contributor to the country's production of food grains and milk. Agriculture is the leading occupation for residents of the State with the flat arable land irrigated by submersible pumps and an extensive canal system. There are four irrigation systems in the State. The East Punjab province housed one of the oldest canals called the Western Jamuna Canal (WJC). WJC is the most important perennial irrigation canal in Haryana which originates from the west bank of the Yamuna and irrigates almost all the districts of Haryana. The Yamuna River enters the lower foothills at Tajewala Headworks/Hathnikund Barrage situated on the border of Haryana and Uttar Pradesh.

Since 1356 AD, WJC has been used as a canal in one of the river creeks. Regular canal control and shaping began in 1626 AD, with reconditioning in the shape of the canal occurring in 1819 AD for the Delhi Branch and 1825 AD for the Hansi Branch. Between 1870 and 1882 AD, piecemeal remodelling projects were implemented. By 1908 AD, large-scale waterlogging, wetlands, and unhealthy conditions had been eliminated by careful remodelling. In the initial 23 km of its course, the WJC flows almost entirely in the old Western Creek of the river. Despite standard sediment exclusion methods, the problem of silt entry had grown to a frightening proportion. As a result, the canal's capacity was reduced. The Somb

River with a level crossing with the canal upstream of the Dadupur Works provided versatile sediment capturing and flushing methods without wasting canal supplies with traditional silt ejectors. With the gradual increase in canal discharge, the number of sediments, such as gravel, shingle, and coarse sand, rose as well. Restorative approaches have been followed by the Government to counter these problems. These approaches include tunnel shingle excluder construction; Construction of a block bar spur island at the intake regulator to create optimum approach conditions; and careful regulation of the under-sluice gates.

The WJC Remodelling Project, proposed in 1954, called for the entire WJC system was remodelled to take advantage of supplies made available by the transfer of the Sirsa Branch and Hisar Major Distributary regions to the Bhakra Canal System, allowing more supplies to be used. According to an agreement signed in May 1954 and a subsequent MOU signed in 1994 (made effective in 1995), the flow of the river Yamuna was managed between Punjab (later Haryana) and Uttar Pradesh. Despite the addition of supplies from the Bhakra system via the NBK link, the available supplies on the WJC system are insufficient. As a result, each year, a Rotational Program is defined for both crops, regulating supplies to the entire network through diverse groups with an average supply of 105 cumecs.

1.9 HYDROMETEOROLOGY

1.9.1 Climate

The climate of the State is subtropical, semi-arid to sub-humid, continental, and monsoon-type. A large part of the plains experiences a semi-arid climate except for the northern parts where conditions are subtropical and in the western part where it is further deteriorating to arid. The major part of the State comes under the fertile Indo-Gangetic belt. In the major period of the year, the climate of Haryana is of a pronounced continental character, very hot in summer (up to 50 °C) and markedly cold in winter (down to a low of 1 °C). The hottest months are May and June and the coldest are December and January.

The State receives 80% of its share of rainfall from July to September. The rest of the rainfall occurs from December to February. All in all, the rainfall is varied, with the Shivalik Hills area being the wettest and the Aravalli Hills area being the driest. Sometimes, the monsoon rainfall may also result in local flooding. Except in the northern regions, where circumstances are sub-humid, and in the western half, where conditions have deteriorated to the desert, the plains have a semi-arid climate.

1.9.2 Rainfall

There are two seasons of rainfall in the State. In the southwest monsoon season, rains commence in the last week of June and withdraw towards the end of September thus contributing about 80% of the annual average rainfall. Another period of rainfall is winter rain from December to March is about 20% of total rainfall which is mostly absorbed into the soil. More than 80% of the annual rainfall was received in the four rainy months from June to September, only thereby leading to large variations on a temporal scale. The rainfall is highly variable in time and space. Refer to Chapter 5 for more details on rainfall in Haryana.

1.10 HYDROGEOLOGY

There are three main physical divisions in the State namely, the Himalayan submountane areas which stretch from the *Jamuna* to the Salt Range, the arid South-western plains and the western portion of the Indo-Gangetic Plain that constitutes the central, southern and western portion of the State. On the basis of Geohydrological conditions as well as groundwater movement and surface drainage patterns, the entire State is divided into the following basins:

1. Yamuna basin; (a) Upper, (b) Lower
2. Ghaggar Basin; (a) Upper, (b) Lower
3. Inland Alluvial Basin (Chautang and others)
4. Krishnawati Basin
5. Sahibi Basin
6. Landoha Nala Basin
7. Kanti Sub Basin (Loharu Satnali area)

Groundwater occurs both under confined and unconfined conditions in the alluvial formation whereas it is mostly under unconfined conditions in Shivaliks and piedmont deposits and semi-confined conditions in hard rocks of Aravalli hills in the south of the State.

1.10.1 Rock Types and Area Coverage

The State contains all three major physiographic units, namely the Peninsula, Extra-Peninsula, and Indo-Gangetic areas, which terminate in the hard rock formations of the Delhi systems (Pre-Cambrian age) in the south, Shivalik system (Tertiary age) in the north, and alluvial formations (Quaternary) in the middle.

Alluvium, belonging to the Quaternary group, makes up approximately 98% of the State's surface area whereas hard rocks cover only 2% area. Clay, silt, *kankar* and fine to medium sand make up the majority of alluvial deposits, which are divided into older and newer varieties. Sand, silt, clay loam, and *kankar* constitute the alluvium in the area belonging to the Older Alluvium. The majority of newer alluvium is found along the banks of river watercourses. The Indo-Gangetic river system's freshwater deposit is known as alluvium. The debris on the hill slopes and wind-blown sands characterise the sub-aerial deposits. The thickness of alluvial deposits is more than 600 metres in the central part of the State to more than 3,000 metres along the Yamunanagar-Karnal section.

However, as we move towards Delhi and the hard rock areas of Bhiwani, Gurugram, Faridabad, and Mahendragarh districts, the thickness of the sediments reduces. The tertiary group is represented by the Shivalik system's outermost zone, which is primarily made up of sandstones, clay, and boulders. The Pre-Cambrian rocks that make up the Aravalli hill ranges are exposed in the districts of Gurugram, Nuh, and Faridabad, and as tiny outcrops in other southern districts.

The Shivalik system (upper tertiary) and the Sabathu series (lower tertiary) are exposed in the extra peninsular region (northern Panchkula district). Greenish grey and crimson gypseous shales with thin bands of sandstone and limestone make up Sabathu. Shales and limestones are abundant in fossils. Graywackes, sandstones, grits, clays, siltstones, conglomerates, and pseudo-conglomerates constitute the Shivalik system. These are fluviatile deposits with a high concentration of mammalian fossils.

Table 1.9 General Geological Succession in Haryana

	Age	Formation	Lithology
Quaternary	Recent	Newer alluvium	Aeolian deposits:
			Wind Blown fine sand, silt, sand dunes
			Fluvial deposits: unconsolidated sand, silt, clay, boulder, gravel, kankar etc.
	Pliestocene	Older Alluvium	Fluvial deposits: unconsolidated gravel, sands, silts, clay, and kankar.
Tertiary	Middle Miocene-	Siwalik System	Sandstone, boulders, conglomerate, siltstone
	Lower Pliestocene		
	Oligocene	Kasauli beds Sirmur series	Sandstone, Claystone, siltstone and Purple shales.
	Eocene	Subathu beds	Limestone, Shales
		Thunda Pathar Series	(Gypseous)
Post Delhi		Intrusives	Erinpura Granites
			Pegmatites quartz, veins and amphibolites
Pre Cambrian	Delhi and Aravalli System		
i)	Ajabgarh series		Slates, phyllites, mica-schists, quartzites.
II)	Horn stones & breccia		
III)	Khushalgarh series		Lime Stone.
Iv)	Alwar series		Quartzitic arkose grits conglomerates
			Limestones micaschists
			Contemporaneous volcanic rocks.

Source: Dynamic Ground Water Resources of Haryana, GWC, I&WRD, Haryana and CGWB, 2021

The *Kandi* (the equivalent of Uttaranchal's Bhabar Belt), *Sirowal* (the equivalent of Uttaranchal's Tarai Belt), and the alluvium lie beneath Ambala, Panchkula, and Yamunanagar. The *Kandi* belt, which runs roughly parallel to the Shivalik foothills and forms the uppermost portions of the composite fan deposits, is 2 to 4 kilometres broad. Boulders, pebbles, gravel, and sand make up the sediments, which are combined with clays in various proportions. Silt, fine to medium sand, and clays underlie the *Sirowal* belt and the surrounding Gangetic plain to the south of the *Kandi* belt. The Delhi system rocks and Quaternary alluvium are found beneath the Gurugram district. In the western half of the area, where the thickness of alluvium is very low, the Ajabgarh shales and quartzite comprise the basement.

The land in Hisar and Bhiwani districts is underlain by unconsolidated quaternary sediments. Sand, silt clay, and *kankar* make up the sediments. The area is underlain by quaternary alluvial sediments in the districts of Sonipat, Jind, Karnal, and Kurukshetra. Clay, silt, and sands of varying grades, as well as *kankar*, gravel, and pebbles, make up alluvium. The lenticular shape is common in alluvial deposits. The following geological succession may be found in Mahendragarh and parts of

Bhiwani districts: alluvial and wind-blown sands (recent to sub-recent); Pegmatites, quartz veins, granites (Post-Delhi intrusives); Ajabgarh Series, Kushalgarh Limestone, Alwar Series (Algonkian Delhi system). The Rohtak district is underlain by quaternary alluvial deposits. Outside the district, the alluvium covers the rocks of the Algonkian system, which can be observed as outcrops. Clay, silt, and various grades of sand make up the alluvium. In several places in the district, wind-blown sand in the form of sand dunes can be seen overlying the alluvial deposits.

1.10.2 Aquifer Systems and their Behaviour

Groundwater occurs both under confined and unconfined conditions in the alluvial formation whereas it is mostly under unconfined conditions in Shivaliks and piedmont deposits and semi-confined conditions in hard rocks. Aquifer comprises freshwater only and the main aquifer formations are gravel and sand. The non-aquifer material comprises clay.

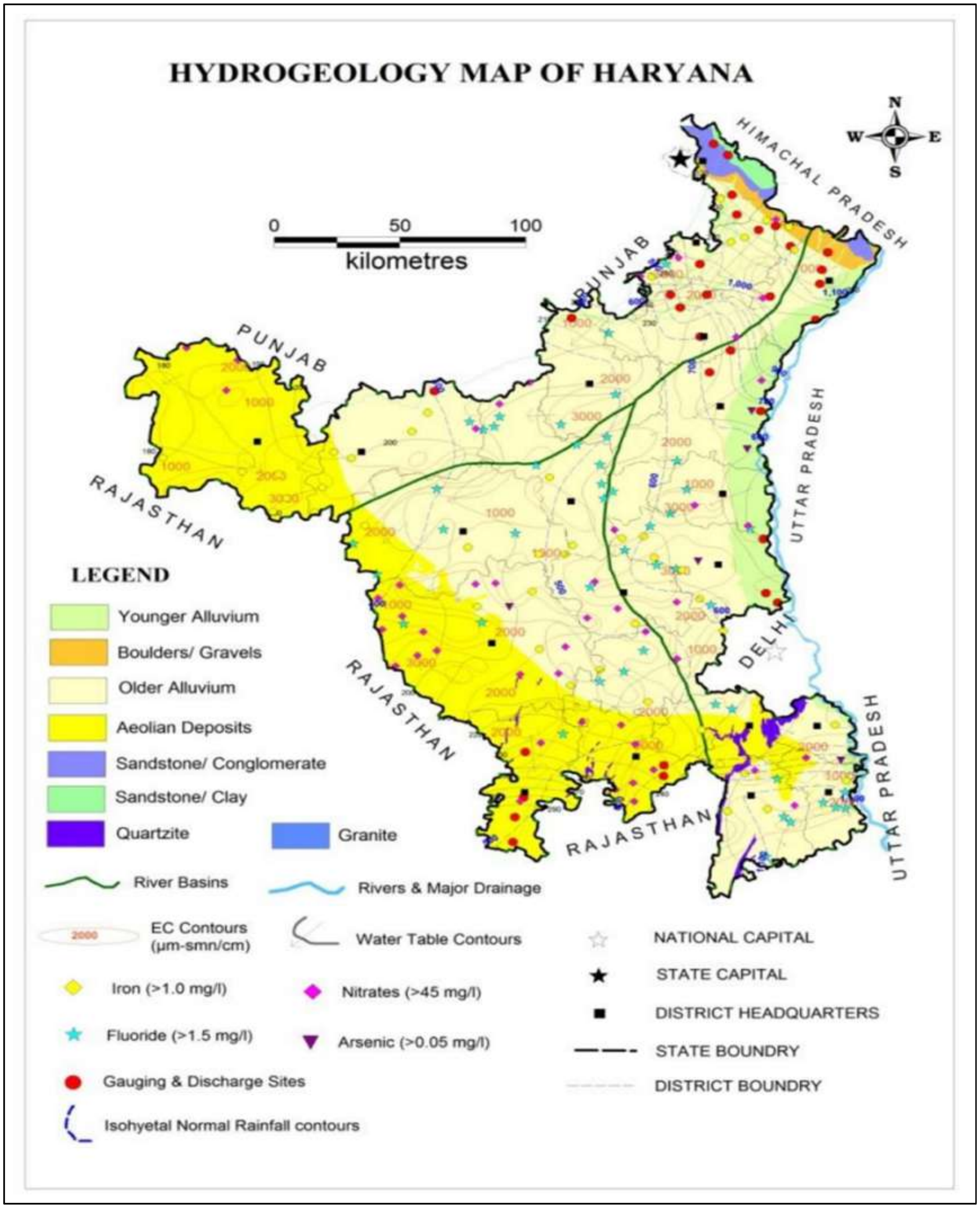
The Central Ground Water Board (CGWB) has deciphered three-aquifer groups in the depth range of 40 to 167 mbgl, 65 to 294 mbgl, and 197 to 383 mbgl. The studies carried out by CGWB indicate that up to the depth of 120 mbgl in the upper reaches of Yamuna and Ghaggar basins covering Ambala, Karnal, and Kurukshetra districts, the percentage of sand is more than clay and silt. Several clay layers of variable thickness are present, but only 2 to 3 layers are regionally extensive. The groundwater in these areas is fresh and is replenished from Ghaggar and Yamuna Basins. Sand content decreases towards the South and aquifers become thinner and the quality of groundwater also deteriorates. In the rest of the districts of the State, below 60 m depth, clay invariably forms the major portion of alluvium. Aquifers in these districts, particularly in the saline areas, are mostly thin and pinch out at short distances, thus restricting the movement of groundwater.

The entire Haryana State has been covered by National Aquifer Mapping and Management (NAQUIM) studies. Based on the current study the areas of the State have been divided into Fresh Water Aquifer, Saline Water Aquifer, and Hard Rock area. The aquifers have further been divided into single or multiple aquifer systems and water-logged areas given in Table 1.10 and Map 1.1.

Table 1.10 Broad Features of Ground Water System in Haryana

Fresh Water Aquifers	Saline Water Aquifers	Hard Rock Aquifers
Single Aquifer System	**Single Aquifer System**	**Single Aquifer with limited freshwater at shallow depth**
Panchkula, Parts of Fatehabad, Gurugram, Rewari, and Faridabad Districts	Jind, Hisar, Sirsa, Southern Fatehabad, Bhiwani, Charkhi Dadri, Jhajjar, Rohtak, Nuh, Palwal and parts of Faridabad, Rewari, Gurugram, Mahendragarh (parts of 14 districts)	Parts of Gurugram, Faridabad, Nuh, Mahendragarh, and Rewari districts
Multiple Aquifer System (2-3)	**Multiple Aquifer System (2-3)**	**Water Logged Areas**
Ambala, Kurukshetra, Karnal, Yamunanagar, Kaithal, Panipat (except Israna, & Madlauda blocks), Eastern Sonipat Districts	Western Sonipat, Israna & Madlauda block of Panipat district.	Parts of Jhajjar, Rohtak, Nuh, Hisar, Gurugram, Sonipat, Bhiwani, Charkhi Dadri, Jind, Sirsa, and Ambala districts

Map 1.1 Hydrogeology of Haryana



Source: Dynamic Ground Water Resources of Haryana, GWC, I&WRD, Haryana and CGWB, 2021

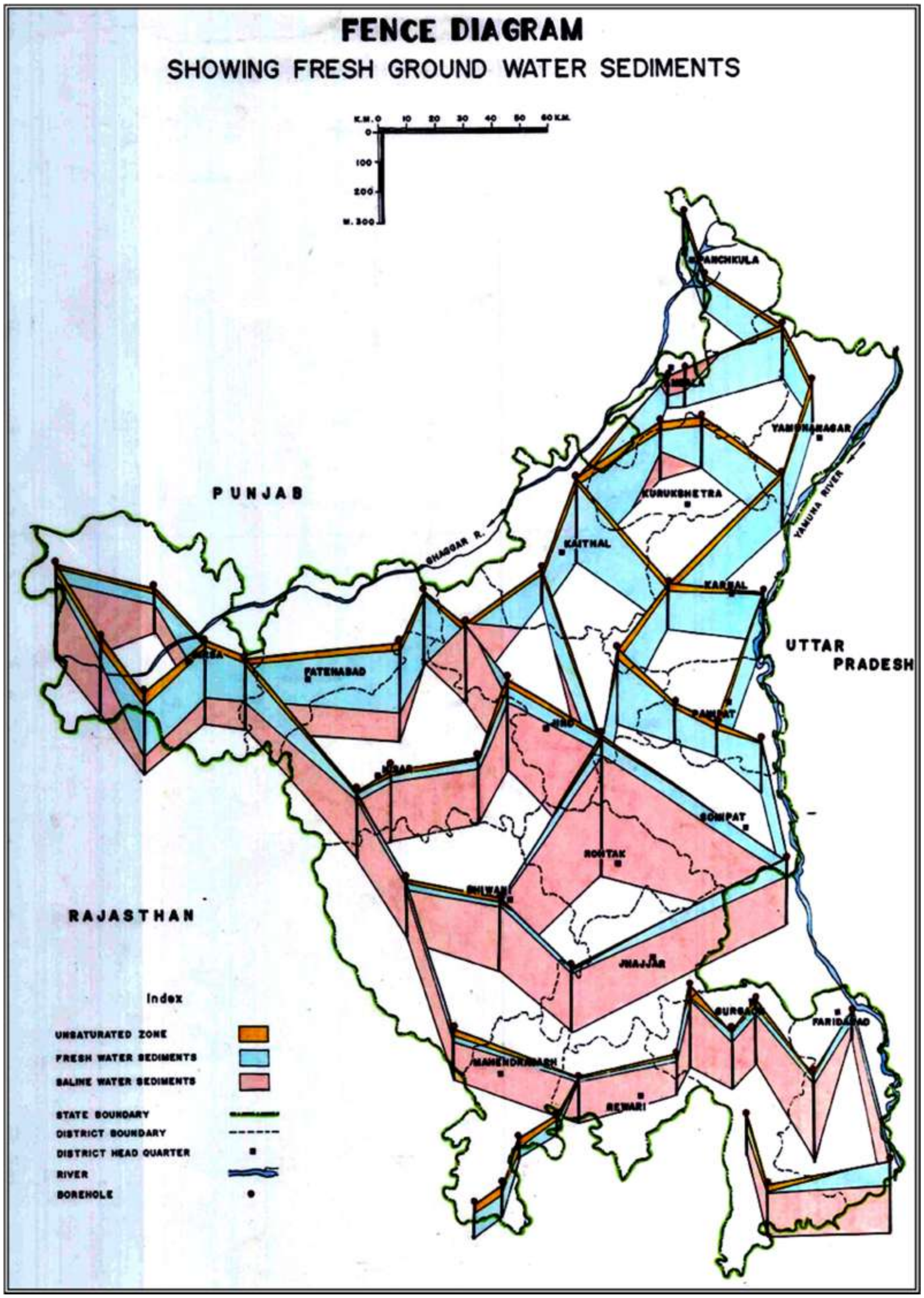
Every formation like Alluvium, Sirowal, Shivalik, and Aravali has a specific type of Lithology and Aquifer Behaviour.

Table 1.11 Lithology and Aquifer Behaviour

Formation	Lithology	Aquifer behaviour
Newer Alluvium	Active flood plains	Best unconfined aquifers with very good groundwater availability and less decline. Multiple aquifers with good potential for freshwater quality.
	Aeolian sediments	Poor top aquifers with average groundwater availability. Good fresh water multiple aquifers
Older Alluvium	Abandoned flood plains	Poor top aquifers with average groundwater availability. Average freshwater aquifers are generally saline
Sirowal	Silt and clay with a subordinate amount of sand and gravel	Very good recharge zones – freshwater High discharge but very deep-water levels
Upper Shivaliks	Sandstone, pebbles bed, boulder, conglomerate, and shale bands	Poor aquifers since it is dominated by clay patches and intervening sand and boulder beds which at places become promising aquifers
Aravalli Hill Ranges	Hard rock, quartzite	Very poor unconfined aquifers with less groundwater availability and very deep-water levels. Vertical recharge is nearly not there.

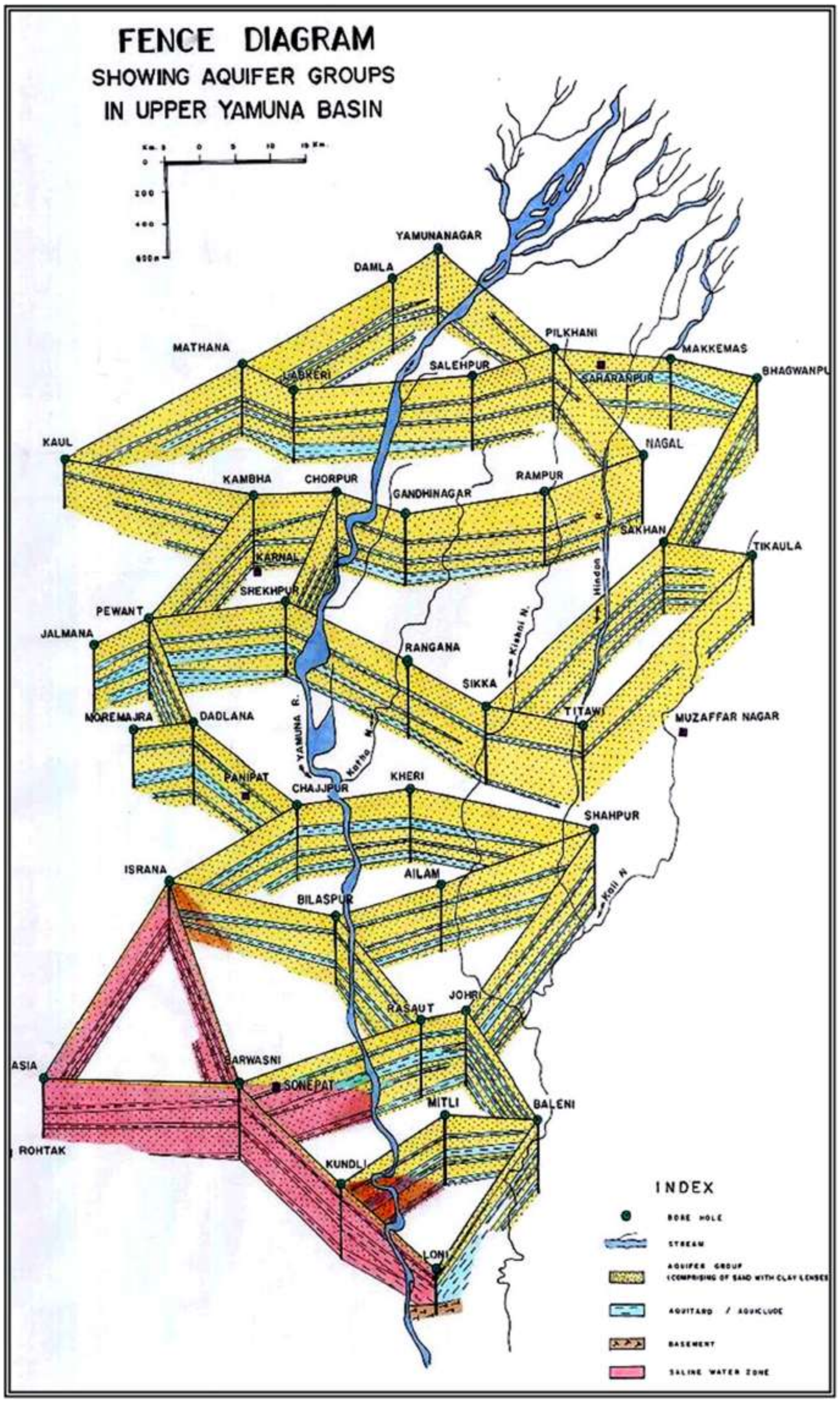
Map 1.2 shows that freshwater resources are majorly present in Northern Haryana. In the Central and Southern parts, fresh water is underlain by brackish saline water. Whereas, the southern part has saline water at all levels. The Aquifer Groups in Upper Yamuna Basin are illustrated in Figure 1.22.

Map 1.2 Freshwater-saline Water Sediments Interface



Source: CGWB

Figure 1.22 Aquifer Groups in Upper Yamuna Basin



Source: Upper Yamuna Project Report, CGWB

1.10.3 Transmissivity, Specific Yield and Storativity

Transmissivity describes the ability of the aquifer to transmit groundwater throughout its entire saturated thickness. Transmissivity is measured as the rate at which groundwater can flow through an aquifer section of unit width under a unit hydraulic gradient. Transmissivity can be determined from a pumping test using the levels of drawdown over time pumped.

Specific yield is the water removed from the unit volume of the aquifer by pumping or drainage and is expressed as the percentage volume of an aquifer. Specific yield depends upon grain size, shape and distribution of pores and compaction of the formation. The values of specific yields for alluvial aquifers are in the range of 10% to 20% and for uniform sands about 30%.

Storativity is the volume of water removed from a unit, of an aquifer for a unit drop in the hydraulic head. For confined aquifers; it is equal to the specific storage times the thickness of the aquifer and is typically very small. For unconfined aquifers; it is equal to the specific storage times the thickness of the aquifer plus the specific yield.

The aquifer parameters such as Transmissivity, Storativity and Specific Yield in Upper Yamuna Basin and Ghaggar River Basin have been represented in Table 1.12 and Table 1.13 respectively.

Table 1.12 Aquifer Parameters of Upper Yamuna Basin

Aquifer Group	Discharge (lpm)	Transmissivity 'T' (m^2/day)	'K' (Lateral) (m/day)	Storativity
I	3937	2200	24	12
II	NA	700	7.2	1.0×10^{-3}
III	1500	525	7.10	4.5×10^{-4}

Source: Aquifer Mapping and Management Plan, Yamunanagar District, Haryana, 2016

Table 1.13 Aquifer Parameters of Ghaggar River Basin

Aquifer Group	Discharge (lpm)	Transmissivity 'T' (m^2/day)	'K' (Lateral) (m/day)	Storativity
I	795 to 4164	874.62 to 2500	18	1.4×10^{-4} to 2.1×10^{-2}
II	1325	1163.91	18	5.2×10^{-5}
III	1325	1745.86	18	3.2×10^{-4}

Source: Aquifer Mapping and Management Plan, Yamunanagar District, Haryana, 2016

1.11 SOIL PROFILE AND INFILTRATION

The soils are non-calcareous and sandy loam on the surface and loam to clayey loam at depth. Due to intensive cultivation micronutrient status of the soils is depleting and reports of deficiency of iron, manganese and zinc have been reported.

Salt-affected soils are extensive in the plains of Haryana State. Three distinct kinds of soils are generally found, i.e., alkali, saline and saline-alkali soils. Rainfall, surface topography, and surface configuration (relief, aspect, micro-relief and microclimate) have influenced mineral weathering, ionic mobility and macro-chromatographic separation leading to the formation of these soils in three distinct zones. The majority of the area is represented by silt loam texture with varying soil colours having dominance of yellowish brown in the top layer. The development of water logging is an inevitable consequence of the introduction of irrigation without providing adequate drainage. If the underground water quality is poor, soil salinity develops soon thereafter. As such, water logging and soil salinity have emerged as major problems in the irrigation commands affecting agricultural productivity and sometimes become too severe such that it becomes imperative to take the land out from crop production.

Infiltration is the process by which water on the ground surface enters the soil. Infiltration rate in soil science is a measure of the rate at which soil is able to absorb rainfall or irrigation. It is measured in inches per hour or millimetres per hour. The rate decreases as the soil become saturated. It is usually measured by the depth (in mm) of the water layer that can enter the soil in one hour. In dry soil, water infiltrates rapidly. This is called the initial infiltration rate. The infiltration rate depends on soil texture (the size of the soil particles) and soil structure (the arrangement of the soil particles) and is a useful way of categorizing soils from an irrigation point of view. The most common method to measure the infiltration rate is by a field test using a cylinder or ring infiltrometer. CGWB conducted infiltration tests in a number of Districts at 568 locations in the NCR region.

Table 1.14 Classification of Infiltration Rates

Class	Rate of Infiltration (mm/hour)	Remarks
Very Slow	<2.5	Soil in this group has a very high percentage of clay.
Low	2.5 – 12.5	Most of these soils are shallow, high in clay andlow in organic matter contents.
Medium	12.5 – 25.0	Soils in this group are loams and silts.
High	>25	These soils are deep sands, deep well-aggregated silt loams and some tropical soils with porosity.

Source: Aquifer Mapping and Management Plans, CGWB

Link to access the plans: http://cgwb.gov.in/AQM/Haryana%20Report.html

The low basic infiltration rates indicate poor percolation of excess water through the sub-surface due to the presence of a hard pan and ultimately causing water logging and salinity in the area. The clay percentage in the soil also influences the infiltration rate. Clay particles in the soil may swell as they become wet and thereby reducing the size of the pores and reducing the infiltration rate. This explains why the infiltration rates of sandy clay and loamy clay are lower than those of sandy loam soils. The higher infiltration rates indicate the sandy nature of local soils. Sandy loam soil is known to have high infiltration rates while clay loam and sandy clay soils are known to have very low infiltration rates.

The average initial and final infiltration rate for the districts in the NCR region is given in Table 1.15. The high values of infiltration rates in Jhajjar, Rewari, Gurugram and Nuh Districts may possibly be due to the Aeolian nature of soils on the surface. The observed low basic infiltration rates at certain sites indicate poor percolation of excess water through the sub-surface due to the presence of a hard pan and ultimately causing water logging and salinity in the area. Initial high infiltration at some sites may be because of the presence of sandy loams and cracks in the soils. The presence of clay and *kankar* in the soil profile reduces the infiltration rate. Clay particles in the soil may swell as they become wet and thereby reducing the size of the pores and reducing the infiltration rate. This explains why the infiltration rates of sandy clay and loamy clay are lower than those of sandy loam soils.

Table 1.15 District-wise Soil Infiltration Rates in the NCR Region

Sr.no	District	No. of Infiltration Tests	Initial Infiltration Rate (mm/hr)		Final Infiltration Rate (mm/hr)	
			Range	Average	Range	Average
1	PANIPAT	60	30-660	177	3-150	18
2	SONIPAT	92	30-720	198	3-84	17
3	ROHTAK	66	12-660	107	3-150	17
4	JHAJJAR	70	60-2010	267	6-156	39
5	REWARI	76	60-1110	325	6-278	67
6	GURUGRAM	46	30-630	306	6-163	45
7	FARIDABAD	29	60-540	155	2-89	15
8	PALWAL	62	60-630	201	3-132	24
9	NUH	67	90-660	264	5-164	37

Source: Aquifer Mapping and Formulation of Aquifer Management Plan for NCR, Haryana, CGWB, 2015

Link to access the plans: http://cgwb.gov.in/AQM/Haryana%20Report.html

Chapter 2

SURFACE WATER RESOURCES AVAILABILITY AND ITS CHALLENGES

TABLE OF CONTENTS

LIST OF TABLES

LIST OF MAPS

LIST OF ANNEXURES

2.1 Introduction

The State of Haryana is a co-basin State to the Indus basin and Yamuna River in the Ganga Brahmaputra-Meghna basin. The Indus River, which rises from Mansarovar in Tibet/ Himalayas at an elevation of 5,182 metres, has its catchment in Tibet, India, Pakistan, and Afghanistan. It has a total drainage area of 1,165,500 sq. Kms and its course length from the source to the confluence with the Arabian sea is 2,880 Kms 27.6% of the total catchment i.e. 321,678 sq. Kms lies in India with a length of 1,114 Kms within India, the catchment is shared by the States of Jammu and Kashmir, Himachal Pradesh, Punjab, Rajasthan, Haryana, and Chandigarh. Jhelum, Chenab, Ravi, Beas, and Sutlej are the principal tributaries of the Indus River. The water resources development of the Indus River is governed by the Indus Water Treaty, 1960 between India and Pakistan. As per these provisions, the water of Rivers Ravi, Beas, and Sutlej defined in the treaty as Eastern Rivers is available to India for unrestricted use. The average annual runoff in the Indus basin as a whole within the Indian catchment is 73.3 BCM. Bhakra Beas Management Board (BBMB) had been constituted for the management of inter-state issues as well as regulation of shares to co-basin States depending on the availability of water in terms of Sutlej and Ravi-Beas agreements.

Yamuna River is one of the major tributaries of the River Ganga in the Ganga-Brahmaputra-Meghna basin. It rises in the Yamnotri glacier in Tehri Garhwal district of the State of Uttar Pradesh, at an elevation of 6,320 m, and flows for a total length of 1,376 Kms, up to its confluence with Ganga at Allahabad. After crossing Shivalik ranges upstream of Dak Pathar, two more tributaries viz. Malawi and Tons join River Yamuna. Tons River carries double the discharge of Yamuna River at its confluence. At this place, the River flows along the border of Uttar Pradesh and Himachal Pradesh. Between Dak-Pathar and Hathnikund Barrage (HKB), three more tributaries viz. Ahsan, Giri and Bata Rivers join Yamuna. At HKB, the bed level of the River is about 329 metres. After this the River enters the plains near Saharanpur in Uttar Pradesh and flows along the borders of Uttar Pradesh and Haryana States, touching Delhi and finally joining the River Ganga. The physiographical and geological features of the upper basin, which lies in the Himalayan ranges, account for most of the runoff in the River. On average, this region receives an annual rainfall in the range of 300 mm to 1100 mm. The major part of the rainfall is received in the monsoon period from June to September.

The State of Haryana receives supplies of Rivers Sutlej, Ravi-Beas and Yamuna as per share decided in inter-state agreements, but Haryana is not receiving its due share in Ravi-Beas water despite the decision given by the Supreme Court of India for early construction of Sutlej Yamuna link Canal (SYL) in Punjab. The arid areas of Districts Rewari, Mahendragarh, Charkhi Dadri and Bhiwani etc are suffering for want of water.

2.2 Assessment of Surface Water Resources

The major surface water resources of Haryana are its shares in Sutlej, Ravi-Beas, and Yamuna waters as per various Inter-state agreements. This accounts for a quantity of about 15.474 BCM of water. The State has no other perennial River and its internal water resources are comparatively very small. Its internal surface water resources have been identified as under:

i. River Ghaggar and Somb / Pathrala

ii. Other Rivers entering Haryana from the State of Rajasthan

iii. Water escaping the State boundary through a network of drains and escapes

iv. Lakes

In addition to Bhakra and Yamuna water, the mean availability from the Ghaggar River is 0.478 BCM. Practically there is no availability from other sources nowadays, so the total share from all sources is 15.952 BCM. A possible source Sharda- Yamuna River link has been proposed under the Himalayan component of interlinking the Rivers to divert surplus waters of Sharda and other *Nadies* enroute.

2.2.1 Water Share of Haryana under Different Inter-State Agreements

2.2.1.1 Share of Water in River Sutlej

After independence, the beneficiaries of Sutlej water were the State of Punjab, erstwhile PEPSU (Patiala & East Punjab States Union), and Rajasthan. On November 1, 1956, PEPSU merged with Punjab State and a formal agreement on the Bhakra Nangal project was concluded between the Punjab and Rajasthan Governments on January 30, 1959, which also set out in detail the extent of the area served by the project in each State. On November 1, 1966, the Punjab State was reorganized creating Haryana State beside Punjab as per the Punjab Reorganisation Act 1966. The total availability of water from River Sutlej based on flow series at the Bhakra dam site from 1921-60 at 50% dependability level was estimated at 17.281 BCM (14.01 MAF) which was distributed amongst three States (Table 2.1)

Table 2.1 Inter-state Water Shares in Sutlej River

State	Water Share (BCM)	Water Share (MAF)
Haryana	5.427	4.40
Punjab	10.053	8.15
Rajasthan	1.801	1.46
Total	**17.281**	**14.01**

Source: I&WRD, Haryana

2.2.1.2 Share of Water in Rivers Ravi and Beas

As per the 1981 agreement based on flow series 1921-60 at Madhopur Head-works across the River Ravi and Mandi plain across River Beas, the availability of surplus water after satisfying the pre-partition uses was placed at an annual mean of 21.179 BCM (17.17 MAF) which was allocated to the five States (Table 2.2)

Table 2. 2 Inter-state Water Shares in Ravi and Beas Rivers as per Agreement dated 31.12.81

State	Water Share (BCM)	Water Share (MAF)
Haryana	4.317	3.50
Punjab	5.205	4.22
Rajasthan	10.608	8.60
Delhi	0.247	0.20
J&K	0.802	0.65
Total	**21.179**	**17.17**

Source: I&WRD, Haryana

The matter was subsequently referred to the Ravi-Beas tribunal (also known as Eradi Tribunal) which was constituted under Section 14 of the Inter-state water dispute Act 1956 vide notification dated April 2, 1986.

Ravi-Beas Tribunal vide its report dated January 30, 1987, placed the total availability of surplus Ravi-Beas water at 22.548 BCM (18.28 MAF).

The State-wise distribution for 22.548 BCM (18.28 MAF) is given in Table 2. 3.

Table 2.3 Inter-state Water Shares (with additional supply) in Ravi and Beas Rivers

State	Water Share (BCM)	Water Share (MAF)
Haryana	4.724	3.83
Punjab	6.167	5.00
Rajasthan	10.608	8.60
Delhi	0.247	0.20
J&K	0.802	0.65
Total	**22.548**	**18.28**

Source: I&WRD, Haryana

The award of the Ravi-Beas Tribunal is yet to be gazetted by the Government of India (GoI) through objections of the basin States under Section 5(3) of the Inter-state water dispute Act. However, Haryana is getting only about 2 BCM (1.62 MAF) of Ravi-Beas water annually against the allocated share of 4.724 BCM because of the non-construction of SYL and system constraints.

2.2.1.3 Integration of Sutlej and Ravi-Beas Water

The water shares of Haryana are delivered through a network linking various Rivers and canals. Ravi, Beas, and Sutlej shares are delivered to Haryana through the Bhakra Main Canal. For this purpose, the transfer of water from River Ravi to River Beas is affected through the Madhopur-Beas link which was constructed in 1954 with a discharge capacity of 283.13 cumecs (10,000 cusecs). A storage dam known as Ranjit Sagar Dam, with a live storage capacity of 2.34 BCM (1.90 MAF), had been constructed on River Ravi upstream of Madhopur Head-works. The Ravi-Beas link joins the Beas River downstream of Pong Dam, having live storage of 5.989 BCM (4.856 MAF), which feeds the system downstream. Downstream of the Pong dam, Water from Ravi and Beas is being used by Punjab and Rajasthan and accounted for utilization from Ravi-Beas waters. Upstream of Pong dam, there is a diversion structure on River Beas at Pandoh, linking Beas River to Sutlej through the

Beas-Sutlej link channel with a capacity of 254.85 cumecs (9,000 cusecs). The storage dam/reservoir at Bhakra has a live storage capacity of 6.164 BCM (4.997 MAF).

2.2.1.4 Sutlej-Yamuna Link Canal

The total quantum of water supplies up to the head works at Ropar was quantified under the Bhakra Nangal Project. However, since the committed supplies from the Sutlej at Nangal were not sufficient to irrigate the high and arid areas of Haryana, it was felt essential to augment the supplies at Nangal with the surplus waters of Ravi and the Beas. It was realized on an analysis of the availability of water from the two Rivers that the low-lying areas of composite Punjab and Rajasthan which were hitherto fed by Sutlej waters could be irrigated by Ravi-Beas water from Harike. By this method, 2.923 BCM (2.37 MAF) of Ravi-Beas water came to be supplied through Harike to areas now forming part of Punjab and Rajasthan. Thus, Sutlej waters to the extent of 2.923 BCM (2.37 MAF) became available at Bhakra-Nangal for distribution to the high and arid areas of composite Punjab (now in Haryana). The supply was further augmented to the extent of 4.712 BCM (3.82 MAF) on the completion of the Beas-Sutlej link. Thus, the total supply of Ravi-Beas waters at Nangal was the tune of 7.635 BCM (2.923 BCM + 4.712 BCM) from this system. This water became available for Haryana at Nangal on the commissioning of the Beas-Sutlej link in 1977. Due to this, Haryana was enabled to take its Ravi-Beas share of water from Nangal itself i.e. Beas water directly and Ravi water through a barter system.

A canal, namely the Sutlej-Yamuna Link Canal (SYL Canal) was proposed to carry Haryana's share of Ravi-Beas water of 4.317 BCM (3.5 MAF). Construction of the SYL Canal was started in Haryana in the year 1976 and it was completed in 1980 in the Haryana portion. The construction of the SYL Canal in the territory of the State of Punjab was not started despite all efforts made in this regard by Haryana at all levels till the signing of the interState agreement between the partner States in the year 1981. The agreement further provided for the completion of the SYL by Punjab in its territory within 2 years. Construction of the SYL canal in Punjab territory was taken up by Punjab in 1982 but stopped in 1990 after completion of about 90% of the work and the work was not resumed by Punjab thereafter despite all-out efforts made by Haryana at all levels.

In the meanwhile, an accord called "The Punjab Settlement" accord provided a review of water allocation by a Tribunal. Accordingly, Ravi-Beas Tribunal was constituted by the GoI in 1986 to decide to share the surplus Ravi Beas waters gave its award in 1987 increasing the share of Haryana to 4.724 BCM (3.83 MAF) from 4.317 BCM (3.50 MAF) and that of Punjab to 6.167 BCM (5.0 MAF) from 5.205 BCM (4.22 MAF).

- The State of Haryana on November 25, 1995, filed a suit (Suit 1 of 1995) in the Supreme Court (later refiled on September 6, 1996, and renumbered as Suit No. 6 of 1996) under Article 131 of the Constitution of India for directions to Punjab and in the alternative to the Union of India to complete the Punjab portion of the SYL Canal which had been completed to the extent of 90 % in the Punjab portion. The court gave judgment in Haryana's favour on January 15, 2002 with directions to Punjab to complete the canal within one year and thereafter on June 4, 2004, directed the Union Government to mobilize a central agency within four weeks to take control of the canal works and the State of Punjab was directed to hand over the works to the central agency within 2 weeks thereafter.
- On July 12, 2004, i.e. two days before Punjab was to hand over the SYL Canal work to Central Public Works Department following the apex court orders, the Punjab Assembly passed the Punjab Termination of Agreements Act. The passing of the bill annulled all the previous agreements on Ravi Beas water sharing and Punjab escaping from the SYL construction. The Act, however, provided that the existing usages by the partner States would continue as before.
- The Government of India on 22nd July 2004 sought the opinion of the Supreme Court through a "Presidential Reference" under Section 143 of the Constitution with terms of reference as under:
    1. Whether the Punjab Termination of Agreements Act 2004 and the provisions thereof are in accordance with the provisions of the Constitution of India.
    2. Whether the Punjab Termination of Agreements Act 2004 and the provisions thereof are in accordance with the provisions of Section 14 of the Inter-state Water Disputes Act 1956, Section 78 of the Punjab Re-

Organization Act, 1966, and the Notification dated 24th March 1976 issued there under.

iii. Whether the State of Punjab has validly terminated the agreement dated 31.12.1981 and all other agreements relating to the Ravi Beas waters and is discharged from its obligation under the said agreement(s).

iv. Whether in view of the provisions of the Act, the State of Punjab is discharged from its obligations flowing from the judgment and decree dated 15.1.2002 and judgment and order dated 4.6.2004 of the Supreme Court of India.

- In the meantime, the State of Punjab filed a review petition on July 2, 2004, which was heard and rejected by the Supreme Court on August 18, 2004. On August 2, 2004, a Constitution Bench of the Hon'ble Supreme Court took up the Presidential Reference for hearing and issued certain directions for the filing of Statements of Facts & Law and issued notices to the concerned States i.e. Punjab, Haryana, Rajasthan, Jammu & Kashmir, Himachal Pradesh and the National Capital Territory of Delhi. The judgment in the matter was delivered on 10.11.2016 wherein the Hon'ble Apex Court decided all the points referred to it in the Presidential Reference in 2004 in favour of Haryana.
- Since the Presidential Reference has now been decided by the Constitution Bench of the Supreme Court, the Punjab Termination of Agreements Act, 2004 has become null and void. Therefore, the decree and orders of 2002 and 2004 of the Supreme Court need to be implemented. Haryana had already filed an execution petition on 01.06.2016 for the execution of the decree and orders.
- On 11.07.2017, The Hon'ble Court heard the matter and ordered that the Court have granted time to the Central Government to proceed with the settlement as some meetings were held by the Central Government. Apex Court directed that the authorities of both States must remember that a decree passed by this court in 2002 has to be respected and this has to be executed.
- The matter was thereafter heard on 07.09.2017. Attorney General informed the Hon'ble Court that GOI is mediating on the issue and has already held

meetings with the Chief Secretary, of Punjab, Haryana, and Rajasthan to sort out the issue and accordingly sought 7 weeks. On Hon'ble court orders, a committee was formed by the Government comprising Chief Secretary, Haryana, Principal Secretary, and Engineer-in-Chief and two meetings on SYL were held on 16.08.2019 and 21.08.2019 wherein nothing concrete emerged.

- As the Government of Punjab did not relent, the matter is placed before the Hon'ble Supreme Court of India for further action without seeking an extension of time. Hon'ble Court passed the following orders *"A meeting of various stakeholders be convened at the high level and the outcome of the same, if any, be informed to this Court. List the matter in the third week of August 2020."*
- Consequently, a meeting of both Punjab and Haryana CM with Union Jal Shakti Minister, Sh Gajendra Singh Shekhawat, was held on 18.08.2020 wherein the Hon'ble CM, Haryana strongly advocated for honouring the verdict of Hon'ble Supreme Court of India to complete the construction of SYL Canal. He further said that we need carrying capacity to convey the legitimate share of water allocated to Haryana. Reacting to the Statement of the Punjab CM that the availability of water has gone down, he said that the construction of SYL and the availability of water are two different issues. We should not confuse the two issues as water will be allocated to the States pro-rata depending on the current availability of water. This is provided in the 1981 agreement. Supreme Court of India in its judgement has also clearly mentioned that the decision of the Supreme Court is to complete the construction of the SYL canal. The precise allocation and distribution of waters among riparian States can be decided by the Tribunal.
- Hon'ble CM Haryana further said that surplus, un-channelized water of Ravi Sutlej and Beas water has flowed to Pakistan. As Narwana Branch and BML are more than 60 years old so we need an alternate carrier for transporting our legitimate share of water. Hon'ble Minister, Jal Shakti, Gajendra Singh Shekhawat also Stated in no uncertain terms that infrastructure and carrier capacity in the shape of SYL canal has to be created to harness the allocated

share of Haryana as per the current availability of water and to also harness water, otherwise flowing to Pakistan, especially during Monsoon season.

- Responding to the demand of Hon’ble CM Punjab in Yamuna waters, Sh Gajendra Singh Shekhawat said that Punjab had raised this issue earlier also before the Supreme Court and this issue had been discussed and deliberated at length before the delivery of judgement on SYL by the Supreme Court of India. Moreover, this issue is not relevant now, as an agreement on sharing Yamuna waters has already been finalized in 1994 among Haryana, Himachal, UP, Rajasthan and Delhi. Moreover, the agreement on Ravi Beas waters pertains to surplus waters, over and above the pre-existing usage during pre-partition days with a foreign country, whereas there is no such issue in Yamuna water.
- Three judge bench of Supreme Court on 07.09.2022 asked the Union Jal Shakti Ministry to call a meeting of the Chief Minister of Punjab & Haryana to resolve the issue as water is natural wealth and the mechanism to share it is to be worked out. In the meanwhile, a meeting was held by the Chief Ministers of Haryana and Punjab at Haryana Niwas, Chandigarh on 14.10.2022. Discussions were held in detail but there was no agreement on the construction of the SYL canal. Further, Union Jal Shakti Minister held the meeting with the Chief Ministers of both States on 04.01.2023 but Punjab refused to give any water through SYL Canal. In the given circumstances, Haryana has apprised the Hon’ble Supreme Court about the outcomes of meetings and requested an early decision on its execution.

2.2.1.5 Share of Water in River Yamuna

In the Memorandum of Understanding (MoU) signed on 12.5.1994 amongst Uttar Pradesh, Haryana, Rajasthan, Himachal Pradesh, and the National Capital Territory (NCT) of Delhi regarding allocation of surface water, the 75% dependable natural virgin flow in River Yamuna up to Okhla had been assessed at 11.70 BCM. Mean year availability had been assessed as 13.00 BCM, which is considered for the allocation of shares. The Inter-state shares of various co-basin States viz. Haryana, Uttar Pradesh, Rajasthan, Himachal Pradesh, and NCT of Delhi are given in Table 2.4.

Table 2.4 Allocation of Water Shares on Mean Year Availability in Yamuna River as per MOU dated 12.05.94

State	Water Availability (BCM)
Haryana	5.730
Uttar Pradesh	4.032
Rajasthan	1.119
Himachal Pradesh	0.378
Delhi	0.724
Total	**11.983**

Source: I&WRD, Haryana

Apart from allocation within States, it is stipulated that a minimum of 10 cumecs of water including Haryana's share of 5.65 cumecs, will be maintained downstream as minimum flow in Yamuna D/s Hathnikund Barrage and Okhla accounting for 0.325 BCM annually for ecological purposes. It is also estimated that 0.680 BCM of floodwater may not be utilizable as a result of unavoidable spills. These together with the shares (11.983 + 0.325 + 0.680) account for a mean year availability of about 13.00 BCM.

2.2.1.6 Share of Water in Ghaggar

River Ghaggar of the Indus River System originates from Shivalik Hills in Himachal Pradesh and enters Haryana in District Panchkula and flows through districts Ambala, Kurukshetra, Kaithal, Jind, Hisar and Sirsa till it exits at Sirsa to Rajasthan. There are many discharge measurement sites on River Ghaggar and its tributaries i.e. Markanda and Tangri Rivers. As the water flows in Ghaggar only in the Monsoon season, data measurement is restricted to monsoon months and data is inconsistent. The share of the partner States i.e. Haryana and Punjab are yet to be decided by Ghaggar Standing Committee. As regards the share of Rajasthan in Ghaggar water, the entire share was given to the erstwhile State of Punjab in the Bhakra Nangal agreement of 1959. In the absence of a decision regarding shares in River Ghaggar, the mean availability in the River is 0.478 BCM has been assumed as a share of Haryana for the time being for planning purposes. The Ghaggar water is mostly utilized in Haryana in the district of Sirsa and Punjab uses it through the Banur canal in the district of Mohali and Patiala.

2.2.2 Assessment of External Water Resources at Various Dependabilities

The optimum utilization was planned by estimating flows at four pre-determined dependability levels (90%, 75%, 50%, and 25%). and mean available annual flows. For the major Inter-state water resources long-term stream flow data for River Ravi at Madhopur Head-works, River Beas at Mandi plain, River Sutlej at Bhakra Dam site, and River Yamuna at Hathnikund Barrage and Okhla weir site, are used for statistical and flow distribution analysis, as the inter-state allocation is also based on the data of these sites. The computations and analysis made have assessed the Share of Haryana in various Rivers as per the Inter-state agreements, at the four dependability levels, which are given below.

2.2.2.1 Water Resources Assessment of River Sutlej

Monthly inflows of River Sutlej at Bhakra Dam were obtained from BBMB (for the period 1920-21 to 1973-74) and the Regulation unit of Haryana Irrigation Department (1961-95). The inflow data of BBMB and statistical analysis of the flow data from 1920-21 to 1959-60 (June-May water year) indicated a 50% dependable value of 16.72 BCM (mean value 16.37 BCM) as against 17.281 BCM (14.01 MAF) based on 1920-21 to 1944-45 flow data series mentioned in the inter-state share agreement.

The mean annual flow of Sutlej at Bhakra was Stated to be of the order of 16.00 BCM which compared well with the data of BBMB. The total availability and share of Haryana in Sutlej waters at different dependability levels computed on the pro-rata basis, as per the Inter-state agreement, is given in (Table 2.5).

Table 2.5 Annual Availability of Water from River Sutlej for Haryana (as per 1920-21 to 1990-91 series)

Annual Availability of Water from River Sutlej for Haryana (BCM)		
Dependability	**Sutlej Inflows**	**Haryana's Prorata Share**
Mean	15.77	4.96
25%	17.34	5.45
50%	15.72	4.94
75%	14.22	4.47
90%	11.90	3.74

Source: I&WRD, Haryana

2.2.2.2 Water Resources Assessment of Rivers Ravi and Beas

Statistical analysis and computation of dependable values, the combined concurrent flows of Ravi and Beas Rivers for 1921-22 to 1984-85 were also carried out. The total combined Ravi-Beas water flows and the pro-rata share of Haryana at different dependability levels are shown in (Table 2.6).

Table 2.6 Annual Availability of Water from River Ravi-Beas for Haryana

Annual Availability of Water from River Ravi-Beas for Haryana (BCM)				
Dependability	**Ravi-Beas Inflows**	**Haryana's Prorata Share**	**Ravi-Beas Inflows** (as per 1921-60 series)	
	(as per 1921-85 series)		BCM	MAF
Mean	20.33	4.15	21.18	17.17
25%	23.35	4.76	26.83	21.75
50%	19.86	4.05	20.81	16.87
75%	17.11	3.49	15.05	12.20
90%	14.57	2.97	12.82	10.39

Source: I&WRD, Haryana

2.2.2.3 Water Resources Assessment of River Yamuna

River Yamuna is gauged at two sites historically within the reach of our interest (Origin to Okhla) viz. at Hathnikund Barrage and in the lower reach at Okhla weir site near Delhi. For determining the shares of the Yamuna between various riparian States, the virgin inflow series at Okhla for the period 1951-74 was considered. Following hydrological data were obtained from various sources for the studies of Yamuna water share.

i. The Yamuna flows from 1951-74 at Tajewala/ Hathnikund Barrage and 1951-72 at Okhla were provided by the Irrigation department.

ii. Flow data of Yamuna River together with information on diversion to Agra canal, Gurgaon canal supplies collected from Superintending Engineer, I&WRD, Faridabad.

iii. River flow data from 1965-66 to 1996-97 and the water withdrawal to the States of Haryana and UP through Western Jamuna Canal (WJC) and Eastern Jamuna Canal (EJC) at Hathnikund Barrage from the Regulation unit of Haryana irrigation department and Hathnikund Head-works site through Hathnikund Water Services Circle, Yamunanagar.

Based on the available data, the water pro-rata shares computed on the basis up to Okhla inflows at various dependabilities are given in (Table 2.7)

Table 2.7 Annual Availability of Water from River Yamuna for Haryana

Annual Availability of Water from River Yamuna for Haryana (BCM)		
Dependability	**Up to Okhla Inflows**	**Haryana's Prorata Share**
Mean	13.84	6.10
25%	16.54	7.29
50%	13.33	5.88
75%	11.33	4.99
90%	8.30	3.66

Source: I&WRD, Haryana

However, data at Tajewala/Hathnikund Barrage for the period 1968 to 2020 has also been analysed in Annexure 2.1 as the results are given in Table 2.8. It reveals that only 4.801 BCM is received at Tajewala/Hathnikund Barrage against the allocation of 5.88 BCM This study conducted by I&WRD, Haryana has been submitted to the Upper Yamuna River Board (UYRB) and all partner States in August 2022 for examination and comments.

Table 2.8 Water Availability at Tajewala/Hathnikund Barrage from the Year 1968 to 2020.

Dependa bility	Water availability at Tajewala/HKB in BCM	Water availability up to Okhla (As per Table 2. 7)	Contribution for HKB/ Tajewala to Okhla
Mean			
25%	11.357	16.54	5.187
50%	8.529	13.33	4.801
75%	7.484	11.33	3.846
90%	6.529	8.30	1.771

Source: I&WRD, Haryana

2.2.2.4 Water Resources Assessment of Rivers Somb and Pathrala

The Rivers Somb and Pathrala are tributaries of the River Yamuna. Six storages have already been planned on them. Construction of the Adi Badri Dam has already been taken up while other dams are at various stages of clearance.

2.2.2.5 Water Resources Assessment of River Ghaggar

The Ghaggar River belonging to the Indus River system originates in Shivalik hills in Himachal Pradesh and enters Haryana in the districts of Panchkula, flows through part of Punjab before it re-enters the district of Ambala where it continues further in the Haryana State till its exit at Sirsa to Rajasthan. The Markanda, the Tangri (also known as Dangri), the Saraswati, and the Chautang are its important tributaries. The Ghaggar basin covers parts of the Ambala, Kurukshetra, Kaithal, Jind, Hisar, and Sirsa districts. The River has a total catchment of 42,200 sq. Kms and is spread over the States of Himachal Pradesh (560 sq. Kms), Union Territory (UT) of Chandigarh (114 sq. Kms), Haryana (13,400 sq. Kms), Punjab (14,800 sq. Kms), and Rajasthan (13,300 sq. Kms). For most parts, the Ghaggar basin consists of plains, with a gentle gradient towards the west but for a small area at the extreme eastern edge near the origin which is hilly. The total length of the River is about 560 Kms from its origin. Climatically, the basin comprises four distinct zones: Humid, Sub-humid, Semi-arid, and Arid. The humid zone with precipitation of 1,100 mm to 1,500 mm covers an area of 1,400 sq. Kms in the Shivalik and Kandi belt. Sub-humid zone with precipitation of 600 mm to 1,100 mm covers about 900 sq. Kms of Eastern Alluvial plains. The tropical semi-arid zone occupies 22,700 sq. Kms of the main part of alluvial plains have a precipitation range of 250 mm to 600 mm. The arid zone with precipitation of less than 250 mm covers an area of 9,100 sq. Kms in the southwestern part of the basin. About 80% of the annual rainfall occurs from June to September in the southwest monsoon season. The remaining 20% falls during the winter months of January to April.

There are several streamflow measurement sites on the River Ghaggar and its tributaries i.e. on Rivers Markanda and Tangri. But, at no site, the data are available continuously. Mostly at all sites, the data measurement activity is restricted to monsoon months. Annual inflow data at various sites, as received from the Water Data Collection Division of I&WRD, was considered and the annual availability of water from Ghaggar for Haryana has been assessed as 478.6 MCM. A number of kharif channels have been constructed from Ottu Weir for using available water from River Ghaggar. The assessment of surface water availability in the Ghaggar River is based on the available long-term flow series and the estimated availability of water at different dependability levels is given in (Table 2.9) below.

Table 2.9 Annual Availability of Water from River Ghaggar for Haryana

Annual Availability of Water from River Ghaggar (MCM)	
Dependability	**Availability**
Mean	629.03
25%	846.18
50%	478.60
75%	238.71
90%	93.75

Source: I&WRD, Haryana

2.2.2.6 Water Availability from Rivers entering Haryana from the State of Rajasthan

River Sahibi, Krishnawati, and Dohan Nalla are the three streams/Rivers flowing in the State of Haryana after crossing the border from the State of Rajasthan.

a) Sahibi River

River Sahibi originates in the eastern slopes of the Saiwar Protected Forest in Rajasthan State. After flowing in a southwest to the north-east direction for about 157 Kms, it enters the Haryana State in Rewari district near Jarthal and covers a total length of about 222 Kms up to Dhansa bund. The River has a defined course up to Pataudi Railway station and thereafter water spreads into branches till it outfalls into the Outfall Drain No. 8 (connecting Bhindawas Lake and Najafgarh Jheel) and flows to Najafgarh Jheel through regulators in Dhansa Bund. Afterwards, water flows into the Yamuna River through the Najafgarh drain. The total catchment of the Sahibi River is about 6,200 sq. Kms out of which 4,442 sq. Kms is in Rajasthan and about 1,800 sq. Kms in Haryana till it divides into several small courses.

The River is gauged in Rajasthan at Sodawas gauging station and shows a mean annual flow of 89 MCM. In Rajasthan, there are three medium and about 50 minor irrigation projects in the Sahibi Basin having a live storage capacity of about 90 MCM. Further, many more medium and minor irrigation projects are under construction and are being planned. The Government of Haryana has constructed Massani Barrage in Haryana near its borders with Rajasthan primarily envisaged for flood control and irrigation. The catchment area of the River at the Massani Barrage Project is 5,242 sq. kms. The Massani Barrage was constructed in the year 1985-86 and the records show that no water has flown downstream of Massani Barrage, even without gates in position. This makes it clear that there is no water available, at reasonable dependability, for utilization in Haryana due to the construction of the storage structures by Rajasthan. However, some flows are received during the monsoon when enough water is available in the River Yamuna.

b) River Krishnawati and Dohan Nalla

River Krishnawati originates in Rajasthan in the hills near Dariba village in Sikar district and flows north-east for about 42 Kms before entering Haryana near Dilpur village where it vanishes in sand dunes.

River Dohan originates in the hills near Sidals village in the Sikar district. It flows north for about 134 Kms and finally disappears in sand dunes after flowing in the Mahendragarh District of Haryana.

Both the above Rivers seem to have occasional flows only during monsoon months of which no record is available. However, after the construction of storage on these Rivers by Rajasthan, no water is flowing to Haryana for any practical use.

2.2.2.7 Summary of Shares of Haryana State

The total share of Haryana State from all sources at 50% dependability is 15.952 BCM as tabulated given below. However, the allocated share of Haryana in Ravi-Beas water and Yamuna water are not available due to non- completion of the SYL canal and up-storage dams.

Table 2.10 Share of Haryana from all Sources at a Dependability of 50%

Source	Share at Dependability of 50% in BCM
River Sutlej	5.427
River Ravi-Beas	4.317
River Yamuna	5.730
River Ghaggar	0.478
Total in BCM	**15.952**
Total in Crore Litres	**1595200**

Source: I&WRD, Haryana

Haryana's share is reduced to about 2 BCM against the allocation of 4.317 BCM in Ravi Beas water due to the non-augmentation of the SYL canal. Yamuna Share of 5.73 BCM is also not completely received in Haryana due to the non-construction of Up Storage Dams on Yamuna Rivers. The State of Haryana receives only 11.69 BCM against the allocation of 15.952 BCM due to the distribution on a pro-rata basis of available water.

2.2.3 Assessment of Internal Water Resources

2.2.3.1 Dams and Barrages

1. Kaushalaya Dam

Keeping in view the scarcity of water in Haryana State Government decided to construct a small dam namely Kaushalaya Dam with a live storage capacity of 1293 Ham and which provides 18.4 Cusecs of drinking water during lean period i.e. September to July and 40.3 Cusecs during filling period i.e. July to September.

Consequent to the construction of the dam, a reservoir area of about 1.06 sq Kms has been formed near Pinjore which can be developed as a tourist spot. The reservoir of the dam gets filled up during monsoon season and supplies drinking water to the Panchkula township through a pipeline laid by HSVP depending upon the availability of water in the reservoir. The subsoil water level in the area stands increased by 3m to 4m. The dam is serving all its purposes successfully and catering to the domestic need of Panchkula after its augmentation.

2. Hathnikund Barrage

Hathnikund Barrage is a concrete barrage constructed on the Yamuna River in Yamunanagar district between the year 1996-1999 to replace the old Tajewala Dam constructed in the year 1873. The barrage diverts water in Western and Eastern Yamuna canals to serve water to the area of Haryana and Uttar Pradesh States. There is no storage available at this Barrage.

2.2.3.2 Water Escaping the State Boundary through a Network of Drains and Escapes

There are few drains which have a catchment of their own. These drains generally flow during monsoon season. The water from the main drains i.e Diversion Drain No 8, Drain No 2, Drain No 8 Ujjina drain, Gounchi drain etc. flows into the River Yamuna. About 1.53 BCM has flown from all the drains in the River during 2020 as detailed in Annexure 2. There are only three escapes i.e Dhanaura Escape, Munak escape and Indri escape. Practically there is no substantial discharge flow from these escapes due to the scarcity of water in the State.

2.2.3.3 Canal Network and Supplies

1. Canal Network

Canal Water is being supplied to the Culturable Command Area (CCA) of about 29.29 lac hectares (72.38 lac acres) through 1,521 channels having a length of 14,125 Kms through four canal systems in Haryana.

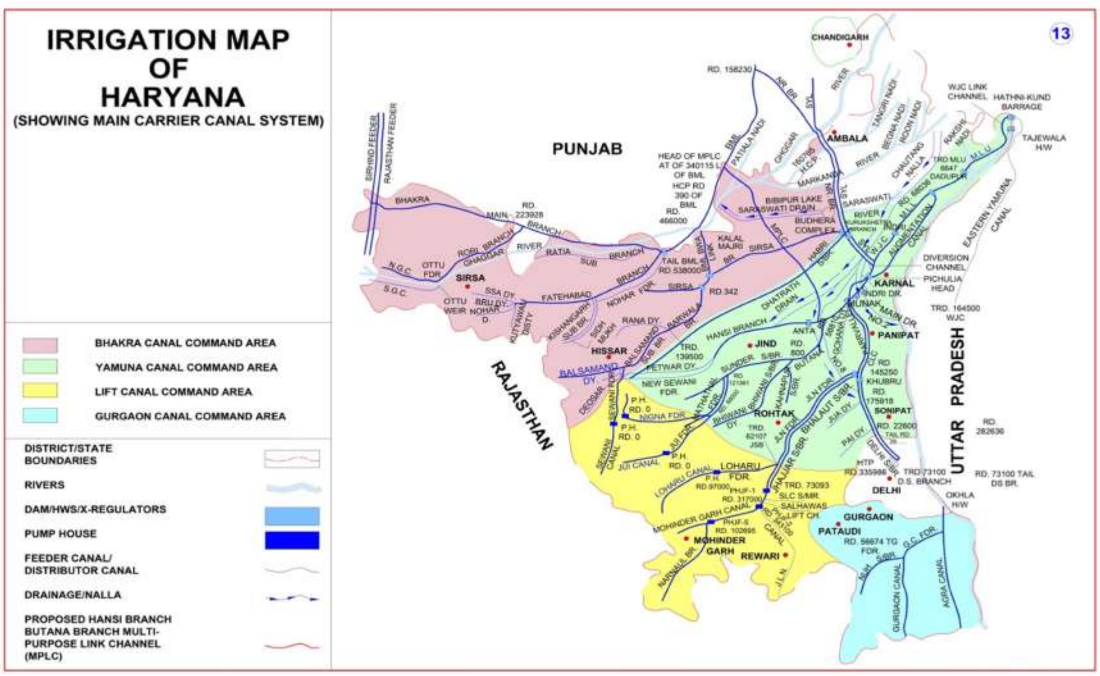
i. Western Jamuna Canal (WJC) System

ii. Bhakra Canal System

iii. Lift Canal System

iv. Agra and Gurgaon Canal Systems

Map 2.1 Main Carrier Canal System of Haryana

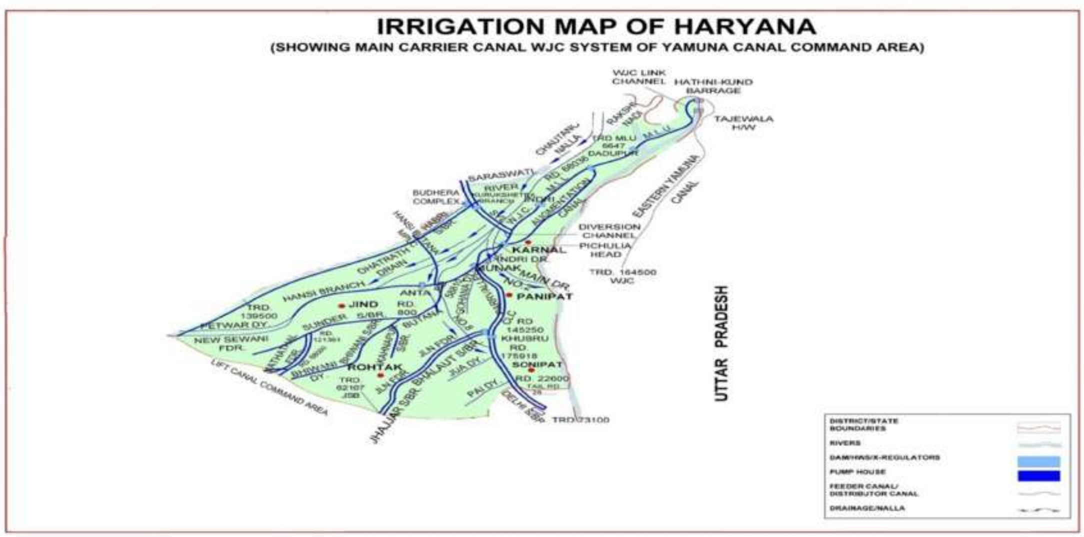


Source: I&WRD, Haryana

i. Western Jamuna Canal (WJC) System

Haryana's share of water in the River Yamuna is received at Hathni Kund Barrage (HKB) through the Western Jamuna Canal (WJC). Thus, water falls into the Dadupur pond upstream of Pathrala Dam through the mainline upper, from where WJC Main Line Lower off-takes with a designed capacity of 19,866 cusecs and length of 1,90,950'. Now its capacity is being increased to 23,780 cusecs to use more flood water. There are four small Hydropower Houses of HPGCL on this Hydel Channel. WJC Main Line Lower (MLL) Feeds Augmentation Canal which off takes at RD 68220' and outfalls in WJC Main Branch at Picholia Head upstream Munak. The MLL ends at Indri Head and down-stream (D/S) Indri Head, it is named as WJC Main Branch with a design capacity of 13,300 cusecs and it tails at Munak Head after traversing a length of 145250'. Munak Head is the main distribution point of Haryana's as well as Delhi's share of Yamuna waters as well as Bhakra waters diverted to the WJC system from Budhera complex through SYL canal and Narwana Branch Karnal (NBK) link channel and from here Delhi Branch, Carrier Lined Channel and Hansi Branch off-take. The total Culturable Command Area (CCA) of the WJC system is 8.62 lacs hectares (21.30 lac acres) with the intensity of irrigation at 62%.

Map 2.2 WJC System of Yamuna Canal Command Area

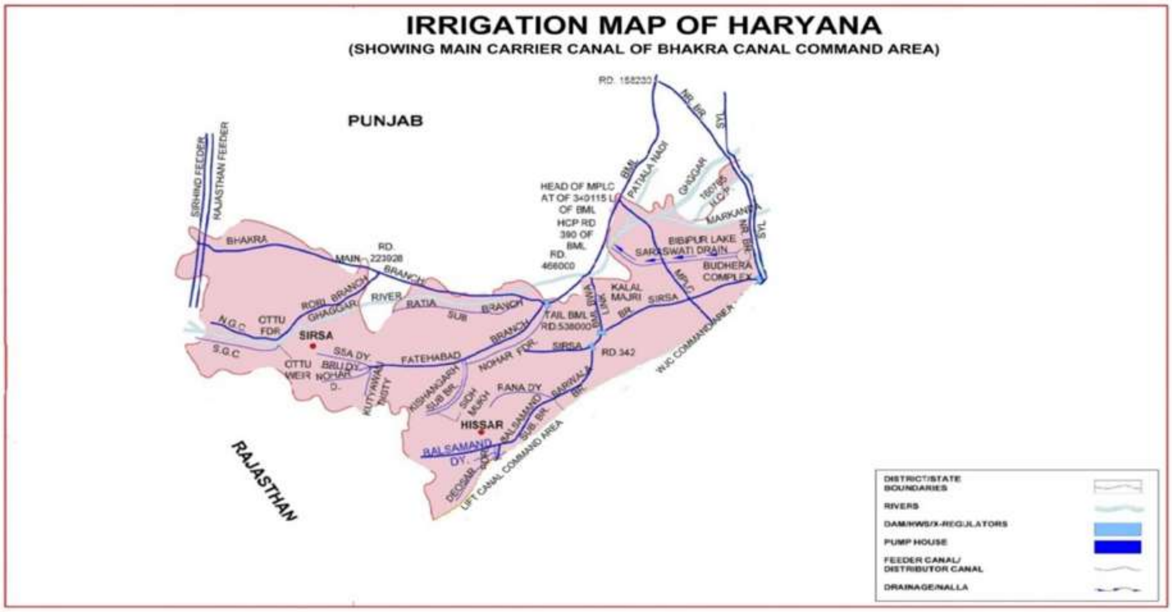


Source: I&WRD, Haryana

WJC Main Branch has been relined with cement concrete to reduce seepage losses thus conserving water. The Augmentation Canal of this system of the length of 75 Kms is being relined with an enhanced capacity of 6000 cs to reduce seepage losses with the purpose of conserving water.

ii. Bhakra Canal System

Map 3.3 Main Carrier Canal of Bhakra Canal Command Area



Source: I&WRD, Haryana

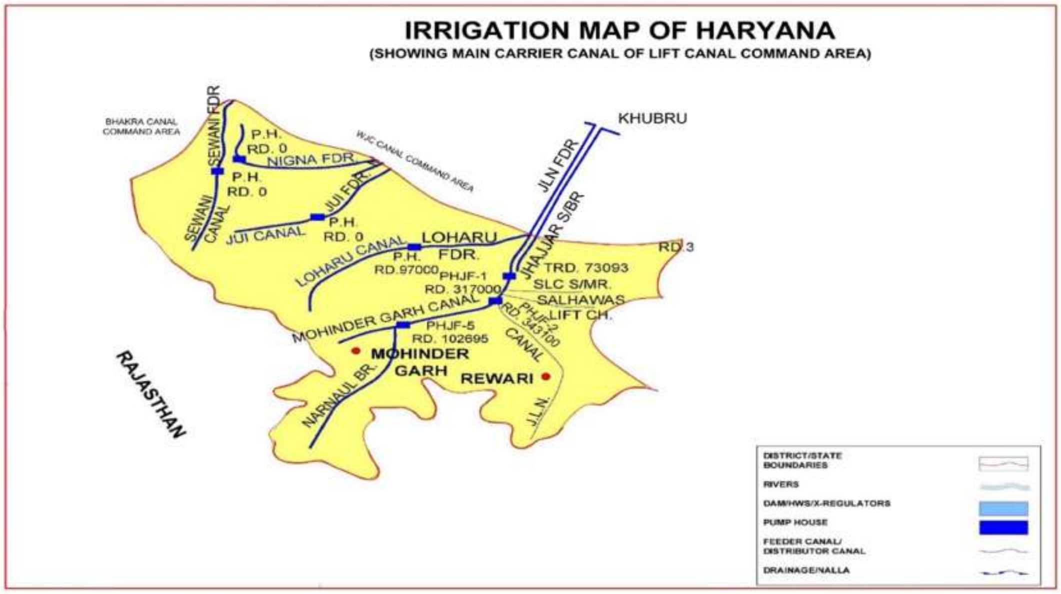
The State of Haryana draws its share of Ravi, Beas, and Sutlej waters from the Bhakra reservoir through Nangal Hydel Channel. Bhakra Main Line off-taking from Nangal Dam and further through:

i. Narwana Branch, off-taking from Bhakra Main Line (BML) at Saunda Head in Punjab,
ii. BML Barwala Link Channel off taking from BML at Khanauri Head in Punjab and joining Sirsa Branch near village Dhakal in Narwana, and
iii. Bhakra Main Branch (BMB) and Fatehabad Branch off taking from tail BML at Baliyala Head near Tohana.

The main carrier channels of the Bhakra System consist of Narwana Branch, Sirsa Branch, Habri Sub Branch, Barwala Branch, BML Barwala Link Channel, Balsamand Sub Branch, Bhakra Main Branch, Pabra Branch, Fatehabad Branch, Kishangarh Sub Branch, and Rori Branch. Total CCA is 13.92 lac hectares (34.40 lac acres) and is irrigated through 5940.87 Kms length of channels through various distributaries and minors with the intensity of irrigation as 110%. The Ghaggar Canal Sub System is part of this system and irrigates the Sirsa area.

iii. Lift Irrigation System

Map 2.4 Main Carrier Canal of Lift Canal Command Area



Source: I&WRD, Haryana

Lift Canal System consists of the following four systems:

a. Jui Lift Irrigation System

This system off-takes from RD 121000 of Sunder Sub Branch through Jui Feeder with a designed discharge of 755 cusecs. This scheme provides irrigation to about 4167 hectares (10297 acres) of CCA in the Bhiwani District. There are 7 pump houses constructed in this scheme to lift water to a height of 129’ in various stages. The Jui System has a length of 242 Kms. It utilizes the water of the Yamuna as well as that of the Bhakra. It is the oldest lift system in Haryana.

b. Siwani Lift Canal System

Siwani system off-takes from the tail of Old Siwani feeder with a designed discharge of 436 cusecs. This scheme has been constructed to provide irrigation to undulating areas of the Bhiwani and Hisar districts. The scheme of Siwani Lift Irrigation was approved by the Government to irrigate CCA of about 72,100 hectares (1.78 lac acres) by lifting water up to 102’ in various stages through 21 pump houses. The scheme was started in the year 1971-72 and was completed in the year 1978-79. The system is fed from the

WJC system in the Monsoon period from the tail Hansi Branch and fed through the Bhakra system from the Balsamand sub-branch for the rest of the period.

c. Loharu Canal System

Loharu Lift Scheme was started in the year 1970 for utilizing the surplus water of the River Yamuna. Presently this system is being fed through the JLN feeder. Loharu Feeder off-takes from JLN Feeder near village Bakra with the designed discharge of 1,379 cs. and flows as a blind channel with gravity flow for a length of 97000’. After this Loharu feeder is named Loharu Canal on which there are 8 pump houses. The area of Dadri Badhra and Loharu Tehsil of District Bhiwani are covered by this canal. There is a total of 31 pump houses on the system. The total lift involved on various channels is 217.15’. The total culturable commanded area of the system is 1.21 lac hectares (2.99 lac acres). There is a total of 103 No. channels on this system which serve 273 villages of district Bhiwani. In addition, 36 water supply schemes are based on this system.

d. Jawahar Lal Nehru (JLN) Canal System

To save the area of the districts of Mahendragarh, Rewari, and Jhajjar from drought, JLN Lift Irrigation Project was constructed which is being fed through JLN Feeder which off-takes from Delhi Parallel Branch at Khubru Head near Panipat. Two canals i.e. JLN Canal and Mahendragarh Canal off-take from Pump House JF-II at the tail of JLN Feeder.

The JLN Canal is off-taking from JLN Feeder with a designed capacity of 927 cusecs and supplies water in Rewari and Jhajjar Districts. There are 43 pump houses on this system and 3 pump houses for dewatering floodwater. The cumulative lift of canals, distributaries, and minors is 464’. All drinking water supply schemes in the area are canal-based.

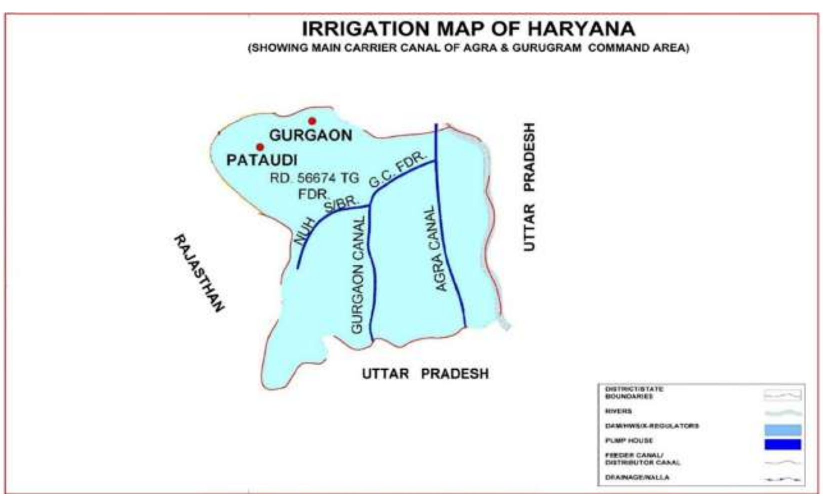
Mahendragarh Canal off-takes from the JLN Feeder with an authorized discharge of 1,690 cusecs and supplies water in Mahendragarh District. 102 channels measuring a total length of 792.03 Kms and 68 pump houses of different capacities and lifts. At present 58 pump houses have been energized and are in running condition. The total lift involved is 467' on Mahendragarh Canal. All 71 waterworks in the district are canal-based. The total CCA of the JLN is 3.21 lac hectares (7.93 lac acres)

iv. Agra and Gurgaon Canal Systems

The regeneration in River Yamuna between HKB and Okhla Head-works near Delhi, including spills from HKB, after utilization by Delhi at Wazirabad Head-works, is diverted into Agra Canal off-taking on the right side of Okhla Head-works. The Okhla Head-works and Agra Canal System are operated and maintained by the Uttar Pradesh State. The channels off-taking directly from Agra Canal serve about 26203 hectares' (64750 acres) area of Haryana State in the Faridabad and Palwal districts.

Gurgaon Canal System receives water from the Gurgaon Canal feeder off-taking at RD 4.3 Miles of Agra Canal. The Gurgaon Canal System supplies water for Irrigation & Industrial use in district Faridabad for 49,331 hectares (1.21 lac acres), Palwal 28,894 hectares (71,340 acres), Nuh and Gurugram 53,270 hectares (1.32 lac acres) covering a total CCA of 1.31 lac hectares (3.24 lac acres). The water share of Rajasthan State is also supplied through Gurgaon Canal. Rajasthan Link Channel has a capacity of 554 cusecs at RD 16,8000 of Gurgaon Canal. Due to higher and non-uniform elevation in various areas of the region, the water is required to be lifted with the pumps and put into the various channels for further distribution. Therefore, to achieve this, Eight Pump Houses are set up at Six Locations on various Channels of the Gurgaon Canal System to lift water for Irrigation.

Map 2.5 Main Carrier Canal of Agra and Gurugram Command Area



Source: I&WRD, Haryana

2. Rotational Program of Canal System

Haryana has constructed an extensive canal system to provide water to each corner of the State. The requirement of water for the simultaneous running of all the channels is over 30,000 cusecs discharge. However, the average availability of water during the Rabi period is about 13,500 cusecs and during the Kharif period, it is about 21,600 cusecs. Therefore, all the channels of the Haryana Irrigation Department can neither be run in the Rabi period nor the Kharif period. As such, channels are required to run in rotation, so that available water could be equitably supplied to its population.

The following grouping of channels has been done for their rotational programmes:

i. Bhakra Canal System

a. **Tail BML Channels**: Tail BML channels have been grouped into two groups, i.e. Group A and Group B. The requirement of discharge for these groups is 3,621 cusecs (including 650 cusecs for Rajasthan supplies) and 3,515 cusecs (including 655 cusecs for Rajasthan supplies). These groups run alternatively for a month. The main channels of A group are Rori Branch, Boha Dudal link, Mamer Khera Disty group B are Ratia Branch, Gorakhpur Disty, Prithala Disty Dhanori feeder, Nohar feeder and Kheri Disty etc

b. **BML-Barwala-link/Sirsa Branch Channels**: These channels have been grouped into three groups i.e. Group A, Group B, and Group C. The requirement of discharge for these groups is 1,344 cusecs, 1,233 cusecs, and 1,285 cusecs respectively. Channels for each group run for 8 days after closure of 16 days as per the preference order issued by I&WRD. The main channels of Group A are Barsola feeder, Balsamand Sub Branch Group B are Subra Disty, Nara Disty, Badhawar Disty, O P Jindal Disty and Group C are Dhamtan feeder, Rana Disty, Devsar feeder Narwana Minor etc.

ii. WJC System (including lift canals)

This system has been grouped into four groups and abbreviated as under:

i. Group I (JLN + HABRI = 6,984 cusecs)
ii. Group II (Bhalout + Sirsa Br. = 7,171 cusecs)
iii. Group III (Sunder + Markanda = 7,315 cusecs)
iv. Group IV (Butana + Jansui = 7,834 cusecs)

The requirement of discharge for these groups is 6,984 cusecs, 7,171 cusecs, 7,315 cusecs, and 7,834 cusecs respectively and every group also includes a water supply for Delhi which varies up to 1050 cusecs. Channels of each group run for 8 days after the closure of 24 days. Sometimes in April, May and June of the year, the WJC system has to run in 5 groups due to the scarcity of water in the Bhakhra and Yamuna systems. During this period, each group is run for 8 days after the closure of 32 days. The main channels of Group I are JLN feeder, Nardak Disty, Israna Disty Rattanthal Disty Group II are Bazida Disty, Hulana Disty, Bhalaut Disty, Sudhkan Disty, Saraswati feeder Group III are Gohana Disty, Jind Disty, Markanda Disty, Jui feeder, Butana Disty, Mithathal Disty Group IV are Kahnaur Disty, Sahlawas link channel, Nanggal lift channel etc.

iii. Simultaneous Running Groups

When water is available to run more than one group, then the channels of the next group are also run on second priority. For example, for the WJC system, sometimes water is available to the extent that all four groups can be run simultaneously. If little less water is available, then three groups are run simultaneously and some channels of the 4th group are also run as per the availability of water. At the beginning and end of the monsoon period, water availability is normally sufficient to run two groups simultaneously.

iv. Canal Water Deficiency

During the non-monsoon period, only one group of WJC systems can be run at a time while no water is supplied in the other three groups. Each group is run for 8 days so that water is available to the farmers for at least 7 days and then so that farmers at least get one turn in the running period. In this way, a farmer gets their turn of water once in 32 days. Crops cannot be sustained without irrigation for such a long non-running day of the canal. Farmers supplement their irrigation from tube wells to sustain their crops. However, as per the booking of irrigation record, the contribution of canal water to the cropped area is only about 35 to 36 % in which some tube well irrigation also gets included. If tube well irrigation is excluded, then Rabi irrigation will even be less than 35% to 36% of the cropped area. However, the position is comfortable during the Kharif season. The rest of the irrigation requirements are supplemented by tube wells; this shows huge canal water deficiency in the State. Construction of the SYL canal and the construction of upstream storage dams on the Yamuna will help improve the situation.

3. Position of Tails

Every distributary and minor has an outlet at its tail end, called tail. If the tail of a channel is fed, it is understood that all other outlets of the channel are also fed. Therefore, checking the feeding of the tails of a canal system projects the health of its working. If some of the tails of a canal system are not fed, then it determines the partial effectiveness of the canal system. The concerned department always strives for feeding all tails of the system or at least feeding a maximum of tails. I&WRD also analyses reasons for the non-feeding of tails and prepares rehabilitation projects for the affected canal to make sure that tails are fed properly. Total Tails in the State and their position of being fed are given in (Table 2.11) and (Table 2.12).

Table 2.11 Unit-wise Number of Tails

BWS System	476
YWS(N) Unit	290
YWS(S) Unit	81
Lift Canal Unit	530
Total	1377

Source: I&WRD, Haryana

Table 2.12 Position of Feeding of Tails as of September 2022

S. no.	Unit	Tails to be fed	Actual fed	Tails short
1.	BWS	476	466	10
2.	YWS(N)	290	253	37
3.	YWS(S)	81	55	26
4.	LCU	530	461	69
	Total	**1377**	**1235**	**142**

Source: I&WRD, Haryana

Reasons for non-feeding of tails;

i) The concerned channel needs repair or rehabilitation for running of adequate discharge;

ii) There can be excess drawl of water by upstream outlets;

iii) Theft of water;

iv) Non-availability of adequate discharge at the head of the channel.

v) Out of the above 142 No. short tails not being fed in September 2022, the tails of 54 channels in the State are chronic for which a proposal has been made to rehabilitate the channels of these tails: Total cost to rehabilitate these channels has been estimated as INR 143.46 crore. Work on the modernization of some channels is in progress. The list of chronic tails district-wise is placed in Annexure 3.

4. Accounting of Canal Water received at Haryana Contact points and WJC head

Supply of Surface water to Haryana State is received from Sutlej, Ravi – Beas and Yamuna Rivers through respective canals. Accounting of water deliveries from Sutlej, Ravi-Beas River is done by BBMB. BBMB prepares its account for the filling period i.e. 21st May to 20th September and the depletion period i.e. 21st September to 20th May in each year. Net deliveries to Haryana for Sutlej and Ravi-Beas Rivers for 12 years i.e. from 2009-10 to 2020-21 are given in the following Table 2.13.

i. Net deliveries of Sutlej and Ravi-Beas water from BBMB to Haryana from the year 2009 -2021.

Table 2.83 Net Deliveries of Sutlej and Ravi-Beas Water from BBMB to Haryana from the year 2009 -2021

Period		Net Deliveries to Haryana			
		Sutlej waters in MAF	Ravi-Beas waters in MAF	Total in MAF	Total in BCM
2009	Filling	1.69	0.35	2.04	
2009-10	Depletion	2.05	0.58	2.63	
	Total	**3.74**	**0.93**	**4.67**	**5.76**
2010	Filling	1.48	0.53	2.01	
2010-11	Depletion	2.49	1.10	3.59	
	Total	**3.97**	**1.63**	**5.6**	**6.91**
2011	Filling	1.56	0.51	2.07	
2011-12	Depletion	2.50	1.27	3.77	
	Total	**4.06**	**1.78**	**5.84**	**7.20**
2012	Filling	1.54	0.64	2.18	
2012-13	Depletion	1.96	1.26	3.22	
	Total	**3.50**	**1.9**	**5.4**	**6.66**
2013	Filling	1.58	0.41	1.99	
2013-14	Depletion	2.21	1.35	3.56	
	Total	**3.79**	**1.76**	**5.55**	**6.85**
2014	Filling	1.59	0.49	2.08	
2014-15	Depletion	2.36	1.10	3.46	
	Total	**3.95**	**1.59**	**5.54**	**6.83**

Period		Net Deliveries to Haryana			
		Sutlej waters in MAF	Ravi-Beas waters in MAF	Total in MAF	Total in BCM
2015	Filling	1.4	0.48	1.88	
2015-16	Depletion	2.36	1.34	3.7	
	Total	**3.76**	**1.82**	**5.558**	**6.86**
2016	Filling	1.63	0.45	2.08	
2016-17	Depletion	2.17	1.27	3.44	
	Total	**3.80**	**1.72**	**5.52**	**6.81**
2017	Filling	1.48	0.66	2.14	
2017-18	Depletion	2.36	1.30	3.66	
	Total	**3.84**	**1.96**	**5.8**	**7.15**
2018	Filling	1.45	0.63	2.08	
2018-19	Depletion	2.12	1.40	3.52	
	Total	**3.57**	**2.03**	**5.6**	**6.91**
2019	Filling	1.56	0.57	2.13	
2019-20	Depletion	2.43	1.30	3.73	
	Total	**3.99**	**1.87**	**5.86**	**7.23**
2020	Filling	1.49	0.63	2.12	
2020-21	Depletion	2.24	1.15	3.39	
	Total	**3.73**	**1.78**	**5.51**	**6.79**
Average in MAF		**3.81**	**1.73**	**5.54**	
Average in BCM		**4.70**	**2.13**	**6.83**	**6.83**
Average in Crore Litres					**683000**

Source: I&WRD, Haryana

Apart from this, Haryana receives water from the Yamuna Rivers through Western Jamuna Canal (WJC) and Gurgaon / Agra Canal under the MoU of 1994. Its water account is prepared by Haryana and submitted to UYRB for their scrutiny. Abstract of Yamuna deliveries to Haryana for twelve years 2009-21 is given as under:

ii. Net Deliveries to Haryana from Yamuna River

Table 2.94 Net Deliveries to Haryana from Yamuna River

Period	Net Deliveries from Yamuna to Haryana (Cusecs day)	Yearly total (Cusecs day)	Yearly Total (MAF)	Yearly total in (BCM)
21.09.2009 to 20.05.2010	436306	1222542	2.42	2.99
21.05.2010 to 20.09.2010	786236			
21.09.2010 to 20.05.2011	799834	2171390	4.31	5.32
21.05.2011 to 20.09.2011	1371556			
21.09.2011 to 20.05.2012	697324	1807496	3.59	4.43
21.05.2012 to 20.09.2012	1110172			
21.09.2012 to 20.05.2013	968741	2236927	4.44	5.48
21.05.2013 to 20.09.20113	1268186			
21.09.2013 to 20.05.2014	1069736	2200124	4.36	5.38
21.05.2014 to 20.09.2014	1130388			
21.09.2014 to 20.05.2015	725487	1749104	3.47	4.28
21.05.2015 to 20.09.2015	1023617			

Period	Net Deliveries from Yamuna to Haryana (Cusecs day)	Yearly total (Cusecs day)	Yearly Total (MAF)	Yearly total in (BCM)
21.09.2015 to 20.05.2016	362174	1462798	2.90	3.58
21.05.2016 to 20.09.2016	1100624			
21.09.2016 to 20.05.2017	451212	1725498	3.42	4.22
21.05.2017 to 20.09.2017	1274286			
21.09.2017 to 20.05.2018	471063	1552655	3.08	3.80
21.05.20118 to 20.09.2018	1081592			
21.09.2018 to 20.05.2019	706860	1762600	3.50	4.32
21.05.2019 to 20.09.2019	1055740			
21.09.2019 to 20.05.2020	1023247	2139550	4.24	5.23
21.05.2020 to 20.09.2020	1116303			
21.09.2020 to 20.05.2021	404365	1438568	2.85	3.52
21.05.2021 to 20.09.2021	1034203			
Average in MAF			**3.55**	
Average in BCM			**4.38**	**4.38**
Average in Crore Litres				**438000**

Source: I&WRD, Haryana

iii. Abstract of Actual Deliveries to Haryana

12-year average actual deliveries to Haryana at contact points from Bhakra and Yamuna Rivers have been summed up in Table 2.15.

Table 2.15 Actual Deliveries to Haryana

River	Share Allocated at 50% dependability to Haryana (BCM)	Actual Delivery to Haryana (BCM)
Sutlej Water	5.427	4.70
Surplus Ravi Beas Water	4.317	2.13
Yamuna Water	5.730	4.38
Ghaggar Water	0.478	0.48
Total in BCM	**15.952**	**11.69**
Total in Crore Litres	**1595200**	**1169000**

Source: I&WRD, Haryana

iv. Comments on Actual Delivery of Water to Haryana

a. Sutlej water

The share of Sutlej water for Haryana is a mean 4.96 BCM of. 5.45, 4.94, 4.47 and 3.74 BCM at 25%, 50%, 75% and 90% dependability against which the actual, average receipt of water to Haryana is 4.70 BCM. Less receipt of water is due to many reasons including losses in the carrying system up-to the State contact points, reservoir losses and other reasons.

b. Ravi Beas water

The share of Haryana in Ravi-Beas Water as per the 1981 agreement is 3.5 MAF (4.317 BCM), but the water was to be delivered through Sutlej Yamuna Canal (SYL) canal. However, the SYL canal could not be completed due to various reasons and part supply of Ravi Beas Water is being received through the spare capacity of Bhakra Main Lain (BML) and Narwana Branch. The above Table shows that the actual availability of water to Haryana from Ravi-Beas is 2.13 BCM. The short supply is mainly due to the non-construction of the SYL Canal.

c. Yamuna Water

As per Table 2.14, the average availability of Yamuna water to Haryana is 4.38 BCM against an allocation of 5.73 BCM. Short supply is mainly due to the non-construction of upstream storage dams, water flows down HKB and Okhla Barrage during the rainy season and Haryana is deprived of its share of water in Yamuna. Thus, the construction of upstream storage dams is very essential.

d. Ghaggar Water

As per Table 2.9, the average availability of Ghaggar Water is 0.478 BCM. As the share between the States has not been decided so its share has been considered as 0.478 BCM for the planning purposes

From above it is very clear that Haryana receives an average of 11.21 BCM of water against the share of 15.47 BCM from the Bhakra and Yamuna Rivers. From Table 2.13 and Table 2.14, it is clear that in the year 2020-2021, Haryana received only (6.79+3.52) 10.31 BCM from Bhakra and Yamuna water for distribution in outlets of channels in Haryana.

5. Water is supplied from the outlets of the channels to fields and to other Entities

i. Canal water is supplied through outlets of the channels.

Water is received from Bhakra and Ravi-Beas Rivers at Haryana Contact Points and water from Yamuna is received through Western Yamuna Canal and Gurgaon/Agra Canal System. Supplies to be given among partner States i.e. Haryana Punjab and Rajasthan are decided by BBMB on the basis of shares/needs of the States and actual availability in the reservoirs of the dams in Technical Committee Meeting (TCM) headed by Chairman of BBMB held in last week of every month. Water allocated in this meeting is distributed by Haryana along with Yamuna water in the network of channels. The main canal supplies water to Branch canals and Branch canals supply water to its Distributaries and its Minors. Outlets have been fixed on Distributaries and Minors, from which water is delivered for various uses such as irrigation for agriculture crops, domestic and industrial water supply, institutional supply etc. A network of canal systems consisting of 1,521 Channels having a length of 14,125 Kms has been laid throughout Haryana covering most of the villages. Discharge of the outlets varies as per *chak* area and other water demands. Details of all these outlets have been collected and summarised in Table 2.16. Water delivered by these outlets during the last water year (01.06.2020 to 31.05.2021) has been collected in the District Water Resources Plan (DWRP) of each district and abstracted in the following Tables. District-wise supplies given through outlets to the fields for agriculture and domestic need have been tabulated below.

Table 2.16 Canal Water Supplied through Outlets

Sr.no.	District	No. of Villages	Total Discharge delivered through outlets from 01.06.2020 to 31.05.2021 (MCM)
1	AMBALA	117	95.08
2	BHIWANI	261	590.55
3	CHARKHI DADRI	195	198.42
4	FARIDABAD	125	14.21
5	FATEHABAD	257	819.77
6	GURUGRAM	118	214.09
7	HISAR	336	1031.73
8	JHAJJAR	213	532.84
9	JIND	332	625.84
10	KAITHAL	226	291.55
11	KARNAL	217	231.88
12	KURUKSHETRA	153	29.19
13	MAHENDRAGARH	653	306.67
14	NUH	120	90.30
15	PALWAL	247	188.01
16	PANCHKULA	-	-
17	PANIPAT	88	114.07
18	REWARI	433	336.10

19	ROHTAK	137	492.00
20	SIRSA	372	1017.45
21	SONIPAT	367	350.35
22	YAMUNANAGAR	31	65.61
	HARYANA	**4998**	**7635.71**

Source: District Water Resources Plans

A canal supply of 7,635.71 MCM has been delivered to the fields for agriculture and domestic use in a year.

ii. Supplies given to Thermal Plants

In addition, to supplies through the above-detailed outlets to the farmers, Canal water is being supplied to thermal plants at Yamunanagar, Panipat, Ballabhgarh, Khedar thermal plant Hisar and Jharli Power Plants, Jhajjar through special channels. The detail of supplies provided to these thermal plants in a year is abstracted below:

Table 2.17 Supplies given to Thermal Plants

Sr. No.	District	Name of Thermal Plants	Authorization	Supplies from 01.06.2020 to 31.05.2021 (MCM)	Remarks
1	Faridabad	Faridabad Thermal Power Station	18.99	1.42	Present demand is being met
2	Hisar	Rajiv Gandhi Thermal Power Plant, Khedar, Hisar	36.79	03.21	--do--
3	Jhajjar	Indira Gandhi Thermal Power Plant,Jarli, Jhajjar	167.36	167.36	
	Jhajjar	Araveli Power Company Pvt Ltd (APCPL) Jhajjar			
4	Panipat	Panipat Thermal Power Station	7.60	4.62	Present demand is being met
5	Yamunanagar	HPGCL Deen Bandhu Chotu Ram Thermal Plant, Yamunanagar	22.32	7.90	--do--
Total				**184.51**	

Source: District Water Resources Plans

184.51 MCM of water have been supplied for different thermal plants in the State through channels.

iii. Supplies through Special Channels to Specific Areas or Industries

Other supplies are directly given through special channels to industries or specific areas i.e. National Fertilizer Limited (NFL) Indian Oil Corporation Limited, Panipat Naptha Creator Project (PNCP), Haryana Shehri Vikas Parithakaran (HSVP), sarovars of Kurukshetra / Pehowa etc as per detailed below.

Table 2.18 Supply Given through Special Channels/Outlets to the Industries/Specific Area

Sr. No.	District	Description	Supplies from 01.06.2020 to 31.05.2021 (MCM)
1	Ambala	MES Channel to Cantonment	14.09
2	Faridabad	Gurgaon Canal	4.82
3	Hisar	MES Channel to cantonment	13.39
4	Kurukshetra	Brahma Sarover and Pehva Tirath	0.65
5	Panipat	PNCP, Refinery, NFL industries and HSVP	35.21
6	Sonipat	Delhi Branch and others	49.76
		5 no. minors of the Delhi division	11.04
7	Nuh	Public Health Channel	0.01
8	Karnal	Karan Lake	0.50
Total			**129.47**

Source: District Water Resources Plans

A canal supply of 129.47 MCM has been delivered to industries or specific areas as per their demand.

iv. Water Supplies through Rice shoots

During Kharif Season, extra water is provided for rice crops due to additional necessity through rice shoots from the channels against permission. The water supplied through rice shoot district-wise is tabulated below. 158.29 MCM supply has been made through rice shoots to the farmers through channels.

Table 2.109 Water Supplies through Rice Shoots

Sr. No.	District	Supply given through Rice Shoots from Channels From 01.06.2020 to 31.05.2021 (MCM)
1	Ambala	4.63
2	Fatehabad	0.38
3	Hisar	2.57
4	Jind	29.44
5	Kaithal	28.59
6	Karnal	29.88
7	Kurukshetra	4.45
8	Panipat	17.11
9	Rohtak	1.37
10	Sirsa	31.31
11	Sonipat	7.83
12	Yamunanagar	0.73
Total		**158.29**

Source: District Water Resources Plans

v. Water Supplies to Ponds against Special Permission

In the summer season, extra water is supplied through the channels for the filling of the ponds. District -wise supplies have been tabulated below:

Table 2.20 Water Supplies to Ponds against Special Permission

Sr. No.	District	Supply given to Ponds through Channels against Special permissions from 01.06.2020 to 31.05.2021 (MCM)
1	Fatehabad	8.14
2	Hisar	5.42
3	Jhajjar	12.48
3	Jind	2.67
4	Nuh	10.48
5	Palwal	0.1
6	Panipat	7.86
7	Rohtak	0.61
8	Sirsa	14.6
9	Sonipat	1.27
Total		**63.62**

Source: District Water Resources Plans

A canal supply of 63.62 MCM has been delivered for the filling of various village ponds in the State.

vi. Water Lifted from Channels by Tankers of the Forest Department

Some of the water is lifted by the tankers of the forest department through motors for watering trees and nurseries but measurement of this water is not possible, so this quantity has not been accounted for.

vii. Summary of Supplies through Bhakra and Yamuna Water

Table 2.21 Water Supplied through Major Supplies

Sr. No.	Deliveries to various entities	Volume of water supplied through channels from 01.06.2020 to 31.05.2021 in MCM
a.	Fields / Domestic drinking supplies through outlets	7635.71
b.	Thermal plants	184.51
c.	Industries through special channels	129.47
d.	To paddy fields through rice shoots	158.29
e.	Village ponds against special permission	63.62
Total in MCM		**8171.60**
Total in Crore Litres		**817160**

Source: District Water Resources Plans

6. Losses in the Canal System

i. Losses in Canal System up to Outlet Head

Annual availability in water year 01.06.2020 to 31.05.2021 from the Bhakra and Yamuna Water is 5.51+2.85=8.36 MAF i.e. 10.31 BCM. Total supplies given through outlets to the farmers, Thermal Plants, Industries & specific channels is 8,171.60 MCM against the receipt of 10,310 MCM, so the average losses in the canal network from Haryana Contact Point to the outlets head are 20.74%.

ii. Losses in Field Channels

The further losses from the outlet to the farmer field have been calculated as about 5% as tabulated below: -

Table 2.22 Losses in Field Channels

Sr. No.	Detail	Value
1	Average length of water course arrived by MICADA	17940'
2	Average discharge of each water course	1.25 Cs
3	The Average X section of the water course	B = 2' FSD = .875' FB = 0.25'

Source: MICADA, Haryana

Total wetted Perimeter = 2+2(0.875) = 3.75'

Taking seepage losses of lined w/c as 2 Cusec /million sq ft

Total losses = 17940*3.75*2/2 * 1,00,0000 =.06727 Cusec

% losses =.06727/1.25 *100 = 5.38%

The I&WRD is supplying water to consumers through 17,866 outlets of the canal network throughout Haryana. Now, MICADA has started constructing RCC piped water courses, but some length of these water courses at the end remain unlined, where losses are three times of lined watercourse. Any gain by piped water courses would get neutralized by the unlined length of these water courses. Thus, the average loss of 5% can be adopted for the whole State, as lined water courses are likely to have losses less than the assumed 2 cusecs per million Sq.ft, when these are lined with 9" side brick walls and inside plastered. Thus, the total losses are 25.74% from the Haryana contact point to the farm gate.

Total Surface Water Availability in the State

The Surface Water Availability from Bhakra and Yamuna water is 8,171.60 MCM, as per information received in the DWRPs, the current reuse of Treated Waste Water is 221.24 MCM where only ~70 MCM reuse is reported by the PHED (HQ) Department and the remaining reuse of ~150 MCM is reported from the field by the districts. It is the water which is being directly used by the people from the drains. Availability from other sources i.e. Ghaggar water, drains, farm ponds etc. is only 963.12 MCM. This total surface water availability from the different sources has been given below as detailed (Table 2.23).

Table 2.23 Total Surface Water Availability from Various Sources

Sr. No.	Sources	Volume of water received from 1.6.2020 to 31.5.2020 (MCM)
1	Supplies from Bhakra & Yamuna water	8171.60
2	Treated Waste Water	221.24
3	Ghaggar water through special channels, drains, farm ponds etc.	963.12
	Total in MCM	**9355.96**
	Total in Crore Litres	**935596**

Twelve-year average deliveries from the Bhakra and Yamuna Rivers have already been summed up in Table 2.15 as 11,210 MCM. Additional availability of 1,184.36 MCM from Ghaggar water, treated waste water, drains etc. in the State will be carried with 11,210 MCM of Bhakra and Yamuna water thus totalling 12,394.36 MCM through canals and water courses to the fields. There are losses of 25.74% in canal water and water courses as calculated above, so the delivery out of 12,394.36 MCM will be 9,204.05 MCM which is near to the compiled district-wise surface water availability of 9,355.96 MCM in the year 2020-2021 (Table 2.24) so this availability has been considered at the consumer end.

Table 2.24 Total Surface Water Availability in the State through Channels

Sr. No.	District	Total Surface Water Availability (MCM)
1	AMBALA	116.8
2	BHIWANI	655.13
3	CHARKHI DADRI	198.77
4	FARIDABAD	34.51
5	FATEHABAD	828.34
6	GURUGRAM	311.67
7	HISAR	1084.34
8	JHAJJAR	781.55

Sr. No.	District	Total Surface Water Availability
9	JIND	698.05
10	KAITHAL	320.30
11	KARNAL	402.28
12	KURUKSHETRA	35.17
13	MAHENDRAGARH	315.09
14	NUH	206.45
15	PALWAL	188.42
16	PANCHKULA	44.19
17	PANIPAT	178.88
18	REWARI	336.10
19	ROHTAK	496.99
20	SIRSA	1627.01
21	SONIPAT	421.66
22	YAMUNANAGAR	74.26
Total in MCM		**9355.96**
Total in Crore Litres		**935596**

Source: District Water Resources Plans

In addition to surface water availability there is groundwater recharge/ availability is 11,580.02 MCM. The Total Water Availability of the State is 20,935.98 MCM.

2.2.3.4 Drainage Network

Haryana is a small landlocked State situated in the northwest part of India and is bounded by the Shivalik range in the North-East and River Yamuna in the East, the Aravali range in the South-West and the River Ghaggar in the West. River Yamuna forms part of the boundary between Haryana and Uttar Pradesh and River Ghaggar between Haryana and Punjab. The total area of the State is 44.2 lac hectares out of which about 39.0 lac hectares are arable.

Topographically, from a drainage angle, the entire State is divided into two parts i.e. area draining into the Yamuna Sub Basin of the Ganga Basin and the area draining into the Ghaggar Sub Basin of the Indus Basin.

1. Yamuna Sub Basin

Yamuna drainage basin forms the boundary on the east and the catchment of drains out-falling in River Yamuna constitutes the western boundary. It comprises an area of Yamuna Nagar (part), Karnal, Panipat, Sonipat, Rohtak, Jhajjar, Rewari, Gurgaon, Nuh, Mahendragarh, Jind (part), Faridabad, and Palwal districts. It covers about 40% area of the State and it drains into the River Yamuna. Experiencing high flooding during heavy rainfall, diversion drains were constructed in the northern portion of this catchment out-falling into River Yamuna in the North of Delhi. Ujjina Diversion Drain has been constructed to out-fall into River Yamuna in Haryana territory in the South of Delhi to check drainage congestion through Khaluka Regulator in Rajasthan. Due to the construction of several bunds in Rajasthan territory in the catchment area of River Sahibi, Krishnawati, Dohan, and Landoha Nalla originating from Aravali hills of Rajasthan, the flood problem in Rewari, Mahendargarh, Jhajjar and Nuh has now reduced considerably. The problem arises only when there is a heavy downpour in low-lying pockets and in such a situation, dewatering is resorted to, on an SOS basis.

Important drains of the Yamuna Sub Basin area are Chautang Nallah, Dhanaura Escape, Nissing Drain, Indri Drain, Main Drain No. 2, NaiNallah, Drain No. 8, Diversion Drain No. 8, Outfall Drain No. 8, Najafgarh Drain, Chhapra Drain, Meham-Lakhanmajra Drain, KCB Drain, Supplementary Drain, Nuh Drain, Ujjina Drain, Ujjina diversion Drain, Gaunchi Main Drain, etc.

2. Ghaggar Sub Basin

The Ghaggar drainage basin is bounded by the River Ghaggar on the north the remaining 60% area of the State drains into the Ghaggar Sub Basin of the Indus Basin comprising Yamuna Nagar (part), Panchkula, Ambala, Kurukshetra, Kaithal, Jind, Bhiwani, Hisar, Fatehabad, and Sirsa districts. This area has a country slope towards the River Ghaggar. The River Ghaggar enters Haryana State in district Panchkula from the foothills of Shivalik and flows in the South-West direction to Rajasthan through Haryana and Punjab. River Tangri and Markanda merge in the Ghaggar River in the Kaithal district. Ghaggar River and its tributaries create serious problems en route in districts Ambala, Kurukshetra, Kaithal, Fatehabad, and Sirsa. The Ghaggar River drains into the desert area of Rajasthan. Important drains of Ghaggar Sub Basin are Ganda Nallah, SYL Parallel Drain, Saraswati Drain, Kaithal Drain, Amin Drain, Pundri Drain No. 1, Pundri Drain No. 2, Kasan Drain, Kalwa-Kinana Drain, Padana Drain, Hansi Drain, Rori- Ghaggar Drain, Rangoi Kharif Channel cum Drain, Rangoi Nallah, Rangoi Diversion Drain. The Bass-Hisar-Ghaggar Drain is under implementation which will provide relief to the areas in Hisar, Fatehabad, and Sirsa districts.

3. Drainage & Flood Protection Infrastructure

At present following flood control and drainage infrastructure are in position (Table 2.25).

Table 2.25 Flood Control and Drainage Infrastructure

1	Number of drains	800
2	Length of drains	5150 Kms
3	Length of embankments	1275 Kms
4	Number of villages/towns protected with ring bunds	800

Source: I&WRD, Haryana

Several ring/protection bunds and embankments have been constructed with high-level approaches and ramps to protect the *abadi* of important towns and villages which otherwise could get marooned as a result of spillover from Rivers/*nallahs* due to their location in the flood belt of this basin. Besides this, Ottu Lake has also been deepened to store Ghaggar flood water to use the same in a number of Kharif channels in district Sirsa. Drainage and Flood Protection. The main drains, their capacity, and the out-fall source are as under (Table 2.26).

Table 2.26 Main Drains, their Capacity, and the Outfall

Sr. No.	Name of Drain	Discharge Capacity (Cusecs)	Outfall
YAMUNA SUB-BASIN			
1	Main Drain No. 2	6325	River Yamuna
2	NaiNallah	2241	Drain No. 8
3	Diversion Drain NO.8	7320	River Yamuna
4	West Jua Drain	500	Mangeshpur Drain
5	Drain No. 8	1537	Bhindawas lake.Drain
6	Out-fall Drain No. 8	4000	Dhansa out-fall Drain
7	KCB Drain	692	Mangeshpur Drain
8	Chandeni Drain	425	NuhDrain
9	Nuh Drain	1362	UjinaDrain
10	UjinaDrain	2200	Ujina Diversion Drain
11	Ujina Diversion Drain	2200	Gaunchi Main Drain
12	Gaunchi Main Drain	6655	River Yamuna
GHAGGAR SUB-BASIN			
1	Saraswati Drain	16660	A tributary of River Ghaggar
2	Kaithal Drain	213	River Ghaggar
3	Rangoi Diversion Drain	4088	River Ghaggar
4	HisarGhaggar multipurpose channel	500	River Ghaggar
5	MirpurChoe Drain	830	River Ghaggar
6	Amin Drain	2250	River Ghaggar
7	HisarGhaggar Drain	750	River Ghaggar
8	Baretta Drain	1380	River Ghaggar

9	SirhindChoe Drain	2454	River Ghaggar
10	RangoiNallah	7000	River Ghaggar

Source: I&WRD, Haryana

i. Flood prone areas

The State can be divided into three tracks as per causes of floods, the first track along River Yamuna comprises Karnal, Panipat, Sonipat and Faridabad districts. In case of passing of heavy discharge from Hathnikund Barrage on River Yamuna, it results in flooding and submergence of adjoining areas.

The second track adjoining Ghaggar, along the boundary of Haryana and Punjab comprising of Ambala, Kaithal, Fatehabad and Sirsa districts, the heavy rain in the catchment area of Ghaggar causes submergence in adjoining areas.

The central and western part is the third track and it is in a saucer shape, Due to this topography, it is more prone to floods. Groundwater is also brackish in this area. Due to the non-extraction of groundwater, waterlogging is rising thus resulting in floods even in normal rainfall.

The maximum discharge observed in the main Rivers during the year 2020 is given in Table 2.27.

Table 2.27 Maximum Discharge Observed in the Main Rivers during the Year 2020

Sr. No.	River	Discharge Site	Danger Level	Maximum Discharge Recorded (Cusec)	Date on which maximum Discharge recorded
1	River Yamuna	Hathni-Kund Barrage	2,50,000	54065	25.08.2020
2	River Ghaggar	Panchkula Site 4A	20,000	3604	13.08.2020
		Gulha Cheeka **(Kaithal)**	51,733	28160	24.08.2020
		Khanauri **(Sirsa)**	25,000	9200	14.07.2020
		Chandpur including Rangoi Nallah and Joya Nallah **(Punjab)**	25,000	10100	15.07.2020
		Downstream Ottu **(Sirsa)**	25,000	6850	16.07.2020
3	River Markanda	Mulana Bridge **(Ambala)**	50,000	10124	21.08.2020
4	River Tangri	Shahpur **(Ambala)**	34,000	4161	22.08.2020

Source: I&WRD, Haryana

ii. Flood Control Measures

A board named Haryana State Drought Relief (HSDR) and Flood Control Board (FCB) under the Chairmanship of the Hon'ble Chief Minister, Haryana & comprising various senior members of other departments is looking after the drainage activities to be executed every year for protection against the flood damages. After monsoon i.e. after 30th September every year, the flood damage report is taken from the field officials and the schemes for protection against these damages are proposed to the HSDR and FCB after due concurrence from the concerned Deputy Commissioner and Chairman, Zila Parishad.

2.2.3.5 Lakes and ponds

There are several lakes in the State i.e Bibipur Lake, Badhkal Lake, Kotla Lake, Damdama Lake, Sultanpur Lake, Bhindawas Lake, Surajkund Lake etc. Bibipur Lake has not been filled since 2002 as the land belongs to private owners who are not willing to part with the land without compensation. However, efforts will be made to revive this lake either by taking its land on lease or by acquiring it.

Other lakes viz Chandena and Bhindawas are reported to have very little utilization and are interconnected to drains. Kotla Lake in District Nuh is being revived to store water from Aravali hills in the Monsoon season in 108 acres costing INR 81 crores and it will benefit 1,620 acres.

2.3 Major Surface Water Issues and Challenges

2.3.1 Inadequate Availability of Water from Dams/Channels

The major water availability in the State is from external water resources, based on various inter-state agreements has been explained in sub-section 2.2.1. The State's share of water in Rivers Sutlej, Ravi, Beas and Yamuna is well defined as per inter-state agreements and is about 15.47 BCM and availability from Ghaggar River is about 0.48 BCM thus totalling 15.95 BCM. However, at present, the availability is constrained and limited to 11.69 BCM as per the distribution of actual availability of water in reservoirs. It should be noted that this is at mean availability and higher dependabilities, this would further reduce. There will also be a reduction in groundwater recharge in future with better use efficiencies. Moreover, all the available water cannot be economically harnessed. Thus, the availability of water in the State is not adequate for meeting the unrestricted demands of all water user sectors.

2.3.2 Need for Inter-state Co-operation and Co-ordination

Many of the major problems of Haryana in irrigation, drainage and floods involve neighbouring States. The need for improvement in inter-state cooperation and coordination is evident from the fact that most of the inter-state issues remain unresolved for a long. Some of the main problems being faced by the State of Haryana on this account are as under:

- The report of the Ravi- Beas (Eradi) Tribunal, relating to sharing of Ravi-Beas water, submitted on 30th January 1987, is yet to be gazetted by the Government of India after inviting and hearing objections of the basin States under Section 5(3) of Inter-state water dispute act.
- The construction of the SYL Canal planned to carry the share of Haryana and Delhi of Ravi-Beas waters, is yet to be completed. There has been no construction activity on the canal in Punjab since 31.07.1990. Haryana is suffering great recurring loss as it is able to utilise only 2.00 BCM of Ravi-Beas waters through the existing carrier channels against its share of 4.72 BCM.
- Commissioning of the BML Hansi Branch- Butana Branch Multipurpose Link Channel constructed to carry 0.98 BCM of water in Haryana territory is pending due to a stay granted by the Supreme Court of India on the objection raised by Punjab.
- As per section 79(1) of the Punjab Re-organisation Act, 1966, the control of irrigation headworks at Ropar, Harike and Ferozepur for administration, maintenance and operation should be with BBMB to enable the Board to carry out proper regulation of water supplies and to ensure delivery of proper share of Sutlej, Ravi and Beas waters to the States of Punjab, Haryana and Rajasthan. Punjab, in whose territory these works fall, has not agreed to transfer the control of the headworks to BBMB.

- As the capacities and conditions of parent channels delivering supplies to Haryana have been changed, there is a necessity for the recalibration of discharge tables to assess the exact availability of water at Haryana Contact Points.
- Haryana State being landlocked and drained by Rivers and streams from adjoining States and tectonically formed in a saucer-shaped bowl has serious drainage problems. The disposal of irrigation wastewater as seepage losses from irrigation canals and spills from natural streams is also compounding the drainage problem in the monsoon season. At present, there is neither any law nor any convention governing inter-state drainage in the country. The problems for which the Central Government brought out some agreements in the past are either not implemented or half-heartedly implemented resulting in controversies remaining unresolved and the maintenance of the drainage systems in the upper and lower riparian States causing serious problems in the State of Haryana.
- For utilisation of Yamuna waters and also for reducing the frequency of floods in the State, the construction of 3 No Up-storage dams i.e. Renuka, Kishau and Lakhwar-Vyasi on Yamuna River, Hathnikund Dam, proposed 9 No dams in Yamuna Basin are the measures which are necessary but again depend on other states.
- Five dams planned on the tributaries of the Ghaggar River i.e. Dewanwala Dam, Dangrana Dam, Khetpurali Dam, Dudhgarh Dam and Bhud Dam discussed in Chapter No.8 can also add the availability of water to Haryana State. But the construction of these dams also needs the approval of the Ghaggar Standing Committee.
- Construction of three small dams i.e. Lohgarh, Dhanaura and Adi Badri Dam is planned on tributaries of the Yamuna River in Himachal Pradesh for increasing water availability in Haryana which has been discussed in detail in the other Chapter.
- Construction of Seven dams i.e. Hathnikund, Chikan, Kansli, Ambawali, Nagli, Khilanwalla and Darpur dams planned on the tributary of Yamuna River

discussed in detail in the other Chapter need the approval of the Upper Yamuna River Board (UYRB)

- The issue of sharing Krishnawati waters in a ratio of 50:50 and other Rivers entering Haryana from Rajasthan remains unresolved. The issue of the construction of check dams on Krishnawati, Sahibi, Dohan etc. by Rajasthan on these Rivers is also pending.

2.3.3 Low Efficiency due to Problems in Canal Systems

Due to an inadequate maintenance budget, no preventive maintenance is usually carried out on four canal systems i.e. Western Jamuna Canal (WJC), Bhakra Canal System, Lift Canal System and Gurgaon and Agra Canal system. Only remedial maintenance, at locations where urgently required, is carried out. This has resulted in deteriorated conditions of the canal system and structures resulting in increased seepage losses, inefficient control of flows and low irrigation efficiency. The seepage losses in channels are excessive resulting in the wastage of water. Modernisation of such canals is also required. This is of special concern in areas where the groundwater table. is high and is rising, and salinity levels are also high. Narwana Branch and BML Barwala Link Channel taking supplies from Bhakra Main Line cannot take design discharge for want of repairs.

The regulating structures on main canals and branches generally have manually operated steel gates. Similar structures on distributaries and minors still have an old system of “Karrie” regulation consisting of wooden battens inserted into pier grooves. Leakage of water occurs through such structures. Further, many canal structures are also old and in deteriorated condition due to inadequate maintenance.

2.3.4 Low On-Farm Irrigation Efficiency

Traditional crops and surface irrigation practices by flooding the fields from canal water are commonly adopted by the farmers in the command area of canals, resulting in low on-farm irrigation efficiency. As the water rates are charged on a cropped area basis, the farmer tends to over-irrigate the crops by sowing in a smaller area compared to irrigating a larger cropped area. The use of modern crops, land and water management techniques for commercial agriculture has not picked up in the State. The use of pressure irrigation, drip or sprinkler irrigation, is minimum in the central part of the State having water logging problems. Its use, only to a limited extent, has been adopted by farmers in areas with undulating ground surfaces and low water availability. The canal water supply system in the part of the State facing the water logging and salinity problem is existing for a long time and the low on-farm irrigation efficiency has also contributed to a large extent in aggravating the problem. This is evident from the fact that even though groundwater quality in southern Haryana (Rewari, Charkhi Dadri, Mahendragarh, Gurugram) like central (Jind, Sonipat, Rohtak) and western (Hisar, Fatehabad, Sirsa) Haryana is predominantly brackish, the groundwater table in southern parts of the State is falling, whereas in central and western parts it is rising. This abnormal situation can be attributed to drainage conditions and there is a need for conjunctive use of groundwater on account of its being of lower quality.

2.3.5 Need for efficient Drainage System

It is a fact that wherever the drainage aspect in irrigation projects is neglected, water logging and salinity problems are bound to emerge. This is particularly relevant for Haryana despite large investments in main drains. The main constraint of a rapid evacuation of drainage and flood water and also of the accumulated excess rainfall is the absence of an adequate land gradient towards the recipient Rivers. The dominant mild northeast-southwest slope ranging between 1.6/1,000 in the northern part of the State to less than 2/10,000 in the centre leads to a bowl-shaped topographically depressed area along the Hisar - Rohtak axis in the central-southern part of the State which has no natural outflow to either one of the two boundary Rivers, the Ghaggar in the north/north-west and the Yamuna in the east. As a result, seasonal inundation from accumulated surface runoff and/or River floods is common in this area. Parts of the flat area with depressions are underlain by sandy soils with high percolation capacities through which accumulated surface runoff, direct rainfall and excess irrigation water reach, and raise the groundwater table.

2.3.6 Frequent Floods and Inundations

Surface water resources have a highly peaking seasonal distribution: About 55-60% of the annual rainfall falls in two months, July and August; 80% in four months, June-September. Similarly, about 45% of the annual average, River flow occurs in two months, August and September; 70% in four months, July-October.

This characteristic of surface water resources creates a considerable surplus of water and associated negative effects during July-September.

Haryana often suffers from floods caused by runoff from high-intensive rainfalls or by floods in Rivers, principally the Yamuna and the Ghaggar, or by a combination of both. High rainfall, steep gradients in the catchment of the State's main Rivers and Haryana's proximity to the foothills from where the Rivers emerge, cause seasonal floods characterized by short flood peaks. It is also felt that many of the problems are interrelated or in some cases, one is the reason for the other. Therefore, an integrated and comprehensive approach has to be adopted not only in dealing with these problems but even in their identification.

2.3.7 Need for Utilization of Escaping Flood Water

About 1.53 BCM of water outfalls in River Yamuna through various drains. This water may be utilized in the State for irrigation or recharging.

2.3.8 Undulating Land Topography

A major part of the State has plain area but some parts have undulating land topography. Such areas are in Ambala, Panchkula and Yamunanagar districts in the foothills of the Shiwalik hill ranges and Mahendragarh, Bhiwani, Rewari and Hisar districts in the foothills of Aravalli hill ranges and nearby areas. These areas overlap with other problems like wind erosion, water erosion and stoniness.

2.3.9 Need for Surface Irrigation Facility in Some Areas

Ambala, Panchkula and Yamunanagar districts located in the foothills of Shiwalik hills do not have any significant surface water irrigation scheme. The main reason for this is that these are on a higher elevation and therefore are not under command of any of the systems. The land slopes in these areas are steep causing soil erosion. Further, undulating topography and small land holdings have made traditional agriculture economically unviable. I&WRD should prepare a project for supplying water to these areas.

2.3.10 Policy, Operational and Institutional Deficiencies

The problem of the water resources sector cannot be effectively solved merely by physical structures or structural measures alone. Proper policy for development, management, operation and maintenance as also the institutional backup for their effective implementation is required. In most cases, the policy and institutional build-up should precede the physical structural measures to ensure their sustainability. In the water resources sector, this is much more important, than other sectors, because the implementation of the measures has to be done by the public development agencies, and by the beneficiaries i.e. farmers, and domestic and industrial users which constitute almost the whole of the population.

2.3.11 Need for Co-ordination between Various Departments

The agencies related to water resources can be categorised into 'development' departments and 'user' departments. The development of surface water resources is mainly looked after by I&WRD but Agriculture and Forest departments also develop surface water resources (watershed development and soil conservation projects). In irrigation, I&WRD is the nodal department but the construction of water courses and on-farm development works are done by MICADA. Groundwater data are collected and analysed by the groundwater cell of I&WRD in addition to CGWB. The development of groundwater resources is mainly with the private sector but it is also developed by the irrigation department, public health department and local bodies for urban and industrial development. Thus, there is a lot of overlapping so need for a clear definition of responsibilities and coordination. The situation in water user departments is not different. There is no system of inter-sectoral water allocation and centralised planning and development of sources.

Chapter 3

GROUNDWATER RESOURCES AVAILABILITY AND ITS CHALLENGES

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

LIST OF ANNEXURES

3.1 GROUNDWATER RESOURCES

Groundwater is the largest available source of fresh water. It is an annually replenishable resource with rainfall being the dominant contributor. Due to the varied hydrogeological characteristics, the groundwater potentials differ from place to place. Groundwater caters to the fresh water demands of the growing domestic, agricultural, and industrial sectors of Haryana State. Increased demand for fresh and potable water has resulted in an unprecedented withdrawal of groundwater, which has resulted in depletion of the water levels and also water logging and salinity problems.

The decline in groundwater levels has been observed in a large area covering Mahendragarh, Kurukshetra, Bhiwani, Fatehabad, Kaithal, Rewari, Gurugram, Charkhi Dadri, and Sirsa Districts. Due to the water level decline, farmers are shifting to the use of deep tube wells with submersible pumps in place of centrifugal pumps. On the contrary in central parts of the state, the water level is rising as a result of extensive surface water irrigation and low extraction of Groundwater, due to its brackish/saline nature. This has resulted in a rise in water levels causing adverse impacts on agriculture production and soil salinity. In some parts, salinity is very high and it cannot be used for any purposes including irrigation.

This demands a judicious, equitable, and planned exploitation of groundwater resources. If the balance could be maintained between utilization and replenishment, a perennial supply of groundwater can be assured. The state needs an effective strategy for the effective utilization and management of groundwater resources.

3.1.1 Categorization of Villages on basis of Depth to Water Level, June 2020 by HWRA

The CGWB has been estimating the groundwater resources and categorising them based on exploitation status at a district/block level. But the Haryana Water Resources Authority (HWRA) has gone a step further to categorize the villages based on depth to groundwater levels. The HWRA has undertaken an extensive exercise of categorizing the villages of the entire state based on groundwater level data.

The State Government approved the recommendations of the HWRA for village-wise categorization of the Haryana State into 07 (Seven) different categories based on the depth of the water level. The groundwater level of all villages (7,287) was computed by Ground Water Cell, I&WRD, Haryana from the existing 2,200 numbers of observations points on the basis of the contouring method. The depth-to-water level data as well as the declining rate for the last 10 years (June 2010 to June 2020) is presented for all the villages of the State (Table 3.1, Table 3.2 and Map 3.1).

The stress level of villages is prioritized based on a rate of decline, greater than 2.00 m/year, 1.01 to 2.00 m/year, 0.00 to 1.00 m/year and villages have no significant declining trend during the last ten years (June 2010 to June 2020). The villages having a water level of more than 30.00 metres are categorized as “Severely Groundwater Stressed Villages” and represented by a ‘Red’ colour. 27% of villages fall under this category (Figure 3.1). The villages having a water level in a range of 20.01 to 30.00 metres are categorized as Moderately Groundwater Stressed Villages and represented by a ‘Pink’ colour (15% of villages are reported in this category. Whereas villages with a water level in a range of 10.01 to 20.00 metres are categorized as “Potential Groundwater Stressed Villages” and represented by ‘Light Green’ colour and villages with a water level in a range of 5.01 to 10.00 metres are categorized as “Good Groundwater Stressed Villages” and represented by ‘Green’ colour.

Similarly, the villages having a water level in a range of 1.51 to 3.00 metres are categorized as “Potential Water Logged Villages” and represented by a ‘Purple’ colour. And villages having a water level in a range of 0.0 to 1.5 metres are categorized as “Severely Water Logged Villages” and represented by a ‘Blue colour. The extent of water logging in these villages is prioritized based on the rate of a rising trend. The average rising trend is equal to or more than 0.01 m/year and villages having no rising trend during the last ten years (June 2010 to June 2020). Villages that have a higher rate of water level rising trend require immediate action on priority in these villages (a block-wise detailed list is attached as Annexure 3.1). For village-level data refer to the HWRA website at https://hwra.org.in/

The categorization of villages will not only help in identifying the gravity of the problem of each village but will guide in prioritizing them to adopt village-wise strategic approaches and context-specific solutions to the problems identified. This decentralized approach to planning will help the State government to succeed in arresting the village-level local water problems. This will help the policy makers to identify the focus areas and challenges.

Table 3.1 Categorization of Villages based on Groundwater Level (Villages showing rising/decline trend and no fluctuations in last 10 years data i.e. June-2010 & June-2020)

Sr. no.		Depth to Water Level Ranges (metre)	Categories	Colour	No. of Villages	Rising >0.01m/yr	No. of Villages Decline	Show no fluctuations
1	(i)	30.01 to more	Severely Groundwater stressed villages	Red	1948	24	1921	3
	(ii)	20.01 to 30.0	Moderately Groundwater stressed Villages	Pink	1093	45	1046	2
2	(iii)	10.01 to 20.0	Potential Groundwater stressed villages	Light green	1903	194	1695	14
	(iv)	5.01 to 10.0	Good Groundwater Potential villages	Green	1304	255	1029	20
3	(v)	3.01 to 5.0	Buffer Zone for water logging villages	Yellow	618	274	330	14
4	(vi)	1.51 to 3.0	Potential water-logged villages	Purple	333	212	116	5
	(vii)	0.0 to 1.5	Severely water-logged villages	Blue	88	75	13	0
		Total			**7287**	**1079**	**6150**	**58**

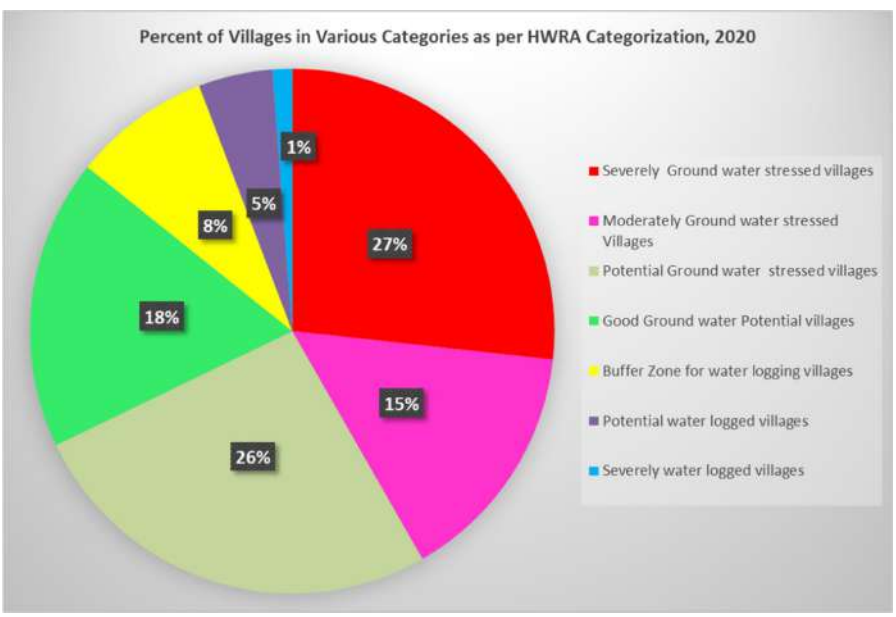
Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

Table 3.2 Categorization of Villages based on Groundwater Level (Villages showing decline trend of last 10 years data i.e. June-2010 & June-2020

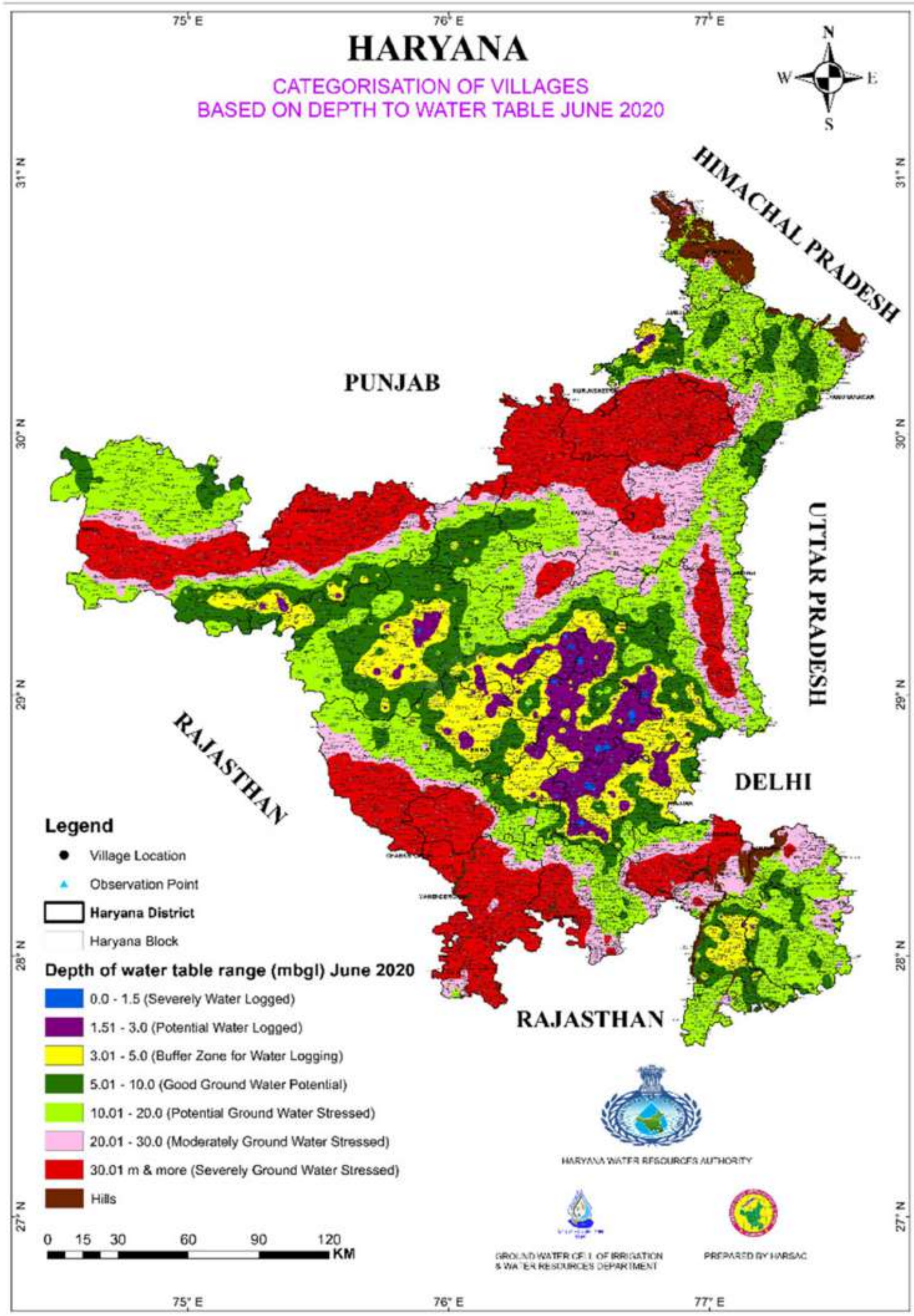
Sr. no.		Depth to Water Level Ranges (metre)	Categories	Colour	No. of Villages	Decline rate 0-1m/yr	Decline rate 1-2m/yr	Decline rate >2m/yr
1	(i)	30.01 & more	Severely Groundwater stressed villages	Red	1948	1010	825	86
	(ii)	20.01 to 30.0	Moderately Groundwater stressed Villages	Pink	1093	936	110	0
2	(iii)	10.01 to 20.0	Potential Groundwater stressed villages	Light green	1903	1677	18	0
	(iv)	5.01 to 10.0	Good Groundwater Potential villages	Green	1304	1029	0	0
3	(v)	3.01 to 5.0	Buffer Zone for water logging villages	Yellow	618	330	0	0
4	(vi)	1.51 to 3.0	Potential water-logged villages	Purple	333	116	0	0
	(vii)	0.0 to 1.5	Severely water-logged villages	Blue	88	13	0	0
		Total			**7287**	**5111**	**953**	**86**

Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

Figure 3.1 Percent of Village in Various Categories, June 2020



Map 3.1 Categorization of Villages based on Depth to Water Level, June 2020

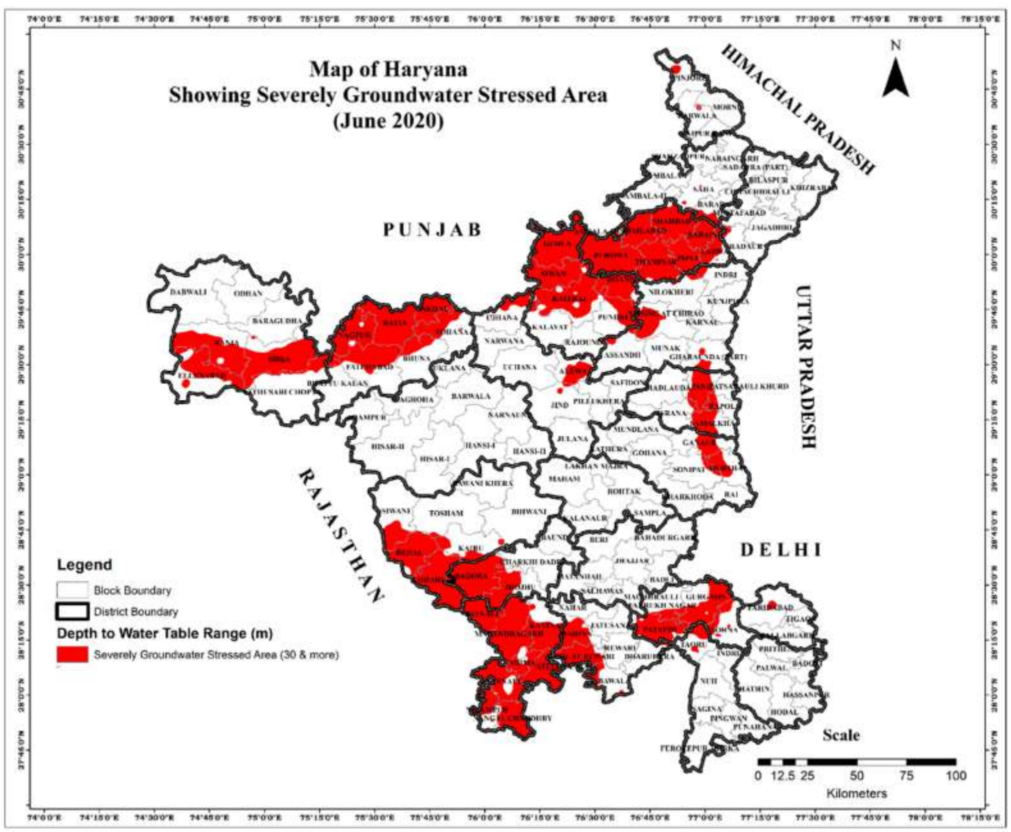


Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

3.1.1.1 Severely Groundwater Stressed Villages

Severely Groundwater Stressed Villages are the first type of category where the depth of groundwater level is deeper than 30.00 metres below ground level (mbgl) or above. According to groundwater level data for June 2020, a total of 1,948 no. of villages come under this category. On the basis of decadal fluctuation (June 2010 to June 2020), a total no. of 1,010 villages have a decline rate between 0.00-1.00 metre/year, a total of 825 no. of villages have a decline rate between 1.01-2.00 metre/year and a total of 86 no. of villages have a decline rate of >2.00 metre/year and 27 no. of villages have no decline. Map 3.2 of this above category is as under:

Map 3.2 Severely Groundwater Stressed Villages, June 2020

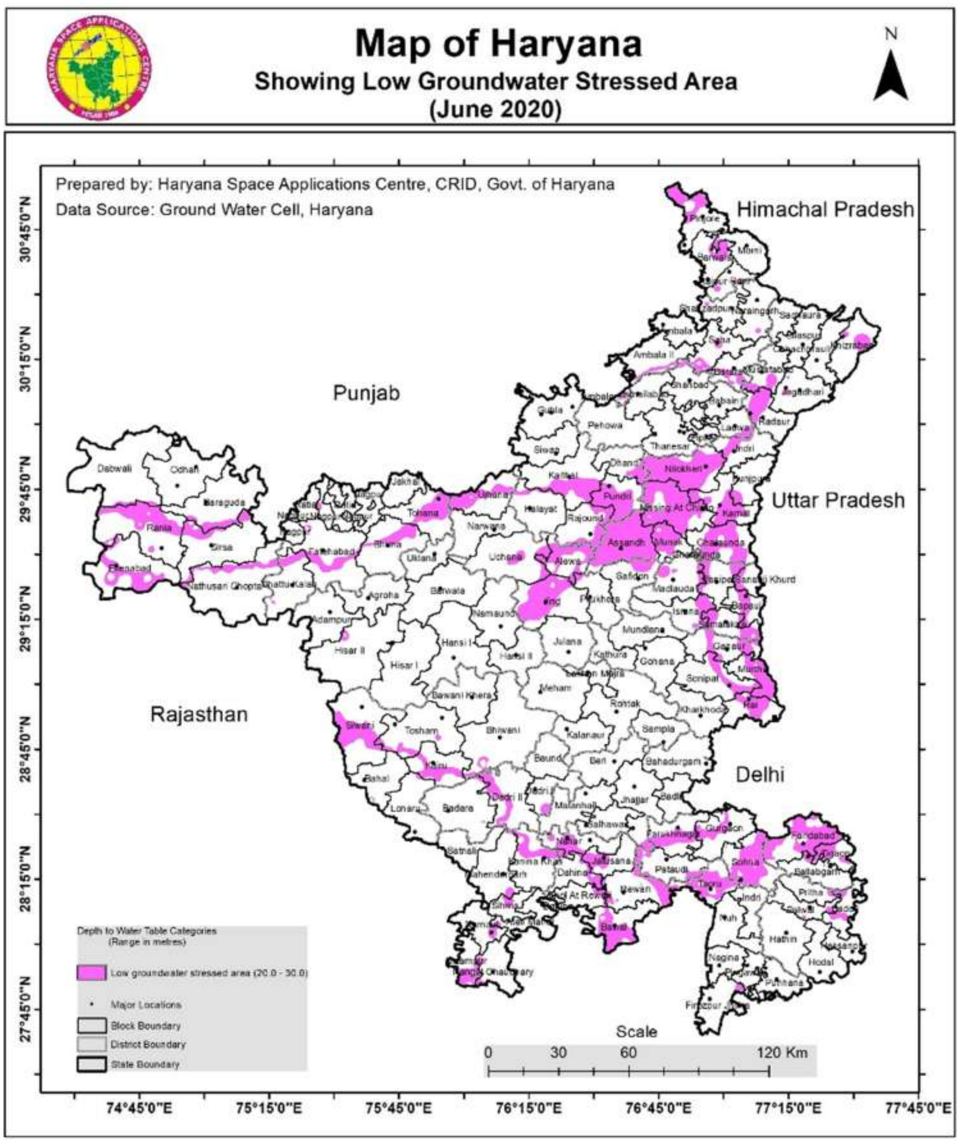


Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

3.1.1.2 Moderately Groundwater Stressed Villages

Moderately Groundwater Stressed is the second category where the depth of groundwater level lies in the range of 20.01 mbgl - 30.00 mbgl. According to groundwater level data for June 2020, a total of 1,093 no. of villages come under this category. On the basis of decadal fluctuation (June 2010 to June 2020), a total of 936 no. of villages have a decline rate of 0.00 - 1.00 metre/year and a total of 110 no. of villages have a decline rate of 1.01-2.00 metre/year and 47 no. of villages have no decline. Map 3.3 showing this category is as under:

Map 3.3 Moderately Groundwater Stressed Villages, June 2020

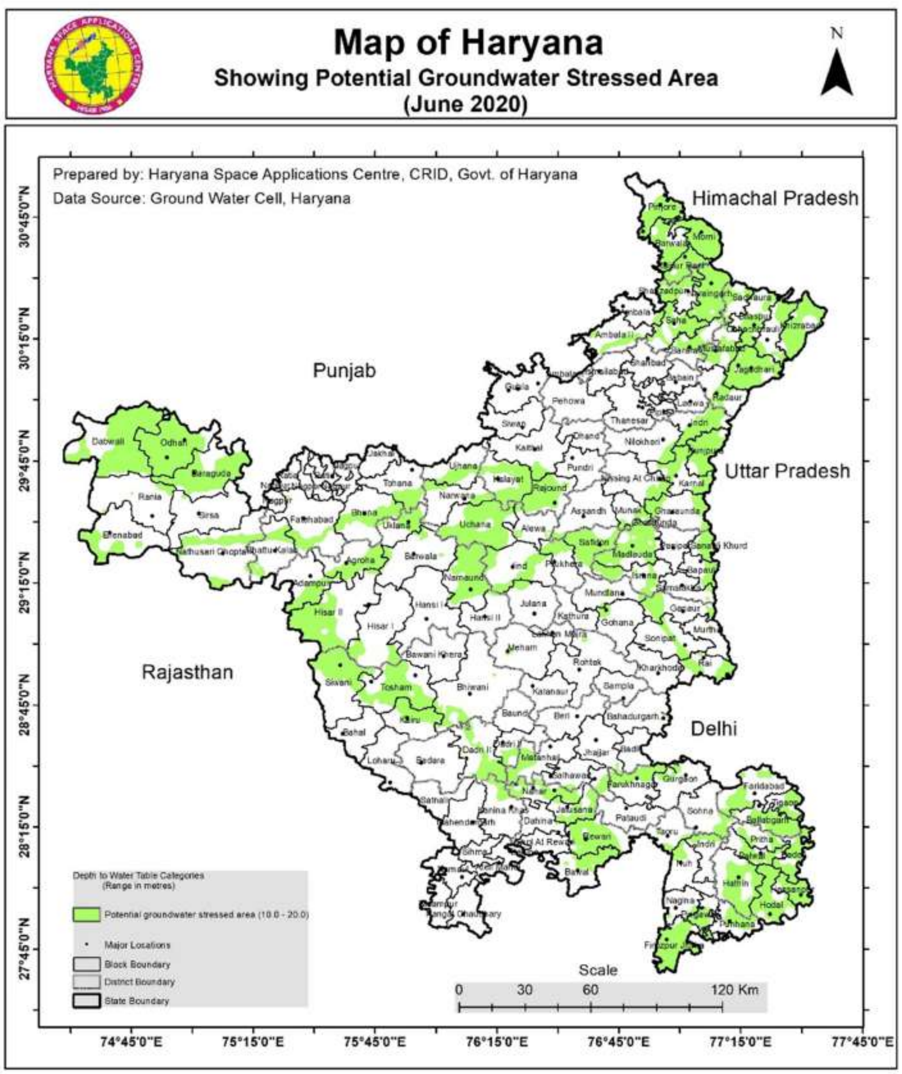


Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

3.1.1.3 Potential Groundwater Stressed Villages

Potential Groundwater Stressed is the third category where the depth of groundwater level lies in the range of 10.01 mbgl - 20.00 mbgl. According to groundwater level data in June 2020, a total of 1,903 no. of villages come under this category. On the basis of decadal fluctuation (June 2010 to June 2020), a total of 1,677 no. of villages have a decline rate of 0.00 to 1.00 metres/year and a total of 18 No. of villages have a decline rate of 1.01 to 2.00 metres/year and 208 no. of villages have no decline. Map 3.4 shows this category as under:

Map 3.4 Potential Groundwater Stressed Villages, June 2020

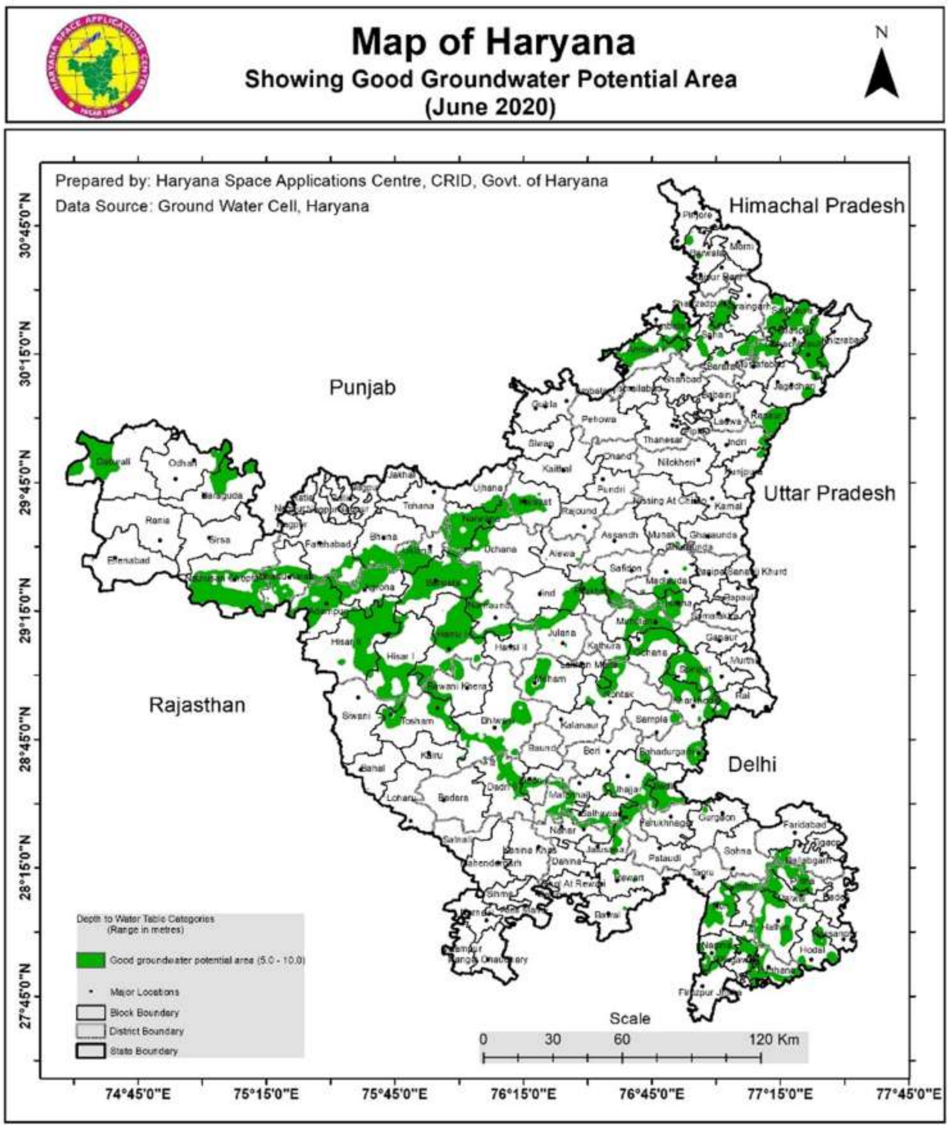


Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

3.1.1.4 Good Groundwater Potential Villages

Good Groundwater Potential is the fourth category where the depth of groundwater level lies in the range of 5.01 mbgl - 10.00 mbgl. According to groundwater level data in June 2020, a total of 1304 no. of villages come under this category. On the basis of decadal fluctuation (June 2010 to June 2020), a total of 1029 no. of villages have a decline rate of 0.00 - 1.00 metre/year and a total of 275 no. of villages have no decline. Map 3.5 showing this category is as under:

Map 3.5 Good Groundwater Potential Villages, June 2020

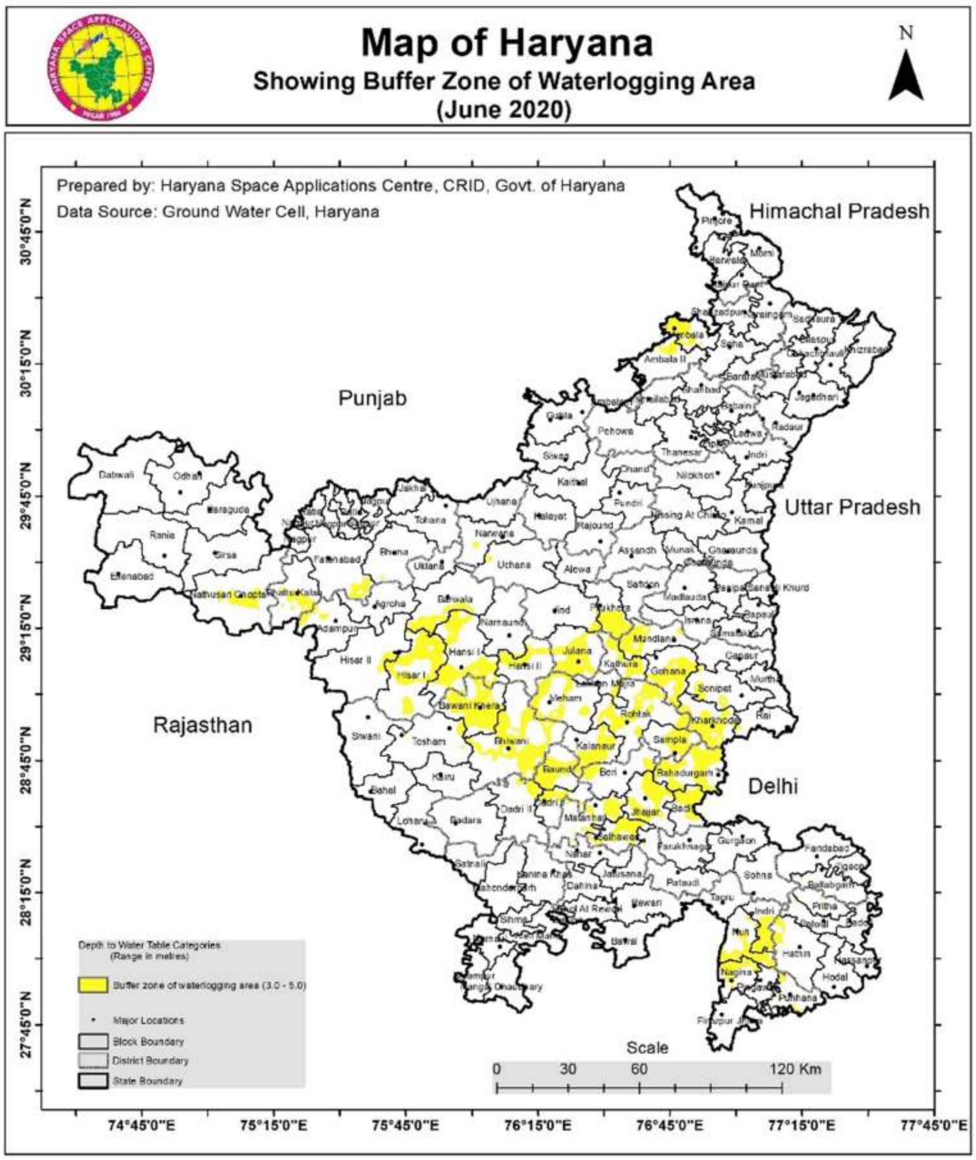


Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

3.1.1.5 Buffer Zone for Water Logged Villages

Buffer Zone for Water Logging is the fifth category where the depth of groundwater level lies in the range of 3.01 mbgl - 5.00 mbgl. According to groundwater level data in June 2020, a total of 618 no. of villages come under this category. On the basis of decadal fluctuation (June 2010 to June 2020), a total of 330 villages have a decline rate of 0.00 - 1.00 metre/year and 288 no. of villages have no decline. Map 3.6 showing this category is as under:

Map 3.6 Buffer Zone for Water Logging Villages, June 2020

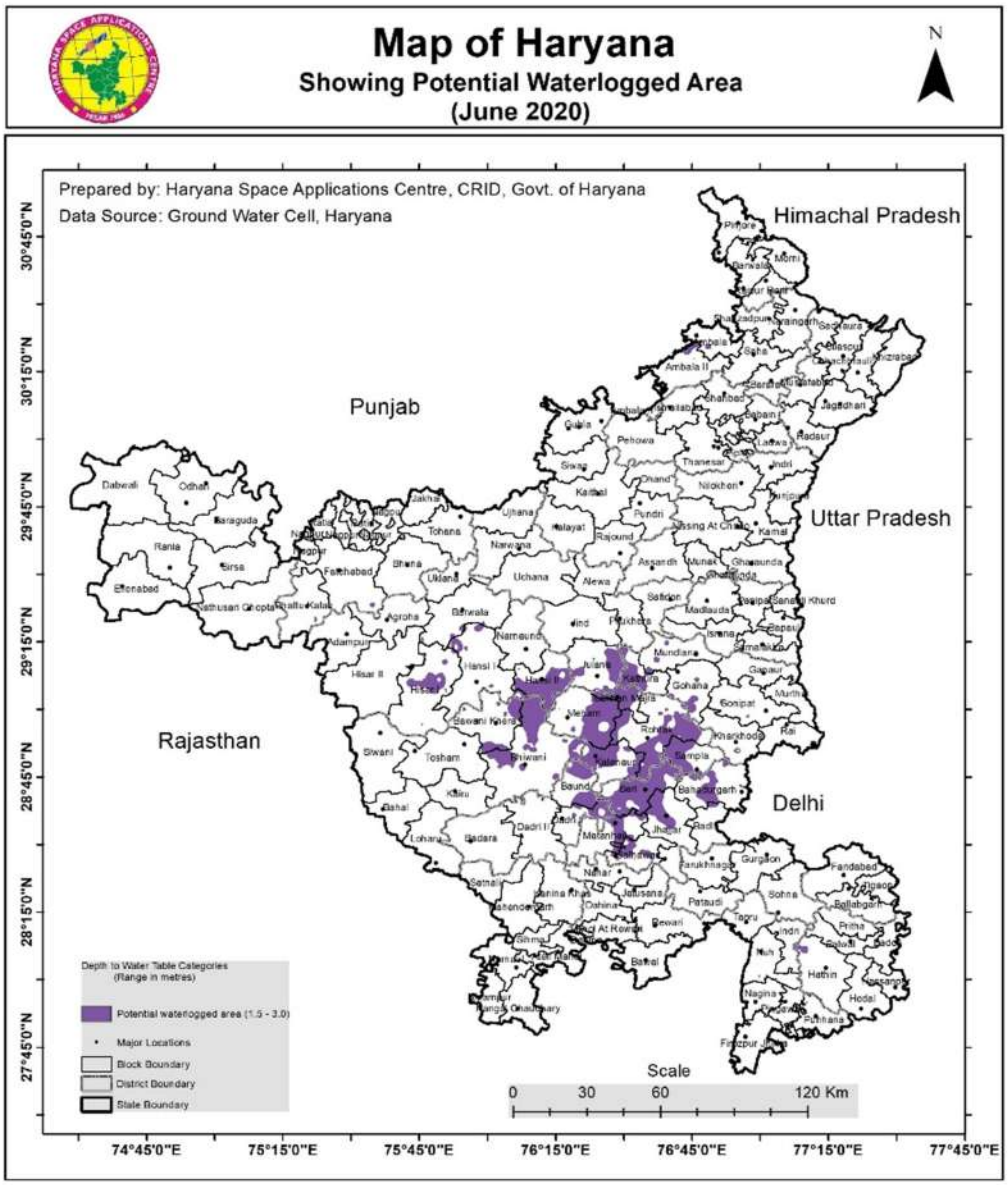


Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

3.1.1.6 Potential Water-Logged Villages

Potential Water Logging is the sixth category where the depth of groundwater level lies in the range of 1.51 mbgl - 3.00 mbgl. According to groundwater level data in June 2020, a total of 333 no. of villages come under this category. On the basis of decadal fluctuation (June 2010 to June 2020), a total of 212 no. of villages have a rising trend i.e. greater or equal to 0.01 metre/year and 121 no. of villages have no rising trend. Map 3.7 shows this category as under:

Map 3.7 Potential Waterlogged Villages, June 2020

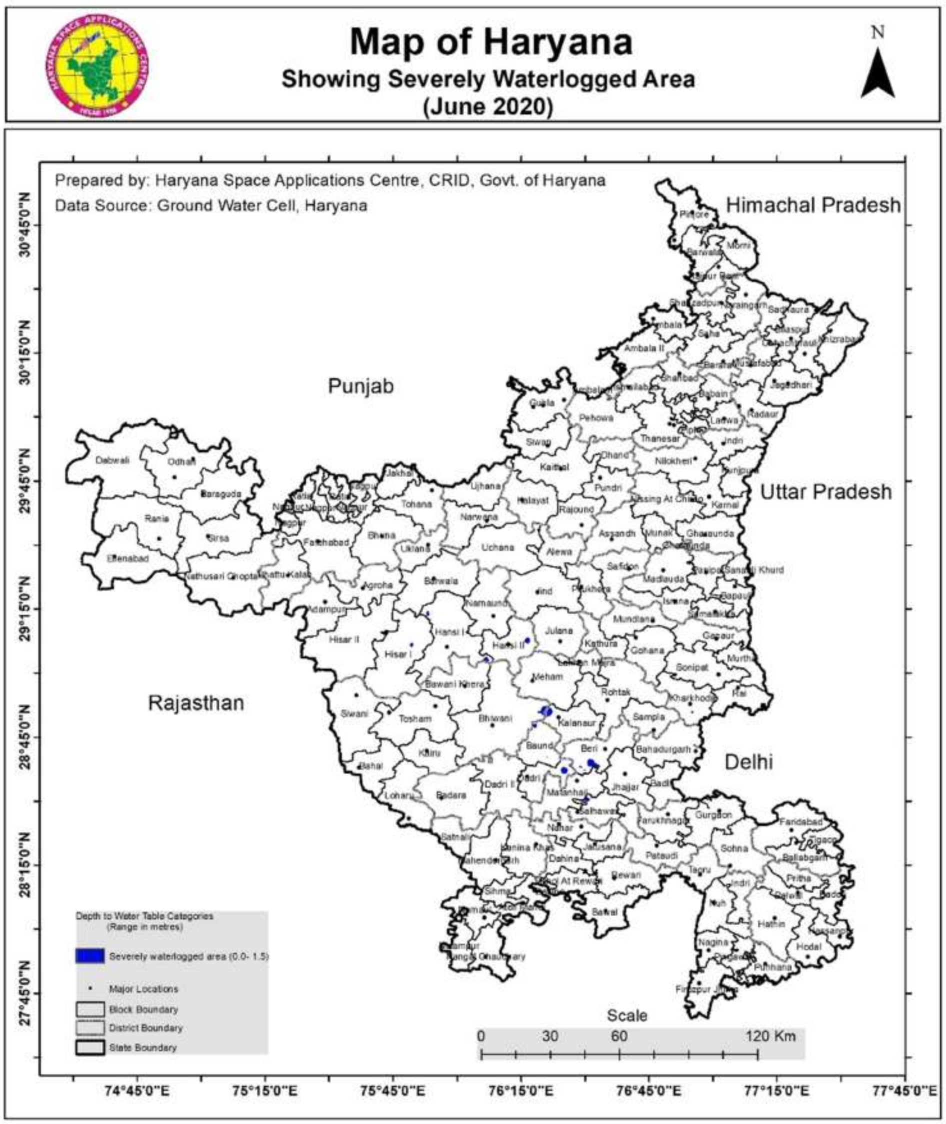


Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

3.1.1.7 Severely Water-Logged Villages

Severely Water Logged is the seventh category where the depth of groundwater level lies in the range of 0.00 mbgl - 1.50 mbgl. These are the villages where the adverse effect of water logging has been observed. According to groundwater level data in June 2020, a total of 88 no. of villages come under this category. On the basis of decadal fluctuation (June 2010 to June 2020), a total of 75 villages have a rising trend i.e greater or equal to.0.01 metre/year and 13 no. of villages have no rising trend. Map 3.8 shows this category as under:

Map 3.8 Severely Waterlogged Villages, June 2020



Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

3.1.2 Dynamic Groundwater Resources by CGWB

Central Groundwater Board (CGWB) in association with other Central Government as well as State Governments agencies has assessed the Groundwater resources of the state according to the methodology recommended by the Groundwater Estimation Committee constituted by the Government of India from time to time. The groundwater resources assessment was carried out based on the guidelines of the Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWR, RD & GR) which broadly follows the methodology recommended by the Groundwater Resources Estimation Committee, 2015.

Groundwater resources are replenished through rainfall and other sources like return flow from irrigation, canal seepage, recharge from water bodies, water conservation structures, etc. Annual Groundwater Recharge is significantly high in the Indus-Ganga-Brahmaputra alluvial belt in North, East, and North East parts of India covering the State of Haryana where rainfall is plenty and thick piles of unconsolidated alluvial formations are conducive for recharge.

This section is derived from the data in the report named Dynamic Ground Water Resources of Haryana State as on 31st March 2020 published by Ground Water Cell, Department of Irrigation & Water Resources, Haryana and Central Ground Water Board, North Western Region, Chandigarh. The overall scenario of groundwater resource availability and extraction in Haryana, 2020 is given in Table 3.3.

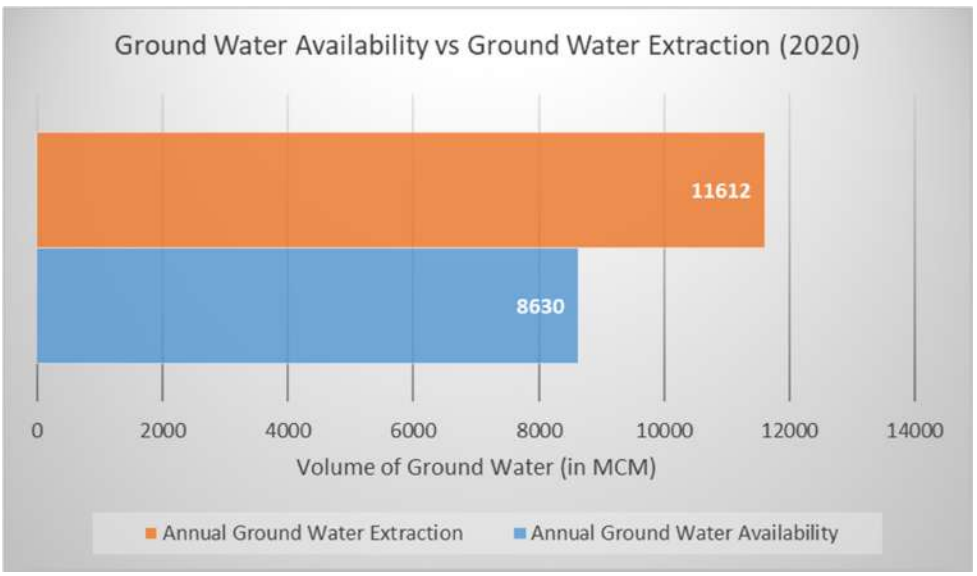
Table 3.3 Current Scenario of Groundwater Resource and Extraction, 2020

	MCM	Crore Litres
Total Annual Groundwater Recharge	9,527	9,52,700
Total Natural Discharges	897	8,97,00
Annual Extractable Groundwater Resources	8,630	8,63,000
Annual Groundwater Extraction	11,612	11,61,200

Source: Dynamic Ground Water Resources of Haryana, GWC, I&WRD, Haryana and CGWB, 2021

Haryana's annual consumption of groundwater is exceeding the Annual Extractable Groundwater Resources by 2,982 MCM as of the year 2020 (Figure 3.2).

Figure 3.2 Groundwater Availability vs Groundwater Extraction as of 2020



As compared to the groundwater assessments done is the years 2013 and 2017, the Total Annual Groundwater Recharge decreased in 2020. The Annual Groundwater Extraction has also shown a decrease in 2020 from 2013 and 2017. Refer to the details given in Table 3.4.

Table 3.4 Comparison of State of Groundwater Resources of Haryana b/w 2013, 2017 and 2020

	2013	2017	2020
Total Annual Groundwater Recharge (in MCM)	11,360	10,500	9,527
Annual Extractable Groundwater Resources (in MCM)	10,300	9,130	8,630
Annual Groundwater Extraction (in MCM)	13,920	12,500	11,612

Source: Dynamic Ground Water Resources of India, 2021, 2019 and 2017, CGWB

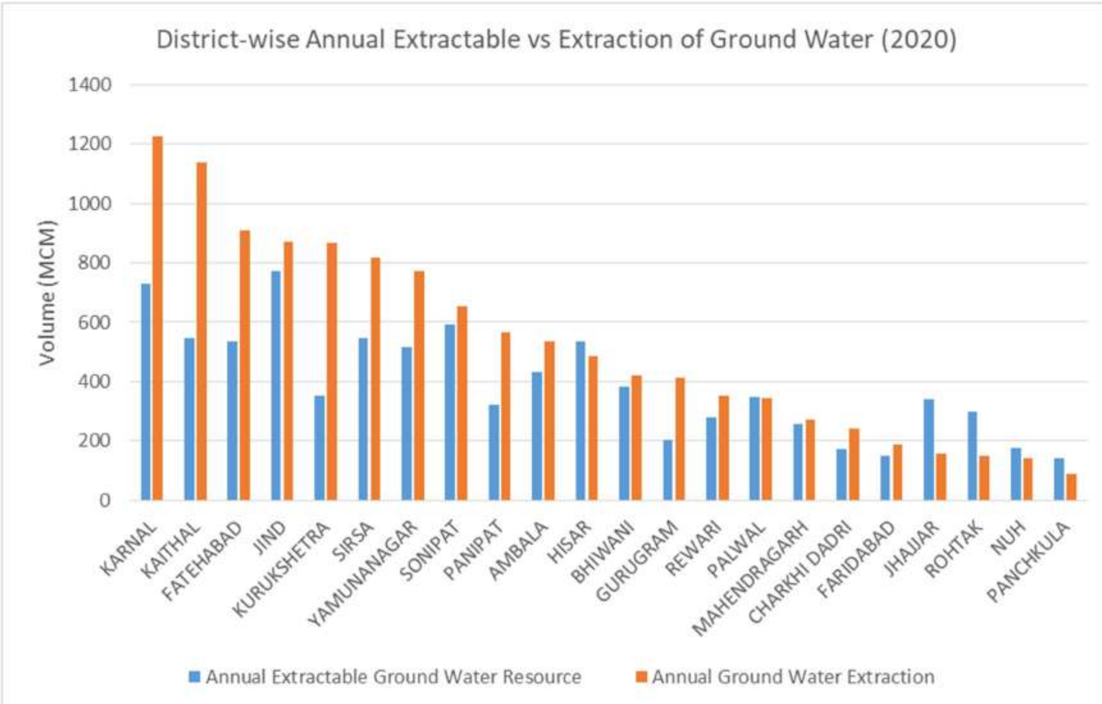
District-wise Groundwater Resources of Haryana (as in 2020) are given in Table 3.5. Block-wise Dynamic Groundwater Resources are given in Annexure 3.2. Figure 3.3 shows a district-wise variation in groundwater extraction in the state. Karnal, Kaithal, Fatehabad, Kurukshetra, Jind, Sirsa, and Yamunanagar are the biggest extractors of groundwater.

Table 3.5 District-wise Dynamic Groundwater Resources of Haryana in 2020

Sr. No	District	Groundwater Recharge from Rainfall	Groundwater Recharge from other Sources	Total Annual Groundwater Recharge	Total Natural Discharges	Annual Extractable Groundwater Resource	Annual Groundwater Extraction
		MCM	MCM	MCM	MCM	MCM	MCM
1	AMBALA	314.59	165.67	480.27	48.03	432.24	536.52
2	BHIWANI	171.27	246.80	418.07	36.69	381.37	419.43
3	CHARKHI DADRI	98.88	94.64	193.52	19.35	174.17	242.20
4	FARIDABAD	79.49	83.24	162.73	14.26	148.47	187.23
5	FATEHABAD	132.07	462.68	594.76	59.48	535.28	908.56
6	GURUGRAM	127.30	99.62	226.91	22.69	204.22	414.23
7	HISAR	232.64	356.14	588.78	52.89	535.89	486.03
8	JHAJJAR	136.01	233.55	369.56	29.15	340.42	157.89
9	JIND	236.45	620.19	856.64	85.66	770.97	869.95
10	KAITHAL	199.15	403.00	602.15	54.59	547.56	1136.59
11	KARNAL	314.83	492.12	806.95	76.05	730.90	1227.86
12	KURUKSHETRA	161.99	227.20	389.19	36.78	352.41	866.80
13	MAHENDRAGARH	167.02	117.67	284.69	28.47	256.22	272.71
14	NUH	102.87	92.95	195.82	19.58	176.24	142.42
15	PALWAL	103.83	283.53	387.36	38.74	348.62	344.51
16	PANCHKULA	128.38	24.14	152.52	12.49	140.03	87.11
17	PANIPAT	136.56	219.45	356.01	35.60	320.41	564.83
18	REWARI	154.68	154.53	309.21	30.92	278.29	353.23
19	ROHTAK	142.95	181.39	324.34	26.88	297.47	147.68
20	SIRSA	204.58	401.07	605.65	58.18	547.46	818.90
21	SONIPAT	208.66	438.14	646.79	53.24	593.55	654.69
22	YAMUNANAGAR	266.07	309.03	575.10	57.51	517.59	772.51
	HARYANA (MCM)	**3820.26**	**5706.75**	**9527.01**	**897.23**	**8629.78**	**11611.89**
	HARYANA (Cr Litres)	**382026**	**570675**	**952701**	**89723**	**862978**	**1161189**

Source: Dynamic Ground Water Resources of Haryana, GWC, I&WRD, Haryana and CGWB, 2021

Figure 3.3 District-wise Variation in Groundwater Extraction, 2020



3.1.2.1 Sector-wise Groundwater Extraction

The Annual Groundwater Extraction for irrigation, domestic and industrial uses at the district level for 2020 is shown in Table 3.6. The block-wise data for the same is given in Annexure 3.3.

Figure 3.4 Sector-wise Ground Water Extraction, 2020

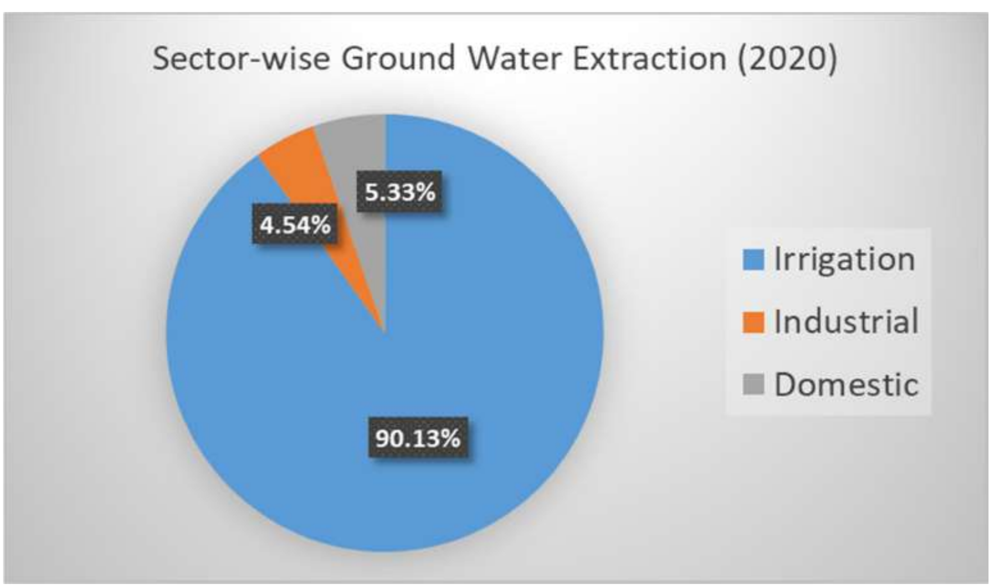


Table 3.6 Sector-wise Groundwater Extraction, 2020

Sr. No.	District	Irrigation		Industrial		Domestic		Total Annual Groundwater Extraction
		MCM	%	MCM	%	MCM	%	%
1	AMBALA	394.28	73.49	75.75	14.12	66.49	12.39	4.62
2	BHIWANI	391.87	93.43	1.44	0.34	26.12	6.23	3.61
3	CHARKHI DADRI	229.45	94.74	0.28	0.12	12.47	5.15	2.09
4	FARIDABAD	126.68	67.66	51.36	27.43	9.19	4.91	1.61
5	FATEHABAD	890.95	98.06	1.36	0.15	16.26	1.79	7.82
6	GURUGRAM	220.73	53.29	171.17	41.32	22.32	5.39	3.57
7	HISAR	480.07	98.77	2.30	0.47	3.66	0.75	4.19
8	JHAJJAR	153.89	97.47	0.86	0.54	3.14	1.99	1.36
9	JIND	831.75	95.61	4.62	0.53	33.59	3.86	7.49
10	KAITHAL	1089.16	95.83	5.74	0.50	41.70	3.67	9.79
11	KARNAL	1143.75	93.15	21.80	1.78	62.31	5.07	10.57
12	KURUKSHETRA	677.81	78.20	125.76	14.51	63.23	7.29	7.46
13	MAHENDRAGARH	247.62	90.80	0.31	0.11	24.78	9.09	2.35
14	NUH	125.26	87.95	0.20	0.14	16.96	11.91	1.23
15	PALWAL	304.52	88.39	6.81	1.98	33.18	9.63	2.97
16	PANCHKULA	73.63	84.53	0.90	1.03	12.57	14.44	0.75
17	PANIPAT	534.06	94.55	6.36	1.13	24.41	4.32	4.86
18	REWARI	318.33	90.12	14.52	4.11	20.37	5.77	3.04
19	ROHTAK	141.67	95.93	1.66	1.12	4.36	2.95	1.27
20	SIRSA	798.73	97.54	1.63	0.20	18.54	2.26	**7.05**
21	SONIPAT	620.13	94.72	9.39	1.43	25.17	3.84	5.64
22	YAMUNANAGAR	671.09	86.87	23.40	3.03	78.02	10.10	6.65
	HARYANA (MCM)	**10465.43**	**90.13**	**527.61**	**4.54**	**618.85**	**5.33**	
	HARYANA (Cr Litres)	**1046543**		**52761**		**61885**		

Source: Dynamic Ground Water Resources of Haryana, GWC, I&WRD, Haryana and CGWB, 2021

The irrigation sector being the biggest consumer of water consumes 90.13% of the total groundwater extraction whereas the domestic sector consumes 5.33% and industries consume 4.54% of the groundwater resources in Haryana (Figure 3.4).

3.1.2.2 Stage of Groundwater Extraction

The assessment of groundwater extraction is carried out considering the Minor Irrigation Census data and sample surveys carried out by the State Groundwater Departments. Ground Water Extraction in Haryana in 2020 is 1,1611 MCM, the largest user being the irrigation sector with a consumption of 10,465 MCM. The overall stage of groundwater extraction for Haryana, which is the percentage of Annual Groundwater Extraction with respect to Annual Extractable Groundwater Recharge, has been computed as 135%.

The stage of groundwater extraction is very high in most districts of Haryana, where it is more than 100%, which implies that in these districts annual groundwater consumption is more than annual extractable groundwater resources. In the districts of Charkhi Dadri, Fatehabad, Gurugram, Kaithal, Karnal, Kurukshetra, Panipat, Sirsa, and Yamuna Nagar the state of groundwater extraction is between 140% to 240%. Ambala, Bhiwani, Faridabad, Jind, Mahendragarh, Rewari, and Sonipat exceed 100% but are below 140%. Hisar, Nuh, Palwal, and Panchkula are between 60% to 100%. Only in the remaining two districts Jhajjar and Rohtak, the stage of groundwater extraction is below 60% (Table 3.7). For Block-wise information on the Stage of Groundwater Extraction refer to Annexure 3.2. Figure 3.5 indicates District-wise Net Groundwater Availability after Extraction for the year 2020.

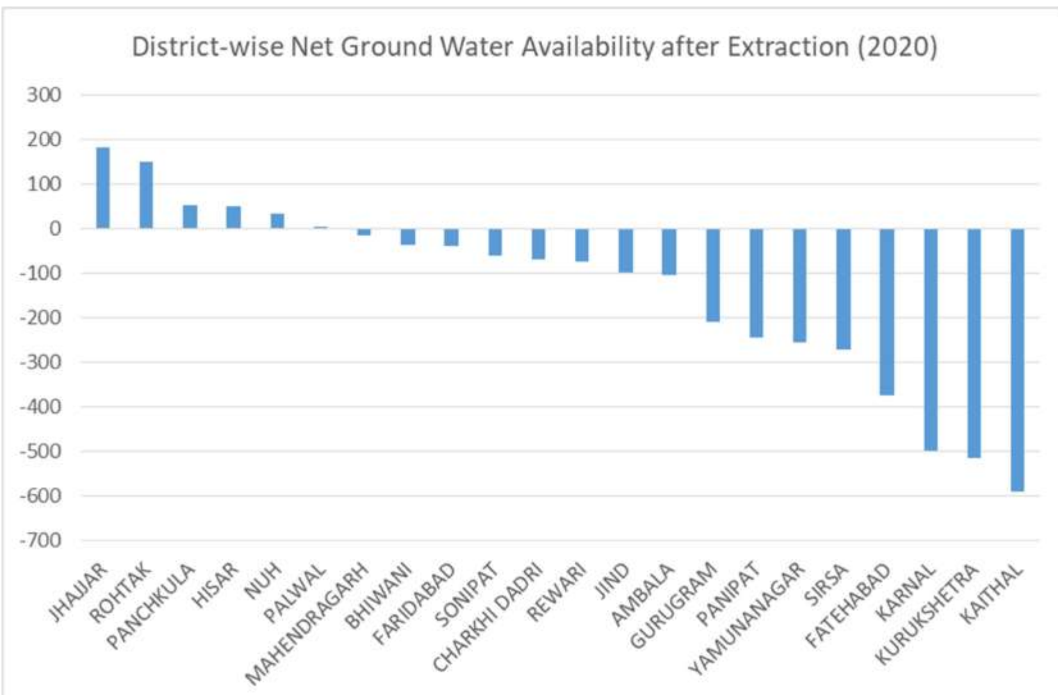
Table 3.7 District-wise Stage of Groundwater Extraction, 2020

Sr. No.	District	Annual Groundwater Resource Availability (MCM)	Current Annual Groundwater Extraction (MCM)	Net Groundwater Availability after Extraction (MCM)	Stage of Groundwater Extraction (%)
1	AMBALA	432.24	536.52	**-104.28**	124
2	BHIWANI	381.37	419.43	**-38.06**	110
3	CHARKHI DADRI	174.17	242.20	**-68.03**	139
4	FARIDABAD	148.47	187.23	**-38.76**	126
5	FATEHABAD	535.28	908.56	**-373.28**	170
6	GURUGRAM	204.22	414.23	**-210.01**	203
7	HISAR	535.89	486.03	49.86	91
8	JHAJJAR	340.42	157.89	182.52	46
9	JIND	770.97	869.95	**-98.98**	113
10	KAITHAL	547.56	1136.59	**-589.04**	208
11	KARNAL	730.90	1227.86	**-496.96**	168
12	KURUKSHETRA	352.41	866.80	**-514.39**	246

Sr. No.	District	Annual Groundwater Resource Availability (MCM)	Current Annual Groundwater Extraction (MCM)	Net Groundwater Availability after Extraction (MCM)	Stage of Groundwater Extraction (%)
13	MAHENDRAGARH	256.22	272.71	**-16.50**	106
14	NUH	176.24	142.42	33.82	81
15	PALWAL	348.62	344.51	4.12	99
16	PANCHKULA	140.03	87.11	52.92	62
17	PANIPAT	320.41	564.83	**-244.42**	176
18	REWARI	278.29	353.23	**-74.93**	127
19	ROHTAK	297.47	147.68	149.78	50
20	SIRSA	547.46	818.90	**-271.44**	150
21	SONIPAT	593.55	654.69	**-61.13**	110
22	YAMUNANAGAR	517.59	772.51	**-254.92**	149
	HARYANA (MCM)	**8629.78**	**11611.89**		**135**
	HARYANA (Cr Litres)	**862978**	**1161189**		

Source: Dynamic Ground Water Resources of Haryana, GWC, I&WRD, Haryana and CGWB, 2021

Figure 3.5 District-wise Net Groundwater Availability after Extraction in 2020



The Stage of Groundwater Extraction has marginally increased from 135% in 2013 to 137% in 2017, whereas it decreased again to 135% in 2020 (Table 3.8).

Table 3.8 Comparison of Stages of Groundwater Extraction in Haryana between 2013, 2017 and 2020

Year	2013	2017	2020
Stage of Groundwater Extraction	135%	137%	135%

Source: Dynamic Ground Water Resources of Haryana 2021, 2017 and 2013, CGWB

3.1.2.3 Categorisation of Assessment Units

As per the CGWB report, Dynamic Groundwater Resources of India, 2021, the groundwater resources estimation has been carried out for all 141 blocks out of 142 blocks in Haryana. The Morni Block being hilly, the groundwater resources have not been estimated in this block.

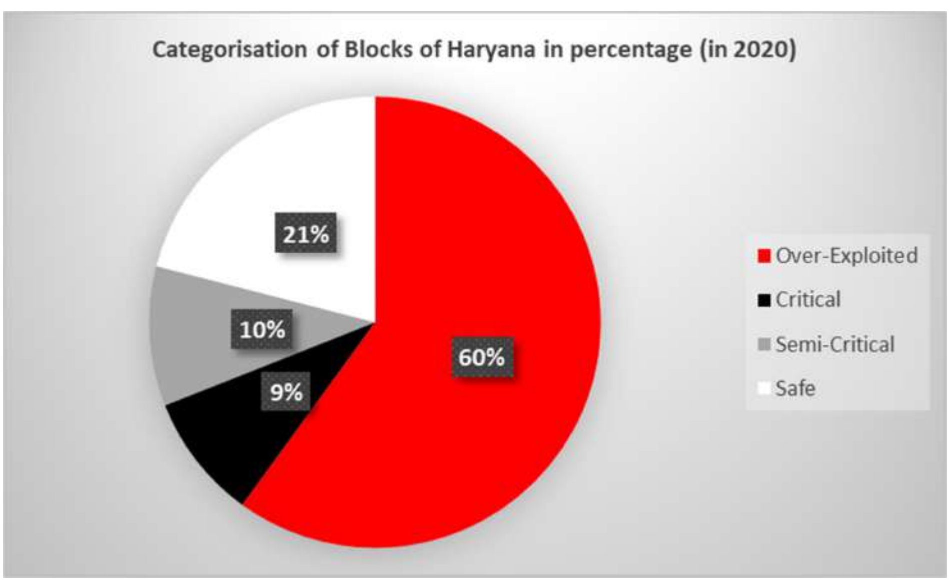
In the estimation, the blocks are categorised into four categories as per GWRE, 2015 estimation methodology. Out of the 141 blocks, 85 have been categorised as 'Over-exploited', 12 as 'Critical', 14 as 'Semi-Critical', and 30 as 'Safe' (Table 3.9 and Map 3.9). The block-wise categorisation of assessment units is given in Annexure 3.2. Over 60% of blocks are estimated to be over-exploited, 9% critical, 10 % semi-critical, and 21% safe as shown in Figure 3.6.

Table 3.9 Categorisation of Blocks by CGWB, March 2020

Sr. No.	Categorization of Block	Number of Blocks	Stage of Groundwater Extraction
1	Over-Exploited	85	>100%
2	Critical	12	Between 90 to 100%
3	Semi-Critical	14	Between 70 to 90%
4	Safe	30	< 70%
Total Blocks		**141***	

*Morni Block is not assessed being a completely hilly area
Source: Dynamic Ground Water Resources of Haryana, GWC, I&WRD, Haryana and CGWB, 2021

Figure 3.6 Categorisation of Blocks of Haryana in percentage as per the Dynamic Groundwater Resources of Haryana, 2021



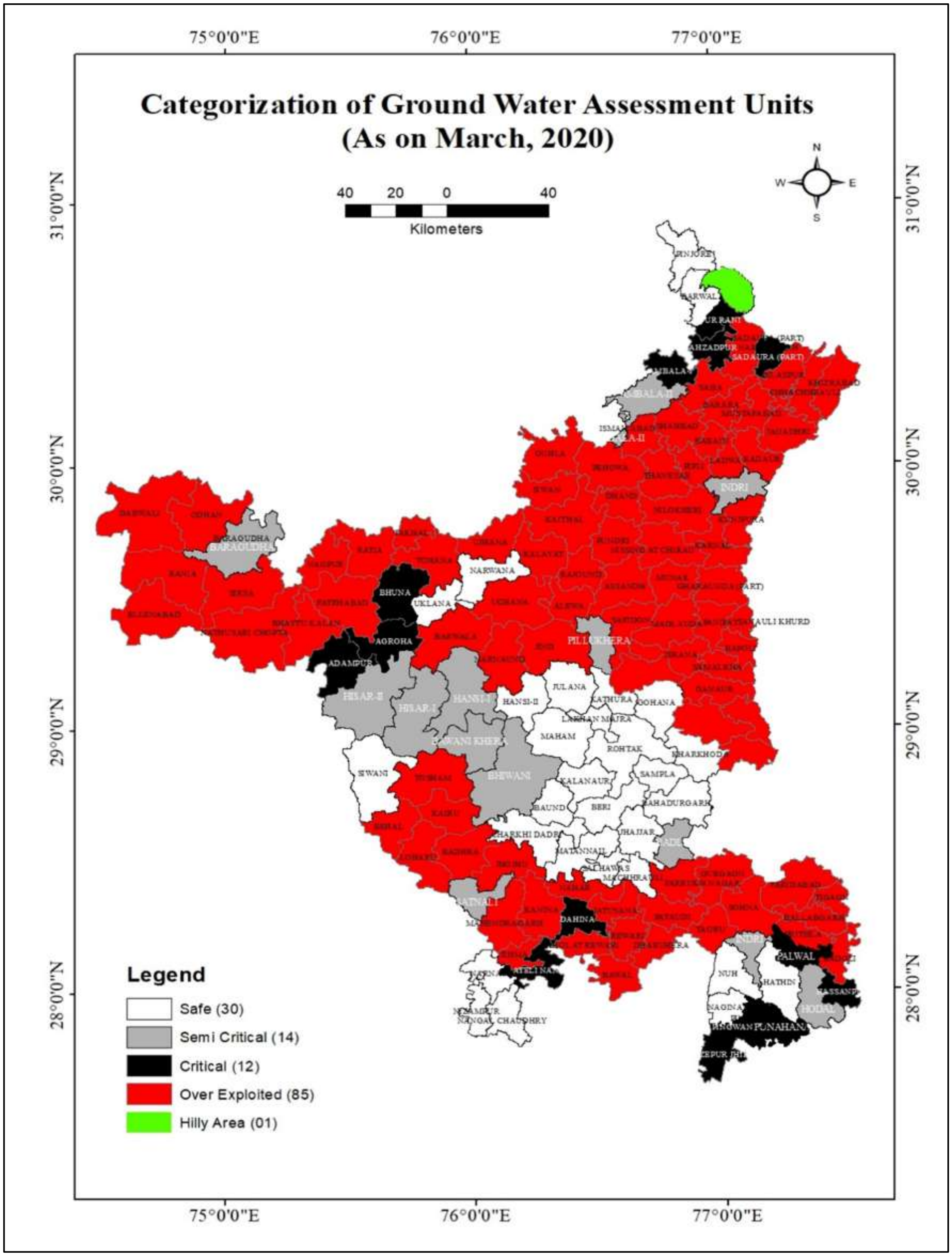
In comparison to the 2004 assessment, the total number of assessment units in Haryana has increased from 114 to 141. Table 3.10 shows a comparison of the Groundwater status of Haryana since 2004.

Table 3.10 Comparison of the Groundwater Status of Haryana since 2004

Category of Blocks	Number of Blocks					
	2004	**2009**	**2011**	**2013**	**2017**	**2020**
Over-Exploited	55 (48%)	69 (59%)	71 (61%)	64 (54%)	78 (61%)	85 (60%)
Critical	11 (10%)	21 (18%)	15 (13%)	14 (12%)	03 (2%)	12 (09%)
Semi-Critical	5 (4%)	9 (8%)	7 (6%)	11(9%)	21 (16%)	14 (10%)
Safe	43 (38%)	18 (15%)	23 (20%)	30 (25%)	26 (21%)	30 (21%)
Total	**114**	**117**	**116**	**119**	**128**	**141**

Source: Dynamic Ground Water Resources of Haryana, GWC, I&WRD, Haryana and CGWB, 2021

Map 3.9 Categorisation of Groundwater Assessment Units by CGWB, 2020



Source: Dynamic Ground Water Resources of Haryana, GWC, I&WRD, Haryana and CGWB, 2021

3.1.2.4 Estimation of Groundwater Recharge

In the Dynamic Ground Water Resources of Haryana, 2021, recharges from the following sources have been taken less than the actual recharge assessed by Tahal Consultancy Engineers Ltd. of Israel for the Haryana State Water Plan. According to the Tahal report the recharges are 1,620 MCM from the canal and 1,090 MCM from tanks, ponds, shallow water bodies and flood-prone areas against the recharges taken in Dynamic Ground Water Resources report as 870 MCM and 217 MCM respectively.

In the Dynamic Ground Water Resources report, the recharges from seepages through water courses have not been taken. In Chapter 2, the loss from watercourses has been assessed as 5% of the water supplied through it and out of which 93% is seepage loss. In this way, recharge from water courses works out to be 430 MCM.

Table 3.11 Additional Groundwater Recharge/Availabilities as per Field Assessments

Sr. No.	Source of Groundwater Recharge	Recharge as per GWRE (MCM)	Actual Recharge (MCM)	Additional Recharge (MCM)
1	Seepage from canals and water courses	870	2050 (1620 +430)	1180
2	Tanks, ponds, Shallow water bodies & flood-prone areas	217	1090	873
	Total (MCM)	**1087**	**3140**	**2053**
	Total (Cr Litres)	**108700**	**314000**	**205300**

Source: Dynamic Ground Water Resources of Haryana, 2020, CGWB and Haryana State Water Plan, 2002, Tahal Consultancy Engineers Ltd.

This above change has primarily resulted from a more accurate assessment of groundwater recharge from irrigated areas, canals and ponds/water bodies etc. for planning purposes. Additional recharge of 1,180 MCM from canal seepages has been distributed proportionately as per the existing canal command area in each district excluding the perennial waterlogged areas having water levels less than 1.5 m throughout the year, considering that there is no recharge to groundwater from these water-logged areas. Additional recharge of 873 MCM has been distributed proportionately in the districts as per their geographical areas excluding waterlogged areas. The distribution of these additional recharge has been given in Table 3.12. With this additional groundwater recharge of 2,053 MCM, total groundwater comes out to be 11,580.02 MCM say 11,580 MCM.

Table 3.12 Distribution of Additional Recharge among Districts

Sr. No.	District	Canal Command Area (Ha)	Water Logged Area in June 2021 (Ha)	Canal Command Area excluding waterlogged area (Ha)	Distribution of additional canal & WC seepage in the ratio of non-water logged CCA (MCM)	Geographical Area of the district (Ha)	Geographical Area of the district excluding waterlogged area (Ha)	Distribution of additional Seepage recharge Ponds/ shallow water bodies, etc. in the ratio of non-water-logged Geographical area (MCM)	Total district-wise Additional recharge (MCM)
1	**2**	**3**	**4**	5	6	7	8	9	10 (Col 6 + Col. 9)
1	AMBALA	30398	903.73	29494.27	11.87	157400	156496.27	31.04	42.91
2	BHIWANI	295676		295676	119.00	336300	336300	66.71	185.70
3	CHARKHI DADRI	115961	3580.08	112380.92	45.23	141500	137919.92	27.36	72.59
4	FARIDABAD	34936		34936	14.06	74300	74300	14.74	28.80
5	FATEHABAD	220945		220945	88.92	253800	253800	50.34	139.26
6	GURUGRAM	20507		20507	8.25	125300	125300	24.85	33.11
7	HISAR	377834		377834	152.06	398300	398300	79.01	231.07
8	JHAJJAR	179119	8301.16	170817.84	68.75	183400	175098.84	34.73	103.48
9	JIND	230499		230499	92.77	266000	266000	52.76	145.53
10	KAITHAL	206404		206404	83.07	235900	235900	46.79	129.86
11	KARNAL	138311		138311	55.66	252000	252000	49.99	105.65
12	KURUKSHETRA	61222		61222	24.64	153000	153000	30.35	54.99
13	MAHENDRAGARH	133446		133446	53.71	189900	189900	37.67	91.37
14	NUH	42133	958.17	41174.83	16.57	150100	149141.83	29.58	46.15
15	PALWAL	15757	239.27	15517.73	6.25	136800	136560.73	27.09	33.33
16	PANCHKULA	180		180	0.07	89800	89800	17.81	17.88
17	PANIPAT	67355		67355	27.11	126800	126800	25.15	52.26
18	REWARI	104533		104533	42.07	159400	159400	31.62	73.69
19	ROHTAK	138666	4814.86	133851.14	53.87	174500	169685.14	33.66	87.53
20	SIRSA	374871		374871	150.87	427700	427700	84.84	235.71
21	SONIPAT	157175	1266.24	155908.76	62.75	212200	210933.76	41.84	104.59
22	YAMUNANAGAR	6120		6120	2.46	176800	176800	35.07	37.53
HARYANA (Ha/MCM)		**2952048**	**20063.51**	**2931984.49**	**1180.00**	**4421200**	**4401136.49**	**873.00**	**2053.000**
HARYANA (Acres/Cr Litres)		**7294510.61**	**49576.93**	**7244933.68**	**118000**	**10924785.2**	**10875208.27**	**87300**	**205300**

3.1.2.5 District-wise Tubewells and Pumping Sets

As per the Statistical Abstract of Haryana 2019-20, there are a total of 7,90,873 tubewells and pumping sets for irrigation reported in the State. Out of which 2,64,472 are Diesel Sets and 5,26,401 are Electric Sets. District-wise data is shown in Table 3.13 and Figure 3.7.

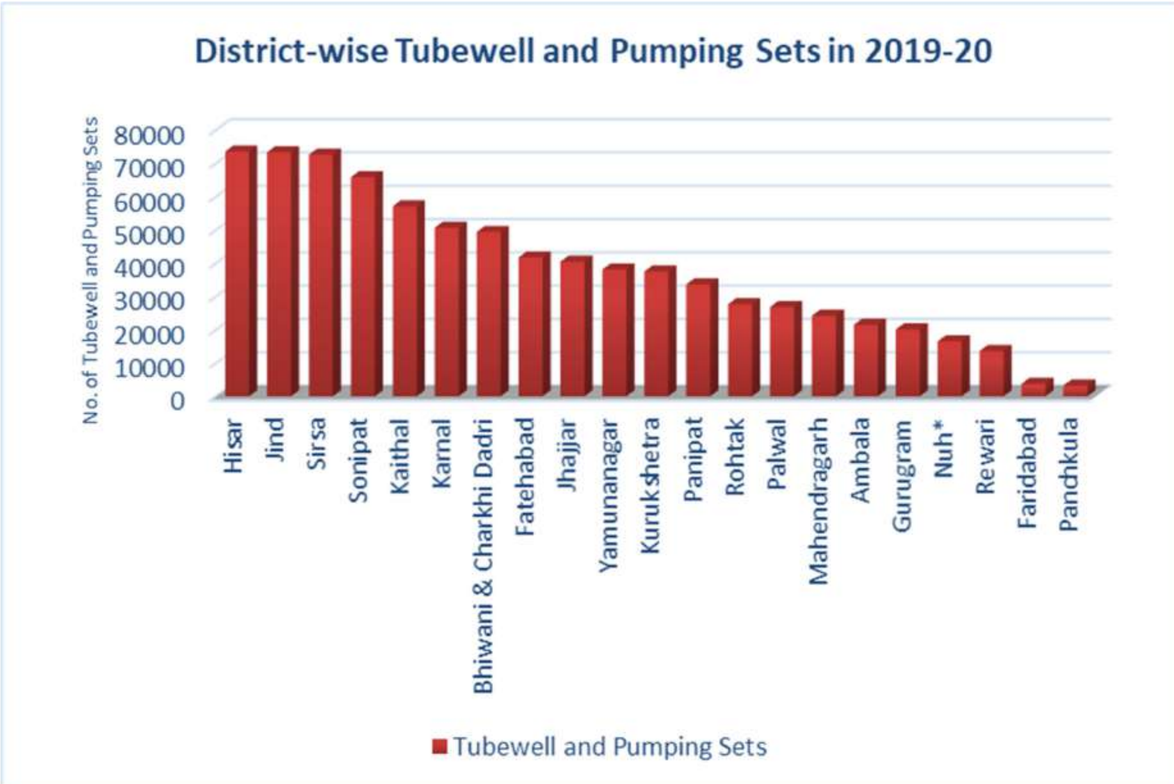
Table 3.13 District-wise Number of Tubewells and Pumping Sets for Irrigation in 2019-20(P)

District	Diesel Sets	Electric Sets	Total
AMBALA	3681	17782	21463
BHIWANI & CHARKHI DADRI	19234	30128	49362
FARIDABAD	922	2834	3756
FATEHABAD	7096	34602	41698
GURUGRAM	1062	19007	20069
HISAR	57112	16406	73518
JHAJJAR	33614	6828	40442
JIND	31655	41659	73314
KAITHAL	5601	51480	57081
KARNAL	381	50265	50646
KURUKSHETRA	164	37306	37470
MAHENDRAGARH	633	23569	24202
NUH*	7218	9292	1,65,10
PALWAL	15260	11535	26795
PANCHKULA	452	2780	3232
PANIPAT	1561	32049	33610
REWARI	3311	10294	13605
ROHTAK	22553	5091	27644
SIRSA	15604	56980	72584
SONIPAT	32171	33629	65800
YAMUNANAGAR	5187	32885	38072
HARYANA	264472	526401	790873

Note: Sets include both pumping sets and tubewells.
P: Provisional
*: Figures not updated because updated data not received from concerned DDA.

Source: Statistical Abstract of Haryana, 2019-20

Figure 3.7 District-wise number of Tubewells and Pumping Sets for Irrigation in 2019-20



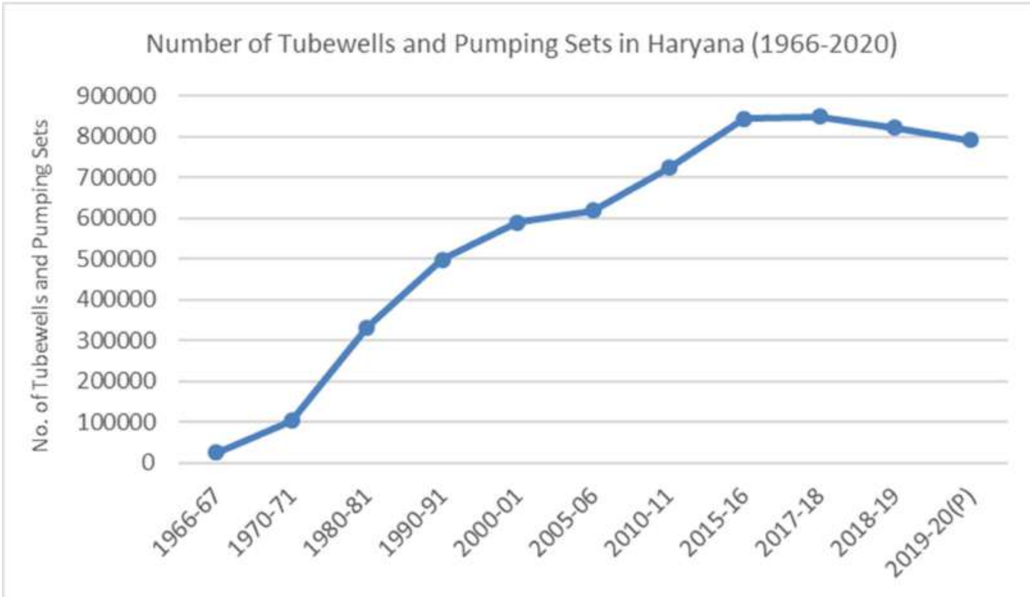
The number of tubewells and pumping sets for irrigation in Haryana from the year 1966 to 2020 is shown in Table 3.14 and Figure 3.8.

Table 3.14 Number of Tubewells and Pumping Sets in Haryana

Year	Diesel Sets	Electric Sets	Total
1966-67	—	—	25311
1970-71	17903	86455	104358
1980-81	109353	222674	332027
1990-91	155842	341729	497571
2000-01	255302	334171	589473
2005-06	231821	386202	618023
2010-11	231146	492311	723457
2015-16	298452	545509	843961
2017-18	297616	550134	847750
2018-19	275211	546188	821399
2019-20(P)	264472	526401	790873

Note: Sets include both pumping sets and tubewells.
P: Provisional
Source: Statistical Abstract of Haryana 2019-20

Figure 3.8 Number of Tubewells and Pumping Sets for Irrigation in Haryana (1966-2020)



3.2 MAJOR GROUNDWATER ISSUES AND CHALLENGES

Groundwater is extremely dispersed in space and usability because it is a resource which is privately owned by industries, farmers, water supply units, etc., and its extraction depends on the decisions and behaviour of individuals. This individualistic nature of access and unregulated use of groundwater through millions of sources make it difficult to manage the resource. The challenge is further intensified owing to the lack of local data on groundwater resources, a nuanced understanding of aquifers and skilled human resources to generate such data and knowledge.

3.2.1 Groundwater Depletion

The groundwater level in the State particularly in the fresh groundwater zone is depleting fast due to the over-extraction of groundwater beyond the annual groundwater recharge. The decline in water level is quite prominent and is a very serious problem in the State. The sub-surface water resource is under great stress as the maximum area is irrigated from groundwater sources. The State is, therefore, witnessing the presence of a large portion of water-stressed areas.

The water level data for the pre-monsoon periods of June 2020 is determined. Summarised details of district-wise minimum and maximum depth to water level are given in Table 3.15. The block-wise information is given in Annexure 3.4.

Table 3.15 District-wise Minimum and Maximum Depth to Water Level, June 2020

Sr. No.	District	Minimum Groundwater Level (m)	Maximum Groundwater Level (m)
1	AMBALA	1.25	37.62
2	BHIWANI	1.77	95.00
3	CHARKI DADRI	1.00	91.80
4	FARIDABAD	3.05	62.65
5	FATEHABAD	0.50	71.99
6	GURUGRAM	2.80	112.70
7	HISAR	0.58	39.50
8	JHAJJAR	0.43	21.64
9	JIND	0.23	48.10
10	KAITHAL	5.00	61.65
11	KARNAL	4.62	37.65
12	KURUKSHETRA	20.64	55.90
13	MAHENDRAGARH	9.68	111.20
14	NUH	2.08	40.05
15	PALWAL	1.50	30.00
16	PANCHKULA	5.39	38.69
17	PANIPAT	3.78	57.49
18	REWARI	5.40	79.00
19	ROHTAK	0.30	13.97
20	SIRSA	3.00	80.79
21	SONIPAT	0.57	42.16
22	YAMUNANAGAR	3.34	32.61

Source: Ground Water Cell, I&WRD, Haryana

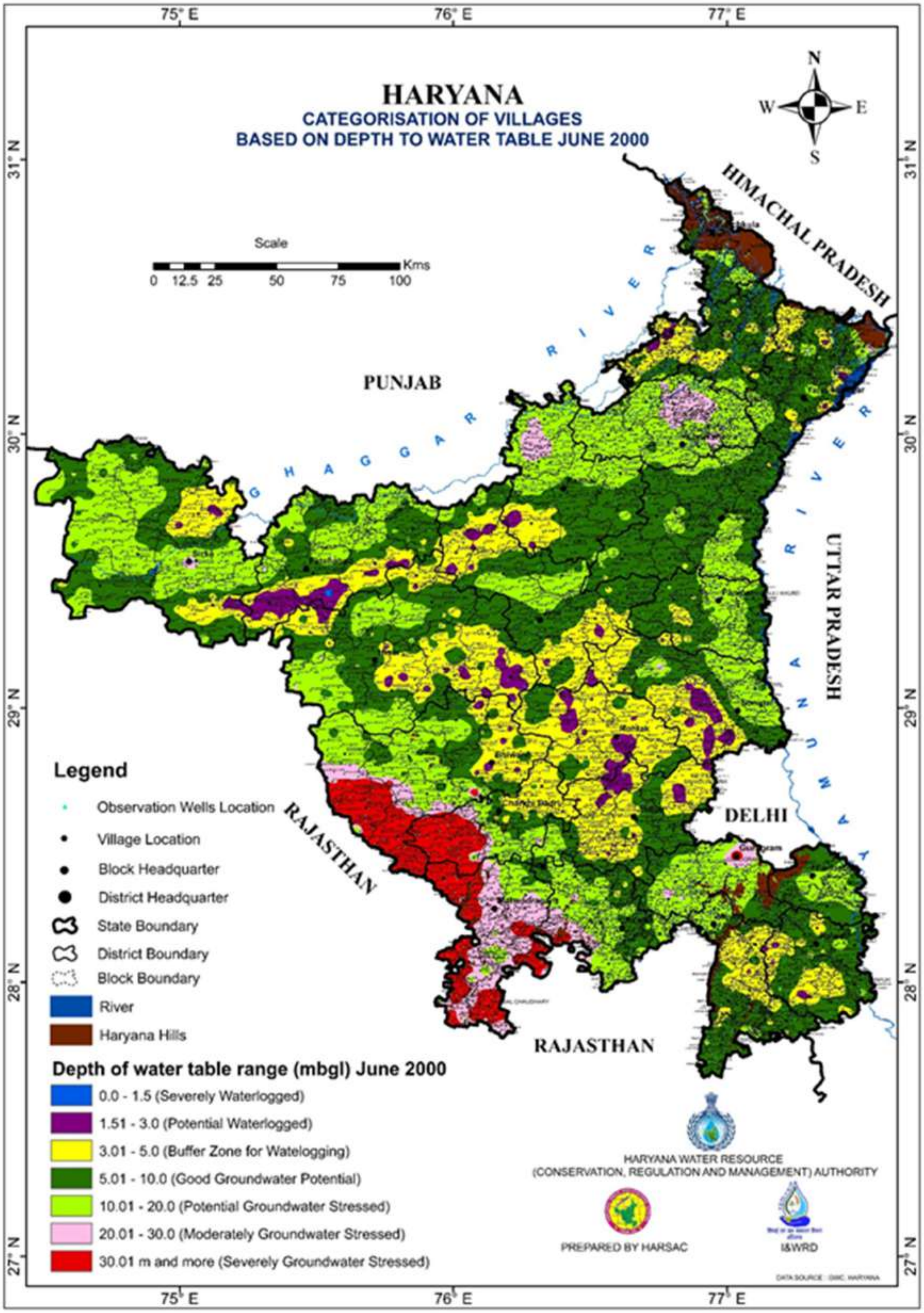
Decadal trends in the area with respect to depth to groundwater levels for June 2000, June 2010 and June 2020 are shown in Table 3.16 along with the corresponding Map 3.10, Map 3.11 and Map 3.12.

Table 3.16 Decadal Trends in Area w.r.t Depth to Water Levels for June 2000, June 2010 and June 2020

Sr. no.		Depth to Water Level Ranges (metre)	Categories	Colour	Area in June 2000 (ha)	Area in June 2010 (ha)	Area in June 2020 (ha)
1	(i)	30.01 to more	Severely Groundwater stressed villages	Red	2,00,700	5,76,140	10,88,620
	(ii)	20.01 to 30.0	Moderately Groundwater stressed Villages	Pink	1,97,430	6,32,950	6,11,450
2	(iii)	10.01 to 20.0	Potential Groundwater stressed villages	Light green	12,99,130	15,42,830	12,90,250
	(iv)	5.01 to 10.0	Good Groundwater Potential villages	Green	16,69,910	10,93,130	7,35,110
3	(v)	3.01 to 5.0	Buffer Zone for water logging villages	Yellow	9,04,230	4,70,050	4,51,210
4	(vi)	1.51 to 3.0	Potential water-logged villages	Purple	1,47,340	1,02,010	2,31,840
	(vii)	0.0 to 1.5	Severely water-logged villages	Blue	2,450	4,110	12,730
		Total			**44,21,200**	**44,21,200**	**44,21,200**

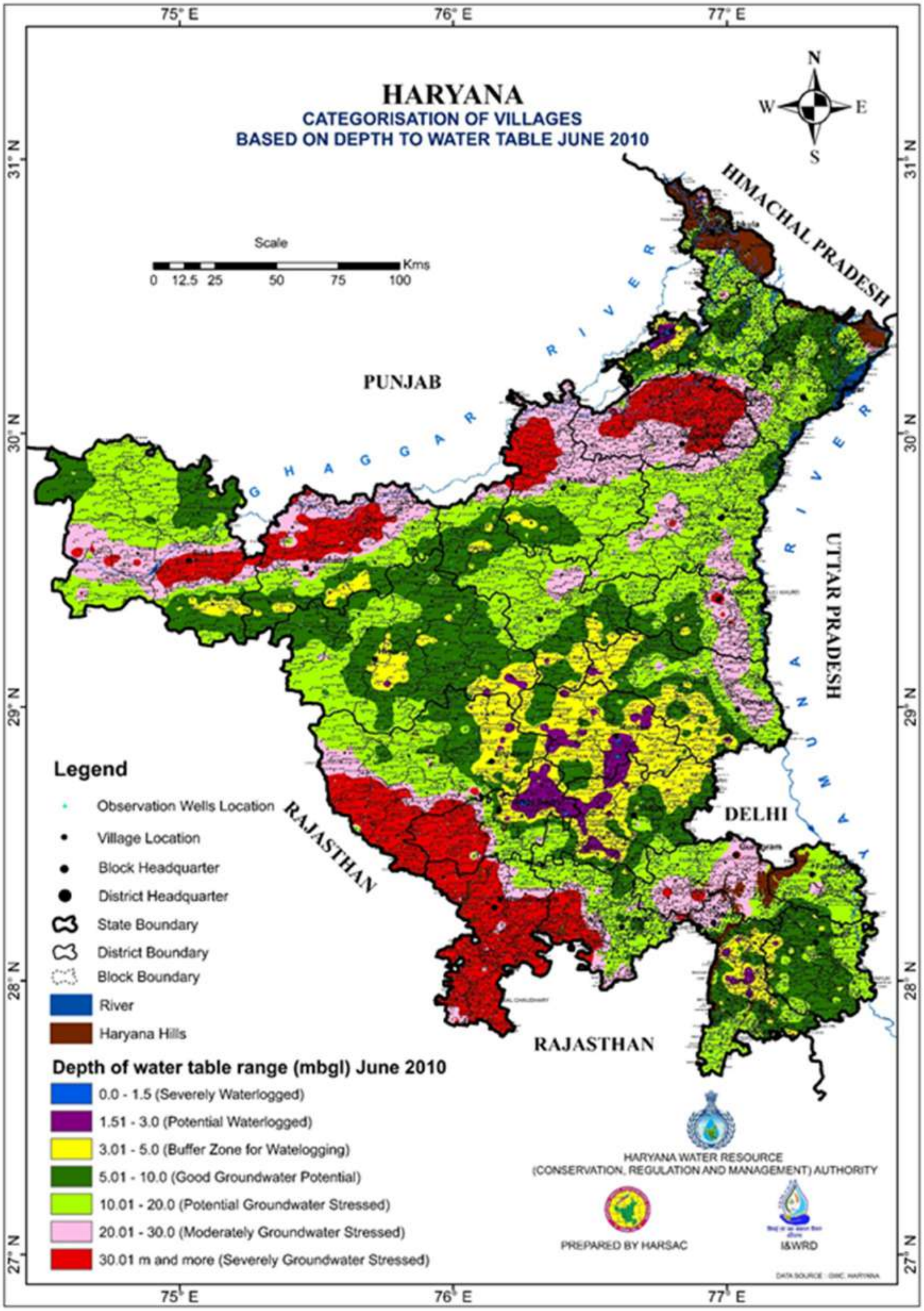
Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

Map 3.10 Categorization of Villages based on Depth to Water Level, June 2000



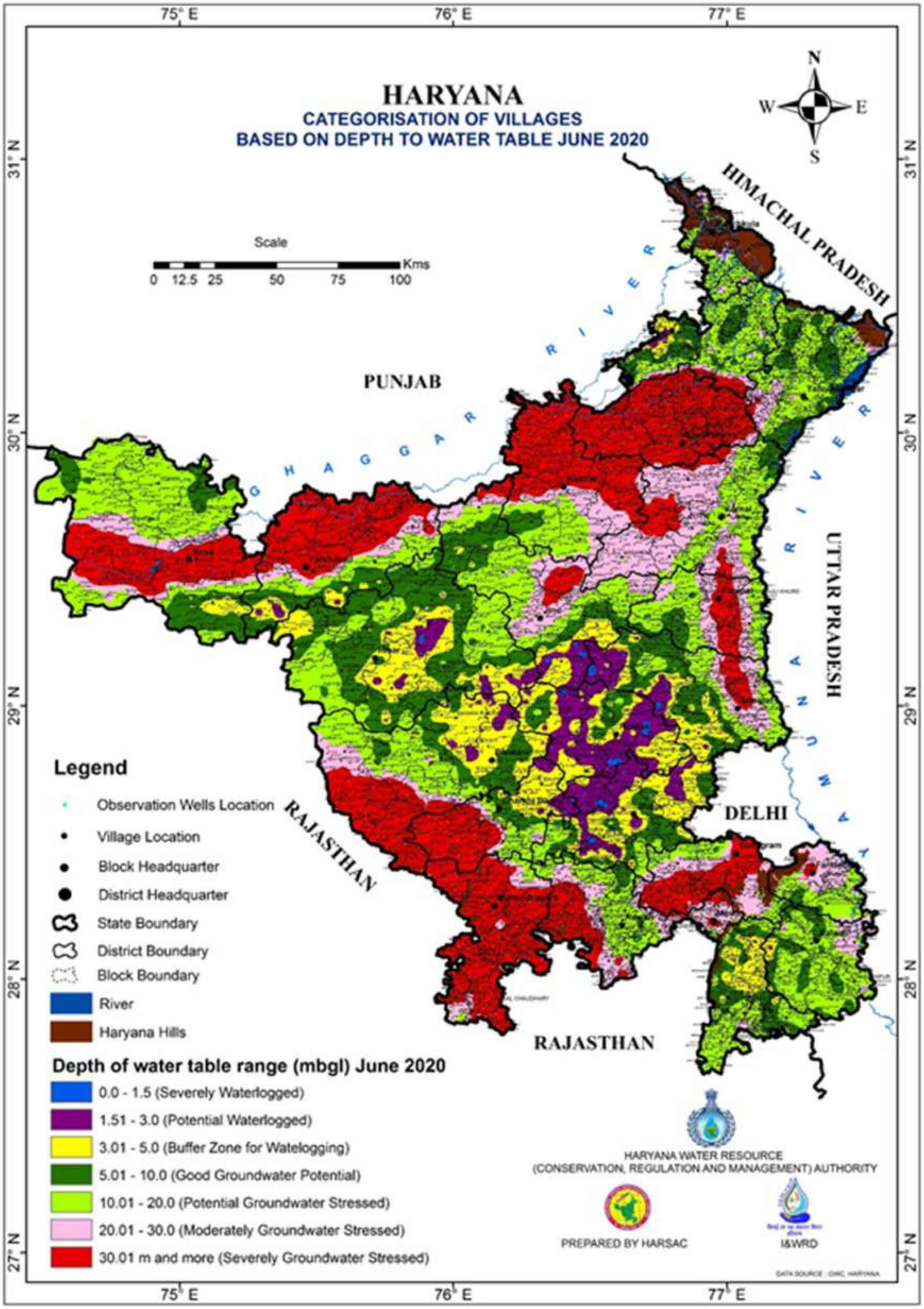
Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

Map 3.11 Categorization of Villages based on Depth to Water Level, June 2010



Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

Map 3.12 Categorization of Villages based on Depth to Water Level, June 2020



Source: Haryana Water Resources Authority and Ground Water Cell, I&WRD, Haryana

3.2.1.1 Cause of Groundwater Depletion

The main causes of depletion of groundwater are a) Intensive flood irrigation in paddy and wheat cultivation; b) Excessive withdrawal of groundwater through tube wells for irrigation and other uses and increased numbers of tube well to meet the rising water demand; c) Rainfall Variation; d) Installation of submersible tube wells instead of centrifugal pumps; e) Increased demand of groundwater for urban/infrastructure/industrial development; f) Insufficient supply and availability of surface water; and g) Withdrawal of groundwater from deeper depths i.e. from static groundwater zones. Refer to Table 3.17 for details on districts facing groundwater depletion and its causes.

Table 3.17 Districts facing Groundwater Depletion and its Causes

Sr.no.	Districts	Causes of Depletion
1	Parts of Ambala, Kurukshetra, Karnal, Panipat, Kaithal, Fatehabad, Sirsa and Sonipat	Due to over-exploitation and flood irrigation in Paddy
2	Parts of Mahendragarh, Rewari, and some blocks of Bhiwani and Charkhi Dadri	Availability of surface water is very less, availability of Groundwater in fracture zones of the hard formation and occurrence of rainfall is very low
3	Parts of Faridabad and Gurugram	Due to less availability of Groundwater and large dependency on Groundwater for infrastructure development

3.2.1.2 Impacts of Groundwater Depletion

1. Groundwater depletion is forcing farmers to shift to the use of deep tube wells with submersible pumps in place of centrifugal pumps. It has resulted in increased expenditure affecting the socio-economic condition of farmers.
2. Groundwater shortage prevents the additional water to flow into the lakes, ponds, and rivers where surface water continues to evaporate. As a result, water bodies become shallower, impacting the water availability for human uses and threatening the survival of fish and wildlife.
3. Many parts of Haryana are completely or partially dependent on groundwater to meet various water demands. The shortage of groundwater impacts the food supply, economy, and human well-being.

3.2.2 Water Logging

Due to the overuse of irrigation water in poorly drained areas, waterlogging and secondary soil salinization appeared and is causing losses in productivity threatening the sustainability of irrigated agriculture in Haryana. In the State, 8.89% area is under waterlogging conditions (June 2020). 1.58% of the area is under critical conditions having a shallow water level of range 0 to 1.5 mbgl and 7.31% of the area has a water level in the range of 1.5 to 3 mbgl. Most affected areas fall in the districts of Rohtak, Jhajjar, Sonipat, and Bhiwani followed by Jind, Hisar, Charkhi Dadri, Fatehabad, etc., which goes on fluctuating depending on the rainfall (Table 3.18 and Figure 3.9). For block-wise data on waterlogging refer to Annexure 3.5.

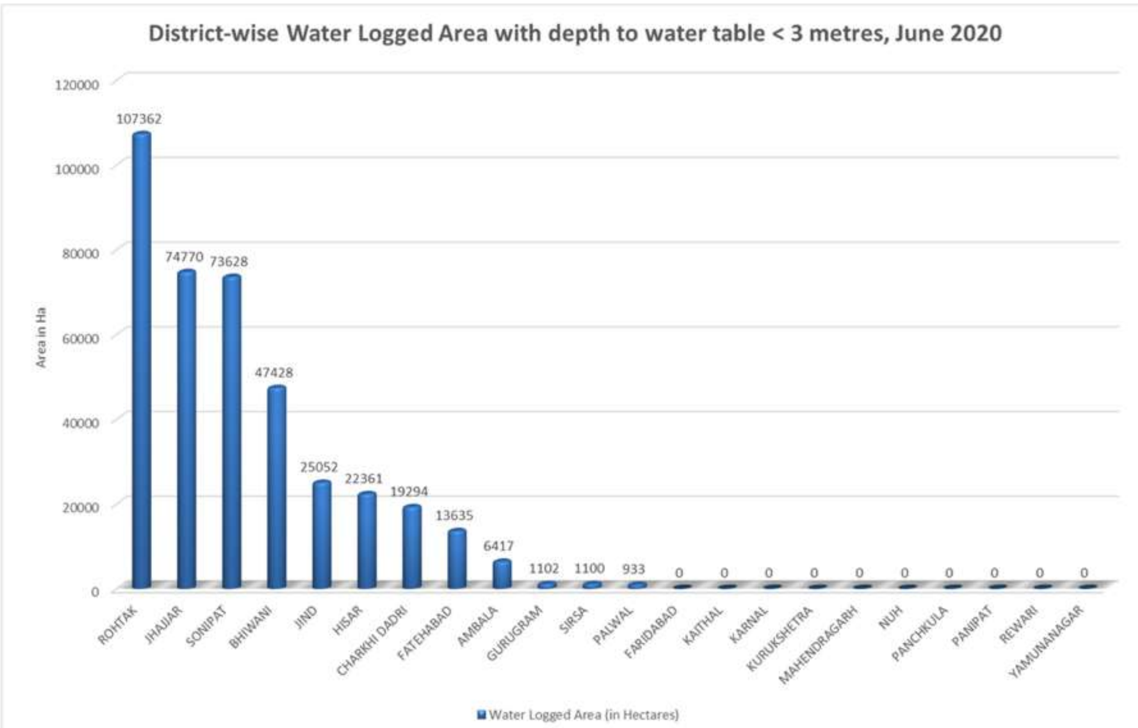
Table 3.18 District-wise Water Logged Area in Haryana, June 2020

Sr. No.	District	Total Geographical Area (Ha)	Water Logged Area (Ha)		Water Logged Area (%)
			Depth to Water Level (0-1.5 m)	Depth to Water Level (1.5-3 m)	
1	AMBALA	157400	1102	5315	4.08
2	BHIWANI	336300	0	47428	14.10
3	CHARKI DADRI	141500	5154	14140	13.64
4	FARIDABAD	74300	0	0	0.00
5	FATEHABAD	253800	1935	11700	5.37
6	GURUGRAM	125300	0	1102	0.88
7	HISAR	398300	2520	19841	5.61
8	JHAJJAR	183400	14186	60584	40.77
9	JIND	266000	7965	17087	9.42
10	KAITHAL	235900	0	0	0.00
11	KARNAL	252000	0	0	0.00
12	KURUKSHETRA	153000	0	0	0.00
13	MAHENDRAGARH	189900	0	0	0.00
14	NUH	150100	0	0	0.00
15	PALWAL	136800	373	560	0.68
16	PANCHKULA	89800	0	0	0.00
17	PANIPAT	126800	0	0	0.00
18	REWARI	159400	0	0	0.00
19	ROHTAK	174500	16824	90538	61.53
20	SIRSA	427700	0	1100	0.26
21	SONIPAT	212200	19729	53899	34.70
22	YAMUNANAGAR	176800	0	0	0.00
	HARYANA (Ha)	**4421200**	**69788**	**323294**	**8.89**

Sr. No.	District	Total Geographical	Water Logged Area (Ha)		Water Logged Area
	HARYANA (Acre)	**10924785**	**172446**	**798860**	
	HARYANA (%)		**1.58**	**7.31**	

Source: Ground Water Cell, I&WRD, Haryana

Figure 3.9 District-wise Water-Logged Area having Depth to Water Level less than 3 metres in Haryana, June 2020



Please refer to Table 3.19 for the number of villages showing rising trends.

Table 3.19 Groundwater Level Rising Trends in Villages of last 10 years data i.e. June-2010 & June-2020

Depth to Water Level Ranges (metre)	No. of Villages showing Rise>0.01m/yr
30.01 to more	24
20.01 to 30.0	45
10.01 to 20.0	194
5.0 to 10.0	255
3.0 to 5.0	274
1.5-3.0	212
Less than 1.5	75
Total Number of Villages	**1079**

Source: Ground Water Cell, I&WRD, Haryana

3.2.2.1 Cause of Water Logging

The waterlogging problems are broadly attributed to the depressed location of the area coupled with the lack of a proper drainage system, poor percolation, and leakage from canals. The issues of waterlogging in Haryana are mainly attributed to the following:

1. Unsustainable agriculture practices like intensive flood irrigation by canal water and excessive paddy cultivation, paddy-wheat crop rotation
2. Lesser withdrawal from tube wells and more withdrawal from canal water
3. It can be seen while comparing the district-wise number of tube wells of Rohtak & Jhajjar districts with other districts that there is a lesser number of tube wells resulting in the lesser withdrawal of groundwater due to poor quality of groundwater (salinity problem) in the area. In these districts' agriculture irrigation depends upon canal water. Due to poor groundwater quality, the groundwater gets transported from remote areas i.e. near canals to waterlogged/saline areas.
4. Groundwater movement is also towards central Haryana in a majority of the parts.
5. Broad syncline/bowl shape topography is also the major reason for the water logging conditions in Rohtak and Jhajjar districts as the elevation of the districts lies between 200 to 220 metres above the Mean Sea Level.
6. Infiltrations of canal water in the areas lead to groundwater level rise.
7. The sub-surface geology of the area is also unfavourable which increases salinity problems.
8. Some of the other notable reasons are-
    - Excessive heights of National Highways.
    - Slow gradient i.e. Gentle slope in the areas.
    - High salinity of groundwater at moderate and deeper depths.

3.2.3 Groundwater Salinity

Intensive irrigation and land-levelling leading to a major change in the natural topography and drainage, coupled with major shifts in cropping patterns and practices have together undergone major changes during the last 50 to 60 years, all of which seem to have contributed to and compounded the dual problem of waterlogging and salinity. The problem is being aggravated by the use of sub-soil water, which is either saline or alkaline in most central parts of the State.

Groundwater is generally suitable for drinking uses except at a few places in the southern, south-western and western parts where it is not suitable due to high Electrical Conductivity (EC) or high fluoride or nitrate or a combination of all. Almost all waters of shallow aquifers are suitable for irrigation on well-drained soils for growing salt-tolerant crops like wheat, mustard, rice, barley, maize, etc. However, at a few places where the EC of Groundwater goes beyond 5000 µS/cm and SAR is more than 10, such waters are not suitable for customary irrigation. It is recommended that areas identified with unsuitable or marginally suitable water quality should be monitored on a micro level to effectively delineate such areas and use suitable management measures.

According to Ground Water Cell, I&WRD, Haryana, the quality of groundwater in shallow aquifers with EC of >6000 µS/cm is reported in 1,78,626 hectares area of Haryana, whereas 4,35,606 hectares of the area is estimated with EC in the range of 4000-6000 µS/cm and 15,30,553 hectares of the area is having EC ranging from 2000-4000 µS/cm and the remaining area of 21,60,842 hectares is reported to be not affected by the problem of salinity as per data of June 2020. Please note that this quality of groundwater is reported in shallow aquifers.

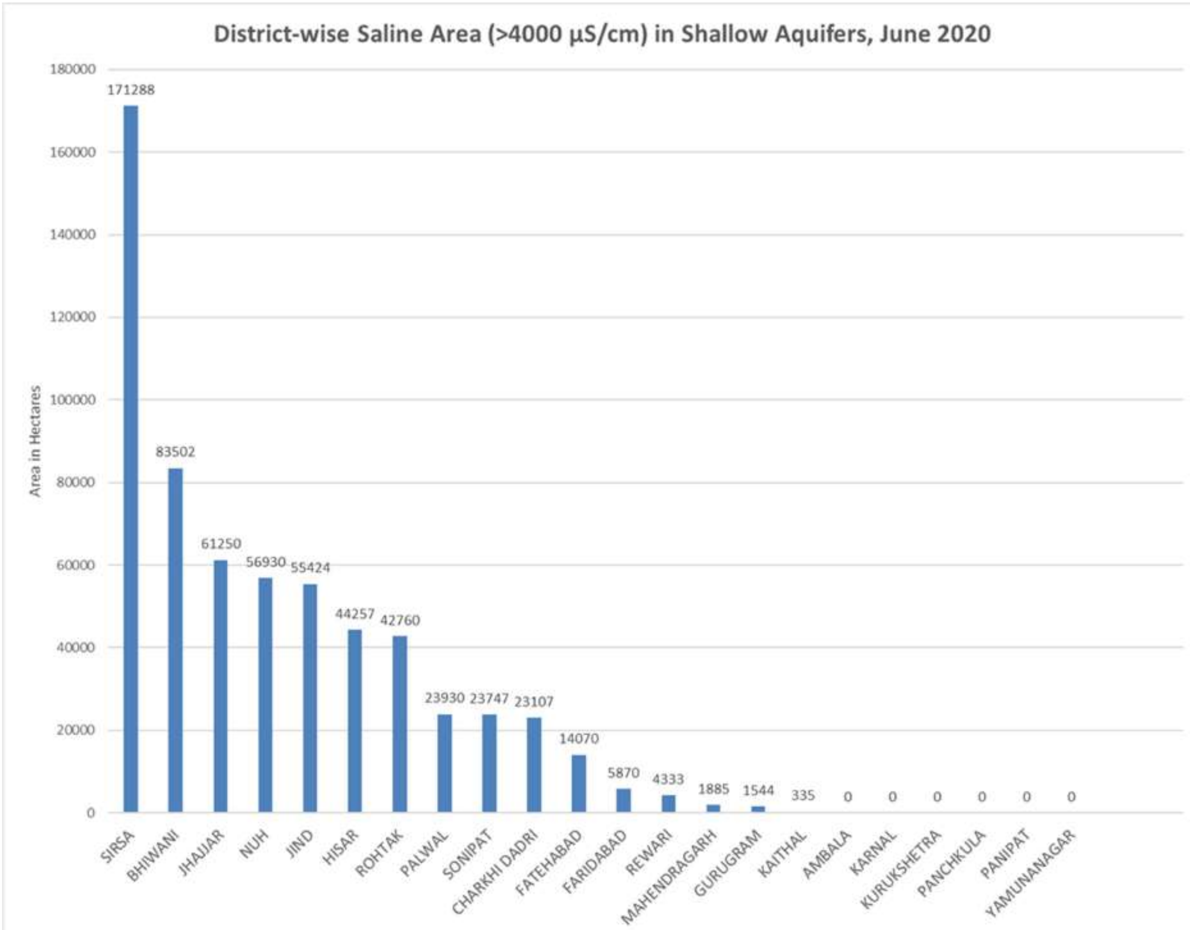
Districts like Sirsa, Nuh, Bhiwani and Jhajjar are the most critical with higher values of >6000 µS/cm. Five districts that are not affected by salinity are Ambala, Panchkula, Yamunanagar, Karnal and Kurukshetra. Refer to Table 3.20 and Figure 3.10 for district-wise details on salinity values. Map 3.13 shows the area affected by different range values of salinity. For block-wise data on salinity refer to Annexure 3.6.

Table 3.20 District-wise Area affected by Groundwater Salinity in Shallow Aquifers, June 2020

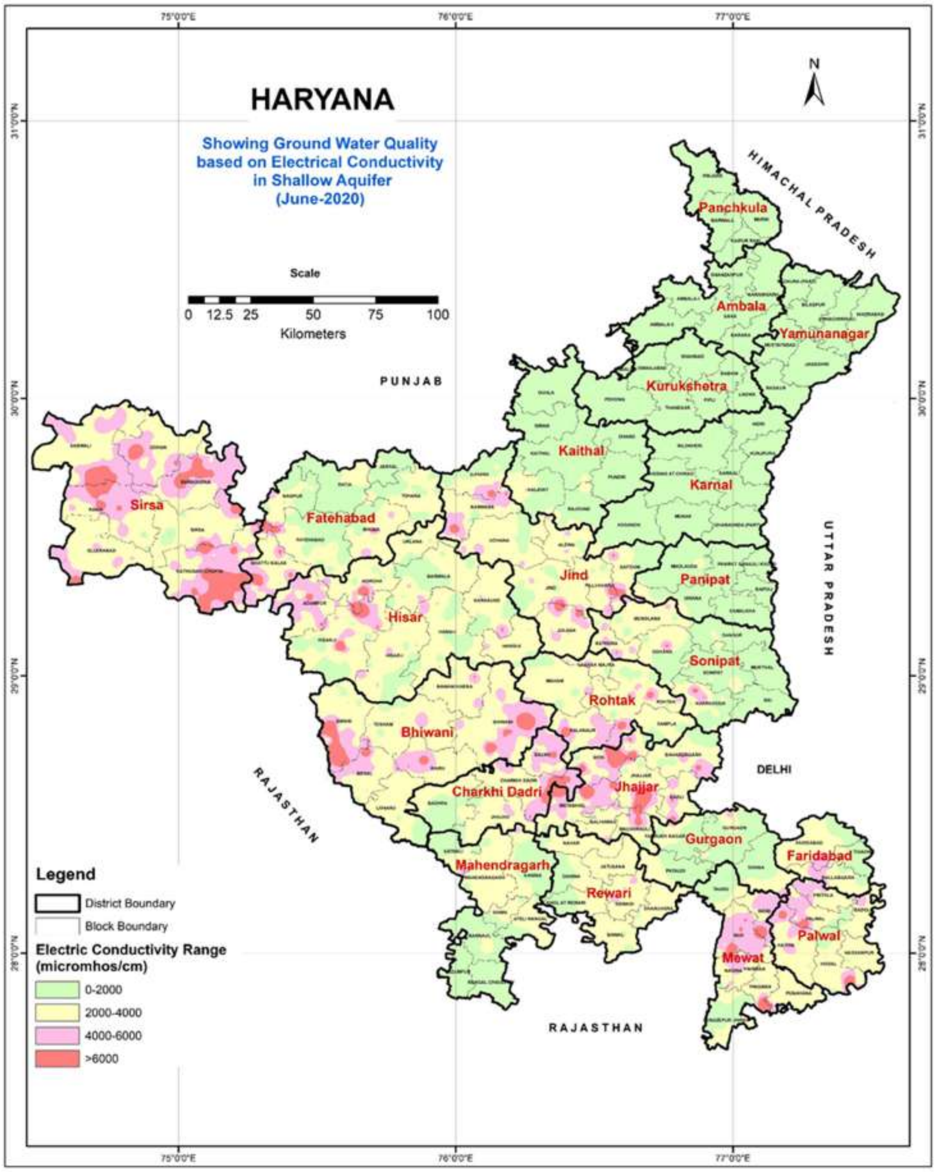
Sr. No.	District	Area Affected by Groundwater Salinity (Ha)			
		Fresh 0-2000 µS/cm	Sub-Marginal 2000-4000 µS/cm	Marginal 4000-6000 µS/cm	Saline > 6000 µS/cm
1	AMBALA	159285	0	0	0
2	BHIWANI	61651	177572	59576	23926
3	CHARKI DADRI	30969	80177	18688	4419
4	FARIDABAD	31126	28332	5870	0
5	FATEHABAD	130534	104506	9912	4158
6	GURUGRAM	90628	28972	1544	0
7	HISAR	132837	208958	39433	4824
8	JHAJJAR	42160	83360	39768	21482
9	JIND	84806	132259	44733	10691
10	KAITHAL	207811	20260	335	0
11	KARNAL	247112	0	0	0
12	KURUKSHETRA	168253	0	0	0
13	MAHENDRAGARH	130780	56636	1885	0
14	NUH	42841	36356	29635	27295
15	PALWAL	33422	78974	18430	5500
16	PANCHKULA	43615	0	0	0
17	PANIPAT	114429	10559	0	0
18	REWARI	30941	118318	3665	668
19	ROHTAK	42848	81189	34877	7883
20	SIRSA	27543	228769	109887	61401
21	SONIPAT	146950	55356	17368	6379
22	YAMUNANAGAR	160301	0	0	0
HARYANA (Ha)		**2160842**	**1530553**	**435606**	**178626**
HARYANA (Acre)		**5339441**	**3781996**	**1076382**	**441385**

Source: Ground Water Cell, I&WRD, Haryana

Figure 3.10 District-wise Area affected by Groundwater Salinity (>4000 µS/cm) in Shallow Aquifers, Haryana, June 2020



Map 3.13 Groundwater Salinity in Shallow Aquifers of Haryana, June 2020



Source: Ground Water Cell, I&WRD, Haryana

3.2.3.1 Impact of Soil Salinization

Due to capillary action, the upwards movement of salts through Groundwater results in increased salinity in the soil. The saline soil decreases the germination of seeds which creates an adverse effect on agricultural production. Due to lesser opportunities for livelihood people are migrating from rural to urban areas. It also attributes to an ecological imbalance.

3.2.4 Other Challenges

Groundwater is extremely dispersed in space and usability because it is a resource which is privately owned by industries, farmers, water supply units, etc., and its extraction depends on the decisions and behaviour of individuals. This individualistic nature of access and unregulated use of groundwater through millions of sources make it difficult to manage the resource. The challenge is further intensified owing to the lack of local data on groundwater resources, a deep understanding of aquifers and skilled human resources to generate such data and knowledge.

3.2.4.1 Policy and Governance

Identifying the principles of governance and applying them effectively, could lead to the formation of practices of responsible groundwater management and use which would include equity, sustainability and efficiency. There is a need to move towards a more Integrated Water Resources Management (IWRM) and recognize the importance of a multidisciplinary approach and harness its usefulness in the management of this precious resource.

The agriculture sector is the major contributor to the enhanced socio-economic indicators in the State. The benefits of the Green Revolution have been reaped but along with it, a grave concern emerged for the water resources in the State. The major challenge in the state in terms of policy and governance is the needed shift from current policies providing subsidies to the agriculture sector, which is proving to be highly unsustainable. The subsidized electricity for irrigation proved detrimental as it led to the over-extraction of groundwater. It could be said the same for the MSP on major crops like rice, sugarcane, cotton, etc. which are among water-guzzling crops. Their high MSP, as well as higher procurement rate, led to extensive cultivation and in the long run, it became one of the major reasons for the current situation of the water crisis in the State.

Water has always been managed and used by multiple departments. Hence various institutions play a crucial role in its planning and management. The Haryana Water Resource Authority, a new body constituted in December 2020 can be an umbrella institution for the overall management, conservation and regulation of water resources in the State of Haryana.

3.2.4.2 Community Awareness and Participation

The region has a reserve of rich alluvial aquifers but the situation in the State is such that with the current rate of utilization and exploitation, we are in danger of losing water stored in deep aquifers for thousands of years. Therefore, community awareness of the water scenario is very necessary and is one of the major challenges in the management of water resources.

Currently, efforts are being made by the Government to involve the community in the management and conservation of water resources through various policies and schemes. But due to the complex fabric of our society and its socio-economic structure, the implementation of those schemes and policies are a major challenge. Many local-level institutions are being formed for a bottom-up approach to managing our precious resources efficiently and effectively but mostly they remain ineffective due to the local power dynamics.

The State of Haryana has a rich history of water management. Traditionally, water from rainfall-runoff was harvested in *Johads* and other water conservation measures were practised and their management was ensured by the community residing nearby and reaping the benefits. But with the development of bore wells over the years, these *Johads* and other traditional water management practices lost their importance and often were left abandoned and neglected. As the groundwater became easily accessible, it changed the way people lived and moved. The surface water structures lost their importance and were often encroached on and became dumping sites for domestic waste. The community ceased to take care of these structures.

HWRA is working on building farmers' and community awareness and advocating best practices through training, workshops, advertisement on social/print media etc. for improved water management and governance in the state. As a part of Atal Bhujal Yojana, the State is working on strengthening institutional arrangements and capacity through training and capacity-building activities, preparing the Water Security Plans (WSPs) for all the 1,669 GPs by engagement of District Implementation Partners (DIPs) viz. community-based organizations (CBOs)/nongovernmental organizations/etc.

3.2.4.3 Water-use Efficiency across Sectors

SDG 6.4.1 indicates the change in the water use efficiency over time and it is to be measured as the change in the ratio of GVA by irrigated agriculture, industry and the services sector to the volume of water being extracted over time. This indicator is considered to be very critical as it will help in assessing the economic growth based on its water use and making a shift from it.

The agriculture sector is the major user of groundwater followed by the domestic and industrial sectors. In the agriculture sector, due to poor irrigation practices and a lack of proper planning and management in terms of cropping patterns, water use inefficiency is very high. In almost all the regions of the State, water-intensive crops are being cultivated against the state's agro-climatic conditions.

Industrial and domestic sectors are also inefficient in the use of water. Treatment facilities for the reuse of wastewater generated from these sectors are limited. The use of water metres has not been fully developed and accepted in the State. There is no provision for mandatory water audits for the efficient management of water resources.

An important step in this direction is being taken by the HWRA which is regulating the illegal extraction of groundwater by granting NOCs/permission to use groundwater for projects including Industry, Mining, and Infrastructure. To make the application process easier a highly user-friendly web portal has been developed and is working efficiently. The Authority has framed a policy for payment of late fees/penalties by the promoters, in case they failed to submit their application with the Authority for registration of their ongoing projects.

By increasing the water use efficiency, water demand and water user conflicts can be effectively managed by utilizing every unit of the existing supply. Efficient water use will lead to an overall reduction in total water consumption which will further lead to greater economic productivity and other benefits per unit of water being utilized.

3.2.4.4 Monitoring and Evaluation

The critical issue of monitoring and evaluating groundwater is due to the fragmented structure of the institutions. There are different bodies for monitoring quality and extraction and the focus also deviates based on the sectors using groundwater. This in turn results in the formation of fragmented data sources which often don't cater to the points of emerging concerns.

There is a need to develop a monitoring system that generates basic data suitable for the evaluation of the overall functioning of the hydrologic system. Unless and until basic data is not available, it is not possible to evaluate and monitor the groundwater resources based on the current points of concern. Moreover, the hydrologic conditions change at a local scale. Therefore, regional data can provide little information. Most of the groundwater development activities occur at a village or local level, so the availability and problems at that level could be misleading if derived from regional data sources. The approach of an integrated monitoring system must be adopted to capture the detail of hydrologic behaviour based on which detailed modelling at both basins, as well as local levels, could be achieved.

The setting up of the Hydrogeological Monitoring Network (HMN) involving the installation of a Water level Indicator, Rain Gauge, Water Flow Metre, Water Quality Testing Kit, and Piezometers is being undertaken as part of the Atal Bhujal Yojana. This would help in developing an integrated data set on groundwater for effective planning and decision-making.

Chapter 4

WASTEWATER TREATMENT, REUSE STATUS AND ITS CHALLENGES

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXURES

4.1 REUSE OF TREATED WASTE WATER POLICY, 2019

The Government of Haryana formulated the Reuse of Treated Waste Water Policy-2019 to maximise sewage collection and treatment, as well as reusing treated wastewater on a long-term basis so as to minimise reliance on freshwater resources and promote treated wastewater as an alternate resource.

The policy establishes the following goals:

1. To achieve a minimum of 80 percent coverage of the area with sewerage infrastructure and sewage collection in all of the State's municipalities.
2. Achieve 100 percent treatment of collected sewage in accordance with CPCB/HSPCB norms.
3. Every municipality must utilise at least 25% of the treated wastewater within the time range established by the local body's policy.
    - To reuse 50% TWW by 2025
    - To reuse 80% TWW by 2030
    - A similar target will be set for villages that have sewage facilities

Future infrastructure will likely contain the following, among other things:

- Phased expansion/strengthening of the sewage system.
- Expand the capacity of existing STPs and build new STPs where sewage treatment facilities are currently lacking.
- Furthermore, existing STPs may be improved appropriately with the addition of functional components, as needed, so that the characteristics of treated effluent meet the most recent GOI/HSPCB/CPCB mandated requirements.

4.2 DOMESTIC WASTEWATER RESOURCES

4.2.1 Domestic Waste Water Generation and its Reuse

The estimated sewage generation for the State of Haryana is 1356.90 MLD and the current total treatment capacity of Sewage Treatment Plants (STPs) is

1839.80 MLD. Table 4.1 provides details on waste generation, treatment capacity, operational capacity, and actual utilisation. `

Table 4.1 Domestic Waste Water Generation and Treatment in Haryana, Oct 2022

	MLD	MCM	Cr Litres
Total water supplied for domestic consumption	**1696.13**	**619.09**	**61909**
Total domestic wastewater being generated out of supplied water	**1356.90**	**495.27**	**49527**
Total treatment capacity available from STPs	**1839.80**	**671.53**	**67153**
Total wastewater being treated out of wastewater generated	**1128.46**	**411.89**	**41189**
Total treated wastewater being reused	**170.30**	**62.16**	**6216**
Total treated wastewater being discharged into drains etc.	**958.16**	**349.73**	**34973**

Source: PHED

At present, 196 STPs have been installed by Public Health & Engineering Department (PHED), Haryana Shahari Vikas Pradhikaran (HSVP), Urban Local Bodies (ULB), Gurugram Metropolitan Development Authority (GMDA) and Municipal Corporation Gurugram (MCG) have a collective capacity of 671.53 MCM. However, the actual utilized capacity is 411.89 MCM only. Out of which only 15.09% (62.16 MCM) is being reused for non-potable purposes in agriculture, horticulture, construction and industrial sectors (Table 4.2).

Table 4.2 Department-wise STPs Waste Water Generation and its Reuse Status, Oct 2022

Sr. No.	Name of Department	No. of STPs Constructed	Treatment Capacity (MCM)	Waste Water being Treated (MCM)	Present Reuse of TWW (MCM)
1	PHED	120	345.62	224.20	6.21
2	HSVP	17	84.24	42.49	8.11
3	ULB	12	99.28	64.86	7.67
4	GMDA	6	141.62	79.57	39.42
5	MCG *(decentralised STPs)*	41	0.77	0.77	0.77
	Total (MCM)	**196**	**671.53**	**411.89**	**62.16**
	Total (Cr Litres)		**67153**	**41189**	**6216**
	Total (MLD)		**1839.81**	**1128.47**	**170.30**

Source: PHED

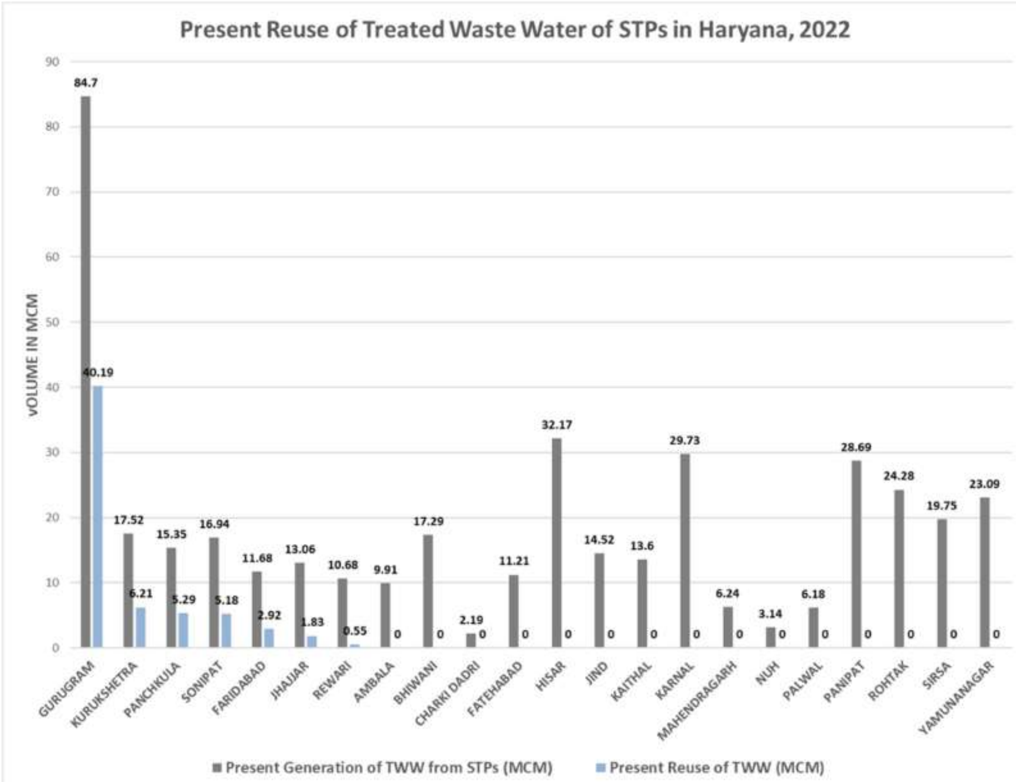
District-wise details on the number of STPs, department, capacity, the present generation of TWW, present reuse of TWW and quantity being discharged are given in Table 4.3 and Figure 4.1. Only seven districts reuse some of the treated wastewater produced by the STPs. The largest percentage of treated wastewater is used in Gurugram (~47%) followed by Kurukshetra (~35%), Panchkula (~34%) Sonipat (~31%), Faridabad (~25%), Jhajjar (~14%) and Rewari (~5%). None of the treated wastewater from the remaining 15 districts is being used; instead, it is dumped into nearby drains. For block-wise details on the same refer to Annexure 4.1.

Table 4.3 District-wise STPs Waste Water Generation and its Reuse Status, Oct 2022

Sr. No.	District	No. of STPs	Department	Total Capacity of STPs (MCM)	Present Generation of TWW from STP (MCM)	Present Reuse of TWW (MCM)	Balance Quantity of TWW not being Reused but Discharged into drains etc. (MCM)
1	AMBALA	13	PHED - 12 HSVP - 1	16.79	9.91	0.00	9.91
2	BHIWANI	9	PHED - 8 HSVP - 1	27.38	17.29	0.00	17.29
3	CHARKI DADRI	2	PHED -2	3.65	2.19	0.00	2.19
4	FARIDABAD	1	ULB -1	16.43	11.68	2.92	8.76
5	FATEHABAD	7	PHED - 8 HSVP - 1	19.16	11.21	0.00	11.21
6	GURUGRAM	51	GMDA - 6 PHED - 4 MCG - 41	149.32	84.70	40.19	44.51
7	HISAR	10	PHED - 9 HSVP - 1	39.97	32.17	0.00	32.17
8	JHAJJAR	6	PHED - 5 HSVP - 1	27.92	13.06	1.83	11.23
9	JIND	11	PHED - 10 HSVP - 1	22.90	14.52	0.00	14.52
10	KAITHAL	7	PHED - 6 HSVP - 1	20.44	13.60	0.00	13.60
11	KARNAL	10	PHED - 6 ULB - 4	39.24	29.73	0.00	29.73
12	KURUKSHETRA	5	PHED - 4 HSVP - 1	24.27	17.52	6.21	11.31
13	MAHENDRAGARH	6	PHED - 4 HSVP - 1 ULB - 1	10.95	6.24	0.00	6.24
14	NUH	4	PHED -4	6.42	3.14	0.00	3.14
15	PALWAL	4	PHED -4	9.31	6.18	0.00	6.18
16	PANCHKULA	5	PHED - 3 HSVP - 2	29.84	15.35	5.29	10.06
17	PANIPAT	8	PHED - 1 HSVP - 3 ULB - 4	53.58	28.69	0.00	28.69
18	REWARI	7	PHED - 6 HSVP - 1	18.62	10.68	0.55	10.13
19	ROHTAK	8	PHED - 7 HSVP - 1	38.51	24.28	0.00	24.28
20	SIRSA	8	PHED -8	30.84	19.75	0.00	19.75
21	SONIPAT	7	PHED - 4 HSVP - 1 ULB - 2	31.13	16.94	5.18	11.76
22	YAMUNANAGAR	7	PHED -7	34.86	23.09	0.00	23.09
	HARYANA (MCM)	**196**		**671.53**	**411.89**	**62.16**	**349.72**
	HARYANA (Cr Litres)			**67153**	**41189**	**6216**	**34972**
	HARYANA (MLD)			**1839.81**	**1128.47**	**170.30**	**958.14**

Source: PHED

Figure 4.1 Treated Waste Water Generation and its Reuse from STPs, 2022



The STPs based on Sequencing Batch Reactor (SBR) and Moving Bed Biofilm Reactor (MBBR) are the predominant technologies in the State of Haryana being used. All the STPs are meeting the level of treatment of collected sewage as per prescribed standards of HSPCB i.e. BOD<30.

Table 4.4 provides details on the existing status of Treated Waste Water (TWW) development in the towns.

Table 4.4 Status of TWW Development in Towns of Haryana, November 2022

Existing status of development in the town	Target	Maximum Duration for implementation of reuse of TWW	Status
Sewerage system and STP exists	Reuse of a minimum of 25% of TWW	2 years	**Usage gap of 149.50 MLD** As of 31.10.2022, the total usage of TWW should be 336.00 MLD and as of 17.11.2022, it is only 187.00 MLD
Sewerage system but STP is not available	Reuse of a minimum of 25% of TWW	3 years	--
No Sewerage system and no STP	Reuse of a minimum of 25% of TWW	4 years	**Six Towns** -In one town (Ismailabad) work is in progress -Remaining 5 towns namely Rajound, Kundli, Mandi Adampur, Badhra and Siwan sewerage system is yet to be laid.

Source: PHED

4.2.2 Mahagram STP Yojana

The State Government of Haryana under its Mahagram Yojana is providing sewerage systems in big villages across the State. The objective of this yojana is to provide a robust and sustainable network of piped sewerage systems in selected villages having a population of more than 10,000 persons as per the 2011 census. The sewage should be treated using the best available technology so that the treated effluent meets the prescribed standards and the treated water can be put to non-potable applications.

This scheme is being implemented in a Mission Mode in 3 phases. The progress status of this yojana is given in Table 4.5.

Table 4.5 Status of Development Works under Mahagram Yojana of Haryana as on 16.12.2022

Phase 1	Phase 2	Phase 3

• Total no. of villages – 38
• Completed- 2
• In progress –
  ○ >90% - 5
  ○ 75-90% - 13
  ○ 50- 75% - 9
  ○ 0-50% - 9
	• Total no. of villages – 45
	• Completed- 0
	• In progress –
	  ○ >90% - 0
	  ○ 75-90% - 0
	  ○ 50- 75% - 0
	  ○ 0-50% - 1
	• Not feasible - 21
	• Approval pending - 23
		• Total no. of villages – 49
		• Completed- 0
		• Approval Pending – 24
		• Not Feasible – 21
		• Urbanized - 4

Source: PHED

4.3 INDUSTRIAL WASTE WATER RESOURCES

4.3.1 Industrial Waste Water Generation and its Reuse

At present, 13 Common Effluent Treatment Plants (CETP) have been installed by Haryana State Industrial and Infrastructure Development Corporation (HSIIDC) and 1 CETP is installed by Gurugram Metropolitan Development Authority (GMDA) with a collective capacity of 52.85 MCM. The present generation of TWW from CETPs is 34.03 MCM and out of which only 24% (8.17 MCM) is being reused for Construction and Horticulture activities (Table 4.6).

Table 4.6 Department-wise CETPs Waste Water Generation from Industrial Estates and its Reuse Status, Oct 2022

Sr. No.	Owner Department	No. of CETPs constructed	Treatment Capacity (MCM)	Present Generation of TWW (MCM)	Present Reuse of TWW (MCM)
1	HSIIDC	13	32.78	17.61	4.89
2	GMDA	1	20.8	16.43	3.29
	Total (MCM)	**14**	**52.85**	**34.03**	**8.17**
	Total (Cr Litres)		**5285**	**3403**	**817**
	Total (MLD)		**144.79**	**93.23**	**22.38**

Source: HSIIDC and PHED

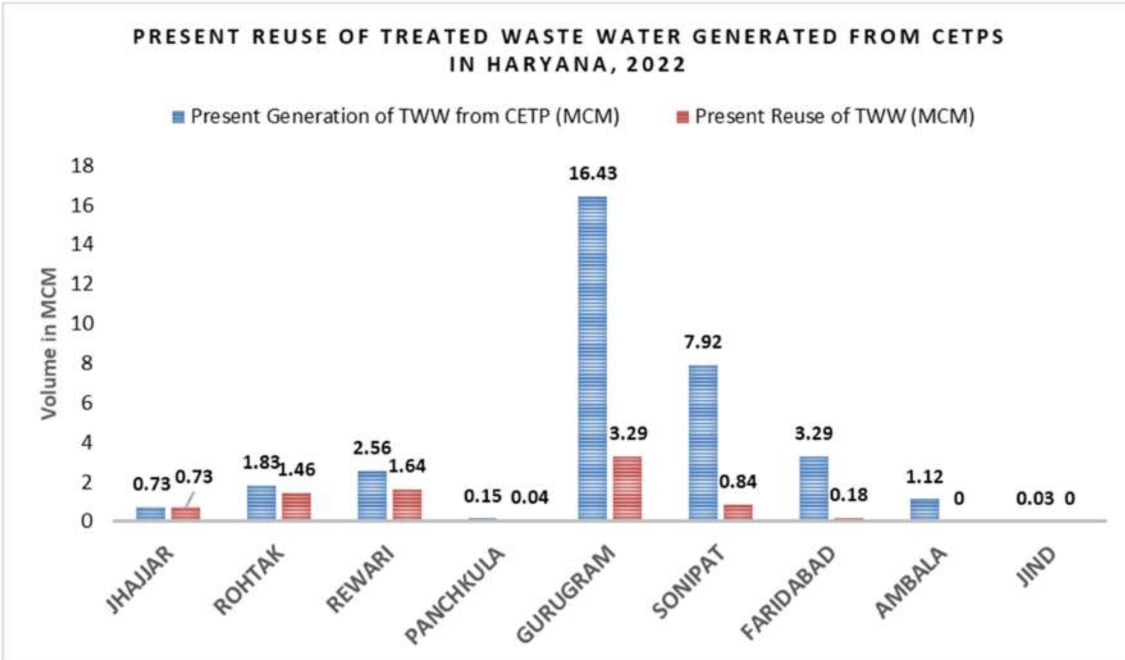
The 14 CETPs (Table 4.7) are installed in 9 Districts of the State – Ambala (2 no.), Faridabad (1 no.), Gurugram (1 no.), Jhajjar (1 no.), Jind (1 no.), Panchkula (1 no.), Rewari (1 no.), Rohtak (2 no.) and Sonipat (4 no.). The TWW from Jhajjar CETP is being 100% (0.73 MCM) reused in Horticulture. Whereas TWW from the other 13 CETPs is also used, though not totally, for horticulture or construction. The remaining TWW is being discharged either into a river or drain or onto the surrounding land. For block-wise details of CETPs refer to Annexure 4.2.

Table 4.7 District-wise CETPs Waste Water Generation from Industrial Estates and its Reuse Status, Oct 2022

Sr. No.	District	No. of Large-Scale Industries in the Estate	No. of MSMEs in the Estate	No. of CETP	Present Treatment Capacity of CETP (MCM)	Present Generation of TWW from CETP (MCM)	Present Reuse of TWW (MCM)	Balance Quantity of TWW not being Reused but Discharged into drains etc. (MCM)	Point(s) of Disposal of TWW from CETP not being Reused
1	AMBALA	4	497	2	2.01	1.12	0.00	1.12	Land and River
2	FARIDABAD	6	340	1	3.83	3.29	0.18	3.10	Nearby drain
3	GURUGRAM	NA	NA	1	20.08	16.43	3.29	13.14	NA
4	JHAJJAR	13	0	1	4.56	0.73	0.73	0.00	No Disposal
5	JIND	0	78	1	0.04	0.03	0.00	0.03	Land
6	PANCHKULA	0	335	1	0.18	0.15	0.04	0.11	River
7	REWARI	120	330	1	8.21	2.56	1.64	0.91	Land
8	ROHTAK	19	447	2	4.75	1.83	1.46	0.37	Nearby drain
9	SONIPAT	1	2799	4	9.20	7.92	0.84	7.08	Nearby drain
	HARYANA (MCM)	**163**	**4826**	**14**	**52.85**	**34.03**	**8.17**	**25.86**	
	HARYANA (Cr Litres)				**5285**	**3403**	**817**	**2586**	
	HARYANA (MLD)				**144.79**	**93.23**	**22.38**	**70.85**	

Source: HSIIDC and PHED

Figure 4.2 Treated Waste Water Generation and its Reuse from CETPs, 2022



4.4 RECYCLING AND EFFECTIVE REUSE OF TREATED WASTEWATER

Wastewater recycling and its reuse is an important plausible and feasible solution to partly arrest the shrinkage of freshwater resources. The need of the hour is, therefore, to consider the fast-increasing municipal TWW as a potential water resource that can suitably be put to effective use, particularly for non-potable purposes. The purposeful application of TWW is, therefore, imperative to bridge the gap between demand and supply, to the maximum possible extent to de-stress the groundwater and surface water resources. Besides, the reuse of TWW would help in generating significantly high revenues which could partly meet the operation and maintenance costs of the STPs. This would require taking steps in the following direction:

1. Providing the facility of supplying TWW to construction sites through pipelines/ tankers/lorries against a fixed, pre-determined charge.
2. Creating a conveyance network for the supply of TWW to institutional areas, business districts, or areas having a large number of such users. The

concerned departments like ULB, PHED, HSVP, HSIIDC and GMDA are required to create such infrastructures within their jurisdiction.

3. Setting up of dual pipe water supply system for flushing and water of lawns/gardens.
4. Facilitating supply of TWW for irrigation purposes

Mandated use of TWW as per the Reuse of Treated Waste Water Policy-2019

The State of Haryana endeavours to use the available TWW to the maximum to substitute freshwater. However, ensuring the suitability of TWW before its allocation for substituting the freshwater supply for any application is the most important factor. It also demands necessary care to safeguard that TWW is not mixed with or used with potable water. Potential non-potable uses of treated wastewater prescribed in the policy are as follows-

1. Thermal Power Plants
2. Industrial Units
3. Construction activities
4. Dual water supply system in Houses/Offices/Business Establishments
5. Large commercial or institutional users
6. Municipal Corporations/Municipalities/Wards/Gram Panchayat Uses
7. Agriculture/Irrigation

4.4.1 Project for Reuse of Treated Waste Water from STPs for Irrigation

The I&WRD, Haryana has formulated a project for utilizing Treated Waste Water for irrigation purposes from 35 STPs having a combined treatment capacity of 338.85 MLD in 21 districts of Haryana has been sanctioned by the Ministry of Agriculture & Farmers Welfare (MoA&FW), Government of India (GoI) namely 'STP MI Project under NABARD assisted MIF' for INR 490.53 crore. This project will cover CCA of about 23,359 hectares through micro-irrigation and the entire project is to be executed up to 2023-24. Out of the 35 no. STPs sanctioned in the project, 27 nos. STPs are found feasible as per site condition and accordingly, administrative approval of all these 27 no. STPs accorded by the Government. Tender of 20 no.

STPs have been approved to date and work has been started on 16 no. STPs. The work allotment of the remaining STPs is under process and will be completed shortly. The project is likely to be completed by 31.03.2024 as scheduled.

4.5 WASTEWATER MANAGEMENT CHALLENGES AND RISKS

4.5.1 Desired Quality of Treated Wastewater

The treatment system for municipal wastewater shall be designed to achieve the norms of water quality prescribed by CPCB/HSPCB. A critical area in the planning process of a wastewater treatment system is the identification of an appropriate treatment technology which is not only techno-economically feasible but also robust and simple to operate and maintain at a comparatively lower cost.

The National Green Tribunal (NGT) states that the disposal of treated sewage must adhere to a set of requirements. The amount of biochemical oxygen demand (BOD), or the amount of oxygen required for aquatic life to survive, in the treated sewage has been set at 10 mg/l; the amounts of COD and total nitrogen are limited to 20 and 10 mg/l, respectively; and the amount of total suspended solids must be less than 50 mg/l.

However, when wastewater disposal is being planned in arid and semi-arid areas, the use of wastewater in agriculture is a crucial factor. The utilization of wastewater finds its application for other non-potable uses outside irrigation like constriction and infrastructure building activities, thermal power plants, gardening, forestry, toilets etc. given the desired quality of TWW is available and supplied. The reuse of treated water makes sense since the marginal cost of alternative suppliers of high-quality water is typically greater in a water-scarce state like Haryana. To ensure the desired quality of TWW the development of projects should consider all environmental aspects while selecting a method of treatment, storage of wastewater and sludge management. Effective procedures should be put in place to adequately factor in environmental and social opportunities and concerns during all stages of the reuse of TWW projects. A robust monitoring system has to be developed for the analysis of wastewater quality regularly, with checkpoints in place to identify any deviations from compliance and remedial actions for the same.

4.5.2 Quality of Waste Water for Agricultural Reuse

Pollutants and contaminants in wastewater and their potential impacts through agricultural use are mentioned in Table 4.8. Because of this, the quality of wastewater will have to be monitored as per various standards set by the competent authority of the State. Generally, the quality of wastewater will conform to Central Pollution Control Board (CPCB) designated best use of water, water quality guidelines as per Environment rules 1986, Water Quality Standards as provided by IS:2296:1992, and other wastewater quality standards as may be prescribed by the competent authority from time to time. At the international level, there are ISO Guidelines for treated wastewater use for irrigation projects (Part-1, 2, 3 & 4), i.e., ISO16075-1, ISO16075-2, ISO16075-3 & ISO16075-4. It is to ensure that the treated wastewater from the STPs conforms to the prescribed standards as applicable to the state.

Table 4.8 Pollutants and contaminants in wastewater and their potential impacts through agricultural use

Pollutant/ Constituent	Parameter	Impacts
Plant food nutrients	N, P, K, etc.	- Excess N: the potential to cause nitrogen injury, excessive vegetative growth, delayed growing season and maturity, and potential to cause economic loss to the farmer - Excessive amounts of N and P can cause excessive growth of undesirable aquatic species. (eutrophication) - nitrogen leaching causes groundwater pollution with adverse health and environmental impacts
Suspended solids	Volatile compounds, settleable, suspended, and colloidal impurities	- development of sludge deposits causing anaerobic conditions - plugging of irrigation equipment and systems such as sprinklers
Pathogens	Viruses, bacteria, helminth eggs, faecal coliforms, etc.	- can cause communicable diseases
Biodegradable organics	BOD, COD	- depletion of dissolved oxygen in surface water - development of septic conditions - unsuitable habitat and environment - can inhibit pond-breeding amphibians - fish mortality - humus build-up
Stable organics	Phenols, pesticides, chlorinated hydrocarbons	- persist in the environment for long periods - toxic to the environment - may make wastewater unsuitable for irrigation
Dissolved inorganic Substances	TDS, EC, Na, Ca, Mg Cl, and B	- cause salinity and associated adverse impacts - phytotoxicity - affect permeability and soil structure
Heavy metals	Cd, Pb, Ni, Zn, As, Hg, etc.	- bioaccumulate in aquatic organisms (fish and plankton) - accumulate in irrigated soils and the environment - toxic to plants and animals - systemic uptake by plants - subsequent ingestion by humans or animals - possible health impacts - may make wastewater unsuitable for irrigation
Hydrogen ion concentrations	pH	- especially of concern in industrial wastewater - possible adverse impact on plant growth due to acidity or alkalinity - impact sometimes beneficial on soil flora and fauna
Residual chlorine in tertiary treated wastewater	Both free and combined chlorine	- leaf-tip burn - groundwater, surface water contamination (carcinogenic effects from organ chlorides formed when chlorine combines with residual organic compounds) - greenhouse effect

4.5.3 Efficiency of Water Treatment Plants

In the current scenario, a significant number of wastewater treatment plants remain inefficient. As a rectifying measure, operators of water treatment plants should constantly assess the plant's efficacy in treating water and make sure that systems are using the latest in equipment and technology. Higher running expenses and reduced income can have a detrimental effect on a treatment plant's bottom line because of ageing, inefficient pumping and processing equipment as well as out-of-date water management techniques.

4.5.3.1 High Energy Consumption

Running a wastewater treatment facility involves a lot of energy usage. Throughout the facility, a number of facilities are in operation 24/7/365, with the main and secondary phases of the wastewater treatment process seeing the most frequent use. The cost of energy may make up as much as 30% of the entire cost of operations. Therefore, controlling energy costs is a key concern for water treatment facilities.

4.5.3.2 High Capital and Operational Investment

Modern Wastewater Treatment Facilities (WTPs) involve the utilization of cutting-edge technology, including sensors, Internet of Things (IoT) gadgets, and AI-based trackers, and are capital-intensive. This is a high-risk industry that discourages private sector participation because of the substantial upfront capital expenditures in machinery and equipment and the unpredictability of revenue streams. Global experience indicates that nations have used the public-private partnership (PPP) model to successfully turn wastewater treatment into an economic opportunity. In this case, the government can support WTPs financially, reducing investment risk, while private sector companies give technical assistance in addition to capital investment. PPPs can thus be more affordable than wholly government-run projects. Additionally, it provides for scale: given the financial limitations of government-led investment, a greater number of WTPs may be formed through PPPs. Two prominent worldwide examples in this respect are Israel and Singapore. In the wastewater industry, both nations have made use of cutting-edge technology, passed regulations, and developed robust institutional capacities.

Another significant consequence is high operational costs. To maintain the purity of the water, many chemicals are employed. During the process, sewage sludge is produced, and it needs to be adequately treated before disposal. Learning how to utilize correct chemical doses and decrease sludge quantities is essential for maximizing profit.

4.5.3.3 Inefficient Plant Management

Many water treatment facilities struggle to find solutions to the issue of ineffective plant management. Poor wastewater management results from the sophisticated and decentralized nature of the water treatment process, which scatters data and makes it difficult for managers to oversee the whole facility. Operators still need to make important judgments, so if they lack expertise, human mistakes can readily occur, resulting in additional expenditures for dealing with unanticipated problems.

With these challenges, wastewater treatment plants face enormous pressure to improve and maintain treatment efficiency. Wastewater treatment plants should regularly analyse their treatment performance to ensure operating facilities and systems are running well. Outdated and inefficient equipment or non-user-friendly systems can result in high labour and operating costs, which can negatively impact business operations.

Efficiency improvements at wastewater treatment facilities have several advantages in terms of cost management and preserving compliance with ever-stricter laws. Additionally, it plays a crucial role in the global effort to strengthen the bond between people and the environment.

4.5.4 Dual-pipe Line System for Storm Water and Sewerage

A dual-pipe line mechanism is imperative for the proper management of storm and sewerage water. In a combined (conventional) sewer system, wastewater from residences, businesses, and industries is mixed with rainwater runoff in a single pipe. Stormwater and wastewater are transported jointly to the sewage treatment facility during dry weather. However, the capacity of a combined sewer system may be exceeded by the huge amounts of runoff and the increasingly frequent heavy rain.

The extra, untreated water overflows and then drains into our rivers or, worse, into the streets. When untreated sewage water rushes into the streets, it not only creates floods and, as a result, unsafe conditions for both pedestrians and vehicle traffic, but it also poses a serious health risk.

Incorporating a separate sewer system will result in the following advantages:

- Reduction of combined sewer overflow, which helps to reduce pollution.
- Increasing capacity to reduce the flooding issue.
- Enabling the use of stormwater as a resource.
- Enhancing the effectiveness of the wastewater treatment system.
- A separate system's effectiveness and durability will eventually pay for itself.

Additionally, separation prevents the possibility of sewage leakage into the environment. Stormwater can be directed to detention basins and watercourses, while sewage will be sent to the treatment plants through a closed system.

4.5.5 Monitoring and Evaluation of Treated Water Quality

Lack of proper monitoring and evaluation can just be as detrimental to wastewater management as the above-mentioned factors. The possible reasons for the same could be a dearth of appropriate equipment for the measurement and calculation of various parameters or just shear neglect. Either way, the consequence can be extremely deleterious for humans as well as the environment as the toxicity levels of water may go unchecked and be made available for human consumption or may be released into the water bodies. For a wastewater treatment plant, the absence of proper monitoring and supervision can lead to inefficient water treatment due to possible discrepancies in the parameters owing to obsolete and faulty equipment and callous observations taken by the plant operators and supervisors.

Many water treatment systems lack the instrumentation necessary to monitor all the parameters and identify issues when they are still easily avoidable or fixable. Many facilities do not properly capture the data, even when the equipment is appropriate, making it difficult to identify trends in the data or develop preventative measures. If you have fantastic feed water, a great membrane unit, and a great pre-treatment design, it could appear that the system runs on its own and takes care of itself. This isn't always the case, though. For a treatment to be effective, it is critical to monitor specific criteria.

Real-time data access is a technological boon for people. Real-time monitoring may help your facilities avoid various issues, including leaks and mechanical failure. The majority of these issues can be solved using green, cutting-edge solutions. It is needed to develop these environmentally friendly solutions to make wastewater treatment greener as automation and innovation advance.

4.5.6 Public Perception

The concept of reuse of TWW is not easily acceptable, in the initial stages keeping in view the traditional values of the people and the taboo on certain acts and practices. Public awareness, therefore, assumes great importance and is the key to changing the mindset of the public, albeit slowly.

The Haryana State Government released the Reuse of Treated Waste Water Policy 2019 with a goal to achieve 50% reuse of TWW by 2025 and 80% reuse of TWW by 2030. This can only be achieved through intensive IEC activities in the State to overcome the public apprehensions regarding the reuse of TWW and issues relating to health and water quality. The tools for conducting IEC activities could be Mass Media, Electronic Media, Print Media, Workshops, Community Awareness programs etc. The ultimate objective is to address the following issues before the implementation of the policy and ensure the success of the projects:

a) Educate the public on TWW while stressing the importance of water as a limited resource.
b) Emphasis on the present status of the availability of water resources and the alarming rate at which the groundwater reservoir is shrinking.
c) Propagate the need for carrying out water harvesting and recharging techniques.
d) Conservation of water by preventing wastage, misuse of water and recycling of waste water for flushing, gardening and washing.
e) Rope in celebrities to take up this cause and educate/motivate the public on the reuse of TWW. The public generally has the propensity to identify with celebrities and icons.
f) Bring about a behavioural change for the success of the projects.

g) Raise awareness among school children. Integrate water education into school curricula to help students recognize its value
h) Plan awareness campaigns that specifically target particular user groups, like farmers who consume a significant amount of water.

Chapter 5

RAINFALL AND ITS VARIABILITY, RUNOFF AND RECHARGE POTENTIAL

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MAPS

5.1 Assessment of Monsoon Rainfall Availability

There are two seasons of rainfall in the State. The southwest monsoon generally extends over the entire State by the last week of June and withdraws towards the end of September and contributes about 80% of the annual average rainfall. July and August are the rainiest months each accounting individually for about 30% of annual rainfall. In each of these months, there are 5 to 11 rainy days (with daily rainfall of at least 2.5 mm). The withdrawal of the monsoon begins from the State in the middle of September and by the third week of September monsoon withdraws from the entire State. This season is a principal source of groundwater. Another period of rainfall is winter rain from December to March about 20% of total rainfall which is mostly absorbed into the soil.

5.2 Climate Change and Observed Rainfall Variability in 30 Years from 1989-2018

The rainfall is having high temporal and spatial variability and due to the impact of climate changes, there are significant changes in the mean rainfall pattern and their variability as well as in the intensity and frequencies of extreme rainfall events. The report Observed Rainfall Variability and Changes over Haryana State published by IMD in the Year 2020 brings the result of the analysis based on the recent 30 years of data (1989-2018) on the mean spatial rainfall pattern as well as the mean spatial pattern of different rainfall events, trends and variability as well as extreme rainfall events during the monsoon months and annual for the State.

5.2.1 State Rainfall Mean, Variability and Trend

Table 5.1 shows the Mean Rainfall (mm) and Coefficient of Variation (CV) of the state for the monsoon months, southwest monsoon season and annually during the period 1989-2018. It can be seen that the state gets the highest rainfall (33%) of southwest monsoon rainfall in August month while July month gets 32% of the southwest monsoon rainfall. June and September receive 14% and 21% of southwest monsoon rainfall. Also, more than 82% of annual rainfall receives during the southwest monsoon season only. The variability of monsoon or annual rainfall is 31% and 27% respectively.

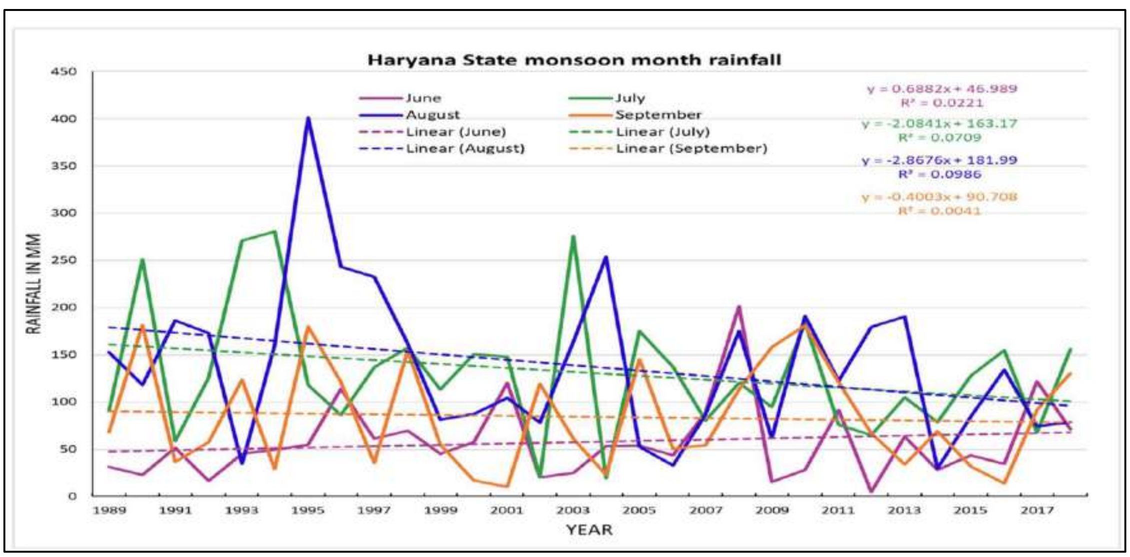
Table 5.1 Mean Rainfall (mm) and Coefficient of Variation of the State

	June	July	August	September	Monsoon Season	Annual
Mean	57.7	130.9	137.5	84.5	410.6	499.7
CV	70.6	52.7	58.4	64.8	31.0	27.2

Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

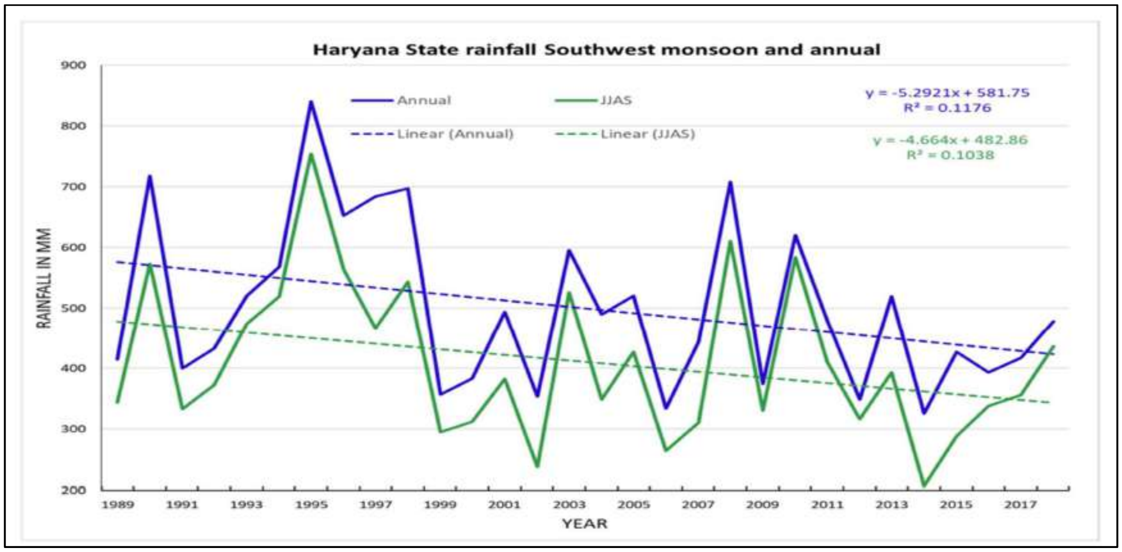
Figures 5.1 and Figure 5.2 show the time series of rainfall in mm for the months of June, July, August, September and Southwest Monsoon season, annually respectively (1989-2018). The trend lines are also displayed for each of the series. Seasonal and annual rainfall shows a decreasing trend. In the monthly rainfall, June shows an increasing trend while July, August and September rainfall show a decreasing trend. However, neither monthly nor seasonal/annual trend is significant statistically. During the last 30 years highest rainfall in June and July was received in the years 2008 and 1994 (201.4 mm and 280.5 mm respectively) while the highest rainfall of 401.2 mm in August was received in the year 1995 and 181.4 mm in September was received in the year 1990. The highest annual rainfall of 840.6 mm and the highest southwest monsoon rainfall of 754.1 mm were received in the year 1995.

Figure 5.1 Time Series of Rainfall (mm) for June, July, August, and September & Trends from 1989-2018



Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

Figure 5.2 Time Series of Rainfall (mm) for the Southwest Monsoon Season and Annual Trends from 1989-2018



Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

5.2.2 District Rainfall Mean, Variability and Trend

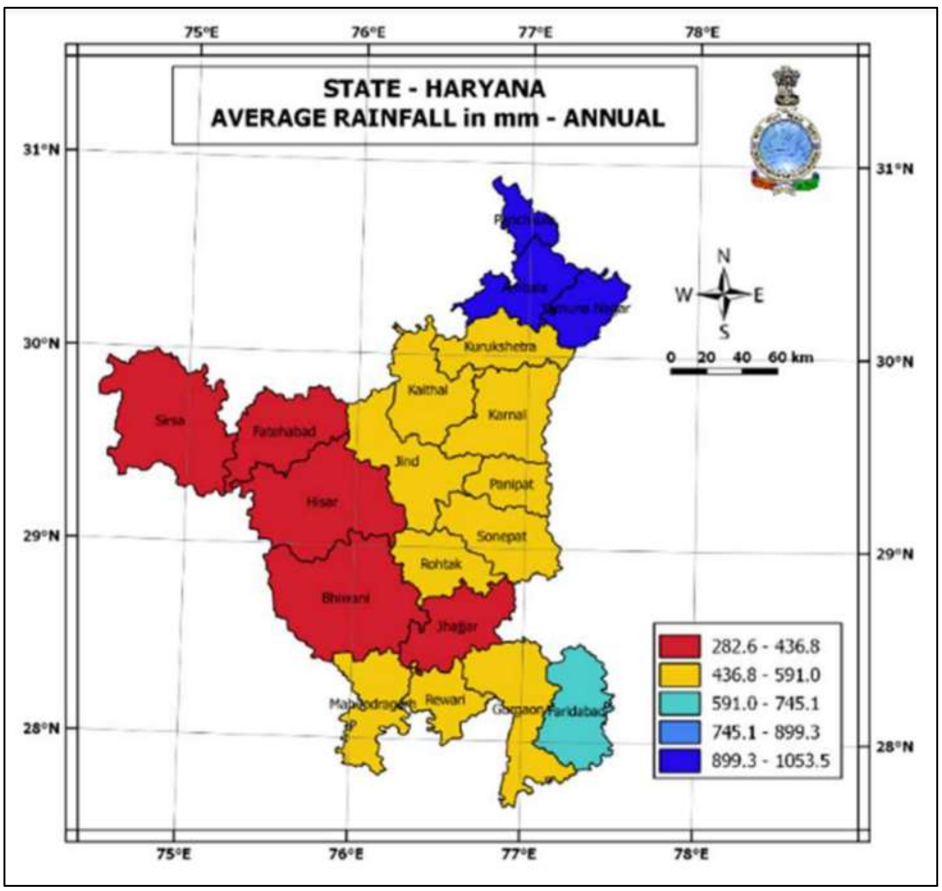
Table 5.2 gives the rainfall statistics for the districts of Haryana for the four monsoon months, the southwest monsoon season. It can be seen that three districts viz. Yamunanagar, Panchkula and Ambala receive the highest rainfall over other districts during all the months and seasons. Rainfall received over these districts is around 90-130 mm in June, 260-320 mm in July, 260-300 mm in August, 140-160 mm in September and during the SW monsoon and annual 790-890 mm. The lowest rainfall receives during the SW monsoon season over the Sirsa district (218.5 mm) while the Fatehabad district receives the lowest annual rainfall (311.0 mm). Map 5.1 and Map 5.2 show district-wise Mean annual Rainfall and its Coefficient of Variation (CV) for the state of Haryana respectively.

Table 5.2 Rainfall Statistics for the Districts of Haryana for the Four Monsoon months, Southwest Monsoon Season and Annual

District	June		July		August		September		Monsoon		Annual	
	MEAN	CV	MEAN	CV	MEAN	CV	MEAN	CV	MEAN	CV	MEAN	CV
AMBALA	109.1	59.0	274.7	51.5	265.3	58.7	149.6	72.8	798.7	30.0	968.2	26.2
BHIWANI	43.8	73.7	102.1	70.3	114.7	96.2	64.4	84.5	319.6	48.8	389.9	47.7
FARIDABAD	46.7	85.3	174.2	65.6	192.5	56.1	123.4	83.7	534.9	31.9	618.8	35.1
FATEHABAD	39.5	66.3	77.0	78.3	71.0	91.2	53.3	99.7	240.5	52.3	311.0	54.9
GURUGRAM	43.8	92.1	146.1	66.1	166.5	62.8	92.9	77.8	447.2	45.0	529.2	40.0
HISAR	48.6	73.1	91.9	78.8	85.9	73.3	55.7	85.7	282.0	42.7	357.0	39.8
JHAJJAR	36.9	107.0	112.2	75.3	122.9	69.4	78.7	83.6	349.3	48.8	427.0	46.6
JIND	56.7	79.6	116.4	64.6	125.7	65.1	83.6	107.3	379.6	45.1	484.2	43.4
KAITHAL	62.2	91.2	134.2	122.6	123.0	77.1	90.4	101.3	414.3	64.1	479.5	49.3
KARNAL	75.3	66.5	142.8	65.2	142.8	57.2	95.3	80.1	456.1	36.5	573.9	31.9
KURUKSHETRA	56.0	74.5	115.1	71.5	131.1	87.4	78.6	98.3	380.6	60.1	474.3	60.9
MAHENDRAGARH	67.4	123.8	125.8	60.1	118.1	76.9	68.5	82.3	379.8	46.3	458.3	39.5
NUH	48.3	133.8	132.7	70.8	178.1	81.4	101.4	77.4	460.5	54.3	536.6	54.3
PALWAL	30.4	94.8	125.5	62.8	160.4	65.9	83.9	79.8	400.9	45.5	474.7	46.3
PANCHKULA	95.3	101.7	264.5	61.4	293.5	52.3	160.0	70.9	820.7	49.1	979.5	51.5
PANIPAT	54.3	76.7	116.3	71.6	137.5	75.3	103.3	87.0	411.0	40.9	495.3	46.4
REWARI	60.4	81.0	152.1	55.6	147.4	72.4	94.3	70.2	454.2	39.5	539.5	37.5
ROHTAK	47.8	88.9	105.7	69.5	131.4	74.8	75.1	90.3	360.0	40.5	446.4	36.8
SIRSA	45.3	108.5	71.1	77.3	59.5	95.4	38.4	99.8	218.5	49.9	282.6	51.1
SONIPAT	54.9	80.2	141.7	64.4	159.7	74.0	108.0	90.3	464.3	42.5	578.8	41.2
YAMUNANAGAR	124.7	81.5	316.6	41.7	297.9	57.3	151.5	66.2	890.6	27.4	1053.5	34.9

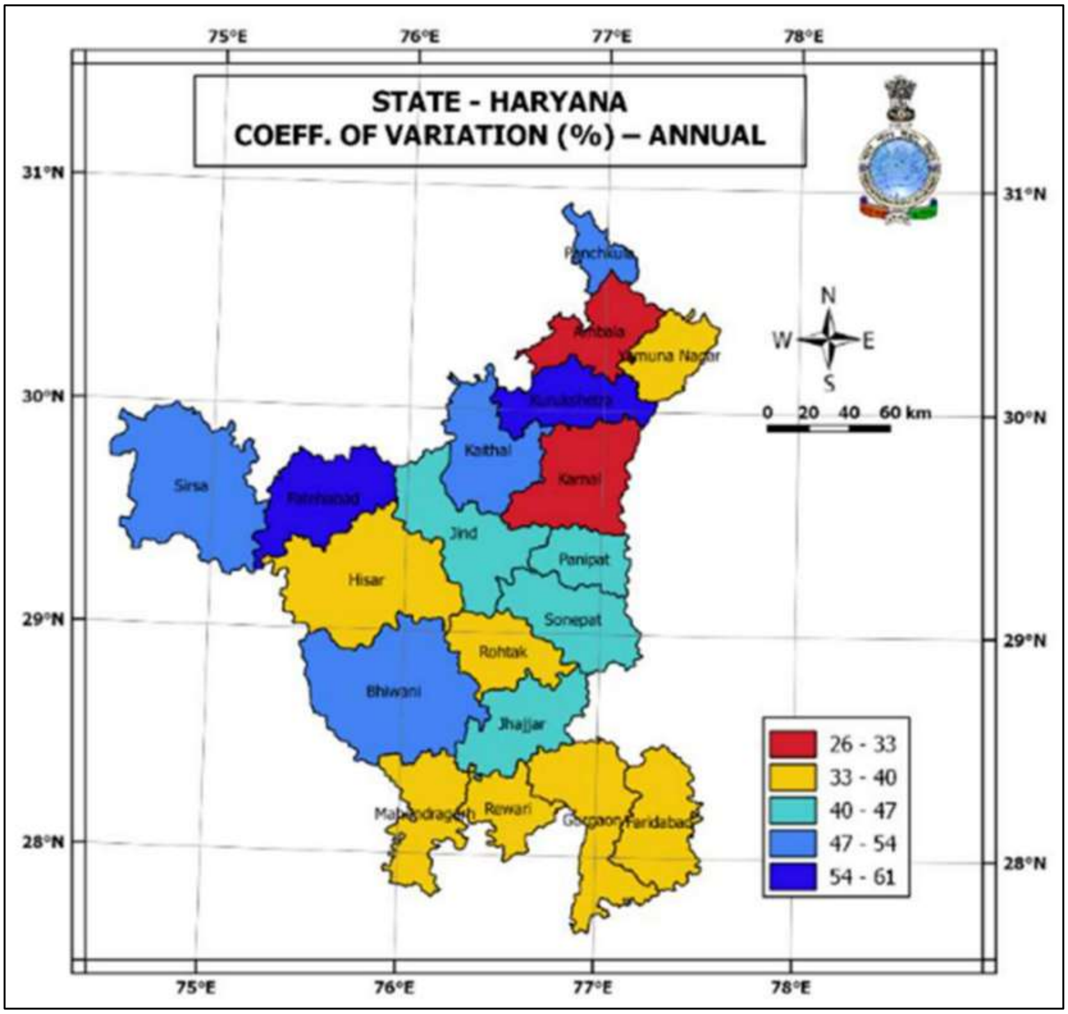
Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

Map 5.1 Mean Rainfall Pattern over Districts of Haryana



Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

Map 5.2 Annual Coefficient of Variation (%) over Districts of Haryana

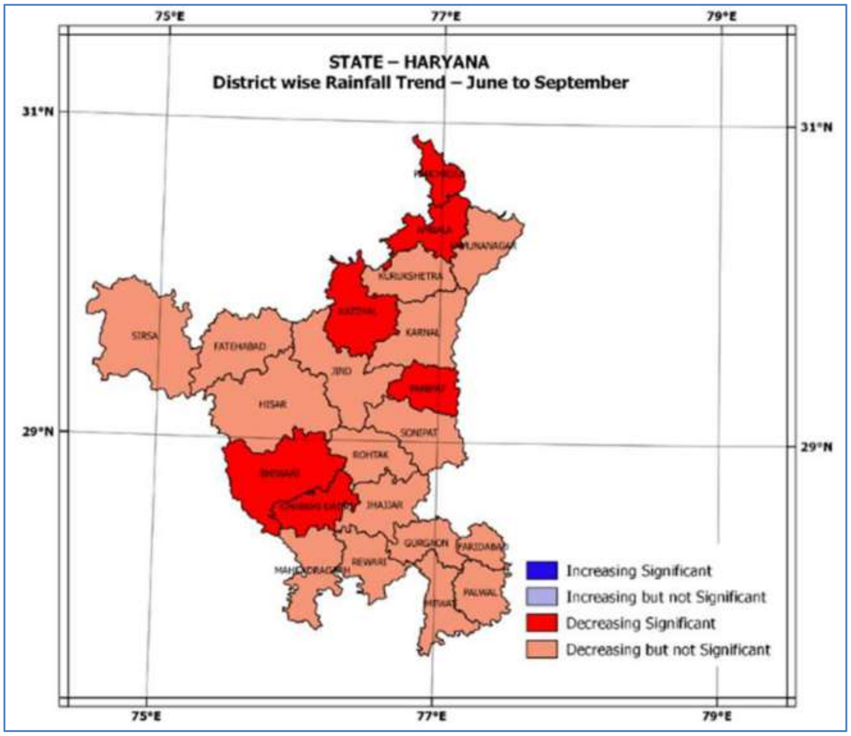


Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

Trend in District Rainfall: Monsoon and Annual

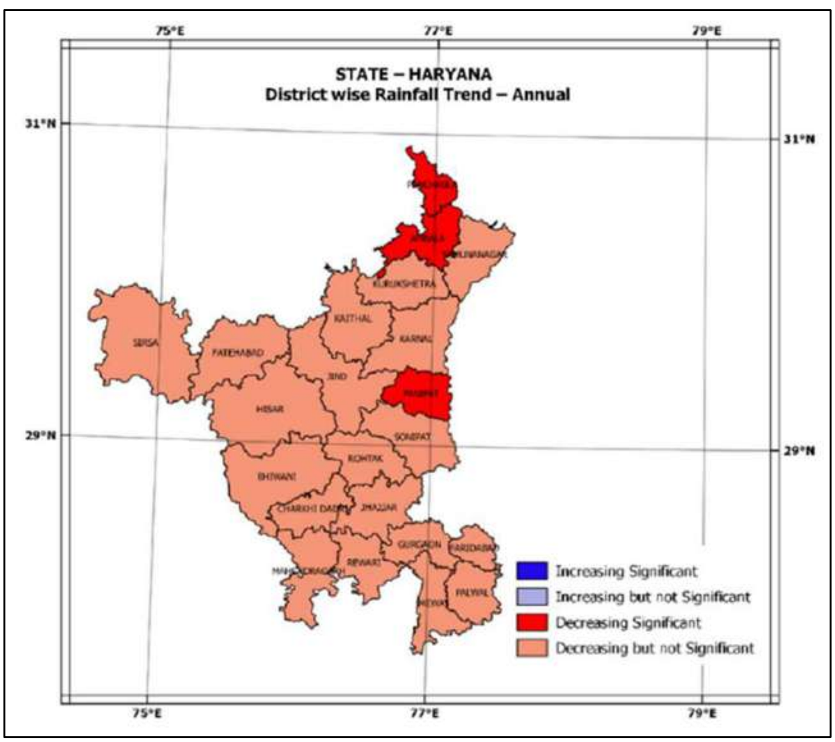
- Map 5.3 shows the trend in the district-wise rainfall for the monsoon season. A significantly decreasing trend in SW monsoon rainfall has been noticed in Ambala, Panchkula, Kaithal, Panipat, Bhiwani and Charkhi Dadri districts. The rest of the districts show a non-significant decreasing trend.
- Map 5.4 shows the trend in the district-wise annual rainfall. In annual rainfall, Ambala, Panchkula, and Panipat districts show a significantly decreasing trend while the rest of the districts shows a non-significantly decreasing trend.

Map 5.3 Trends in District-wise Monsoon Rainfall for the Period 1989-2018



Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

Map 5.4 Trends in District-wise Annual Rainfall for the Period 1989-2018

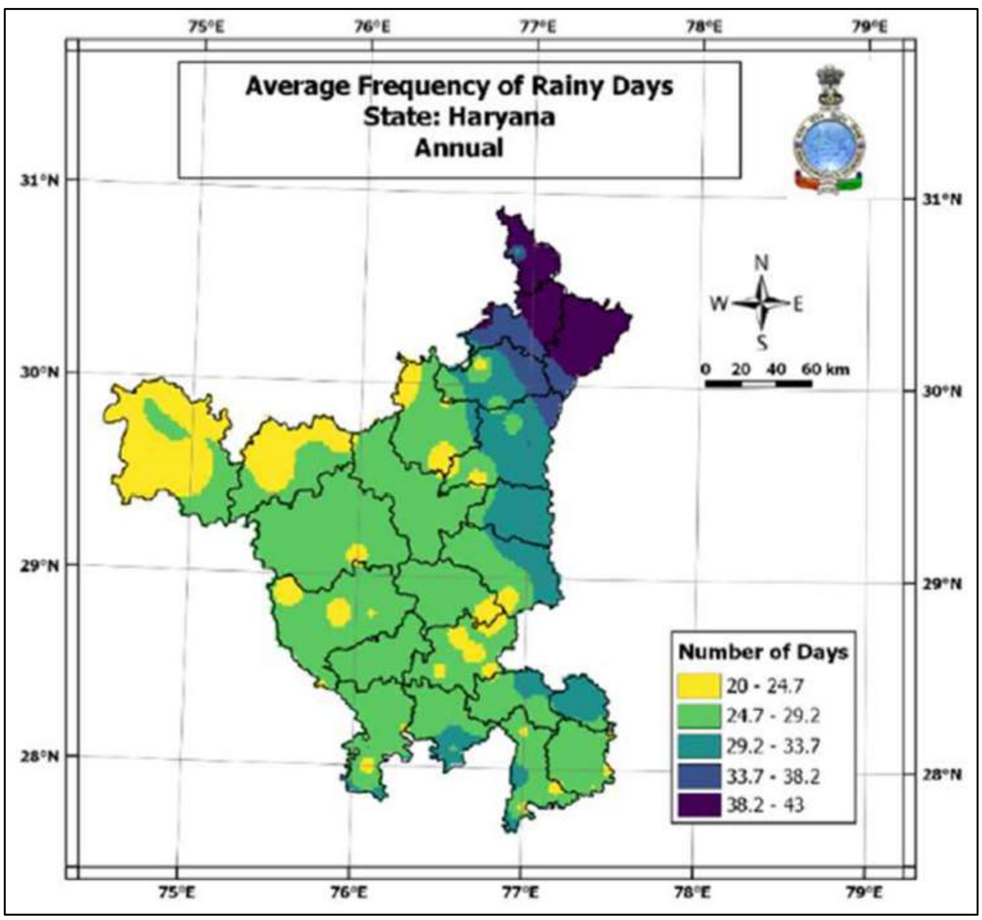


Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

Average Frequency and Trend in Frequency of Rainy Days

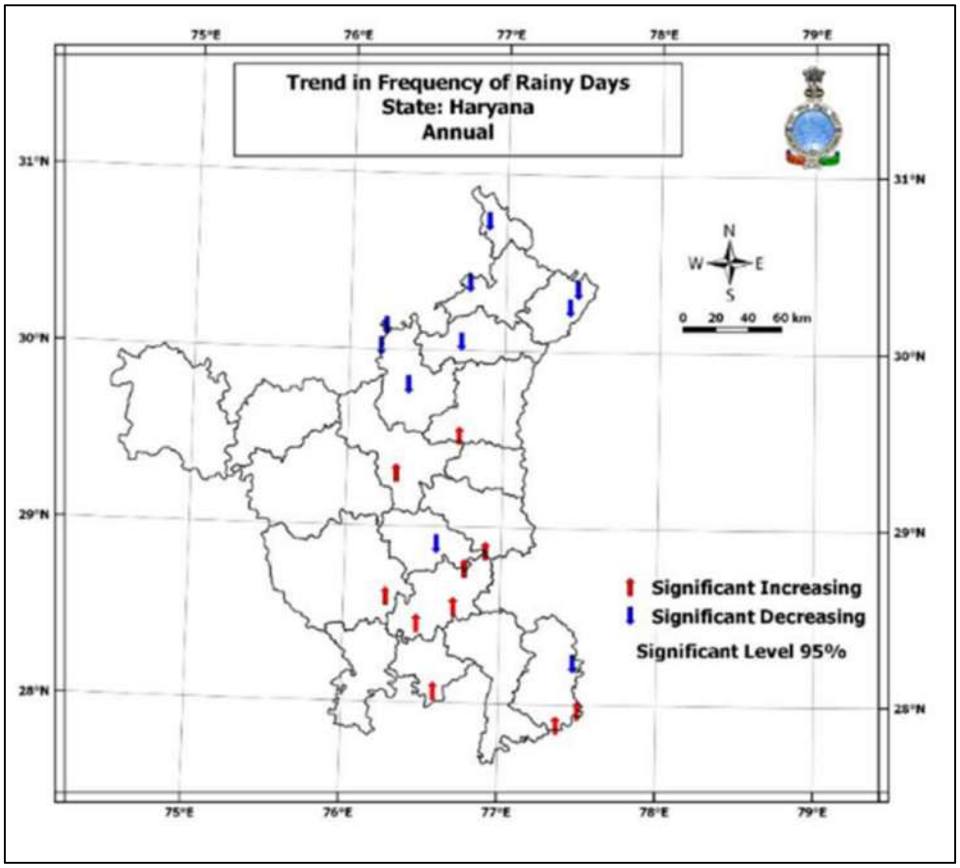
- Panchkula and parts of Ambala and Yamunanagar districts receive on an average 27-32 rainy days (daily rainfall >=2.5mm) out of 122 days of southwest monsoon season while upper parts of Sirsa, Fatehabad districts get 14-18 rainy days and central parts of Haryana get even less than 27 rainy days.
- During the period June to September, there is a significantly increasing trend in the frequency of Rainy days in stations in Jhajjar districts. Whereas there is a significantly decreasing trend on Rainy days in stations Bhiwani, Faridabad, Kaithal, Kurukshetra, Ambala, Panchkula and Yamunanagar districts.
- During the entire year, there is a significant increase in Rainy days in Jhajjar, Rewari, Palwal, Jind, and Karnal districts. Whereas there is a significant decrease in Rainy days in north-eastern districts viz Kaithal, Kurukshetra, Ambala, Yamunanagar, and Panchkula.

Map 5.5 Average Frequency of Rainy Days: Annual



Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

Map 5.6 Trend in Frequency of Rainy Days: Annual

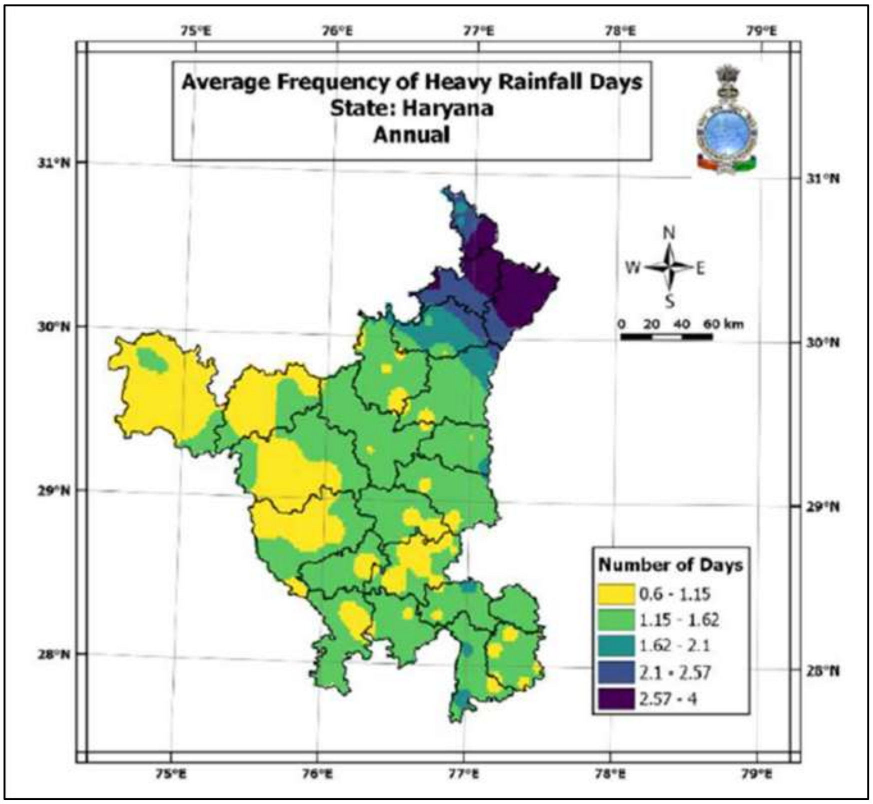


Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

Average Frequency and Trend in Frequency of Heavy Rainfall Days

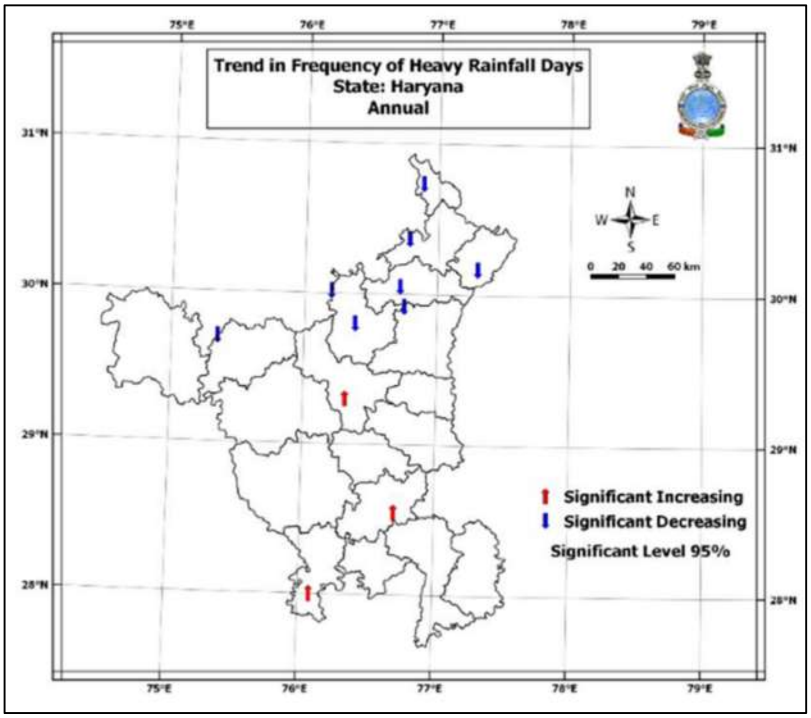
- For heavy to extremely heavy rainfall (daily rainfall >=64.5mm) parts of Panchkula, Ambala and Yamunanagar districts get 2-3 days during the SW monsoon season, western parts (Sirsa, Fatehabad, Hisar, Bhiwani districts) of the state get around 0-1 heavy to extremely heavy rainfall days.
- During the period June to September, there is a significant increase in Heavy rainfall days in Jind, Jhajjar and Mahendragarh districts. Whereas there is a significant decrease in Heavy rainfall days in Sirsa, Fatehabad, Kaithal, Kurukshetra, Ambala, and Panchkula. While the remaining districts did not show any significant change.
- During the entire year, there is a significant increase in Heavy rainfall days in Jind, Jhajjar and Mahendragarh districts. Whereas there is a significant decrease in heavy rainfall days in Fatehabad, Kaithal, Kurukshetra, Ambala, Panchkula, and Yamunanagar districts.

Map 5.7 Average Frequency of Heavy Rainfall Days: Annual



Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

Map 5.8 Trend in Frequency of Heavy Rainfall Days: Annual

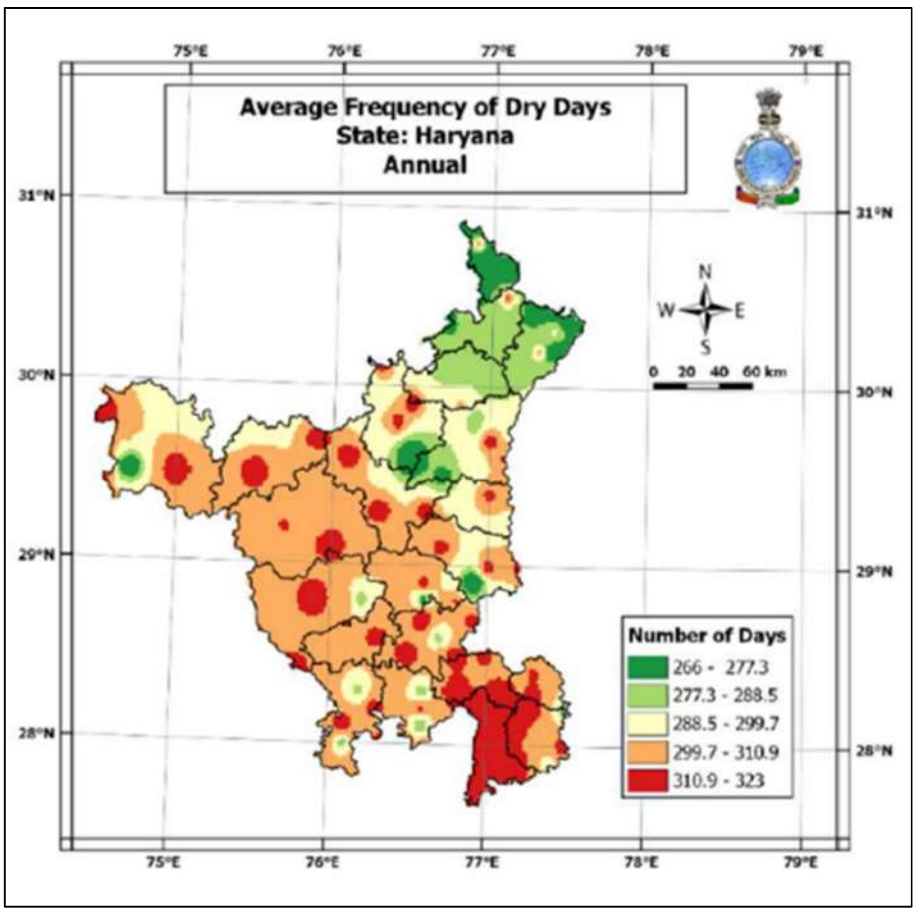


Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

Average Frequency and Trend in Frequency of Dry Days

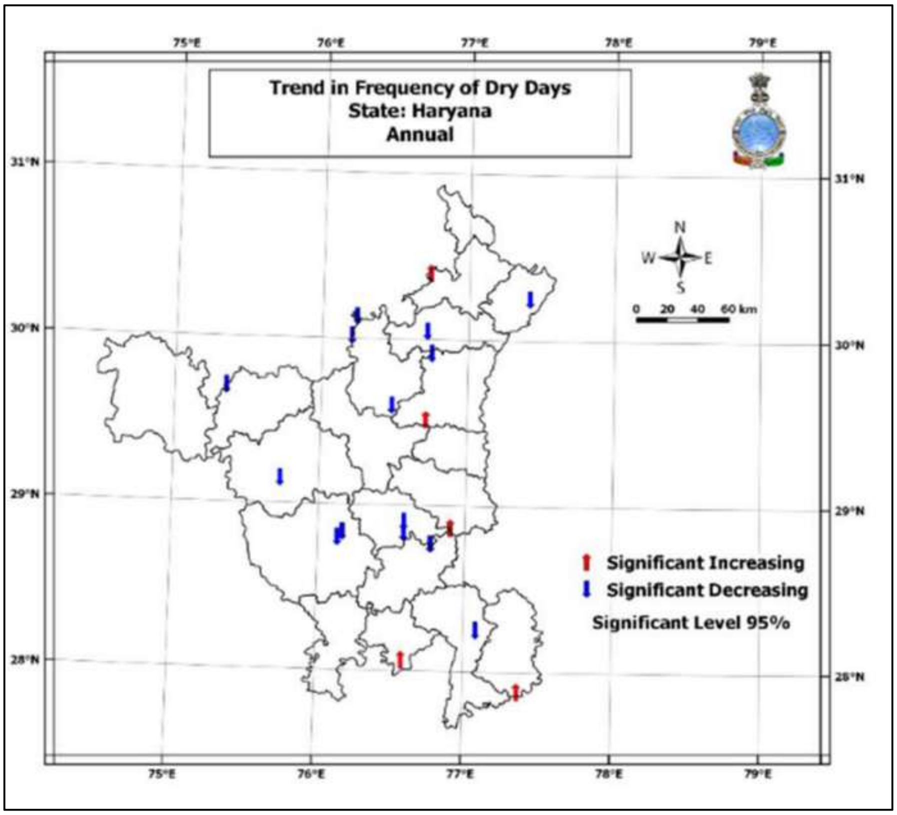
- The number of dry days is maximum over central and Southern parts of the state (87-92) dry days out of 122 days during the SW monsoon season while on average 289-300 dry days in 365 days have been noticed in many parts of the State.
- From June to September, there is a significant increase in dry days in Ambala, Karnal, Sonipat, and Palwal districts. Whereas there is a significant decrease in dry days in Fatehabad, Hisar, Bhiwani, Mahendragarh, Rohtak, Jhajjar, Kaithal, and Kurukshetra districts.
- During the entire year, there is a significant increase in dry days in Ambala, Rewari, Karnal, and Palwal districts. Whereas there is a significant decrease in dry days in Fatehabad, Hisar, Bhiwani, Rohtak, Jhajjar, Kaithal, Kurukshetra, Yamunanagar, and Gurugram districts.

Map 5.9 Average Frequency of Dry Days: Annual



Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

Map 5.10 Trend in Frequency of Dry Days: Annual



Source: Observed Rainfall Variability and Changes over Haryana State, 2020, IMD

5.2.3 Monsoon Rainfall in the Year 2021

- During this year, the monsoon advanced through northern parts of Haryana on 13th June, some more parts on 18th June and covered the entire state of Haryana. During this monsoon season (1st Jun- 30th Sep 2021), the State of Haryana received 598.3 (+33%) mm of rainfall against its average of 484.2 mm which is 33% above normal. However, this is within the Excess range of rainfall (+20% to +59%).

- Out of 22 districts for which rainfall was reported in Haryana during monsoon 2021, 5 Districts received Large Excess, 9 districts received excess, and 06 districts received normal rainfall, whereas rainfall in 2 districts was deficient and none of the districts was large deficient.

- District Jhajjar received 759.7 mm (102%), followed by districts Fatehabad and Kaithal having departures of 89% and 80% respectively. (Table 5.3).

- Month-wise, rainfall in the month of Jun 48.8mm (3%) was normal, Jul 253.1mm (63%) was Large Excess, was a deficit in August 81.9mm (-48%) and Large Excess in the month of September 187.5 (+139%).

Table 5.3 District-wise Monsoon Rainfall in Haryana 2021

District	Actual Monsoon Rainfall (mm)	Normal Monsoon Rainfall (mm)	Departure from Normal Monsoon Rainfall (%)
AMBALA	596.5	850.4	-30
BHIWANI	340.0	304.0	12
CHARKHI DADRI	521.0	425.6	22
FARIDABAD	569.7	578.6	-2
FATEHABAD	522.7	277.3	89
GURUGRAM	738.9	503.3	47
HISAR	555.2	309.6	79
JHAJJAR	759.7	376.4	102
JIND	564.4	401.0	41
KAITHAL	623.6	345.8	80
KARNAL	675.1	546.0	24
KURUKSHETRA	630.9	499.6	26
MAHENDRAGARH	582.3	407.8	43
NUH	574.2	504.3	14
PALWAL	477.9	426.6	12
PANCHKULA	519.7	925.0	-44
PANIPAT	718.4	480.1	50
REWARI	628.5	432.1	45
ROHTAK	559.1	502.0	11
SIRSA	269.1	211.3	27
SONIPAT	962.5	524.2	84
YAMUNANAGAR	773.7	822.9	-6
HARYANA	598.3	484.3	33

Source: IMD

Monthly Rainfall Distribution in Haryana during Monsoon 2021

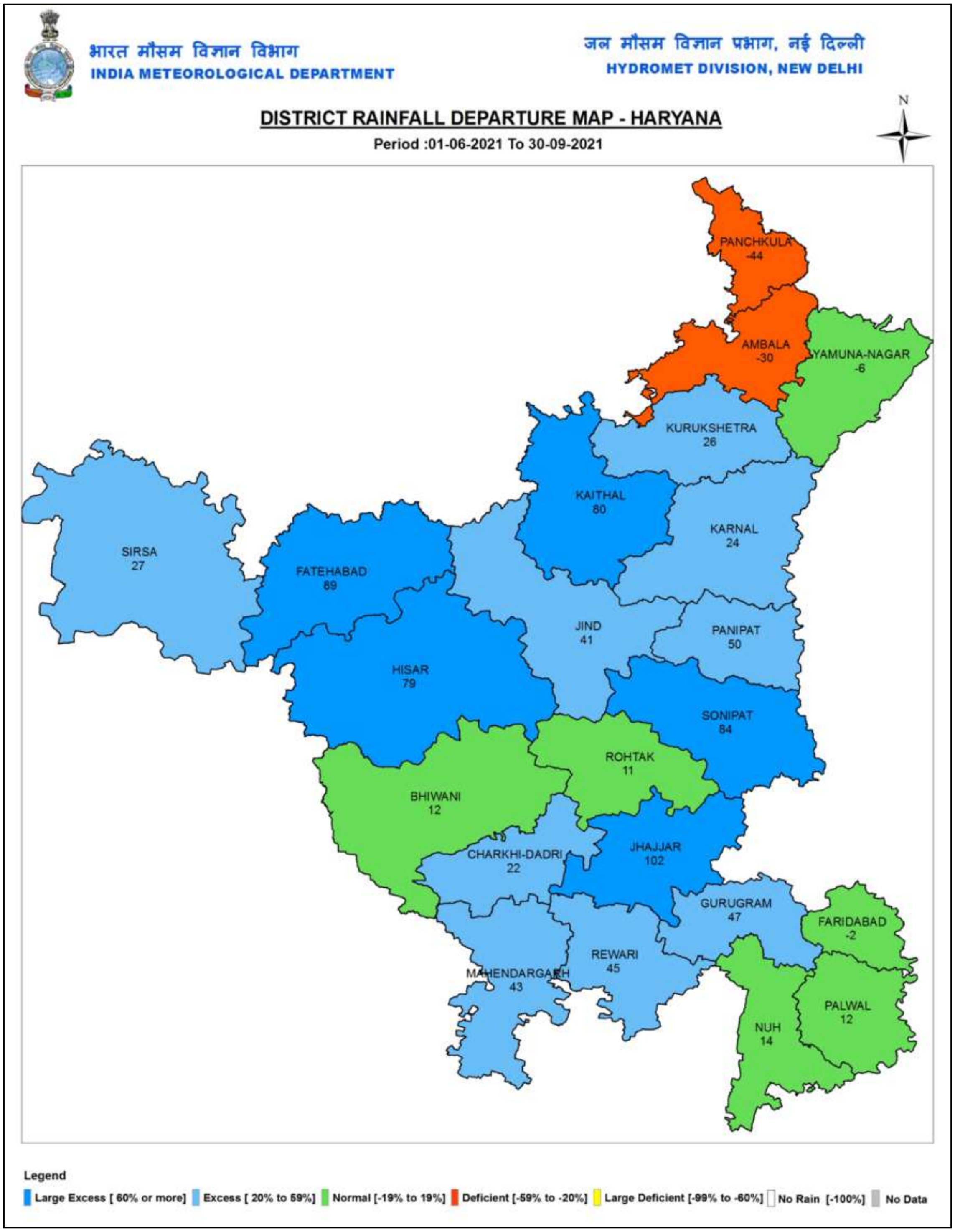
- In June 2021 Haryana State received 48.8 mm (3%) of rainfall against a 47.5 mm long-period average.
- In July 2021 State received 253.1(63%) mm of rainfall against its normal rainfall of 155.3 mm which was Large Excess than Normal.
- In August Haryana received 81.9 mm of rainfall against its Normal of 157.2 mm which was 48% less than Normal.
- While in September state received 187.5 mm (+139%) of rainfall against its Normal of 78.6 mm which was Large Excess.

Table 5.4 Monthly Monsoon Rainfall Distribution of Haryana 2021

Month	Actual Rainfall (mm)	Normal Rainfall (mm)	Departure from Normal Rainfall (%)
June	48.8	47.5	3
July	253.1	155.3	63
August	81.9	157.2	-48
September	187.5	78.6	139
Season (Jun-Sep)	571.3	438.6	30

Source: IMD

Map 5.11 District-wise Monsoon Rainfall Departure of Haryana 2021



Source: IMD

5.2.4 Monsoon Rainfall in the Year 2020

- The monsoon advanced some parts of Haryana on 24th June and covered the entire state on 26th June 2020. The earliest onset so far in Haryana is 13th June 2008 and the latest is 27th July 1987.
- Haryana, State received 376.1 mm of rainfall (June-September) against its average of 438.6 during monsoon 2020 with an overall negative departure of 14% which is in a normal range.
- Out of 22 districts for which rainfall was reported in Haryana during monsoon 2020, 08 districts received normal rainfall, 3 districts received Excess whereas rainfall in 10 districts was Deficient and 1 was Large Deficient. District Panchkula observed the highest deficit of 65 % followed by districts Rohtak and Bhiwani having a deficit of 57% and 43% respectively. District Sirsa observed the highest positive departure in rainfall (+43%) followed by district Kaithal (+35%) and Karnal (+29%). The percentage departure of district-wise rainfall from normal is shown in Map 5.12.
- Monsoon withdrew from Haryana on 30th September 2020.

Monthly Rainfall Distribution during Monsoon 2020

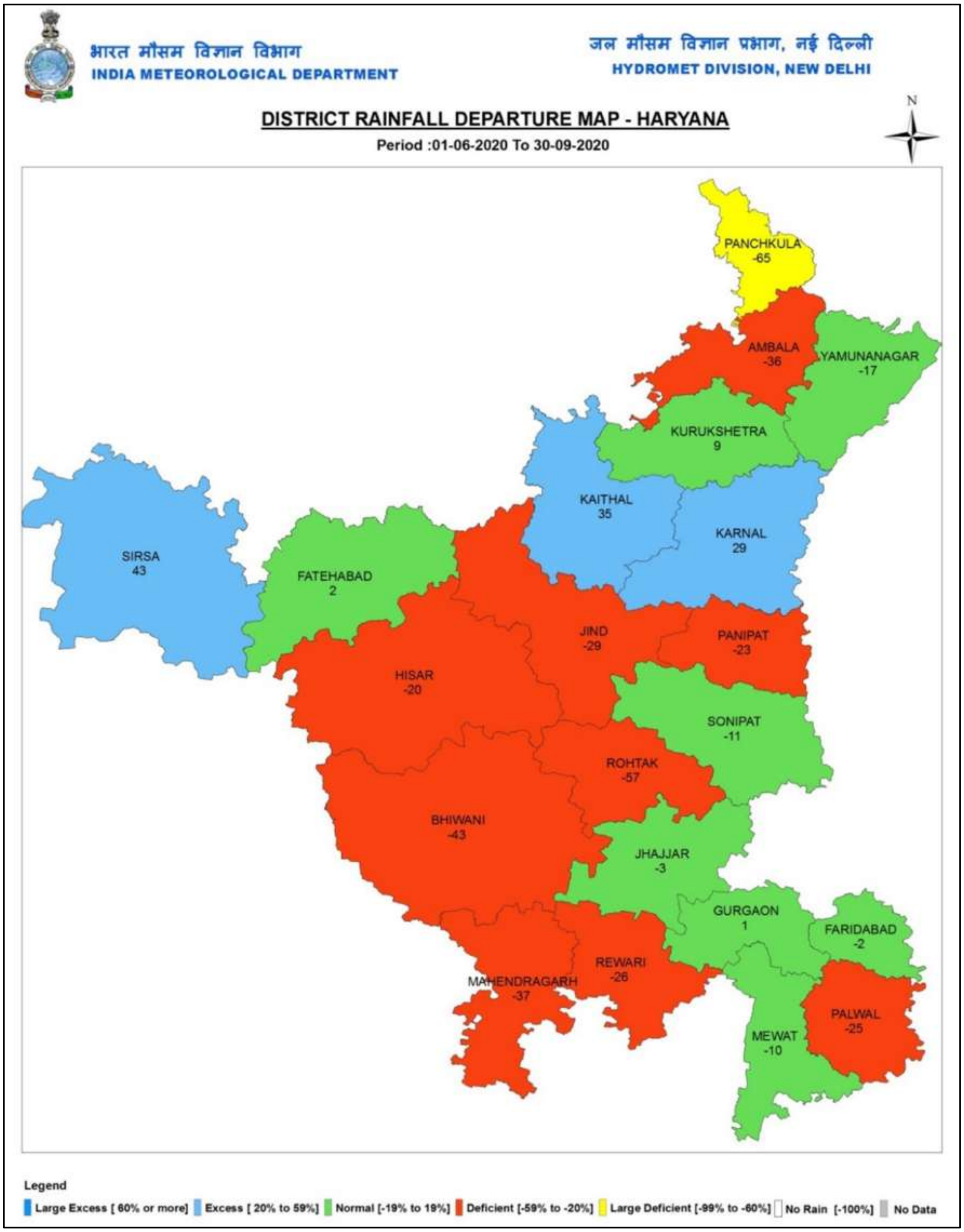
Monthly Rainfall Distribution Monthly rainfall distribution for the month of June, July, August and September and the first & second half of Monsoon 2020 for Haryana is shown in Table 5.5.

Table 5.5 Monthly Monsoon Rainfall Distribution of Haryana 2020

Months	Actual Rainfall (mm)	Normal Rainfall (mm)	Departure from Normal Rainfall (%)
June	47.7	47.5	0.42
July	166.1	155.3	6.9
August	137.5	157.2	-12.53
September	24.8	78.6	-68.45
Jun-July (1st half)	213.8	202.8	5.42
Aug –Sep (2nd half)	162.3	235.8	-31.17

Source: IMD

Map 5.12 District-wise Monsoon Rainfall Departure of Haryana i2020



Source: IMD

5.3 Rainfall Runoff

Runoff means the draining or flowing of precipitation from a catchment area through a surface channel. The rivers and rivulets of the Indian sub-continent are mainly monsoons fed with 80 to 90 percent runoff generated during the monsoon. The principal source for groundwater recharge is also monsoon precipitation.

For given precipitation, the evapotranspiration, initial loss, infiltration and detention storage requirements will have to be first satisfied before the commencement of runoff. When these are satisfied, the excess precipitation moves over land surfaces to reach smaller channels.

5.3.1 Rainfall Runoff Estimation

It is important to fully utilize the available direct monsoon runoff which is that part of the runoff which enters the stream/drain immediately after the rainfall. The surplus runoff in rural areas could be captured by the adoption of artificial recharge techniques based on surface spreading like percolation tanks, *nala* bunds, etc., and sub-surface techniques of recharge shafts, well recharge, etc. In urban areas and hilly areas, priority has to be given to rainwater conservation measures through rooftop harvesting techniques etc. Harnessing excess monsoon runoff in groundwater storage/reservoirs will not only increase the availability of water to meet the growing water demands but also help in controlling damages from floods. The designed capacity should not normally be more than 50 percent of the total quantum of rainfall in the catchment.

Total Rainfall in the State is about 20 BCM out of which 3.82 BCM goes to recharge of non-water-logged areas and 9.64 BCM is estimated to be used by crops. It is to be noted that some recharge also happens in the water-logged areas which are not really beneficial for the State. Hence, it has not been considered in the total recharge value. The quantity of rainfall-runoff generated in Haryana State for the period 01.06.2020 to 31.05.2021 has been estimated by the districts to be 2.20 BCM by using Binnie's empirical table (Table 5.6). However, a detailed hydrological study for runoff assessment is needed to compute a more accurate value.

Out of the estimated 2.20 BCM runoff; 1.53 BCM goes to Yamuna as per the measurement of inflow to the River as detailed in Annexure 2 of Chapter 2. There is runoff drainage into the Ghaggar River as well but that has not exactly been estimated. Also, some of the water from the drains is consumed before it reaches the rivers but it may not be accounted for. The remaining 4.34 BCM rainfall is lost by evaporation from non-cropped areas as well as agriculture fields during no-crop periods etc.

Table 5.6 Estimated District-wise Rainfall Runoff

District	Estimated Runoff (MCM)	Potential for Artificial Recharge (20% of Runoff) (MCM)
AMBALA	94.98	19.00
BHIWANI	8.31	1.66
CHARKI DADRI	19.78	3.96
FARIDABAD	79.43	15.89
FATEHABAD	59.21	11.84
GURUGRAM	66.30	13.26
HISAR	257.80	51.56
JHAJJAR	125.68	25.14
JIND	119.60	23.92
KAITHAL	119.49	23.90
KARNAL	135.24	27.05
KURUKSHETRA	110.21	22.04
MAHENDRAGARH	72.79	14.56
NUH	84.78	16.96
PALWAL	84.64	16.93
PANCHKULA	85.77	17.15
PANIPAT	55.1	11.02
REWARI	4.51	0.90
ROHTAK	108.24	21.65
SIRSA	84.21	16.84
SONIPAT	155.49	31.10
YAMUNANAGAR	246.92	49.38
HARYANA (MCM)	**2178.48**	**435.70**
HARYANA (Cr Litres)	**217848**	**43570**

Source: District Water Resources Plans

5.3.2 Scope of Artificial Recharge

Out of the total runoff available, only 20% is considered for a recommendation of artificial recharge structures by CGWB. The source of water for recharge in the State of Haryana can be runoff generated in large Farms and rainwater from a rooftop. The runoff generated from farmland could be used for farm ponds and by making provision for rooftop rainwater harvesting.

The scope of artificial recharge depends on the available subsurface space for recharge, water required for recharge and non-committed surplus water available for recharge (Table 5.7). The source water available is less than the requirement and artificial recharge structures are restricted to the source water availability.

Table 5.7 Scope of Artificial Recharge in Haryana

Scope for Artificial Recharge in Haryana		
Area identified for Artificial Recharge	39381.20 Sq. Km	
Available Sub Surface storage for Artificial Recharge	77964.29 MCM	7796429 Cr Litres
Water Required for Recharge	103692.51 MCM	10369251 Cr Litres
Surplus Available for Recharge	679.26 MCM	67926 Cr Litres

Source: Master Plan of Artificial Recharge to Groundwater 2020, CGWB

According to the Master Plan of Artificial Recharge to Groundwater 2020 published by the CGWB; the recommended structures for Haryana are Rooftop Rainwater Harvesting, Farm Ponds, Check Dam and injection wells, and horizontal trench with or without recharge shafts. It is proposed to harness the runoff available from the agricultural lands and farms located in rural areas through Farm ponds. The Total surface runoff from farms to be recharged through 3,93,811 number of farm ponds/percolation ponds is 3,294 MCM considering 10% of the total area of the district is suitable for constructing farm ponds. The rooftop rainfall runoff available for recharging purposes is estimated as 24.52 MCM in 30 lakh houses with 200 Sq.mt roof areas, government buildings, institutes etc. in urban and municipal areas.

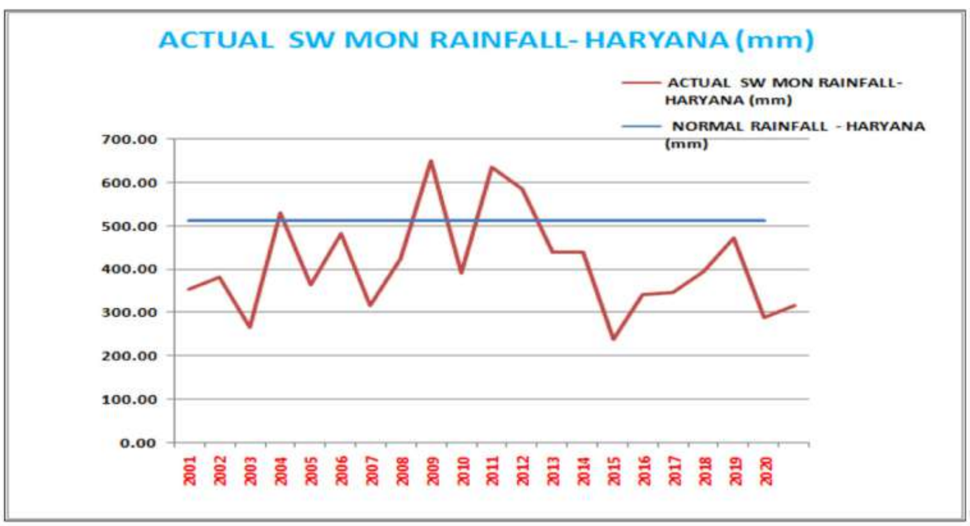
5.4 Decadal Fluctuation in South West Monsoon and Annual Rainfall from 2000 to 2020 and its Departure from Normal

Changes in rainfall behaviour over the last decade are determined using decadal data. The Ground Water Year Book 2021 of CGWB computed and compared the rainfall of the past two decades with the normal rainfall of the given monitoring to determine the decadal fluctuation of Haryana State.

The annual and monsoon rainfall and their departures from normal rainfall from the years 2000 to 2020 for the State of Haryana show that there is deficient rainfall observed in Annual rainfall during the years 2000, 2002, 2006, 2009, 2012, 2014, 2016, 2017, 2019 and 2020 and there is excess rainfall observed in 2008 only and remaining years normal rainfall observed in the State.

While observing South West Monsoon rainfall deficient rainfall was observed in 2000, 2001, 2002, 2004, 2006, 2009, 2014, 2015, 2016, 2017 and 2019 over the State of Haryana. Only in 2008 and 2010 was excess rainfall observed during South West Monsoon rainfall. Deviation in actual southwest monsoon rainfall (2000-2020) from normal rainfall is shown in Figure 5.3.

Figure 5.3 Actual Southwest Monsoon Rainfall of Haryana from 2000-2020



Source: Ground Water Year Book of Haryana State 2020-2021, CGWB

Chapter 6

WATER DEMAND ACROSS VARIOUS SECTORS IN HARYANA

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXURES

6.1 WATER DEMAND

The present water demand in the year 2021 for different uses and projections for the year 2025 has been arrived at with the objective to plan water saving for the future years in view of limited water availability in the State. Net present and future water demand and the gap of each entity have been assessed. The assessment and projection are based on basis of the District Water Resources Plans (DWRPs) prepared by the District Water Resources Planning Committee of each district while compiling block wise data. Water demand of various sectors i.e. Domestic, Agriculture, Horticulture, Livestock, Industry & Infrastructure, Power, Fisheries, Forest & Wildlife and Establishments & Institutions have been assessed.

6.1.1 Domestic Water Demand

The total population of Haryana State is 2,53,51,462 as per the Census of the year 2011. The current population and projected population have been calculated by each district as per the growth rate of the Census 2001 and Census 2011. Water demand has been calculated as per the following norms of the Central Public Health Environmental Engineering Organization (CPHEEO) for water supply in rural/ urban which are being adopted by the Public Health Engineering Department, Haryana:

1. In the non-desert rural area, the drinking water supply is at the rate of 55 litres per capita per day (lpcd).
2. In the desert districts, namely Hisar, Fatehabad, Sirsa, Bhiwani, Charkhi Dadri, Jhajjar, Mahendragarh and Rewari, water supply in a rural area is 70 lpcd.
3. In towns provided with piped water supply, drinking water supply is at a rate of 70 lpcd.
4. In urban areas, the drinking water supply is 135 lpcd.
5. In Metropolitan and Megacities, the drinking water supply is at the rate of 150 lpcd.

These norms exclude Unaccounted for Water (UFW) which is limited to 15% and include the requirement of water for commercial, institutional and minor industries. District domestic water supply demand has been worked out by districts on the basis of the aforementioned norms given in Table 6.1.

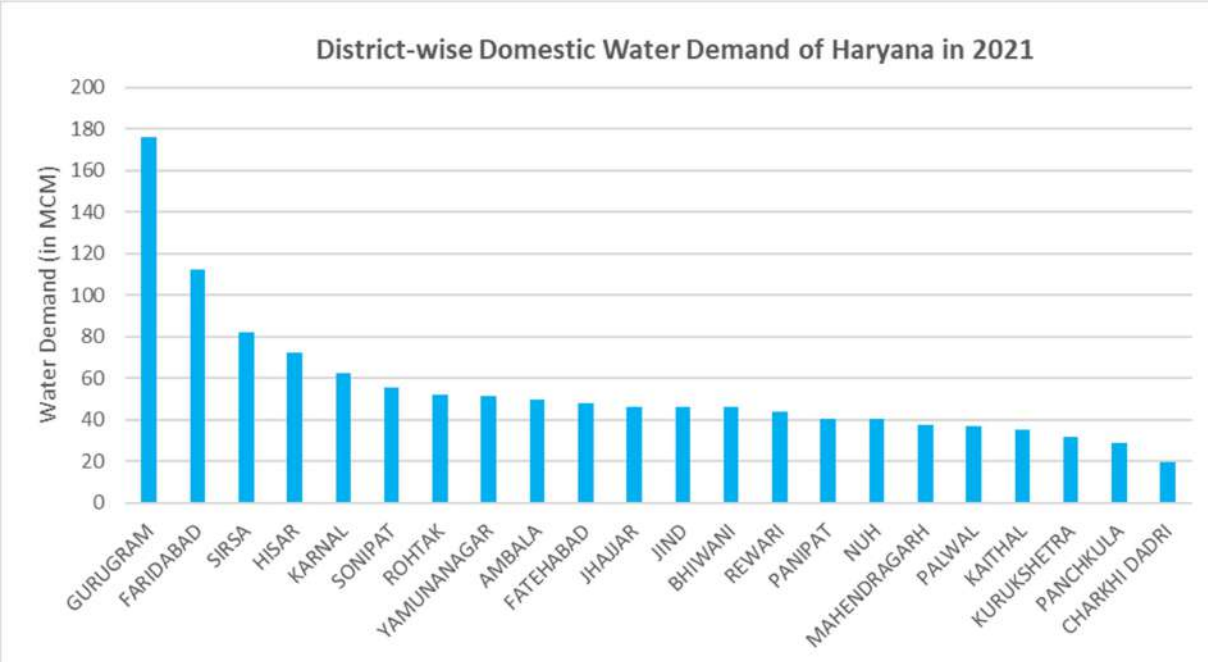
Table 6.1 District-wise Domestic Water Demand of Haryana in 2021 and 2025

Sr. No.	District	Population in 2021 (No.)	Domestic Water Demand in 2021 (MCM)	Population in 2025 (No.)	Domestic Water Demand in 2025 (MCM)
1	AMBALA	1239039	49.63	1347181	49.63
2	BHIWANI	1298476	45.96	1371650	48.55
3	CHARKHI DADRI	605540	19.61	658499	21.41
4	FARIDABAD	2195940	112.28	2416323	123.76
5	FATEHABAD	1383267	48.05	1529260	54.30
6	GURUGRAM	3031871	176.03	3783578	222.60
7	HISAR	1956356	72.12	1986386	75.28
8	JHAJJAR	1148360	46.13	1249701	46.13
9	JIND	1495984	46.10	1572197	48.44
10	KAITHAL	1159960	34.91	1587350	45.63
11	KARNAL	1881651	62.11	2112641	68.55
12	KURUKSHETRA	964595	31.64	1207567	40.44
13	MAHENDRAGARH	1127849	37.55	1224280	40.84
14	NUH	1448077	40.19	1648512	44.29
15	PALWAL	1180346	37.05	1243911	39.05
16	PANCHKULA	683073	28.51	738890	30.85
17	PANIPAT	1205436	40.40	1266462	42.45
18	REWARI	1241614	43.73	1355410	47.99
19	ROHTAK	1289707	51.92	1380655	56.2
20	SIRSA	1644890	81.96	1829863	91.18
21	SONIPAT	1642851	55.62	1734695	58.94
22	YAMUNANAGAR	1417181	51.40	1684643	59.74
	HARYANA	**31242063**	**1212.90**	**34929654**	**1356.25**

Source: District Water Resources Plan

This demand has been arrived at by adding the block-wise domestic water demand as calculated in DWRP prepared by each district. The quantity of water required for domestic consumption of the State comes out to be 1,212.90 MCM for the present population of 31,242,063 which is 3.47% of the total demand. The present requirement of domestic water is the highest for the district of Gurugram i.e. 176.03 MCM followed by Faridabad i.e. 112.28 MCM. Gurugram is a metropolitan City near to National Capital Delhi and it has developed rapidly, having many non-polluting industries and a hub of information technologies companies, so its domestic demand is high. In view of the fast urbanization of the Gurugram district, the water supply is being provided through Special Channels i.e. Gurgaon Water Supply (GWS) and National Capital Region (NCR) Channels. The domestic water requirement of the other three districts Sirsa, Hisar and Karnal is also high i.e. 81.96 MCM, 72.12 MCM, and 62.11 MCM respectively. Charkhi Dadri has the lowest water demand i.e. 19.61 MCM being a small district with having more rural population. The domestic water requirement of the State will increase from 1,212.90 MCM to 1,356.25 MCM in the year 2025 which is 11.81% more than the present water requirement.

Figure 6.1 District-wise Domestic Water Demand of Haryana in 2021



6.1.2 Agriculture and Horticulture Water Demand

6.1.2.1 Agriculture Water Demand

Crop water requirement is the depth of water needed to meet the water loss through evapotranspiration. Consumptive use of water by a crop is the depth of water consumed by the plant in the process of transpiration and evaporation during crop growth. These two processes are called evapotranspiration. In other words, crop water requirement is defined as the depth of water needed to meet the water loss through evapotranspiration of a disease-free crop growing in large fields under non-restricting soil conditions including soil water and achieving full production under the given growing environment. The total quantity of water required by the crop for its full growth may be expressed simply as a depth to which, the total supplied irrigation water would stand above the surface without evaporation or percolation. This depth is known as a delta of the crop. On the other hand, duty is defined as the area that can be irrigated per unit volume of discharge running for the base period. The base period is the total time between the first watering done for the preparation of land for sowing a crop and the last watering done before its harvesting. We can design an efficient canal irrigation system, knowing the crop area required to be irrigated and its duty to arrive at the discharge required for designing the canal.

Broadly, crop water requirement means the total quantity of water required from the time of sowing to its harvesting. Every crop has different water requirements. The net water requirement of the crop depends upon rainfall during the crop period. Effective rainfall during the crop period has been subtracted from the total crop water requirement to arrive at the net water requirement of the crop. The norms for crop water requirement and month-wise effective rainfall were taken from Chaudhary Charan Singh Haryana Agricultural University (CCSHAU) tabulated below. The crop water requirement of sugarcane and paddy is the highest varying from 1500-2500 mm and 1200-1500 mm respectively, whereas the water requirement of the gram is the lowest varying from 180-220 mm.

Table 6.2 Agriculture Crop Water Requirement Norms by CCSHAU, Hisar

Kharif Crop	Crop Water Requirement (mm)	Rabi Crop	Crop Water Requirement (mm)
Paddy	1200-1500 (1350)	Wheat	400-450 (425)
Pearl millet	240-280 (260)	Gram	180-220 (200)
Sorghum	550-600 (575)	Barley	200-250 (225)
Maize	450-500 (475)	Mustard	240-300 (270)
Cluster bean	350-400 (375)	Berseem	600-750 (675)
Cotton	550-600 (575)	Linseed	240-300 (270)
Groundnut	500-700 (600)	Sugarcane	1500-2500 (2000)
Caster	400-600 (500)	Sunflower	350-500 (425)
Moth bean	100-180 (140)	Oats	350-400 (375)
Soybean	450-700 (575)	Field pea	350-500 (425)

Source: CCSHAU, Hisar, Haryana

Table 6.3 District-wise Average Monthly Effective Rainfall in Haryana (mm)

District	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AMBALA	7.0	30.0	8.0	0.5	8.0	60.4	216.0	197.0	105.8	1.5	0.0	3.0
BHIWANI	0.6	4.0	0.0	0.0	1.9	9.4	65.0	59.7	21.6	0.0	0.0	0.0
FARIDABAD		8.0	0.0	0.0	3.0	15.0	127.0	157.5	69.9	0.7	0.0	0.0
FATEHABAD	0.7	7.8	0.0	0.0	1.5	9.7	53.3	49.8	21.3	0.0	0.0	0.0
GURUGRAM	1.0	5.0	0.0	0.0	2.8	15.8	118.0	129.6	45.8	0.0	0.0	0.0
HISAR	0.0	2.5	0.0	0.0	1.9	12.9	64.0	57.0	24.6	0.0	0.0	0.0
JHAJJAR	0.0	2.2	0.0	0.0	1.3	8.2	82.0	86.3	31.6	0.0	0.0	0.0
JIND	0.0	11.0	0.7	0.0	1.9	15.0	87.0	83.0	42.9	0.0	0.0	0.0
KAITHAL	1.3	8.0	0.5	0.0	0.5	15.8	72.8	72.4	25.5	0.0	0.0	0.0
KARNAL	1.2	19.0	1.8	0.0	1.8	27.3	130.0	131.9	50.0	0.2	0.0	0.5
KURUKSHETRA	3.5	16.0	2.0	0.5	1.3	32.1	122.8	108.9	36.7	1.2	0.0	0.0
MAHENDRAGARH	2.2	2.7	0.0	0.0	3.0	20.0	96.3	90.8	26.3	0.0	0.0	0.0
NUH	0.2	1.9	0.0	0.0	1.5	17.0	102.2	136.2	55.0	0.5	0.0	0.0
PALWAL	0.0	1.8	0.0	0.0	0.5	8.7	87.7	109.6	43.5	0.0	0.0	0.0
PANCHKULA	0.0	37.0	8.2	0.7	8.0	65.5	227.6	238.0	105.9	1.5	0.0	2.0
PANIPAT	12.2	10.0	0.6	0.0	0.6	25.0	105.6	113.7	43.0	0.0	0.0	0.0
REWARI	1.8	1.6	0.0	0.0	1.8	12.2	95.0	110.4	35.3	0.0	0.0	0.0
ROHTAK	0.0	9.8	1.5	0.0	5.0	22.0	118.0	125.1	40.7	0.0	0.0	0.0
SIRSA	1.3	2.0	0.0	0.0	1.5	5.0	46.0	29.9	8.4	0.0	0.0	0.0
SONIPAT	0.0	9.8	0.7	0.0	10.4	20.0	122.6	133.4	48.0	0.7	0.0	0.0
YAMUNANAGAR	1.3	30.2	7.8	1.5	8.0	67.0	206.0	198.5	84.2	1.5	0.0	1.9

*Average effective rainfall has been estimated from normal monthly rainfall with the help of FAO Training manual no. 3, Irrigation Water Management: Irrigation Water Needs, https://www.fao.org/3/s2022e/s2022e03.htm

*Effective rainfall of Charkhi Dadri has been taken the same as of Bhiwani as Charkhi Dadri has been mostly carved out of Bhiwani.

Source: CCSHAU, Hisar, Haryana

Table 6.4 Agriculture Crop Water Demand of Haryana in 2021 and 2025

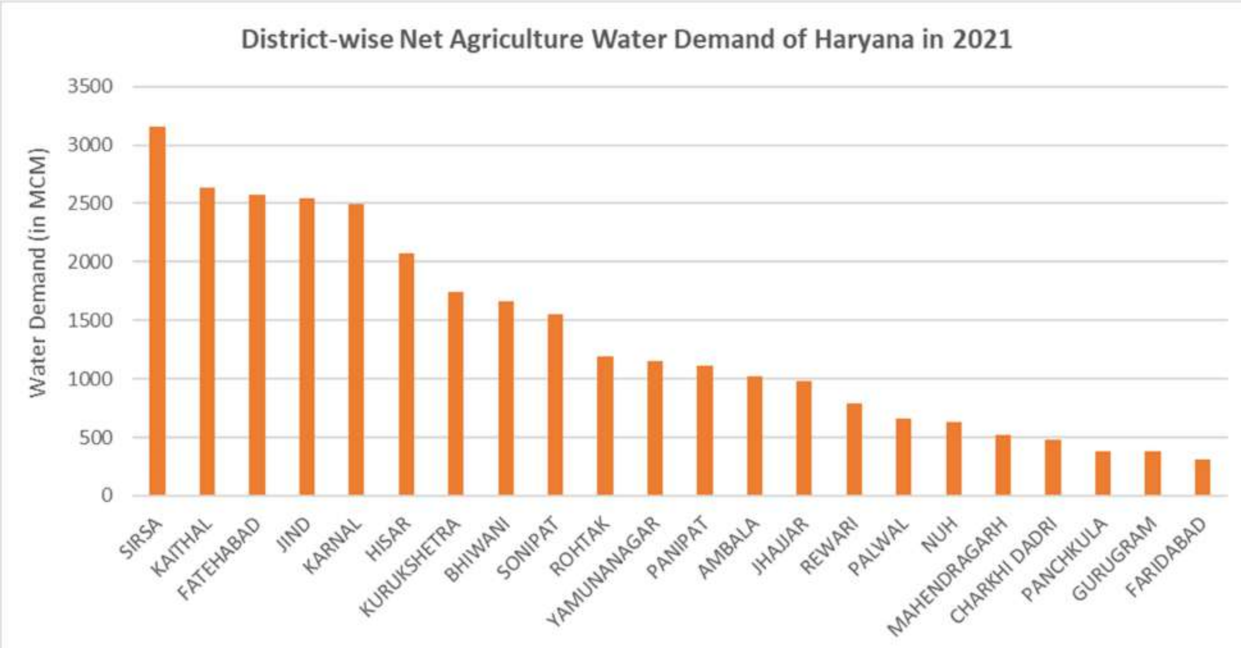
Sr. No.	District	Cultivated Area (Agri) 2021 (Ha)	Net Agriculture Water Demand in 2021 (MCM)	Proposed Cultivated Area in 2025 (Ha)	Net Agriculture Water Demand in 2025 (MCM)
1	AMBALA	205524	1019.8	205524	1019.99
2	BHIWANI	468603	1659.48	480031	1621.97
3	CHARKHI DADRI	190093	476.26	199148	476.26
4	FARIDABAD	62571	305.63	54025	419.3
5	FATEHABAD	432885	2576.56	432885	2557.56
6	GURUGRAM	105126	378.49	87007	314.49
7	HISAR	600796	2069.29	600862	2057.75
8	JHAJJAR	203954	979.28	177272	887.41
9	JIND	454912	2545.73	456665	2570.53
10	KAITHAL	383591	2639.05	383591	2975.39
11	KARNAL	398300	2492.21	398300	2492.21
12	KURUKSHETRA	259325	1744.43	259325	1744.46
13	MAHENDRAGARH	232556	524.12	285934	565.32
14	NUH	175578	629.59	207965	677.37
15	PALWAL	157603	663.8	136130	549.32
16	PANCHKULA	40473	381.46	40745	378.69
17	PANIPAT	171282	1116.58	171282	1118.06
18	REWARI	262071	790.03	262071	725.3
19	ROHTAK	217751	1190.05	217751	1303.54
20	SIRSA	680550	3160.53	686322	3172.45
21	SONIPAT	260096	1556.67	260701	1556.02
22	YAMUNANAGAR	207692	1156.1	210960	1162.15
	HARYANA	**6171332**	**30055.14**	**6214496**	**30345.54**

Source: District Water Resources Plans

The block-wise present and future agriculture water demand as calculated in the DWRPs by each district has been added to determine the district's net agricultural water demand considering the demand of unsown area based on the same pattern. This net agricultural water demand has been calculated excluding the effective rainfall consumed by agriculture from rainfall. The total effective rainfall has been worked out to be about 9,057 MCM detailed in Annexure 6.1. In other words, 9,057 MCM of rainfall has contributed to the growth of agricultural crops in a year. The volume of water amounting to 30,055.14 MCM is required for watering the cultivated area of 61,71,332 hectares (1,52,49,978 acres) of the State, which is 85.96% of the total demand. The present district-wise crop water requirement shows that the total crop water requirement of Sirsa is the highest i.e. 3,160.53 MCM followed by Kaithal with 2639.05 MCM and Fatehabad with 2,576.56 MCM.

The crop water requirement of Faridabad is lowest at 305.63 MCM due to less cultivated area because of urbanisation. Agricultural water demand is projected to increase by 290.40 MCM in the year 2025.

Figure 6.2 District-wise Net Agriculture Water Demand of Haryana in 2021



6.1.2.2 Horticulture Water Demand

Horticultural Water Demand has been calculated by Horticulture Department as per norms provided for the different crops by CCSHAU, Hisar. Refer to Table 6.5.

Table 6.5 Crop Water Requirement Norms for Horticulture Crops by CCSHAU, Hisar

Sr. No.	Name of Crops	Crop Water Requirement (mm)
1.	Aonla	845.8
2.	Arbi	600.0
3.	Bael	725.8
4.	Ber	725.8
5.	Bhindi	490.0
6.	Bitter guard	500.0
7.	Bottle Guard	540.0
8.	Brinjal	300.0
9.	Cabbage	325.0
10.	Capsicum	600.0
11.	Capsicum (Protected)	750.0
12.	Carrot	325.0
13.	Cauliflower	325.0

Sr. No.	Name of Crops	Crop Water Requirement (mm)
14.	Chiku	1205.8
15.	Chilli	350.0
16.	Chrysanthamum (Cut Flower)	1875.0
17.	Chrysanthamum (Open)	1500.0
18.	Citrus	1325.8
19.	Coriander	360.0
20.	Cucumber	500.0
21.	Cucumber Prtocted	406.3
22.	Date palm	540.0
23.	Fennel	420.0
24.	Fenugreek	360.0
25.	Garlic	370.0
26.	Gerbera (Protected cultivation)	900.0
27.	Ginger	1200.0
28.	Gladiolus	600.0
29.	Grapes	785.8
30.	Guava	965.8
31.	Leafy Veg	540.0
32.	Lilium (Protected cultivation)	1125.0
33.	Litchi	905.8
34.	Mango	845.8
35.	Marigold	600.0
36.	Muskmelon	350.0
37.	Onion	550.0
38.	Other (Cut Flower)	750.0
39.	Other (Open)	750.0
40.	Other Fruits	540.0
41.	Other Vegetable	500.0
42.	Peach	1505.8
43.	Pear	845.8
44.	Peas	200.0
45.	Plum	845.8
46.	Pomegranate	540.0
47.	Potato	550.0
48.	Pumpkin	500.0
49.	Radish	464.0
50.	Ridge guard	540.0
51.	Rose (Desi & Hybrid) Open	3240.0
52.	Rose (Desi & Hybrid) CF/Protected	4050.0
53.	Strawberry	1350.0
54.	Tomato	325.0
55.	Tomato Prtocted	406.3
56.	Tube Rose	1500.0
57.	Tuberose (Cut Flower)	1500.0
58.	Turmeric	1200.0

Sr. No.	Name of Crops	Crop Water Requirement (mm)
59.	Watermelon	350.0

Source: Norms provided by Horticulture Department (HQ) as per CCSHAU, Hisar, Haryana

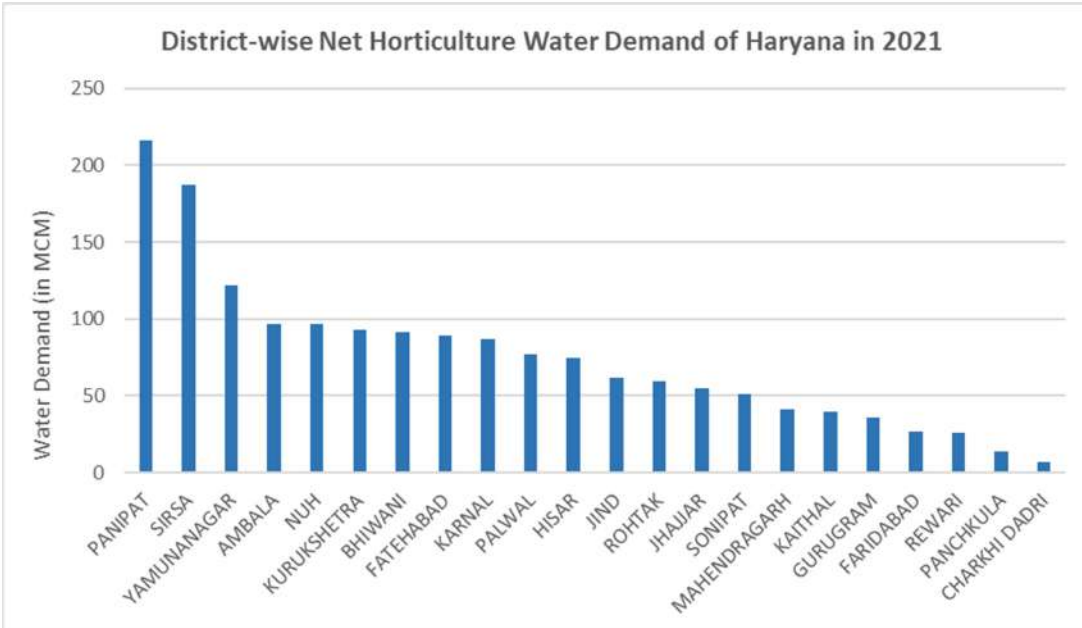
The Department of Horticulture has provided the present i.e. the year 2021 district-wise net horticulture water demand as per norms of CCSHAU, Hisar as 1,648.38 MCM, for an area of 4,16,493 hectares (10,29,196 acres), which is 4.71% of the total water demand. This net horticulture demand has been given excluding the effective rainfall consumed by the horticulture from the rainfall i.e. about 580 MCM (Annexure 6.2). So, there is a contribution of 580 MCM of rainfall for the growth of horticulture crops in a year. The present requirement of district Panipat is the highest at 216.09 MCM followed by districts of Sirsa, Yamunanagar and Nuh at 187.6 MCM, 122.05 MCM and 96.84 MCM respectively. The requirement of Charkhi Dadri is minimum i.e. 7.07 MCM. Future water demand for 2025 for the proposed area of 5,29,881 hectares (13,09,389 acres) is 2,121.31 MCM.

Table 6.6 Horticulture Crop Water Demand of Haryana in 2021 and 2025

Sr. No.	District	Area under Horticulture in 2021 (Ha)	Horticulture Water Demand in 2021 (MCM)	Proposed Area under Horticulture in 2025 (Ha)	Horticulture Water Demand in 2025 (MCM)
1.	AMBALA	29484	97	33494	92.45
2.	BHIWANI	19095	91.43	27956	133.87
3.	CHARKHI DADRI	1665	7.07	4597	19.14
4.	FARIDABAD	7198	26.58	10581	37.4
5.	FATEHABAD	16742	88.76	19274	100.86
6.	GURUGRAM	10116	35.77	14110	49.66
7.	HISAR	15297	74.38	20140	101.21
8.	JHAJJAR	12533	55.2	16470	71.63
9.	JIND	16555	61.61	20072	77.81
10.	KAITHAL	8932	39.56	12168	53.56
11.	KARNAL	25587	87.02	29582	95.2
12.	KURUKSHETRA	21698	92.6	33365	143.84
13.	MAHENDRAGARH	10137	41.54	14226	57.42
14.	NUH	33067	96.84	49016	156.18
15.	PALWAL	20780	76.8	18463	73.3
16.	PANCHKULA	6225	14.09	6797	16.52
17.	PANIPAT	53014	216.09	63332	260.49
18.	REWARI	8703	26.09	13428	35.61
19.	ROHTAK	16116	59.4	22693	87.3
20.	SIRSA	22843	187.6	29202	258.3
21.	SONIPAT	15640	50.9	11356	34.69
22.	YAMUNANAGAR	45066	122.05	59559	164.87
	HARYANA	**416493**	**1648.38**	**529881**	**2121.31**

Source: Department of Horticulture (HQ), Haryana

Figure 6.3 District-wise Horticulture Water Demand of Haryana in 2021



6.1.2.3 Total Net Water Demand of Agriculture and Horticulture

Net Agriculture and Horticulture water demand for the year 2021 has been arrived at 31,703.52 MCM which is about 90.67% of the total demand. These demands have been calculated excluding the effective rainfall contributions of 9,637 MCM. The demand for both these sectors will increase to 32,466.85 MCM in the year 2025. So, maximum efforts are required for the reduction of water demand in these two sectors.

6.1.3 Livestock Water Demand

Haryana is predominantly a rural dominated State. Thus, livestock is the major source of livelihood and a source of income during the lean period. The daily water requirement of livestock varies with different animal species. The animal size and stage of growth have an influence on daily water intake consumption rates and can be affected by environmental and management factors. The quality of water, its temperature, salinity, impurities, its taste and odour affect its intake by livestock. The water content in an animal's diet will influence its drinking habit. The moisture content of the animal diet also influences its drinking habit and health. By adding the block-wise water demand for livestock in the District Water Resources Plans calculated by each district, the total water demand for livestock has been determined. The water demand by districts has been calculated as per the norms of the Animal Husbandry & Dairying Department, Haryana which is given below:

1. Cattle - 110 litres/day
2. Buffalo - 140 litres/day
3. Sheep/Goat - 7 litres/day
4. Pig - 10 litres/day
5. Horse/Mule/Pony - 75 litres/day
6. Layer adult - 300 litres/1000 birds/day
7. Broiler 8-week-old - 400 litres/1000 birds/day

The present water demand of livestock in the State is 307.75 MCM, which is 0.88% of the total demand. The present water demand of district Hisar is highest at 28.89 MCM followed by district Jind at 25.6 MCM. Panchkula has the lowest livestock water demand at 4.42 MCM due to poultry farming in this district.

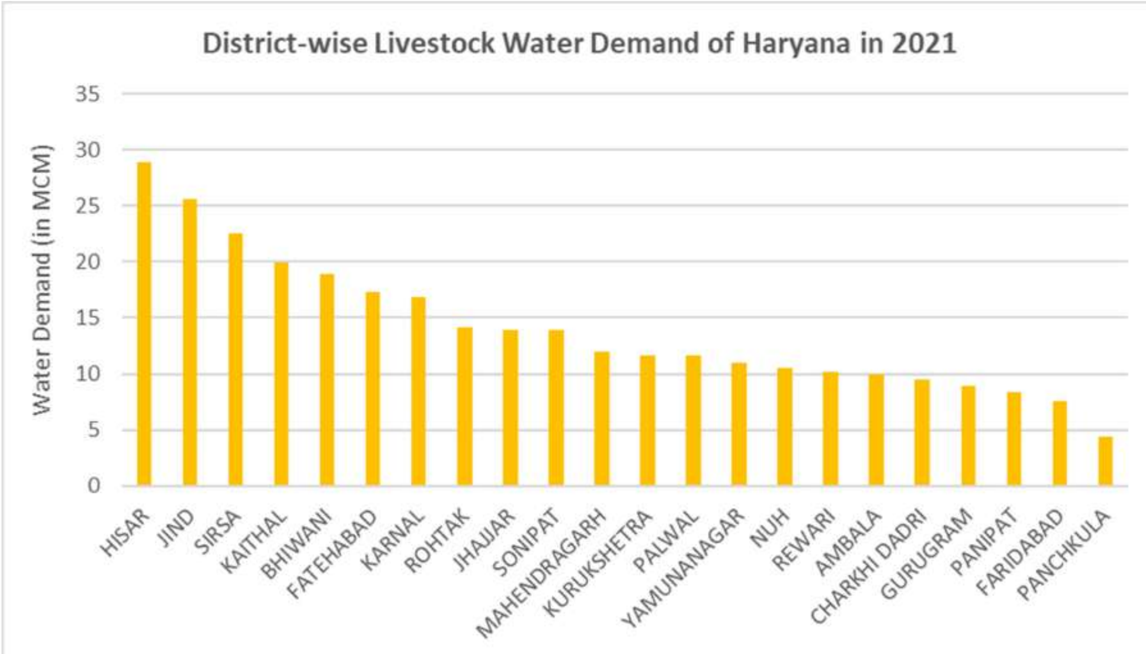
The water demand of livestock in the year 2025 will increase to 319.88 MCM thus the additional potential of 12.13 MCM water supply has to be created.

Table 6.7 District-wise Livestock Water Demand of Haryana in 2021 and 2025

Sr. No.	District	Total no. of Livestock	Livestock Water Demand in 2021 (MCM)	Proposed no. of livestock in 2025	Livestock Water Demand in 2025 (MCM)
1	AMBALA	234910	9.96	234910	9.96
2.	BHIWANI	2336983	18.95	2553697	20.71
3.	CHARKHI DADRI	1354059	9.54	1354059	9.54
4.	FARIDABAD	169300	7.59	169300	7.59
5.	FATEHABAD	1205460	17.33	1372734	17.16
6.	GURUGRAM	2023256	8.89	2692957	11.83
7.	HISAR	1703347	28.89	1703347	28.88
8.	JHAJJAR	689951	13.97	649377	13.15
9.	JIND	5717671	25.60	5717671	25.64
10.	KAITHAL	4025318	19.90	3728382	19.92
11.	KARNAL	2622115	16.82	3490035	22.38
12.	KURUKSHETRA	4313389	11.70	7970171	11.73
13.	MAHENDRAGARH	1653292	11.98	2151993	13.90
14.	NUH	435037	10.46	461660	10.89
15.	PALWAL	259466	11.67	198066	8.54
16.	PANCHKULA	6393670	4.42	7192008	4.97
17.	PANIPAT	3723485	8.32	4955970	11.07
18.	REWARI	1027224	10.21	1369389	11.98
19.	ROHTAK	1030371	14.16	974296	13.42
20.	SIRSA	182785	22.50	184904	22.23
21.	SONIPAT	1156824	13.88	1318800	13.38
22.	YAMUNANAGAR	2287529	11.01	2287529	11.01
	HARYANA	**44545442**	**307.75**	**52731255**	**319.88**

Source: District Water Resources Plans

Figure 6.4 District-wise Livestock Water Demand of Haryana in 2021



6.1.4 Industrial & Infrastructure Water Demand

Ever since the inception of Haryana in the year 1966, it is the leading State in social and economic advancement and its achievement in the field of industrialization has been quite significant. Water demand for industries comprises the quantity of water required for factories, offices, industries, hospitals, etc. The forecast of this demand will be based on the nature and magnitude of each industry and the quantity of water required per count of production. Haryana is developing as an industrial hub due to its proximity to National Capital Territory. Many international corporate houses have set up their units in the districts of Gurugram, Rewari and Sonipat. The future water demand should be adequate to attract industries to add to the economic prosperity of the State. The quantity of water used by the industries varies widely as affected by many factors such as cost, availability of water, waste disposal problem, and management type of process involved. In the context of the statutory reuse of water in several industries, the requirement for fresh water is reducing considerably. Many big industries reuse their wastewater. However, efforts should be made to promote those industries in the upcoming industrial corridors discharging zero liquid i.e. using the entire treated wastewater by the industry itself within its premises. District Industrial and Infrastructure water demand has been arrived at by adding the block-wise water demand of the sectors as calculated in DWRPs prepared by each district.

The existing water demand (in the year 2021) of industries & Infrastructure in the State is 1,044.18 MCM, which is 2.99% of the total demand. The water demand of district Panipat is the highest i.e. 322.75 MCM having many dye Industries employing many workers. It is followed by district Gurugram having a water demand of 243.87 MCM. The industry & infrastructure water demand of district Fatehabad is a minimum of 0.02 MCM, because of few industries.

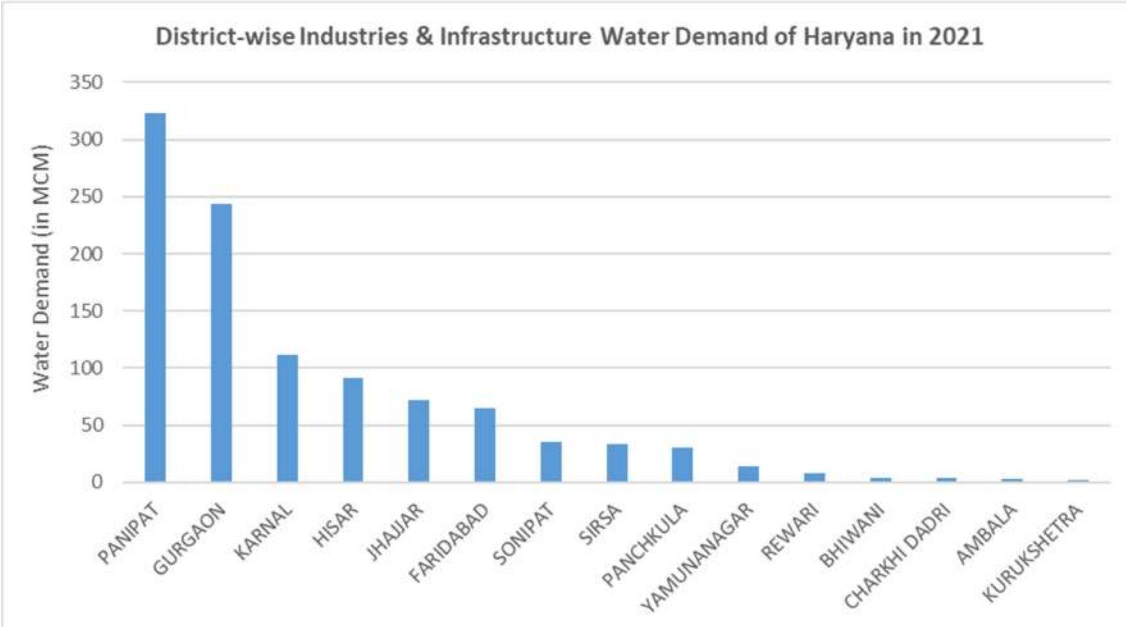
Water demand in 2025 will be 1,465.18 MCM thereby increasing the demand to 421 MCM because of the development of industrial hubs in the NCR falling in Haryana.

Table 6.8 District-wise Industries and Infrastructure Water Demand of Haryana in 2021 and 2025

Sr. No.	District	Industries & Infrastructure Water Demand in 2021 (MCM)	Industries & Infrastructure Water Demand in 2025 (MCM)
1.	AMBALA	2.75	2.76
2.	BHIWANI	4.29	5.88
3.	CHARKHI DADRI	3.74	6.02
4.	FARIDABAD	65.03	84.14
5.	FATEHABAD	0.02	0.02
6.	GURUGRAM	243.87	243.87
7.	HISAR	90.75	47.28
8.	JHAJJAR	72.02	302.14
9.	JIND	1.05	6.21
10.	KAITHAL	0.18	0.41
11.	KARNAL	111.66	147.7
12.	KURUKSHETRA	1.98	3.14
13.	MAHENDRAGARH	0.06	0.08
14.	NUH	0.85	13.35
15.	PALWAL	1.64	1.64
16.	PANCHKULA	30.00	39.22
17.	PANIPAT	322.75	455.67
18.	REWARI	7.81	9.72
19.	ROHTAK	0.37	0.40
20.	SIRSA	33.61	44.72
21.	SONIPAT	35.55	39.00
22.	YAMUNANAGAR	14.20	11.81
HARYANA		**1044.18**	**1465.18**

Source: District Water Resources Plans

Figure 6.5 District-wise Industries and Infrastructure Water Demand of Haryana in 2021



6.1.5 Power Generation Water Demand

As power is the main input for economic and industrial growth many power stations have been installed in the State to meet the power demand of the State. There are six thermal plants in five districts of Haryana State i.e. Panipat, Hisar, Jhajjar, Faridabad, Yamunanagar and Fatehabad. Six plants are in working condition and another nuclear power plant at the village Gorakhpur of district Fatehabad is being constructed. There are two plants in the Jhajjar district. The total water requirement for power plants in Haryana is tabulated below:

Table 6.9 District-wise Power Generation Water Demand of Haryana in 2021 and 2025

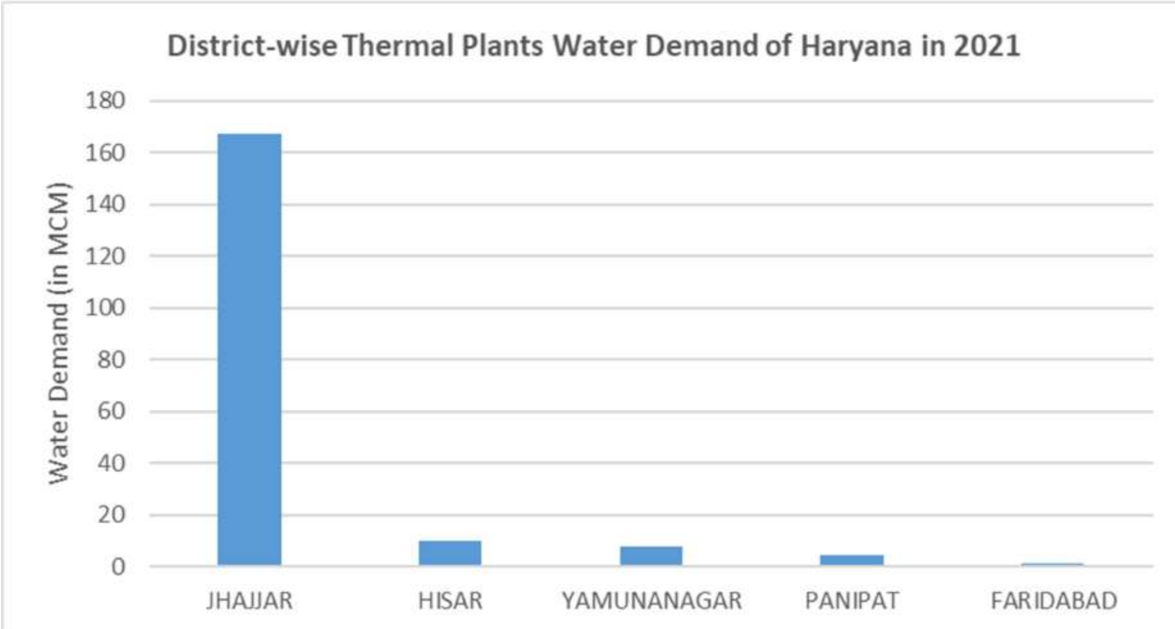
Sr. No.	District	Thermal Plants Water Demand in 2021 (MCM)	Thermal Plants Water Demand in 2025 (MCM)
1	FARIDABAD	1.42	1.42
2	HISAR	9.97	36.79
3	JHAJJAR	167.36	167.36
4	PANIPAT	4.62	7.60
5	YAMUNANAGAR	7.90	7.90
	HARYANA	**191.27**	**221.07**

Source: District Water Resources Plans

The present water requirement for power generation is 191.27 MCM, which is 0.55% of the total demand. However, the water demand of two thermal plants at Jhajjar is 167.36 MCM. The Faridabad thermal plant has minimum water demand of 1.42 MCM. Water demand for power generation will increase by 29.8

MCM in 2025. However, HWRA is advising thermal plants to meet their demand from Treated Waste Water, instead of Canal Supply.

Figure 6.6 District-wise Thermal Power Plants Water Demand of Haryana in 2021



6.1.6 Fisheries Water Demand

Haryana State is the front runner in aquaculture by extension and implementation of various fisheries schemes. The economic viability motivates the farmers to go for fish farming. To meet the demand in National Capital Delhi, fishes are even grown in villages ponds given on lease by Panchayat. Agriculture, animal husbandry and fish farming are now considered both complementary and supplementary activities in the ecological chain and receiving worldwide attention. Farmers in Haryana have begun integrating fish culture with cattle rearing, mushroom culture and agricultural activities. Aquaculture is being taken up in Haryana as an effort to utilize land unsuitable for agriculture. It can easily be adopted in the waterlogged area. The block-wise fisheries water demand computed in the district water resources plans calculated by each district has been included to arrive at the district's fisheries water demand.

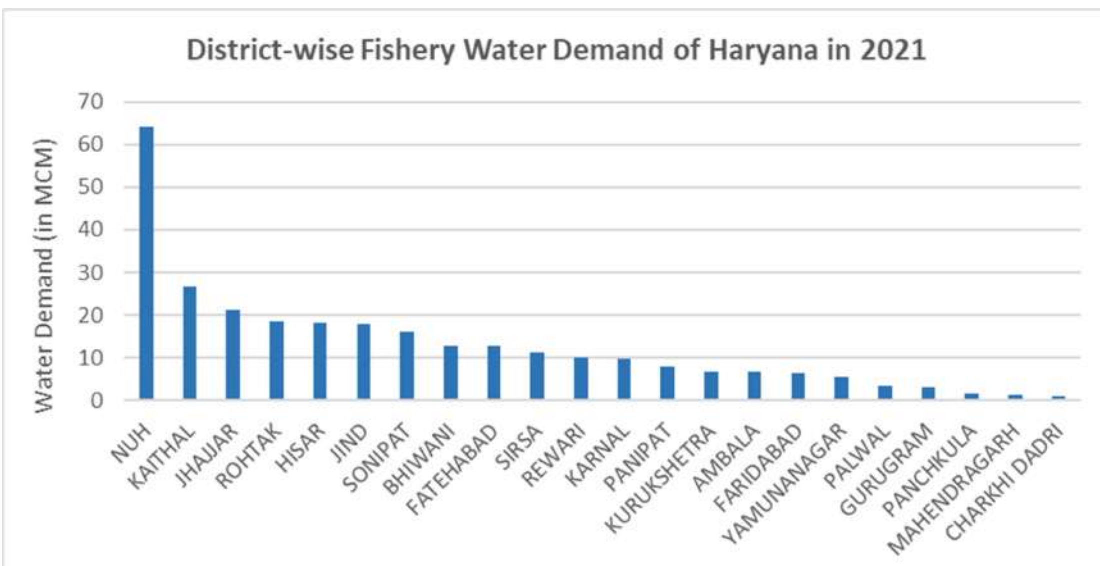
Water demand for fisheries is 282.65 MCM of the State, which is 0.81% of the total demand. The demand for fisheries is highest in Nuh i.e. 64.10 MCM followed by Kaithal at 26.63 MCM. The projected water requirement of fisheries in the year 2025 will be 322.51 MCM thus a potential of 39.86 MCM needs to be created. The district-wise fisheries water demand is given below:

Table 6.10 District-wise Fisheries Water Demand of Haryana in 2021 and 2025

Sr. No.	District	Fishery Water Demand in 2021 (MCM)	Fishery Water Demand in 2025 (MCM)
1.	AMBALA	6.64	9.65
2.	BHIWANI	12.80	16.78
3.	CHARKHI DADRI	0.86	2.10
4.	FARIDABAD	6.35	7.08
5.	FATEHABAD	12.71	16.92
6.	GURUGRAM	2.98	2.38
7.	HISAR	18.35	19.16
8.	JHAJJAR	21.36	21.36
9.	JIND	17.90	17.9
10.	KAITHAL	26.63	28.25
11.	KARNAL	9.60	10.34
12.	KURUKSHETRA	6.78	6.81
13.	MAHENDRAGARH	1.23	0.76
14.	NUH	64.10	64.10
15.	PALWAL	3.33	3.79
16.	PANCHKULA	1.45	1.75
17.	PANIPAT	7.98	8.9
18.	REWARI	10.11	21.22
19.	ROHTAK	18.50	21.6
20.	SIRSA	11.15	13.25
21.	SONIPAT	16.21	22.02
22.	YAMUNANAGAR	5.63	6.39
HARYANA		**282.65**	**322.51**

Source: District Water Resources Plans

Figure 6.7 District-wise Fishery Water Demand of Haryana in 2021



6.1.7 Forest & Wildlife Water Demand

The forest coverage in Haryana is very limited mostly in Kalesar in the Yamunanagar district. There are two bird sanctuaries i.e. Bhindawas in the Jhajjar district and Sultanpur Bird Sanctuary in the Gurugram district. Now, these bird sanctuaries have been developed as Tourist Spots. There is also a bird sanctuary in Khaperwas in Jhajjar District. Water is an important constituent to grow trees and plants in Nurseries. By summing the block-wise water demands for these sectors as determined in the District Water Resources Plans, the district's forests and animals have been arrived at as tabulated.

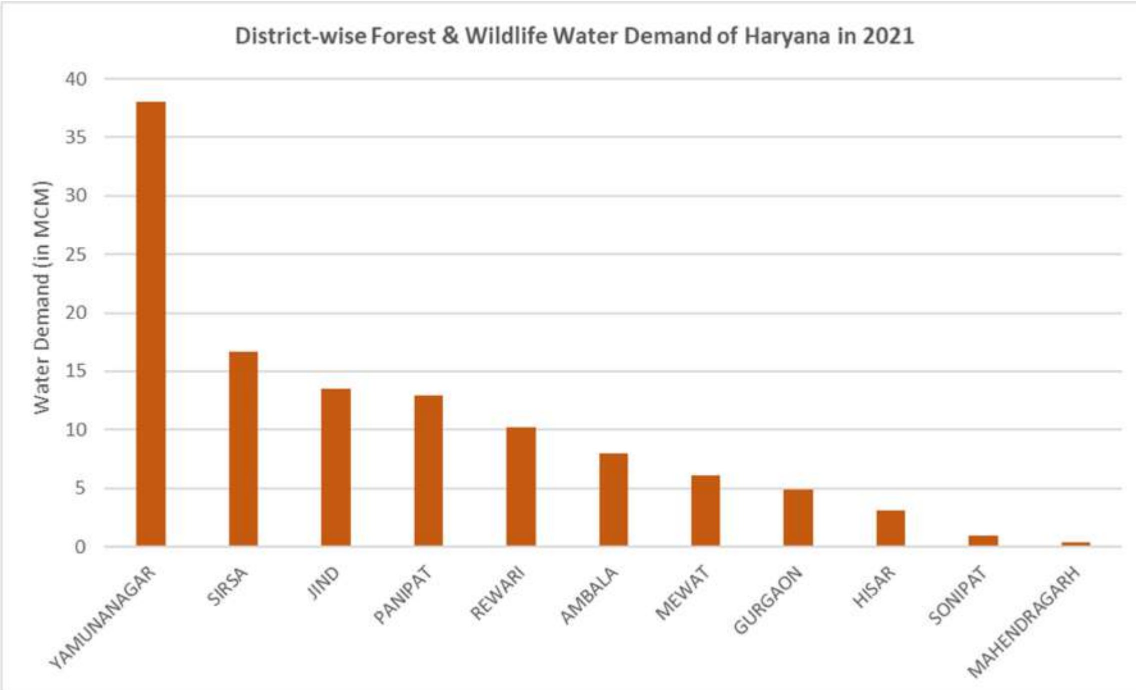
Table 6.11 District-wise Forest and Wildlife Water Demand in 2021 and 2025

Sr. No.	District	Forest & Wildlife Water Demand in 2021 (MCM)	Forest & Wildlife Water Demand in 2025 (MCM)
1.	AMBALA	8.01	8.01
2.	BHIWANI	0.22	0.29
3.	CHARKHI DADRI	0.05	0.05
4.	FARIDABAD	0.04	0.05
5.	FATEHABAD	0.21	0.21
6.	GURUGRAM	4.85	5.01
7.	HISAR	3.08	3.12
8.	JHAJJAR	0.19	0.19
9.	JIND	13.54	13.65
10.	KAITHAL	0.02	0.01
11.	KARNAL	0.17	0.19
12.	KURUKSHETRA	0.11	0.02
13.	MAHENDRAGARH	0.41	0.34
14.	NUH	6.09	0.09
15.	PALWAL	0.03	0.04
16.	PANCHKULA	0.10	0.10
17.	PANIPAT	12.90	18.70
18.	REWARI	10.26	10.27
19.	ROHTAK	0.21	0.21
20.	SIRSA	16.67	23.81
21.	SONIPAT	0.90	0.25
22.	YAMUNANAGAR	38.00	37
HARYANA		**116.06**	**121.61**

Source: District Water Resources Plans

Forest & wildlife demand of the State has been assessed as 116.06 MCM, which is 0.33% of the total demand. The highest demand is for district Yamunanagar at 38.00 MCM followed by district Sirsa at 16.67 MCM. The net water requirement of forests & wildlife in the year 2025 will increase by 5.55 MCM.

Figure 6.8 District-wise Forest and Wildlife Water Demand of Haryana in 2021



6.1.8 Establishment & Institutions Water Demand

The water requirement for the establishment & institutions of the State has been assessed. The water demand of institutions varied from 70 lpcd for the airport to 450 lpcd for hospitals. The water demand for district establishments and institutions is computed by aggregating the block-by-block water demand for these industries as determined by the DWRPs created by each district.

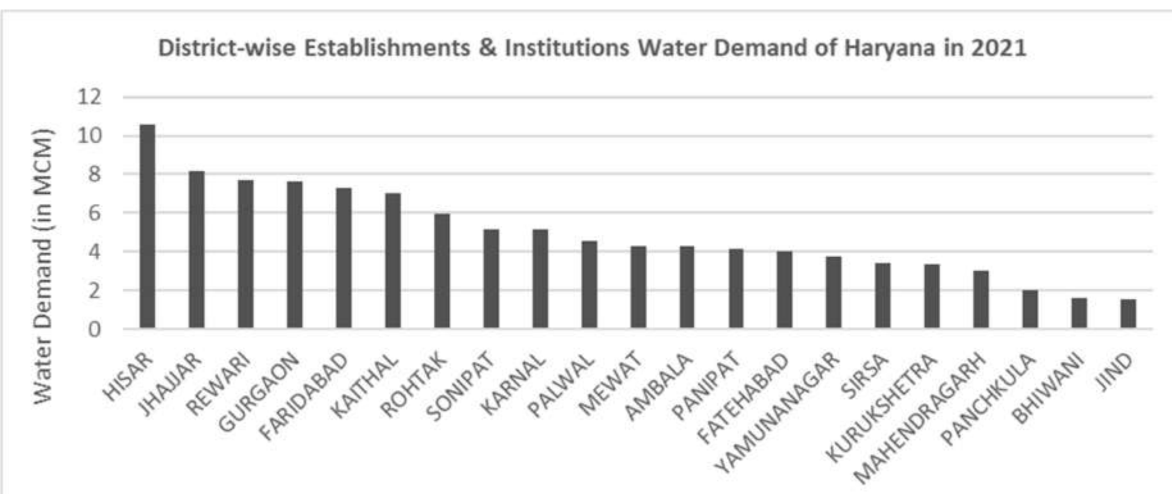
The present establishment & institution demand of the State is 104.43 MCM, which is 0.33% of the total demand. The highest water demand is in Hisar district i.e. 10.57 MCM followed by Jhajjar at 8.16 MCM. Water demand for this sector has been projected in the year 2025 as 149.03 MCM. It can be inferred that with the additional future demand of 44.6 MCM in 2025; a water potential of 44.6 MCM needs to be created.

Table 6.12 Water Demand for Establishments and Institutions of Haryana in 2021 and 2025

Sr. No.	District	Establishment & Institution Water Demand in 2021 (MCM)	Establishment & Institution Water Demand in 2025 (MCM)
1.	AMBALA	4.27	4.27
2.	BHIWANI	1.61	1.87
3.	CHARKHI DADRI	-	1.46
4.	FARIDABAD	7.29	8.45
5.	FATEHABAD	4.01	4.08
6.	GURUGRAM	7.63	9.15
7.	HISAR	10.57	10.57
8.	JHAJJAR	8.16	8.15
9.	JIND	1.53	2.26
10.	KAITHAL	7.00	7
11.	KARNAL	5.13	1.17
12.	KURUKSHETRA	3.32	3.34
13.	MAHENDRAGARH	3.02	3.63
14.	NUH	4.29	4.47
15.	PALWAL	4.52	50.44
16.	PANCHKULA	1.98	2.10
17.	PANIPAT	4.15	4.15
18.	REWARI	7.68	7.68
19.	ROHTAK	5.96	1.25
20.	SIRSA	3.39	3.62
21.	SONIPAT	5.17	6.18
22.	YAMUNANAGAR	3.75	3.74
	HARYANA	**104.43**	**149.03**

Source: District Water Resources Plans

Figure 6.9 District-wise Water Demand for Establishments and Institutions of Haryana in 2021



6.1.9 Total Water Demand of the State

6.1.9.1 Total Water Demand in 2021

Annual Water Demand for various sectors has been assessed as 34,962.76 MCM. The major water demand is from the Agriculture sector & Horticulture sector i.e. 30,055.14 MCM and 1648.38 MCM totalling 31,703.52 MCM. The demand for both these sectors is about 90.67% of the total demand. The water demand of the Domestic and Industry and Infrastructure sectors are 1,212.90 MCM and 1,044.18 MCM respectively. Water demand of other sectors i.e. Livestock, Fishery, Power, Forest & Wildlife and Establishment & Institutions is 307.75 MCM, 282.65 MCM, 191.27 MCM 116.06 and 104.43 MCM respectively consolidating to 1002.16 MCM. This water demand has been arrived at excluding the contribution of effective rainfall of 9,637 MCM in the agriculture sector and horticulture sector.

The water demand of Sirsa is maximum i.e. 3,517.41 MCM followed by district Karnal and Kaithal as 2,784.72 MCM and 2,767.25 MCM respectively. The water demand of Panchkula is a minimum of 462.01 MCM.

Figure 6.10 Sector-wise Water Demand for Haryana in 2021

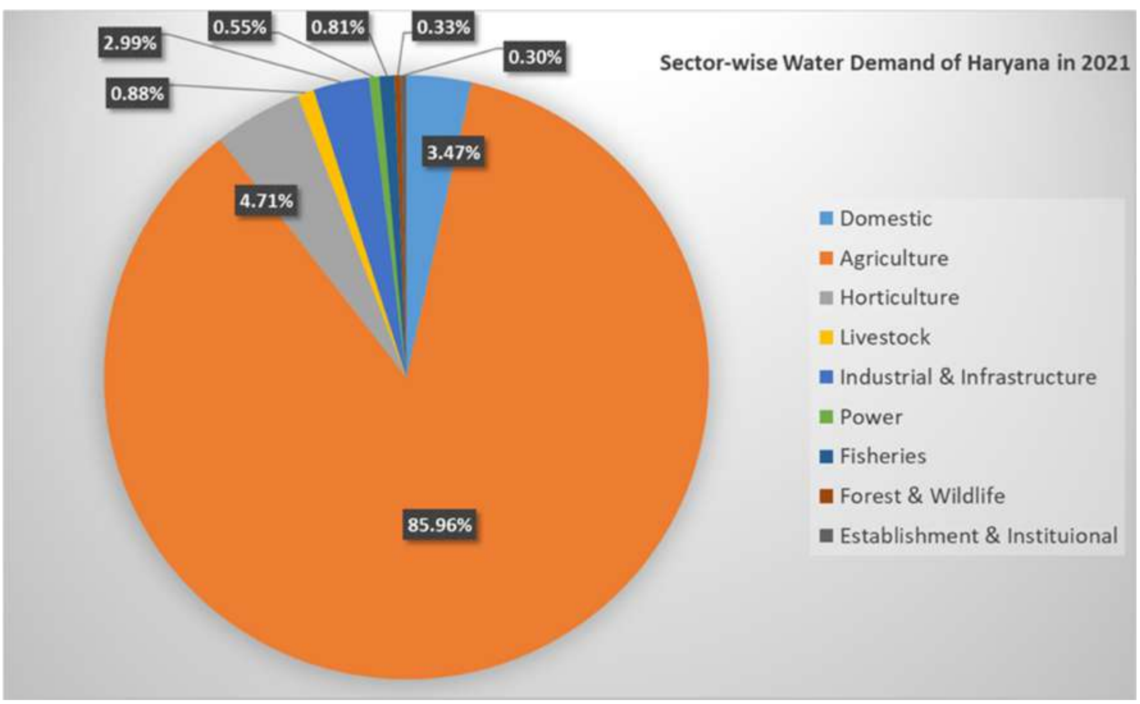


Table 6.13 District-wise Total Water Demand of Haryana in 2021

Sr. No.	District	Domestic (MCM)	Net Agriculture (MCM)			Net Horticulture (MCM)	Livestock (MCM)	Industrial & Infrastructure (MCM)	Power (MCM)	Fisheries (MCM)	Forest & Wildlife (MCM)	Establishment & Institution (MCM)	Water Demand in 2021 (MCM)
			Sown	Unsown	Total								
1	AMBALA	49.63	1019.8	-	1019.8	97	9.96	2.75	0	6.64	8.01	4.27	1198.06
2	BHIWANI	45.96	1302.15	357.33	1659.48	91.43	18.95	4.29	0	12.8	0.22	1.61	1834.74
3	CHARKHI DADRI	19.61	446.75	29.51	476.26	7.07	9.54	3.74	0	0.86	0.05		517.13
4	FARIDABAD	112.28	284.63	21	305.63	26.58	7.59	65.03	1.42	6.35	0.04	7.29	532.21
5	FATEHABAD	48.05	2505.2	71.36	2576.56	88.76	17.33	0.02	0	12.71	0.21	4.01	2747.65
6	GURUGRAM	176.03	285	93.49	378.49	35.77	8.89	243.87	0	2.98	4.85	7.63	858.51
7	HISAR	72.12	2069.29	-	2069.29	74.38	28.89	90.75	9.97	18.35	3.08	10.57	2377.4
8	JHAJJAR	46.13	979.28	-	979.28	55.2	13.97	72.02	167.3	21.36	0.19	8.16	1363.67
9	JIND	46.1	2480.42	65.31	2545.73	61.61	25.6	1.05	0	17.9	13.54	1.53	2713.06
10	KAITHAL	34.91	2639.05	-	2639.05	39.56	19.9	0.18	0	26.63	0.02	7	2767.25
11	KARNAL	62.11	2492.21	-	2492.21	87.02	16.82	111.66	0	9.6	0.17	5.13	2784.72
12	KURUKSHETRA	31.64	1744.43	-	1744.43	92.6	11.7	1.98	0	6.78	0.11	3.32	1892.56
13	MAHEND-GARH	37.55	425.97	98.15	524.12	41.54	11.98	0.06	0	1.23	0.41	3.02	619.91
14	NUH	40.19	469.25	160.34	629.59	96.84	10.46	0.85	0	64.1	6.09	4.29	852.41
15	PALWAL	37.05	663..80	-	663.8	76.8	11.67	1.64	0	3.33	0.03	4.52	798.84
16	PANCHKULA	28.51	244.44	137.02	381.46	14.09	4.42	30	0	1.45	0.1	1.98	462.01
17	PANIPAT	40.4	1116.58	-	1116.58	216.09	8.32	322.75	4.62	7.98	12.9	4.15	1733.79
18	REWARI	43.73	652.97	137.06	790.03	26.09	10.21	7.81	0	10.11	10.26	7.68	905.92
19	ROHTAK	51.92	1190.05	-	1190.05	59.4	14.16	0.37	0	18.5	0.21	5.96	1340.57
20	SIRSA	81.96	2716.24	444.29	3160.53	187.6	22.5	33.61	0	11.15	16.67	3.39	3517.41
21	SONIPAT	55.62	1556.67	-	1556.67	50.9	13.88	35.55	0	16.21	0.9	5.17	1734.9
22	YAMUNANAGAR	51.4	1156.1	-	1156.1	122.05	11.01	14.2	7.9	5.63	38	3.75	1410.04
Total Demand in MCM		**1212.9**	**27776.48**	**1614.86**	**30055.14**	**1648.38**	**307.75**	**1044.18**	**191.27**	**282.65**	**116.06**	**104.43**	**34962.76**
Total Demand in Crore Litres		**121290**	**2777648**	**161486**	**3005514**	**164838**	**30775**	**104418**	**19127**	**28265**	**11606**	**10443**	**3496276**
%age of total demand		**3.47**			**85.96**	**4.71**	**0.88**	**2.99**	**0.55**	**0.81**	**0.33**	**0.33**	**100%**

Note: Net demands are excluding the effective rainfall contribution

Source: District Water Resources Plans and Horticulture Department (HQ), Haryana

Figure 6.11 District-wise Total Water Demand of Haryana in 2021

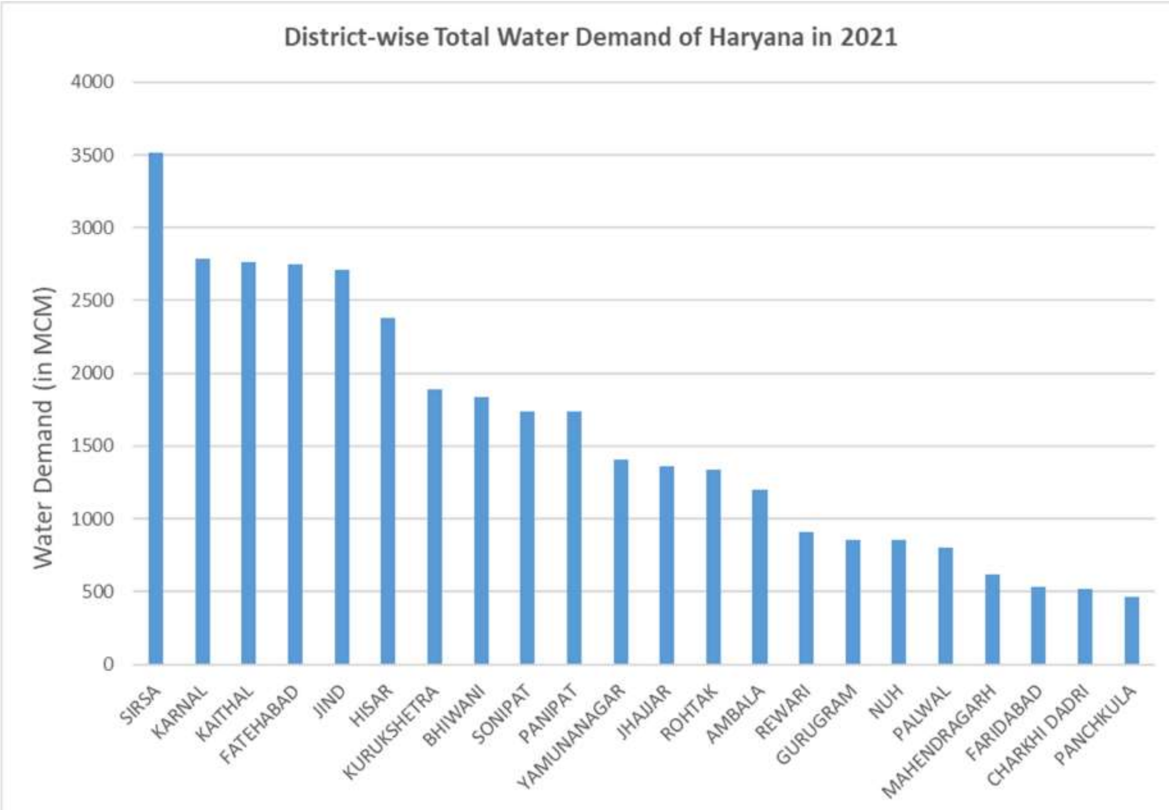
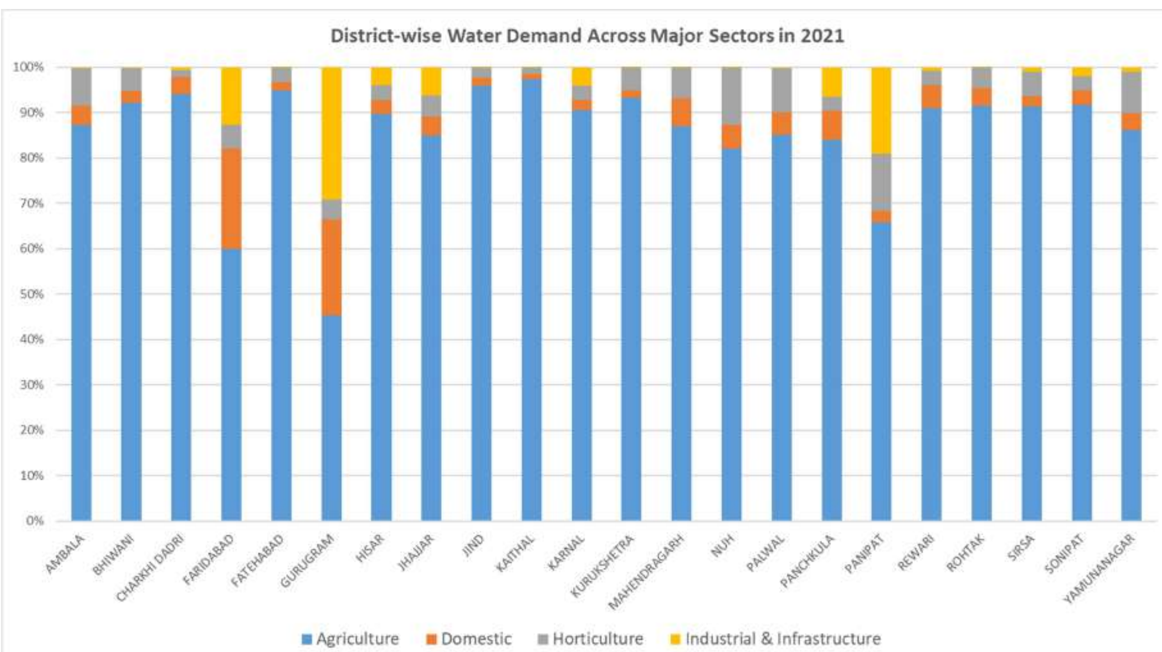


Figure 6.12 District-wise Water Demand Across Major Sectors in 2021



6.1.9.2 Total Future Water Demand in 2025

The annual water demand of the State for the year 2025 has been projected as 36,422.38 MCM. Maximum water demand will be in the Agriculture & Horticulture sector i.e. 30,345.54 and 2,121.31 MCM totalling 32,466.85 MCM excluding the contribution of rainfall (Effective Rainfall). It is followed by the Industry and Infrastructure sector as 1,465.18 MCM. Future requirements for Domestic, Fisheries, Livestock, Power Generation, Establishment & Institutions and Forest & Wildlife sectors are 1,356.25 MCM, 322.51 MCM, 319.88 MCM, 221.07 MCM, 149.03 MCM and 121.61 MCM respectively consolidating to 2,490.35 MCM. District Sirsa will require a maximum of 3,629.56 MCM followed by districts Kaithal and Karnal as 3,130.17 MCM and 2,837.74 MCM respectively. In view of the present water demand of 34,962.76 MCM and the future demand of 2025 is 36,422.38 MCM, it can be inferred that an additional potential of 1,459.62 MCM needs to be created for the year 2025.

Table 6.14 District-wise Total Future Water Demand of Haryana in 2025

Sr. No.	District	Domestic (MCM)	Net Agriculture (MCM)			Net Horticulture (MCM)	Livestock (MCM)	Industrial & Infrastructure (MCM)	Power (MCM)	Fisheries (MCM)	Forest & Wildlife (MCM)	Establishment & Institutions (MCM)	Water Demand in 2025 (MCM)
			Sown	Unsown	Total								
1	AMBALA	49.63	1019.99	0	1019.99	92.45	9.96	2.76	0	9.65	8.01	4.27	1196.72
2	BHIWANI	48.55	1264.64	357.33	1621.97	133.87	20.71	5.88	0	16.78	0.29	1.87	1849.92
3	CHARKHI DADRI	21.41	446.75	29.51	476.26	19.14	9.54	6.02	0	2.1	0.05	1.46	535.98
4	FARIDABAD	123.76	398.3	21	419.3	37.4	7.59	84.14	1.42	7.08	0.05	8.45	689.19
5	FATEHABAD	54.3	2486.2	71.36	2557.56	100.86	17.16	0.02	0	16.92	0.21	4.08	2751.11
6	GURUGRAM	222.6	221	93.49	314.49	49.66	11.83	243.87	0	2.38	5.01	9.15	858.99
7	HISAR	75.28	2057.75	0	2057.75	101.21	28.88	47.28	36.79	19.16	3.12	10.57	2380.04
8	JHAJJAR	46.13	887.41	0	887.41	71.63	13.15	302.14	167.36	21.36	0.19	8.15	1517.52
9	JIND	48.44	2505.22	65.31	2570.53	77.81	25.64	6.21	0	17.9	13.65	2.26	2762.44
10	KAITHAL	45.63	2975.39	0	2975.39	53.56	19.92	0.41	0	28.25	0.01	7	3130.17
11	KARNAL	68.55	2492.21	0	2492.21	95.2	22.38	147.7	0	10.34	0.19	1.17	2837.74
12	KURUKSHETRA	40.44	1744.46	0	1744.46	143.84	11.73	3.14	0	6.81	0.02	3.34	1953.78
13	MAHEN-GARH	40.84	467.17	98.15	565.32	57.42	13.9	0.08	0	0.76	0.34	3.63	682.29
14	NUH	44.29	517.03	160.34	677.37	156.18	10.89	13.35	0	64.1	0.09	4.47	970.74
15	PALWAL	39.05	549.32	0	549.32	73.3	8.54	1.64	0	3.79	0.04	50.44	726.12
16	PANCHKULA	30.85	241.67	137.02	378.69	16.52	4.97	39.22	0	1.75	0.1	2.1	474.2
17	PANIPAT	42.45	1118.06	0	1118.06	260.49	11.07	455.67	7.6	8.9	18.7	4.15	1927.09
18	REWARI	47.99	588.24	137.06	725.3	35.61	11.98	9.72	0	21.22	10.27	7.68	869.77
19	ROHTAK	56.2	1303.54	0	1303.54	87.3	13.42	0.4	0	21.6	0.21	1.25	1483.92
20	SIRSA	91.18	2728.16	444.29	3172.45	258.3	22.23	44.72	0	13.25	23.81	3.62	3629.56
21	SONIPAT	58.94	1556.02	0	1556.02	34.69	13.38	39	0	22.02	0.25	6.18	1730.48
22	YAMUNANAGAR	59.74	1162.15	0	1162.15	164.87	11.01	11.81	7.9	6.39	37	3.74	1464.61
	Total Demand in MCM	**1356.25**	**28730.68**	**1614.86**	**30345.54**	**2121.31**	**319.88**	**1465.18**	**221.07**	**322.51**	**121.61**	**149.03**	**36422.38**
	Total Demand in Crore Litres	**135625**	**2873068**	**161486**	**3034554**	**212131**	**31988**	**146518**	**22107**	**32251**	**12161**	**14903**	**3642238**

Note: Net Water Demand of Agriculture and Horticulture sector excludes the contribution of effective rainfall

Source: District Water Resources Plans

Chapter 7

WATER AVAILABILITY, DEMAND AND GAP IN HARYANA

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXURES

7.1 Water Gap Assessment

The water gap has been calculated by summing the water gap of all the districts. The water gap of the districts for the base year 2020-21 and 2024-25 as per water availability and demand. The water gap of the years 2021 and 2025 has been calculated as per availability and water demand at that time. The water gap is 14,026.78 MCM (14,02,678 crore litres) in 2021 and 15,486.40 MCM (15,48,640 crore litres) in the year 2025. Water availability in the year 2025 has been assumed as the same as present availability as it is not likely to increase.

7.1.1 Water Availability, Water Demand and Water Gap in 2021

The district-wise data for Total Water Availability, which comprises surface water and groundwater Availability, as well as the water demand and water gap for the year 2021 has been given in Table 7.1. The block-wise data is given in Annexure 7.1. The surface water availability of Haryana as compiled for DWRP of all districts in Chapter 2 is 9,355.96 MCM (9,35,596 crore litres) and Groundwater recharge as per the report- Dynamic Ground Water Resources Estimation (GWRE) of Haryana State as on 31st March 2020 published by Ground Water Cell, Department of Irrigation & Water Resources, Haryana and Central Ground Water Board North Western Region Chandigarh in the State is 9,527.02 MCM (9,52,702 crore litres) but actual recharge in the field is more as per field assessments i.e. 11,580.02 MCM (11,58,002 crore litres) as discussed in Chapter 3.

Taking the groundwater recharge of 11,580.02 MCM (11,58,002 crore litres) as availability, the total availability of the State is 20,935.98 MCM (20,93,598 crore litres) including surface water available of 9,355.96 MCM (9,35,596 crore litres). The overall water demand of the State in 2021 has been calculated to be 34,962.76 MCM (34,96,276 crore litres) in Chapter 6. The water gap for 2021 will be -14,026.78 MCM (-14,02,678 crore litres) as detailed in Table 7.1. Figure 7.1 illustrates the water gap for all the districts for the year 2021. It can be observed that Kaithal has the highest gap at -1,714.94 MCM (-1,71,494 crore litres), whereas Mahendragarh district has no gap as low water-requiring crops are grown in this district as the availability of water is not reliable. Figure 7.2 represents district-wise Water Availability, Demand and Gap values for the year 2021.

Table 7.1 District-wise Water Availability, Water Demand and Water Gap in 2021

Sr. No.	District	Total Surface Water Availability (MCM)	Ground Water recharge /availability as per GWRE (MCM)	Additional GW Recharge (MCM)	Total GW Recharge Availability (MCM)	Total Water Availability from all Resources (MCM)	Water Demand in 2021 (MCM)	Water Gap in 2021 (MCM)
1	2	3	4	5	6= Col 4 + Col 5	7= Col 3 + Col 6	8	9= Col 8 – Col 7
1	AMBALA	116.80	480.27	42.91	523.18	639.98	1198.06	-558.08
2	BHIWANI	655.13	418.07	185.70	603.77	1258.90	1834.74	-575.84
3	CHARKHI DADRI	198.77	193.52	72.59	266.11	464.88	517.13	-52.25
4	FARIDABAD	34.51	162.73	28.80	191.53	226.04	532.21	-306.17
5	FATEHABAD	828.34	594.76	139.26	734.02	1562.36	2747.65	-1185.29
6	GURUGRAM	311.67	226.91	33.11	260.02	571.69	858.51	-286.82
7	HISAR	1084.34	588.78	231.07	819.85	1904.19	2377.4	-473.21
8	JHAJJAR	781.55	369.56	103.48	473.04	1254.59	1363.67	-109.08
9	JIND	698.05	856.64	145.53	1002.17	1700.22	2713.06	-1012.84
10	KAITHAL	320.30	602.15	129.86	732.01	1052.31	2767.25	-1714.94
11	KARNAL	402.28	806.95	105.65	912.60	1314.88	2784.72	-1469.84
12	KURUKSHETRA	35.17	389.19	54.99	444.18	479.35	1892.56	-1413.21
13	MAHENDRAGARH	315.09	284.69	91.37	376.06	691.15	619.91	71.24
14	NUH	206.45	195.82	46.15	241.97	448.42	852.41	-403.99
15	PALWAL	188.42	387.36	33.33	420.69	609.11	798.84	-189.73
16	PANCHKULA	44.19	152.52	17.88	170.40	214.59	462.01	-247.42
17	PANIPAT	178.88	356.01	52.26	408.27	587.15	1733.79	-1146.64
18	REWARI	336.10	309.21	73.69	382.90	719.00	905.92	-186.92
19	ROHTAK	496.99	324.34	87.53	411.87	908.86	1340.57	-431.71
20	SIRSA	1627.01	605.65	235.71	841.36	2468.37	3517.41	-1049.04
21	SONIPAT	421.66	646.79	104.59	751.38	1173.04	1734.9	-561.86
22	YAMUNANAGAR	74.26	575.1	37.53	612.63	686.89	1410.04	-723.15
Total in MCM		**9355.96**	**9527.02**	**2053.00**	**11580.02**	**20935.98**	**34962.76**	**-14026.78**
Total in Crore Litres		**935596**	**952702**	**205300**	**1158002**	**2093598**	**3496276**	**-1402678**

Source: District Water Resources Plans

While working out agriculture/horticulture demand for water, effective rainfall used by the crops has been deducted from the overall water requirement of the crops however, water used by these crops for the entire State has been estimated as per CCSHAU, Hisar norms as 9,637 MCM (9,63,700 crore litres) (Annexure 6.1 and Annexure 6.2 of Chapter 6). This figure of 9,637 MCM (9,63,700 crore litres) has also been considered as the availability of water from rainfall for the State and the same has also been added to the demand in the abstract given below, however, this will not affect the water gap of the districts.

Table 7.2 Abstract of Gross Availability, Demand and Gap including Rainfall used by Crops (Effective Rainfall) in the year 2021

	MCM	Crore Litres
Surface Water	9355.96	935596
Groundwater Recharge as per field assessment	11580.02	1158002
Effective Rainfall	9637	963700
Total Availability	**30572.98**	**3057298**
Total demand without effective rainfall	34962.76	3496276
Effective Rainfall	9637	963700
Gross Water Demand	**44599.76**	**4459976**
Gross Water Gap	**-14026.78**	**-1402678**

However, this water gap will reduce to -12,416.78 MCM (-12,41,678 crore litres) excluding the requirement of 1,610 MCM (1,61,000 crore litres) for the unsown area.

District-wise present (2021) water availability, demand and gap have been summed up in the below-given figure.

Affects of Water deficit on the Water Balance of the State

The water deficit is affecting the water balance of the State in two ways: -

1. Various water user sectors

    a. Due to scarcity of water about 10% deficient supply is given to Agriculture and Horticulture accounting for 3,170 MCM (3,17,000 crore litres), but this results in less yield of crops.

    b. Even other sectors i.e. Domestic, Fishery, Industry etc. may be receiving 10% less supplies to the tune of 330 MCM (33,000 crore litres).

2. Over withdrawal from aquifers

    a. There is an over withdrawal of 8,917 MCM (8,91,700 crore litres) from aquifers.

Figure 7.1 District-wise Water Gap in 2021

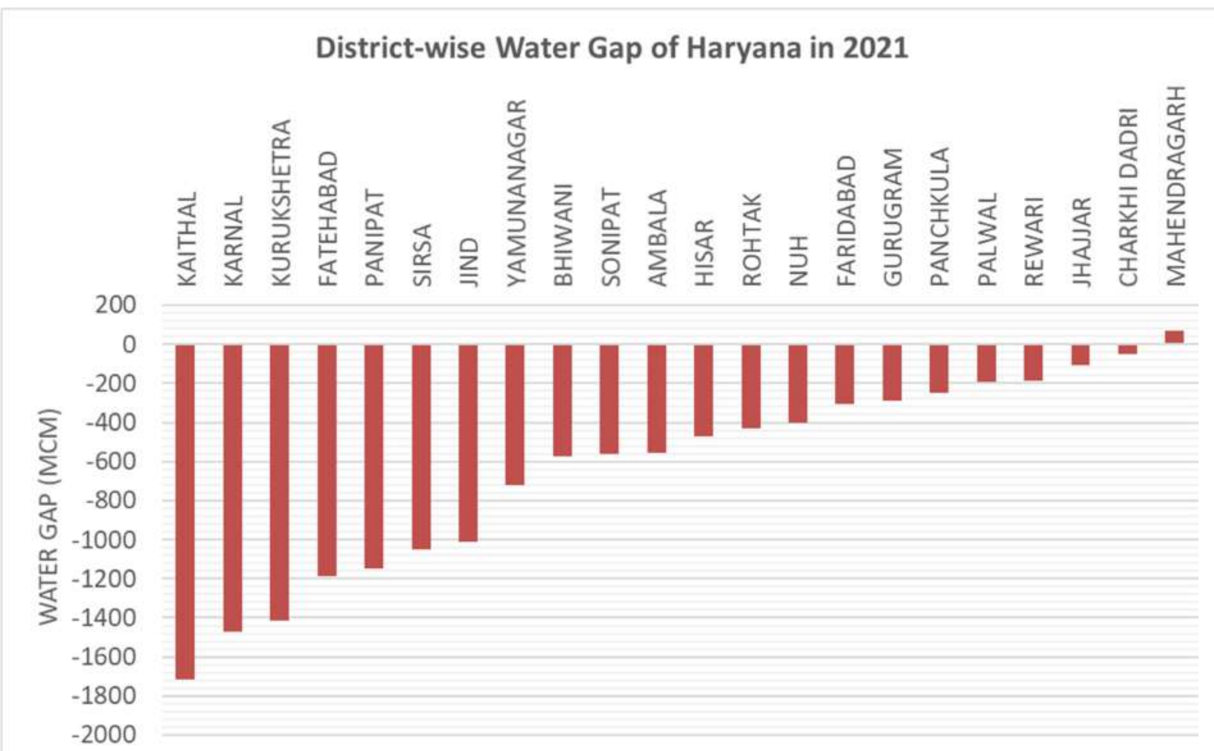
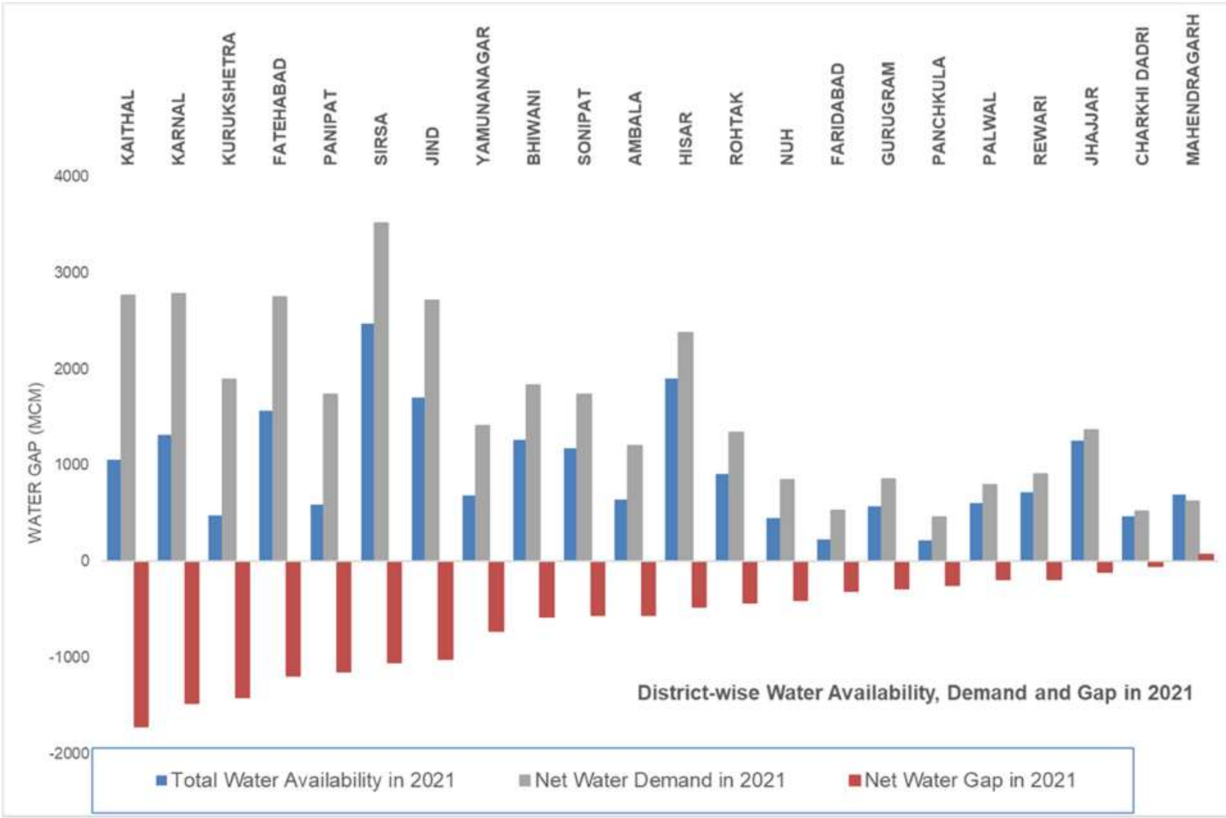


Figure 7.2 District-wise Water Availability, Demand and Gap in 2021



7.1.2 Water Availability, Water Demand and Water Gap in 2025

The total water availability, demand and gap for the year 2025 have been predicted by the districts as tabulated in Table 7.3. Water availability in 2025 has been considered the same as availability in the year 2021 i.e. 20,935.98 MCM (20,93,598 crore litres) because it is assumed that the surface water and groundwater availability is not likely to increase for the next three years. A total of 36,422.38 MCM (36,42,238 crore litres) have been estimated as Haryana's total water demand in the year 2025. The water gap of the State has been predicted as -15,486.40 MCM (-15,48,640 crore litres) for the year 2025. The Water Gap for each district in 2025 is shown in Figure 7.3. District Kaithal is predicted to have a maximum water gap of -2,077.86 MCM (-2,07,786 crore litres). District Mahendragarh is likely to have no water gap since most of the crops grown are not dependent on canal water. District-level water availability demand and gap figures for the year 2025 are shown in Figure 7.4.

Table 7.3 District-wise Water Availability, Water Demand and Water Gap in 2025

Sr. No.	District	Total Surface Water Availability (MCM)	Total Groundwater Recharge/Availability (MCM)	Total Water Availability from all Resources (MCM)	Water Demand in 2025 (MCM)	Water Gap in 2025 (MCM)
1	2	3	4	5 Col 3+Col 4	6	7 Col 6 - Col 5
1.	AMBALA	116.80	523.18	639.98	1196.72	-556.74
2.	BHIWANI	655.13	603.77	1258.90	1849.92	-591.02
3.	CHARKHI DADRI	198.77	266.11	464.88	535.98	-71.10
4.	FARIDABAD	34.51	191.53	226.04	689.19	-463.15
5.	FATEHABAD	828.34	734.02	1562.36	2751.11	-1188.75
6.	GURUGRAM	311.67	260.02	571.69	858.99	-287.30
7.	HISAR	1084.34	819.85	1904.19	2380.04	-475.85
8.	JHAJJAR	781.55	473.04	1254.59	1517.52	-262.93
9.	JIND	698.05	1002.17	1700.22	2762.44	-1062.22
10.	KAITHAL	320.30	732.01	1052.31	3130.17	-2077.86
11.	KARNAL	402.28	912.60	1314.88	2837.74	-1522.86
12.	KURUKSHETRA	35.17	444.18	479.35	1953.78	-1474.43
13.	MAHENDRAGARH	315.09	376.06	691.15	682.29	8.86
14.	NUH	206.45	241.97	448.42	970.74	-522.32
15.	PALWAL	188.42	420.69	609.11	726.12	-117.01
16.	PANCHKULA	44.19	170.40	214.59	474.2	-259.61
17.	PANIPAT	178.88	408.27	587.15	1927.09	-1339.94
18.	REWARI	336.10	382.90	719.00	869.77	-150.77
19.	ROHTAK	496.99	411.87	908.86	1483.92	-575.06
20.	SIRSA	1627.01	841.36	2468.37	3629.56	-1161.19
21.	SONIPAT	421.66	751.36	1173.04	1730.48	-557.44
22.	YAMUNANAGAR	74.26	612.63	686.89	1464.61	-777.72
Total in MCM		**9355.96**	**11580.02**	**20935.98**	**36422.38**	**-15486.40**
Total in Crore Litres		**935596**	**1158002**	**2093598**	**3642238**	**-1548640**

Source: District Water Resources Plans

Figure 7.3 District-wise Water Gap in 2025

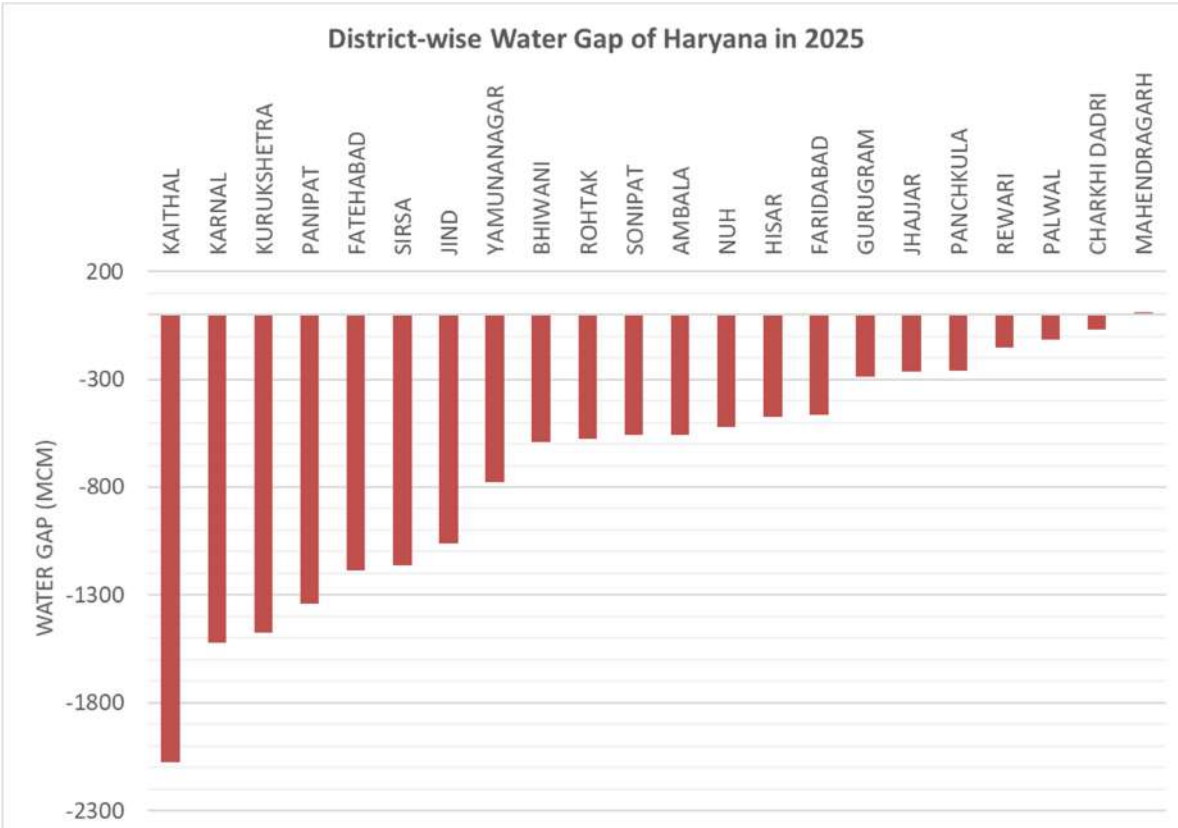
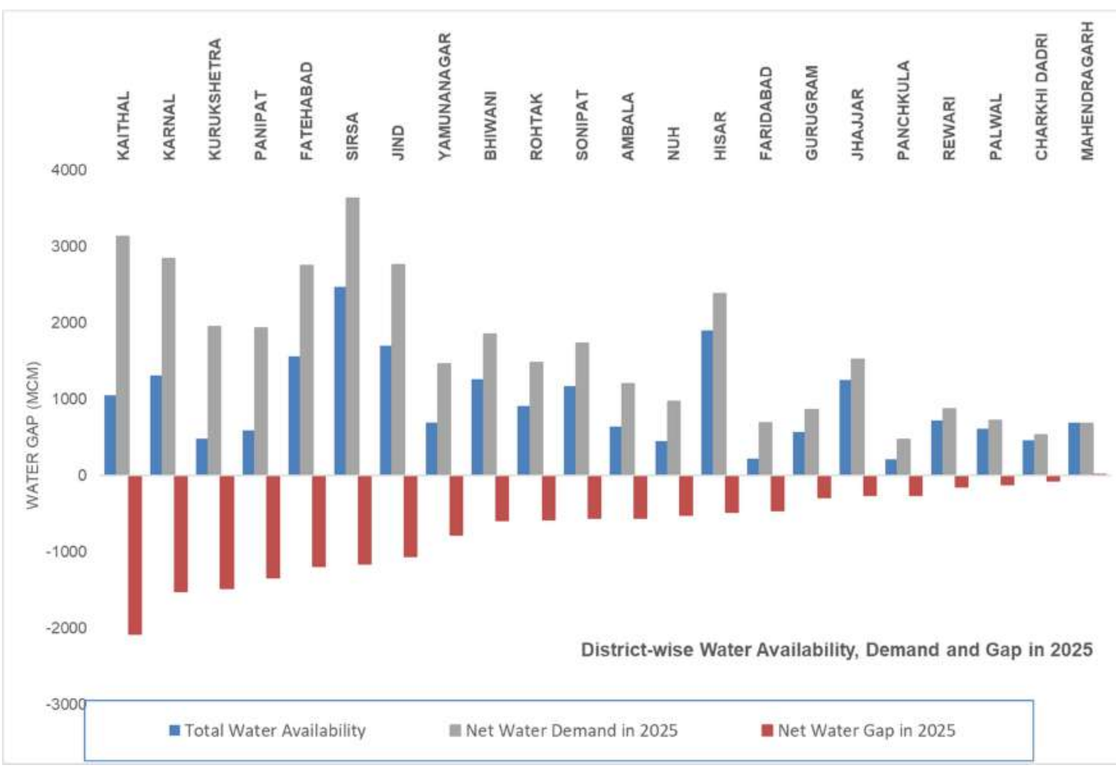


Figure 7.4 District-wise Water Availability, Demand and Gap in 2025



7.1.3 District-wise Comparison of Water Gap for 2021 and 2025

District-wise comparison of the water gap of the years 2021 and 2025 is given in Table 7.4. It depicts due to an increase in the water demand that the state water gap will increase by 1,459.62 MCM (1,45,962 crore litres) in the next three years.

Table 7.4 Comparisons of the Water Gap of 2021 and 2025

Sr. No.	District	Water Gap in 2021 (MCM)	Water Gap in 2025 (MCM)
1.	AMBALA	-558.08	-556.74
2.	BHIWANI	-575.84	-591.02
3.	CHARKHI DADRI	-52.25	-71.10
4.	FARIDABAD	-306.17	-463.15
5.	FATEHABAD	-1185.29	-1188.75
6.	GURUGRAM	-286.82	-287.30
7.	HISAR	-473.21	-475.85
8.	JHAJJAR	-109.08	-262.93
9.	JIND	-1012.84	-1062.22
10.	KAITHAL	-1714.94	-2077.86
11.	KARNAL	-1469.84	-1522.86
12.	KURUKSHETRA	-1413.21	-1474.43
13.	MAHENDRAGARH	71.24	8.86
14.	NUH	-403.99	-522.32
15.	PALWAL	-189.73	-117.01
16.	PANCHKULA	-247.42	-259.61
17.	PANIPAT	-1146.64	-1339.94
18.	REWARI	-186.92	-150.77
19.	ROHTAK	-431.71	-575.06
20.	SIRSA	-1049.04	-1161.19
21.	SONIPAT	-561.86	-557.44
22.	YAMUNANAGAR	-723.15	-777.72
Total in MCM		**-14026.78**	**-15486.40**
Total in Crore Litres		**-1402678**	**-1548640**

Source: District Water Resources Plans

7.2 Summary of District-wise Water Gap

The district-wise estimated present and future water gap has been discussed below with broad reasons for a high or low water gap: -

1. Ambala

The water availability in the year 2021 from all available sources is 639.98 MCM (Surface Water Availability 116.8 MCM and Groundwater Availability 523.18 MCM) whereas the water demand in 2021 and projected for the year 2025 of various sectors are 1,198.06 MCM and 1,196.72 MCM, resulting in the present and projected water gap as -558.08 MCM and -556.74 MCM respectively. This gap may be due to the non-availability of surface water in some areas of blocks Barara, Saha, Naraingarh and Shahzadpur because of its topography besides other reasons.

2. Bhiwani

The water gap in the year 2021 and projected in the year 2025 are -575.84 MCM and -591.02 MCM respectively, as total present water availability from all sources is 1,258.90 MCM (Surface Water Availability 655.13 MCM and Groundwater Availability 603.77 MCM) against demands of various sectors are 1,834.74 MCM and 1,849.92 MCM respectively. The water gap is more due to the sowing of paddy in sandy soil.

3. Charkhi Dadri

The water availability in the year 2021 from all available sources is 464.88 MCM (Surface Water Availability 198.77 MCM and Groundwater Availability 266.11 MCM) whereas water demand in 2021 and projected for the year 2025 of various sectors are 517.13 MCM and 535.98 MCM. Thus the present and projected water gap is -52.25 MCM and -71.10 MCM respectively. The water demand of Charkhi Dadri is less due to the sowing of crops requiring lesser water i.e. Bajra, Jowar etc. Moreover, farmers cannot withdraw more groundwater as there is less availability of water in their tube wells. This district receives supplies through the lift canal system, which was to receive supplies from the SYL Canal. Part of Charkhi Dadri district is waterlogged which results into less demand of water as farmers resort to conjunctive use of groundwater and surface water. Though groundwater in the waterlogged stretches is saline yet farmers use it by mixing with canal water.

4. Faridabad

The water gap in the year 2021 and projected in the year 2025 are -306.17 MCM and -463.15 MCM respectively, as the total present water availability from all sources is 226.04 MCM (Surface Water Availability 34.51 MCM and Groundwater Availability 191.53 MCM) against demands of various sectors are 532.21 MCM and 689.19 MCM respectively. The water gap in 2021 is more due to less availability of surface water i.e. 34.51 MCM. The water gap of the year 2025 is more due to fast urbanization and the growth of industries in the district.

5. Fatehabad

The water availability in the year 2021 from all available sources is 1,562.36 MCM (Surface Water Availability 828.34 MCM and Groundwater Availability 734.02 MCM) whereas water demand in the year 2021 and projected for the year 2025 of various sectors are 2,747.65 MCM and 2,751.11 MCM, resulting in the present and projected water gap as -1,185.29 MCM and -1,188.75 MCM respectively. The water Gap in the district Fatehabad is more because of the sowing of paddy requiring more water.

6. Gurugram

The water gap in the year 2021 and projected in the year 2025 are -286.82 MCM and -287.30 MCM respectively as total present water availability from all sources is 571.69 MCM (Surface Water Availability 311.67 MCM and Groundwater Availability 260.02 MCM) against the demand of various sectors are 858.51 MCM and 858.99 MCM respectively.

7. Hisar

The water availability in the year 2021 from all available sources is 1,904.19 MCM (Surface Water Availability is 1,084.34 MCM and Groundwater Availability is 819.85 MCM) whereas water demand in the year 2021 and projected for the year 2025 of various sectors are 2,377.40 MCM and 2,380.04 MCM, thus the present and projected water gap is -473.21 MCM and -475.85 MCM respectively.

8. Jhajjar

The water gap in the year 2021 and projected in the year 2025 are -109.08 MCM and -262.93 MCM respectively as total present water availability from all sources is 1,254.59 MCM (Surface Water Availability is 781.55 MCM and Groundwater Availability is 473.04 MCM) against demands of various sectors are 1,363.67 MCM and 1,517.52 MCM respectively. The water gap in district Jhajjar is less because most of its area is waterlogged.

9. Jind

The water availability in the year 2021 from all available sources is 1,700.22 MCM (Surface Water Availability 698.05 MCM and Groundwater Availability 1,002.17 MCM) whereas water demand in 2021 and projected for the year 2025 of various sectors are 2,713.06 MCM and 2,762.44 MCM, thus the present and projected water gap is -1,012.84 MCM and -1,062.22 MCM respectively. The water gap in district Jind is more due to the sowing of paddy requiring more water.

10. Kaithal

The water gap in the year 2021 and projected in the year 2025 are -1,714.94 MCM and -2,077.86 MCM respectively, as total present water availability from all sources is 1,052.31 (Surface Water Availability 320.30 MCM and Groundwater Availability 732.01 MCM) against demands of various sectors are 2,767.25 MCM and 3,130.17 MCM respectively. The water gap of district Kaithal is the highest due to the sowing of paddy in a large area and less utilization of surface water.

11. Karnal

The water availability in the year 2021 from all available sources is 1,314.88 MCM (Surface Water Availability 402.28 MCM and Groundwater Availability 912.60 MCM) whereas water demand in 2021 and projected for the year 2025 of various sectors are 2,784.72 MCM and 2,837.74 MCM, thus the present and projected water gap is -1,469.84 MCM and -1,522.86 MCM respectively. The water gap in district Karnal is more due to the sowing of paddy requiring more water and less utilization of surface water.

12. Kurukshetra

The water gap in the year 2021 and projected in the year 2025 are -1,413.21 MCM and -1,474.43 MCM respectively, as total present water availability from all sources is 479.35 MCM (Surface Water Availability 35.17 MCM and Groundwater Availability 444.18 MCM) against demands of various sectors are 1,892.56 MCM and 1,953.78 MCM respectively. The water gap in district Kurukshetra is more due to the sowing of paddy in the large area, requiring more water and utilization of surface water to the tune of 35.17 MCM only.

13. Mahendragarh

The water availability in the year 2021 from all available sources is 691.15 MCM (Surface Water Availability 315.09 MCM and Ground Water Availability 376.06 MCM) whereas water demand in 2021 and projected for the year 2025 of various sectors are 619.91 MCM and 682.29 MCM, District Mahendragarh has surplus water i.e. +71.24 MCM and +8.86 MCM in the year 2021 and 2025 respectively on same cropping pattern. The water is surplus in District Mahendragarh due to the sowing of crops needing less water and the use of micro-irrigation. Most of the area remains unsown due to undulating topography and hilly terrain. In this district, underground water is also limited resulting in the lesser overall availability of water to the farmers compelling them to grow crops requiring less water. Surface water supply in this district is also less as it is being supplied through a lift canal system which was to be augmented by SYL water.

14. Nuh

The water gap in the year 2021 and projected in the year 2025 are -403.99 MCM and -522.32 MCM respectively, as total present water availability from all sources is 448.42 MCM (Surface Water Availability 206.45 MCM and Groundwater Availability 241.97 MCM against demands of various sectors are 852.41 MCM and 970.74 MCM respectively. Future demand may be increasing for more farming because this district is near the national capital.

15. Palwal

The water availability in the year 2021 from all available sources is 609.11 MCM (Surface Water Availability 188.42 MCM and Groundwater Availability 420.69 MCM) whereas water demand in 2021 and projected for the year 2025 of various sectors are 798.84 MCM and 726.12 MCM, thus the present and projected water gap is -189.73 MCM and -117.01 MCM respectively. The future water gap will reduce due to the use of water-saving techniques. Part of the groundwater of the district is saline which discourages the farmers use it directly except using it by mixing with canal water.

16. Panchkula

The water gap in the year 2021 and projected in the year 2025 are -247.42 MCM and -259.61 MCM respectively, as the total present water availability from all sources is 214.59 (Surface Water Availability 44.19 MCM and Groundwater Availability 170.40 MCM) against demands of various sectors are 462.01 MCM and 474.2 MCM respectively. Surface water availability is less due to its hilly terrain. The water requirements are increasing due to fast urbanization.

17. Panipat

The water availability in the year 2021 from all available sources is 587.15 MCM (surface Water Availability 178.88 MCM and Groundwater Availability 408.27 MCM) whereas water demand in 2021 and projected for the year 2025 of various sectors are 1,733.79 MCM and 1,927.09 MCM, thus the present and projected water gap is -11,46.64 MCM and -1339.94 MCM respectively. The water gap is more due to the non-utilization of available surface water. The water demand of this district is more due to fast industrialization and urbanization.

18. Rewari

The water gap in the year 2021 and projected in the year 2025 are -186.92 MCM and -150.77 MCM respectively, as total present water availability from all sources is 719.00 MCM (Surface Water Availability 336.10 MCM and Groundwater Availability 382.90 MCM) against demands of various sectors are 905.92 MCM and 869.77 MCM respectively. The water gap is less due to the sowing of crops having less water requirement. Future demand has been projected less due to the use of water-saving techniques.

19. Rohtak

The water availability in the year 2021 from all available sources is 908.86 MCM (Surface Water Availability 496.99 MCM and Groundwater Availability 411.87 MCM) whereas water demand in 2021 and projected for the year 2025 of various sectors are 1340.57 MCM and 1483.92 MCM, thus the present and projected water gap is -431.71 MCM and -575.06 MCM respectively. The water gap is more due to the sowing of paddy in water-logged areas. Groundwater is saline in this district, so canal water is being used excessively despite water logging. The water gap is increasing also because of its fast industrialization as this district falls in National Capital Region.

20. Sirsa

The water gap in the year 2021 and projected in the year 2025 are -1,049.04 MCM and -1,161.19 MCM, as total present water availability from all sources is 2,468.37 MCM (Surface Water Availability is 1,627.01 MCM and Groundwater Availability 841.36 MCM) against demands of various sectors are 3,517.41 MCM and 3,629.56 MCM respectively. Water demand in this district is highest because of the sowing of paddy crops. However, maximum surface water to the tune of 1,627.01 MCM is supplied due to the utilization of Ghaggar water through the Ottu system in addition to Bhakra water in this district.

21. Sonipat

The water availability in the year 2021 from all available sources is 1,173.04 MCM (Surface Water Availability 421.66 MCM and Groundwater Availability 751.38 MCM) whereas water demand in 2021 and projected for the year 2025 of various sectors are 1,734.90 MCM and 1,730.48 MCM, thus the present and projected water gap is -561.86 MCM and -557.44 MCM respectively. The water gap in district Sonipat is due to the non-utilization of available surface water. The water demand is more due to fast industrialization because of its proximity to National Capital Delhi.

22. Yamunanagar

The water gap in the year 2021 and projected in the year 2025 are -723.15 MCM and -777.72 MCM, as the total present water availability from all sources is 686.89 MCM (Surface Water Availability 74.26 MCM and Groundwater Availability 612.63 MCM) against demands of various sectors are 1,410.04 MCM and 1,464.61 MCM respectively. The water gap is more due to less availability of surface water because of its topography. The demand is more due to the fast growth of industrialization.

Summary

The total present water gap for the year 2021 and future water gap for the year 2025 considering the same water resources availability over the next three years is -14,026.78 MCM (-14,02,678 crore litres) and -15,486.40 MCM (-15,48,640 crore litres) respectively. Thus, demand will increase by 1,459.62 MCM (1,45,962 crore litres) in the next three years. In view of limited water resources availability, the Haryana Water Resources Authority directed the District Water Resources Planning Committee of each district to prepare an action plan for the next three years period to reduce this water gap by at least 45% over the next three years with a water savings target of 10% in Ist year, 15% in IInd year and 20% in IIIrd year by adopting both demand and supply side water management interventions. The action plan is presented in Chapter 10.

At present sugarcane is cultivated in 1,07,651 ha (2.67 lakh acres). Efforts will be made to use drip irrigation in more and more sugarcane crop areas. This will reduce gap of demand and availability of water. It has been proposed to reduce gap by 45% in three years and details are given in Chapter 10.

Chapter 8

EXISTING POLICIES, LAWS AND INSTITUTIONS RELATING TO WATER

TABLE OF CONTENTS

8.1 EXISTING LEGISLATIVE ARRANGEMENTS

This section provides information on the various policies and laws pertaining to the use, supply, conservation, regulation and management of water which are currently existing in the State of Haryana.

8.1.1 State Government Level

8.1.1.1 The Haryana Canal and Drainage Act, 1974

This Act governs irrigation, navigation, and drainage in Haryana for public use. The methods for the building and maintenance of works, canal navigation, drainage, and water supply, as well as their rates, are all addressed in the provisions. The Act also covers the levy and collection of costs for canal water supplied for irrigation and non-irrigation uses, as well as offences and penalties, the State Government's rule-making authorities, and more. It encompasses guidelines and a framework for the following facets:

- Application of Water for Public Purposes
- Construction and Maintenance of Works
- Supply of water
- Water rates
- Canal Navigation
- Drainage
- Jurisdiction
- Offences and Penalties
- Subsidiary Rules

8.1.1.2 The Haryana Pond and Waste Water Management Authority Act, 2018

It is an act to create a State authority for the development, protection, rejuvenation, conservation, construction, and management of ponds, the use and treatment of pond water, and the management and use of treated effluent from sewage effluent treatment plants for irrigation, thereby reducing the stress of over-exploitation of groundwater, and for matters connected with or incidental thereto. It has guidelines for:

- Constitution of Haryana Pond and Waste Water Management Authority
- Salary, allowances and conditions of service
- Meetings of Authority
- Functions and Powers as well as the Organizational Structure of Authority
- Powers and duties of Executive Vice-Chairperson, Technical Advisor and Member Secretary
- District Consultation and Monitoring Committee
- Functions and duties of District Pond Management Officer
- Acts prohibited in pond
- Construction and development of pond to vest in Authority
- Declaration of a protected area and regulation of activities in it
- Power to seize
- Village pond and wastewater management committee
- Penalty for contravention and causing obstruction as well as enhanced penalty for a subsequent offence
- Offences by company
- Fund of authority, accounts and audit and budget

8.1.1.3 Reuse of Treated Waste Water Policy, 2019

The policy has been covered in detail in Chapter 4.

8.1.1.4 The Haryana Water Resources (Conservation, Regulation and Management) Authority Act, 2020

This Act was constituted in 2020 for the conservation, management, and regulation of water resources, including groundwater and surface water, within the State of Haryana, in order to ensure the judicious, equitable, and sustainable utilisation, management, and regulation thereof, as well as to fix the rates for water use, and for matters related to or incidental to the foregoing. Some of the Key mandates of the act are as follows:

- Establishment and incorporation of the Haryana Water Resources Authority
- Formulation of Integrated State Water Plan
- Development of State Groundwater and Surface Water Plan
- Constitution of District Water Resources Planning Committee
- Power of entry and inspection
- Self-regulation, rainwater harvesting, groundwater recharge, re-cycling and re-use, prevention of waterlogging

8.1.1.5 New Construction/ Rehabilitation/ Remodeling/Extension of Water Courses, 2021

To promote Micro Irrigation, Government has approved Watercourse Policy-2021 for giving appropriate weightage to the cases of Watercourses construction, in which WUA (Water User Association) opts for Micro Irrigation. Similarly, priority is given to cases opting for Underground Pipeline (UGPL) instead of open watercourses, to save seepage and evaporation losses. Therefore, farmers opting for Micro Irrigation and UGPL will automatically come above in the priority and water to be used through watercourses will be used judiciously.

Moreover, a policy has also been formulated for providing subsidies for the construction of on-farm tanks for storing irrigation water to be used for the purpose of micro irrigation for crops. This will further promote micro irrigation and save groundwater and canal water.

An online portal **https://micada.haryana.gov.in** has been launched for inviting applications from farmers for micro irrigation-related projects

8.1.1.6 On-Farm Water Tank Policy 2021

MICADA has introduced On-Farm Water Tank Policy 2021. As per policy, in case, a farmer/group of farmers opts to excavate the On-Farm Water Tank at their own level, then a 70% / 85% subsidy is being provided to them as per policy. Similarly, for the installation of Solar Powered Pump 75% subsidy of the total cost and for the installation of Micro Irrigation System, an 85% subsidy of the total cost will be provided to the farmers and thus they will switch to micro-irrigation methods. This will usher in a revolutionary change in the following manner.

- Encourage farmers to save water and use only as much needed, whenever needed and to go for micro–irrigation to increase acreage.
- Save area from water logging due to excess watering as happens during uncontrolled irrigation.
- Save fertilizer/pesticides etc. from being washed out due to flood irrigation.
- Save water for farmers at the tail.
- Improve humidity spread as the water will not get used in one go.

8.1.2 Central Government Level

8.1.2.1 The Water (Prevention and Control Pollution) Act, 1974

The Water (Prevention and Control of Pollution) Act was passed in 1974 with the goals of preventing and controlling water pollution as well as maintaining or restoring the quality of the country's water. The Act was amended in 1988. The Water (Prevention and Control of Pollution) Cess Act was passed in 1977 to establish the levying and collecting of a cess on water used by individuals engaging in specific industrial activities. In order to increase the resources available to the Central Board and State Boards for the prevention and control of water pollution established under the Water (Prevention and Control of Pollution) Act, 1974, this cess is collected. The Act was last amended in 2003.

Section 19 of the Act states that in cases involving the prevention and management of water pollution, the State board may restrict the geographical scope of any order it issues. This indicates that the State board's instructions will only be effective in those locations where water contamination is a problem. The State board has the authority to decide which region is to be labelled as having contaminated water and which is not. To make this determination, the State board may refer to a map, a watershed line, or a district border.

In accordance with Section 20 of the Act, the State board may inspect any site, carry out surveys, or measure a region if it deems it necessary for reducing or avoiding water pollution. It may also request that any business or industry dispose of any information related to the design, installation, or operation of its facility. According to Section 21 of the Act, the State board or any employee acting on its behalf may examine any stream or well in order to prevent and restrict water use.

Additionally, the State board has the authority to forbid anybody from entering any substance that has been declared to be dangerous, noxious, or contaminating in line with the Act's requirements. According to Section 25, no one is permitted to establish an industry, start a new operation, or begin any sewage treatment without the State board's previous consent. The State board may provide him with a notice of approval, and only then is he authorized to continue or begin a new business.

If someone begins a new activity without first receiving the board's consent, the board may impose whatever conditions it deems appropriate for not receiving notice of approval. The State board has the authority under Section 27 of the Act to refuse to issue any notices for the establishment of a new industry or the continuation of an existing operation. The State board has the authority to evaluate any restrictions it placed before issuing the notice of approval if the corporation was given a license with conditions attached.

8.1.2.2 The Environment Protection Act, 1986, amended 1991

The Environment (Protection) Act was enacted in the year 1986 and was amended in the year 1991. It was enacted with the main objective to provide the protection and improvement of the environment and matters connected therewith. "Environment" includes water, air and land and the inter-relationship which exists among and between them.

Central Ground Water Authority has been constituted under Section 3 (3) of the Environment (Protection) Act, 1986 to regulate and control the development and management of groundwater resources in the country.

8.1.2.3 National Water Policy, 2012

The National Water Policy of 2012 has the goal of assessing the current situation and proposing a framework for a plan of action from a united national viewpoint. A variety of proposals for conservation, development, and improved management of the country's water resources have been made in order to fulfil the Policy's goal. The implementation of these proposals necessitates coordinated and ongoing efforts on the part of the relevant Central Government Ministries /Departments and State Governments. Some noteworthy features of the National Water Policy are:

- The importance of a national water framework law and comprehensive legislation for the optimal development of interstate rivers and river valleys is emphasised.
- Water should be recognised as an economic good after satisfying the immediate needs for clean drinking water and sanitation, establishing food security, assisting impoverished people who rely on agriculture for their livelihood, and high priority allocation for minimal ecological needs.
- The river's ecological demands should be identified, considering the fact that river flows are characterised by low or no flows, minor floods (freshets), major floods, and flow fluctuation, as well as development needs. A percentage of river flows should be set aside for ecological purposes, ensuring that the proportional low and high flow releases follow the natural flow regime in terms of timing.
- Adaptation techniques for planning and managing water resource structures in light of climate change, as well as a review of acceptability criteria, have been stressed.
- To guarantee effective water usage, a mechanism to set benchmarks for water consumption for various purposes, such as water footprints and water

auditing, should be devised. Project finance has been proposed as a means of incentivizing efficient and cost-effective water use.

- It has been suggested that a Water Regulatory Authority be established.
- Recycling and reusing have been advocated as incentives.
- Statutory rights should be provided to Water Users Associations to collect and retain a share of water rates, regulate the volumetric quantity of water allotted to them, and maintain the distribution system in their area.
- It has been suggested that the huge discrepancy in water supply requirements between urban and rural regions be eliminated.
- Water resource developments and services should be handled in collaboration with the community. Wherever state governments or local governments decide, the private sector can be invited to join the public-private partnership model as a service provider to satisfy agreed-upon service delivery requirements, including consequences for failure.
- Appropriate funding for states to upgrade technology, design processes, planning and management practises, yearly water balances and accounting for the site and basin, hydrologic balances for water systems, benchmarking and performance evaluation, and other activities.

8.1.2.4 Model Bill for the Conservation, Protection, Regulation and Management of Groundwater, 2016

This act was enacted to restore and ensure groundwater security for all stakeholders in rural and urban regions by ensuring the availability of sufficient quantities and suitable quality of groundwater. This Act's goals are to guarantee that groundwater is protected, preserved, and controlled in order to:

- Meet fundamental human and animal requirements.
- In the public interest, promote sustainable groundwater usage based on long-term resource conservation.
- To enable conjunctive use of surface water and groundwater, ensuring that groundwater protection, conservation, and regulation are linked with surface water protection, conservation, and regulation.
- Ensure that the subsidiarity principle is followed.

- Ecosystems and biological variety should be protected.
- Reduce and avoid groundwater contamination and deterioration.
- Ensure that current and future generations have adequate access to basic water in both quantity and quality.
- Ensure protection from gender discrimination and historical inequalities in water access.

8.1.2.5 Draft National Water Framework Bill, 2016

The National Water Framework Bill, 2016, has been introduced by the Central Government as a final draught to offer a standard national legislative framework for improved and efficient water management. Model legislation for all states is proposed in the complete draught Bill. However, because water is a state matter under the constitution's VII Schedule, the bill will not be binding for states to enact.

The chief objectives of this bill are:

- Regardless of socioeconomic status, everyone has the right to an adequate supply of safe drinking water within easy reach of their homes.
- All basin states have equitable rights to utilise river water as long as it does not infringe on any person's right to water for life in the river basin.
- States must accept the idea that rivers are public trustees rather than state-owned assets.
- There is no hierarchy of rights among the basin states, and they all have the same rights and status. In this case, equality of rights refers to equitable rather than equal allocations of river waters.
- To settle problems, river basin water management and accurate assessment of the state's contribution to the river system are required.
- Creating a River Basin Authority (RBA) for each interstate basin to guarantee that rivers and valleys grow optimally and sustainably.
- Putting in place institutional structures to deal with interstate water issues in order to avoid them through talks, mediation, or conciliation.

- Other measures proposed include national water quality and footprint requirements, an integrated river basin development and management plan, and a grading system.

8.1.2.6 Wetlands (Conservation and Management) Rules, 2017

The Ministry of Environment, Forests and Climate Change (MoEFCC) have published new Wetland (Conservation and Management) Rules 2017 that ban a variety of activities in wetlands. Salient points of these rules are:

1. State Wetland Authority (SWA)

- It calls for the formation of an SWA in each state/UT, which would be led by the State's environment minister and comprise a variety of government authorities.
- Wetland ecology, hydrology, fisheries, landscape design, and socioeconomics will each be represented by one expert from the State government.

2. Functions of SWA

- It will create a complete list of activities that will be controlled and authorised inside wetlands that have been notified and their zone of impact.
- It will also provide recommendations for further banned activities in specific wetlands, develop strategies for smart use of wetlands and their protection, and take steps to raise understanding of the benefits and functions of wetlands among stakeholders and local populations.
- Wise use is described as a concept of sustainable usage that is consistent with conservation in this circumstance.

3. Prohibited Activities

- The laws restrict actions such as encroachment of any type, the establishment and extension of industries, waste dumping, and the discharge of untreated wastes and effluents from factories, cities, towns, villages, and other human settlements.

4. Digital inventory of all wetlands

- State officials must compile a list of all wetlands and a list of wetlands that must be notified within six months. It will be used to generate a thorough digital inventory of all wetlands, which will be updated every 10 years.

5. National Wetlands Committee (NWC)

- The regulations provide for the formation of a National Working Committee (NWC), chaired by the Secretary of the MoEFCC, to supervise and monitor the implementation of the rules.
- NCW will also advise the Central Government on appropriate policies and action plans for wetlands conservation and wise use, recommend the designation of wetlands of international importance under the Ramsar Convention, and advise on collaboration with international agencies on wetlands issues, among other things.

8.1.2.7 Draft Policy on Sediment Management, 2017

The Centre has released a draught sediment management policy proposal that calls for the formation of a River Basin Authority to ensure that no interstate or international river is harmed by arbitrary de-silting actions. The government proposes in the Draft Policy on Sediment Management that no de-silting operations of more than 1 cubic metre be carried out in any river without the authority's or the Central Water Commission's (CWC) consent.

According to it, dredging/de-silting/mining activities upstream of the structure will not be allowed within about 200 metres, in order to protect the structural integrity of the barrage or a weir. Such activities will not be permitted within an 800-meter radius of the structures. The draft paper highlights the need of providing enough floodplains and lakes along the river to regulate flood levels and advises against encroaching on the floodplain or lake reclamation. It also advises against separating lakes and rivers. Instead, nearby lakes/depressions might be de-silted to boost storage capacity.

Lake de-silting should be done in such a way that sediment continuity is preserved. The draught states that storage with appropriate flood cushion must be built, and that stored water must be released during non-monsoon periods in such a way that the river's silt carrying capacity is maintained since this will help the river's ecosystem. It also emphasises the need for local government agencies to manage solid waste, claiming that littering solid garbage in catchment regions adds to river contamination. It states that additional caution should be exercised while dealing with the solid waste created by industrial operations, which frequently contain dangerous elements. Intermixing with other silt may render it unfit for use in the food chain. This type of garbage will not be disposed of in the river.

8.2 EXISTING INSTITUTIONAL ARRANGEMENTS

Water comes under the State list as entry 17 in list II of Schedule VII of the Constitution of India. It is a State subject; the State Governments are primarily responsible for the use and control of the resource. Various State Departments and Corporations are responsible for the development and administrative control of the resource. The institutional structure is such that it facilitates the top-down approach along with the bottom-up approach in the planning and management of the water resources of the State. The institutions run across the National to the village level across various sectors which reflect centralized as well as the decentralized process of management. The institutional structures at various levels of governance in the State are given below.

8.2.1 National Level Institutions

8.2.1.1 Bhakra Beas Management Board

The waters of three eastern rivers, the Sutlej, the Beas, and the Ravi, were given to India for exclusive usage under the Indus Water Treaty of 1960, signed between India and Pakistan. A Master Plan was created to maximise the rivers' potential for reliable irrigation, electricity generation, and flood management. The Bhakra and Beas Projects, which were developed as a joint venture between the former States of Punjab and Rajasthan, are a major part of the plan. The Bhakra Management Board (BMB) was established on November 1, 1966, when the erstwhile State of Punjab was reorganised under section 79 of the Punjab Reorganisation Act, 1966. With effect from October 1, 1967, the administration, maintenance, and operation of the Bhakra Nangal Project were transferred to the Bhakra Management Board. Following completion, the Beas Project Works were passed by the Government of India from the Beas Construction Board (BCB) to the Bhakra Management Board under Section 80 of the Punjab Reorganisation Act, 1966. With effect from May 15, 1976, the Bhakra Management Board was renamed Bhakra Beas Management Board (BBMB). Since then, the Bhakra Beas Management Board has been dedicated to the service of the nation, regulating the provision of water and power to the States of Punjab, Haryana, Rajasthan, Himachal Pradesh, Delhi, and Chandigarh from the Bhakra Nangal and Beas Projects.

The functions of BBMB include:

- Administration, operation, and maintenance of the Bhakra-Nangal Project, the Beas Project Unit I (Beas Satluj Link Project), and the Beas Project Unit II (Pong Dam) in Northern India.
- The regulation of the supply of water from Satluj, Ravi and Beas to the States of Punjab, Haryana and Rajasthan.
- The regulation and supply of power generated from Bhakra-Nangal and Beas Projects.
- Providing and performing engineering, related technologies, and consultancy services in the various fields of hydroelectric power and irrigation projects, as well as conducting all types of business-related thereto, either independently or as a Joint Venture with any Central/State/Public Sector Undertaking(s) or establishment(s) under the administrative control of Ministry of Power. The Central Government must approve any joint venture with another department or entity.
- Construction of new Hydro Projects within and outside the BBMB System.

8.2.1.2 Upper Yamuna River Board

The Upper Yamuna River Board (UYRB) is a subordinate office of the Government of India's Union Ministry of Water Resources, River Development, and Ganga Rejuvenation. On May 12, 1994, the participating basin states (Haryana, Himachal Pradesh, Uttar Pradesh, Uttarakhand, Rajasthan and Delhi) signed an MoU for the sharing of Yamuna's waters up to and including the Okhla Barrage.

The MoU calls for the establishment of the Upper Yamuna River Board, which will be responsible for regulating the allocation of available flows among beneficiary states as well as monitoring return flows; monitoring, conserving, and improving the quality of surface and groundwater; maintaining hydro-meteorological data for the basin; overseeing watershed management plans; and monitoring and reviewing the progress of all projects up to and including the Okhla Barrage.

The main functions of UYRB include:

- Regulation and supply of water from all storages and barrages up to and including the Okhla barrage, in accordance with the agreements or arrangements, reached between the Governments of the Basin States pursuant to the MoU, dated 12.05.1994, but keeping in mind the peaking requirements of existing and run-of-the-river hydropower stations. The operation and maintenance of the control structures will be handled by the individual States in accordance with the agreements that have been made for each structure. If a disagreement arises over flow regulation at any of the structures, the Board, with the permission of the Review Committee, may take over management and control of that structure until the dispute is resolved.

- Maintenance of a minimum flow, in the proportion of completion of upstream storages going up to 10 cumecs downstream of Tajewala/ Hathnikund and downstream of Okhla Head Works throughout the year from ecological considerations as upstream storages are built up progressively in a phased manner.

- Monitoring of flows from the Khara hydroelectric station's tail race into the Yamuna River upstream of Hathnikund, given that the Hathnikund Barrage should be designed to ensure the best possible operation of the Khara tail race channel, as well as have provision for the second stage of WJC hydroelectric project.

- Monitoring return flows from water withdrawn from Yamuna by:

  - Haryana and Uttar Pradesh for silt elimination.

- Delhi after allowing for consumptive use for municipal and drinking water uses as agreed upon, and after carrying out treatment to ensure adequate effluent quality in accordance with the Central Pollution Control Board's regulations. For this aim, the Board will devise a plan in cooperation with the basin states that specifies the location and quantity of raw water to be pulled, as well as the sites where excess water will be returned to the system after adequate treatment.

- Formulation of norms and regulations for water accounting, as well as the computation of water shares for each state every 10 days for regulatory purposes.
- Keeping contemporaneous records of Yamuna's flow at all stations deemed required by the Board, reviewing/completing the data, and calculating the volume of water flowing in the Yamuna throughout the year.
- Keeping track of water withdrawals for agriculture, domestic, municipal, industrial, and other uses, as well as water flowing down the river below Okhla.
- Taking all necessary efforts to ensure that supplies are delivered to all relevant States in line with their rights, including delivering instructions on how to set self-recording gauges, taking observations without impediment, and preparing rating curves, among other things.
- Overseeing inter-state projects and projects that submerge regions in other states for catchment area treatment, watershed management, rehabilitation of impacted populations, and environmental conservation.
- Monitoring and assessing the status of all projects up to and including the Okhla Barrage, as well as advising on project phasing based on the Basin States' work plans.
- Monitoring of groundwater exploitation in the Upper Yamuna Catchment, in conjunction with the Central Ground Water Board, and drafting of rules to prevent over-exploitation of groundwater that is damaging to surface flow, particularly for ensuring minimum flow in the river system.

8.2.2 State Level Institutions

8.2.2.1 Haryana Water Resources Authority

The Government of Haryana has established the Haryana Water Resources Authority (HWRA) for the conservation, regulation, and management of water resources including groundwater under the provisions of the Haryana Water Resources Authority Act, 2020. It aims to consolidate interrelated functions pertaining to groundwater and surface water management within the State of Haryana for ensuring the judicious, equitable, and sustainable utilization, management, and regulation of water.

Some of the key Powers, functions and Duties of the authority are as follows –

- issue directions with regard to the development, management and conservation of water resources of the State with prior approval of the Government;
- impose restrictions, if any, for the categorisation of water resource potential, usage and recharge across the State with prior approval of the Government;
- granting NOCs/permissions for groundwater extraction to infrastructure, Industry and Mining
- issue advisories to the Government, regarding the effective implementation of policies and programs of the Union Government and Government of Haryana for the development, management, and conservation of water resources;
- publish or cause to be published such reports to disseminate scientific data and information to generate public awareness about water and its management;
- publish Integrated State Water Resources Report every three years;
- make recommendations to the Government for the establishment of a system for enforcement, monitoring and measurement of the quality, type of water use and disposal of wastewater;
- establish Bulk Water Rates, Treated Waste Water Rates and recommend retail water tariffs;

- to take suo-moto cognizance of any subject dealing with or involving water and issue directions with prior approval of the Government;
- carry out or cause to be carried out surveys, investigations and research relating to conservation, usage, or quality of water etc.

Key Focus Areas of HWRA

HWRA offers advice, develops plans, facilitates dialogues, provides platforms for collaboration, generates knowledge, and regulates groundwater extraction for improved water governance in the State.

1. **Integrated and Holistic Planning**
   a. Spearheading the integrated and holistic approach to address waterlogging and water depletion;
   b. Village-wise categorisation and planning to design village-specific programmes/interventions;
   c. Development of State Integrated Water Action Plan with block-level water gap analysis and action plan;
2. **Regulation and Monitoring**
   a. Grant NOCs/permission for groundwater extraction for the projects including Industry, Mining, and Infrastructure;
   b. Establishment of tariffs on the bulk water supply, and treated wastewater;
   c. Regulatory authority for treated wastewater policy to ensure its implementation and achieve effective industrial wastewater management and maximum reuse of treated wastewater;
   d. Issuance of directions to ensure compliance with the issued guidelines/orders;
   e. Monitoring of implementation of water-related schemes and programmes of the government like Atal Bhujal Yojana, Jal Shakti Abhiyan etc;
3. **Coordination and Collaboration**
   a. Facilitate collaborations and convergence of schemes and programmes with various line departments;

4. Knowledge Sharing, Training, and Awareness

- Facilitate IEC activities, training, and awareness programmes for various stakeholders like industries, communities, farmers, school children, and youth;
- Providing a platform for discussions and interventions on potential technological solutions to address the key water issues of Haryana;
- Advocating the adoption of best practices on water conservation, sustainable and conjunctive use of surface and groundwater, and equitable distribution of water.

8.2.2.2 Haryana Pond and Wastewater Management Authority

In Haryana, there are a total of 19,324 ponds, with 18,461 in rural regions and 863 in urban areas. These ponds have been used for a variety of reasons, including cattle, irrigation, and pisciculture. However, the pond situation in Haryana has deteriorated over time, resulting in pond water quality deterioration and the drying up of numerous ponds. This resulted in a decrease in groundwater percolation, resulting in groundwater depletion. Water supply for agriculture, industry, and residential usage has been impacted. With this in mind, the State Government has established the Haryana Pond and Waste Water Management Authority (HPWWMA).

The HPWWMA was established under the provisions of Act No. 33 of 2018, which was notified on October 23, 2018, with the goal of promoting/monitoring the development, protection, rejuvenation, conservation, construction, and management of ponds, as well as the management and use of treated effluent from sewage effluent treatment plants for irrigation, thereby reducing the stress of overexploitation of groundwater. The Pond Authority's mission is to repair, restore, and revitalise ponds, as well as develop the ponds surrounded with vegetation and maintain the aquatic life of ponds for biodiversity conservation.

The Authority is to perform the following functions:

- Conduct a survey and investigation of the pond, its limits, and the protected area.

- To determine the appropriateness of pond water for irrigation and other purposes by analysing it.
- To regulate, govern, protect, clean, beautify, conserve, reclaim regenerate, restore, and create the pond.
- To examine the pond's environmental impact.
- Create an integrated strategy for pond growth and encroachment reduction.
- Organize awareness programmes, workshops, and seminars to encourage community participation and awareness in pond cleaning, conservation, tourism, and beautification.
- To construct infrastructure, such as pumping machines, channels, and pipe systems, for the irrigation of pond water and sewage effluent treatment plant effluent.

8.2.2.3 Micro Irrigation Command Areas Development Authority

Command Area Development Authority was set up in Haryana in the year 1974 under a Centrally Sponsored Scheme on sharing basis i.e. 50:50 by the State Government and Government of India to bridge the gap between the irrigation potential created and irrigation potential utilized through micro-level infrastructure development and effective farm water management, to enhance agricultural production & productivity and to improve socio-economic conditions of the farmers on selected Canal Commands in the State under Command Area Development Programme (CADP).

The CAD programme was restructured and renamed Command Area Development & Water Management (CADWM) w.e.f. 01.04.2004 and since 2008-09 the programme was implemented as a State sector scheme with Central assistance up to 2015-16.

Out of the total 14,973 outlets, 11,458 watercourses were lined under the various projects by both the Irrigation and CADA now MICADA. Since many of these watercourses (about 7,900 w/cs) were lined more than 30 years ago, many have been damaged and require major Rehabilitation.

The year-wise detail of a number of watercourses constructed by MICADA is as under: -

STATEMENT SHOWING YEAR-WISE PROGRESS OF WATERCOURSES IN THE COMMAND AREA DEVELOPMENT AUTHORITY HARYANA PANCHKULA				
Sr. No.	Year	No. of completed watercourses	Progress in Lac rft	Progress in KM
	1966 - 1982	Progress of lining of watercourses from 1966-1982 is nil because this work was started in CADA w.e.f 1983-84		
1	1983-84	12	0.25	7.62
2	1984-85	12	2.00	60.98
3	1985-86	16	3.61	110.06
4	1986-87	56	6.00	182.93
5	1987-88	73	5.71	174.09
6	1988-89	109	14.84	452.44
7	1989-90	160	16.79	511.89
8	1990-91	139	13.05	397.87
9	1991-92	124	11.16	340.24
10	1992-93	154	14.19	432.62
11	1993-94	173	18.32	558.54
12	1994-95	240	26.51	808.23
13	1995-96	208	20.44	623.17
14	1996-97	267	21.47	654.57
15	1997-98	185	16.93	516.16
16	1998-99	148	14.18	432.32
17	1999-2000	203	15.07	459.45
18	2000-01	117	10.83	330.18
19	2001-02	135	13.03	397.26
	Total A	**2531**	**244.38**	**7450.61**
20	2002-03	95	6.22	189.63
21	2003-04	122	16.54	504.27
22	2004-05	249	36.59	1115.55
23	2005-06	255	25.91	789.94
24	2006-07	259	25.37	773.48
25	2007-08	214	25.08	764.63
26	2008-09	265	31.91	972.87
27	2009-10	179	45.38	1383.54
28	2010-11	280	39.08	1191.46
29	2011-12	355	37.57	1145.43
30	2012-13	319	25.06	762.80
31	2013-14	253	36.82	1122.56
32	2014-15	323	28.33	863.72
33	2015-16	385	38.00	1158.54
34	2016-17	257	36.40	1109.76
35	2017-18	215	21.80	664.63
36	2018-19	89	10.19	310.67
37	2019-20	161	23.49	716.16
38	2020-21	73	8.16	248.78
39	2021-22	105	14.46	440.85
	Total B	**4453**	**532.36**	**16229.26**
Grand Total (A+B)		**6984**	**776.74**	**23679.87**

Evolution of MICADA

To encourage Micro Irrigation for optimum utilisation of available surface water, Command Area Development Authority has been restructured and renamed as Micro Irrigation and Command Area Development Authority (MICADA). Although difficulty was being faced by the farmers to approach different offices for their work as a mandate of works relating to Rehabilitation/Remodelling was with Irrigation & Water Resources Department and CADA, Haryana was only taking up works relating to construction of new water courses from time to time on "first come first serve basis". Now the MICADA is functioning as a multi-disciplinary body with additional mandates such as enhanced micro-irrigation coverage; use of solar pumps for micro-irrigation; re-use of wastewater for irrigation.

8.2.2.4 State Wetland Authority Haryana

The state-level authority was constituted in 2017 and was entrusted with affairs related to wetland conservation, regulation and management under the relevant state by-laws. The powers and functions that the authority exercises are subject to any central law and policies. The main objectives and functions are to prepare an inventory of wetlands in the State and notify them under the Wetland (Conservation and Management) Rules, 2017 for preparing strategies for conservation and wise use. It also reviews the integrated management plan for each of the notified wetlands. The authority acts as a nodal body for all wetland-specific authorities within the State and issues necessary directions and guidelines for the conservation and sustainable management of wetlands to the respective implementing agencies. Apart from the above functions it also creates awareness among the local community about the importance of wetlands and acts as an advisory body to the State government on any other matters related to wetlands.

Some other objectives and functions of this authority are:

- Prepare a thorough list of wetlands in the State, as well as a list of wetlands that need to be notified under the 2017 Wetland (Conservation and Management) Rules.
- Recommend regulation of identified wetlands based on their short documentation.

- Prepare and submit a computerised inventory of all wetlands.
- Develop a comprehensive list of activities that will be regulated and permitted in wetlands that have been notified.
- Define strategies for wetlands conservation and appropriate usage and give the required instructions to the implementing authorities for the protection and sustainable management of wetlands.
- Examine each notified wetland's integrated management plan.
- Recommend strategies for maintaining ecological integrity through promotional efforts in circumstances where lands inside the boundaries of a notified wetlands or wetlands complex have private tenancy rights.

8.2.2.5 Haryana State Pollution Control Board

The Haryana State Pollution Control Board was established in 1974, following the passage of the Water (Prevention and Control of Pollution) Act, 1974, to protect the country's water resources. Following the implementation of further environmental legislation, the HSPCB in the State of Haryana was given the role of enforcing the requirements of those laws. The Central Government established the following legislation in order to have consistent regulations for broad environmental concerns across the country:

- The Water (Prevention & Control of Pollution) Act, 1974 as amended to date
- The Water (Prevention & Control of Pollution) Cess Act, 1977
- The Air (Prevention & Control of Pollution) Act, 1981 as amended to date

Haryana's government has enacted the aforementioned legislation to combat pollution in the State. The job of enforcing environmental regulations in Haryana has been assigned to the Haryana State Pollution Control Board. They have developed an action plan for the rivers Yamuna and Ghaggar, and they are regularly checking the water quality in contaminated river segments throughout the State.

8.2.2.6 Haryana Irrigation Research & Management Institute

The I&WRD established Haryana Irrigation Research & Management Institute (HIRMI) at Kurukshetra under the Societies Registration Act, 1860. Its principal goal is to conserve and manage water resources efficiently through research and teaching.

The Institute's responsibilities are as follows:

- To provide Irrigation and Command Area Development Authority (CADA) staff with in-service training.
- To act as a training and extension education centre for engineers, NGOs, farmers, and Water User Associations (WUAs) in the field of water resources.
- To conduct research on many elements of irrigation and water resource management.
- To assist farmers and WUA members in participating in irrigation management.
- Demonstrations of drip, sprinkler, and micro-sprinkler irrigation systems for effective water usage will be held at the research farm.
- To undertake feasibility studies on various plants for intercropping.
- Provide training on the newest software and mathematical models to Department employees and officials.

8.2.2.7 Haryana Sarasvati Heritage Development Board

The Haryana Sarasvati Heritage Development Board is an autonomous body of the Haryana government that was established in 2015 under the Art and Cultural Affairs Department with the goals of revitalising the Sarasvati River and developing, preserving, promoting and protecting the Sarasvati Heritage. Its activities have been expanded to showcase the rich heritage and glorious traditions of Sarasvati with its magnificent monuments and exquisite temples, as well as to promote a deeper understanding of the Sarasvati Heritage. The Board’s primary mandate is to develop the Sarasvati River and disseminate its heritage for scientific and sustainable groundwater development and management, as well as to showcase the rich heritage to the world, including exploration, assessment, conservation, augmentation of water resources, protection, restoration, and development of heritage, all while adhering to economic and ecological efficiency and equity principles. More than 70 organisations, including ISRO, GSI, ASI, ONGC, BARC, CGWB, and HARSAC, are involved in Sarasvati River and Heritage research.

8.2.2.8 State Environment Impact Assessment Authority

The State Environment Impact Assessment Authority (SEIAAs) is a crucial division for implementing EIA Notification at the State level, and they have been given authority to evaluate and approve Environmental Clearance (EC) for all plans falling under Category B to mitigate pollution and protect environment. To assist SEIAA, a State Expert Appraisal Committee (SEAC) is constituted. The SEAC scrutinize the projects and forward its recommendations to the SEIAA for taking a decision on granting EC.

8.2.2.9 State Line Departments

Various line departments of Haryana are directly or indirectly focused on the conservation and management of water allocated for different utilities. Some of the key departments are as follows:

Irrigation and Water Resources Department (I&WRD) is one of the major establishments of the Government of Haryana and is the umbrella institution looking into the overall planning and management of the Water resources of the State. The department aims to achieve optimal and efficient utilization of water resources in an equitable manner through active participation from all stakeholders. It wants to set a benchmark and establish the department as a role model in the field of water resources management. The department handles the major and medium irrigation projects in the State and also looks into the allocation of water to various sectors and districts in the State.

Public Health Engineering Department (PHED) is responsible for making raw water portable. In addition to that, it takes charge of the cleaning of wastewater obtained from domestic and industrial applications via STPs and ETPs and supplies the purified water back to homes as well the irrigation department for use in agriculture. The department also undertakes the installation of dams to store and treatment of water obtained in flooding season.

Haryana Forest Department: The forest department is taking various vegetative, mechanical, soil and water conservation measures to conserve the topsoil, reduce the fury of the floods and improve the groundwater regime. Over the years, the department has put up various soil and water conservation structures.

Department of Agriculture and Farmers Welfare: This department is implementing various Soil Conservation schemes in which the works like Water Storage/Water Harvesting Activities (Farm Ponds/Community Ponds/Village Tanks), Renovation of existing water bodies, Check Dams, Earthen Dams, Drop Structures & installation of Micro Irrigation Systems, etc., are being executed. The main objective of these activities is to recharge the groundwater to conserve soil & water, water-saving, harvesting & soil health management, etc. These measures will also help in moisture conservation, erosion control, checking of land degradation, improvement in crop productivity, and restoration of the eco fragile system.

8.2.3 District Level Institutions

At the district level, there are various sub-departments of state-level institutions to look after various aspects of water resources. Apart from this, the district-level governing bodies also look into the management and planning of water resources.

8.2.3.1 District Water Resources Planning Committee

As per the mandate of the provisions under Section 14 of the Haryana Water Resources (Conservation, Regulation and Management) Authority Act, 2020, the Government of Haryana hereby constitutes a Committee to be known as District Water Resources Planning Committee to be known as District Water Resource Plan to be submitted to the Haryana Water Resources Authority. The Committee shall consist of the following members, namely: -

(i)	Deputy Commissioner	Presiding Officer
(ii)	Additional Deputy Commissioner	Member,
(iii)	Chairman, Zila Parishad or his/her representative	Member,
(iv)	Superintending Engineer/Executive Engineer of Irrigation and Water Resources Department.	Member, Secretary;
(v)	Superintending Engineer of Public Health Engineering Department	Member;
(vi)	Hydrologist or Assistant Geologist of the Ground Water Cell	Member;
(vii)	Representative or Urban Local Bodies	Member;
(viii)	DDA or representative of Agriculture Department	Member;
(ix)	Two non-official members of local area including one expert nominated by the Deputy Commissioner	Member;
(x)	Any other member Co-opted by Deputy Commissioner.	Member;

The District Water Resources Planning Committee shall perform the following functions namely -

- To prepare a District Water Resources Plan comprising block-wise/area-wise plans by giving notices and inviting objections, if any, in such form and in such manner, as may be prescribed;
- To consider and decide, within a period of two months, all objections received against the District Water Resources Plans and finalize the District Water Resources Plan and submit to the Authority;
- To identify and demarcate such areas which are found affected by water resources quality and pollution hazards for the purpose of prevention and control of water including groundwater and surface water pollution in such areas and also to find safe water quality zones for potable water supply;
- Discuss strategies to regulate, manage and conserve water in the district and work towards implementing the plans of action systematically, especially for overexploited/ waterlogged saline blocks,

- Shall exercise such powers and perform such functions and duties as may be directed or assigned by the Authority from time to time, for the purposes of the Act;
- Shall ordinarily meet at least once a month at District Headquarters or at such place as may be decided by the presiding Officer;
- Shall report to the Authority and shall work under the general superintendence of the Authority;
- The Authority shall work under the general superintendence of the Authority;
- The Authority may assign such duties and functions, as it may deem necessary, to the District Water Resource Planning Committee,
- Shall prepare the District Water Resources Plan and Shall assist the Authority in finalization of the same and implementation of the plan;
- The Member Secretary of the Committee shall be the reporting officer to the Authority;
- Set up Sub-Committee for formulating or collecting data for District Water Resources Plan.

8.2.3.2 Ground Water Cell

The Ground Water Cell (GWC) of I&WRD works in collaboration with the CGWB and monitors the quality of groundwater resources in various locations in every district of the State. GWC had set up 2200 Grid observation points and it monitors the GW depth to water level and Quality twice a year (pre and post-monsoon). The GWC section is headed by the Chief Hydrologist. The brief of activities of Officers/Officials of GWC is classified under various aspects of groundwater management. It creates awareness among farmers for water conservation and promotes crops that are less water-guzzling. It also promotes rooftop rainwater harvesting structures construction for augmenting the natural water resources in government buildings on a demonstration basis for creating awareness among students for water conservation and recharging.

Under the Atal Bhujal Yojana, and National Hydrology Project provides all necessary assistance in activities related to it. It provides all necessary assistance to district administration related to groundwater depth and quality in their respective districts. Apart from these responsibilities, it also collects and submits village-wise minor irrigation unit data on the number of tube wells.

8.2.3.3 Jal Shakti Kendras

Jal Shakti Kendras have been set in each district of Haryana as part of the Jal Shakti Abhiyan. These Kendras serve as knowledge centres, distributing information about water conservation practices and providing individuals with technical assistance. They are managed by the concerned office of Superintending Engineers/ Executive Engineers of the Irrigation & Water Resources Department, Haryana.

The major goal of establishing a Jal Shakti Kendra in each district is:

- To assist the Deputy Commissioners in coordinating all water conservation activities in the district. This will not be a fund-raising centre; instead, it will serve as a resource for Deputy Commissioners on water-related matters, such as plan development.
- To serve as a knowledge centre for the public seeking information on water and water sources in the area, as well as a technical guidance centre advising locals on the appropriate rainwater harvesting structures suitable for the climatic conditions and soil strata to be used to store rainwater.

8.2.4 Village/ Block Level Institutions

8.2.4.1 Village Water Sanitation Committee

Village Water and Sanitation Committee (VWSC) are formed at the Gram Panchayat level for promoting community participation, community-level awareness and management of water supply schemes in which the operation and maintenance have been handed over to the panchayat. It is proposed to undertake many training and awareness programs regarding water supply and sanitation sectors. The primary functions of the committee include:

- Providing inputs for the Village Water Security Plan and submitting facts and figures to the Gram Panchayat for reviewing water and sanitation problems.
- Facilitating community contribution towards capital costs, both in cash and kind (such as land, labour or materials), if required.
- Opening and monitoring bank account for depositing community cash contributions, O&M funds and management of project funds.
- Sanctioning private water supply connections to consumers.

- To assist the State Government/Line Departments in solving the problems of the area and in various other activities such as IEC etc.
- Regular checking of the quality of water from the lab to ensure a potable water supply.
- To obtain funds/aid from the State Government as per the policy of the Line Department and incur expenditure in accordance with the guidelines.
- Ensuring sanitation and hygiene in the village and promoting community involvement in disease prevention activities.

Community participation forms a crucial part of the Atal Bhujal Yojana being run in the State. As a part of this programme, VWSC are being actively involved in the following activities:

- Activating the community on concerns of groundwater management.
- Conducting water budgeting activities with the community, preferably seasonally or at least once a year.
- Identifying groundwater management actions on both the supply and demand sides.
- Putting together a two-year (or longer, but with a year-by-year breakdown) implementation strategy for the Gram Panchayat.

8.2.4.2 Water User Associations

A participatory approach is very crucial for the management of irrigation projects for conserving and optimal utilization of resources. Participatory Irrigation Management (PIM) refers to the involvement of irrigation users in all aspects of Irrigation Management at all levels. Water Users' Association (WUA) has been registered for the purpose in various states in India. A WUA is a cooperative association of individual water users who wish to undertake water-related activities for their mutual benefit. The specific nature of the service that a WUA provides will differ from case to case. The need of the members will differ from one area to another; a WUA is normally set up to cater to the aspirations of its members

Up to 31.03.2020, only 6,924 WUAs are registered and 4,956 WUAs are functional. As per the provisions made in the MOU and Bye-Laws of WUAs issued by the Irrigation Department for the implementation of the PIM Programme, all the water courses have been handed over to Irrigation Department for technical guidance and repair & maintenance of water courses through WUAs after the release of functional grant in respect of the completed projects.

The major responsibilities undertaken by the WUAs are to prepare and implement *Warabandi* Schedule for each season and regulate the use of water among outlets under its jurisdiction as per the schedule. They also need to prepare a plan for maintenance and carry out the maintenance works with the association's funds. The WUAs must promote equitable water use, prevent unauthorized tapping of water and monitor the flow of water for irrigation. Apart from the above responsibilities it should also maintain prescribed records and resolve disputes if any among members. The responsibility of repair and maintenance of watercourses has been entrusted to WUAs under the technical guidance of the I&WRD and the JE/Canal Patwari of I&WRD has been made an ex-officio member of WUA. WUA would also engage in measures to raise awareness among local leaders about the importance of groundwater management and the need to promote participatory groundwater management processes in their specific areas through monthly meetings and workshops.

8.2.4.3 Eco Clubs

The Haryana School Shiksha Pariyojna Parishad (HSSPP) has set up youth and environmental clubs in all the government-run schools in the State. This has been done in order to instil a feeling of responsibility in pupils towards the environment and environmental education based on real-life experiences, resulting in lifetime attitudes, values, and behaviour toward the environment from a young age. The goal of eco clubs is to educate youngsters about environmental concerns. Each eco club contains 20-30 students interested in environmental concerns, according to the mandate.

The HSSPP has set aside INR 16.11 crores for youth and eco groups in the State's 14,353 schools. As yearly support to sustain the eco clubs, government-run primary schools receive INR 5,000, while elementary and upper secondary schools receive INR 15,000 and INR 25,000, respectively. The eco clubs receive cash from the government to hold seminars, discussions, awareness programmes, rallies, plantation drives, and field trips.

These clubs expose youngsters to the environmental issues that our society is experiencing and encourage them to consider potential solutions. It also engages youngsters in action-based environmental programmes in their communities.

8.2.4.4 Nehru Yuva Kendras

Nehru Yuva Kendras were founded in 1972 with the goal of giving rural youth an opportunity to participate in the nation-building process while also allowing them to develop their personalities and abilities. To monitor the operation of these Kendras, the Nehru Yuva Kendra Sangathan (NYKS) was established in 1987-88 as an autonomous agency under the Ministry of Youth Affairs and Sports of the Government of India. NYKS is the world's largest grassroots youth organisation and the only one of its type. It uses the ideas of voluntarism, self-help, and community engagement to channel the potential of youth.

NYKS has built a network of youth clubs in communities where NYKs have been created throughout the years. NYKS has set a goal of identifying locations where youth power may be harnessed for development by organising Youth Clubs, which are village-level volunteer action organisations of youth to engage them in nation-building initiatives. NYKS's network of youth clubs is its most valuable asset. Village-based organisations dedicated to community development and youth empowerment are known as Youth Clubs.

The primary goal of forming youth clubs is to provide community support through developmental programmes that include activities geared toward youth empowerment. The execution of youth club programmes and activities is based on local needs and requirements, and resources are mobilised from a variety of government departments and other organisations, including national, state, and multinational entities. The NYKS' broad nationwide rural network is built on the backs of a youth club.

Chapter 9

KEY WATER ACHIEVEMENTS IN 2022-23

TABLE OF CONTENTS

9.1 KEY WATER INITIATIVES AND PROGRAMMES IN 2022-23

Haryana has been a pioneer state in the field of water conservation, management, and sustainable use of water resources. The efforts of the State have also been recognized by the GoI. Over the years, the state has formulated several revolutionary schemes for water conservation and management. A number of pilot schemes, projects, and new techniques have been adopted to achieve conservation and judicious use of water. The state has also carried out schemes and interventions developed by the central government with full diligence.

9.1.1 Atal Bhujal Yojana

Atal Bhujal Yojana is a groundwater management scheme launched by Prime Minister, Sh. Narendra Modi on the 95th birth anniversary of former Prime Minister Atal Bihari Vajpayee (i.e. on 25 December 2019). The purpose of the scheme is to arrest the decline in groundwater levels and improve groundwater management by involving community participation and line departments in seven states of India (i.e. Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, and Uttar Pradesh).

Atal Bhujal Yojana is a central sector scheme worth Rs. 6,000 crore which aims for sustainable management of groundwater with community participation. It envisages people's participation through the formation of 'Water User Associations', water budgeting, preparation and implementation of Gram-panchayat-wise water security plans, etc. It is being implemented by the Ministry of Jal Shakti. The scheme is being funded by the Government of India and the World Bank on a 50:50 basis. The States have been selected according to the degree of groundwater exploitation and degradation, established legal and regulatory instruments, institutional readiness, and experience in implementing initiatives related to groundwater management. Atal Bhujal Yojana intends to enhance sustainable groundwater management in the Member States by bringing about behavioural change at the grassroots level through awareness initiatives and capacity building. The scheme uses a four-pronged strategy:

- **Decision support tools for groundwater management:** To operationalize and standardise programme implementation across the Participating States, a Management Information System (MIS) has been developed by the Ministry of Jal Shakti.

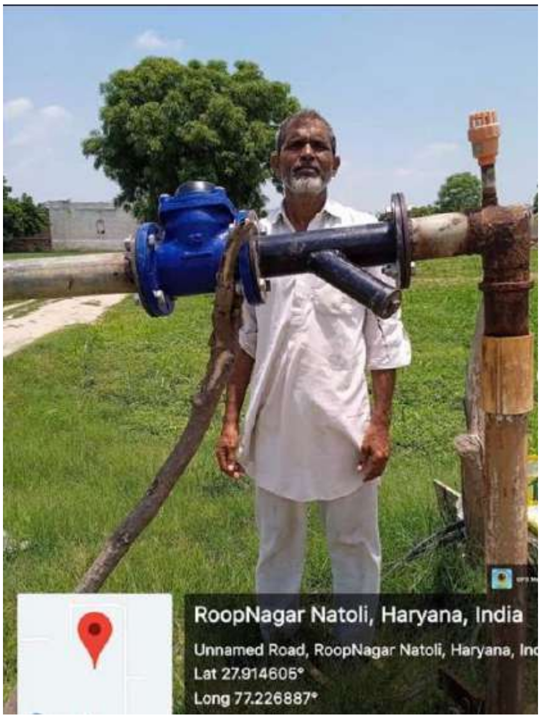
- **Strengthen community-based institutions to foster management:** Activities to develop enabling institutions and build the necessary database for bottom-up, participatory planning and execution of appropriate groundwater management and usage solutions. This is a significant departure from the business-as-usual approach and put things on the right track to achieving long-term groundwater management on a bigger scale.
- **Improve water use efficiency and enhance groundwater recharge:** The program promotes volumetric metering and real-time data systems, as well as boosting public awareness about the necessity of sound groundwater management. It also promotes on-the-ground efforts based on community ownership and sensible water resource management.
- **Fiscal decentralisation:** The initiative not only focuses on strengthening state institutions, but it also helps the GoI overall march toward fiscal decentralisation. It advances the Ground Water Management and Regulation (GWMR) Scheme, a centrally funded programme that does not distribute payments to states. This centralised strategy has an impact on the Aquifer Management Plan's (AMPs) ownership, adoption, and implementation. Funds are moving from the Central government to the states, and then to the appropriate implementation levels according to Atal Bhujal (districts, blocks, Gram Panchayats, and beneficiaries).

In Haryana, the said scheme is currently being implemented by the Irrigation

and Water Resources Department. It has a proposed budgetary provision of INR 723 crores to help in conserving groundwater and strengthen the organisations concerned from the year 2020-21 to 2024-25. Under this scheme, 1,656 Gram Panchayats of 36 blocks in 14 districts have been identified, which fall in the overexploited/critical category. These 14 districts are Bhiwani, Charkhi

Dadri, Faridabad, Fatehabad, Gurugram, Kaithal, Karnal, Kurukshetra, Mahendragarh, Palwal, Panipat, Rewari, Sirsa, Yamunanagar. Till date, Water Security Plans (WSPs) have been prepared with the help of the active participation of the community for all the 1,656 Gram Panchayats as a part of this scheme.

The final allocated funds for Atal Bhujal Yojana are INR 677.69 crores, out of which INR 207.17 crores are used for institutional strengthening and capacity building and the rest INR 470.52 crores would be utilized for incentives. The Haryana government is focused on stabilising the groundwater table in these blocks. Convergence and implementation of actions are being taken up based on the WSPs prepared and the line department's yearly action plans. The State is promoting micro-irrigation (MI) to save groundwater being used in agriculture. The government is offering an 85% subsidy for the expenditure associated with the auxiliary infrastructure of the micro-irrigation component. Additionally, the remaining 15% cost of the MI system is also incentivized for the farmers whose gram panchayats are under Atal Bhujal Yojana. Thus, the farmers need to pay only GST for the installation of the MI system in their agriculture fields.



In terms of the physical progress of the scheme, the construction of 1,000 nos. of piezometers and installation of Digital Water Level Recorders (DWLR) has been started, and work will likely be completed by September 2023. 1,200 out of 2,000 water flow meters have been installed and data collection has started in 1,003 water flow meters. 1,669 Nos. of manual rain gauges have been installed in Atal Bhujal Gram Panchayats and data collection is in progress. Groundwater quality testing using field water quality testing kits has been completed for 1st phase, and field water quality testing for 2nd phase is in progress. Around 15,000 water samples have been tested by VWSC/DIP/DPMU under Atal Bhujal Yojana. 2 water quality sample per Gram Panchayat was collected for laboratory analysis i.e., 3,312 and analysis have already been completed.

Each Gram Panchayat has developed a Village Water and Sanitation Committee (VWSC), which is being taught various elements of groundwater management, water quality testing, and monitoring. The Hydrogeological Monitoring Network (HMN) will be established in 1,656 GPs as part of this initiative. This would entail the purchase and installation of a water level indicator, rain gauge, water flow metre, water quality testing kit and piezometers.

Haryana is taking a paradigm shift in the IEC approach mainly because of changes in groundwater (aquifers), farmers' population and due to Covid 19. There is also a shift in implementation which includes association to utility, information to participation, school-based activities to community-led activities, wall paintings/street plays to digitalised content, social media and PRI techniques to youth/school children. The major IEC activities currently incorporated under Atal Bhujal Yojana are:

- Community Orientation- Capacity Building training/workshops at State/District/Block/Gram Panchayat level
- Organizing school-level competitions
- Wall paintings
- Jal Panchayats
- Targeted social media campaign
- Workshops-cross learning
- Nukkad Nataks
- Pamphlets distribution
- Hoardings
- Documentary films

9.1.2 Jal Jeevan Mission

Jal Jeevan Mission was launched in August 2019 with a vision to provide safe and adequate drinking water through individual household tap connections by 2024 to all households in rural India. Source sustainability measures, such as recharge and reuse through greywater management, water conservation, and rainwater harvesting, have also been included as obligatory aspects of the program. The Jal Jeevan Mission is centred on a community-based approach to water, and a significant component of the mission is broad information, education, and communication.

Haryana has successfully implemented the Central Government's Jal Jeevan Mission, completing the process of supplying piped water to families in 22 districts on 06.04.2022. At the time of its launch in 2019, 17.66 lac connections out of the total of 30.96 lac connections had already been provided in the State. Women have been liberated from the laborious duty of delivering fresh water from far-off areas by keeping pots and utensils on their heads as part of this mission. The Mahagram Yojana was launched by the State government to improve drinking water supplies, establish sewage systems, and install sewage treatment plants. 132 communities have been recognised as part of this program.

Grey Water Management is another JJM project, with money collected through a combination of JJM, Swachh Bharat Mission - Gramin, and the 15th Finance Commission. The Development and Panchayat Department and I&WRD are working together to implement it, with the HPWWMA serving as a technical support and monitoring agency and the PHED serving as an inspection agency after the work is completed. A greywater management system has been installed in 620 villages as part of the plan, and projects for another 760 communities are in the works.

To provide a safe drinking water supply, the state has established a broad network of 44 laboratories, including 1 state-level NABL recognised lab, 21 district-level NABL accredited labs, 21 block-level labs, and 1 mobile van. All of the labs contain qualified professionals and state-of-the-art technology. In comparison to the annual aim of 1,29,000 tests for FY 20-21, 1,38,272 tests were completed, representing a 107.19 percent success rate. In the current fiscal year 2022-23, 21 sub-district laboratories are also expected to receive NABL certification.

To encourage and engage residents in water quality testing, the PHED has created an online portal for water sample testing at https://phedharyana.gov.in/. Citizens have submitted 2238 applications to the portal thus far.

To ensure the JJM scheme's long-term viability, the PHED department is working to empower gram panchayats on the ground. It is proposed that a Village Water & Sewerage Committee (VWSC) be formed at the village level, with the Sarpanch as Chairperson and members including PHED Junior Engineers, Panchayat Department Junior Engineers, Gram Sachiv, and other members. Planning, monitoring, and infrastructure enhancement would be required by the VWSC, as well as Operations & Management, Accounting and Record-Keeping, Customer Services, Billing & Collection, Information, Education, and Communication (IEC) & Human Resource Development, and Grievance Redressal.

9.1.3 Jal Shakti Abhiyan

'Jal Shakti Abhiyan: Catch the Rain- 2021' was a nationwide campaign launched by the Hon'ble Prime Minister of India with the theme "Catch the rain- where it falls, when it falls". The focus of the campaign was on saving and conserving rainwater in the pre-monsoon and monsoon periods of 2021, covering both urban and rural areas of all the districts in the country. National Water Mission (NWM), Ministry of Jal Shakti was the nodal agency for this campaign to be taken up during the pre-monsoon and active monsoon periods i.e. from 22nd March to 30th November 2021.

The JSA aimed at making water conservation a 'Jan Andolan' through asset creation and participatory campaign, just like Swachh Bharat Abhiyan. The goal of JSA was to nudge the states and all stakeholders to create RWHS (Rain Water Harvesting Structures) suitable to the climatic conditions and sub-soil strata, with people's active participation. During the campaign, officers, groundwater experts, NGOs and scientists from the Government of India worked together with State and district officials in India's all districts for water conservation and water resource management by focusing on the accelerated implementation of six target interventions, namely:

a) Water conservation and rainwater harvesting.

b) Renovation of traditional and other water bodies/tanks.

c) Reuse, borewell recharge structures.

d) Watershed development.

e) Intensive afforestation.

f) Krishi Vigyan Kendra Melas.

g) The following special Interventions were proposed to be carried out:

h) Development of Block and District Water Conservation Plans.Krishi Vigyan Kendra Melas to promote efficient water use for irrigation.

i) Village-level contour maps may be created and made accessible for efficient planning of interventions.

j) GIS mapping of all water-related structures.

k) In ‘Jal Shakti Abhiyan: Catch the Rain- 2021’ Haryana achieved the creation of 49,136 water conservation and rainwater harvesting structures, renovation of 8,623 traditional waterbodies/tanks, creation of 25,921 reuse and recharge structures, 6,238 watershed development-related works and plantation of 1,42,92,229 trees

Various IEC activities were undertaken under Jal Shakti Abhiyan, which includes twit under #jalshaktiabhiyan; radio jingles; *nukkad nattaks*; newspaper advertisements; films/ documentaries; Taru Yatras; Prabhat Pheris; Paudhagiris; special projects such as crop diversification; micro-irrigation, etc.; wall paintings; school competitions etc.

District Water Conservation Plans for all 22 districts of Haryana were prepared. Hon'ble Minister of Jal Shakti, the Government of India appreciated the work done by the state of Haryana during "Jal Shakti Abhiyan: Catch the Rain" – 2021. The work done in the districts of Bhiwani, Rewari, Mahendragarh, Ambala and Kurukshetra was especially applauded.

After the successful implementation of JSA in the year 2021, the third phase of Jal Shakti Abhiyan was launched by the Hon'ble President of India from 29th March 2022 to 30th November 2022, covering both urban and rural areas of all the districts in the country. Some new features of this campaign were spring shed development, protection of water catchment areas, and gender mainstreaming in the water sector. Gender mainstreaming is anticipated to promote the role of women in water governance/conservation and management. Deputy Commissioners and village sarpanches played a key role in persuading the local population to participate actively in water conservation efforts.

In 'Jal Shakti Abhiyan: Catch the Rain- 2022' Haryana achieved the creation of 10,643 water conservation and rainwater harvesting structures, renovation of 4,343 traditional water bodies/tanks, creation of 9,514 reuse and recharge structures, 2,290 watershed development-related works and plantation of 1,49,26,363 trees. Apart from the above, around 12,000 IEC activities were carried out during 2022-23 to spread awareness of rainwater conservation and harvesting.

9.1.4 Atal Mission for Rejuvenation and Urban Transformation (AMRUT 2.0)

The Atal Mission for Rejuvenation and Urban Transformation 2.0 (AMRUT 2.0) was launched by the Hon'ble Prime Minister 1st October 2021. This mission aims to develop water-secure and self-sustaining cities in the spirit of Aatma Nirbhar Bharat.

A Tripartite Agreement/Memorandum of Understanding (MoU) has been signed on 01.10.2021 between the three stakeholders i.e. Ministry of Housingand Urban Affairs (Nodal Department of GoI), State Government of Haryana &Urban Local Bodies of Haryana as a part of joint understanding for the implementation of the said scheme. All 93 ULBs + Ambala Cantonment Board are covered under AMRUT 2.0 and signed this agreement.

This mission focus is on achieving the below given functional outcomes through project implementation under AMRUT 2.0 as one of the means. While formulating the projects, it is to be ensured that households of Informal settlements and low-income groups are duly considered.

Sr. No.	Functional outcomes	Admissible elements of Projects
1	Providing universal piped water supply with functional household water tap connection	• Water source improvement and augmentation in the city • Fresh Water treatment • Water distribution system in uncovered areas • Augmentation of the existing water distribution system • Sustainability of quality and quantity of water supply • Reuse of treated used water • Provision for 24x7 water supply# • Smart solutions like SCADA • Last mile connectivity to households (Not exceeding ₹ 3,000 per HH)
2	Providing universal coverage of sewerage and septage management in 500 AMRUT cities and promoting circular economy of water	• Sewerage network • Interception and Diversion (I&D) infrastructure • Sewage Treatment Plants (STPs) • Tertiary Treatment with end-to-end reuse plan (preferably in PPP mode) • Faecal Sludge and Septage Management (FSTP cum STP Plant & collection mechanism) • Provision/ augmentation and rehabilitation of sewerage systems with end-to-end treatment and reuse • Tapping of used water for recycling • Identifying the bulk users of recycled used water and facilitating the sale of used water to potential users (e.g. industrial clusters such as textile/ leather/ paper/ power plants/ railways, etc.) • Smart solutions like SCADA

Sr. No.	Functional outcomes	Admissible elements of Projects
		• Last mile connectivity to households (Not exceeding ₹ 3000 per HH)
3	Rejuvenation of water bodies to augment water and enhance amenity value and development of green spaces	• Rejuvenation of wetlands, and water bodies by desilting, strengthening the embankments, and stone packing. • Diverting the polluting drains to treatment plants. • Harvesting the rainwater through storm water drains into the water body (which is not receiving sewage/effluent). • Strengthening/rejuvenation of the aquifers/community wells. • Creation/strengthening of stormwater drains around the water body • Provision of STP to treat inflow into the water body. • Development of the community green spaces linked to a clean water body • Funds for the projects of this sector shall not exceed 5% of the total project allocation (4% for the rejuvenation of water bodies and 1% for the development of green spaces & parks).
	Outcomes-based funding	• Functional outcomes in terms of functional water tap and sewer connection to households beyond the baseline and not covered by AMRUT, implemented on or after 1 Nov. 2021, shall be considered for funding. (Note 3)

The Funding Pattern under AMRUT 2.0 is as follows:

ULBs	Central Share
Union Territories	100% project funds by Centre
Northeastern States and Himalayan States	90% of the project funds by Centre
With less than one lac population	50% of the project funds by Centre
With a population of one lac to ten lac (both included)	1/3rd of the project funds by Centre
With a population of more than ten lac	25% of the project funds by the Centre (except for projects taken up under PPP mode)

INR 1,494 Crores has been allocated to Haryana as admissible Central Assistance (Includes Central Share of project fund and funding towards functional outcomes) and INR 48.55 Crore towards A&OE. Mission at the State level is being led by State Mission Director, nominated by the State Government. The release of funds under AMRUT 2.0 is linked with a number of *Reforms* with a primary objective to strengthen the ULBs. There are 3 Mandatory reforms and 15 Incentive based reforms.

In Haryana State, all works relating to Water Supply, Sewerage, Reuse of Treated Waste Water etc. are executed by Public Health Engineering Department in all towns whereas works relating to the Rejuvenation of water bodies to augment water and enhance amenity value and development of green spaces is executed by Urban Local Bodies Department. Hon'ble CM, Haryana approved the same on 11.02.2022. AMRUT 2.0 is being implemented through an Institutional mechanism which includes Apex Committee at National Level and State High Powered Steering Committee and State Level Technical Committee at the State level.

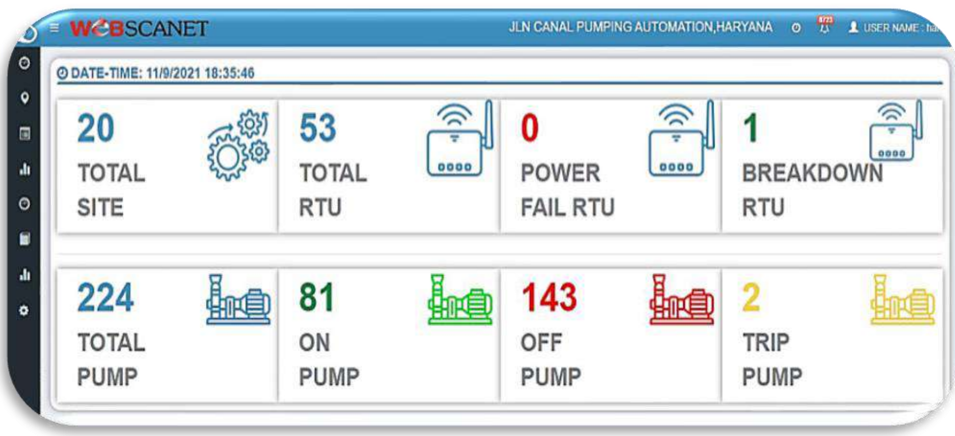
9.1.5 National Hydrology Project

The National Hydrology Project aims to increase the scope, quality, and accessibility of water resource information, as well as to strengthen the competence of targeted water resource experts and management organisations throughout India. It consists of four key components:

- Water resources monitoring system- Improved water resources data in terms of scope, timeliness, and reliability in this component. Funding the building of data centres that capture both water resources and usage, as well as the installation or upgrade of new and current hydromet data systems, including meteorological, streamflow, groundwater, and water storage measures. All states/UTs are executing the component with the help of a central implementing agency.
- Water Resource Information System- Strengthen national and subnational water information centres with web-enabled water resources information systems by standardising databases and products from various data sources/departments and making comprehensive, timely, and integrated water resources information available to decision-makers for effective planning, decision-making, and operations.
- Water Resources Operation and Planning System- Development of interactive analytical tools and a decision-making platform to integrate a database, models, and scenario manager for hydrological flood forecasting, integrated reservoir operations, and water resource accounting for better surface and groundwater operation, planning, and management. Under component 2, interactive systems to study the effects of alternative management scenarios and develop knowledge products utilising real-time data.

- Water Resources Institutions Capacity Enhancement- Component 4 aims to improve knowledge-based water resource management capabilities. It would help to fund the building of water resource knowledge centres, as well as professional development, project management, and operations.

The Haryana government is implementing the National Hydrology Project (NHP) in the state, which would cost INR 50 crore and last for eight years, from 2016 to 2024. Farm communities chosen for trial projects, rural and urban water and power users, and those affected by floods and droughts would be the end beneficiaries, and such households might profit from enhanced irrigation water supply and management. Under the National Hydrology Project, a Memorandum of Understanding was signed between the Principal Secretary of Haryana's Irrigation and Water Resources Department and the Joint Secretary of the Union Ministry of Water Resources, River Development, and Ganga Rejuvenation. The goal is to establish monitoring networks across Haryana, with a focus on the deployment of new sensors, data storage, and telemetry technology and to create comprehensive, contemporary, and automated real-time surface and groundwater monitoring systems. It entails major projects such as the installation of a Real-Time Data Acquisition system for 90 canal locations, a SCADA system at Hathnikund Barrage and 20 Pump Houses in JLN, the renovation of the Knowledge Centre, the construction of a Peizometric Tube and the installation of a Digital Water Level Recorder, and the sediment assessment of the Kaushalya Dam and River, among others. The NHP is anticipated to improve and expand hydrology data and information systems, strengthen water resource operation and planning systems, and boost institutional water resource management capabilities. The State is ranked first in the country for program implementation.



In order to effectively manage water supply systems, innovation and technology are critical. The efficient delivery of irrigation services requires continued access to precise information on canal flows to diverse stakeholders in the irrigation ecosystem in a timely way.

In August 2021, the state commissioned 90 real-time data acquisition systems (RTDAS) for monitoring water levels and discharge in irrigation canals, as well as supervisory control of all gates of the Hathnikund Barrage and 20 pump houses of the JLN Canal System, via a Supervisory Control and Data Acquisition (SCADA) system.

RTDAS 90 Locations:

The RTDAS system offers real-time data on water flow in irrigation canals. The data produced by RTDAS can easily verify canal regulation actions such as gate opening and closing or adherence to established schedules. Employees at all levels of the company benefit from unrestricted 24/7 access to field data. At the field level, it aids with the prevention of incidents caused by human error and allows for a swift response to events. It assists senior management in maintaining monitoring and ensuring responsibility. It also aids in the prediction of canal water theft or loss due to breach, among other things.

JLN SCADA:

A SCADA-based decision support system to assist smooth running of supplies in JLN Canal Systems. On 20 JLN Canal Pump Houses, the SCADA system is installed, commissioned, operated, and maintained. SCADA is making it easier to distribute water to off-taking distributors and minors in an equal and timely manner. It includes the following:

- Sensors for water level, inflow/outflow discharge, motor operations, Energy monitoring system, Condition monitoring system, and other field equipment at JLN Canal pumping stations, as well as RTU/PLCs for a degree of local control at pumping stations.
- Communication between existing Master and Local control stations using VSAT and cellular networks at the same time for redundancy.

- Motor activities based on water schedules are monitored and controlled using SCADA software with computer processing to provide data in a usable format and relay instructions back to the local control stations (Client SCADA).

The project's overall goal is to monitor and control water flow through the JLN Canal network utilising condition-based monitoring systems, based on water scheduling and availability, automatic pump operations, energy efficiency monitoring, and predictive and preventative diagnosis of pumping systems. Flows and other data from the SCADA system are used to calculate how much water has been given to various areas of the canal system, as well as to ensure that water and energy are not squandered.

HKB SCADA:

Hathni Kund Barrage is built on the Yamuna River. Its Construction was completed in 1999. This barrage has eight under-sluice gates measuring 18000 x 5320 mm and ten additional bay gates measuring 18000 x 4320 mm. The irrigation canals West Jamuna Canal (WJC) and East Jamuna Canal (EJC) are built on the right and left sides of the barrage, respectively.

The salient features of HKB SCADA are:

- The Dynamic Gate Operation Scheduling Program determines the position of each gate based on the required water discharge.
- The scope of work includes the creation of a dynamic scheduling programme.
- From the Control Panel, the operator should be able to control the movement of individual gates. This is required for both testing and emergency situations.
- SCADA System Gates are automatically operated.

SCADA-based operations provide the following advantages:

- The parameters/data acquired from the local sensors directly wired/wireless and from the Master Control Facility were used in a computerised remote-control system for discharge regulation from Barrage.
- It regulates gates in such a way that the discharge through the channel is controlled without jeopardising safety.

- Water levels in the Barrage, for example, shall be taken into account when releasing discharges through the canal's gate opening. The Barrage control software adjusts the gate openings of the Barrage/Head Regulator gates automatically.
- In a closed-loop system, the gate positions can be adjusted regularly based on received/calculated data.
- The system is provided with a watchdog & self-diagnostic facility. The remote monitoring station at Panchkula HO for online monitoring of the happenings at the dam.
- Using GSM/GPRS wireless telemetry, the Master Control system sends data to the Remote Monitoring Station at predetermined intervals. This time interval can be chosen anywhere between 15 minutes and 24 hours. In addition, monitoring software allows you to examine and print data in the formats you need. All of the gates are now monitored by cameras in real time.

9.1.6 Mera Pani Meri Virasat Yojana

During Kharif 2020 State Government launched a new scheme “Mera Pani Meri Virasat” to diversify the Paddy Crop (water-guzzling crop) into alternative less water-consuming crops like Maize, Cotton, Bajra, Pulses, Vegetables and Fruits in the State. Under the “MPMV”, the assistance of INR 7,000.00 per acre is being provided to the farmers who have replaced their paddy crop with alternate crops during Kharif- 2021 the MPMV scheme was continued with some additional alternate crops like Kharif Oilseeds (Til, Caster, Groundnut), Kharif Onion, Kharif Pulses (Moth, Urd, Guar, Soyabean). Even fodder crops and fallow lands were also added. Bajra crop was dropped from the above-said scheme. The scheme continued in the FY 2022-23.

Main Objectives of the Scheme:

(i) To reduce the area of water-guzzling crops (paddy) in Haryana for crop diversification which has various added benefits.

(ii) To restore the groundwater table which has declined in recent decades due to over-exploitation by Paddy farmers.

(iii) To shift farmers from the paddy-wheat cycle which is not in the national interest and give more profitable crop options (like Horticulture & vegetables) to the farmers. The continuous use of Rice-Wheat crops for long period causes soil fatigue. The soil health has deteriorated owing to a decline in the organic fraction and widespread deficiencies of micronutrients.

(iv) Induction of technological innovation for establishing alternate crops for sustainable agriculture.

Details of the Scheme (guidelines):

1. The scheme was implemented in all the districts throughout the State with a target of 1.0 Lac Acre. However, the district may be given an additional budget if it exceeds the given target.

2. Farmers are given an incentive of a number of INR 7,000.00 per acre for diversification of paddy by alternate crops i.e. Maize, Cotton. Kharif Pulses (Arhar, Moong, Moth, Urd, Guar, Soyabean), Kharif Oilseeds (Til, Castor, Groundnut), Fodder crops, Kharif Onion, Horticulture/Vegetables and even in case of fallow land also.

3. The incentive of INR 7000.00 per acre is provided to the beneficiaries in one instalment after physical verification of the field in the prescribed proforma by a committee consisting of ADO/HDO, Patwari, Numberdar and the concerned farmer, after 15th August 2022 and the crops get verified through the MFMB portal. To avoid payment failure through the treasury, the incentive is provided to the farmers in their accounts through the e-payment Gateway.

4. Those farmers are eligible who had cultivated paddy last year and want to cultivate alternate crops on the same field during this Kharif, 2022 season. The farmers who adopted crop diversification during last Kharif, 2021 under MPMV are also eligible this year for getting incentive if they continue sowing alternate crops instead of paddy on the same field.

5. The farmers who kept their last year's Kharif paddy fields fallow during this Kharif, 2022 are also eligible for getting the incentives.

6. Interested farmers have to register themselves on the MFMB portal.
7. The MFMB portals opened from 15.05.2022 and kept open for registration by the farmers till 30.06.2022.
8. The farmer's share of Crop Insurance of the above-mentioned alternate crops covered under PMFBY borne by the farmer at his own discretion within the incentive provided.
9. The Government ensured the 100% procurement of all the alternate crops on MSP if the crop falls under MSP fixed by GoI.
10. The zone-wise officers deputed by the A&FWD and Horticulture Department for achieving the targets of this Scheme.
11. The Department informed the farmers about the package of practices of these alternative crops through various IEC (Information Education and Communication) activities. The success stories should be recorded. The KVKs and DDAs should aware the farmers about MPMV practices by arranging a visit to such fields.

Outcome:

- Under this scheme, during Kharif-2020 an area of 63,950 was diversified in the state and an incentive of INR 44.76 crores were provided to the eligible farmers.
- During Kharif, 2021, an area of 51,877 acres was diversified in the state and an incentive of INR 30.96 crores have been provided to the eligible farmers.
- During Kharif-2022, an area of 84,000 acres was registered against the target of 1,00,000 acres.

9.1.7 Direct Seeding of Paddy

Paddy is conventionally grown by transplanting seedlings in puddled soil. The farmers usually use different types of paddy transplanters that require mat-type seedlings. The speed of adoption of the transplanter in India is quite slow due to the complexity of the machine's operation, its expensive cost, the requirement of growing mat-type seedlings, and variations in machine efficiency in different types of soil and also in different fields. With the development of superior cultivars and the introduction of powerful weedicides, Direct Seeded Rice (DSR) is gaining traction. Farmers are gradually adopting the DSR technology, which involves distributing dry paddy seeds in well-pulverized soil. The mixing of seed in soil caused by tillage devices results in seed dissemination at varying depths in a randomised pattern, resulting in poor seed germination and crop establishment. In the case of DSR, no nursery preparation or transplantation is required. Farmers only need to level their soil and apply one round of pre-sowing irrigation.

In Haryana, this strategy is being encouraged in 12 districts, namely, Ambala, Yamunanagar, Karnal, Kurukshetra, Kaithal, Panipat, Sonipat, Jind, Fatehabad, Sirsa, Hisar and Rohtak. The Haryana government aims to allocate an area of 1 lac acres for demonstration. The farmers who practise the direct seeding technique were given financial aid of INR 4,000 per acre. This scheme can also save as much as 15-20% of water. Besides this, a lesser number of labourers is required, thereby saving labour costs. Methane emissions are tremendously owing to a shorter flooding period and decreased soil disturbance compared to the traditional method of transplanting rice seedlings.

9.1.8 Meri Fasal Mera Byora

Haryana Government has launched Meri Fasal Mera Byora Yojana in 2022 for the farmers of the state wherein a portal has been launched. The farmers availed benefits of several government schemes directly after uploading their crop-related details.

- It is a multi-level, transparent system, and this program was a step toward increasing the income of farmers by 2022.
- The system allowed farmers to self-report their land and crop information, allowing them to obtain direct benefits from a variety of government programmes.
- For the benefit of farmers, the portal fasalhry.in has brought together the departments of agriculture and farmer welfare, revenue, food civil supply and consumer affairs, and research and technology on one platform.
- The site was created to ensure that farmers receive the benefits provided by the state government, such as insurance coverage, reimbursement for crop loss caused by natural disasters, and other financial help through various schemes.
- The government also received correct data on the area and name of crops cultivated in various sections of the State via the portal.
- Farmers had to upload information such as the name of the crop sown, area under cultivation, cropping month, bank account number, and mobile number on the portal by July 31st for Kharif and December 31st for Rabi Crops with the help of Village Level Entrepreneurs (VLEs) at nearby Common Service Centres (CSCs) or Atal Seva Kendras.
- If the farmer has not yet sown any crop, he needed to fill in the facts regarding the non-cultivated area.
- Under this approach, e-girdawari (harvest inspection) was undertaken, and the concerned officer stayed physically present in the field while conducting girdawari. After that, the departments handled the registration.
- When the crop is ready for harvesting, the Science and Technology Department took satellite photos of the field. These photographs included in their registration as well. If a disparity is discovered in the girdawari, the Deputy Commissioner in charge performed a special girdawari.

- Each farmer received a financial incentive of INR 10 per acre or part thereof, subject to a minimum of INR 20 and a maximum of INR 50, for registering on the platform.

Some noteworthy benefits of the portal are:

Subsidy: The portal makes it simple for farmers to obtain subsidies on agricultural implements.

Relief: This system makes agricultural damage assessment and relief disbursement easier during natural disasters.

Information: This portal provides real-time information on sowing, harvesting season, and mandi-related information. Furthermore, it makes seed distribution, fertiliser distribution, and farm loan distribution more transparent and simpler.

Collaboration: Various departments to work together to verify that the data given by the farmers is accurate. For the benefit of farmers, the portal has brought together the departments of Agriculture and Farmers Welfare, Revenue, Food Civil Supplies and Consumer Affairs, and Science and Technology on one platform.

Time-Saving: This system allows for the registration of all land, whether cultivated or not, at the same time.

Cross-checking: With the submission of crop cultivation data, the government could keep an eye on farmers who come to Haryana from other states to sell their produce. At the *mandis*, the records of Haryana farmers who are coming to sell their products could be compared to the area cultivated.

9.1.9 Mukhya Mantri Pragatisheel Kisan Samman Yojana

The Mukhya Mantri Pragatisheel Kisan Samman Yojana was launched by the Haryana government with an aim to encourage progressive farmers to use optimum farming practices. In addition, the Haryana progressive farmer incentive system enabled farmers to contribute to the Hon'ble Prime Minister's initiative of "Doubling of Farmers Income" by 2022. Progressive farmers were motivated to achieve sustainable agriculture goals by being recognised and honoured, and they also educated their fellow farmers about the best agriculture methods. Selected farmers were aided under the Mukhya Mantri Pragatisheel Kisan Samman Yojana 2022 by receiving monetary prizes/awards for their exemplary efforts in agriculture/allied sectors. The scheme is run by the Haryana Agricultural Department. Under this, the Haryana government provides an incentive of INR 60 lac to 96 farmers of the State for their better cultivation practices and to the farmers who adopt new techniques of farming and are already working in this direction. Cash awards were also given for works like getting more produce from crops, saving water, crop residue management, organic farming, integrated farming systems, and sustainable agriculture.

A total of 96 farmers were awarded under the Kisan Samman Scheme of the Haryana Government. Cash amount of INR 5 lac to the farmer who wins the first prize at the State level and 2 prizes of INR 3 lac each were given. At the same time, 5 awards of INR 1 lac each were given to 5 progressive farmers. Apart from this of INR 50,000 each was given to 88 progressive farmers. Farmers who have 5 to 10 acres of land were eligible to receive a consolation reward of INR 50,000 four farmers from every district of the State were selected for this award.

The benefits of this scheme are:

- Farmers who do advanced farming in the state are awarded cash awards.
- Cash prizes to farmers who get more produce from crops.
- Farmers who have adopted water saving, crop residue management, organic farming, adoption of integrated farming systems and sustainable farming practices can also apply.
- Inspired by the awardees, other farmers could also take up advanced farming in the agriculture sector by adopting the new technology of agriculture.

9.1.10 Pond Rejuvenation Project

The Haryana Pond and Waste Water Management Authority (HPWWMA) geotagged 19,321 ponds in the State of Haryana.

- Total 19,321 (Rural: 18,458; Urban: 863) ponds as per PDMS.
- Having area =>0.5 acre: 18392 (Rural: -17608, Urban: - 784)
- Having area <0.5 acre 929 (Rural: -850, Urban: - 79),
- Polluted and overflowing ponds: - 1976 (Rural: - 1922; Urban: - 54)
- Polluted but not overflowing ponds: - 10229 (Rural: - 9764, Urban:- 465)
- Clean Ponds: - 5066 (Rural: - 4969; Urban:- 97)
- Dry Ponds:- 2041 (Rural:- 1794, Urban:- 247)

In 2019, the state government devised a plan to rehabilitate the Ponds in rural and urban areas across the state in order to analyze pond water to ascertain its suitability for irrigation and other uses. On the National Green Tribunal's instructions, Haryana's Pond and Waste Management Authority requested IWRD, PR-PW & ULBD to identify water bodies within their jurisdiction and issue them a unique identification number so that data may be collected for their preservation. Initially, HPWWMA took 18 model ponds for rejuvenation on a pilot project basis in FY 2019-20. Rejuvenation of ponds is primarily concerned with the beautification, and demarcation of areas utilization of Pond Water for fishing, agriculture, animals and water conservation for irrigation.

As per the Directions of Hon'ble CM Haryana, all polluted and overflowing ponds were proposed to be taken for Rejuvenation during FY 2021-22 with an allocated budget of INR 800 crores. Presently, a total of 5,454 ponds have been taken for rejuvenation for the FY 2022-23, 2023-24 and 2024-25.

The above includes the rejuvenation of 1,660 Ponds under the Amrit Sarovar Scheme. As per guidelines & directions of MoRD (GoI), the work is to be completed by 15.08.2023. As per Ground Water Level Survey, out of a total of 2,642 Ponds in

1,655 villages (Water Stressed Zones), a total of 1,097 Ponds in 619 villages have been taken for rejuvenation under various schemes. As of date, a total of 5,454 Ponds has been taken for rejuvenation under various schemes e.g. Amrit Sarovar, Model Pond, GWM and Swachh Bharat Mission-Gramin, for the FY-2021-22, 2022-2023 and 2023-2024. The treatment of grey water entering the pond is being done through Constructed Wetland Technology (CWL). The excess water of overflowing ponds is being used for agriculture through micro-irrigation. The Native Trees are planted all around the ponds in the buffer area.

9.1.11 Reclamation of Saline and Waterlogged Land

With the technical assistance of the Central Soil Salinity Research Institute (CSSRI), Karnal, the Haryana Operational Pilot Project (HOPP) of the Department of Agriculture, Haryana has implemented Sub Surface Drainage (SSD) system projects in waterlogged and saline soils throughout the State for the past two decades. Up till June 2021, 19 SSD projects in Haryana, including vertical drainage, reclaimed a total of 11,260 acres of crucial waterlogged saline soils, benefiting 7,948 people. From saturated saline soils, the project has aided in increasing/restoring agricultural yield and farmers' revenue. These projects were carried out by Agriculture Department. For the monsoon season in Haryana, the state must urgently plan, construct, and implement technically possible, economically viable, and ecologically acceptable short and long-term measures for minimising waterlogging and soil salinity, as well as managing surface water stagnation/flooding. The Haryana government has set a target of reclaiming one lac acres of waterlogged and salty areas in the next two years as part of its ongoing commitment to reclaim waterlogged and salinized fields.

The Department of Agriculture and Farmers Welfare (A&FWD) has produced a lucrative proposal to reclaim saline soil, which has been submitted to the government and accepted. Salinity and waterlogging have harmed 1,80,244 acres of land in the Sonipat, Jhajjar, Rohtak, and Charkhi Dadri districts. The A&FWD field functionaries conducted and finished the survey of these four districts in the first phase, which covered 415 villages and reached out to 827 farmers.

In the second phase, a team of representatives from all interested departments - Fisheries, Forest, I&WRD, Panchayati Raj, Horticulture, and A&FWD – would undertake a joint survey and obtain written approval from farmers, specifying the area to be covered and the technology to be used under the project. In addition, the project's second phase will include four new districts: Sirsa, Bhiwani, Fatehabad, and Hisar.

The ICAR-Central Soil Salinity Research Institute (CSSRI) will participate in this endeavour by providing necessary support on reclamation technologies for integrated planning and development of projects for the reclamation of one lac acres of waterlogged saline land in the State. The institute will take the lead in providing technical guidance on this project, which will include joint ground-truthing of problem areas, the preparation of a macro-level Detailed Project Report (DPR) for funding, the evaluation of drainage and reclamation project designs, and the monitoring of reclamation project implementation, among other things. The DPR is required in order to obtain finance from NABARD, HARCO, and other nationalised banks.

9.1.12 Micro Irrigation

Micro Irrigation scheme to replace Flood Irrigation

Although water is a renewable resource, its availability in appropriate quality and quantity is under severe stress due to increasing demand from various sectors. Agriculture is the largest user of water, which consumes more than 80% of the state’s exploitable water resources. The overall development of the agriculture sector and the intended growth rate in GDP is largely depending on the judicious use of the available water resources. While the irrigation projects (major and medium) have contributed to the development of water resources, the conventional methods of water conveyance and irrigation, being highly inefficient, has led not only to wastage of water but also to several ecological problems like water logging, salinization and soil degradation making productive agricultural lands unproductive. It has been recognized that the use of modern irrigation methods like drip and sprinkler irrigation is the only alternative for the efficient use of surface as well as groundwater resources. Hence, this scheme on Micro Irrigation aims at increasing the area under methods of irrigation viz. under drip and sprinkler irrigation systems.

Objectives

1. To reduce the over-exploitation of available water resources including groundwater.
2. To reduce the cost of cultivation, weed problems, and soil erosion.
3. To increase the water, electricity and fertilizer use efficiency.
4. To improve the performance of related sectors viz. irrigation and water resource, fertilizer, power, banking, agriculture, forest and environment, petroleum and petrochemical.

Type of farmer

Generally in Haryana State, farmers usually have small land holdings & categorized accordingly. The farmer type depending upon ownership of total land holding is defined as under:

a) Marginal Farmer	-	Area up to 1.0 ha.
b) Small Farmer	-	Area from 1.0 ha. to 2.0 ha.
c) Other General Farmer	-	Area greater than 2.0 ha.

Pattern of assistance

Micro Irrigation covers various micro irrigation systems like drip irrigation systems, mini sprinkler systems, portable sprinkler systems etc. The assistance for these systems is to be provided as per the guidelines of the Government of India and State policy, which is 55% for small and marginal farmers and 45% for other farmers. State Government. provides extra assistance to all farmers up to the extent of an 85% subsidy on the equipment. The assistance is limited to five ha. per beneficiary family. The scheme covers all categories of farmers. The scheme is being implemented through Implementing Agency (IA) at the district level under the guidelines of Govt. of India.

Encouraging Tank-based Irrigation.

It is realized that irrigation water is a very precious resource, especially in areas of lift irrigation where Government spends a huge amount of money to pump the water (up to 8 times in the Rewari/Bhiwani area for instance).

Since the farmers feel they get canal water for their limited time as per *warabandi*, generally they go for flood irrigation. Also, they time the application of fertilizer etc. as per the availability of water rather than as per need. Farmers need to move from flood irrigation as per wari (turn) to control irrigation (preferably sprinkler/drip) as per requirement. But for controlled irrigation to happen storage of canal water at or near the fields is necessary. For the new paradigm of controlled irrigation using stored water, new storage tanks at/near the fields are needed. Also since the land holdings are small we may have more than one water storage tank in every *chak/chunk* of land.

The On-Farm Water Tank Policy 2021 was introduced by MICADA keeping the aforementioned in mind. According to the policy, a farmer or group of farmers will receive a 70% to 85% subsidy if they choose to excavate the on-farm water tank at their own level. The farmers will move to micro-irrigation techniques as a result of receiving 85% of the whole cost of installing a micro-irrigation system and a 75% subsidy of the total cost of installing a solar-powered pump, respectively.

Pattern of assistance

i) Assistance @85% of the construction cost of the water tank shall be applicable in the case of the community water tank. However, it shall be 70% of the construction cost of the water tank in the case of an individual farmer.

ii) Assistance norms which are applicable at the time of the case shall be followed.

iii) The cost norms for assessment of the construction cost of the water tank will be followed as per prevailing rates of the HSR/I&WR Department.

iv) Assistance shall be released on the community as well as an individual water tank in 3 stages of ongoing construction work i.e.

Stage-I: 60% of the total cost of earthwork executed as per MB (digging of a tank);

Stage-II: 60% of total eligible assistance including Stage-I after completion of the water tank as per measurement recorded in MB; and

Stage-III: Remaining eligible assistance i.e. 40% after installation of MI system.

v) Assistance shall be released after physical verification of structure by a team constituted or through any agency as decided by the Administrator, MICADA.

vi) Assistance shall be credited directly to the bank account of the beneficiary. However, in the case of the community tank, the assistance shall be credited to the joint bank account of a group of farmers / a farmer authorized by all members of the group.

Annual Budget 2022-23

A budget provision of INR 946.52 crore was kept for the year 2022-23. Out of which budget provision of INR 606.42 crore was made under PMKSY-PDMC to cover 2.5 lakh acres. In addition to the above, to assure irrigation through micro-irrigation, assistance for INR 4,000 On Farm Water Tank (Community or Single) was also provided.

9.1.13 Haryana Treated Waste Water Irrigation Project

In July 2019, the 'Project Report for Haryana Treated Waste Water Irrigation Project' (hereafter referred to as 'Haryana TWW IP') was prepared for INR 1,098.25 crores, covering practically all of the State's existing, under construction, and projected STPs. This was a massive project that was supposed to be completed in stages, starting with the towns that pollute the Yamuna and Ghaggar rivers the most.

There will be 207 STPs in the Haryana TWW IP, with a treatment capacity of 1,828 MLD or 747 cusecs. This project will cover a total of 6.05 lac acres in new and existing commands, with a 66 percent (21.0 percent in Kharif and 45.0 percent in Rabi) irrigation intensity, delivering real irrigation to roughly 4.00 lac acres (1.28 lac acres in Kharif and 2.72 lac acres in Rabi). The scheme's total cost has been calculated to be INR 1,098.25 crores at current prices, with a BC ratio of 1.69:1. This project is expected to take 5 years to complete, with an annual budget of around INR 220.0 crores at current pricing. In addition to the 207 STPs listed above, 35 STPs have been chosen to implement micro-irrigation. These 35 STPs in 21 districts of the State have a combined treatment capacity of 338.85 MLD, and the Government of India has sanctioned a project for these STPs, titled "STP MI Project under NABARD aided MIF" for INR 490.53 crores.

9.1.14 Soil Conservation Projects

Water storage/water harvesting activities (Farm Ponds/Community Ponds/Village Tanks), renovation of existing water bodies, check dams, earthen dams, drop structures, and installation of Micro Irrigation Systems, among other things, are all being carried out by the Department of A&FWD. The major goal of these operations is to replenish groundwater in order to conserve soil and water, as well as water conservation, harvesting, and soil health management. These approaches will also aid in moisture conservation, erosion management, land degradation prevention, crop productivity increase, and ecosystem restoration.

Soil conservation projects implemented by A&FWD in the State are:

- Integrated watershed management development project in Haryana (IWDMP)
- Soil conservation and water management on agricultural land in Haryana
- National Project on the management of soil health and fertility
- Soil health card for general and SC category farmers
- National Mission on Sustainable Agriculture (NMSA) - Soil Health Management
- Pardhan Mantri Krishi Sinchai Yojana (PMKSY)
- Rashtriya Krishi Vikas Yojana for General Category Farmers (JSA Projects)
- Rashtriya Krishi Vikas Yojana for SC category farmers (JSA Projects)
- Rashtriya Krishi Vikas Yojana (Underground Pipe Line System (UGPL) Projects
- Scheme for Development of Saline/ Waterlogged Soils in Haryana State

9.1.15 Artificial Recharge to Groundwater

In Haryana, the CGWB has installed 1,331 groundwater observation wells to monitor water levels. Monitoring of changes in water levels and chemical quality of the groundwater system at pre-selected locations called NHS stations is carried out four times a year with the National Hydrograph Network Stations (NHS) in May (pre-monsoon), August (mid-monsoon), November (post-monsoon), and January (post-monsoon) (mid-winter). These are well-placed open wells or professionally installed Piezometers that tap various aquifer systems. The information gathered at the NHS is used to create maps that illustrate seasonal depth to water level, water table elevation, seasonal fluctuations in water levels within the same year, water level changes over time, water level trends, and so on. This data is extremely useful for assessing groundwater resources and managing groundwater development.

I&WRD installed 50 injection wells in the bed Krishnawati and Dohan rivers, filling of 350 village ponds from the

Mahendragarh Canal System from various channels, enhancement of the capacity of 200 village ponds under Jal Shakti Abhiyan, and construction of 46 Check Dams/Bunds Kms with a total capacity of about 9 MCM have all been launched to maintain the groundwater table in Mahendragarh District.

Chapter 10

INTEGRATED WATER ACTION PLAN OF HARYANA 2023-2026

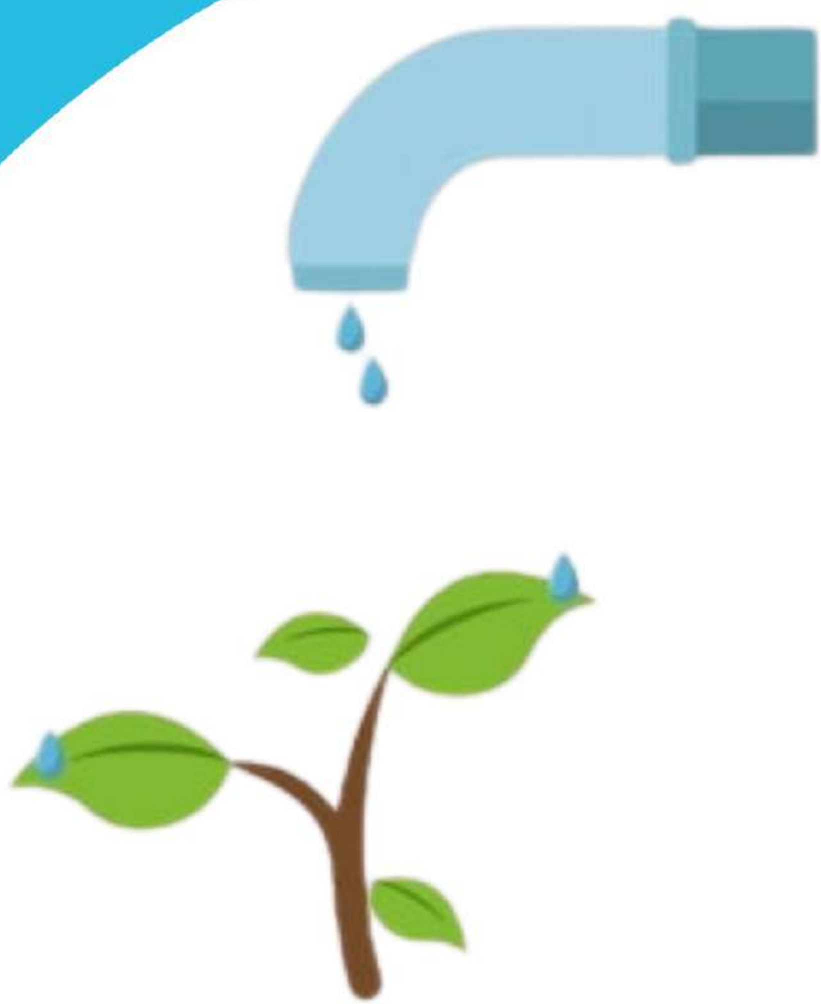


TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXURES

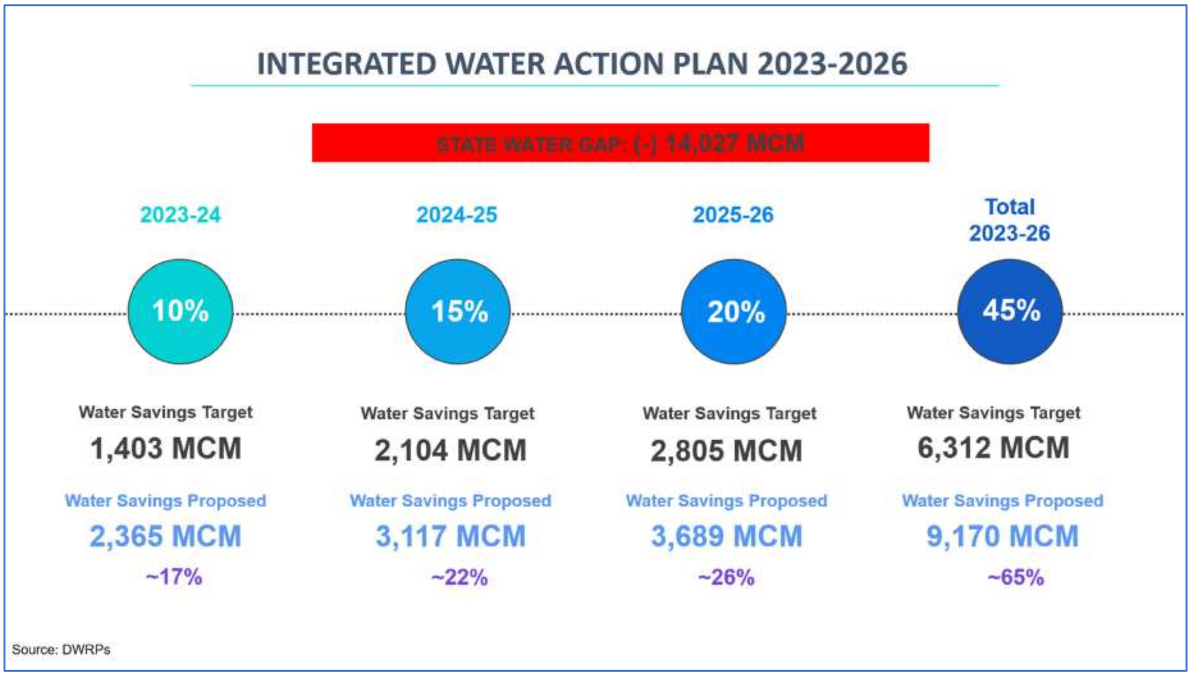
10.1 WATER SAVING AND CONSERVATION TO REDUCE THE WATER GAP

The overall water demand of the State in 2021 has been calculated to be 34,962.76 MCM whereas the total water availability from all resources is 20,935.98 MCM. The corresponding water gap for 2021 is estimated to be -14,026.78 MCM as detailed in Chapter 7. This exercise of estimating the current gap between water supply and demand has shown that the water scarcity situation is becoming more serious for the State of Haryana. knowing this gap and its main driving factors has helped the State to put forward water protection measures correctly.

Accordingly, State Water Action Plan has been formulated by HWRA to reduce the existing water gap of -14,026.78 MCM by 45% in the next three years from 2023 to 2026. The emphasis will be on the sustainable development and integrated management of water resources for the achievement of social, economic, and environmental objectives, as well as on the implementation and promotion of related programmes and projects. There will also be a focus on advancing cooperation and partnership at all levels to help meet water conservation goals. Additionally, it will assist in achieving water-related objectives and targets outlined in the 2030 Agenda for Sustainable Development.

Figure 10.1 illustrates the state water gap, three-year water saving targets set by the Haryana Government to reduce the water gap by 45% and the corresponding water savings proposed for the State by the respective 22 districts.

Figure 10.1 Set Targets and Proposed Water Savings from 2023-26 for Haryana to Reduce the Water Gap by 45%



To achieve these targets an action plan has been developed of all districts at block level by the District Water Resources Planning Committees. The proposed block-level interventions are put together to form the State Water Action Plan for Haryana State. Detailed tables and pie chart illustrating the statistical and percent share of each intervention for the entire Haryana have been shown in Table 10.1 to 10.4 and Figure 10.2. The proposed interventions are grouped into 9 major categories with the water to be saved under each category and their targets

The action plan contains both supply-side and demand-side water interventions activities into account. Supply-side water management has included a variety of ways like minimising losses in water supply; expanding the storage available; groundwater recharge; water harvesting; and reuse of wastewater. Groundwater Recharge includes activities like Rooftop Rainwater Harvesting, Shaft Pits, Injection Borewells, Percolation Tanks, Ponds, Check Dams, Trenches and Harvesting of Surface Runoff for recharging the aquifers. Whereas, demand-side interventions are focused on reducing the amount of water used for agricultural needs which includes activities like micro-irrigation, crop diversification, direct seeding of rice, conservation tillage etc.

Table 10.1 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the State of Haryana

Proposed Interventions	2023-24			
	Water Savings		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	237	23700	93349 ha	230665 acres
Modernization of Channels/Water Courses (Ha)	171	17100	285032 ha	704314 acres
Crop Diversification (Ha)	382	38200	61688 ha	152431 acres
Direct Seeding of Rice (Ha)	104	10400	42208 ha	104296 acres
Reuse of Treated Wastewater (MCM)	179	17900	179 MCM	17900 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	388	38800	9369 No.	
Fisheries Water Use Efficiency (Ha)	4	400	121 ha	299 acres
Varietal Interventions (Ha)	94	9400	134468 ha	332270 acres
Conservation Tillage (Ha)	806	80600	446590 ha	1103524 acres
Total	**2365**	**236500**		

Source: District Water Resources Plans

Table 10.2 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the State of Haryana

Proposed Interventions	2024-25			
	Water Savings		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	318	31800	113597 ha	280698 acres
Modernization of Channels/Water Courses (Ha)	271	27100	196115 ha	484600 acres
Crop Diversification (Ha)	511	51100	77947 ha	192607 acres
Direct Seeding of Rice (Ha)	198	19800	78292 ha	193460 acres
Reuse of Treated Wastewater (MCM)	249	24900	249 MCM	24900 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	451	45100	9274 No.	
Fisheries Water Use Efficiency (Ha)	4	400	124 ha	306 acres
Varietal Interventions (Ha)	135	13500	155600 ha	384488 acres
Conservation Tillage (Ha)	979	97900	495394 ha	1224119 acres
Total	**3117**	**311700**		

Source: District Water Resources Plans

Table 10.3 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the State of Haryana

Proposed Interventions	2025-26			
	Water Savings		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	385	38500	128358 ha	317173 acres
Modernization of Channels/Water Courses (Ha)	244	24400	173978 ha	429900 acres
Crop Diversification (Ha)	616	61600	91423 ha	225906 ares
Direct Seeding of Rice (Ha)	264	26400	103801 ha	256492 acres
Reuse of Treated Wastewater (MCM)	291	29100	327 MCM	32700 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	486	48600	9655 No.	
Fisheries Water Use Efficiency (Ha)	2	200	62 ha	153 acres
Varietal Interventions (Ha)	210	21000	189137 ha	467358 acres
Conservation Tillage (Ha)	1191	119100	564273 ha	1394319 acres
Total	**3689**	**368900**		

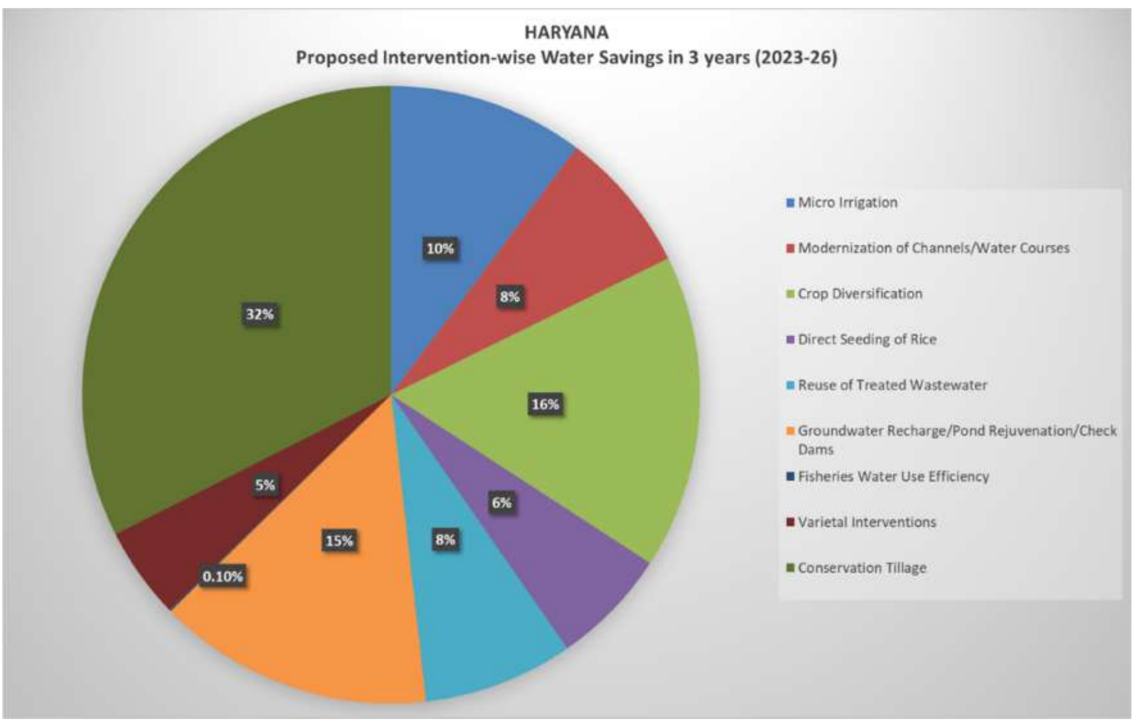
Source: District Water Resources Plans

Table 10.4 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the State of Haryana

Proposed Interventions	Total 2023-26			
	Water Savings		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	940	94000	335304 ha	828536 acres
Modernization of Channels/Water Courses (Ha)	685	68500	655125 ha	1618814 acres
Crop Diversification (Ha)	1509	150900	231058 ha	570944 acres
Direct Seeding of Rice (Ha)	566	56600	224301 ha	554248 acres
Reuse of Treated Wastewater (MCM)	720	72000	720 MCM	72000 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	1326	132600	28298 No.	
Fisheries Water Use Efficiency (Ha)	9	900	306 ha	756 acres
Varietal Interventions (Ha)	439	43900	479204 ha	1184113 acres
Conservation Tillage (Ha)	2976	297600	1506257 ha	3721961 acres
Total	**9170**	**917000**		

Source: District Water Resources Plans

Figure 10.2 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the State Haryana



10.1.1 District-wise Action Plan

This section contains the district-level action plans for the next three years for all 22 districts. The districts have further been compiled from the block-level plans prepared by the District Water Resources Planning Committees on the basis of their water gap assessment of their blocks. For a detailed block-level action plan for each district refer to Annexure 10.1. Further details on each proposed intervention can be seen in the District Water Resources Plan of the respective districts.

1) AMBALA

Table 10.5 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Ambala District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 558	2023-24	10%	56	56
	2024-25	15%	84	71
	2025-26	20%	112	95
	Total	**45%**	251	**222**

Source: District Water Resources Plan, Ambala

Table 10.6 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Ambala District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	1	100	694 ha	1715 acres
Modernization of Channels/Water Courses (Ha)	11	1100	8469 ha	20927 acres
Crop Diversification (Ha)	11	1100	1500 ha	3707 acres
Direct Seeding of Rice (Ha)	5	500	2835 ha	7005 acres
Reuse of Treated Wastewater (MCM)	12	1200	12 MCM	1200 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	16	1600	127 No.	
Total	**56**	**5600**		

Source: District Water Resources Plan, Ambala

Table 10.7 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Ambala District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	5	500	3914 ha	9673 acres
Modernization of Channels/Water Courses (Ha)	1	100	756 ha	1868 acres
Crop Diversification (Ha)	11	1100	1500 ha	3707 acres
Direct Seeding of Rice (Ha)	5	500	2835 ha	7005 acres
Reuse of Treated Wastewater (MCM)	20	2000	20 MCM	2000 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	29	2900	106 No.	
Total	**71**	**7100**		

Source: District Water Resources Plan, Ambala

Table 10.8 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Ambala District

Proposed Interventions	Water Savings 2025-26 (MCM)		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	5	500	3890 ha	9611 acres
Modernization of Channels/Water Courses (Ha)	0.40	40	716 ha	1769 acres
Crop Diversification (Ha)	11	1100	1500 ha	3707acres
Direct Seeding of Rice (Ha)	5	500	2835 ha	7005 acres
Reuse of Treated Wastewater (MCM)	30	3000	30 MCM	3000 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	44	4400	108 No.	
Total	**95.40**	**9540**		

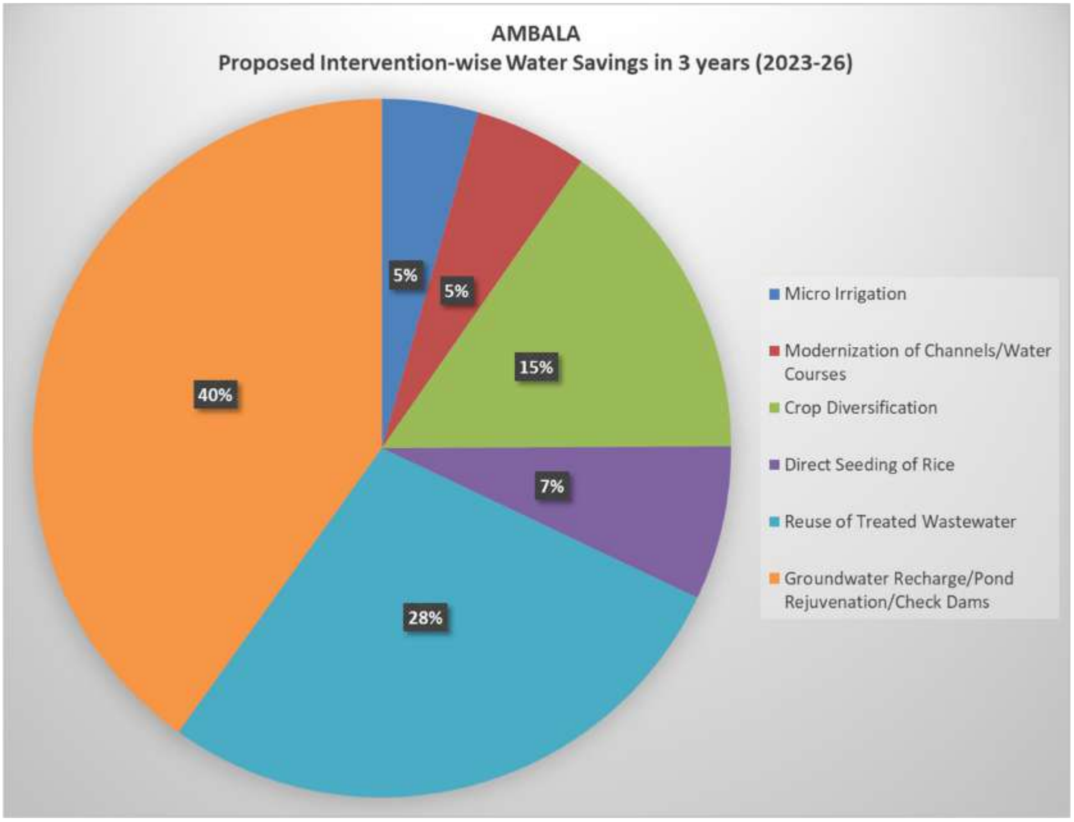
Source: District Water Resources Plan, Ambala

Table 10.9 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Ambala District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	10	1000	8498 ha	20998 acres
Modernization of Channels/Water Courses (Ha)	12	1200	9941 ha	24564 acres
Crop Diversification (Ha)	34	3400	4500 ha	11120 acres
Direct Seeding of Rice (Ha)	16	1600	8505 ha	21016 acres
Reuse of Treated Wastewater (MCM)	62	6200	62 MCM	6200 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	89	8900	341 No.	
Total	**223**	**22300**		

Source: District Water Resources Plan, Ambala

Figure 10.3 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Ambala District



2) BHIWANI

Table 10.10 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Bhiwani District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 576	2023-24	10%	58	97
	2024-25	15%	86	145
	2025-26	20%	115	193
	Total	**45%**	**259**	**435**

Table 10.11 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Bhiwani District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	31	3100	5286 ha	13062 acres
Modernization of Channels/Water Courses (Ha)	12	1200	2249 ha	5557 acres
Crop Diversification (Ha)	16	1600	1859 ha	4594 acres
Reuse of Treated Wastewater (MCM)	8	800	8 MCM	800 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	12	1200	344 No.	
Conservation Tillage (Ha)	18	1800	3700 ha	9143 acres
Total	**97**	**9700**		

Source: District Water Resources Plan, Bhiwani

Table 10.12 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Bhiwani District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	46	4600	7929 ha	19593 acres
Modernization of Channels/Water Courses (Ha)	18	1800	3374 ha	8336 acres
Crop Diversification (Ha)	24	2400	2789 ha	6890 acres
Reuse of Treated Wastewater (MCM)	12	1200	12 MCM	1200 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	18	1800	182 No.	
Conservation Tillage (Ha)	27	2700	5550 ha	13714 acres
Total	**145**	**14500**		

Source: District Water Resources Plan, Bhiwani

Table 10.13 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Bhiwani District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	62	6200	10572 ha	26123 acres
Modernization of Channels/Water Courses (Ha)	24	2400	4498 ha	11115 acres
Crop Diversification (Ha)	32	3200	3718 ha	9187 acres
Reuse of Treated Wastewater (MCM)	16	1600	16 MCM	1600 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	25	2500	222 No.	
Conservation Tillage (Ha)	36	3600	7400 ha	18285 acres
Total	**195**	**19500**		

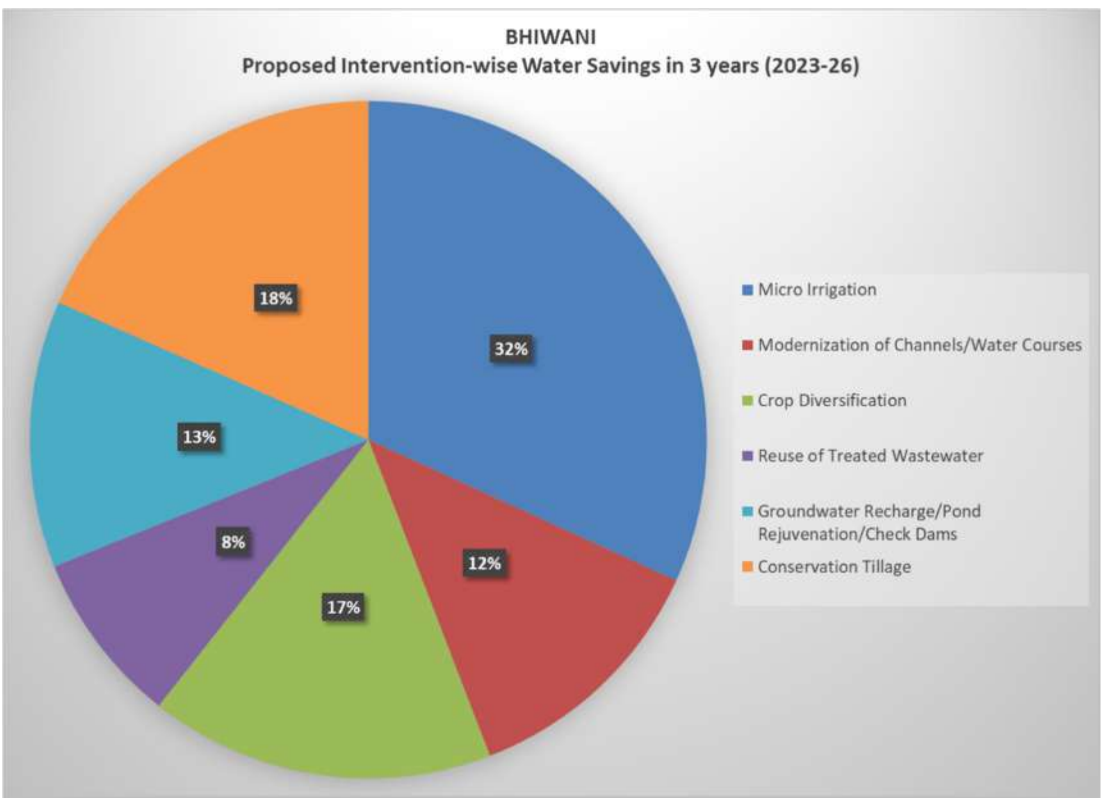
Source: District Water Resources Plan, Bhiwani

Table 10.14 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Bhiwani District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	139	13900	23787 ha	58778 acres
Modernization of Channels/Water Courses (Ha)	54	5400	10121 ha	25008 acres
Crop Diversification (Ha)	72	7200	8366 ha	20671 acres
Reuse of Treated Wastewater (MCM)	36	3600	36 MCM	3600 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	55	5500	748 No.	
Conservation Tillage (Ha)	80	8000	16650 ha	41142 acres
Total	**436**	**43600**		

Source: District Water Resources Plan, Bhiwani

Figure 10.4 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Bhiwani District



3) CHARKHI DADRI

Table 10.15 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Charkhi Dadri District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 52	2023-24	10%	5	17
	2024-25	15%	8	17
	2025-26	20%	10	17
	Total	**45%**	24	**51**

Table 10.16 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Charkhi Dadri District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	3	300	420 ha	1038 acres
Modernization of Channels and Water Courses (Ha)	1	100	360 ha	890 acres
Crop Diversification (Ha)	13	1300	1390 ha	3435 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	0.01	1	66 No.	
Total	**17.01**	**1701**		

Source: District Water Resources Plan, Charkhi Dadri

Table 10.17 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Charkhi Dadri District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	3	300	470 ha	1161
Modernization of Channels and Water Courses (Ha)	2	200	387 ha	956
Crop Diversification (Ha)	13	1300	1390 ha	3435
Reuse of Wastewater (MCM)	0.005	0.5	0.005 MCM	0.5 Cr Litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	0.01	1	66 No.	
Total	**18**	**1800**		

Source: District Water Resources Plan, Charkhi Dadri

Table 10.18 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Charkhi Dadri District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	3	300	515 ha	1273 acres
Modernization of Channels and Water Courses (Ha)	2	200	427 ha	1055 acres
Crop Diversification (Ha)	13	1300	1390 ha	3435 acres
Reuse of Wastewater (MCM)	0.001	0.1	0.001 MCM	0.1 Cr Litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	0.01	1	66 No.	
Total	**18**	**1800**		

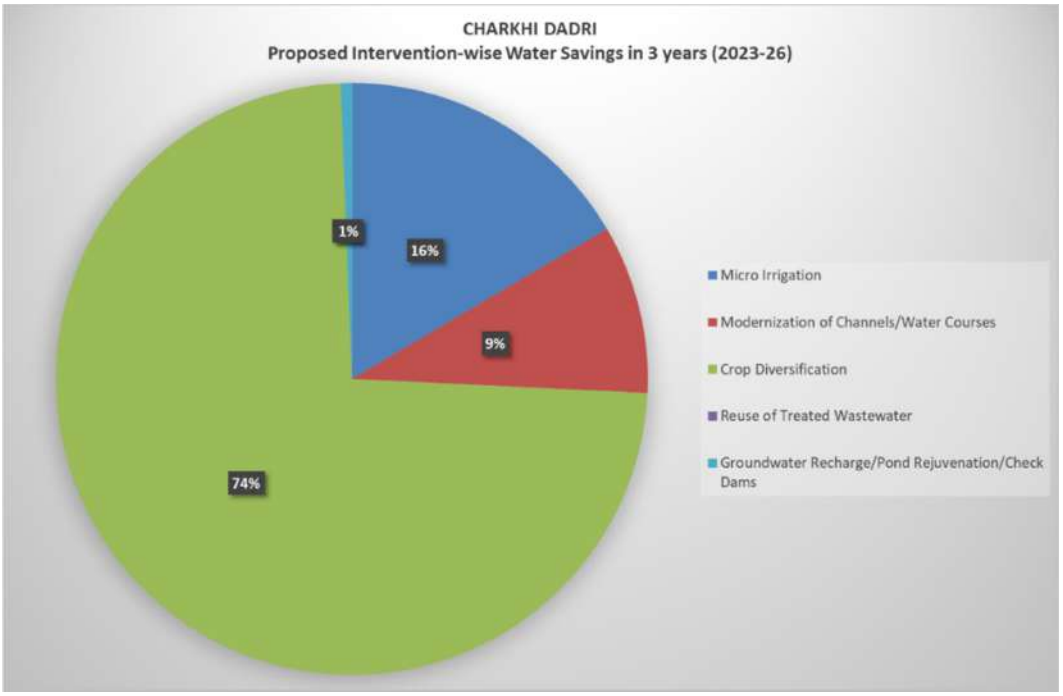
Source: District Water Resources Plan, Charkhi Dadri

Table 10.19 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Charkhi Dadri District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	8	800	1405 ha	3472 acres
Modernization of Channels and Water Courses (Ha)	5	500	1174 ha	2901 acres
Crop Diversification (Ha)	38	3800	4170 ha	10304 acres
Reuse of Wastewater (MCM)	0.01	1	0.01 MCM	1 Litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	0.02	2	198 No.	
Total	**51.03**	**5103**		

Source: District Water Resources Plan, Charkhi Dadri

Figure 10.5 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Charkhi Dadri District



4) FARIDABAD

Table 10.20 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Faridabad District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 306	2023-24	10%	31	34
	2024-25	15%	46	59
	2025-26	20%	61	70
	Total	**45%**	**138**	**162**

Table 10.21 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Faridabad District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	2	200	858 ha	2119 acres
Modernization of Channels and Water Courses (Ha)	1	100	45 ha	111 acres
Crop Diversification (Ha)	11	1100	1140 ha	2817 acres
Reuse of Wastewater (MCM)	12	1200	12 MCM	1200 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	8	800	754 No.	
Total	**34**	**3400**		

Source: District Water Resources Plan, Faridabad

Table 10.22 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Faridabad District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	3	300	1359 ha	3359 acres
Modernization of Channels and Water Courses (Ha)	1	100	45 ha	111 acres
Crop Diversification (Ha)	23	2300	2312 ha	5713 acres
Reuse of Wastewater (MCM)	24	2400	24 MCM	2400 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	8	800	751 No.	
Total	**59**	**5900**		

Source: District Water Resources Plan, Faridabad

Table 10.23 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Faridabad District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	3	300	1610 ha	3978 acres
Modernization of Channels and Water Courses (Ha)	1	100	45 ha	111 acres
Crop Diversification (Ha)	27	2700	2715 ha	6709 acres
Reuse of Wastewater (MCM)	30	3000	30 MCM	3000 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	8	800	784 No.	
Total	**69**	**6900**		

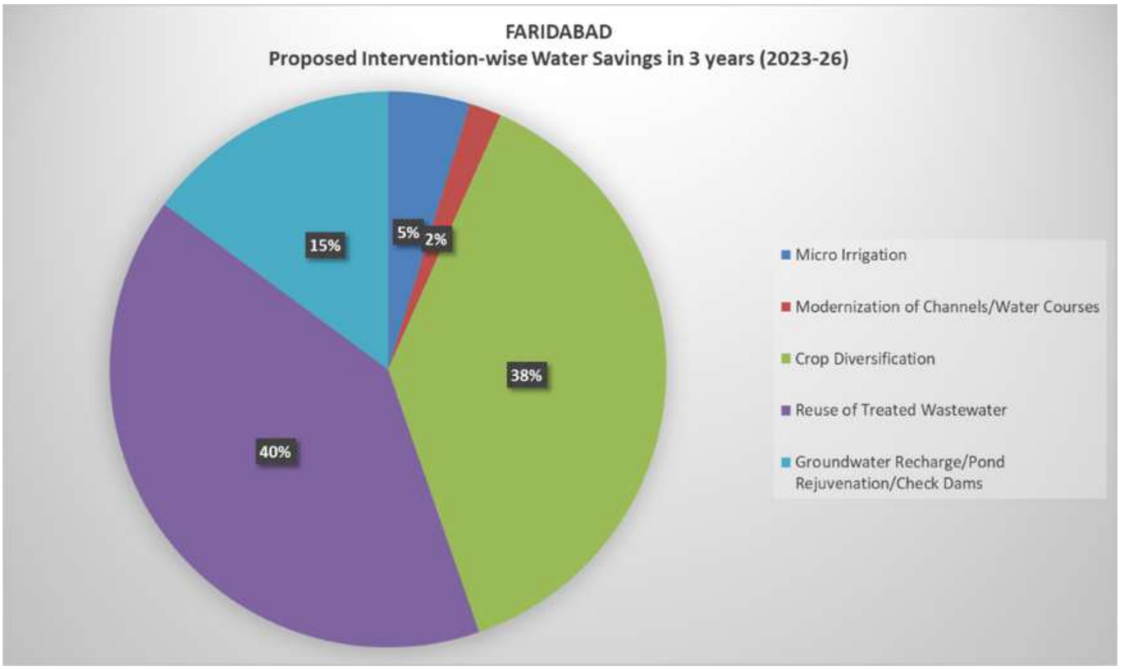
Source: District Water Resources Plan, Faridabad

Table 10.24 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Faridabad District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	8	800	3827 ha	9456 acres
Modernization of Channels and Water Courses (Ha)	3	300	135 ha	334 acres
Crop Diversification (Ha)	62	6200	6167 ha	15239 acres
Reuse of Wastewater (MCM)	66	6600	66 MCM	6600 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	24	2400	2289 No.	
Total	**163**	**16300**		

Source: District Water Resources Plan, Faridabad

Figure 10.6 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Faridabad District



5) FATEHABAD

Table 10.25 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Fatehabad District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 1185	2023-24	10%	119	319
	2024-25	15%	178	344
	2025-26	20%	237	370
	Total	**45%**	**533**	**1032**

Table 10.26 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Fatehabad District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	1	100	514 ha	1271 acres
Crop Diversification (Ha)	22	2200	4475 ha	11059 acres
Direct Seeding of Rice (Ha)	11	1100	3916 ha	9676 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	92	9200	217 No.	
Varietal Interventions (Ha)	26	2600	12380 ha	30591 acres
Conservation Tillage (Ha)	166	16600	45550 ha	112554 acres

Total	**318**	**31800**		

Source: District Water Resources Plan, Fatehabad

Table 10.27 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Fatehabad District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	0.26	26	270 ha	667 acres
Modernization of Channels and Water Courses (Ha)	2	200	843 ha	2083 acres
Crop Diversification (Ha)	26	2600	4653 ha	11498 acres
Direct Seeding of Rice (Ha)	11	1100	3775 ha	9328 acres
Reuse of Wastewater (MCM)	0.05	5	0.05 MCM	5 Cr Litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	96	9600	217 No.	
Varietal Interventions (Ha)	29	2900	13700 ha	33853 acres
Conservation Tillage (Ha)	179	17900	50560 ha	124934 acres
Total	**343.31**	**34331**		

Source: District Water Resources Plan, Fatehabad

Table 10.28 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Fatehabad District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	0.40	40	485 ha	1198 acres
Modernization of Channels and Water Courses (Ha)	2	200	843 ha	2083 acres
Crop Diversification (Ha)	28	2800	5168 ha	12770 acres
Direct Seeding of Rice (Ha)	14	1400	3950 ha	9760 acres
Reuse of Wastewater (MCM)	0.05	5	0.05 MCM	5 MCM
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	100	10000	217 No.	
Varietal Interventions (Ha)	32	3200	15225 ha	37621 acres
Conservation Tillage (Ha)	193	19300	55570 ha	137313 acres
Total	**369.45**	**36945**		

Source: District Water Resources Plan, Fatehabad

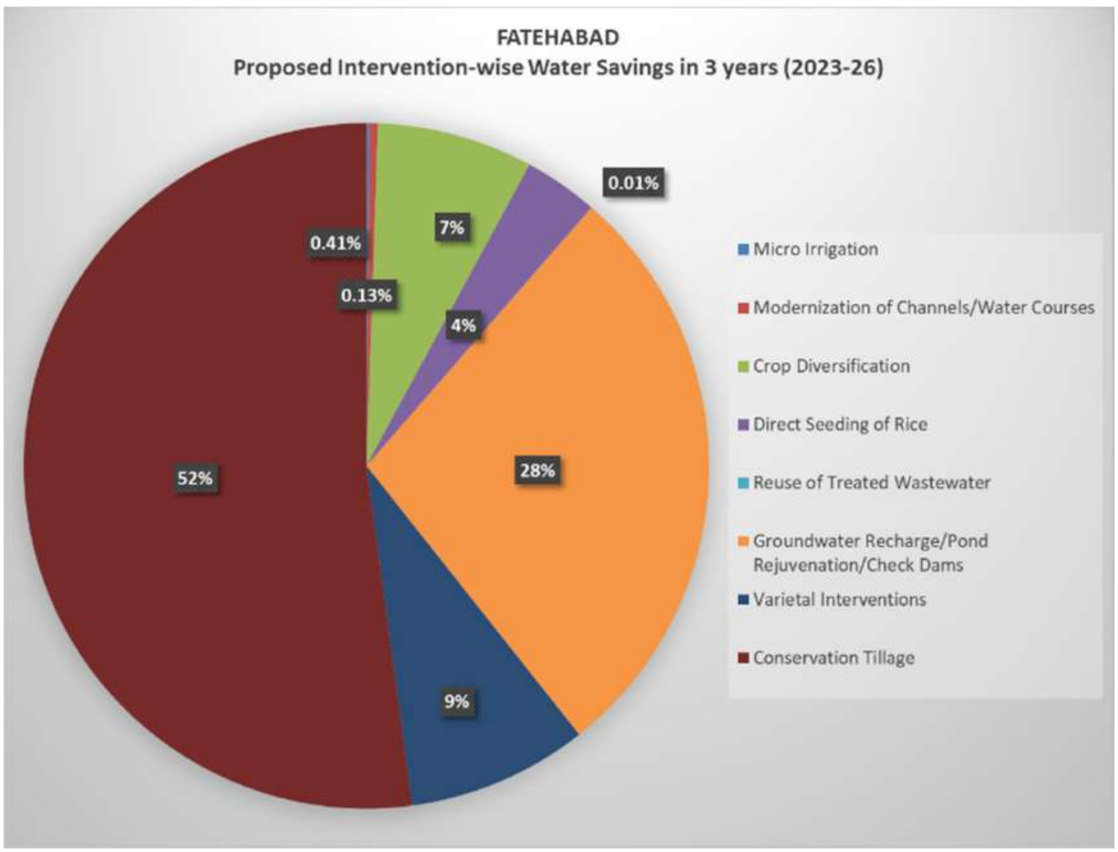
Table 10.29 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Fatehabad District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	1	100	1269 ha	3136 acres
Modernization of Channels and Water Courses (Ha)	4	400	1686 ha	4166 acres
Crop Diversification (Ha)	76	7600	14296 ha	35327 acres

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Direct Seeding of Rice (Ha)	36	3600	11641 ha	28764 acres
Reuse of Wastewater (MCM)	0	0	0	0
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	289	28900	651 No.	
Varietal Interventions (Ha)	88	8800	41305 ha	102065 acres
Conservation Tillage (Ha)	538	53800	151680 ha	374801 acres
Total	**1032**	**103200**		

Source: District Water Resources Plan, Fatehabad

Figure 10.7 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Fatehabad District



6) GURUGRAM

Table 10.30 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Gurugram District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 287	2023-24	10%	29	41
	2024-25	15%	43	63
	2025-26	20%	57	65
	Total	**45%**	**129**	**170**

Table 10.31 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Gurugram District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	6	600	1218 ha	3010 acres
Modernization of Channels and Water Courses (Ha)	4	400	1028 ha	2540 acres
Crop Diversification (Ha)	1	100	850 ha	2100 acres
Reuse of Wastewater (MCM)	15	1500	15 MCM	1500 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	12	1200	970 No.	
Varietal Interventions (Ha)	1	100	2103 ha	5197 acres
Conservation Tillage (Ha)	3	300	5005 ha	12367 acres
Total	**42**	**4200**		

Source: District Water Resources Plan, Gurugram

Table 10.32 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Gurugram District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	9	900	1418 ha	3504 acres
Modernization of Channels and Water Courses (Ha)	5	500	2892 ha	7146 acres
Crop Diversification (Ha)	4	400	857 ha	2118 acres
Reuse of Wastewater (MCM)	26	2600	26 MCM	2600 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	12	1200	967 No.	
Varietal Interventions (Ha)	2	200	3153 ha	7791 acres
Conservation Tillage (Ha)	4	400	7505 ha	18545 acres
Total	**62**	**6200**		

Source: District Water Resources Plan, Gurugram

Table 10.33 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Gurugram District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	10	1000	1820 ha	4497 acres
Modernization of Channels and Water Courses (Ha)	1	100	101 ha	250 acres
Crop Diversification (Ha)	5	500	1008 ha	2491 acres
Reuse of Wastewater (MCM)	27	2700	27 MCM	2700 cr litres
Groundwater Recharge/	12	1200	784 No.	

Pond Rejuvenation/ Check Dams (No.)				
Varietal Interventions (Ha)	3	300	4728 ha	11683 acres
Conservation Tillage (Ha)	6	600	11255 ha	27811 acres
Total	**64**	**6400**		

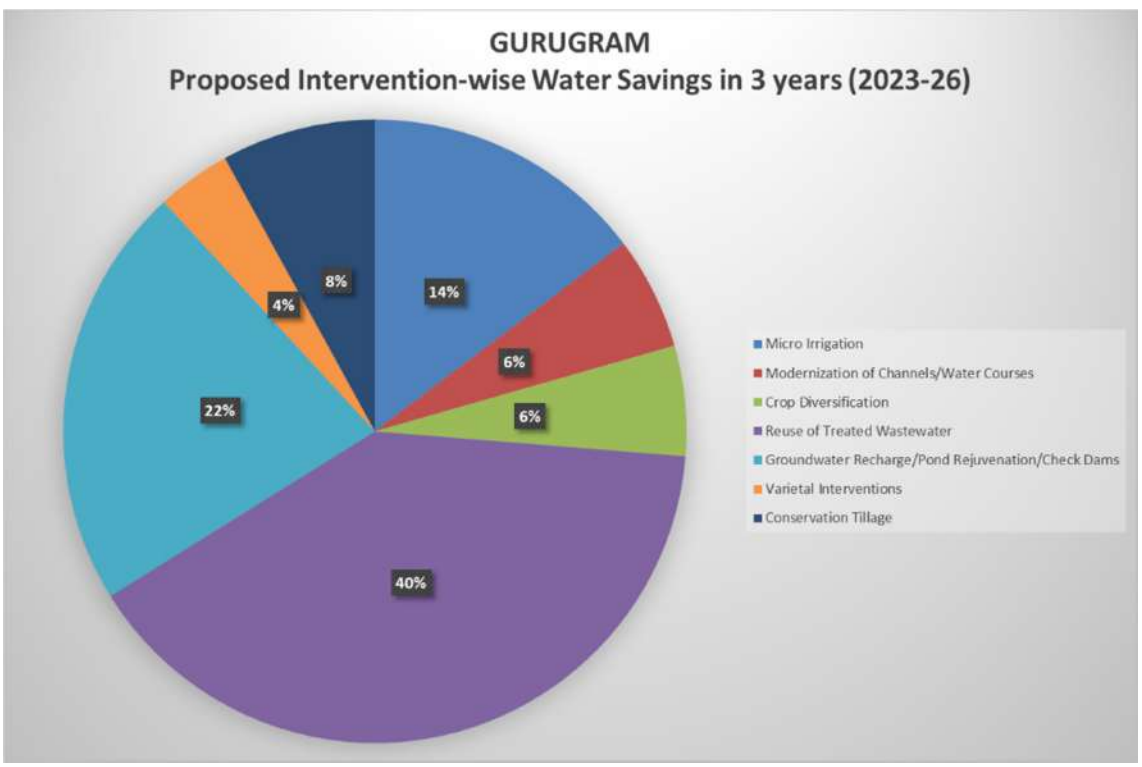
Source: District Water Resources Plan, Gurugram

Table 10.34 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Gurugram District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	25	2500	4456 ha	11011 acres
Modernization of Channels and Water Courses (Ha)	10	1000	4021 ha	9936 acres
Crop Diversification (Ha)	10	1000	2715 ha	6709 acres
Reuse of Wastewater (MCM)	68	6800	68 MCM	6800 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	37	3700	2721 No.	
Varietal Interventions (Ha)	7	700	9984 ha	24670 acres
Conservation Tillage (Ha)	14	1400	23765 ha	58723 acres
Total	**171**	**17100**		

Source: District Water Resources Plan, Gurugram

Figure 10.8 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Gurugram District



7) HISAR

Table 10.35 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Hisar District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 473	2023-24	10%	47	90
	2024-25	15%	71	107
	2025-26	20%	95	115
	Total	**45%**	**213**	**312**

Table 10.36 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Hisar District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	4	400	3800 ha	9390 acres
Modernization of Channels and Water Courses (Ha)	4	400	3994 ha	9869 acres
Crop Diversification (Ha)	72	7200	11019 ha	27228 acres
Direct Seeding of Rice (Ha)	8	800	3240 ha	8006 acres
Reuse of Wastewater (MCM)	1	100	1 MCM	100 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No,)	1	100	84 No.	
Fisheries Water Use Efficiency (Ha)	1	100	56 ha	138 acres
Total	**91**	**9100**		

Source: District Water Resources Plan, Hisar

Table 10.37 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Hisar District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	5	500	4750 ha	11737 acres
Modernization of Channels and Water Courses (Ha)	7	700	26426 ha	65298 acres
Crop Diversification (Ha)	82	8200	12456 ha	30779 acres
Direct Seeding of Rice (Ha)	10	1000	4050 ha	10008 acres
Reuse of Wastewater (MCM)	1	100	1 MCM	100 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No,)	1	100	84 No.	

Fisheries Water Use Efficiency (Ha)	1	100	59 ha	146 acres
Total	**107**	**10700**		

Source: District Water Resources Plan, Hisar

Table 10.38 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Hisar District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	6	600	5700 ha	14085 acres
Modernization of Channels and Water Courses (Ha)	3	300	24034 ha	59388 acres
Crop Diversification (Ha)	92	9200	13961 ha	34498 acres
Direct Seeding of Rice (Ha)	11	1100	4860 ha	12009 acres
Reuse of Wastewater (MCM)	1	100	1 MCM	100 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No,)	0.48	48	84 No.	
Fisheries Water Use Efficiency (Ha)	2	200	62 ha	153 acres
Total	**115.48**	**11548**		

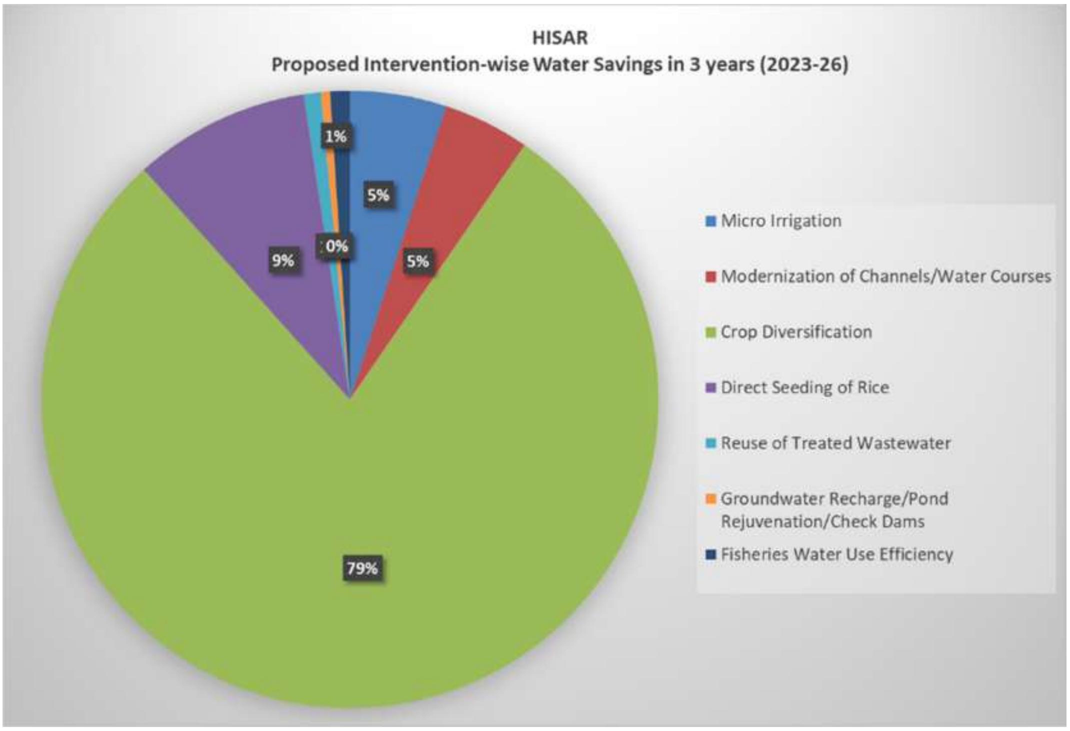
Source: District Water Resources Plan, Hisar

Table 10.39 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Hisar District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	16	1600	14250 ha	35212 acres
Modernization of Channels and Water Courses (Ha)	14	1400	54454 ha	134555 acres
Crop Diversification (Ha)	246	24600	37436 ha	92504 acres
Direct Seeding of Rice (Ha)	29	2900	12150 ha	30023 acres
Reuse of Wastewater (MCM)	3	300	3 MCM	300 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No,)	2	200	252 No.	
Fisheries Water Use Efficiency (Ha)	3	300	177 ha	437 acres
Total	**313**	**31300**		

Source: District Water Resources Plan, Hisar

Figure 10.9 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Hisar District



8) JHAJJAR

Table 10.40 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Jhajjar District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 109	2023-24	10%	11	174
	2024-25	15%	16	181
	2025-26	20%	22	198
	Total	**45%**	**49**	**553**

Table 10.41 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Jhajjar District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	9	900	519 ha	1282 acres
Modernization of Channels and Water Courses (Ha)	4	400	19170 ha	47369 acres
Crop Diversification (Ha)	14	1400	1652 ha	4082 acres
Direct Seeding of Rice (Ha)	12	1200	950 ha	2347 acres
Reuse of Wastewater (MCM)	72	7200	72 MCM	7200 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	1	100	9 No.	
Varietal Interventions (Ha)	12	1200	3725 ha	9204 acres
Conservation Tillage (Ha)	51	5100	13500 ha	33359 acres
Total	**175**	**17500**		

Source: District Water Resources Plan, Jhajjar

Table 10.42 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Jhajjar District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	9	900	471 ha	1164 acres
Crop Diversification (Ha)	16	1600	1900 ha	4695 acres
Direct Seeding of Rice (Ha)	12	1200	950 ha	2347 acres
Reuse of Wastewater (MCM)	69	6900	69 MCM	6900 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	1	100	9 No.	
Varietal Interventions (Ha)	14	1400	4635 ha	11453 acres
Conservation Tillage (Ha)	59	5900	15850 ha	39165 acres
Total	**180**	**18000**		

Source: District Water Resources Plan, Jhajjar

Table 10.43 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Jhajjar District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	9	900	337 ha	833 acres
Modernization of Channels and Water Courses (Ha)	4	400	NA	NA
Crop Diversification (Ha)	11	1100	1983 ha	4900 acres
Direct Seeding of Rice (Ha)	12	1200	950 ha	2347 acres
Reuse of Wastewater (MCM)	69	6900	69 MCM	6900 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	1	100	10 No.	
Varietal Interventions (Ha)	19	1900	6185 ha	15283 acres
Conservation Tillage (Ha)	74	7400	19625 ha	48493 acres
Total	**199**	**19900**		

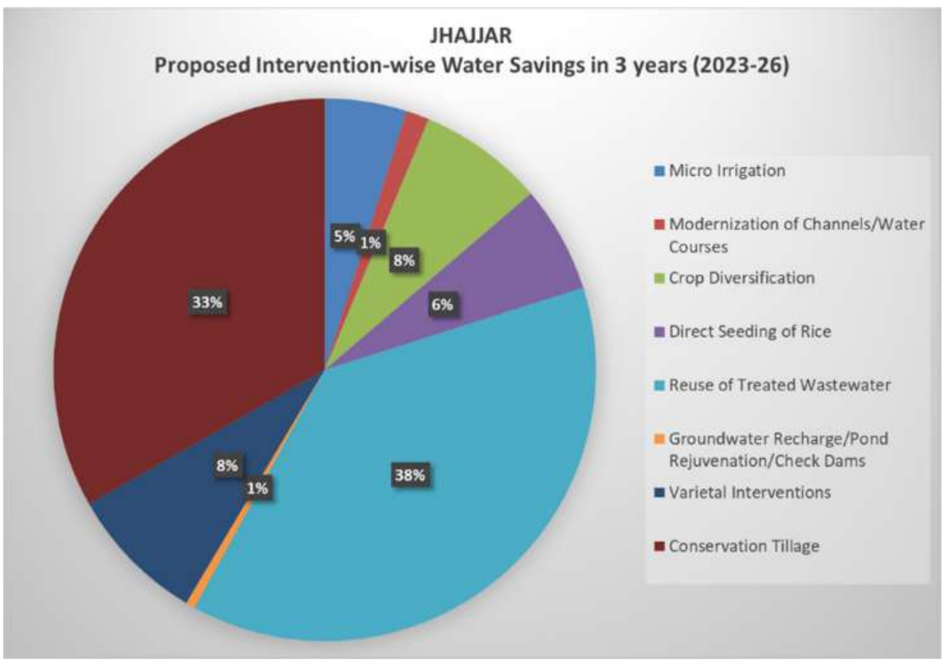
Source: District Water Resources Plan, Jhajjar

Table 10.44 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Jhajjar District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	27	2700	1327 ha	3279 acres
Modernization of Channels and Water Courses (Ha)	8	800	19170 ha	47369 acres
Crop Diversification (Ha)	41	4100	5535 ha	13677 acres
Direct Seeding of Rice (Ha)	35	3500	2850 ha	7042 acres
Reuse of Wastewater (MCM)	209	20900	209 MCM	20900 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	3	300	28 No.	
Varietal Interventions (Ha)	45	4500	14545 ha	35941 acres
Conservation Tillage (Ha)	184	18400	48975 ha	121017 acres
Total	**552**	**55200**		

Source: District Water Resources Plan, Jhajjar

Figure 10.10 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Jhajjar District



9) JIND

Table 10.45 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Jind District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 1013	2023-24	10%	101	203
	2024-25	15%	152	243
	2025-26	20%	203	290
	Total	**45%**	456	**737**

Table 10.46 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Jind District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	0.30	30	140 ha	346 acres
Modernization of Channels and Water Courses (Ha)	3	300	2331 ha	5760 acres
Crop Diversification (Ha)	16	1600	4825 ha	11923 acres
Direct Seeding of Rice (Ha)	6	600	4419 ha	10919 acres
Reuse of Wastewater (MCM)	11	1100	11 MCM	
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No,)	6	600	221 No.	
Conservation Tillage (Ha)	162	16200	76000 ha	187796 acres
Total	**204.30**	**20430**		

Source: District Water Resources Plan, Jind

Table 10.47 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Jind District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	1	100	234 ha	578 acres
Modernization of Channels and Water Courses (Ha)	4	400	3264 ha	8064 acres
Crop Diversification (Ha)	22	2200	5308 ha	13115 acres
Direct Seeding of Rice (Ha)	11	1100	8131 ha	20090 acres
Reuse of Wastewater (MCM)	12	1200	12 MCM	1200 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No,)	1	100	200 No.	
Conservation Tillage (Ha)	193	19300	76000 ha	187796 acres
Total	**244**	**24400**		

Source: District Water Resources Plan, Jind

Table 10.48 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Jind District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	1	100	305 ha	754 acres
Modernization of Channels and Water Courses (Ha)	2	200	2334 ha	5767 acres
Crop Diversification (Ha)	24	2400	5838 ha	14426 acres
Direct Seeding of Rice (Ha)	12	1200	8838 ha	21837 acres
Reuse of Wastewater (MCM)	13	1300	14 MCM	1400 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No,)	1	100	184 No.	
Conservation Tillage (Ha)	238	23800	76000 ha	187796 acres
Total	**291**	**29100**		

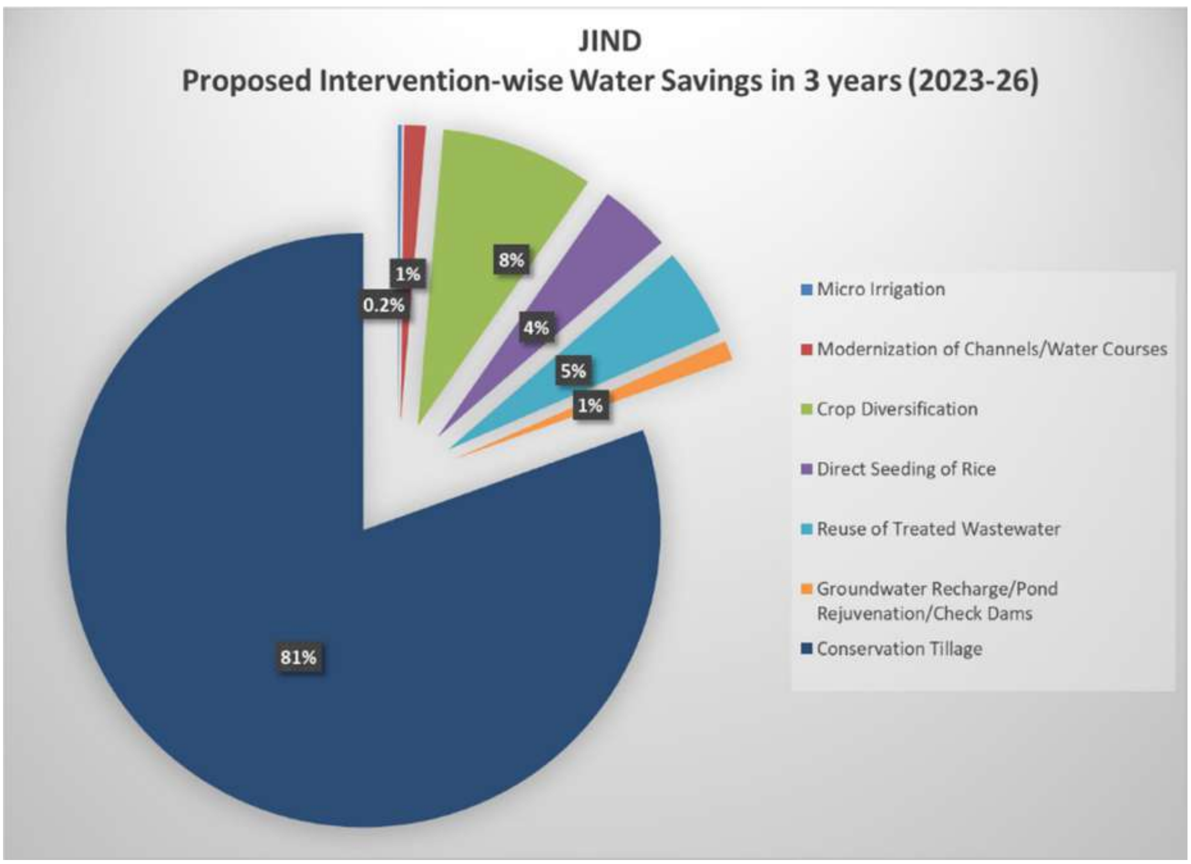
Source: District Water Resources Plan, Jind

Table 10.49 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Jind District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	1	100	679 ha	1678 acres
Modernization of Channels and Water Courses (Ha)	9	900	7929 ha	19591 acres
Crop Diversification (Ha)	61	6100	15971 ha	39464 acres
Direct Seeding of Rice (Ha)	29	2900	21387 ha	52847 acres
Reuse of Wastewater (MCM)	36	3600	36 MCM	3600 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No,)	8	800	605 No.	
Conservation Tillage (Ha)	593	59300	228000 ha	563388 acres
Total	**737**	**73700**		

Source: District Water Resources Plan, Jind

Figure 10.11 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Jind District



10) KAITHAL

Table 10.50 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Kaithal District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 1715	2023-24	10%	172	227
	2024-25	15%	257	323
	2025-26	20%	343	411
	Total	**45%**	**772**	**961**

Table 10.51 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Kaithal District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	1	100	446 ha	1102 acres
Modernization of Channels and Water Courses (Ha)	30	3000	22378 ha	55296 acres
Crop Diversification (Ha)	46	4600	2969 ha	7337 acres
Direct Seeding of Rice (Ha)	13	1300	4406 ha	10887 acres
Reuse of Wastewater (MCM)	7	700	7 MCM	700 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	15	1500	2264 No.	
Conservation Tillage (Ha)	116	11600	14776 ha	36511 acres
Total	**228**	**22800**		

Source: District Water Resources Plan, Kaithal

Table 10.52 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Kaithal District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	2	200	757 ha	1871 acres
Modernization of Channels and Water Courses (Ha)	22	2200	16452 ha	40653 acres
Crop Diversification (Ha)	50	5000	4393 ha	10856 acres
Direct Seeding of Rice (Ha)	18	1800	6391 ha	15792 acres
Reuse of Wastewater (MCM)	13	1300	13 MCM	1300 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	17	1700	2264 No	
Conservation Tillage (Ha)	201	20100	20996 ha	51881 acres
Total	**323**	**32300**		

Source: District Water Resources Plan, Kaithal

Table 10.53 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Kaithal District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	0.42	42	341 ha	843 acres
Modernization of Channels and Water Courses (Ha)	5	500	3613 ha	8928 acres
Crop Diversification (Ha)	56	5600	5986 ha	14792 acres
Direct Seeding of Rice (Ha)	25	2500	8622 ha	21306 acres
Reuse of Wastewater (MCM)	18	1800	18 MCM	1800 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	16	1600	2264 No	
Conservation Tillage (Ha)	291	29100	24592 ha	60766 acres
Total	**411.42**	**41142**		

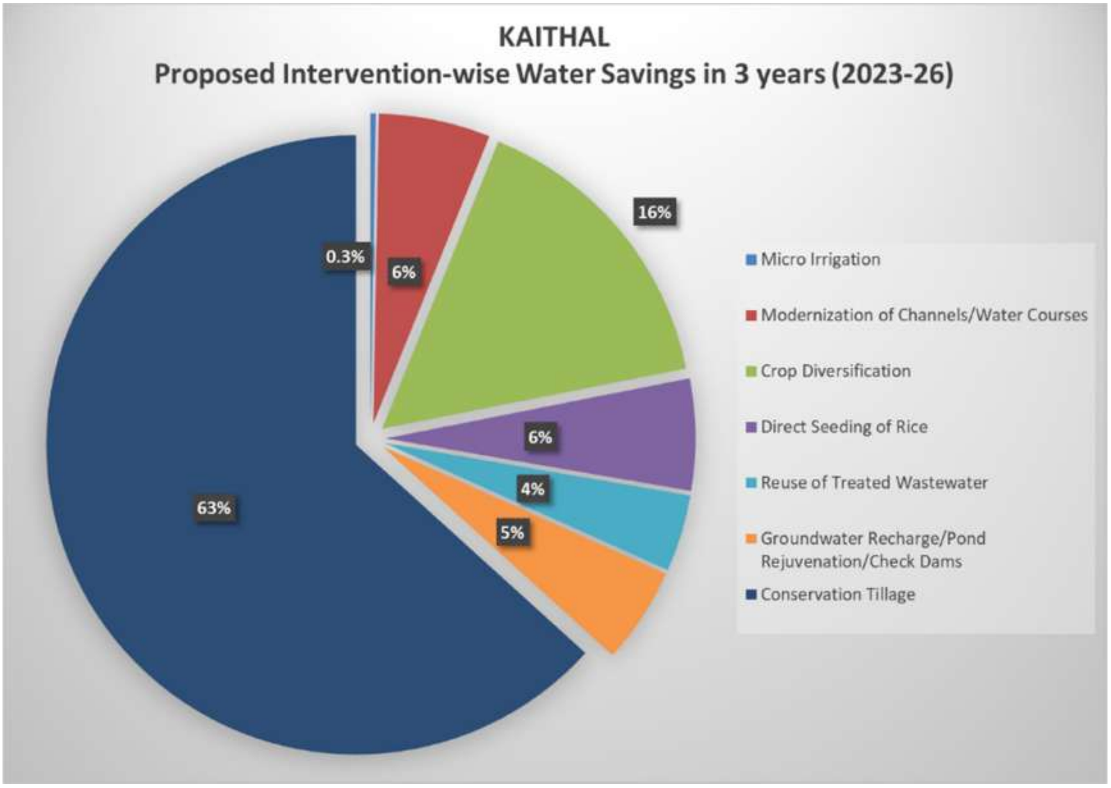
Source: District Water Resources Plan, Kaithal

Table 10.54 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Kaithal District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	3	300	1544 ha	3815 acres
Modernization of Channels and Water Courses (Ha)	56	5600	42443 ha	104877 acres
Crop Diversification (Ha)	152	15200	13349 ha	32985 acres
Direct Seeding of Rice (Ha)	56	5600	19419 ha	47984 acres
Reuse of Wastewater (MCM)	38	3800	38 MCM	3800 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	48	4800	6792 No.	
Conservation Tillage (Ha)	608	60800	60364 ha	149158 acres
Total	**961**	**96100**		

Source: District Water Resources Plan, Kaithal

Figure 10.12 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Kaithal District



11) KARNAL

Table 10.55 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Karnal District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 1470	2023-24	10%	147	173
	2024-25	15%	221	278
	2025-26	20%	294	342
	Total	**45%**	**662**	**792**

Table 10.56 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Karnal District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	39	3900	38581 ha	95334 acres
Crop Diversification (Ha)	21	2100	1736 ha	4291 acres
Direct Seeding of Rice (Ha)	13	1300	3581 ha	8849 acres
Reuse of Wastewater (MCM)	5	500	5 MCM	500 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	3	300	299 No.	
Conservation Tillage (Ha)	92	9200	194190 ha	479844 acres
Total	**173**	**17300**		

Source: District Water Resources Plan, Karnal

Table 10.57 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Karnal District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	45	4500	43383 ha	107199 acres
Modernization of Channels and Water Courses (Ha)	12	1200	4698 ha	11609 acres
Crop Diversification (Ha)	64	6400	5371 ha	13272 acres
Direct Seeding of Rice (Ha)	31	3100	8480 ha	20954 acres
Reuse of Wastewater (MCM)	19	1900	19 MCM	1900 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	3	300	299 No.	
Conservation Tillage (Ha)	103	10300	216460 ha	534872 acres
Total	**277**	**27700**		

Source: District Water Resources Plan, Karnal

Table 10.58 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Karnal District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	56	5600	50679 ha	125228 acres
Modernization of Channels and Water Courses (Ha)	12	1200	NA	NA
Crop Diversification (Ha)	90	9000	7531 ha	18609 acres
Direct Seeding of Rice (Ha)	38	3800	10531 ha	26023 acres
Reuse of Wastewater (MCM)	19	1900	19 MCM	1900 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	4	400	299 No.	
Conservation Tillage (Ha)	123	12300	255399 ha	631091 acres
Total	**342**	**34200**		

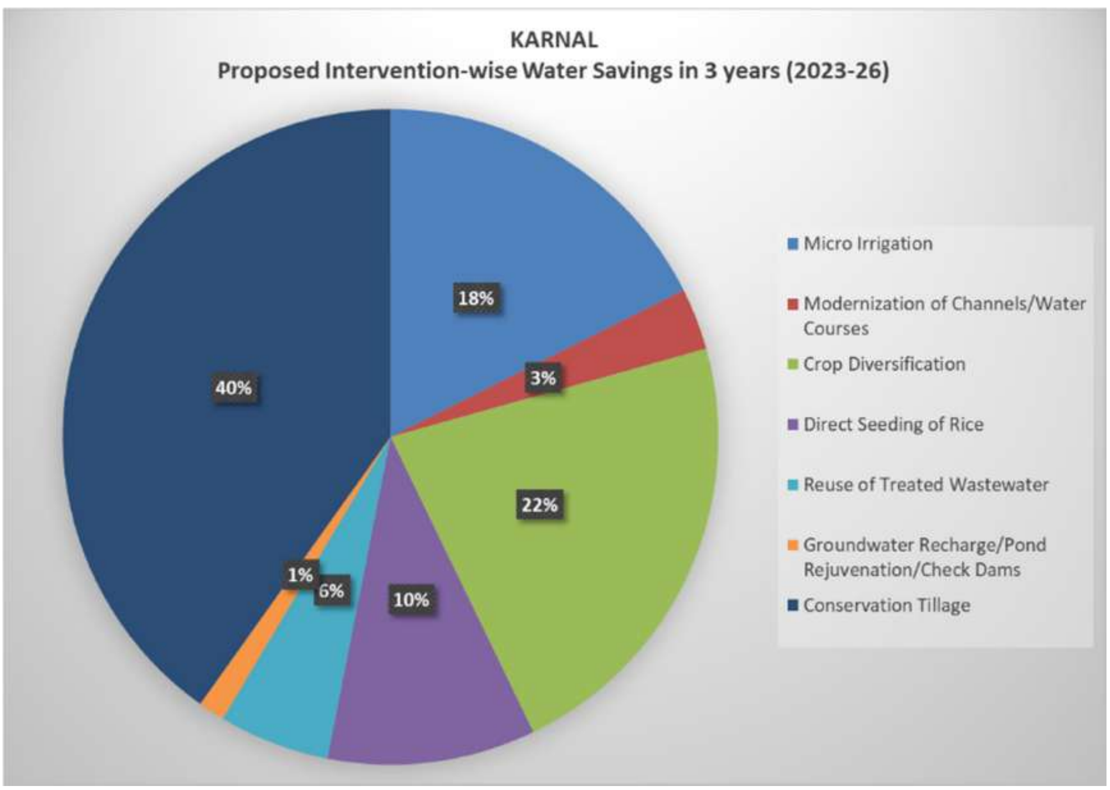
Source: District Water Resources Plan, Karnal

Table 10.59 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Karnal District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	140	14000	132643 ha	327761 acres
Modernization of Channels and Water Courses (Ha)	24	2400	4698 ha	11609 acres
Crop Diversification (Ha)	176	17600	14638 ha	36171 acres
Direct Seeding of Rice (Ha)	81	8100	22592 ha	55826 acres
Reuse of Wastewater (MCM)	43	4300	43 MCM	4300 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	10	1000	897 No.	
Conservation Tillage (Ha)	318	31800	666049 ha	1645808 acres
Total	**792**	**79200**		

Source: District Water Resources Plan, Karnal

Figure 10.13 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Karnal District



12) KURUKSHETRA

Table 10.60 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Kurukshetra District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 1413	2023-24	10%	141	156
	2024-25	15%	212	224
	2025-26	20%	283	293
	Total	**45%**	636	**673**

Table 10.61 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Kurukshetra District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	17	1700	4471 ha	11048 acres
Modernization of Channels and Water Courses (Ha)	10	1000	4586 ha	11332 acres
Crop Diversification (Ha)	37	3700	10751 ha	26566 acres
Direct Seeding of Rice (Ha)	7	700	4050 ha	10008 acres
Reuse of Wastewater (MCM)	1	100	1 MCM	100 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	3	300	565 No.	
Varietal Interventions (Ha)	32	3200	12458 ha	30784 acres
Conservation Tillage (Ha)	50	5000	21613 ha	53406 acres
Total	**157**	**15700**		

Source: District Water Resources Plan, Kurukshetra

Table 10.62 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Kurukshetra District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	41	4100	8407 ha	20774 acres
Modernization of Channels and Water Courses (Ha)	10	1000	4386 ha	10838 acres
Crop Diversification (Ha)	50	5000	21613 ha	53406 acres
Direct Seeding of Rice (Ha)	7	700	4050 ha	10008 acres
Reuse of Wastewater (MCM)	1	100	1 MCM	100 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	3	300	490 No.	
Varietal Interventions (Ha)	64	6400	24914 ha	61562 acres
Conservation Tillage (Ha)	50	5000	21613 ha	53406 acres
Total	**226**	**22600**		

Source: District Water Resources Plan, Kurukshetra

Table 10.63 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Kurukshetra District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	59	5900	8303 ha	20517 acres
Modernization of Channels and Water Courses (Ha)	9	900	4310 ha	10650 acres
Crop Diversification (Ha)	37	3700	10751 ha	26566 acres
Direct Seeding of Rice (Ha)	7	700	4050 ha	10008 acres
Reuse of Wastewater (MCM)	1	100	1 MCM	100 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	3	300	490 No.	
Varietal Interventions (Ha)	127	12700	49830 ha	123130 acres
Conservation Tillage (Ha)	50	5000	21613 ha	53406 acres
Total	**293**	**29300**		

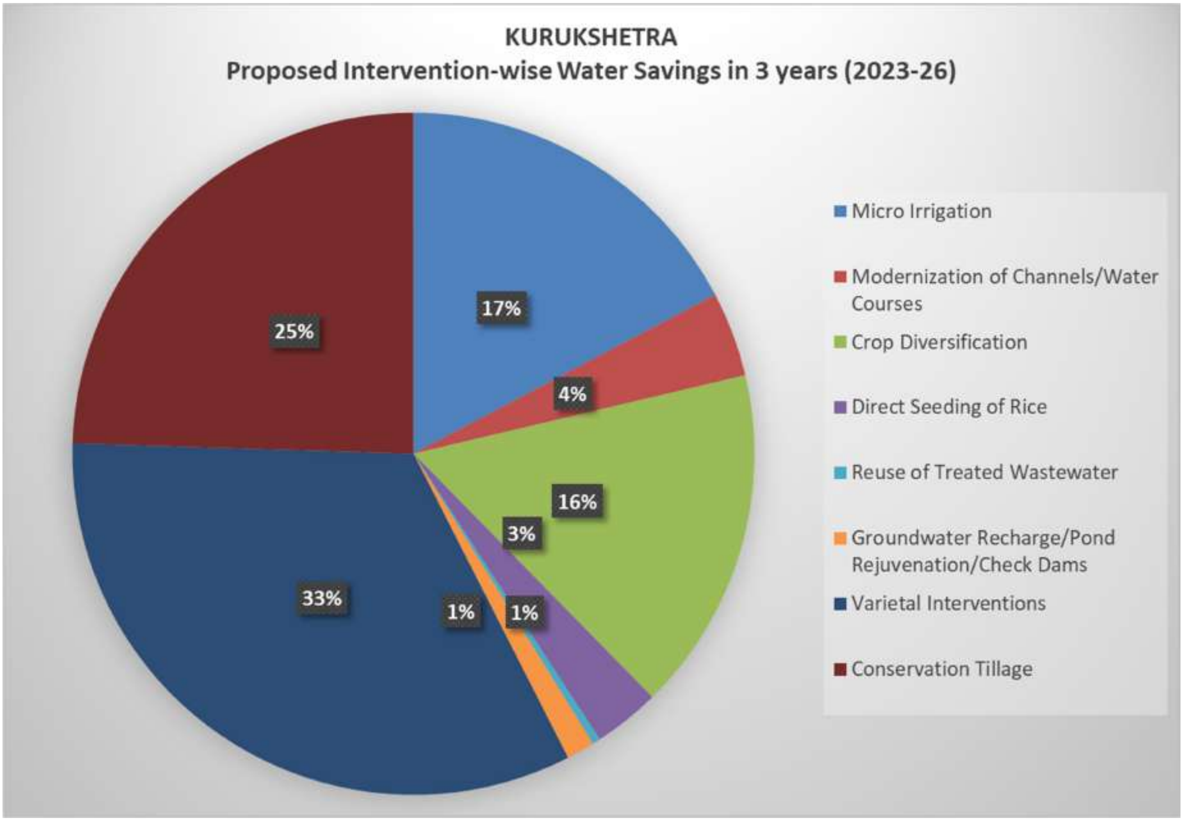
Source: District Water Resources Plan, Kurukshetra

Table 10.64 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Kurukshetra District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	117	11700	21181 ha	52338 acres
Modernization of Channels and Water Courses (Ha)	29	2900	13282 ha	32820 acres
Crop Diversification (Ha)	123	12300	43115 ha	106537 acres
Direct Seeding of Rice (Ha)	21	2100	12150 ha	30023 acres
Reuse of Wastewater (MCM)	3	300	2 MCM	200 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	9	900	1545 No.	
Varietal Interventions (Ha)	223	22300	87202 ha	215476 acres
Conservation Tillage (Ha)	149	14900	64839 ha	160217 acres
Total	**674**	**67400**		

Source: District Water Resources Plan, Kurukshetra

Figure 10.14 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Kurukshetra District



13) MAHENDRAGARH

Table 10.65 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Mahendragarh District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(+) 71	2023-24	10%	7	11
	2024-25	15%	11	15
	2025-26	20%	14	22
	Total	**45%**	**32**	**48**

Table 10.66 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Mahendragarh District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	3	300	5500 ha	13591 acres
Modernization of Channels and Water Courses (Ha)	4	400	75132 ha	185651 acres
Crop Diversification (Ha)	2	200	997 ha	2464 acres
Reuse of Wastewater (MCM)	0.03	3	0.03 MCM	3 Cr Litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	2	200	91 No.	
Total	**11**	**1100**		

Source: District Water Resources Plan, Mahendragarh

Table 10.67 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Mahendragarh District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	6	600	6000 ha	14826 acres
Modernization of Channels and Water Courses (Ha)	7	700	NA	
Crop Diversification (Ha)	2	200	1172 ha	2896 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	0.32	32	42 No.	
Total	**15**	**1500**		

Source: District Water Resources Plan, Mahendragarh

Table 10.68 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Mahendragarh District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	9	900	7000 ha	17297 acres
Modernization of Channels and Water Courses (Ha)	10	1000	NA	
Crop Diversification (Ha)	2	200	1385 ha	3422 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	1	100	47 No.	
Total	**22**	**2200**		

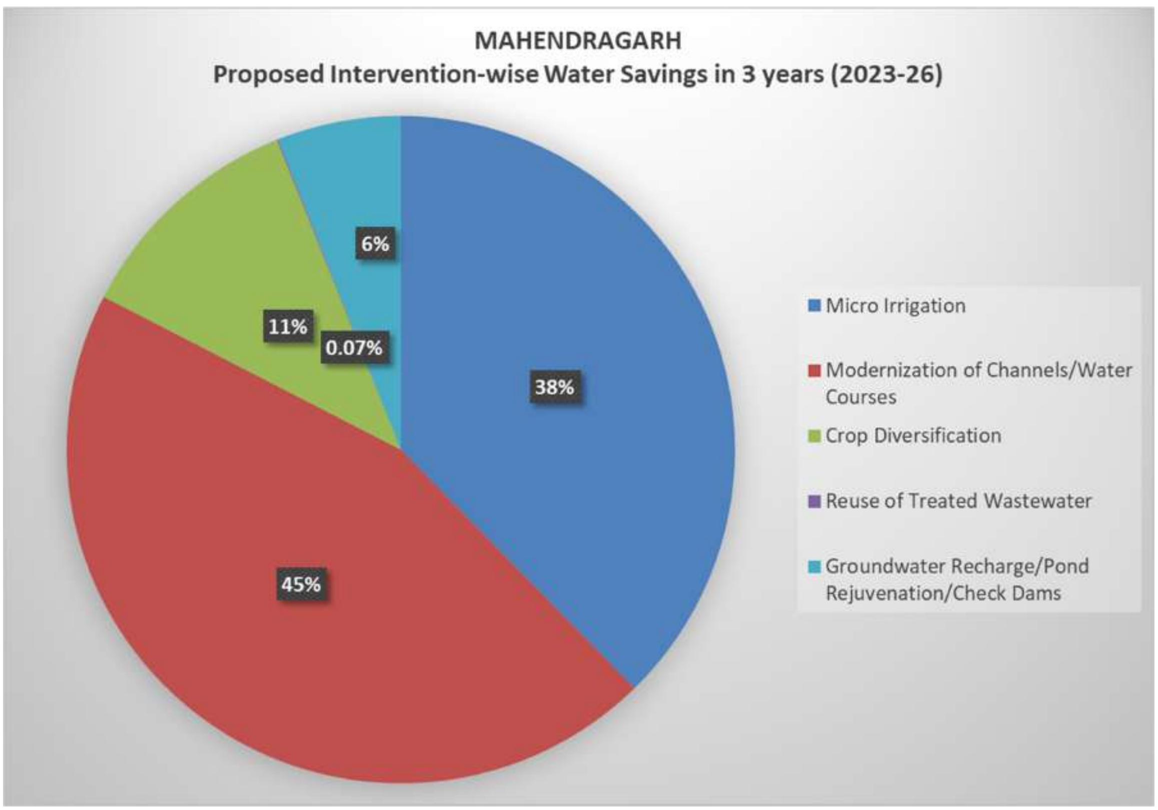
Source: District Water Resources Plan, Mahendragarh

Table 10.69 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Mahendragarh District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	18	1800	18500 ha	45714 acres
Modernization of Channels and Water Courses (Ha)	21	2100	75132 ha	185651 acres
Crop Diversification (Ha)	5	500	3554 ha	8782 acres
Reuse of Wastewater (MCM)	0.03	3	0.03 MCM	3 Cr Litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	3	300	180 No.	
Total	**47**	**4700**		

Source: District Water Resources Plan, Mahendragarh

Figure 10.15 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Mahendragarh District



14) NUH

Table 10.70 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Nuh District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 404	2023-24	10%	40	53
	2024-25	15%	61	65
	2025-26	20%	81	86
	Total	**45%**	**182**	**203**

Table 10.71 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Nuh District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	0.0001	0.01	2698 ha	6667 acres
Modernization of Channels and Water Courses (Ha)	1	100	16724 ha	41325 acres
Crop Diversification (Ha)	0.18	18	358 ha	885 acres
Reuse of Wastewater (MCM)	0.01	1	0.01 MCM	1 Cr Litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	44	4400	1007 No.	
Fisheries Water Use Efficiency (Ha)	3	300	65 ha	160 acres
Varietal Interventions (Ha)	4	400	70000 ha	172970 acres
Conservation Tillage (Ha)	0.39	39	3500 ha	8649 acres
Total	**52**	**5200**		

Source: District Water Resources Plan, Nuh

Table 10.72 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Nuh District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	0.0031	0.31	2562 ha	6330 acres
Modernization of Channels and Water Courses (Ha)	1	100	1450 ha	3583 acres
Crop Diversification (Ha)	0.18	18	358 ha	885 acres
Reuse of Wastewater (MCM)	0.01	1	0.01 MCM	1 Cr Litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	56	5600	1098 No.	
Fisheries Water Use Efficiency (Ha)	3	300	65 ha	160 acres
Varietal Interventions (Ha)	4	400	70000 ha	172970 acres
Conservation Tillage (Ha)	0.39	39	3500 ha	8649 acres
Total	**64**	**6400**		

Source: District Water Resources Plan, Nuh

Table 10.73 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Nuh District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	0.0031	0.31	3012 ha	7442 acres
Modernization of Channels and Water Courses (Ha)	3	300	2047 ha	5058 acres
Crop Diversification (Ha)	0.18	18	358 ha	885 acres
Reuse of Wastewater (MCM)	0.015	1.5	0.015 MCM	1.5 Cr Lires
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	78	7800	1601 No.	
Varietal Interventions (Ha)	4	400	70000 ha	172970 acres
Conservation Tillage (Ha)	0.39	39	3500 ha	8649 acres
Total	**85**	**8500**		

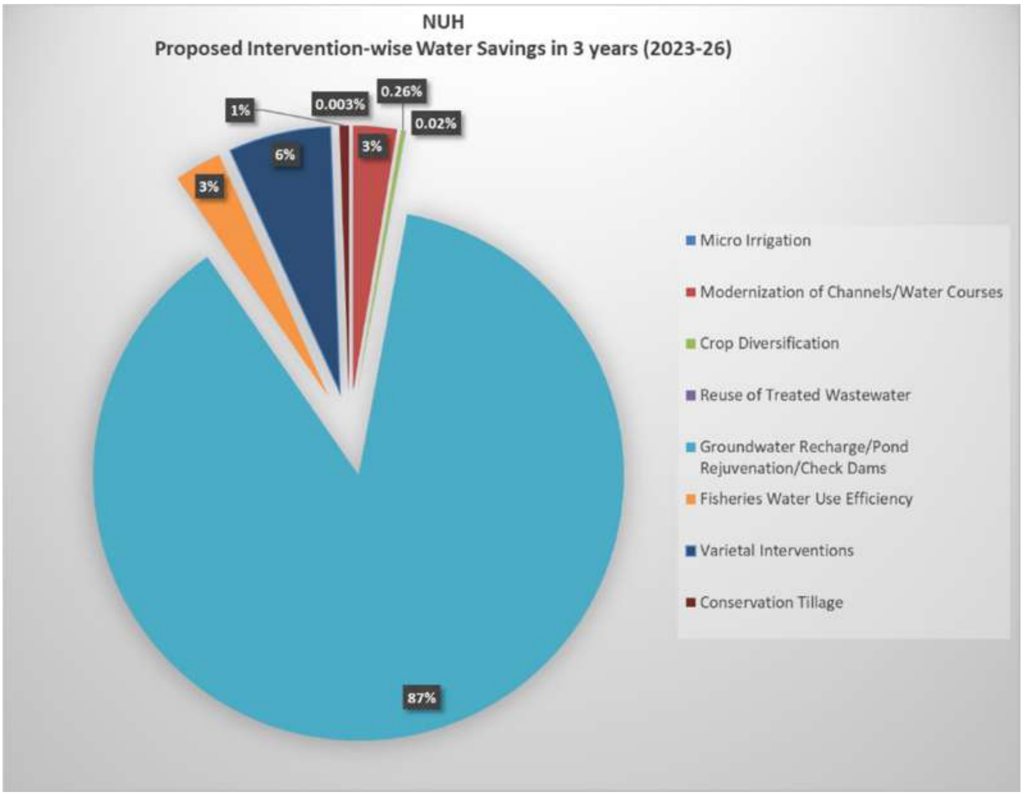
Source: District Water Resources Plan, Nuh

Table 10.74 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Nuh District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	0.01	1	8272 ha	20439 acres
Modernization of Channels and Water Courses (Ha)	5	500	20221 ha	49966 acres
Crop Diversification (Ha)	1	100	1074 ha	2655 acres
Reuse of Wastewater (MCM)	0.04	4	0.04 MCM	4 Cr Lires
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	177	17700	3706 No.	
Fisheries Water Use Efficiency (Ha)	6	600	129 ha	320 acres
Varietal Interventions (Ha)	13	1300	210000 ha	518910 acres
Conservation Tillage (Ha)	1	100	10500 ha	25946 acres
Total	**203**	**20300**		

Source: District Water Resources Plan, Nuh

Figure 10.16 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Nuh District



15) PALWAL

Table 10.75 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Palwal District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 190	2023-24	10%	19	25
	2024-25	15%	29	38
	2025-26	20%	38	48
	Total	**45%**	**86**	**112**

Table 10.76 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Palwal District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	2	200	1186 ha	2930 acres
Modernization of Channels and Water Courses (Ha)	2	200	570 ha	1409 acres
Crop Diversification (Ha)	16	1600	2133 ha	5272 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	1	100	83 No.	
Varietal Interventions (Ha)	3	300	22275 ha	55042 acres
Conservation Tillage (Ha)	2	200	6480 ha	16012 acres
Total	**26**	**2600**		

Source: District Water Resources Plan, Palwal

Table 10.77 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Palwal District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	5	500	2587 ha	6391 acres
Modernization of Channels and Water Courses (Ha)	2	200	1140 ha	2818 acres
Crop Diversification (Ha)	25	2500	3293 ha	8137 acres
Direct Seeding of Rice (Ha)	0.24	24	128 ha	315 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	1	100	90 No.	
Varietal Interventions (Ha)	3	300	23389 ha	57794 acres
Conservation Tillage (Ha)	2	200	6824 ha	16863 acres
Total	**38**	**3800**		

Source: District Water Resources Plan, Palwal

Table 10.78 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Palwal District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	4	400	3817 ha	9433 acres
Modernization of Channels and Water Courses (Ha)	2	200	1711 ha	4227 acres
Crop Diversification (Ha)	35	3500	4639 ha	11463 acres
Direct Seeding of Rice (Ha)	0.38	38	203 ha	500 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	1	100	88 No.	
Varietal Interventions (Ha)	4	400	24503 ha	60546 acres
Conservation Tillage (Ha)	2	200	7169 ha	17713 acres
Total	**48**	**4800**		

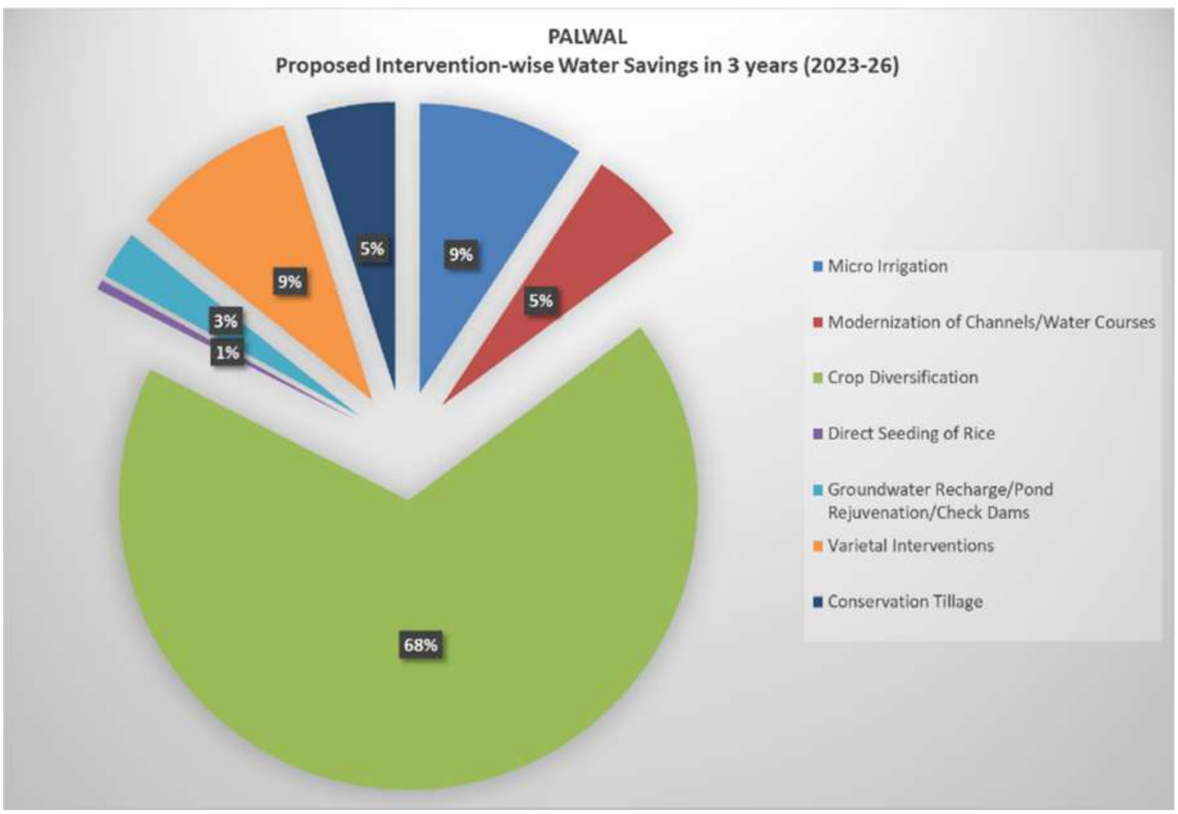
Source: District Water Resources Plan, Palwal

Table 10.79 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Palwal District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	10	1000	7590 ha	18754 acres
Modernization of Channels and Water Courses (Ha)	6	600	3421 ha	8454 acres
Crop Diversification (Ha)	75	7500	10065 ha	24872 acres
Direct Seeding of Rice (Ha)	0.61	61	330 ha	816 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	3	300	261 No.	
Varietal Interventions (Ha)	10	1000	70166 ha	173381 acres
Conservation Tillage (Ha)	6	600	20473 ha	50588 acres
Total	**111**	**11100**		

Source: District Water Resources Plan, Palwal

Figure 10.17 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Palwal District



16) PANCHKULA

Table 10.80 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Panchkula District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 247	2023-24	10%	25	105
	2024-25	15%	37	107
	2025-26	20%	49	48
	Total	**45%**	**111**	**259**

Table 10.81 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Panchkula District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	3	300	NA	
Crop Diversification (Ha)	7	700	670 ha	1656 acres
Reuse of Wastewater (MCM)	3	300	2 MCM	200 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	93	9300	359 No.	
Total	**106**	**10600**		

Source: District Water Resources Plan, Panchkula

Table 10.82 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Panchkula District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	2	200	NA	
Crop Diversification (Ha)	11	1100	1070 ha	2644 acres
Reuse of Wastewater (MCM)	3	300	3 MCM	300 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	91	9100	402 No.	
Total	**107**	**10700**		

Source: District Water Resources Plan, Panchkula

Table 10.83 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Panchkula District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	2	200	NA	
Crop Diversification (Ha)	15	1500	1480 ha	3657 acres
Reuse of Wastewater (MCM)	3	300	3 MCM	300 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	28	2800	419 No.	
Total	**48**	**4800**		

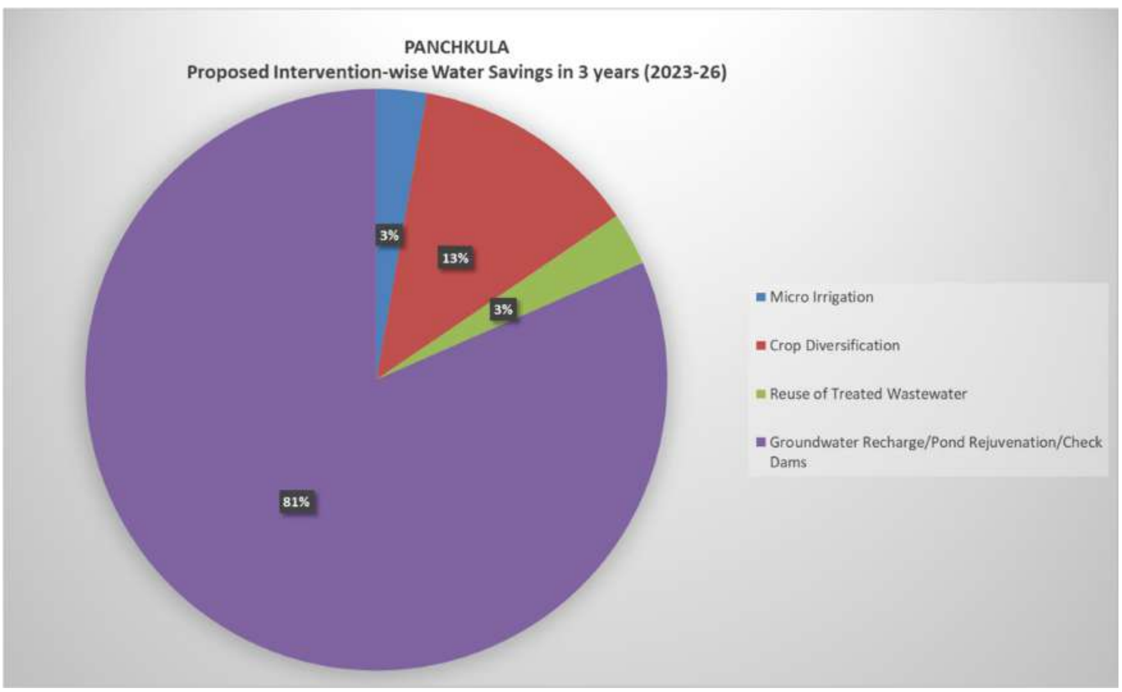
Source: District Water Resources Plan, Panchkula

Table 10.84 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Panchkula District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	7	700	NA	
Crop Diversification (Ha)	33	3300	3220 ha	7957 acres
Reuse of Wastewater (MCM)	8	800	8 MCM	800 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	212	21200	1180 No.	
Total	**260**	**26000**		

Source: District Water Resources Plan, Panchkula

Figure 10.18 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Panchkula District



17) PANIPAT

Table 10.85 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Panipat District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 1147	2023-24	10%	115	124
	2024-25	15%	172	172
	2025-26	20%	229	228
	Total	**45%**	**516**	**524**

Table 10.86 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Panipat District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	20	2000	7340 ha	18137 acres
Modernization of Channels and Water Courses (Ha)	39	3900	93531 ha	231115 acres
Crop Diversification (Ha)	7	700	1042 ha	2575 acres
Direct Seeding of Rice (Ha)	5	500	2430 ha	6005 acres
Reuse of Wastewater	9	900	9 MCM	900 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	45	4500	120 No.	
Total	**125**	**12500**		

Source: District Water Resources Plan, Panipat

Table 10.87 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Panipat District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	30	3000	7334 ha	18122 acres
Modernization of Channels and Water Courses (Ha)	51	5100	97509 ha	240945 acres
Crop Diversification (Ha)	7	700	1042 ha	2575 acres
Direct Seeding of Rice (Ha)	5	500	2430 ha	6005 acres
Reuse of Wastewater	14	1400	14 MCM	1400 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	67	6700	120 No.	
Total	**174**	**17400**		

Source: District Water Resources Plan, Panipat

Table 10.88 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Panipat District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	32	3200	6905 ha	17062 acres
Modernization of Channels and Water Courses (Ha)	62	6200	101489 ha	250779 acres
Crop Diversification (Ha)	7	700	1042 ha	2575 acres
Direct Seeding of Rice (Ha)	5	500	2430 ha	6005 acres
Reuse of Wastewater	21	2100	21 MCM	2100 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	102	10200	120 No.	
Total	**229**	**22900**		

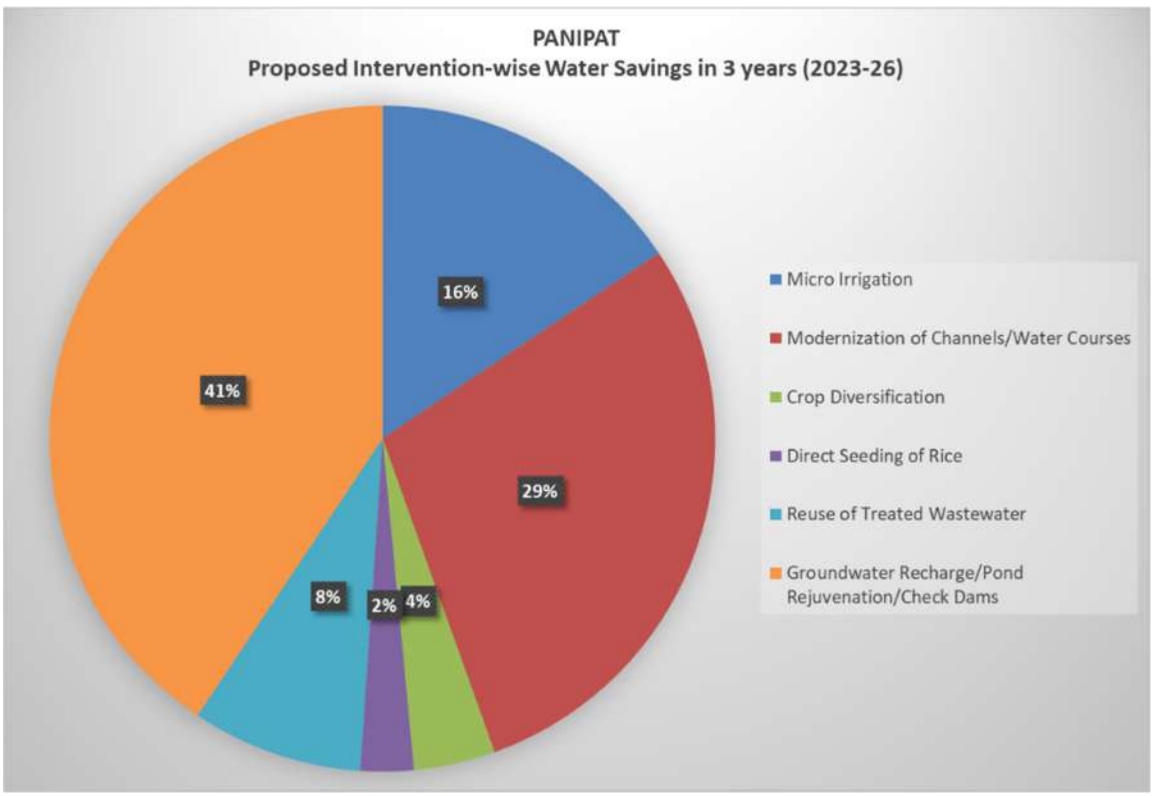
Source: District Water Resources Plan, Panipat

Table 10.89 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Panipat District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	82	8200	21579 ha	53322 acres
Modernization of Channels and Water Courses (Ha)	151	15100	292529 ha	722839 acres
Crop Diversification (Ha)	21	2100	3126 ha	7724 acres
Direct Seeding of Rice (Ha)	14	1400	7290 ha	18014 acres
Reuse of Wastewater	43	4300	44 MCM	4400 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	213	21300	360 No.	
Total	**524**	**52400**		

Source: District Water Resources Plan, Panipat

Figure 10.19 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Panipat District



18) REWARI

Table 10.90 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Rewari District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 187	2023-24	10%	19	53
	2024-25	15%	28	63
	2025-26	20%	37	83
	Total	**45%**	**84**	**199**

Table 10.91 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Rewari District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	26	2600	1576 ha	3894 acres
Modernization of Channels and Water Courses (Ha)	7	700	11149 ha	27549 acres
Crop Diversification (Ha)	6	600	1180 ha	2916 acres
Reuse of Wastewater (MCM)	4	400	4 MCM	400 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	10	1000	797 No.	
Total	**53**	**5300**		

Source: District Water Resources Plan, Rewari

Table 10.92 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Rewari District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	23	2300	1498 ha	3702 acres
Modernization of Channels and Water Courses (Ha)	6	600	12054 ha	29785 acres
Crop Diversification (Ha)	6	600	1180 ha	2916 acres
Reuse of Wastewater (MCM)	7	700	7 MCM	700 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	21	2100	703 No.	
Total	**63**	**6343**		

Source: District Water Resources Plan, Rewari

Table 10.93 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Rewari District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	38	3800	2567 ha	6343 acres
Modernization of Channels and Water Courses (Ha)	6	600	5331 ha	13173 acres
Crop Diversification (Ha)	6	600	1180 ha	2916 acres
Reuse of Wastewater (MCM)	7	700	7 MCM	700 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	26	2600	591 No.	
Total	**83**	**8300**		

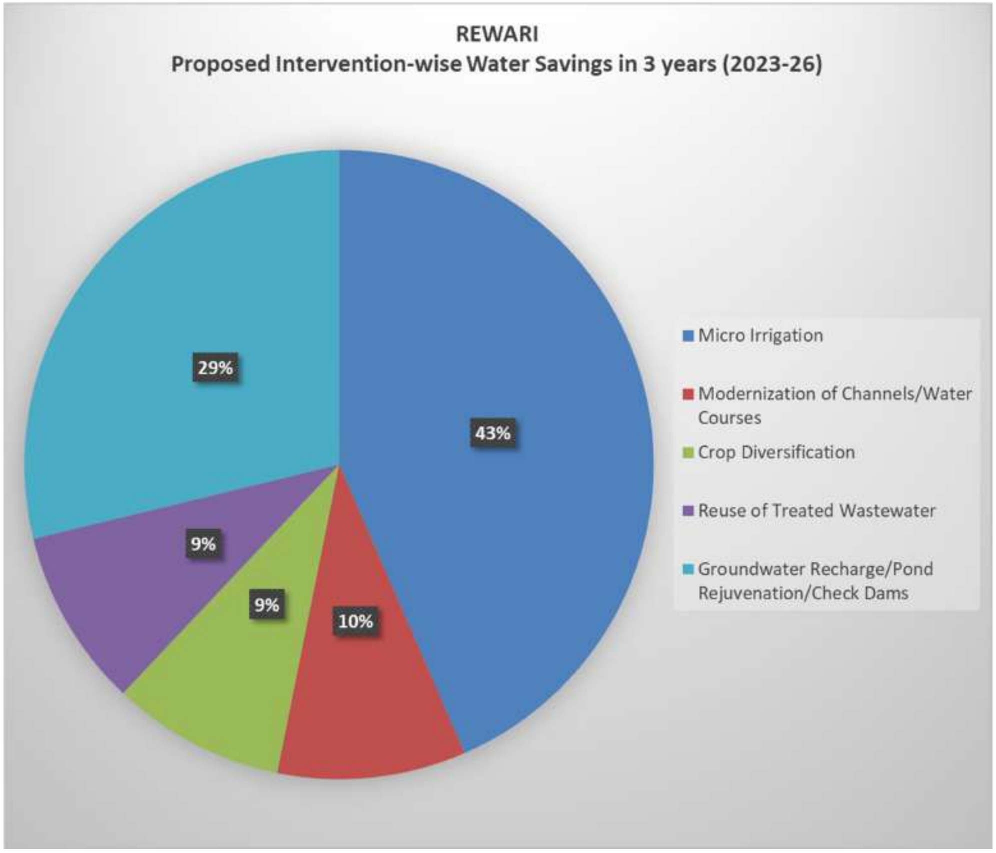
Source: District Water Resources Plan, Rewari

Table 10.94 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Rewari District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	87	8700	5641 ha	13939 acres
Modernization of Channels and Water Courses (Ha)	19	1900	28534 ha	70508 acres
Crop Diversification (Ha)	18	1800	3540 ha	8747 acres
Reuse of Wastewater (MCM)	18	1800	18 MCM	1800 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	57	5700	2091 No.	
Total	**199**	**19900**		

Source: District Water Resources Plan, Rewari

Figure 10.20 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Rewari District



19) ROHTAK

Table 10.95 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Rohtak District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 432	2023-24	10%	43	26
	2024-25	15%	65	78
	2025-26	20%	86	129
	Total	**45%**	**194**	**233**

Table 10.96 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Rohtak District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	3	300	442 ha	1091 acres
Modernization of Channels and Water Courses (Ha)	15	1500	12794 ha	31614 acres
Crop Diversification (Ha)	4	400	713 ha	1762 acres
Direct Seeding of Rice (Ha)	2	200	955 ha	2360 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	1	100	20 No.	
Total	**25**	**2500**		

Source: District Water Resources Plan, Rohtak

Table 10.97 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Rohtak District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres	MCM	
Micro Irrigation (Ha)	4	400	195 ha	482 acres
Modernization of Channels and Water Courses (Ha)	36	3600	10570 ha	26118 acres
Crop Diversification (Ha)	25	2500	2794 ha	6904 acres
Direct Seeding of Rice (Ha)	10	1000	4100 ha	10131 acres
Reuse of Wastewater (MCM)	3	300	3 MCM	300 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	1	100	17 No.	
Total	**79**	**7900**		

Source: District Water Resources Plan, Rohtak

Table 10.98 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Rohtak District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	4	400		0
Modernization of Channels and Water Courses (Ha)	50	5000	6444 ha	15923 acres
Crop Diversification (Ha)	50	5000	5304 ha	13106 acres
Direct Seeding of Rice (Ha)	21	2100	8200 ha	20262 acres
Reuse of Wastewater (MCM)	3	300	3 MCM	300 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	2	200	17 No.	
Total	**130**	**13000**		

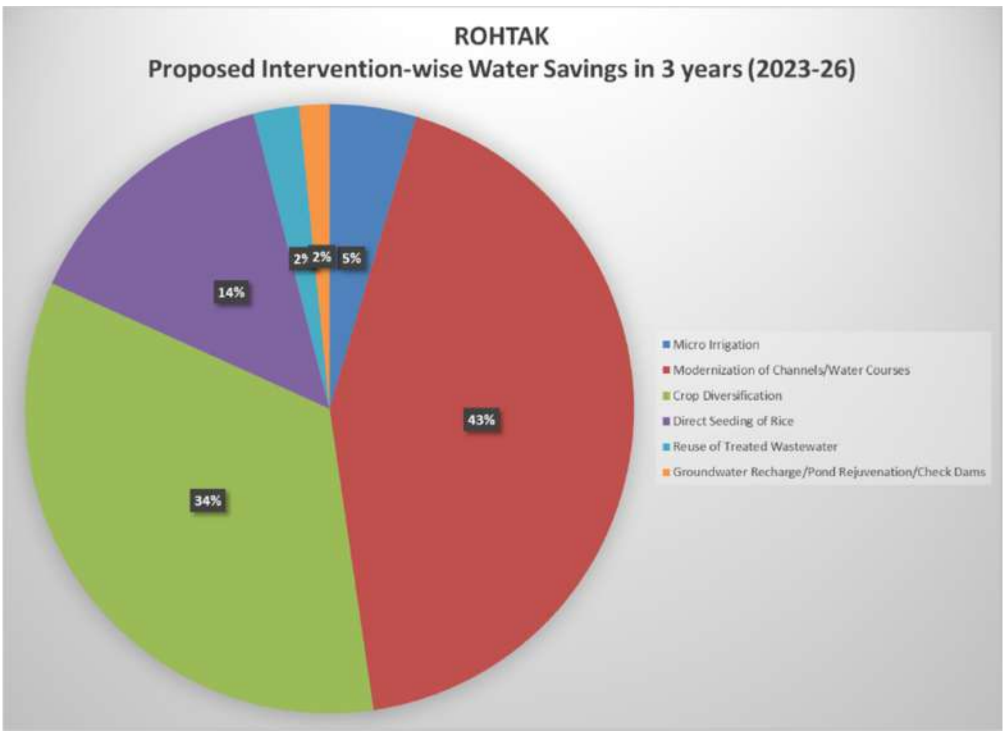
Source: District Water Resources Plan, Rohtak

Table 10.99 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Rohtak District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	11	1100	637 ha	1573 acres
Modernization of Channels and Water Courses (Ha)	100	10000	29808 ha	73656 acres
Crop Diversification (Ha)	79	7900	8811 ha	21772 acres
Direct Seeding of Rice (Ha)	33	3300	13255 ha	32753 acres
Reuse of Wastewater (MCM)	6	600	6 MCM	600 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	4	400	54 No.	
Total	**233**	**23300**		

Source: District Water Resources Plan, Rohtak

Figure 10.21 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Rohtak District



20) SIRSA

Table 10.2 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Sirsa District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 1049	2023-24	10%	105	138
	2024-25	15%	157	192
	2025-26	20%	210	256
	Total	**45%**	**472**	**586**

Table 10.101 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Sirsa District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	24	2400	8703 ha	21505 acres
Modernization of Channels and Water Courses (Ha)	17	1700	8164 ha	20173 acres
Crop Diversification (Ha)	21	2100	5034 ha	12439 acres
Direct Seeding of Rice (Ha)	18	1800	8798 ha	21740 acres
Reuse of Wastewater (MCM)	21	2100	21 MCM	2100 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	10	1000	446 No.	
Varietal Interventions (Ha)	7	700	8127 ha	20082 acres
Conservation Tillage (Ha)	22	2200	29276 ha	72341 acres
Total	**140**	**14000**		

Source: District Water Resources Plan, Sirsa

Table 10.102 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Sirsa District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	28	2800	10340 ha	25550 acres
Modernization of Channels and Water Courses (Ha)	32	3200	11470 ha	28342 acres
Crop Diversification (Ha)	28	2800	6066 ha	14989 acres
Direct Seeding of Rice (Ha)	36	3600	14698 ha	36319 acres
Reuse of Wastewater (MCM)	26	2600	26 MCM	2600 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	11	1100	648 No.	
Varietal Interventions (Ha)	9	900	12009 ha	29674 acres
Conservation Tillage (Ha)	23	2300	34476 ha	85190 acres
Total	**193**	**19300**		

Source: District Water Resources Plan, Sirsa

Table 10.103 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Sirsa District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	33	3300	11766 ha	29074 acres
Modernization of Channels and Water Courses (Ha)	46	4600	17559 ha	43388 acres
Crop Diversification (Ha)	39	3900	6694 ha	16541 acres
Direct Seeding of Rice (Ha)	51	5100	20941 ha	51745 acres
Reuse of Wastewater (MCM)	32	3200	32 MCM	3200 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	15	1500	739 No.	
Varietal Interventions (Ha)	10	1000	14516 ha	35869 acres
Conservation Tillage (Ha)	31	3100	43081 ha	106453 acres
Total	**257**	**25700**		

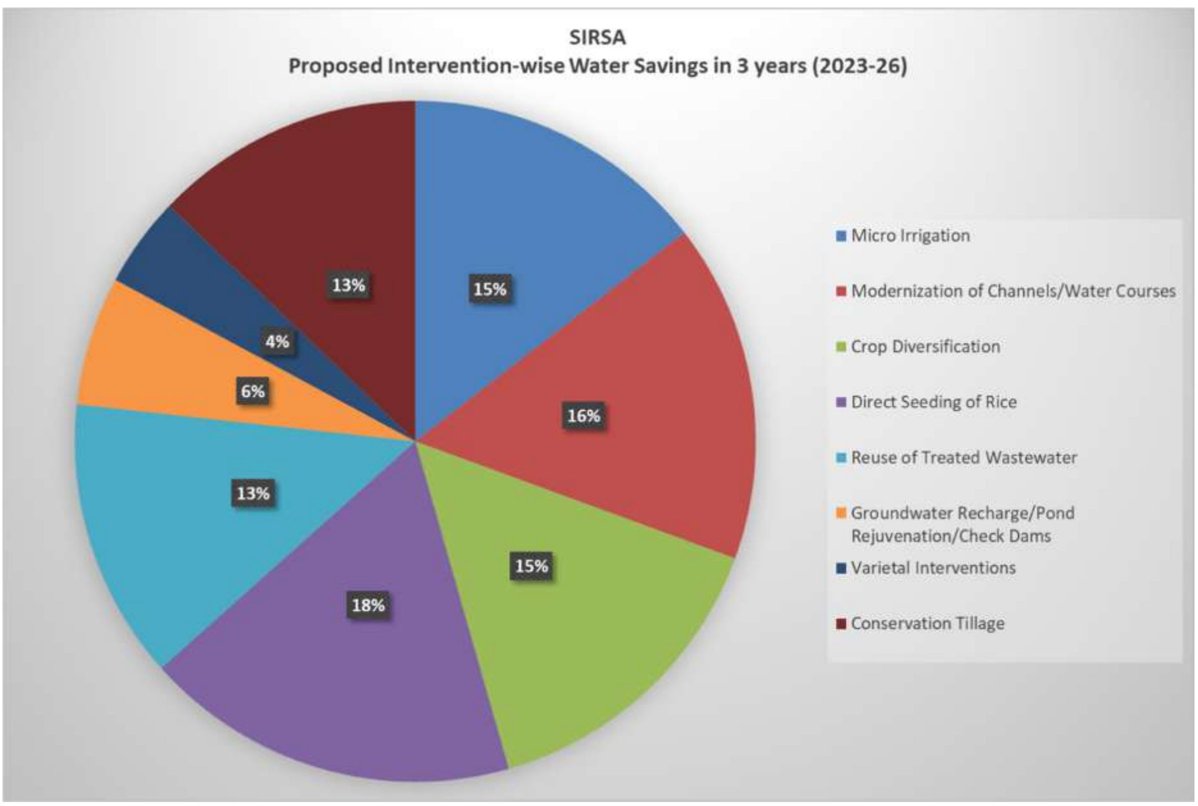
Source: District Water Resources Plan, Sirsa

Table 10.104 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Sirsa District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	85	8500	30809 ha	76129 acres
Modernization of Channels and Water Courses (Ha)	94	9400	37193 ha	91904 acres
Crop Diversification (Ha)	88	8800	17794 ha	43969 acres
Direct Seeding of Rice (Ha)	104	10400	44437 ha	109804 acres
Reuse of Wastewater (MCM)	78	7800	78 MCM	7800 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	36	3600	1833 No.	
Varietal Interventions (Ha)	25	2500	34652 ha	85625 acres
Conservation Tillage (Ha)	75	7500	106833 ha	263984 acres
Total	**585**	**58500**		

Source: District Water Resources Plan, Sirsa

Figure 10.22 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Sirsa District



21) SONIPAT

Table 10.105 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Sonipat District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 562	2023-24	10%	56	163
	2024-25	15%	84	225
	2025-26	20%	112	186
	Total	**45%**	**253**	**574**

Table 10.106 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Sonipat District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	14	1400	1502 ha	3712 acres
Modernization of Channels and Water Courses (Ha)	8	800	4158 ha	10274 acres
Crop Diversification (Ha)	7	700	2040 ha	5041 acres
Direct Seeding of Rice (Ha)	4	400	2430 ha	6005 acres
Reuse of Wastewater (MCM)	1	100	1 MCM	100 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	0.48	48	201 No.	
Varietal Interventions (MCM)	9	900	3400 ha	8401 acres
Conservation Tillage (MCM)	120	12000	33000 ha	81543 acres
Total	**163.48**	**16348**		

Source: District Water Resources Plan, Sonipat

Table 10.107 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Sonipat District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	14	1400	721 ha	1782 acres
Modernization of Channels and Water Courses (Ha)	54	5400	NA	NA
Crop Diversification (Ha)	10	1000	2770 ha	6845 acres
Direct Seeding of Rice (Ha)	5	500	2650 ha	6548 acres
Reuse of Wastewater (MCM)	1	100	1 MCM	100 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	0.48	48	194 No.	
Varietal Interventions (MCM)	10	1000	3800 ha	9390 acres
Conservation Tillage (MCM)	132	13200	36060 ha	89104 acres
Total	**226.48**	**22648**		

Source: District Water Resources Plan, Sonipat

Table 10.108 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Sonipat District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	13	1300	448 ha	1107 acres
Modernization of Channels and Water Courses (Ha)	0.20	20	NA	NA
Crop Diversification (Ha)	12	1200	3270 ha	8080 acres
Direct Seeding of Rice (Ha)	5	500	2820 ha	6968 acres
Reuse of Wastewater (MCM)	2	200	2 MCM	200 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	0.48	48	193 No.	
Varietal Interventions (MCM)	11	1100	4150 ha	10255 acres
Conservation Tillage (MCM)	143	14300	39070 ha	96542 acres
Total	**186.48**	**18648**		

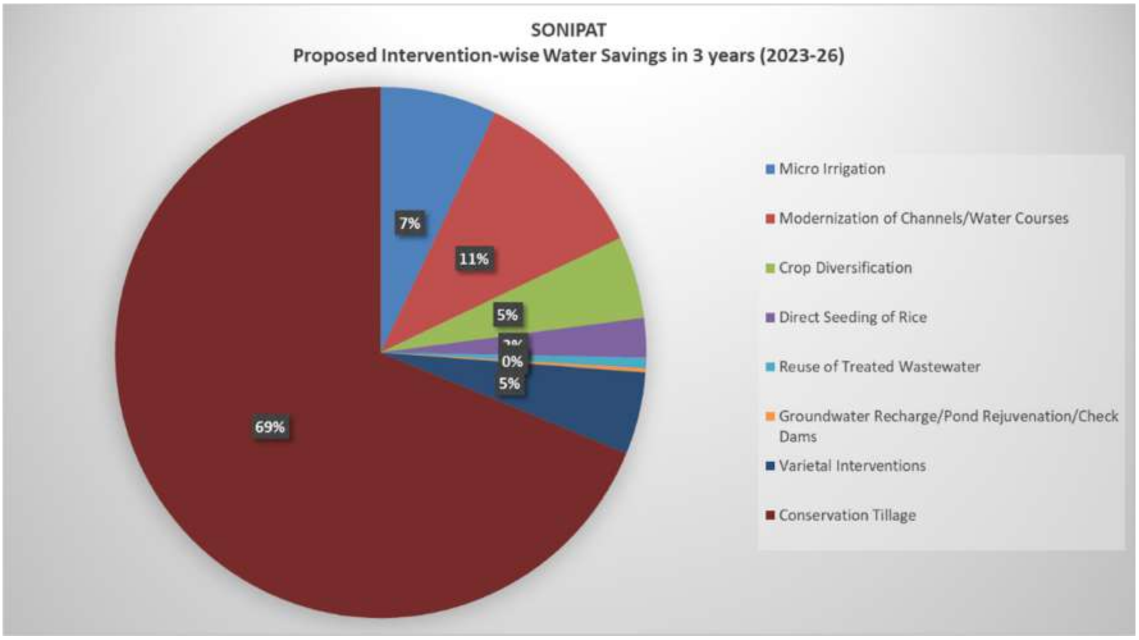
Source: District Water Resources Plan, Sonipat

Table 10.109 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Sonipat District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	41	4100	2671 ha	6601 acres
Modernization of Channels and Water Courses (Ha)	62	6200	4158 ha	10274 acres
Crop Diversification (Ha)	29	2900	8080 ha	19966 acres
Direct Seeding of Rice (Ha)	14	1400	7900 ha	19521 acres
Reuse of Wastewater (MCM)	4	400	4 MCM	400 cr litres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	1.44	144	588 No.	
Varietal Interventions (MCM)	29	2900	11350 ha	28046 acres
Conservation Tillage (MCM)	395	39500	108130 ha	267189 acres
Total	**575.44**	**57544**		

Source: District Water Resources Plan, Sonipat

Figure 10.23 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Sonipat District



22) YAMUNANAGAR

Table 10.110 Estimated Gap, Set Targets and Proposed Water Savings from 2023-26 in Yamunanagar District

Estimated Water Gap (MCM)	Target Year	Water Savings Targets (%)	Water Savings Targets (MCM)	Proposed Water Savings (MCM)
(-) 723	2023-24	10%	72	77
	2024-25	15%	108	115
	2025-26	20%	145	175
	Total	**45%**	**325**	**332**

Table 10.111 Action Plan for Water Savings and Conservation to be achieved in 2023-24 in the Yamunanagar District

Proposed Interventions	Water Savings 2023-24		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	31	3100	7455 ha	18421 acres
Crop Diversification (Ha)	33	3300	3353 ha	8285 acres
Direct Seeding of Rice (Ha)	0.30	30	199 ha	490 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	13	1300	325 No.	
Total	**77.3**	**7730**		

Source: District Water Resources Plan, Yamunanagar

Table 10.112 Action Plan for Water Savings and Conservation to be achieved in 2024-25 in the Yamunanagar District

Proposed Interventions	Water Savings 2024-25		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	39	3900	8998 ha	22234 acres
Crop Diversification (Ha)	25	2500	4522 ha	11174 acres
Direct Seeding of Rice (Ha)	38	3800	15625 ha	38609 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	13	1300	325 No.	
Total	**115**	**11500**		

Source: District Water Resources Plan, Yamunanagar

Table 10.113 Action Plan for Water Savings and Conservation to be achieved in 2025-26 in the Yamunanagar District

Proposed Interventions	Water Savings 2025-26		Target Area/No./Vol..	
	MCM	Cr Litres		
Micro Irrigation (Ha)	35	3500	8286 ha	20475 acres
Crop Diversification (Ha)	25	2500	4522 ha	11174 acres
Direct Seeding of Rice (Ha)	59	5900	24571 ha	60715 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	20	2000	328 No.	
Total	**139**	**13900**		

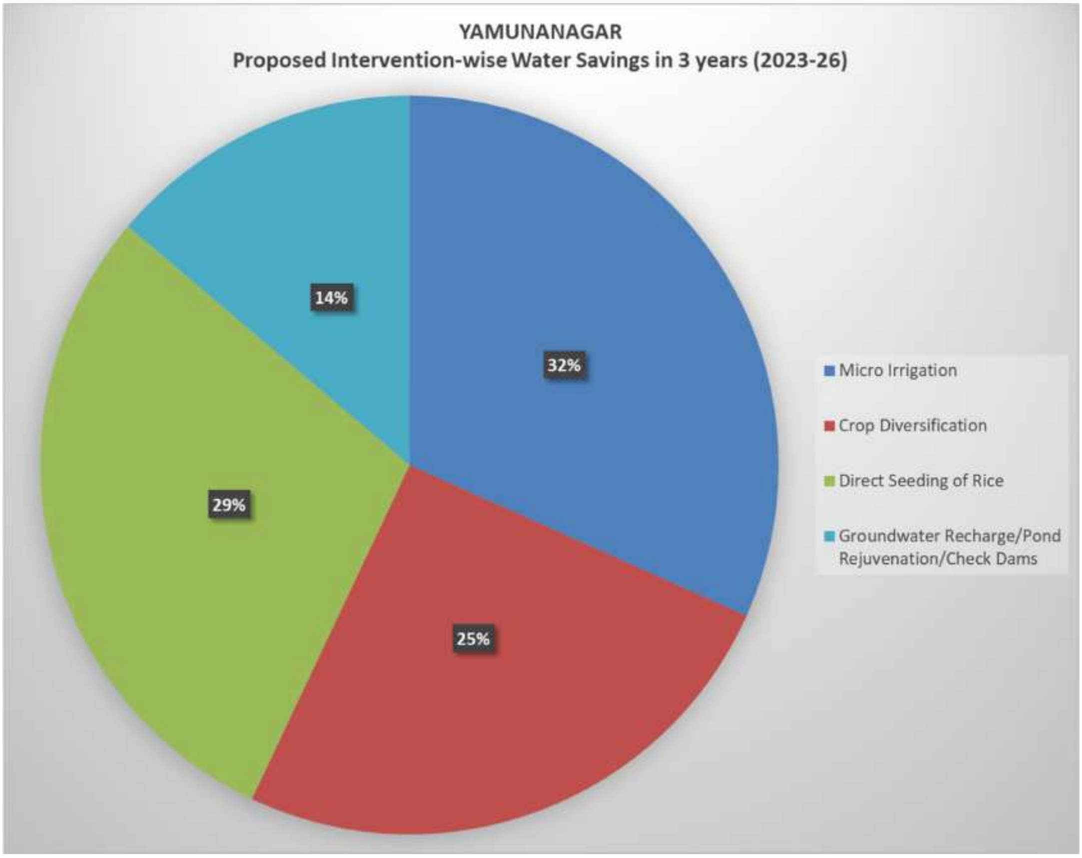
Source: District Water Resources Plan, Yamunanagar

Table 10.114 Action Plan for Water Savings and Conservation to be achieved in 2023-26 in the Yamunanagar District

Proposed Interventions	Water Savings 2023-26		Target Area/No./Vol.	
	MCM	Cr Litres		
Micro Irrigation (Ha)	105	10500	24739 ha	61130 acres
Crop Diversification (Ha)	84	8400	12397 ha	30633 acres
Direct Seeding of Rice (Ha)	97	9700	40395 ha	99815 acres
Groundwater Recharge/ Pond Rejuvenation/ Check Dams (No.)	46	4600	978 No.	
Total	**332**	**33200**		

Source: District Water Resources Plan, Yamunanagar

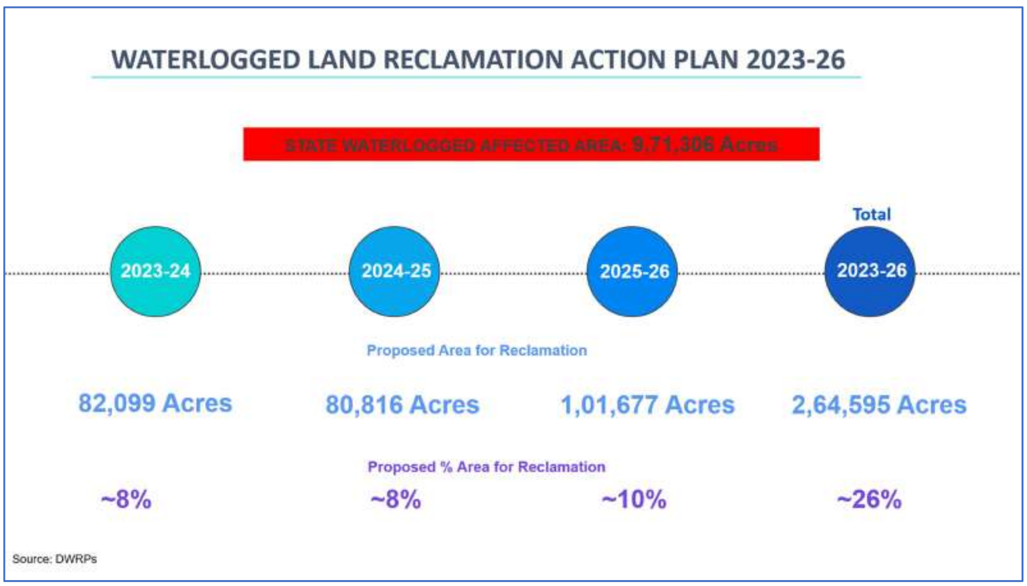
Figure 10.24 Proposed Intervention-wise Water Savings in Three Years (2023-24 to 2025-26) for the Yamunanagar District



10.2 RECLAMATION OF LAND FROM WATER LOGGING

Haryana has been severely impacted by water logging due to which most of the otherwise utilizable land has been rendered useless. 8.89% of the State's geographical area is reported to be under waterlogging conditions in June 2020 (Details are given in Chapter 3). The waterlogging in agricultural fields has been causing heavy losses to farmers for several years. Recognizing this as an urgent issue a separate three-year action plan is prepared to reclaim the affected land in the next three years 2023-26. Figure 10.25 provides details of the target areas for three years for land reclamation and the corresponding area for reclamation proposed by the Districts.

Figure 10.25 Proposed Land Reclamation Area from 2023-26 for Haryana



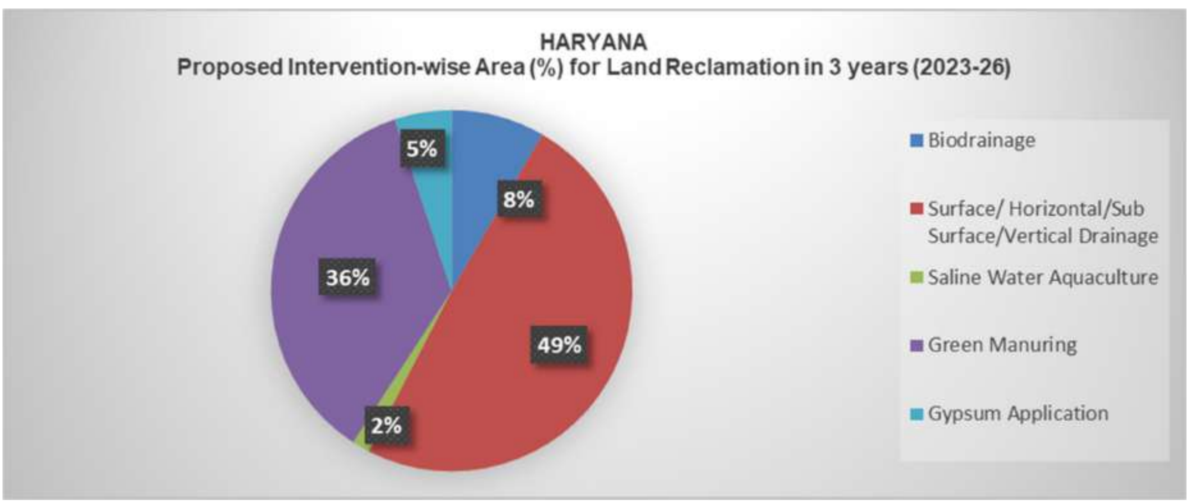
Districts have proposed multiple measures like bio-drainage, vertical drainage, sub-surface drainage, saline water aquaculture, and green manuring for controlling waterlogging in the State. Refer to Table 10.115 and Figure 10.26 for the intervention-wise area to be reclaimed.

Table 10.115 Action Plan for Land Reclamation for 2023-24, 2024-25 & 2025-26 for the Haryana State

Proposed Interventions	Proposed Land Reclamation Area							
	2023-24		2024-25		2025-26		Total 2023-26	
	Ha	Acres	Ha	Acres	Ha	Acres	Ha	Acres
Bio Drainage	2637	6516	2904	7175	3418	8445	8958	22136
Surface/ Horizontal/ Sub-Surface/ Vertical Drainage	14262	35242	16596	41009	21850	53992	52709	130244
Saline Water Aquaculture	415	1025	566	1398	718	1774	1699	4197
Green Manuring	14334	35420	10841	26787	13084	32331	38259	94537
Gypsum Application	1577	3896	1800	4449	2078	5136	5455	13480
Total	**33225**	**82099**	**32706**	**80817**	**41149**	**101678**	**107080**	**264595**

Source: District Water Resources Plan

Figure 10.26 Proposed Interventions for Land Reclamation in Three Years (2023-24 to 2025-26) for the Haryana State



10.2.1 District-wise Action Plan for Land Reclamation

This section contains the district-level action plans for the next three years for the reclamation of land affected by water logging. The district's plan has been compiled from the block-level plans prepared by the District Water Resources Planning Committees. For a detailed block-level action plan for each district refer to Annexure 10.2. Further details on each proposed intervention can be seen in the District Water Resources Plan of the respective districts.

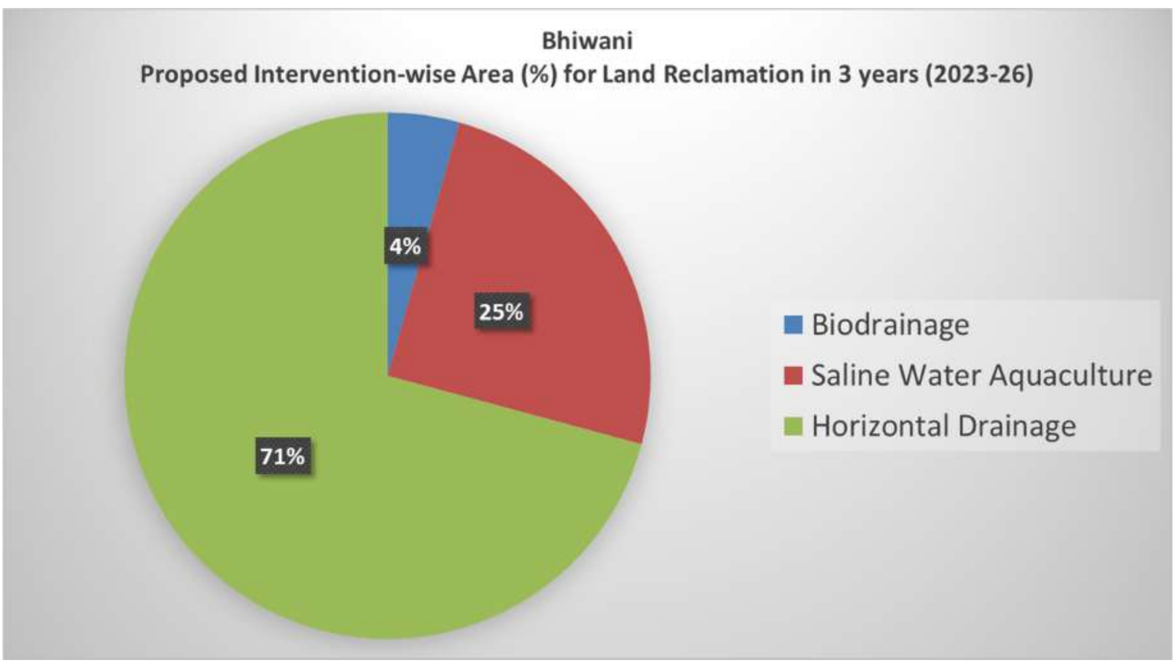
1) BHIWANI

Table 10.116 Action Plan for Land Reclamation for 2023-24, 2024-25 & 2025-26 in the Bhiwani District

Water-Logged Area (water level <3 mtr.) as per GWC June 2020 (ha)	Proposed Interventions	Proposed Land Reclamation Area							
		2023-24		2024-25		2025-26		Total 2023-26	
		Ha	Acres	Ha	Acres	Ha	Acres	Ha	Acres
47428	Bio Drainage	25	62	37	91	50	124	112	277
	Saline Water Aquaculture	140	346	210	519	280	692	630	1557
	Horizontal Drainage	400	988	600	1483	800	1977	1800	4448
	Total	**565**	**1396**	**847**	**2093**	**1130**	**2792**	**2542**	**6281**

Source: District Water Resources Plan, Bhiwani

Figure 10.27 Proposed Interventions for Land Reclamation in Three Years (2023-24 to 2025-26) for the Bhiwani District



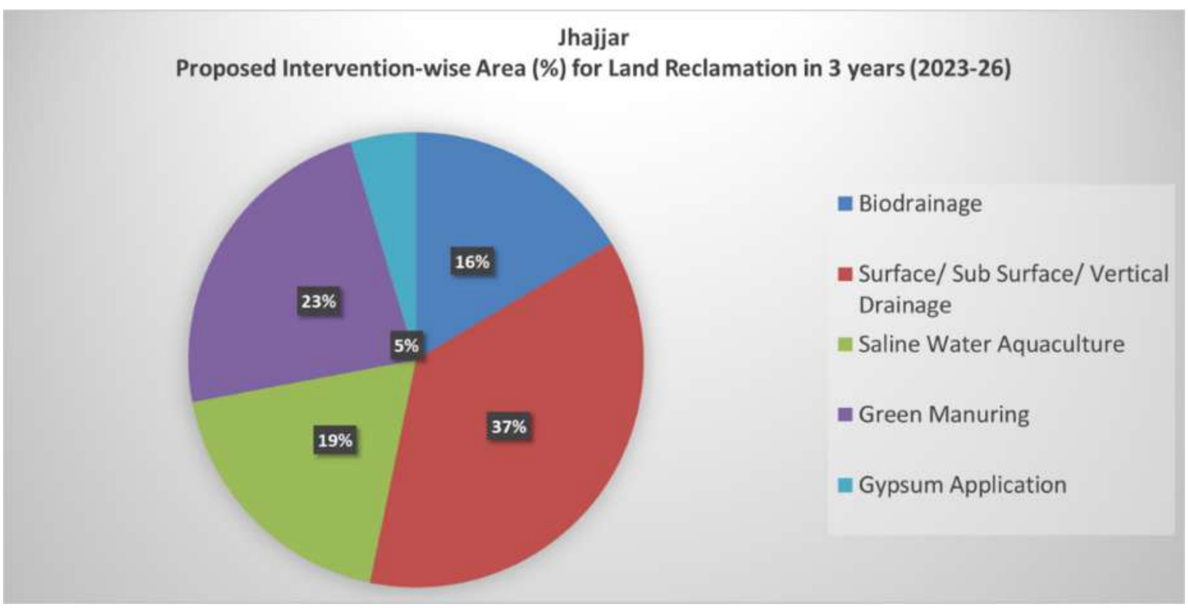
2) JHAJJAR

Table 10.117 Action Plan for Land Reclamation for 2023-24, 2024-25 & 2025-26 in the Jhajjar District

Water-Logged Area (water level <3 mtr.) as per GWC June 2020 (ha)	Proposed Interventions	Proposed Land Reclamation Area							
		2023-24		2024-25		2025-26		Total 2023-26	
		Ha	Acres	Ha	Acres	Ha	Acres	Ha	Acres
74770	Bio-drainage	280	692	210	519	180	445	670	1656
	Surface/ Sub Surface/ Vertical Drainage	1425	3521	25	62	50	124	1500	3707
	Saline Water Aquaculture	182	450	255	629	328	810	765	1889
	Green Manuring	325	803	250	618	375	927	950	2347
	Gypsum Application	85	210	85	210	20	49	190	469
	Total	**2297**	**5676**	**825**	**2038**	**953**	**2354**	**4075**	**10068**

Source: District Water Resources Plan, Jhajjar

Figure 10.28 Proposed Interventions for Land Reclamation in Three Years (2023-24 to 2025-26) for the Jhajjar District



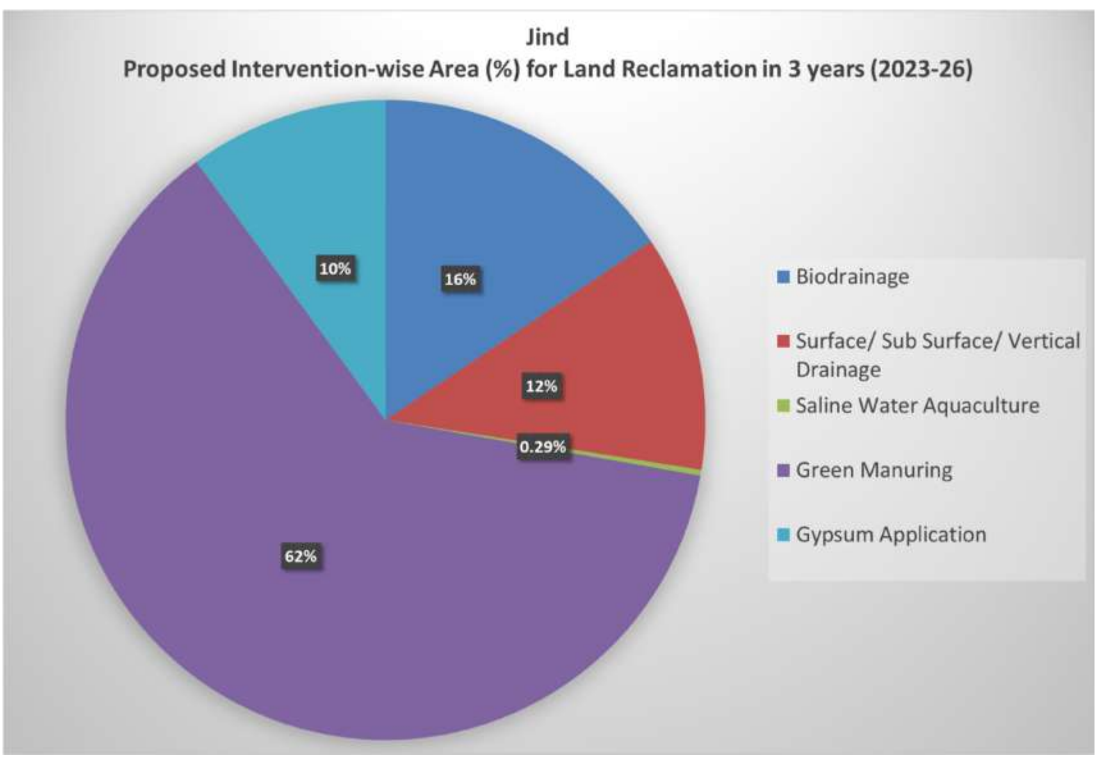
3) JIND

Table 10.118 Action Plan for Land Reclamation for 2023-24, 2024-25 & 2025-26 in the Jind District

Water-Logged Area (water level <3 mtr.) as per GWC June 2020 (ha)	Proposed Interventions	Proposed Land Reclamation Area							
		2023-24		2024-25		2025-26		Total 2023-26	
		Ha	Acres	Ha	Acres	Ha	Acres	Ha	Acres
25052	Bio-drainage	2310	5708	2657	6564	3188	7877	8154	20149
	Surface/ Sub Surface/ Vertical Drainage	1631	4030	2046	5055	2553	6308	6229	15393
	Saline Water Aquaculture	50	124	51	126	51	126	152	376
	Green Manuring	9209	22756	10591	26169	12709	31403	32508	80328
	Gypsum Application	1492	3686	1715	4239	2058	5086	5265	13011
	Total	**14692**	**36303**	**17059**	**42153**	**20559**	**50800**	**52309**	**129257**

Source: District Water Resources Plan, Jind

Figure 10.29 Proposed Interventions for Land Reclamation in Three Years (2023-24 to 2025-26) for the Jind District



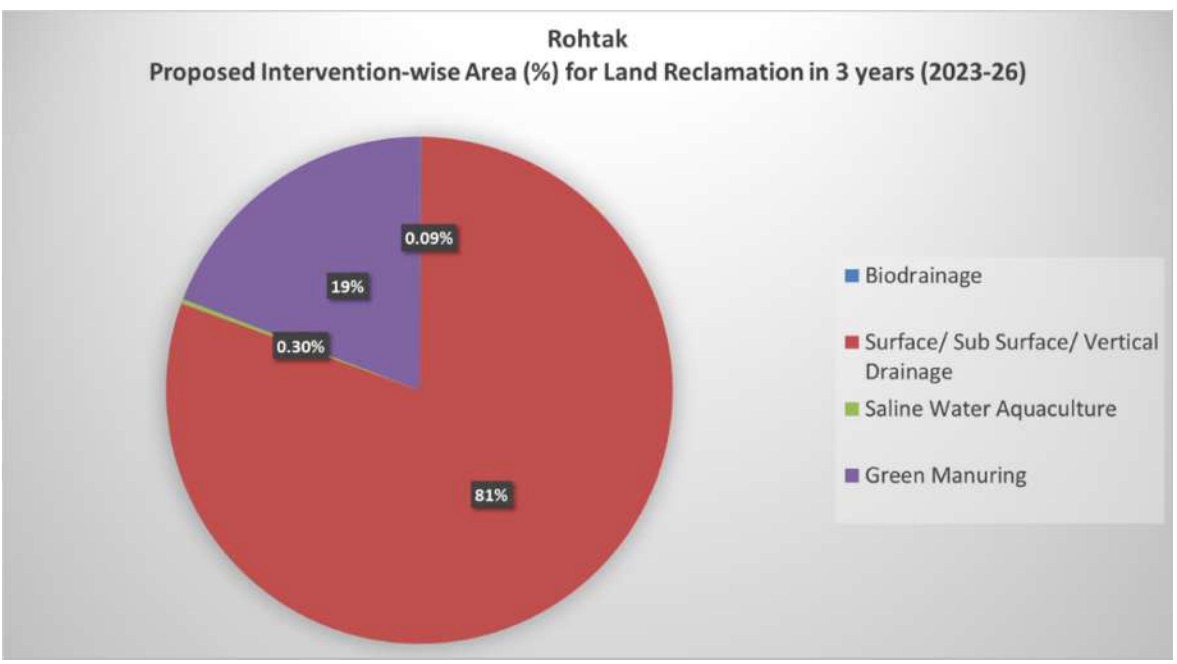
4) ROHTAK

Table 10.119 Action Plan for Land Reclamation for 2023-24, 2024-25 & 2025-26 in the Rohtak District

Water-Logged Area (water level <3 mtr.) as per GWC June 2020 (ha))	Proposed Interventions	Proposed Land Reclamation Area							
		2023-24		2024-25		2025-26		Total 2023-26	
		Ha	Acres	Ha	Acres	Ha	Acres	Ha	Acres
107362	Bio-drainage	22	54					22	54
	Surface/ Sub Surface/ Vertical Drainage	4502	11125	6724	16614	8964	22151	20190	49890
	Saline Water Aquaculture	21	51	25	62	29	72	75	185
	Green Manuring	4800	11861	0	0	0	0	4800	11861
	Total	**9345**	**23092**	**6749**	**16676**	**8994**	**22223**	**25087**	**61991**

Source: District Water Resources Plan, Rohtak

Figure 10.30 Proposed Interventions for Land Reclamation in Three Years (2023-24 to 2025-26) for the Rohtak District



5) SONIPAT

Table 10.120 Action Plan for Land Reclamation for 2023-24, 2024-25 & 2025-26 in the Sonipat District

Water-Logged Area (water level <3 mtr.) as per GWC June 2020 (ha)	Proposed Interventions	Proposed Land Reclamation Area							
		2023-24		2024-25		2025-26		Total 2023-26	
		Ha	Acres	Ha	Acres	Ha	Acres	Ha	Acres
73628	Vertical Drainage	1720	4250	1040	2570	1180	2916	3940	9736

Source: District Water Resources Plan, Sonipat

6) CHARKHI DADRI

Table 10.121 Action Plan for Land Reclamation for 2023-24, 2024-25 & 2025-26 in the Charkhi Dadri District

Water- Water-Logged Area (water level <3 mtr.) as per GWC June 2020 (ha)	Proposed Interventions	Proposed Land Reclamation Area							
		2023-24		2024-25		2025-26		Total 2023-26	
		Ha	Acres	Ha	Acres	Ha	Acres	Ha	Acres
19294	Sub-Surface Drainage	1100	2718	1280	3163	1336	3301	3716	9182

Source: District Water Resources Plan, Charkhi Dadri

7) FATEHABAD

Table 10.122 Action Plan for Land Reclamation for 2023-24, 2024-25 & 2025-26 in the Fatehabad District

Water-Logged Area (water level <3 mtr.) as per GWC June 2020 (ha)	Proposed Interventions	Proposed Land Reclamation Area							
		2023-24		2024-25		2025-26		Total 2023-26	
		Ha	Acres	Ha	Acres	Ha	Acres	Ha	Acres
13635	Vertical Drainage	320	790	479	1185	639	1579	1438	3554

Source: District Water Resources Plan, Fatehabad

8) HISAR

Table 10.123 Action Plan for Land Reclamation for 2023-24, 2024-25 & 2025-26 in the Hisar District

Water-Logged Area (water level <3 mtr.) as per GWC June 2020 (ha)	Proposed Interventions	Proposed Land Reclamation Area							
		2023-24		2024-25		2025-26		Total 2023-26	
		Ha	Acres	Ha	Acres	Ha	Acres	Ha	Acres
22361	Vertical Drainage	2236	5525	3354	8288	4472	11051	10062	24864

Source: District Water Resources Plan, Hisar

9) PALWAL

Table 10.124 Action Plan for Land Reclamation for 2023-24, 2024-25 & 2025-26 in the Palwal District

Water-Logged Area (water level <3 mtr.) as per GWC June 2020 (ha)	Proposed Interventions	Proposed Land Reclamation Area							
		2023-24		2024-25		2025-26		Total 2023-26	
		Ha	Acres	Ha	Acres	Ha	Acres	Ha	Acres
933	Saline Water Aquaculture	22	54	25	62	30	74	77	190

Source: District Water Resources Plan, Palwal

Chapter 11

STRATEGY AND APPROACH TO ACHIEVE WATER SECURITY IN HARYANA

TABLE OF CONTENTS

LIST OF TABLES

11.1 Introduction

Haryana having a land area of 1% of the total area has achieved a cropping intensity in the order of nearly 200% primarily due to assured surface water and groundwater. Irrigation intensity of the State is nearly 95% as compared to around 50% on all India basis. This has though contributed in a large way to ensuring national food security but it has resulted in a continued decline in its per capita water availability over the last 50 years because of increasing water use by the irrigation sector. With the agricultural export of crops like rice; a huge quantity of virtual water is also getting exported to other states. This implies that owing to its sizable agricultural exports, Haryana has been losing water thereby putting its water sustainability at risk. Moreover, the water footprint (total volume of water used to produce one tonne of rice) of producing rice in India is higher in comparison to China and other countries. According to a 2010 report by the UNESCO-IHE Institute of Water Education, the water footprint of producing rice is 2,020 m^3 annually in India, 970 m^3 annually in China, and 1,325 m^3 annually on average worldwide. Adopting novel water-saving strategies is crucial for preserving food security.

The groundwater level in the State is depleting fast due to the over-extraction of groundwater beyond the annual groundwater recharge. Moreover, water logging conditions have given rise to the secondary problem of salinity which has made the water unfit not only for drinking but also for agricultural purposes. As per the latest study of HWRA, out of the 7,287 villages, 3,041 villages (42%) are groundwater stressed and 421 villages (6%) are affected by water logging. Both these situations require urgent attention so that the sustainability of water is achieved without having an adverse impact on food grain production.

Water consumption has grown significantly as cities have expanded quickly. The areas around the National Capital especially in the districts of Faridabad, Gurugram and Sonipat are witnessing increased migration of people. The urban areas have already started showing signs of water shortage and groundwater depletion as the water supplies rely on tube wells in many areas. Population growth will further increase the water demand in future adding more burden on water resources. In order to ensure that the majority of metropolitan areas are water self-sufficient in the future, holistic and systemic solutions need to be implemented to solve urban water issues.

The strategic interventions for sustainable development in the water sector would require initiatives at the level of a) policy; b) legislation wherever required; c) institutional; d) infrastructural backed by technological innovation; e) continuous scientific research. This Chapter seeks to elaborate upon these proposed interventions for improving the water scenario in the State of Haryana.

11.2 Effective Policy and Governance

Effective evidence-based policymaking and governance in the management of scarce water resources are critical. State governments, as custodians of the water resource, have an important role to play in the development and effective implementation of integrated programmes and schemes for the water sector and monitoring the compliance of regulatory frameworks in this regard.

There is a need to have a fresh look at our water-related policies and laws, considering the new developments. Effective policies could be a roadmap to ensure that conservation, development, regulation and management of water resources is governed by a common integrated approach considering local, regional, state and national context. However, water policies have focused more on the expansion and physical availability of water without regard to sustainability. This approach has adversely affected the availability of water resources which includes both groundwater and surface water. The major proposed policy decisions are as under:

1. Incentivizing Cultivation of Sugarcane using Drip Irrigation

- The crop of sugarcane in the State of Haryana is being grown in some areas like Yamunanagar, Charkhi Dadri, Ambala, Karnal, Kaithal, Sonipat and Jind etc. These areas are dominated by the occurrence of fresh groundwater generally at all levels thereby enabling the growing of sugarcane crops a very remunerative option. Sugarcane has the highest crop water requirement of 1500-2500 mm as per the CCSHAU norms. Moreover, farmers tend to apply excessive water, which not only wastes fertiliser and precious water but also causes waterlogging and soil salinization, which ultimately causes irreparable harm to the land. Large areas of sugarcane are still being irrigated using traditional flood irrigation techniques, which significantly overuses water.

- The Maharashtra Government had made obligatory the adoption of drip/ sprinkler irrigation for all perennial crops including sugarcane which are irrigated by conventional flood irrigation methods in the canal command areas. Individual Farmers/WUAs who will adopt drip/sprinkler irrigation systems will be charged at the concessional rate of water charges; while defaulters will be required to pay the additional water charges.
- In 2019, the government of Tamil Nadu announced an increase in the subsidy for sugarcane farmers who install drip irrigation systems in their plantations from 24% to 37%. The installation of the system is entirely free for small farmers with holdings of less than five acres, and farmers with big holdings can take advantage of a 75% subsidy. Numerous major actors in Central America, Brazil, and Africa have converted hundreds of thousands of hectares to drip irrigation.
- Using drip irrigation leads to 50% of higher yields as compared to furrow irrigation and also uses up to 50% less water. According to the National Seed Association of India, a private sugar firm in Marathwada with offices in Osmanabad, drip irrigation consumes 7.5 million litres of water to irrigate one hectare of sugarcane over the course of a year as opposed to flood irrigation, which requires 15 million litres. Additionally, drip irrigation systems evenly irrigate the crop while operating flawlessly on any slope. Also, drip is the best option for implementing precision fertigation which will save the application costs of farmers.
- Therefore, it is strongly recommended to take effective policy measures to implement the use of drip irrigation to cultivate sugarcane throughout the State. It needs to be implemented with a number of supportive measures such as incentivizing farmers through interest-free loans with budgetary support for specific regions of the State.

2. Incentivizing Direct Seeding of Rice on Drip Irrigation

- It is now well known that the Direct Seeding of Rice (DSR) uses significantly less water for irrigation (15-20%), enhances percolation, decreases reliance on agricultural labour, and improves soil health, increasing paddy output by 5–10%. Direct seeding is widely practised in the United States and South America
- Haryana has successfully achieved implementation of the DSR technique on 72,000 acres for demonstration in the 12 districts in the year 2022. Farmers who adopted DSR were given financial aid of INR 4,000 per acre.
- Another advancement in this DSR is using it with drip irrigation technology which saves even more water and gives better yield due to minimised loss of nutrients in fertigation. According to the research study[1] conducted on the performance of drip-irrigated DSR which resulted in higher grain yield than flood irrigation with water savings of more than 40%.
- There is a need to encourage farmers to sow paddy through the DSR using drip in the next Kharif season. The farmers should be given incentives for at least three years if they continue to opt for DSR using the drip method. Training and demonstration plots should also be planned to assist the farmers in the installation of systems.
- The farmers should be identified as champion farmers so that the adoption of these technologies can be replicated in a big way.

3. Incentivizing Crop Diversification

- Haryana Government has launched Mera Pani Meri Virasat Yojana in 2020 to shift the farmers from growing water-intensive crops like paddy to less water-consuming crops like Maize, Bajra, Cotton, Pulses, and Vegetables/Horticulture. The scheme continued in the years 2021 and 2022.

[1] Sharda. R. et al. (2016) 'Performance of drip-irrigated dry-seeded rice (Oryza sativa L.) in South Asia', Paddy and Water Environment; Dordrecht Vol. 15, Iss. 1, (Jan 2017): 93-100.

- An extension of Mera Pani Meri Virasat covering the farmers who have diversified their crops for at least three years is suggested.
- At least 10%-15% area should be developed for Horticulture using drip in NCR, especially in districts Gurugram, Faridabad, Rewari and Mahendragarh.

4. Promoting and Incentivizing Conservation Tillage

- Conservation tillage includes options like laser levelling, bed planting, and zero tillage. Water saving is one of the main advantages of conservation tillage over conventional tillage. According to CCSHAU, Hisar the Conservation tillage options can potentially save 20-25% of irrigation water. Research shows that the use of conservation tillage practices may be less risky than conventional intensive-tillage practices.
- Additionally, no-till or zero-tillage saves the costs of fuel, labour, and equipment. Continuous no-till will increase productivity and profitability even further because of the enhanced soil structure and residue cover which also enhances infiltration, thereby further lowering runoff.
- Savings in soil moisture can be equally significant, particularly in years with low soil moisture and precipitation which saves expensive irrigation or require only a few water supplies.
- Compared to traditionally levelled land, a laser-levelled farm minimises run-off and water logging ensuring that farmers use just as much water as they need in the best possible way. It also helps in uniform soil moisture distribution resulting in good germination, enhanced input use efficiency, and improved crop yield.
- A farmer’s mindset can be a significant obstacle to the adoption and success of conservation tillage systems. Technical assistance may be provided to the farmers by professionals like extension agents, agricultural consultants, and researchers to learn about different aspects of conservation tillage systems.
- Implementing new knowledge and techniques on farms is the biggest challenge. Trying new methods on a small portion of the farm is a crucial tactic.

- A dedicated programme/scheme providing training and monetary incentives to help farmers establish and maintain conservation practices is needed.

5. Incentivizing Natural Farming and providing Adequate Marketing Facilities

- Natural Farming reduces water consumption by using a variety of crops that support one another and cover the soil to reduce wasteful water loss through evaporation. The Haryana government has prepared a plan to promote natural farming on 50,000 acres of land.
- Financial assistance for three years should be provided for different components including seeds, bio-fertilisers, bio-pesticides, organic manure, compost/ vermicompost, botanical extracts etc. to encourage the use of natural on-farm inputs for chemical-free farming. In addition, the State government should also support the farmers in training, certification and marketing of their produce.

6. Affordable Soil Moisture Sensors

- It is crucial for farmers to know the soil moisture level on their land to schedule irrigation systems effectively. Using soil moisture sensors to measure water levels can greatly simplify farming operations and cut costs. It is an effective strategy for optimal water supply.
- These field sensors provide precise real-time field data on the soil moisture status indicating when crops are at risk for stress, when to irrigate, and when to stop. This allows the farmer to conserve water and resources while increasing yields.
- This technology should be made affordable to the farmers so that they can grow more crop per drop.

7. Building Water Storage with Low Evaporation Rate

One of the primary concerns for the State in the future decades is the provision of enough storage capacity under rising water demands and rising climatic variability. It is anticipated that a multiple of the current storage capacity may be required in the near future. Significant amounts of water can be stored either above ground, in reservoirs behind dams, or underground, in aquifers. Under hydrological extremes brought on by climate variability, particularly in arid to semiarid regions, underground storage is thought to be very environmentally benign and may be a sustainable way to handle any emergency crisis.

a. Utilizing Surface/Rooftop Runoff for Underground Storage or Aquifer Recharge

There is a huge quantity of surface/rooftop runoff being generated from building roofs, and paved and unpaved areas but is not being utilized to the extent needed. The following action areas are identified:

- Compulsory underground storage or groundwater recharge structures can be taken up by all the institutions, universities, tourism complexes, shopping malls, hospitals, hotels, banquet halls, service stations etc. having an area of more than one acre so that not even a single drop of water is let out from their areas in the form of rainfall run-off and all the rainfall in these areas is conserved/stored/utilised for groundwater recharge, horticulture and flushing in toilets.
- Provision for compulsory water harvesting in rural areas by the Panchayati Raj Department on a similar concept of Building Code for urban areas.
- O&M should be made mandatory along with a provision to systematically monitor these structures in the Building Code.
- The land is very costly in big cities like Gurugram and Faridabad. Thus, it would be appropriate to construct artificial underground water storage tanks for saving evaporation losses. The top of such reservoirs can be used for cricket stadiums, parks, gardens, sports complexes etc. Faridabad can construct underground water storage reservoirs for storing Yamuna water during monsoons to use it during lean periods. Systematic Identification of such open areas/grounds for underground storage tanks is required.
- A large number of tube wells installed in the State are lying unused/defunct. Thus, groundwater extraction structures can be reversely utilised for recharge to the groundwater utilising excess rainfall during rainy seasons.

The areas/towns having excess water in canals/drains should be identified and this excess water should be let into these unused tube wells/wells. This may be made compulsory for PHED, HSVP, GMDA, FMDA and Education Institutions, especially in areas where there is no scope for groundwater contamination.

b. Solar Canals to Minimize Evaporation Losses

- By shading canals, solar panels can aid in reducing water loss due to evaporation. The Gujarat government in a trial project in 2014, installed solar panels were over 750 metres of irrigation canals in order to lessen water evaporation. Due to this, it built two 100-megawatt solar plants, one over the Narmada River and the other across an entire canal in the Vadodara district. The water beneath those panels, according to Indian experts, significantly lowered their temperature, preventing overheating and resulting in an average efficiency improvement of 2% to 5%. Now that California has seen the advantages of these effective installations and is planning to cover its canals with solar panels. UC Santa Cruz (UCSC) researchers in California have examined this method and concluded that spanning canals with solar panels could significantly cut costs from water conservation, aquatic weed maintenance and enhanced electricity production.
- Given the vast network of canals in Haryana, solar canals can help in minimizing the conveyance losses which would add to the water availability. However, challenges associated with its O&M like regular cleaning of solar panels and repair or removal of silt from canals have to be addressed innovatively.

c. Storage in Palaeochannels

- Palaeochannels in semi-arid to arid regions are discovered to have favourable geohydrological conditions for recharge by rainwater collection techniques as well as imported water through the canal and its distributaries. The unsaturated part of the palaeochannel deposits can act as a storage reservoir for artificial recharge for augmenting groundwater resources.

- In the dry western part of the Indian sub-continent encompassing Haryana, southern Punjab, Rajasthan and Gujarat, numerous palaeochannels have been identified and comprehensively investigated. The quality of groundwater in these palaeochannels is generally good. The aggregate length of all the palaeochannels in parts of Haryana, Rajasthan and Gujarat is of the order of more than 2,200 km. Almost all of them can be artificially recharged and replenished with water.

- In the Ghaggar basin, North-West India, the extensive network of surface and deep palaeochannels constitute potential aquifers in multiple groups covering the entire plain land. Groundwater abstractions from these aquifers have boosted irrigation in the agriculture sector in these areas.

- A study carried out in the Upper Ganga Plain around the Muzaffarnagar area for the identification of sites for artificial groundwater recharge using remote sensing-GIS techniques concluded that in the foothill zones of mountains and adjoining plains, the upper reaches of palaeochannels where groundwater may occur at deeper levels can be considered as potential sites for artificial groundwater recharge.

- As per studies undertaken by the Government of India, huge quantities of water can be artificially recharged in the State of Haryana through Palaeochannels utilizing non-committed surface water resources by diverting flood waters. Due to deep water levels in these areas, the channel fills remain perennially de-saturated. Detailed studies need to be undertaken along these Palaeochannels utilizing advanced geophysical, hydro-geological, and geo-morphological investigations. The possible areas of investigation should centre around Markanda, Sarsuti, Yamuna rivulets and other similar areas of interest.

- The recharge would not only increase the region's groundwater supply but would also revive the lost river and decaying ephemeral riverine features, causing the disturbed and vulnerable ecological system to recover.

d. Trees as Wind Breaker

- The wind is one of the most important factors which affect the rate of evaporation loss from the water surface. The greater the movement of air over the water's surface, the greater the evaporation loss. Planting trees in normal to windward directions is found to be an effective measure for checking evaporation loss. Plants (trees, shrubs or grass) should be grown around the rim of tanks in a row or rows to act as a windbreaker. These windbreakers are found to influence the temperature, atmospheric humidity, soil moisture, evaporation and transpiration of the area protected.
- Plants to act as windbreakers are usually arranged in rows, with the tallest plants in the middle and the smallest along the end rows, so that a more or less conical formation is formed.
- Trees grown as windbreakers are constantly subjected to the usual stress of wind, temperature, moisture, evaporation, insects and diseases. Thus, plants selected as windbreakers should be capable of resisting these stresses. In Haryana, trees have been grown by the Forest Department along both banks of the canals. This tree plantation along canals is beneficial on two counts, firstly they increase green cover for the State and secondly these are helpful in reducing evaporation from canals. HWRA recommends that Forest Department should plant trees along canals in such a way that these act as windbreakers for the canals thereby reducing evaporation.

e. Reduction of Exposed Water Surface

- In this method, shallow portions of the reservoirs are isolated or curtailed by the construction of dykes or bunds at suitable locations. Water accumulated during the monsoon season in such shallow portions is diverted or pumped to an appropriate deeper pocket in the summer months so that the shallow water surface area exposed to evaporation is effectively reduced. This method is one of the recognized methods. This method has been tried for Nayka reservoir, supplying water to

Surendranagar in Gujarat, which yielded good results. The compartmentalization work in the lakes supplying water to Chennai city has indicated that this method is more economical and effective than the chemical WER method.

- It is recommended that all water bodies should be suitably deepened in order to reduce net evaporation. Construction of water storage tanks by PHED, HSVP, and HSIIDC should have such a design that their depth is kept more. This would help in two ways, firstly it would require relatively lesser land and secondly, it would substantially reduce evaporation losses.

f. Sub-surface Dams

- This is a radically different approach to the control of evaporation losses, which comprises the storage of water in underground cavities or aquifers. This can certainly be done with great advantage in specific cases, where aquifers for such storages are available and do not entail higher lateral dispersion losses. Sub-surface dams can also be constructed in such schemes to prepare limited aquifers and thereby raise the level of storage, reducing subsequent pumping.

- Sub-surface dams or underground check dams have been constructed in Maharashtra, Andhra Pradesh, Gujarat and even in the Morni area of Haryana across streams or rivulets in water-deficient areas to hold groundwater and recharge the adjoining limited aquifers. They can be of masonry on rolled imperious fill depending on the rocky or alluvial strata. Problems of water supply by raising groundwater, thus have been mitigated for many settlements. One outstanding application of this method was the recharge of the aquifer adjoining Talaji rivulet near the town of Talaja in the Bhavnagar District of Gujarat where a significant water level rise was registered, after the limited monsoon. The main advantage of this method is that the loss of valuable lands and forest areas due to surface submergence can be altogether avoided. The method has a great future all over India in view of the environmental advantage.

- The construction of sub-surface dams in the Morni area for local irrigation requirements should be duplicated in other Shivalik hills and the Aravalli area.

g. Integrated Operation of Reservoirs

- This method is suitable for a system of reservoirs which can be operated in an integrated way. The method consists of operating the reservoirs in such a way that the total exposed water surface area is kept minimum for the system as a whole. Consequently, evaporation loss gets minimized. In order to achieve this objective, water use should be planned in such a way that shallow reservoirs with large water spread areas are depleted first.
- This method has been successfully practised by Mumbai Municipal Corporation in their water supply scheme. Such techniques were also tried in the Hiran dam 1 and 2 in the Junagarh district of Saurashtra region of Gujarat. The Chennai Metropolitan Water Supply and Sewerage Board have also been practising integrated operation of Red Hills, Cholavaram and Poondi reservoirs, which supply water to Chennai City so that the exposed water surface is kept minimum.
- It is recommended that PHED should use multiple reservoirs and initially empty the shallow reservoirs to reduce evaporation losses.

h. Treatment with Chemical Water Evapo-Retarders

- The chemicals capable of forming a thin mono-molecular film have been found to be effective in reducing evaporation loss from the water surface. The film so formed reflects energy inputs from the atmosphere, as a result of which evaporation loss is reduced. The film allows enough passage of air through it and hence, aquatic life is not affected. The film developed by using fatty alcohols of different grades has been found most useful for the control of evaporation. These materials form a film of a mono-molecular layer when applied on the water surface which works as a barrier between the water body and the atmospheric conditions. These fatty alcohols used for evaporation control are generally termed Chemical Water Evapo-retardants (WERs) and these are available in the form of powder, solution or emulsion. The departments managing water storage tanks can try this method on a pilot basis. However, they should ensure public safety and should get the recommendations of Health Authorities for using chemicals.

- The following chemicals are generally used for water evaporation retardation:
    - Cetyl Alcohol (Hexadecanol) $C_{16}H_{33}OH$
    - Stearyl Alcohol (Octadecanol) $C_{18}H_{37}OH$
    - Ethoxylated Alcohols and Linear Alcohols
    - Linoxyd CS-40
    - Acilol TA 1618 (Cetyl Stearyl Alcohol)

8. Water Harvesting using Farm Ponds

- One of the most effective technologies for water harvesting has been to collect excess runoff in dug-out ponds and recycle it for supplemental irrigation of Kharif crops or pre-sowing irrigation of rabi crops. Farm Ponds could help in successful rainfed farming in semi-arid regions. It also helps to recharge groundwater.
- Although farm pond technology is widely used in the nation, its adoption in Haryana, however, has been quite low due to a number of obstacles, including high initial costs, a lack of suitable lifting systems, and, most importantly, low farmer awareness on the benefits of the technology and cost-benefit analysis. Another issue is land availability, especially with small farmers for the construction of farm ponds.
- The farmers are typically hesitant to adopt any new ideas. Maharashtra and Telangana States have successfully used farm ponds as an agent of rural transformation. Learning from their experience Haryana can also promote rainfed agriculture in its region. The following actions could help in succeeding with farm ponds a) education and encouragement; b) spreading an idea by demonstrating its impact and; c) operational support along with direct financial help.

9. Reducing Dependence on Groundwater and Replacing it with Surface Water for Irrigation Needs

- The districts of Karnal, Kurukshetra and Kaithal are highly dependent on groundwater for their irrigation needs despite the canal water supply systems passing through these districts. The major reason is either the bad condition or the non-existence of water courses in these areas. It is highlighted that the Water User Associations (WUAs) which are responsible for the maintenance of these watercourses are not active in the region. The easy access and availability of groundwater also influence its greater dependence instead of canal water. Very minimal rates are charged for electricity supply which acts as a positive incentive for extraction. The overexploitation in these three districts has resulted in excessive depletion of groundwater levels.

- Hence, it is highly important to completely stop the extraction of groundwater in these areas and take necessary measures to shift to a 100% canal water supply. Canal water should be made available and mandatorily used by the farmers, especially in the monsoon season, when the availability of water is surplus in the canals.

Supply of additional canal water during the Kharif season for Karnal, Kurukshetra and Kaithal Paddy belt

- The paddy belt of Karnal, Kurukshetra and Kaithal need additional canal water for the growing of paddy. Incidentally, the capacity of the Western Yamuna Canal is being increased by 5,000 cusecs to receive more water from the river Yamuna during the monsoon period. A part of this water can easily be used by way of supplying more water to this area so that the pumping of groundwater could be effectively reduced to stabilize groundwater in these districts. Efforts should be made to give continuous canal water supply to the area from 16th July to 30th September irrespective of the rotational running of channels in the WJC command.

- Helper outlets should be installed on the side of each regular outlet with 30% to 50% discharge of the regular outlet from 16th July to 30th

September, discharge from such helper outlets can be run in the same water course so that each shareholder gets it equitably. Efforts will be made to remodel all channels in a phased manner for adding a capacity of 50% for Kharif supplies. Watercourses should be lined in the 80% of the watercourse lengths shown in the *chakbandi* with 50% additional capacity to synchronize it with the discharge from the helper outlets during the Kharif season.

- About 80% of the additional supplies required would come from Sirsa Branch Ex-Indri. Presently Sirsa Branch suffers from capacity constraints and this has been one of the causes of fewer monsoon supplies to this area. The theoretical capacity of the Sirsa Branch is 2,600 cs - 2,700 cs, but it runs only around 1,500 cs and that too is also taken back by the WJC system for feeding NBK link off-takes. Therefore, the capacity of the Sirsa Branch Ex-Indri can suitably be increased (say about 3,500 cs) by lining it on the bed and sides. The present proposal to line it only on sides can be held in abeyance for the time being.

- Any water which is received in Sirsa Branch Ex-Indri is accounted as Bhakra Water and eventually, it reduces our share in Bhakra Waters. It is observed that Sirsa Branch is being run to feed NBK link-off takes which were part of the WJC system prior to 1968. Therefore, the Old Nardak distributary offtaking from WJC Main Branch to the NBK link can be restored for the total requirement of supplies for off-takes of the NBK link which are required to be fed from the WJC system.

- Originally, Kurukshetra, Kaithal and part of Karnal areas were supplied water as per with other Bhakra command areas, but after the construction of NBK in 1968, the part capacity of Narwana Branch was diverted to NBK link and supply to the Narwana Branch and off-takes of Sirsa Branch was approximately made half. This disheartened the farmers who abandoned their water courses and shifted to tube well irrigation. This whole process had a cumulative effect on our exploitation of groundwater resulting in its decline in this area. This trend is needed to be reversed by supplying more Yamuna water to the area during the Kharif season. For sustainable groundwater in the paddy belt of this area, we will have to almost double the Kharif supplies to the area through Sirsa Branch by increasing no. of running days for the canals and resorting to the concept of 'helper outlets' for Kharif cultivation which were prevalent in Punjab during the 50s and 60s to use maximum flood water in these days.

10. Efficient Regulation and Distribution of Water in Command Areas

- After receiving supplies at Haryana Contact Points, this water is being supplied in four canal systems as per Rotational Programme issued by the Government. I&WRD should frame the Rotational Programme in consultation with the A&FWD as per the periodical water demand of crops of each command area.
- The field officers at the level of Sub Divisional Offices of I&WRD and A&FWD of water use departments and research officers of Agriculture Universities should have periodic meetings with farmers in villages to assess the requirement for water. In these meetings, the farmers can share their requirements for water for their crops and other problems regarding crops. In these meetings, farmers may be advised to irrigate their fields by using water-saving techniques. A cell should be created in the office of the Deputy Director, A&FWD at the district level, where they should assess the water requirements of crops on daily basis and should send demands of various canals to the Executive Engineer of I&WRD. Further, it should be the responsibility of I&WRD to schedule supplies in the channels as per the indent given by A&FWD.
- The water supplied and losses should be accounted for properly amongst different head works to assess its distribution among channels.

11. Reclamation of Water Logging Affected Areas

A comprehensive anti-water logging program is the need of the hour in the State of Haryana. Improving irrigation techniques through micro-irrigation in water-logged areas could arrest the problem. A combination of interventions like Sub-surface drainage, bio-drainage, crop selection in different agroclimatic zones, shrimp cultivation and conjunctive use of fresh water and saline water should be used to deal with the twin problems of waterlogging and salinization. Whereas, activities like water harvesting, groundwater recharge and flood irrigation should be highly discouraged in water-logged areas.

A combination of the following short-term, medium-term and long-term measures are recommended by the High-Level Expert Committee:

1. Reduce canal water supply by 25% from mid-July to mid-September and December-February in the districts of Rohtak, Jhajjar, Hisar, Sirsa and Jind. The canal water thus saved should be diverted to the water deficit area.

2. Conjunctive use of water i.e. canals water transported through Under Ground Pipe Line (UGPL) from tube wells installed near the canal must be used in a secondary system like the first store in a farm pond and then mix with marginal to sub marginally quality water of shallow tubewell and then irrigate the field through a micro-irrigation system.

3. Effective and efficient lining of canals and watercourses and their periodic maintenance for checking seepage losses.

4. Prohibit flood irrigation and promote micro-irrigation techniques (Sprinkler, Drip).

5. Installation of an appropriate surface and sub-surface drainage system.

6. Adopt crop diversification to shift from growing water-intensive crops.

7. Promote fish farming of saltwater species.

8. Constructing balancing/storage reservoirs at appropriate sites in canal command areas for storage of surplus canal and flood water for its subsequent use.

9. A network of drains and ditch drains in the area should be created to the extent that the excessive rain/ flood water does not remain standing for a longer period.

Conjunctive Use of Fresh Water and Saline Water

The conjunctive use of water is an important concept to control water-logging conditions and proper use of freshwater mixing with marginal to sub-marginal quality groundwater for irrigation purposes.

In waterlogged areas like Rohtak and Jhajjar where the canal network is very good and the water table is at a very shallow depth with poor groundwater quality in tube wells zones. 80% of tube wells in the districts are at shallow depth i.e. up to 20 metres depth only. Farmers are installing tube well near the canal for fresh water and transporting the water through pipelines into their fields and irrigating their fields by a flood irrigation system which further increases water logging problems. For controlling this situation there is an urgent need for the adaption of conjunctive use of water techniques. The conjunctive use of water can be illustrated as under:

Step-1: 70% Groundwater of having EC- 2000-6000 µS/cm (marginal to sub-marginal) which is not used by farmers must be pumped out using Solar Water Pumps for use after mixing with good quality canal water.

Step-2: The water from the canal has EC-100-200 µS/cm.

Step-3: The water from both sources i.e. tube well having EC between 2000-6000 µS/cm and canal having EC in the range of 100-200 µS/cm will be moved to a suitable size tank for mixing.

Step-4: The water should be mixed in a manner to obtain water of EC below 3000 µS/cm which can be used to irrigate crops like paddy. Mixed water will be stored in tanks which can be used by Micro irrigation systems.

Bio Drainage

It is to be noted that subsurface drainage has several recognized advantages, yet it is an expensive technique. Additionally, it produces low-quality effluents that must be either carefully reused or properly disposed of. Bio drainage, which is positioned as the least expensive and most environmentally benign type of land reclamation, is a substitute option asserted by Scientists. The

State should try experimental methods to establish its viability as an alternative drainage measure for land reclamation.

CSSRI and other institutes have developed some varieties of different crops which can give profitable yields even in salt-affected soils up to some extent. An area of about 10%-15% may be undertaken under salt-tolerant crops in the 1st year of 2023 Kharif and 2023-24 Rabi. The advance order for seeds of these varieties is to be ensured with CSSRI (Karnal) and CCSHAU (Hisar).

Inland Saline Water Aquaculture

Water logging and Salinity is a severe ecological concern in Haryana which has impacted the agricultural output with varying degrees of detrimental influence on the financial well-being of their farming communities. These inland, salt-affected, and water-logged regions, where agriculture plays a minor role but water is readily available, could be used to expand saline water aquaculture. Its success is shown by the research of Guru Angad Dev Veterinary & Animal Sciences University (GADVASU) in Ludhiana (Punjab, India) under various projects - including the Niche Area Excellence Program from 2010 to 2015, funded by the Indian Council of Agricultural Research (ICAR), New Delhi (India). Prominent steps should be taken in this direction. Farmers would need financial aid and a necessary support system to adopt this alternate livelihood option. This could help the area's poor farmers to regain their lands and establish a stable income.

Divert Water to Water Depleted Areas

Possibilities of diverting water from water-logged areas like Rohtak, and Jhajjar for supplying it to water-depleted areas like Charkhi Dadri, Mahendragarh, and Nuh to meet their demands should be explored.

Alternate Land-use Option

Farmers should be encouraged to install solar panels on their fields to sell solar energy as an alternate land-use option. This would not only generate livelihood for the farmers whose land has become unfit for agriculture due to water logging and salinity but would also contribute to the growth and development of renewable energy power generation in the country and reach net zero by 2050.

12. Urban Water Management

Urban Water Management needs to be equally focussed and a separate strategy is to be devised accordingly. The State government is looking towards adopting a new framework for Integrated Urban Water Management for efficient water management in urban areas. This would require a holistic and cross-sectoral approach linking urban water management with overall urban planning.

a) Comprehensive and Integrated Urban Water Planning

- There is an urgent need to formulate and execute comprehensive and integrated urban water management plans addressing concerns of water availability and quality.
- PHED should prepare water action plans for all the 144 towns of Haryana under the GoI Scheme AMRUT 2.0 in close cooperation with the other agencies (ULB, T&CP, HSVP, GMDA, FMDA & MCs) responsible for the water supply, treatment and management in their respective towns.
- All five ULB towns - Gurugram, Faridabad, Panipat, Karnal and Sonipat are very critical with respect to water. Therefore, ULB should plan specific water conservation activities for these areas.
- Priority is to be given to the towns having more than one lakh population.

b) Introducing Block Tariff System based on Consumption of Water

- Water pricing is a crucial economic tool for raising social fairness, reducing water waste, and ensuring the long-term financial viability of water utilities and operators.
- Block tariffs are volumetric charges where users pay different amounts for different consumption levels. It follows a step-wise structure. The water charge is set per unit of water consumed and remains constant for a certain quantity of consumption (first block). As the water use increases, the tariff shifts to the next block of consumption and so on for each block of consumption until the highest one. Block tariffs can be

differentiated among consumer categories (e.g. domestic and non-domestic).

- The most typical fee for water services is an increasing block tariff. They are employed in places like Spain and the Middle East where there has historically been a lack of water, and they are widely used in developing nations. Haryana should also think in this direction.

c) Punitive Action to Prevent Misuse of Water

- The State government should ban the following activities, especially during lean season to prevent the misuse of water.
  - Washing of vehicles, courtyards
  - Watering of lawns
  - Waste or misuse of water for any other reason
  - Overflow from overhead/ underground water tanks
  - Leakage from the water meter chamber and desert cooler
  - Wastage of water due to non-installation of bib taps
  - Installation and use of booster pump on the water supply line
- The violation of the ban should attract a penalty and can lead to the disconnection of the water supply. The fine can be added to the water bills.

d) Shift from Ground Water to Canal Water based Drinking/Domestic Water Supply

- Urban townships' having a large population is generally dependent only on tube wells for the supply of drinking/domestic water to the local population in large parts of the State. Even the industrial estates are also withdrawing groundwater for their domestic needs.
- Even peri-urban areas have become a source of water supply from tube wells which needs to be discouraged. The sale of water through water

tankers drawing water from tube wells situated in nearby villages should be monitored.

- There is an urgent need to shift from groundwater to canal-based drinking water supply to reduce the pressure on aquifers to meet the growing water demand of the urban population. Monsoon season brings surplus water which goes down the drains and gets wasted. Instead, that water can be used effectively to supply water to towns/peri-urban/cities at least during that rainfall season.

13. Reuse of Treated Waste Water

Realizing that the huge quantity of unused treated wastewater is available in urban cities; a comprehensive plan for the utilization of treated wastewater should be prepared to reduce dependence on freshwater sources. The following policy measures are required:

- The addition of a Dual Pipeline System in Drainage (one for grey water and the other for sewage/black) for Industries should be made in the T&CP license conditions.
- Strict enforcement of the following mentioned T&CP conditions should be done:
    - reuse of TWW in construction/ infrastructure projects.
    - water from waste pipe (grey water) shall be treated in a treatment plant within the premises and reused within premises of group housing, commercial, institutional and industrial buildings.
- PHED can plan and implement access to the Dual Water Supply System (one for potable water and the other for TWW) in new Housing/Office Complexes/Business Establishments as per the TWW Policy 2019.
- Promote the reuse of Treated Waste Water in Agriculture in peri-urban areas.

- A large quantity of fresh water is being utilised by power plants. This water needs to be substituted by TWW of optimum water quality by December 2024.
- Decentralised STPs in villages with an existing population of over 10,000 should be administered by Gram Panchayat.

11.3 Legislative Support

The policy initiatives outlined in sub-section 8.2 needs very strong legislative backing so that the goals and further futuristic ambitions are properly met by the involvement of all the stakeholders. The legislative backing for the policy initiatives as per requirements will enforce the stakeholders to adopt the water conservation practices to ameliorate the grave water crisis being faced by the state to date.

Formulation of Haryana State Water Policy

- An appropriate State Water Policy based on the geographical conditions, hydrological status (surface water and groundwater), water allocation priorities and other specific needs should be formulated with an objective to propose a framework for the creation of a system of laws and institutions and for a plan of action for development and management of water resources.

11.4 Institutional Strengthening

The establishment of political, social, economic and administrative systems is needed for managing the development and use of water resources.

1. Incentivizing Local-Level Participation

- It is important to understand that managing the water situation is not the job of only engineers, hydrogeologists, economists, and planners but most importantly, communities/ locals/ citizens themselves. The local-level water institutions – Village Water and Sanitation Committees (VWSC) or Pani Panchayats should have a legal status and should be recognised fully by the concerned administrative authorities. Special funds should be provided to ensure their continuous participation, functioning, and sustainability.

- Due to constraints of funds, maintenance of drains, which is a responsibility of the State or Central Government agencies is inadequate at present. The impact of improved maintenance of the drains would contribute to reducing inundations and waterlogging. Communities of inundated areas and water-logged areas should be assigned the responsibility to actively participate in the maintenance of drains. Beneficiaries' participation in the maintenance of drainage systems is also necessary. Such participation is expected to lead to a change in the beneficiaries' current passive attitude to drains and persuade them in desisting from using drains as garbage collectors and outlets for raw sewage.

2. Assigning Responsibility and Accountability at Panchayat Level

- Panchayats or local bodies should be assigned to take responsibility for judicious use, recharge, water conservation, and prevention of runoffs.
- The heads or *panchs* should be educated about different methods of water treatment, conservation, and recharge which shall further be implemented in the village at ground level.
- There needs to be a mechanism for accountability for water conservation and a penalty for water wastage.

3. Effective Functioning of Water User Associations

- As per guidelines of the Government of India, Ministry of Water Resources, CADWM wing, New Delhi, the involvement of farmers in the management of irrigation is essential for increasing agricultural productivity and water use efficiency. The National Water Policy, of 1987 emphasized the need for the progressive involvement of farmers in the management of irrigation. Recognizing this fact, the Ministry of Water Resources in April 1987 circulated guidelines to State Governments for forming farmers' associations or Water User Associations (WUA) for the operation and maintenance of the system. Further, GoI, MoWR, and CADWM in their guidelines issued in July 2005 made it mandatory to form WUAs for handing over watercourses to WUAs for the O&M. However, there is no Statutory Provision/Central Legislation except these guidelines.
- In the State of Haryana, these guidelines were adopted and Command Area Development Authority (CADA) was established in 1974 in Haryana first WUA was registered in 2004 and onwards under the Societies Registration Act 1860. It is mandatory to form WUA before starting of construction of watercourses. After completion of watercourses, the same is being handed over to WUAs for their future repair and maintenance under the technical guidelines of the Irrigation Department. The interest earned on the FDR is put in the bank on account of the release of the Functional Grant and Farmers' share. However, the interest earned on FDR is a very meagre amount and maintenance cost is high. Therefore, the WUAs could not maintain the watercourses properly.
- In Haryana, about 17,200 watercourses exist, out of which about 7,400 watercourses have been lined by MICADA under CADWM Programme since its inception and about 7,090 WUAs have been formed under the Societies Registration Act 1860. The WUA execute a Memorandum of Understanding with the Irrigation/CADA Department wherein the rights and liability of both the department and WUA are enshrined. These WUAs are not functioning properly due to a lack of funds/grant/administrative structure and legal sanctity. There is a need to create an enabling environment through policy resolutions, specific programs, projects and activities to be

implemented or sponsored by the Government. It is suggested that the WUAs should be brought under a legal framework similar to as done in the States of Tamil Nadu and Gujarat by putting into place legal and administrative provisions and procedures. Undertaking mass awareness building and promotional efforts are required to encourage the large participation of the farmers.

4. Information, Education, and Communication

- IEC is a potent tool for social transformation and development.
- Strengthening local institutions by investing in building their capacities is important to achieve participatory water management. There is a need to plan consistent awareness campaigns in the form of Jal Samvad for community mobilization.
- Regular periodic training of the officers/officials of various line departments in Haryana Irrigation Research and Management Institute, Kurukshetra (HIRMI) or Haryana Institute of Public Administration (HIPA) to apprise the grave situation of increasing water scarcity. These topics could include but are not limited to the current water situation, optimal utilization, water saving and conservation methods etc. A liaison officer in each department should be appointed to regularly assess the present and future water demand and advocate water conservation measures for optimum utilization of water in their respective departments.
- Additionally, sensitizing MLAs and elected representatives of Panchayati Raj Institutions is equally important to ensure water-sensitive decision-making.

5. Interdepartmental Collaboration and Cooperation

- It is also important to create the necessary mechanism for stakeholders' participation/discussion in ensuring water resources management issues to bring transparency, accountability and consensus for all decisions. Further, coordination with various line departments is required to facilitate collaborations and the convergence of schemes and programmes.

6. Formation of Cross-Sectoral and Interdepartmental Committees

- Dwivarshik Jal Prabandhan Yojana Monitoring Committees one at the level of Hon'ble CM and another headed by the W/Chief Secretary to Govt. Haryana should be formed to monitor the implementation of the action plan in the next two years.
- The constitution of the committee headed by the Hon'ble Chief Minister is suggested as follows:

1.	Hon'ble Chief Minister	Chairman
2.	Irrigation & Water Resources Minister	Member
3.	Finance and Planning Department Minister	Member
4.	Education Minister	Member
5.	Agriculture and Farmer Welfare Minister	Member
6.	Forests & Wildlife Minister	Member
7.	Cooperation Minister	Member
8.	Public Health Engineering Minister	Member
9.	Development & Panchayats Minister	Member
10.	Chief Secretary to Govt. Haryana	Member
11.	Chief Principal Secretary/Principal Secretary to Chief Minister, Haryana	Member
12.	Advisor (Irrigation) to. Hon'ble Chief Minister	Member
13.	Chairperson, Haryana Water Resources Authority	Member
14.	Administrative Secretary, Irrigation & Water Resources Department	Member
15.	Administrative Secretary, Finance and Planning Department	Member
16.	Administrative Secretary, Agriculture and Farmer Welfare Department	Member
17.	Administrative Secretary, Forests & Wildlife Department	Member
18.	Administrative Secretary, Cooperation Department	Member
19.	Administrative Secretary, Public Health Engineering Department	Member
20.	Administrative Secretary, Development & Panchayats Department	Member
21.	Administrative Secretary, School Department	Member
22.	Member(s), Haryana Water Resources Authority	Member
23.	Engineer-in-Chief, Irrigation & Water Resources Department, Haryana.	Member Secretary

- The constitution of the committee headed by the W/Chief Secretary to Govt. Haryana is suggested as follows:

1.	Chief Secretary to Govt. Haryana	Chairman
2.	Advisor (Irrigation) to Hon'ble Chief Minister	Member
3.	Chairperson, Haryana Water Resources Authority	Member
4.	Principal Secretary to Chief Minister, Haryana	Member
5.	Administrative Secretary, Irrigation & Water Resources Department	Member
6.	Administrative Secretary, Finance and Planning Department	Member
7.	Administrative Secretary, Agriculture and Farmer Welfare Department	Member

8.	Administrative Secretary, Forests & Wildlife Department	Member
9.	Administrative Secretary, Cooperation Department	Member
10.	Administrative Secretary, Development & Panchayats Department	Member
11.	Administrative Secretary, Public Health Engineering Department	Member
12.	Administrative Secretary, School Education Department	Member
13.	Member(s), Haryana Water Resources Authority	Member
14.	Special Secretary, Finance and Planning Department	Member
15.	Director, Agriculture and Farmer Welfare Department	Member
16.	Principal Chief Conservator, Forests & Wildlife Department	Member
17.	Registrar, Cooperation Department	Member
18.	Engineer-in-Chief, Public Health Engineering Department	Member
19.	Engineer-in-Chief, Irrigation & Water Resources Department, Haryana.	Member Secretary

- This committee will support the committee headed by the Hon'ble Chief Minister, Haryana and regularly review the functioning of various departments to achieve the ultimate objectives of the Dwivarshik Jal Prabandhan Yojana 2023-25.

7. Constitution of Advisory Board

- As per the Draft "The Haryana Water Resources (Conservation, Regulation & Management) Authority, Rules, 2022", the Chairperson or the Authority may, under the Chairpersonship of Chairperson, constitute the Advisory Board, with such experts, official or non-official, for the purpose of rendering advice to the Chairperson/Authority in matters related to, however not limited to, groundwater and surface water, improving the quality and availability of water and any other issue may be referred to the Advisory Board by the Chairperson/Authority.
- The constitution of the board should consist of water experts from various national and international institutes and organizations.

8. Involvement of Hydrologists and Geohydrologists in Decision Making

- Decision-making on water management and utilization should involve hydrologists and geohydrologists to better protect and manage both surface and groundwater resources.

- The State should hire competent geohydrologists and hydrologists to guide in designing and implementing water-related interventions and schemes.
- There is a need to strengthen the Ground Water Cell both at the district and headquarters level.
- Developing the capacities of rural local youth by conducting training programs and by handholding through Panchayats and other community institutions is an effective way of engaging youth in the system. They can be known as "Jal Sahyogi" who are to be educated and trained through synthesizing formal geo-hydrological science with traditional water management techniques. This needs funding and institutional support.

9. Introducing System of Audit

- It is essential to compare official records with the actual situation on the ground in order to evaluate the impact of government schemes and programmes. This will also bring transparency and accountability into the system.
- Third-party audit systems to broaden the scope of the social audit to include all state-wide water saving and conservation programmes in order to evaluate its actual impact on the ground must be undertaken.

10. Inter-state Water Issues

- The major surface water resources of Haryana State are external. The State's share of water in rivers Sutlej, Ravi, Beas, and the Yamuna is well defined as per inter-state agreements and is about 15.95 BCM of water. Year-wise shares, however, are on a pro-rata basis according to the availability of water in reservoirs, which is about 11.69 BCM.
- The construction of the SYL Canal planned to carry the share of Haryana and Delhi of Ravi-Beas waters, is yet to be completed. There has been no construction activity on the canal in Punjab since 31.07.1990. Haryana is suffering great recurring loss as it is able to utilise only 2.00 BCM of Ravi-Beas waters through the existing carrier channels against its share of 4.72 BCM. Haryana Government should prevail upon the Government of India to

take up the construction of the incomplete portion of the SYL canal in the Punjab region as per the decision of the Hon'ble Supreme Court of India 2004 for its completion in one year because the Presidential reference filed by Punjab has also been decided in favour of Haryana by the constitutional bench of Hon'ble Supreme Court declaring it as null and void in favour of Haryana. This share of water will irrigate the arid areas of districts i.e. Rewari, Mahendergarh, Charkhi Dadri, Bhiwani etc.

- The commissioning of this Multipurpose Channel is pending due to the stay granted by the Supreme Court of India on the objections raised by Punjab. Haryana Government should get expedite the proceeding of the court case for the decision regarding its commissioning as this channel has been constructed to carry 0.98 BCM of water from Bhakra Main Line for additional supply to the Western Jamuna Canal (WJC) System.

- As per section 79(1) of the Punjab Re-organisation Act, 1966, the control of irrigation headworks at Ropar, Harike and Ferozepue for administration, maintenance and operation should be with BBMB to enable the board to carry out proper regulation of water supplies and ensure delivery of proper share of Sutej, Ravi and Beas water to partner states. I&WRD should take this matter in the Board meeting of BBMB for transfer, and control of irrigation head works at Ropar, Harike and Firozpur.

- I&WRD should take the matter of recalibration of the discharge table of parent channels in the Technical Committee Meeting (TCM) and Board meeting of BBMB to ensure its due share at Haryana Contacts Points.

- The issue with the State of Punjab to address the drainage problem by framing a composite scheme regarding areas of Punjab and Haryana should be taken up. Sometimes the flood water flowing from the Punjab portion enter Haryana through an incomplete SYL Canal and causes damage.

- Practically, no water is received in Haryana through Krishnawati, Sahibi and Dohan rivers as Rajasthan has constructed check dams on these rivers and utilizes all water depriving Haryana of its due share. This issue should be taken up with Rajasthan Government to take its due share in the ratio of 50:50.

- Narwana Branch and BML Barwala Link Channels off-taking Bhakra Main Line Channel, receiving supplies of Bhakra Water for Haryana are not in a position to take design discharge being old construction. These channels should be modernised/repaired at top priority so that to take design discharge in case of excess water availability in the parent channel i.e. Bhakra Main Line.

11.5 Infrastructure Development

The building of sustainable infrastructure plays an important role in meeting the demands of multiple sectors in order to fulfil needs for flood water management, drought resilience, safe and adequate water supply, energy security and ecosystem services. This includes developing sustainable infrastructure for irrigation, energy, groundwater recovery, flood management, water supply, wastewater treatment, reclaiming saline soil and water, rainwater harvesting and natural systems (e.g. ponds, wetlands, floodplains and catchment restoration).

1. Ground Water Monitoring using Piezometers

- Piezometers are one of the critical components in groundwater monitoring. Piezometer is a bore well/ tube well used for measuring the water level by lowering the tape/sounder or automatic/ digital water level measuring equipment. It can also be used to take a water sample for water quality testing whenever needed. The data collected from piezometers can provide insights on medium and short-term cycles of groundwater fluctuations, and rainfall recharge relationships, and also enable refinement of groundwater resources computations.

- The establishment of piezometers in both rural and urban areas is needed to create a monitoring network. Installing piezometers with online telemetry for live data on groundwater depletion would be an effective step in monitoring and regulating this critical resource.

2. Enhancing the Efficiency of Channels

- I&WRD is already taking up the work of lining the Channels to reduce seepage losses, but it is needed to be expedited. I&WRD has already taken up the works of modernization of Western Jamuna Canal (WJC), J.L.N. feeder, Parallel Lined Channel (PLC) Augmentation Canal etc to reduce the seepage losses and enhance their capacities to take the flood water and future availability of water from up-storage dams.
- There are many channels in districts such as Yamunanagar. Ambala etc., which are unlined channels. These should be repaired periodically to reduce seepage losses which are about 21% in the canal network as calculated in Chapter 2. Reduction in seepage losses of channels will conserve water for other uses.

3. IoT-Based Operation and Maintenance

- Intelligent Water Management is needed for improving water management and bringing efficiency to the use of this precious resource. Since many cities rely on outdated infrastructure, water projects can be particularly complex. The IoT also offers options to lower operating costs related to development, maintenance, and other costs. IoT can improve water management in many ways including water leakage detection, water quality and safety monitoring, quality control on water reserves, transparency on consumption and prescriptive maintenance of infrastructure.

- HSVP has undertaken the O&M of all groundwater extraction units with help of IoT based system in Panchkula. Similar, interventions are required to be introduced for other cities as well.

4. Modernized Laboratories

- There is a need to modernize laboratories with advanced geophysical and chemical equipment for effective assessment and monitoring of important parameters related to water.

5. Recharging of Groundwater East of NH-44 from Gharaunda to Sonipat

- Groundwater has depleted in the area lying between NH-44 and river Yamuna from Gharaunda to Sonipat. This is a rice belt and very limited canal supplies are available in this area which has led to the decline of the groundwater table. Adequate water will be available in the WJC system during the monsoon period after the enhancement of the capacity of the WJC system by 5,000 cusecs. The water table in this area can be stabilized if canal water is supplied for paddy cultivation in the area during the Kharif season. The following Kharif channels can be constructed for this area: -
- Gharaunda Kharif Channel- A Kharif channel of adequate capacity can be planned from the Augmentation canal opposite Madhuban up to Panipat town. Gharaunda Irrigation Scheme was planned in the past also, but it could not mature as the capacity of the WJC system was not adequate at that point in time. On construction, this channel can supply adequate canal water during the Kharif season to reduce pressure on the groundwater.
- Samalkha-Ganuar Kharif Channel- A Kharif channel can also be constructed from Paralleled Delhi Branch opposite Panipat to run in the Samalkha and Ganuar areas for Kharif irrigation of the command area lying between NH-44 and river Yamuna.

6. Storage of Excess Rain/Flood Water

- The additional storage capacity can be created in the groundwater reservoir by allowing and arranging for bigger swings in water levels or by allocating more room for surface water.
- The State Government is implementing projects to enhance the capacity of the WJC carrier system to utilize surplus water in River Yamuna during monsoon amounting to INR 3,921.29 crore out of which funding of INR 1,415.29 crore is already approved. Additional water of around 5,000 Cusecs would be available during the monsoon after the execution of the entire WJC project. This will result in 36.50% increased water availability in

various carrier systems- Sirsa Branch System, Hansi Branch System, JLN System, Bhalaut System, GWS and Mewat Canal Feeder System

- Excess availability of Yamuna water during the monsoon period delivered through canals is required to be suitably stored in the State for groundwater recharging and direct uses. This water can be stored in the existing water bodies of the state such as Khaparwas Lake, Bhindawas Lake, Sultanpur Lake, Badkhal Lake, Masani Barrage Lake, and storages created by bunds in Gurugram, Rewari and Narnaul areas. This water can also be stored in village ponds and all other such ponds.
- In water-starved districts like Karnal, Kurukshetra etc. a number of drains exist which take surplus rainwater runoff out of the said area. Adequate recharge structures should be constructed in these drains so as to harness all the rainwater runoff flowing out of these districts. More groundwater structures are needed to be constructed in this area in consultation with CGWB.

6.1. Storage along the Yamuna River

- Efforts will be made for identifying suitable land along the River Yamuna to construct storage by excavating reservoirs and also by constructing suitable dykes (wherever possible) to divert and store flood water in the natural depressions along the River during monsoon. This could be done on the lines of the storage created by the Government of NCT of Delhi at Palla.
- The creation of such storages along River Yamuna would go a long way toward conserving excess monsoon river water. These storages would serve the twin purpose of groundwater recharge and direct use for irrigation along the Yamuna belt where canals are almost nonexistent. The use of stored floodwater would reduce the pressure on groundwater resources.
- The construction of Ranney Wells will help in augmenting the raw water resources right from Tajewala to Palwal for domestic and industrial water supply in the towns along NH-44 (GT Road belt). This will help bridge the ever-increasing gap in the demand and supply of water.

7. Dams on River Yamuna

River Yamuna flows on the eastern boundary of the State and as per the interstate agreement, 1994 (M0U of 1994) share of Haryana in Yamuna water up to Okhla is nearly 48%. Three storages, namely Renuka Dam, Kishau Dam and Lakhwar Dam have already been planned and are at various stages of approval and construction. The mountainous catchment area up to Hathnikund Barrage is 11,197 sq. km out of which 2,175 sq. km, 4,755 sq. km and 2,100 sq. km lie in the catchment area of the proposed Renuka Dam, Kishau Dam and Lakhwar Dam respectively. Out of the remaining catchment area, a Preliminary Report has already been prepared for the 2,140 sq. km catchment area and submitted to the Central Water Commission for the construction of a fourth dam, namely Hathnikund Dam which would be approximately 4.5 km upstream of the existing Hathnikund Barrage. All these dams are discussed in brief as under:

Renuka Dam

It is located on river Giri, a tributary of River Yamuna, in Himachal Pradesh in Sirmaur, 5 Km. upstream of the existing Jateon Barrage. It will be constructed by Himachal Pradesh Power Corporation Limited within 6 years. It is a rock-fill dam, 148 m high with live storage of 498 MCM, which will produce Hydro-power of 40 MW. The water share of Haryana is 238 MCM. MoU has been signed by all the basin states. Techno-economic approval by CWC/CEA and environment clearances have been accorded. Land payment has been made to the farmers. Its construction work will start during this financial year (2023-24).

As per the runoff data available at the dam site, the following dependable runoff is available:

Table 11.1 Abstract of the Availability of Water at the Renuka Dam Site

Dependability	Monsoon (MCM)	Non-Monsoon (MCM)	Annual (MCM)
Average	869.39	383.51	1252.90
25%	1069.85	463.51	1515.39
50%	750.53	331.96	1170.47
75%	533.89	248.18	821.79
90%	277.21	199.52	560.04

However, a major part of the above available water is received during the monsoon period and a substantial part of which flows down unused by Haryana. It has been estimated that after the construction of this dam, the total availability of water for the partner States during the rabi crop season would be 1,600 cusecs and 1,500 cusecs at 50% and 75% dependabilities respectively. This dam will also supply 2300 cusecs and 2,100 cusecs water on a regular basis at 50% and 75% dependability respectively during the Kharif period Thus construction of this dam would go a long way in improving rabi crop and Kharif crop availability of water in Haryana.

Kishau Dam

It is located on river Tons in Dehradun Uttaranchal Pradesh and Sirmaur (H.P) about 45 Km upstream of Dakpathar, the confluence of river Yamuna and Tons. It will be constructed by UJVNL and HPPCL (Kishau Cooperation Limited) to be completed in 9 years. It is a 236-metre-high concrete gravity dam with live storage of 1,324 MCM, which will produce a Hydro-power of 600 MW. The water share of Haryana is 633 MCM. Fresh DPR is under preparation and it will take one & half years. The MoU for the construction of this dam is being negotiated.

As per the runoff data available at the dam site, the following dependable runoff is available:

Table 11.2 Abstract of the Availability of Water at the Kishau Dam Site

Dependability	Monsoon (MCM)	Non-Monsoon (MCM)	Annual (MCM)
Average	869.39	383.51	1252.90
25%	1069.85	463.51	1515.39
50%	750.53	331.96	1170.47
75%	533.89	248.18	821.79
90%	277.21	199.52	560.04

However, a major part of the above available water is received during the monsoon period and a substantial part of which flows down unused by Haryana. It has been estimated that after the construction of this dam, the total availability of water for the partner States during the rabi crop season would be 6,200 cusecs and 5,200 cusecs at 50% and 75% dependabilities respectively. This dam will also supply 8,800 cusecs and 4,700 cusecs water on a regular basis at 50% and 75% dependabilities respectively during the Kharif period Thus construction of this dam would go a long way in improving rabi crop and Kharif crop availability of water in Haryana.

Lakhwar and Vyasi Dam

It is located on the river Yamuna near Lohari in District Dehradun (Uttarakhand). Lakhwar dam is a storage dam while the Vyasi component is run off the river power project. This project is being constructed by UJVNL to be completed in 4.5 years. Lakhwar Dam is 204 m high in concrete, with live storage of 331 MCM, out of which the share of Haryana is 158 MCM which will produce hydro-power of 300 MW. Water Share of Haryana is 158 MCM. Vyasi dam is located on the river Yamuna near Lohari in District Dehradun (Uttarakhand) which will produce a hydro-power of 120 MW. It will be constructed by UJVNL, to be completed in 4.5 years. MoU for its construction has been signed by all the basin states. Techno-economic approval by CWC/CEA and environment clearances have been accorded.

As per the runoff data available at the dam site, the following dependable runoff is available:

Table 11.3 Abstract of the Availability of Water at the Lakhwar and Vyasi Dam Site

Dependability	Monsoon (MCM)	Non-Monsoon (MCM)	Annual (MCM)
Average	1585.06	753.31	2338.37
25%	1585.06	753.31	2338.37
50%	1559.16	763.39	2320.19
75%	1200.01	530.99	1905.10
90%	949.80	428.73	1583.60

However, a major part of the above available water is received during the monsoon period and a substantial part of which flows down unused by Haryana. It has been estimated that after the construction of this dam, the total availability of water to the partner States during the rabi crop season would be 2,200 cusecs and 1,900 cusecs at 50% and 75% dependabilities respectively. This dam will also supply 4,500 cusecs and 3,800 cusecs water on a regular basis at 50% and 75% dependabilities respectively during the Kharif period Thus construction of this dam would go a long way in improving rabi crop and Kharif crop availability of water Haryana.

Hathnikund Dam

It is proposed to construct a 50 m high Earth fill dam namely Hathnikund Dam at about 4.5 km upstream of the existing Hathnikund Barrage. It will tap water from the 2140 sq. km. catchment area lying downstream of the already proposed three upstream storage dams namely Renuka Dam, Kishau Dam and Lakhwar Dam, which is about 19% of the catchment area up to Hathnikund Barrage. The gross storage capacity of this dam up to a Maximum Water Level (MWL) of 387.50 m will be 57.47 MCM, which includes 310.16 MCM as live storage, 123.8 MCM as dead storage and 103.51 MCM as flood absorption capacity. It will supply about 1,21,000 cs days of water during the rabi period at 50% dependability, which will provide 1,600 cs of water for 75 days for the partner States. Construction of this dam will convert uneven monsoon discharge from the 2,140 sq. km. catchment area to regular flow usable during the kharif period. It will provide net irrigation to about 2.24 lakh acres in Rabi and 1.27 lakh acres in Kharif totalling 3.51 lakh acres as annual net irrigation.

This dam reservoir will also act as a balancing reservoir for the other three upstream storage dams thereby avoiding the construction of individual balancing reservoirs for each dam. This dam has a power potential of 250 MW with an average annual power generation of 763 MU (Million Units). Its tentative cost will be about INR 6,134 crore with BC for irrigation components as 1.59:1.

8. Construction of Other Dams

- I&WRD has initiated the process for the construction of six small dams i.e. Chikan, Kansali, Ambawali, Nagli, Khillanwalla and Darpur Dams to increase the availability of water thus reducing the water gap. Storage of these dams will irrigate the area of districts Yamunanagar, Ambala and Panchkula etc.

- In addition to these, there is a scope of check dams in foot-hills to Shivalik and Aravalli hills to store water to serve the local area.

- I&WRD has also investigated five dams i.e. Dewanwalla Dam, Dangrana Dam, Khetpurali Dam, Dudhgarh Dam and Bhud Dam on Ghaggar and its tributaries. These are being pursued with the Ghaggar Standing Committee for approval from an interstate angle and their construction will add the availability of water to Haryana.

- Construction of three dams on tributaries of the Yamuna River in Himachal Pradesh has been planned and Haryana Government is pursuing these dams with the Himachal Pradesh Government for their approval and construction thereafter. Out of these three dams, MOU with the Himachal Pradesh Government has already been signed for the construction of the Adi Badri Dam while clearance for the other two dams from Central Water Commission (CWC) is being pursued.

9. Interconnecting Water Channels and Ponds

- Potential sinks (such as other rivulets, ponds, percolation tanks, etc.) should be discovered after identifying watershed dynamics and surplus capacity in the current channels during the monsoon and the quickest route to the sink should be chosen.
- Interlinking will reduce flooding by increasing percolation which will also boost groundwater recharging.

11.6 Research in New Vistas

By stepping up research efforts in a number of areas, such as the following, the frontiers of knowledge need to be advanced in multiple directions for tackling specific issues to achieve their long-term sustainability.

- Tackling water logging and salinity in the affected areas to reclaim the land and improve soil and water salinity.
- Adoption of appropriate agriculture practices, block-wise/district wise as per varied Agro-hydro Climatic Zones.
- There is less knowledge regarding the behavioural patterns of deeper aquifers and their recharge capabilities. Extensive research is required to understand recharge mechanisms based on the aquifer geometries so that flood water can optimally recharge the deeper aquifers.

- Analysis of total aquifer recharges with respect to the decline in groundwater levels.
- Realistic estimation of groundwater draft and recharges.
- Detailed studies need to be undertaken along the Palaeochannels to investigate areas around Markanda, Sarsuti, Yamuna rivulets and other similar areas of interest to ascertain their feasibility for artificial recharge.
- Identification of new advanced techniques for catching/tapping flood waters, removing excessive silt content and creating additional adequate facilities for their storage.
- Studies should be conducted regarding the quantum of unutilised water passing through the Hathnikund Barrage in Yamuna River, especially in monsoon season and the possibilities of its utilization in Haryana by creating storages along Yamuna River.
- Assessment of water losses due to Evapotranspiration (ET) and identification of effective methods to minimize ET losses.
- Practical ways to reduce evaporation losses from canals, waterbodies i.e. ponds, farm ponds etc.
- Studies are required to estimate and calculate the quantum of virtual water which is being exported to other countries as well as within the country.

All these areas need to be well-researched. A Memorandum of Understanding (MoU) can be entered into with leading institutes of the country such as IITs, NITs and NIH etc.

ANNEXURES

Annexure 1.1 Block-wise Annual Production & Productivity of Major Crops (2021-22)

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
Hisar	Hansi I	Rice	20526	2.73	2732	56077
	Hansi II		19463	2.53	2525	49144
	Narnaund		16542	3.06	3063	50668
	Hisar I		10833	2.6	2599	28155
	Hisar II		222	3.07	3071	682
	Barwala		7880	2.86	2864	22568
	Uklana		6068	3.72	3722	22585
	Agroha		956	3.77	3765	3599
	Adampur		187	1.96	1957	366
	Total		82677	2.88	2882	238275
	Hansi I	Cotton	16163	0.28	283	4574
	Hansi II		3130	0.33	334	1045
	Narnaund		12312	0.61	614	7560
	Hisar I		14564	0.37	367	5345
	Hisar II		14802	0.42	416	6158
	Barwala		24193	0.28	275	6653
	Uklana		9378	0.36	363	3404
	Agroha		17457	0.33	334	5831
	Adampur		15689	0.41	407	6385
	Total		127688	0.38	375	47883
	Hansi I	Bajra	4708	2.21	2205	10381
	Hansi II		1072	2.24	2238	2399
	Narnaund		2866	2.89	2891	8286
	Hisar I		5740	2.47	2465	14149
	Hisar II		5350	2.38	2377	12717
	Barwala		4463	2.4	2398	10702
	Uklana		1657	2.86	2856	4732
	Agroha		1732	2.6	2598	4500
	Adampur		1699	2.17	2170	3687
	Total		29287	2.44	2438	71402
	Hisar I	Maize	2	4.08	4078	8
	Barwala		1	3.39	3388	3
	Uklana		7	3.21	3208	22
	Agroha		1	5.07	5069	5
	Adampur		12	4.57	4569	55
	Total		23	4.08	4078	94
	Hansi I	Sugarcane	224	75.59	75590	16932
	Hansi II		1053	81.97	81965	86309
	Narnaund		124	74.65	74645	9256
	Hisar I		89	75.59	75590	6727
	Hisar II		16	81.97	81965	1311
	Barwala		363	91.11	91109	33073
	Uklana		29	109.9	109900	3187
	Agroha		53	84.85	84850	4497
	Adampur		38	83.55	83549	3175
	Total		1989	83.55	83549	166178
	Hansi I	Wheat	38303	4.77	4769	182667
	Hansi II		23704	4.59	4589	108778
	Narnaund		29507	4.69	4694	138506
	Hisar I		25387	4.53	4531	115028
	Hisar II		14289	4.68	4676	66815
	Barwala		32720	4.6	4597	150414
	Uklana		14531	4.63	4629	67264

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Agroha		15711	4.74	4736	74407
	Adampur		12708	4.57	4574	58126
	Total		206860	4.64	4644	960658
	Hansi I	**Barley**	60	3.22	3217	193
	Hansi II		32	3.99	3988	128
	Narnaund		34	2.43	2430	83
	Hisar I		145	2.99	2987	433
	Hisar II		290	3.13	3133	909
	Barwala		91	3.62	3623	330
	Uklana		37	3.82	3823	141
	Agroha		62	4.61	4613	286
	Adampur		40	3.46	3459	138
	Total		791	3.39	3394	2685
	Hansi I	**Gram**	362	1.54	1539	557
	Hansi II		1	1.19	1194	1
	Narnaund		1	1.66	1658	2
	Hisar I		1480	1.22	1217	1801
	Hisar II		7973	1.22	1217	9703
	Barwala		32	1.48	1483	47
	Uklana		9	1.27	1272	11
	Agroha		56	1.9	1895	106
	Adampur		1121	1.39	1393	1562
	Total		11035	1.38	1380	15228
	Hansi I	**Mustard**	13429	1.93	1926	25864
	Hansi II		1486	1.82	1821	2706
	Narnaund		6335	1.65	1654	10478
	Hisar I		15457	1.78	1783	27560
	Hisar II		29677	1.92	1915	56831
	Barwala		9586	1.95	1950	18693
	Uklana		4028	2.26	2256	9087
	Agroha		11395	2.32	2321	26448
	Adampur		15678	2.04	2044	32046
	Total		107071	1.92	1922	205790
Fatehabad	Ratia	**Rice**	42047	4.5	4504	189380
	Fatehabad		26757	3.33	3325	88967
	Bhattukalan		954	2.62	2618	2498
	Bhuna		15824	3.82	3821	60464
	Tohana		30460	4.27	4266	129942
	Jakhal		13154	4.71	4707	61916
	Total		129196	4.06	4057	524148
	Ratia	**Cotton**	3670	0.37	369	1354
	Fatehabad		24086	0.4	402	9683
	Bhattukalan		18242	0.35	347	6330
	Bhuna		15065	0.47	467	7035
	Tohana		2461	0.37	365	898
	Jakhal		30	0.48	479	14
	Total		63554	0.39	392	24913
	Ratia	**Bajra**	40	2.18	2175	87
	Fatehabad		998	2.69	2685	2680
	Bhattukalan		840	1.93	1926	1618
	Bhuna		485	2.16	2161	1048
	Tohana		99	2.15	2151	213
	Jakhal		1	2.24	2242	2
	Total		2463	2.28	2281	5618
	Ratia	**Maize**	6	2.15	2145	13

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Fatehabad		1	0.96	956	1
	Bhattukalan		27	1.54	1536	41
	Bhuna		2	1.63	1627	3
	Jakhal		1	1.63	1627	2
	Total		37	1.63	1627	60
	Ratia	**Sugarcane**	20	77.03	77027	1541
	Fatehabad		702	63.38	63380	44493
	Bhattukalan		47	69.33	69327	3258
	Bhuna		246	74.12	74116	18233
	Tohana		180	93.2	93198	16776
	Jakhal		1	77.03	77027	77
	Total		1196	77.03	77027	92124
	Ratia	**Wheat**	44459	4.71	4714	209580
	Fatehabad		49098	4.7	4702	230859
	Bhattu kalan		17616	4.67	4667	82214
	Bhuna		28565	4.38	4382	125172
	Tohana		31919	4.6	4602	146891
	Jakhal		12550	4.89	4886	61319
	Total		184207	4.67	4665	859326
	Ratia	**Barley**	1	3.21	3210	3
	Fatehabad		16	3.86	3862	62
	Bhattu kalan		84	2.38	2380	200
	Bhuna		26	3.07	3066	80
	Tohana		2	2.74	2741	5
	Total		129	2.88	2875	371
	Ratia	**Gram**	22	2	1999	44
	Fatehabad		55	1.8	1796	99
	Bhattu kalan		579	1.51	1510	874
	Bhuna		42	1.37	1373	58
	Tohana		31	1.74	1744	54
	Jakhal		2	1.73	1729	3
	Total		731	1.65	1648	1205
	Ratia	**Mustard**	677	1.94	1938	1312
	Fatehabad		5179	1.83	1831	9483
	Bhattu kalan		12421	1.73	1730	21488
	Bhuna		4338	1.64	1642	7123
	Tohana		1023	1.84	1842	1884
	Jakhal		94	1.64	1639	154
	Total		23732	1.81	1810	42955
Sirsa	Sirsa	**Rice**	29622	3.72	3719	110164
	Nathusari Chopta		4747	2.41	2406	11421
	Baragudha		11314	3.82	3821	43231
	Rania		19205	3.11	3105	59632
	Ellenabad		25761	3.19	3188	82126
	Dabwali		11622	4.19	4191	48708
	Odhan		3270	3.8	3796	12413
	Total		105541	3.52	3524	371926
	Sirsa	**Cotton**	13160	0.38	379	4988
	Nathusari Chopta		36766	0.32	320	11765
	Baragudha		30202	0.27	270	8155
	Rania		22366	0.42	417	9327
	Ellenabad		15019	0.49	488	7329
	Dabwali		39952	0.58	577	23052

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Odhan		30078	0.28	278	8362
	Total		187543	0.39	386	72392
	Sirsa	**Bajra**	428	2.85	2853	1221
	Nathusari Chopta		2731	2.34	2337	6382
	Baragudha		360	3.09	3092	1113
	Rania		557	2.58	2584	1439
	Ellenabad		716	2.37	2369	1696
	Dabwali		1031	3.56	3562	3672
	Odhan		424	3.31	3311	1404
	Total		6247	2.84	2837	17723
	Sirsa	**Maize**	6	1.87	1870	11
	Nathusari Chopta		4	1.74	1736	7
	Ellenabad		5	1.87	1870	9
	Dabwali		9	1.87	1870	17
	Odhan		10	2.68	2676	27
	Total		34	1.87	1870	64
	Sirsa	**Sugarcane**	15	0		0
	Nathusari Chopta		14	0		0
	Rania		2	0		0
	Ellenabad		8	0		0
	Dabwali		1	0		0
	Total		40	0		0
	Sirsa	**Wheat**	39724	4.22	4223	167754
	Nathusari Chopta		31553	4.07	4065	128263
	Baragudha		37832	4.71	4711	178227
	Rania		36283	4.26	4262	154638
	Ellenabad		34857	4.3	4300	149885
	Dabwali		47426	4.13	4129	195822
	Odhan		30063	4.42	4424	132999
	Total		257738	4.29	4293	1106469
	Sirsa	**Barley**	29	3.61	3612	105
	Nathusari Chopta		171	3.39	3390	580
	Baragudha		57	3.66	3661	209
	Rania		39	4.08	4075	159
	Ellenabad		94	3.75	3749	352
	Dabwali		109	4.02	4024	439
	Odhan		30	3.85	3848	115
	Total		529	3.66	3664	1938
	Sirsa	**Gram**	57	1.57	1571	90
	Nathusari Chopta		2112	1.17	1169	2469
	Baragudha		44	1.84	1835	81
	Rania		85	1.2	1199	102
	Ellenabad		514	0.82	818	420
	Dabwali		470	1.8	1797	845
	Odhan		33	1.96	1961	65
	Total		3315	1.35	1346	4462
	Sirsa	**Mustard**	5240	2	2001	10485
	Nathusari Chopta		30445	1.39	1386	42197

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Baragudha		9298	2.16	2160	20084
	Rania		11809	2.02	2017	23819
	Ellenabad		11774	1.91	1908	22465
	Dabwali		22775	2.12	2115	48169
	Odhan		12624	2.23	2234	28202
	Total		103965	1.96	1958	203563
Bhiwani	Bhiwani	**Rice**	15376	1.82	1819	27969
	Tosham		465	2.81	2814	1309
	Bawani khera		6407	2.33	2334	14954
	Siwani		19	3.2	3203	61
	Kairu		23	3.07	3066	71
	Total		22290	2.1	2099	46787
	Loharu	**Cotton**	11995	0.3	298	3575
	Bhiwani		17305	0.19	186	3219
	Tosham		10745	0.3	295	3170
	Bawani khera		13711	0.22	221	3030
	Siwani		9316	0.29	290	2702
	Kairu		6987	0.19	189	1321
	Behal		11995	0.23	226	2711
	Total		82054	0.24	244	20021
	Loharu	**Bajra**	11926	2.33	2326	27740
	Bhiwani		8745	1.48	1475	12899
	Tosham		13569	1.62	1616	21928
	Bawani khera		3033	1.74	1744	5290
	Siwani		7650	1.64	1642	12561
	Kairu		12943	1.66	1660	21485
	Behal		5540	1.9	1904	10548
	Total		63406	1.76	1758	111468
	Bhiwani	**Maize**	1	3.13	3133	3
	Bawani khera		4	3.13	3133	13
	Total		5	3.13	3133	16
	Loharu	**Sugarcane**	2	65.51	65509	131
	Bhiwani		1600	56.52	56517	90427
	Tosham		46	65.51	65509	3013
	Bawani khera		1312	72.25	72254	94797
	Siwani		1	65.51	65509	66
	Total		2961	65.51	65509	193972
	Loharu	**Wheat**	10628	3.4	3400	36135
	Bhiwani		31082	4.29	4290	133342
	Tosham		10419	4.74	4744	49428
	Bawani khera		17336	4.8	4797	83161
	Siwani		8081	4.29	4292	34684
	Kairu		5529	4.38	4382	24228
	Behal		3839	4.39	4391	16857
	Total		86914	4.27	4271	371210
	Loharu	**Barley**	124	3.42	3424	425
	Bhiwani		143	2.41	2414	345
	Tosham		50	3.84	3835	192
	Bawani khera		80	3.43	3430	274
	Siwani		85	3.37	3367	286
	Kairu		7	3.51	3511	25
	Behal		4	4.05	4046	16
	Total		493	3.26	3258	1606
	Loharu	**Gram**	127	1.15	1151	146
	Bhiwani		29	1	1001	29

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Tosham		842	1.01	1006	847
	Bawani khera		184	1.38	1375	253
	Siwani		15284	0.79	785	11998
	Kairu		90	0.74	736	66
	Behal		27	1.12	1121	30
	Total		16583	0.99	989	16401
	Loharu	**Mustard**	21118	1.44	1443	30473
	Bhiwani		32379	1.78	1778	57570
	Tosham		33183	1.99	1989	66001
	Bawani khera		14419	1.47	1470	21196
	Siwani		23213	1.75	1750	40623
	Kairu		22509	1.77	1772	39886
	Behal		22928	2.04	2044	46865
	Total		169749	1.76	1756	298079
Rohtak	Lakhan Majra	**Rice**	11222	2.92	2917	32735
	Rohtak		27066	2.88	2882	78004
	Sampla		5922	2.74	2737	16209
	Meham		15941	2.83	2829	45097
	Kalanaur		6929	2.87	2872	19900
	Total		67080	2.85	2850	191178
	Lakhan Majra	**Cotton**	271	0.19	191	52
	Rohtak		1985	0.28	275	546
	Sampla		747	0.3	301	225
	Meham		7024	0.38	381	2676
	Kalanaur		3384	0.5	500	1692
	Total		13411	0.34	341	4573
	Lakhan Majra	**Bajra**	294	1.66	1660	488
	Rohtak		2402	1.63	1625	3903
	Sampla		2230	1.57	1572	3506
	Meham		1861	2.24	2242	4172
	Kalanaur		2509	2.08	2076	5209
	Total		9296	1.82	1816	16882
	Lakhan Majra	**Sugarcane**	683	69.04	69040	47154
	Rohtak		2202	71.76	71762	158020
	Sampla		437	62.75	62745	27420
	Meham		3564	89.92	89925	320491
	Kalanaur		3289	53.89	53886	177230
	Total		10175	68.57	68573	697729
	Lakhan Majra	**Wheat**	12773	4.57	4571	58385
	Rohtak		35873	4.21	4213	151133
	Sampla		12523	4.19	4192	52496
	Meham		24680	4.38	4379	108074
	Kalanaur		15164	4.75	4748	71999
	Total		101013	4.37	4373	441730
	Lakhan Majra	**Barley**	10	1.92	1916	19
	Rohtak		33	2.01	2013	66
	Sampla		62	2.28	2277	141
	Meham		63	2.84	2836	179
	Kalanaur		88	1.93	1926	169
	Total		256	2.2	2198	563
	Rohtak	**Gram**	2	1.62	1616	3
	Sampla		1	1.09	1093	1
	Meham		7	1.14	1137	8
	Kalanaur		55	1.58	1575	87
	Total		65	1.47	1469	95

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Lakhan Majra	Mustard	384	1.74	1742	669
	Rohtak		1564	1.6	1596	2496
	Sampla		2013	1.76	1758	3539
	Meham		5244	1.89	1894	9932
	Kalanaur		5738	1.97	1972	11315
	Total		14943	1.76	1763	26345
Jhajjar	Jhajjar	Rice	5608	2.82	2823	15831
	Beri		16870	2.79	2785	46983
	Salhawas		905	2.77	2774	2510
	Matanhail		3751	2.69	2691	10094
	Bahadurgarh		11534	2.42	2424	27958
	Total		38668	2.69	2685	103824
	Jhajjar	Cotton	2680	0.45	452	1211
	Beri		2710	0.42	424	1149
	Salhawas		1262	0.51	511	645
	Matanhail		4019	0.36	359	1443
	Bahadurgarh		1041	0.34	340	354
	Total		11712	0.43	426	4989
	Jhajjar	Bajra	6845	2.19	2188	14977
	Beri		2635	2.15	2150	5665
	Salhawas		7601	2.45	2451	18630
	Matanhail		13911	2.23	2226	30966
	Bahadurgarh		2920	1.14	1141	3332
	Total		33912	2.07	2070	70198
	Jhajjar	Maize	104	3.13	3133	326
	Salhawas		2	3.13	3133	6
	Matanhail		5	3.13	3133	16
	Bahadurgarh		14	3.13	3133	44
	Total		125	3.13	3133	392
	Jhajjar	Sugarcane	535	74.53	74526	39871
	Beri		2171	70.45	70449	152945
	Salhawas		187	68.04	68039	12723
	Matanhail		225	67.51	67510	15190
	Bahadurgarh		535	51.15	51148	27364
	Total		3653	67.51	67510	246614
	Jhajjar	Wheat	17554	4.41	4408	77378
	Beri		24103	4.51	4505	108584
	Salhawas		7364	4.48	4480	32991
	Matanhail		11045	4.46	4458	49239
	Bahadurgarh		20831	4.17	4166	86782
	Total		80897	4.4	4400	355947
	Jhajjar	Barley	42	4.76	4762	200
	Beri		36	3.41	3408	123
	Salhawas		14	3.31	3307	46
	Matanhail		73	4.43	4425	323
	Bahadurgarh		10	2.85	2853	29
	Total		175	3.83	3825	669
	Jhajjar	Gram	8	1.19	1194	10
	Beri		2	0.99	985	2
	Matanhail		2	2.05	2045	4
	Bahadurgarh		18	0.8	799	14
	Total		30	1.05	1047	31
	Jhajjar	Mustard	15312	1.98	1977	30272
	Beri		4570	1.79	1793	8194
	Salhawas		9310	2.15	2150	20017

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Matanhail		14624	2.01	2011	29409
	Bahadurgarh		4230	2.05	2047	8659
	Total		48046	2	1999	96044
Sonipat	Sonepat	**Rice**	26795	2.7	2701	72373
	Rai		9541	2.6	2595	24759
	Kharkhoda		9296	2.62	2615	24309
	Gohana		16105	2.74	2744	44192
	Kathura		14109	2.76	2760	38941
	Mundlana		18401	2.73	2734	50308
	Ganaur		19862	2.68	2680	53230
	Total		114109	2.68	2676	305356
	Sonepat	**Cotton**	2181	0.43	433	944
	Rai		6	0.25	247	1
	Kharkhoda		1520	0.42	421	640
	Gohana		629	0.37	372	234
	Kathura		540	0.42	421	227
	Mundlana		670	0.42	418	280
	Ganaur		83	0.51	511	42
	Total		5629	0.41	412	2319
	Sonepat	**Bajra**	772	2.47	2467	1905
	Rai		43	2.03	2030	87
	Kharkhoda		1807	2.05	2053	3710
	Gohana		870	1.93	1929	1678
	Kathura		677	2.15	2150	1456
	Mundlana		929	2.18	2179	2024
	Ganaur		274	2.55	2546	698
	Total		5372	2.23	2230	11980
	Sonepat	**Maize**	121	2.6	2597	314
	Rai		18	3.28	3277	59
	Kharkhoda		10	3.42	3416	34
	Gohana		5	3.47	3465	17
	Kathura		3	3.31	3305	10
	Mundlana		6	3.31	3305	20
	Ganaur		7	3.67	3669	26
	Total		170	3.31	3305	562
	Sonepat	**Sugarcane**	2064	79.58	79577	164248
	Rai		338	91.79	91792	31026
	Kharkhoda		767	82.17	82170	63024
	Gohana		2016	62.05	62052	125097
	Kathura		1708	50.75	50746	86674
	Mundlana		2025	62.02	62019	125588
	Ganaur		1346	91.67	91672	123391
	Total		10264	77.28	77284	793242
	Sonepat	**Wheat**	32219	4.86	4863	156681
	Rai		10260	4.87	4866	49925
	Kharkhoda		17231	4.61	4610	79435
	Gohana		18780	4.76	4763	89449
	Kathura		18557	4.06	4058	75304
	Mundlana		18992	4.68	4676	88807
	Ganaur		20795	4.66	4658	96863
	Total		136834	4.72	4720	645856
	Rai	**Barley**	36	3.82	3820	138
	Kharkhoda		3	3.6	3597	11
	Kathura		15	0.97	967	15
	Total		54	2.97	2973	161

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Sonepat	**Gram**	2	1.19	1194	2
	Rai		1	1.19	1194	1
	Kharkhoda		3	2.42	2419	7
	Total		6	2.42	2419	15
	Sonepat	**Mustard**	1750	1.79	1787	3127
	Rai		302	1.89	1894	572
	Kharkhoda		1429	1.95	1954	2792
	Gohana		870	2.16	2157	1877
	Kathura		882	2.17	2168	1912
	Mundlana		840	1.92	1917	1610
	Ganaur		1038	1.79	1789	1857
	Total		7111	1.9	1899	13504
Gurugram	Gurugram	**Rice**	1057	2.27	2266	2395
	Farrukh Nagar		469	3.19	3187	1495
	Sohna		1926	2.28	2280	4391
	Pataudi		1393	3	2998	4176
	Total		4845	2.78	2779	13464
	Gurugram	**Cotton**	36	0.23	233	8
	Farrukh Nagar		1283	0.32	317	407
	Sohna		86	0.27	266	23
	Pataudi		909	0.3	304	276
	Total		2314	0.3	303	701
	Gurugram	**Bajra**	7886	2.53	2533	19975
	Farrukh Nagar		5365	2.9	2901	15564
	Sohna		6729.5	2.53	2533	17046
	Pataudi		12556	2.74	2741	34416
	Total		32536.5	2.71	2710	88174
	Gurugram	**Maize**	4	3.13	3133	13
	Farrukh Nagar		3	3.13	3133	9
	Sohna		10	3.13	3133	31
	Total		17	3.13	3133	53
	Gurugram	**Sugarcane**	1	0		0
	Farrukh Nagar		0	0		0
	Sohna		5.5	0		0
	Pataudi		0	0		0
	Total		6.5	0		0
	Gurugram	**Wheat**	4044	4.04	4036	16322
	Farrukh Nagar		8654	5.01	5014	43391
	Sohna		7202	3.99	3985	28700
	Pataudi		10186	4.89	4894	49850
	Total		30086	4.67	4673	140592
	Gurugram	**Barley**	9	2.26	2264	20
	Farrukh Nagar		45	3.24	3237	146
	Sohna		7	3.24	3237	23
	Pataudi		17	4.53	4533	77
	Total		78	3.71	3708	289
	Gurugram	**Gram**	0	0	0	0
	Farrukh Nagar		0	0	0	0
	Sohna		12	1.06	1061	13
	Pataudi		0	0	0	0
	Total		12	1.06	1061	13
	Gurugram	**Mustard**	4008	1.82	1824	7311
	Farrukh Nagar		9189	1.97	1969	18093
	Sohna		4662	1.76	1756	8186

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Pataudi		10761	2.12	2115	22760
	Total		28620	1.99	1988	56897
Nuh	Nuh	**Rice**	3239	2.54	2542	8234
	Tauru		65	2.83	2833	184
	Indri		2608	2.39	2389	6231
	Nagina		240	2.36	2357	566
	Pinangwan		1546	2.71	2705	4182
	Punhana		566	2.62	2622	1484
	Total		8264	2.54	2544	21024
	Nuh	**Cotton**	449	0.56	558	251
	Tauru		28	0.58	584	16
	Ferozpur Jhirka		180	0.56	561	101
	Indri		505	0.49	486	245
	Nagina		150	0.68	682	102
	Pinangwan		782	0.62	618	483
	Punhana		1498	0.59	592	887
	Total		3592	0.58	578	2076
	Nuh	**Bajra**	3681	2.48	2479	9125
	Tauru		11690	2.87	2870	33550
	Ferozpur Jhirka		6300	2.55	2554	16090
	Indri		1437	2.52	2516	3615
	Nagina		3354	2.62	2616	8774
	Pinangwan		6639	2.77	2772	18403
	Punhana		6778	2.81	2808	19033
	Total		39879	2.67	2672	106557
	Pinangwan	**Maize**	3	3.13	3133	9
	Punhana		1	3.13	3133	3
	Total		4	3.13	3133	13
	Nuh	**Sugarcane**	95	81.92	81918	7782
	Indri		404	81.92	81918	33095
	Nagina		2	81.92	81918	164
	Pinangwan		28	81.92	81918	2294
	Punhana		34	81.92	81918	2785
	Total		563	81.92	81918	46120
	Nuh	**Wheat**	16653	3.78	3779	62932
	Tauru		7415	4.64	4639	34398
	Ferozpur Jhirka		4937	4.34	4343	21441
	Indri		6664	3.36	3357	22371
	Nagina		6198	4.27	4272	26478
	Pinangwan		13535	4.41	4413	59730
	Punhana		6768	4.69	4690	31742
	Total		62170	4.26	4262	264969
	Nuh	**Barley**	8	1.21	1212	10
	Tauru		53	3.24	3237	172
	Ferozpur Jhirka		14	3.24	3237	45
	Indri		8	3.24	3237	26
	Nagina		17	3.24	3237	55
	Pinangwan		7	3.24	3237	23
	Punhana		4	3.24	3237	13
	Total		111	1.21	1212	135
	Ferozpur Jhirka	**Gram**	2	1.19	1194	2
	Nagina		71	1.67	1673	119
	Total		73	1.67	1673	122
	Nuh	**Mustard**	5339	1.97	1971	10523
	Tauru		6016	2.07	2067	12435

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Ferozpur Jhirka		11374	2.17	2165	24625
	Indri		1001	1.98	1980	1982
	Nagina		9424	2.08	2081	19611
	Pinangwan		4651	2.05	2046	9516
	Punhana		2330	2.04	2043	4760
	Total		40135	2.07	2065	82879
Faridabad	Faridabad	**Rice**	4040	2.54	2541	10266
	Ballabgarh		10873	1.99	1994	21681
	Total		14913	2.22	2218	33077
	Faridabad	**Cotton**	106	0.3	301	32
	Ballabgarh		674	0.24	241	162
	Total		780	0.26	261	204
	Faridabad	**Bajra**	2403	1.74	1744	4191
	Ballabgarh		2282	1.5	1501	3425
	Total		4685	1.65	1649	7726
	Faridabad	**Maize**	15	3.13	3133	47
	Ballabgarh		15	3.13	3133	47
	Total		30	3.13	3133	94
	Faridabad	**Sugarcane**	21	81.92	81918	1720
	Ballabgarh		269	81.92	81918	22036
	Total		290	81.92	81918	23756
	Faridabad	**Wheat**	10801	4.28	4280	46228
	Ballabgarh		17845	3.63	3628	64742
	Total		28646	3.92	3916	112178
	Faridabad	**Barley**	26	3.24	3237	84
	Ballabgarh		37	2.02	2022	75
	Total		63	2.02	2022	127
	Ballabgarh	**Gram**	1	1.19	1194	1
	Total		1	1.19	1194	1
	Faridabad	**Mustard**	1154	2.27	2266	2615
	Ballabgarh		647	1.67	1667	1079
	Total		1801	1.98	1978	3562
Palwal	Palwal	**Rice**	24272	2.74	2740	66505
	Hodal		3570	2.83	2828	10096
	Hassanpur		4145	3.09	3089	12804
	Hathin		2243	2.53	2533	5682
	Total		34230	2.83	2830	96871
	Palwal	**Cotton**	8018	0.26	256	2053
	Hodal		8105	0.26	262	2124
	Hassanpur		772	0.31	307	237
	Hathin		6524	0.28	276	1801
	Total		23419	0.27	270	6323
	Palwal	**Bajra**	5750	2.36	2358	13559
	Hodal		3052	2.49	2492	7606
	Hassanpur		927	2.48	2483	2302
	Hathin		5194	2.47	2473	12845
	Total		14923	2.43	2434	36323
	Palwal	**Maize**	37	3.13	3133	116
	Hassanpur		17	3.13	3133	53
	Hathin		13	3.13	3133	41
	Total		67	3.13	3133	210
	Palwal	**Sugarcane**	2053	79.66	79662	163546
	Hodal		549	79.7	79700	43755
	Hassanpur		497	79.7	79700	39611
	Hathin		916	80.2	80200	73463

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Total		4015	79.7	79700	319997
	Palwal	**Wheat**	44226	4.73	4728	209101
	Hodal		19424	4.59	4586	89078
	Hassanpur		8303	4.46	4462	37048
	Hathin		22725	4.65	4652	105717
	Total		94678	4.64	4641	439401
	Palwal	**Barley**	57	3.21	3211	183
	Hodal		20	3.24	3237	65
	Hassanpur		2	4.46	4457	9
	Hathin		13	3.24	3237	42
	Total		92	3.39	3389	312
	Palwal	**Mustard**	2180	2.24	2238	4879
	Hodal		809	2.05	2050	1658
	Hassanpur		432	1.95	1945	840
	Hathin		3090	2.05	2048	6328
	Total		6511	2.11	2105	13706
Panipat	Panipat	**Rice**	11508	3.13	3130	36020
	Samalkha		13910	3.04	3043	42328
	Matlauda		25142	3.01	3006	75577
	Bapoli		13543	2.89	2889	39126
	Israna		19215	3.07	3068	58952
	Total		83318	3.02	3021	251704
	Samalkha	**Cotton**	33	0.63	630	21
	Matlauda		3	0.47	467	1
	Bapoli		3	0.46	463	1
	Israna		38	0.68	684	26
	Total		77	0.63	628	48
	Panipat	**Bajra**	5	2.21	2212	11
	Samalkha		108	2.01	2014	218
	Matlauda		25	1.57	1574	39
	Bapoli		53	2.08	2075	110
	Israna		376	2.66	2660	1000
	Total		567	2.21	2212	1254
	Panipat	**Maize**	13	2.67	2672	35
	Samalkha		15	1.9	1899	28
	Matlauda		5	2.21	2213	11
	Bapoli		23	2.83	2833	65
	Israna		2	2.22	2219	4
	Total		58	2.21	2213	128
	Panipat	**Sugarcane**	554	106.84	106843	59191
	Samalkha		1789	80.17	80165	143415
	Matlauda		954	93.71	93714.8	89404
	Bapoli		2556	79.97	79965	204391
	Israna		1474	107.16	107155	157946
	Total		7327	93.58	93576	685628
	Panipat	**Wheat**	10697	4.45	4447	47570
	Samalkha		20072	4.67	4665	93636
	Matlauda		14557	4.74	4742	69029
	Bapoli		14461	4.66	4655	67316
	Israna		24190	4.69	4692	113499
	Total		83977	4.63	4632	388981
	Panipat	**Barley**	1	3.24	3237	3
	Samalkha		6	3.24	3237	19
	Matlauda		1	3.24	3237	3
	Bapoli		2	3.24	3237	6

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Israna		4	3.24	3237	13
	Total		14	3.24	3237	45
	Samalkha	**Gram**	0	1.51	1509	0
	Matlauda		0	1.32	1321	0
	Bapoli		3	1.19	1194	4
	Israna		4	0.32	322	1
	Total		7	0.85	845	6
	Panipat	**Mustard**	389	2.36	2358	917
	Samalkha		905	2.15	2152	1948
	Matlauda		1049	2.24	2244	2354
	Bapoli		633	2.05	2053	1300
	Israna		868	2.48	2476	2149
	Total		3844	2.24	2243	8622
Karnal	Karnal	**Rice**	41768	3.91	3905	163104
	Nissing		18602	4.03	4032	75003
	Indri		20868	4.2	4200	87646
	Gharaunda		25311	3.58	3578	90563
	Assandh		37381	3.94	3943	147393
	Nilokheri		31864	3.45	3453	110026
	Total		175794	3.87	3868	679971
	Karnal	**Cotton**	2	0.35	352	1
	Assandh		26	0.35	352	9
	Total		28	0.35	352	10
	Karnal	**Bajra**	6	2.32	2318	14
	Gharaunda		2	2.32	2318	5
	Assandh		68	2.32	2318	158
	Nilokheri		1	2.32	2318	2
	Total		77	2.32	2318	178
	Karnal	**Maize**	68	5.63	5629	383
	Nissing		7	4.82	4816	34
	Indri		59	5.53	5528	326
	Gharaunda		87	3	3004	261
	Assandh		13	4.82	4816	63
	Nilokheri		9	4.82	4816	43
	Total		243	4.82	4816	1170
	Karnal	**Sugarcane**	2519	82.3	82300	207314
	Nissing		38	84.41	84413	3208
	Indri		4678	91.76	91759	429249
	Gharaunda		2131	83.18	83180	177257
	Assandh		1222	100.19	100187	122428
	Nilokheri		600	91.76	91759	55055
	Total		11188	91.76	91759	1026600
	Karnal	**Wheat**	39417	5.43	5427	213916
	Nissing		17440	5.2	5196	90618
	Indri		20125	4.97	4970	100021
	Gharaunda		25592	5.46	5458	139681
	Assandh		33062	4.88	4876	161210
	Nilokheri		14410	4.75	4751	68462
	Ballah		10654	4.53	4533	48295
	Nighdu		15894	4.43	4433	70458
	Total		176594	5.11	5105	901512
	Karnal	**Barley**	51	3.24	3237	165
	Gharaunda		5	3.24	3237	16
	Nilokheri		2	3.24	3237	6
	Ballah		1	3.24	3237	3

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Total		59	3.24	3237	191
	Nissing	**Gram**	9	1.19	1194	11
	Gharaunda		2	1.19	1194	2
	Nilokheri		2	1.19	1194	2
	Total		13	1.19	1194	16
	Karnal	**Mustard**	688	2.19	2187	1505
	Nissing		43	2.23	2227	96
	Indri		1218	2.09	2085	2540
	Gharaunda		751	2.14	2136	1604
	Assandh		1340	1.99	1987	2663
	Nilokheri		627	1.89	1885	1182
	Ballah		474	1.91	1914	907
	Nighdu		247	1.91	1914	473
	Total		5388	2.05	2050	11045
Kurukshetra	Thanesar	**Rice**	23750	4.68	4678	111103
	Pipli		14129	4.76	4760	67254
	Ismailabad		37367	4.75	4751	177531
	Shahabad		9512	4.78	4778	45448
	Ladwa		8078	4.87	4871	39348
	Pehowa		19149	4.8	4801	91934
	Babain		12587	4.73	4728	59511
	Total		124572	4.77	4767	593835
	Ladwa	**Bajra**	1	2.32	2318	2
	Total		1	2.32	2318	2
	Thanesar	**Maize**	9	3.62	3619	33
	Pipli		4	2.66	2662	11
	Ismailabad		11	1.81	1809	20
	Shahabad		4	2.87	2866	11
	Ladwa		3	2.15	2148	6
	Pehowa		10	4.41	4406	44
	Babain		31	2.87	2866	89
	Total		72	2.87	2866	206
	Thanesar	**Sugarcane**	1300	87.6	87604	113885
	Pipli		736	84.41	84407	62123
	Ismailabad		955	92.56	92562	88397
	Shahabad		2753	75.73	75729	208482
	Ladwa		2222	84.5	84504	187767
	Pehowa		3164	84.41	84407	267063
	Babain		477	88.87	88873	42393
	Total		11607	87.25	87249	1012699
	Thanesar	**Wheat**	21686	4.36	4359	94529
	Pipli		10450	4.06	4062	42448
	Ismailabad		13443	4.46	4464	60010
	Shahabad		13230	3.92	3915	51795
	Ladwa		7999	4.52	4523	36179
	Pehowa		30393	4.5	4499	136738
	Babain		6933	4.09	4093	28377
	Total		104134	4.26	4256	443194
	Thanesar	**Barley**	4	3.24	3237	13
	Pipli		1	3.24	3237	3
	Babain		1	3.24	3237	3
	Total		6	3.24	3237	19
	Ladwa	**Gram**	7	1.19	1194	8
	Babain		4	1.19	1194	5
	Total		11	1.19	1194	13

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Thanesar	Mustard	968	1.36	1355	1312
	Pipli	Mustard	744	1.4	1396	1039
	Ismailabad	Mustard	1380	1.58	1575	2174
	Shahabad	Mustard	3390	1.39	1393	4722
	Ladwa	Mustard	1091	1.54	1536	1676
	Pehowa	Mustard	902	1.37	1372	1238
	Babain	Mustard	1119	1.66	1657	1854
	Total	Mustard	9594	1.5	1502	14410
Kaithal	Kaithal	Rice	60055	3.61	3613	216979
Kaithal	Pundri	Rice	26044	3.21	3211	83627
Kaithal	Kalayat	Rice	14329	2.88	2884	41325
Kaithal	Rajound	Rice	9731	3.74	3738	36374
Kaithal	Gulha	Rice	41141	4.66	4660	191717
Kaithal	Siwan	Rice	10730	4.76	4758	51053
Kaithal	Dhand	Rice	14064	4.81	4809	67634
Kaithal	**Total**	Rice	176094	4.03	4033	710187
Kaithal	Kaithal	Cotton	3142	0.41	405	1273
Kaithal	Pundri	Cotton	26	0.27	271	7
Kaithal	Kalayat	Cotton	1516	0.28	278	421
Kaithal	Rajound	Cotton	861	0.43	434	374
Kaithal	Dhand	Cotton	13	0.36	355	5
Kaithal	**Total**	Cotton	5558	0.36	355	1973
Kaithal	Kaithal	Bajra	260	2.14	2135	555
Kaithal	Pundri	Bajra	9	1.94	1939	17
Kaithal	Kalayat	Bajra	76	1.81	1814	138
Kaithal	Rajound	Bajra	42	2.54	2535	106
Kaithal	Gulha	Bajra	12	2.14	2135	26
Kaithal	Siwan	Bajra	33	2.14	2135	70
Kaithal	Dhand	Bajra	7	2.14	2135	15
Kaithal	**Total**	Bajra	439	2.14	2135	937
Kaithal	Kaithal	Maize	4	3.13	3133	13
Kaithal	Pundri	Maize	5	3.13	3133	16
Kaithal	Gulha	Maize	11	3.13	3133	34
Kaithal	Siwan	Maize	2	3.13	3133	6
Kaithal	Dhand	Maize	2	3.13	3133	6
Kaithal	**Total**	Maize	24	3.13	3133	75
Kaithal	Kaithal	Sugarcane	1741	93.92	93923	163520
Kaithal	Pundri	Sugarcane	1413	90.73	90731	128203
Kaithal	Kalayat	Sugarcane	43	90.17	90174	3877
Kaithal	Rajound	Sugarcane	41	92.06	92057	3774
Kaithal	Gulha	Sugarcane	66	97.43	97433	6431
Kaithal	Siwan	Sugarcane	374	79.37	79375	29686
Kaithal	Dhand	Sugarcane	875	91.7	91697	80235
Kaithal	**Total**	Sugarcane	4553	91.7	91697	417495
Kaithal	Kaithal	Wheat	45170	4.35	4348	196399
Kaithal	Pundri	Wheat	26375	4.96	4959	130794
Kaithal	Kalayat	Wheat	26102	4.92	4921	128448
Kaithal	Rajound	Wheat	14739	4.93	4934	72722
Kaithal	Gulha	Wheat	40299	4.45	4452	179411
Kaithal	Siwan	Wheat	11327	4.62	4616	52285
Kaithal	Dhand	Wheat	12539	4.82	4821	60451
Kaithal	**Total**	Wheat	176551	4.62	4622	816019
Kaithal	Pundri	Barley	1	3.24	3237	3
Kaithal	Kalayat	Barley	2	3.24	3237	6
Kaithal	Gulha	Barley	3	3.24	3237	10

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Total		6	3.24	3237	19
	Kaithal	**Gram**	3	1.19	1194	4
	Pundri		1	1.19	1194	1
	Gulha		12	1.19	1194	14
	Siwan		5	1.19	1194	6
	Dhand		2	1.19	1194	2
	Total		23	1.19	1194	27
	Kaithal	**Mustard**	1210	1.95	1947	2356
	Pundri		936	1.9	1897	1776
	Kalayat		888	2.19	2192	1946
	Rajound		706	1.32	1316	929
	Gulha		798	1.89	1887	1506
	Siwan		912	1.96	1957	1785
	Dhand		439	1.64	1640	720
	Total		5889	1.85	1850	10895
Ambala	Ambala I	**Rice**	24950	3.99	3987	99476
	Ambala II		10020	4.06	4064	40721
	Barara		21345	4.19	4188	89393
	Saha		9050	3.99	3988	36091
	Naraingarh		14902	4.29	4293	63974
	Sahazadpur		13677	4.13	4132	56513
	Total		93944	4.11	4107	385828
	Barara	**Bajra**	2	2.32	2318	5
	Saha		2	2.32	2318	5
	Naraingarh		49	2.32	2318	114
	Sahazadpur		42	2.32	2318	97
	Total		95	2.32	2318	220
	Ambala I	**Maize**	14	1.71	1711	24
	Ambala II		32	2.8	2796	89
	Barara		24	4.54	4543	109
	Saha		23	5.08	5077	117
	Naraingarh		64	4.08	4077	261
	Sahazadpur		61	2.61	2609	159
	Total		218	3.95	3954	862
	Ambala I	**Sugarcane**	213	114.2	114200	24325
	Ambala II		1305	75.8	75800	98919
	Barara		3115	80.26	80260	250010
	Saha		1102	84.12	84122	92702
	Naraingarh		2292	75.3	75300	172588
	Sahazadpur		1924	80.56	80560	154997
	Total		9951	81.18	81180	807819
	Ambala I	**Wheat**	23017	3.48	3484	80191
	Ambala II		8550	4.35	4346	37158
	Barara		20161	4.11	4105	82761
	Saha		7792	4.1	4101	31955
	Naraingarh		16824	5.01	5006	84221
	Sahazadpur		11540	3.89	3892	44914
	Total		87884	4.11	4108	361027
	Ambala I	**Barley**	2	3.24	3237	6
	Barara		7	3.24	3237	23
	Naraingarh		2	3.24	3237	6
	Sahazadpur		2	3.24	3237	6
	Total		13	3.24	3237	42
	Ambala II	**Gram**	2	1.19	1194	2
	Barara		3	1.19	1194	4

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Saha		3	1.19	1194	4
	Sahazadpur		1	1.19	1194	1
	Total		9	1.19	1194	11
	Ambala I	**Mustard**	1469	1.69	1685	2475
	Ambala II		1244	1.89	1888	2349
	Barara		2048	1.78	1784	3654
	Saha		1120	1.69	1694	1897
	Naraingarh		811	1.96	1964	1593
	Sahazadpur		950	1.94	1939	1842
	Total		7642	1.79	1790	13679
Panchkula	Morni	**Rice**	211	2.58	2584	545
	Barwala		6378	4.85	4848	30921
	Raipurrani		5469	4.51	4505	24638
	Pinjore		1545	3.42	3420	5284
	Total		13603	4.01	4012	54575
	Morni	**Bajra**	8	2.56	2562	20
	Barwala		78	2.71	2708	211
	Raipurrani		47	2.46	2462	116
	Pinjore		143	2.56	2562	366
	Total		276	2.56	2562	707
	Morni	**Maize**	1369	3.36	3362	4603
	Barwala		333	3.86	3861	1286
	Raipurrani		270	3.85	3852	1040
	Pinjore		1694	2.33	2327	3942
	Total		3666	2.96	2963	10862
	Barwala	**Sugarcane**	274	81.58	81580	22353
	Raipurrani		210	81.74	81740	17165
	Pinjore		2	81.66	81660	163
	Total		486	81.66	81660	39687
	Morni	**Wheat**	1557	2.42	2420	3768
	Barwala		6851	4.18	4178	28623
	Raipurrani		6965	4.35	4354	30326
	Pinjore		3893	3.48	3477	13536
	Total		19266	3.77	3772	72671
	Morni	**Barley**	2	3.24	3237	6
	Barwala		1	3.24	3237	3
	Raipurrani		2	3.24	3237	6
	Total		5	3.24	3237	16
	Morni	**Gram**	10	1.19	1194	12
	Barwala		2	0.91	910	2
	Raipurrani		4	1.09	1091	4
	Pinjore		16	0.81	807	13
	Total		32	0.84	844	27
	Morni	**Mustard**	302	0.3	302	91
	Barwala		528	1.43	1431	756
	Raipurrani		459	1.75	1749	803
	Pinjore		476	0.8	801	381
	Total		1765	1.16	1158	2044
Yamunanagar	Jagadhari	**Rice**	17095	4.48	4478	76551
	Bilaspur		15156	4.39	4389	66520
	Radaur		18829	4.47	4472	84203
	Sadaura		7590	4.69	4686	35567
	Chhachhrauli		18042	4.51	4508	81333
	Mustafabad		11913	4.2	4204	50082
	Total		88625	4.45	4454	394736

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Jagadhari	Cotton	7	2.32	2318	16
	Bilaspur		90	2.32	2318	209
	Sadaura		67	2.32	2318	155
	Chhachhrauli		19	2.32	2318	44
	Total		183	2.32	2318	424
	Jagadhari	Maize	10	3.7	3704	37
	Bilaspur		10	4.48	4477	45
	Radaur		8	4.48	4477	36
	Sadaura		12	5.93	5933	71
	Chhachhrauli		81	5.04	5039	408
	Mustafabad		8	3.58	3577	29
	Total		129	4.48	4477	578
	Jagadhari	Sugarcane	4697	83.56	83556	392464
	Bilaspur		3744	84.36	84356	315829
	Radaur		4389	92.6	92600	406420
	Sadaura		1344	85.1	85101	114375
	Chhachhrauli		3833	74.47	74467	285432
	Mustafabad		2183	84.46	84461	184377
			20190	83.67	83668	1689254
	Total	Wheat	19620	4.95	4951	97139
	Bilaspur		16705	4.33	4334	72399
	Radaur		15783	4.68	4681	73880
	Sadaura		6960	4.64	4643	32315
	Chhachhrauli		20744	4.3	4303	89261
	Mustafabad		14687	4.28	4283	62904
	Total		94499	4.51	4510	426190
	Jagadhari	Barley	2	3.24	3237	6
	Chhachhrauli		2	3.24	3237	6
	Mustafabad		1	3.24	3237	3
	Total		5	3.24	3237	16
	Jagadhari	Gram	6	1.19	1194	7
	Bilaspur		18	1.19	1194	21
	Radaur		10	1.19	1194	12
	Sadaura		10	1.19	1194	12
	Chhachhrauli		2	1.19	1194	2
	Mustafabad		7	1.19	1194	8
	Total		53	1.19	1194	63
	Jagadhari	Mustard	1035	1.51	1509	1562
	Bilaspur		1065	1.37	1368	1457
	Radaur		1100	1.8	1798	1978
	Sadaura		405	1.13	1126	456
	Chhachhrauli		849	1.04	1044	886
	Mustafabad		925	1.05	1046	968
	Total		5379	1.26	1263	6794
Jind	Jind	Rice	21136	3.24	3243	68544
	Julana		18267	2.96	2963	54125
	Alewa		14067	3.12	3121	43903
	Safidon		23412	3.34	3338	78149
	Pillukhera		15506	3.42	3421	53046
	Uchana		16943	3.43	3427	58064
	Narwana		36821	3.64	3635	133844
	Total		146152	3.33	3331	486832
	Jind	Cotton	7284	0.25	254	1850
	Julana		6688	0.28	281	1879
	Alewa		5016	0.47	466	2337

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Safidon		246	0.28	277	68
	Pillukhera		356	0.31	312	111
	Uchana		23066	0.25	254	5859
	Narwana		13520	0.31	309	4178
	Total		56176	0.29	292	16403
	Jind	**Bajra**	2028	2.32	2322	4709
	Julana		1580	1.61	1613	2549
	Alewa		345	2.91	2913	1005
	Safidon		442	2.01	2009	888
	Pillukhera		307	2.04	2044	628
	Uchana		1434	2.94	2944	4222
	Narwana		333	2.47	2465	821
	Total		6469	2.37	2369	15325
	Safidon	**Maize**	5	3.13	3133	16
	Narwana		4	3.13	3133	13
	Total		9	3.13	3133	28
	Jind	**Sugarcane**	2553	79.59	79592	203200
	Julana		1240	83.18	83181	103145
	Alewa		144	86.12	86124	12402
	Safidon		865	73.09	73092	63224
	Pillukhera		855	73.09	73092	62493
	Uchana		65	29.38	29380	1910
	Narwana		31	29.09	29085	902
	Total		5753	73.09	73092	420497
	Jind	**Wheat**	31008	4.46	4464	138420
	Julana		25840	4.38	4384	113283
	Alewa		19274	4.44	4438	85538
	Safidon		23464	4.8	4804	112721
	Pillukhera		16191	4.59	4592	74349
	Uchana		39219	5	4997	195977
	Narwana		49721	4.79	4794	238362
	Total		204717	4.66	4660	953981
	Jind	**Barley**	2	4.04	4038	8
	Julana		16	4.46	4464	71
	Alewa		2	3.24	3237	6
	Uchana		16	3.24	3237	52
	Narwana		5	5.51	5507	28
	Total		41	4.52	4519	185
	Jind	**Gram**	9	1.19	1194	11
	Julana		1	1.19	1194	1
	Safidon		9	1.19	1194	11
	Pillukhera		1	1.19	1194	1
	Total		20	1.19	1194	24
	Jind	**Mustard**	4205	2.14	2138	8990
	Julana		1586	2.13	2132	3381
	Alewa		966	1.95	1951	1885
	Safidon		1482	2	2004	2970
	Pillukhera		884	1.98	1981	1751
	Uchana		3728	2.27	2271	8466
	Narwana		1392	2.32	2318	3227
	Total		14243	2.15	2146	30565
Mahendragarh	Kanina	**Cotton**	4278	0.51	513	2195
	Mahendragarh		6885	0.51	510	3511
	Ateli		1615	0.54	541	874
	Narnaul		1181	0.54	544	642

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Nagal Chaudhary		308	0.49	485	149
	Nizampur		112	0.53	534	60
	Sihma		270	0.54	543	147
	Satnali		2235	0.52	519	1160
	Total		16884	0.52	521	8797
	Kanina	**Bajra**	19220	2.77	2773	53297
	Mahendragarh		22772	2.76	2755	62737
	Ateli		9540	2.9	2903	27695
	Narnaul		15798	2.68	2682	42370
	Nagal Chaudhary		14821	2.85	2845	42166
	Nizampur		7815	2.73	2734	21366
	Sihma		9166	2.86	2856	26178
	Satnali		9255	2.92	2916	26988
	Total		108387	2.8	2802	303700
	Narnaul	**Maize**	5	3.13	3133	16
	Total		5	3.13	3133	16
	Kanina	**Barley**	13	2.78	2776	36
	Mahendragarh		35	3.98	3980	139
	Ateli		4	3.24	3237	13
	Narnaul		1	3.24	3237	3
	Nagal Chaudhary		3	3.24	3237	10
	Nizampur		3	3.05	3052	9
	Satnali		85	3.51	3509	298
	Total		144	3.5	3500	504
	Kanina	**Gram**	12	1.4	1403	17
	Mahendragarh		380	1.27	1267	481
	Ateli		3	1.19	1194	4
	Narnaul		1136	1.28	1276	1450
	Nagal Chaudhary		395	1.18	1181	466
	Nizampur		2569	1.25	1246	3201
	Satnali		1172	1.3	1304	1528
	Total		5667	1.24	1243	7044
	Kanina	**Mustard**	20968	2.07	2068	43362
	Mahendragarh		27302	1.93	1926	52584
	Ateli		11868	1.96	1963	23297
	Narnaul		23608	2.12	2121	50073
	Nagal Chaudhary		9509	2.14	2137	20321
	Nizampur		7777	2.14	2143	16666
	Sihma		4333	1.98	1983	8592
	Satnali		7215	1.93	1931	13932
	Total		112580	2.04	2037	229325
Rewari	Rewari	**Rice**	466	2.49	2487	1159
	Jatusana		434	1.71	1714	744
	Bawal		4	1.98	1981	8
	Nahar		27	1.99	1985	54
	Total		931	1.98	1981	1844
	Rewari	**Cotton**	1184	0.22	222	263
	Khol		920	0.2	202	186
	Jatusana		2625	0.19	186	488
	Bawal		1248	0.25	248	310

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Nahar		2821	0.17	170	480
	Total		8798	0.21	208	1830
	Rewari	**Bajra**	11175	2.14	2142	23937
	Khol		15430	2.04	2038	31446
	Jatusana		17695	1.8	1798	31816
	Bawal		14916	2.16	2161	32233
	Nahar		14728	2.04	2035	29971
	Total		73944	2.04	2042	150994
	Jatusana	**Maize**	31	3.13	3133	97
	Bawal		1	3.13	3133	3
	Total		32	3.13	3133	100
	Rewari	**Wheat**	5385	4.7	4700	25310
	Khol		5219	4.23	4226	22055
	Jatusana		7977	4.62	4619	36846
	Bawal		5597	4.65	4648	26015
	Nahar		3778	4.66	4661	17609
	Total		27956	4.58	4579	128011
	Rewari	**Barley**	7	5.83	5826	41
	Khol		2	3.24	3237	6
	Jatusana		9	4.83	4827	43
	Bawal		4	4.63	4634	19
	Total		22	4.93	4929	108
	Rewari	**Gram**	1	1.19	1194	1
	Khol		2	1.19	1194	2
	Jatusana		1	0.74	744	1
	Nahar		1	1.19	1194	1
	Total		5	0.74	744	4
	Rewari	**Mustard**	16546	2.02	2020	33423
	Khol		16530	1.91	1910	31572
	Jatusana		18248	1.72	1720	31387
	Bawal		17475	2.08	2084	36418
	Nahar		16325	1.98	1980	32324
	Total		85124	1.95	1949	165907
Charkhi Dadri	Bond kalan	**Rice**	2832	1.53	1527	4324
	Dadri		1931	2.04	2039	3937
	Jhojhu Kalan		116	2.49	2492	289
	Total		4879	1.85	1849	9021
	Bond kalan	**Bajra**	5311	0.22	220	1168
	Dadri		6465	0.32	321	2075
	Badhra		9233	0.31	308	2844
	Jhojhu Kalan		5399	0.36	363	1960
	Total		26408	0.31	314	8292
	Bond kalan	**Cotton**	5698	2.06	2058	11726
	Dadri		14450	2.01	2005	28972
	Badhra		18151	1.89	1892	34342
	Jhojhu Kalan		12309	2.13	2126	26169
	Total		50608	2.01	2010	101722
	Badhra	**Maize**	1	3.13	3133	3
	Total		1	3.13	3133	3
	Bond kalan	**Sugarcane**	1336	94.2	94200	125851
	Dadri		97	96	96000	9312
	Total		1436	94.92	94920	136305
	Bound kalan	**Wheat**	7493	4.4	4399	32962
	Dadri		9939	4.28	4281	42549
	Jhojho kalan		5077	3.84	3835	19470

District	Block	Crops Name	Area (Ha)	Productivity (Tonne/ha)	Productivity (Kg/ha)	Production (Tonne)
	Badhra		10679	4.13	4131	44115
	Total		33188	4.12	4124	136867
	Bound kalan	**Barley**	20	3.47	3469	69
	Dadri		90	2.77	2768	249
	Jhojho kalan		25	3.89	3890	97
	Badhra		69	4.18	4180	288
	Total		204	3.26	3258	665
	Bound kalan	**Gram**	9	1.54	1543	14
	Dadri		27	1.53	1531	41
	Jhojho kalan		159	2.38	2380	378
	Badhra		103	1.6	1595	164
	Total		298	1.84	1844	550
	Bound kalan	**Mustard**	12063	2.2	2201	26551
	Dadri		22433	2.04	2042	45808
	Jhojho kalan		21820	1.67	1671	36461
	Badhra		20936	1.91	1912	40030
	Total		77252	1.92	1918	148169

Source: Agriculture and Farmers Welfare Department, Haryana

Annexure 1.2 Block-wise Livestock Population (2021)

Sr. No.	District	Block	Cattle	Buffalo	Draft Animals	Sheep	Goat	Pig	Birds	Broilers	Camel	Total
1	AMBALA	Ambala-I	16598	34413	2442	6261	1275	1593	147536			221417
2	AMBALA	Ambala-II	8174	18945	1628	1520	833	507	79441			122698
3	AMBALA	Barara	12328	24413	1916	2423	1569	1254	133704			189084
4	AMBALA	Naraingarh	10761	51522	3343	3116	1549	1421	179809			263063
5	AMBALA	Saha	5993	7610	1032	2411	623	627	71994			102031
6	AMBALA	Shahzadpur	6193	743	670	3438	994	608	96820			121199
7	BHIWANI	BawaniKhera	9830	37162	90	3913	2918	615	23000	130000	50	207578
8	BHIWANI	Behal	10846	26403	88	3649	3316	85	20250	195751	200	260588
9	BHIWANI	Bhiwani	36525	95722	170	7859	6468	2085	35000	300150	101	484080
10	BHIWANI	Kairu	9321	29200	120	5698	6642	223	0	136150	50	187404
11	BHIWANI	Loharu	13112	30734	162	3680	4021	180	13000	368546	300	433735
12	BHIWANI	Siwani	14402	28431	122	7774	5855	29	0	234700	200	291513
13	BHIWANI	Tosham	11400	30087	148	2000	3050	300	20000	405000	100	472085
14	CHARKI DADRI	Badhra	12056	36875		2896	4064	0				55891
15	CHARKI DADRI	Baund	5071	23924		3106	2694	630				35425
16	CHARKI DADRI	Charkhi Dadri	11505	56257		4062	4807	982				77613
17	CHARKI DADRI	Jhojhu	9780	35465		2882	5510	125				53762
18	FARIDABAD	Ballabgarh	9632	31310	75	1933	900	975				44825
19	FARIDABAD	Faridabad	19263	35867	39	805	4978	373				61325
20	FARIDABAD	Tigaon	14093	46923	25	983	912	214				63150
21	FATEHABAD	Bhattu Kalan	18120	29147	512	1697	1380	46	165002			217869
22	FATEHABAD	Bhuna	10900	29177	30	3472	1259	350	249002			295820
23	FATEHABAD	Fatehabad	35072	57681	110	5189	4554	224	135578			242260
24	FATEHABAD	Jakhal	4889	14800	27	321	613	693	30000			52140
25	FATEHABAD	Nagpur	8403	21561	86	1259	1745	118	7300			41693
26	FATEHABAD	Ratia	15386	30726	141	1506	2574	275	62203			114710
27	FATEHABAD	Tohana	16030	50745	286	1865	1713	591	139200			213129
28	GURUGRAM	Farrukh Nagar	13818	21752	2253	810	3000	2500	161600	256400		464021
29	GURUGRAM	Gurgaon	24525	39574	2443	442	1417	2210	175600	298300		547947
30	GURUGRAM	Pataudi	12812	20738	2900	945	2410	2010	174600	285800		504015
31	GURUGRAM	Sohna	12900	21623	1678	1010	2925	2160	172600	290500		507273
32	HISAR	Adampur	20103	40142	384	2338	1909	60	132410			197346
33	HISAR	Agroha	15816	28669	389	1772	1261	188	167981			216076
34	HISAR	Barwala	17232	62141	648	9583	2858	877	158695			252034
35	HISAR	Hansi-I	25654	85712	256	2261	2800	499	138145			255327
36	HISAR	Hansi-II	6383	31656	204	1092	683	397	62207			102622
37	HISAR	Hisar-I	24915	55394	649	6301	3171	1599	85332			177361
38	HISAR	Hisar-II	21504	45420	234	7470	3850	328	185435			264241
39	HISAR	Narnaund	13996	48972	556	2795	1801	670	68234			137024
40	HISAR	Uklana	13010	34422	434	1734	1026	249	50441			101316
41	JHAJJAR	Badli	9418	20214	140	1711	855	1291	642			35670
42	JHAJJAR	Bahadurgarh	15562	32449	115	689	670	3738	660			56257
43	JHAJJAR	Beri	12091	30572	78	1858	1210	3395	164567			215770
44	JHAJJAR	Jhajjar	10118	37086	238	1988	1998	2548	42040			98301
45	JHAJJAR	Machhrauli	3423	13984	67	1947	1015	588	34153			55978
46	JHAJJAR	Matannail	8472	29576	176	994	1899	1079	161107			205273
47	JHAJJAR	Salhawas	3190	16278	77	733	714	563	48			22702
48	JIND	Alewa	7476	30414	35	1402	541	315	461000			501183
49	JIND	Jind	21147	75405	206	3539	2556	1120	1269045			1373018
50	JIND	Julana	12564	46009	48	3097	1531	671	265220			329140
51	JIND	Narwana	16935	51688	43	2445	658	702	342000			414471
52	JIND	Pillukhera	12505	42894	85	2277	936	623	612916			672236
53	JIND	Safidon	12604	31423	208	1282	779	681	1249934			1296911
54	JIND	Uchana	24250	75155	155	3443	2656	1326	786276			893261
55	JIND	Ujhana	9143	40618	148	5320	1352	870	180000			237451

Sr. No.	District	Block	Cattle	Buffalo	Draft Animals	Sheep	Goat	Pig	Birds	Broilers	Camel	Total
56	KAITHAL	Dhand	7291	24523	7411	493	687	634	382878			431117
57	KAITHAL	Guhla	11997	32976	21680	3101	1510	557	951299			1030120
58	KAITHAL	Kaithal	15774	77475	21119	2868	1693	915	1008692			1138426
59	KAITHAL	Kalayat	11277	31548	11279	1124	783	467	523673			588351
60	KAITHAL	Pundri	10916	32966	2891	748	368	474	202839			258592
61	KAITHAL	Rajound	6152	34393	8555	1983	845	678	428477			487083
62	KAITHAL	Siwan	186	249	2230	0	243	11	88840			91629
63	KARNAL	Assandh	16259	35160	266	1432	629	947	0			54693
64	KARNAL	Gharaunda (Part)	16462	28086	192	1463	1117	1393	1198000			1246713
65	KARNAL	Indri	23587	21470	121	1150	1258	814	0			48400
66	KARNAL	Karnal	28099	28483	125	1779	1742	4421	207714			272363
67	KARNAL	Kunjpura	5774	6596	27	488	514	256	0			13655
68	KARNAL	Munak	11709	24593	220	800	939	360	365000			403621
69	KARNAL	Nilokheri	24651	30052	74	3022	2011	2655	462000			524465
70	KARNAL	Nissing at Chirao	24344	27297	77	692	902	393	4500			58205
71	KURUKSHETRA	Babain	9747	10369	43	1151	387	792	0			22489
72	KURUKSHETRA	Ismailabad	8508	12551	75	1357	847	147	0			23485
73	KURUKSHETRA	Ladwa	12661	11818	79	695	598	372	0			26223
74	KURUKSHETRA	Pehowa	20870	39063	130	2001	1763	1290	0			65117
75	KURUKSHETRA	Pipli	13381	14810	66	1959	1499	494	0			32209
76	KURUKSHETRA	Shahbad	15915	22742	32	1484	1268	323	0			41764
77	KURUKSHETRA	Thanesar	20859	27712	95	2308	790	664	0			52428
78	MAHENDRAGARH	Ateli Nangal	6184	18288	86	1048	3693	4	291198			320501
79	MAHENDRAGARH	Kanina	11007	35808	73	3878	5290	997	329441			386494
80	MAHENDRAGARH	Mahendragarh	7400	32106	104	3522	7768	77	269124			320101
81	MAHENDRAGARH	Nangal Chaudhry	6095	25918	65	2473	7652	15	142418			184636
82	MAHENDRAGARH	Narnaul	8052	31613	94	1314	6067	70	175519			222729
83	MAHENDRAGARH	Nizampur	2068	13724	23	5433	5561	55	35883			62747
84	MAHENDRAGARH	Satnali	7609	16621	96	3918	6787	136	53899			89066
85	MAHENDRAGARH	Sihma	2698	13129	14	1409	3149	0	46619			67018
86	NUH	Ferozepur Jhirka	8119	44544	89	1461	7871	9			221	62314
87	NUH	Indri	3054	9409	19	415	2116	316			0	15329
88	NUH	Nagina	1152	11522	12	214	1714	0			67	14681
89	NUH	Nuh	10650	37846	74	1954	7293	295			1	58113
90	NUH	Pingwan	1422	14025	11	448	2656	90			0	18652
91	NUH	Punahana	2305	40003	12	743	3411	17			1	46492
92	NUH	Taoru	3418	17409	27	3	1569	60			0	22486
93	PALWAL	Badoli	6097	26830	0	578	496	173	0	0		32174
94	PALWAL	Hassanpur	2182	12161	51	178	321	153	0	0		14046
95	PALWAL	Hathin	9891	55583	106	3005	7183	432	0			74200
96	PALWAL	Hodal	13815	47579	152	1646	1436	734	0	8000		71362
97	PALWAL	Palwal	9541	39496	98	1534	1489	325	0			49483
98	PALWAL	Prithla	4956	18825	0	236	552	182	0	6500		31251
99	PANCHKULA	Barwala	8321	2351	78	2495	1307	1086	4800000			4815644
100	PANCHKULA	Morni	5084	4091	200		300					9315
101	PANCHKULA	Pinjore	9818	25045	96	10	3321	1022	0			35047

Sr. No.	District	Block	Cattle	Buffalo	Draft Animals	Sheep	Goat	Pig	Birds	Broilers	Camel	Total
102	PANCHKULA	Raipur Rani	9228	24540	354	1906	1485	800	1500000			1533754
103	PANIPAT	Bapoli	4738	13347	75	78	317	212	865	340892		360524
104	PANIPAT	Israna	11961	30048	93	770	486	593	1150	1136150		1181251
105	PANIPAT	Madlauda	15922	30822	90	1387	638	667	1268	1080968		1131762
106	PANIPAT	Panipat	18595	38022	102	1332	1710	1090	850	598350		660051
107	PANIPAT	Samalkha	18396	36416	78	469	809	1679	895	797700		856442
108	PANIPAT	Sanauli Khurd	4498	16461	40	1009	480	97	385	110775		133745
109	REWARI	Bawal	8701	28526	97	1174	2996	897	91600			133991
110	REWARI	Dahina	4827	24794	93	1075	3295	77	171700			205861
111	REWARI	Jatusana	6457	18561	77	614	2913	5951	55800			90373
112	REWARI	Khol at Rewari	4706	21122	103	318	6754	65	74850			107918
113	REWARI	Nahar	5680	27087	173	957	2178	143	180300			216518
114	REWARI	Dharuhera	5649	16306	72	799	2475	78	181000			206379
115	REWARI	Rewari	8290	24027	158	447	3516	246	29500			66184
116	ROHTAK	Kalanaur	2796	24464	130	2104	1350	1682	61500	72000		168792
117	ROHTAK	Lakhan Majra	35018	19297	54	1285	710	712	33000	42400		167123
118	ROHTAK	Maham	6347	42477	160	2355	1668	1873	85500	92000		238660
119	ROHTAK	Rohtak	16876	66775	127	2320	1976	1579	102000	115700		324051
120	ROHTAK	Sampla	2637	21145	67	1917	956	2848	41000	58600		131780
121	SIRSA	Baragudha	12364	20034	60	1415	3336	219	71	10332	11	47842
122	SIRSA	Dabwali	49516	35876	89	3519	12816	423	31047	49490	9	182785
123	SIRSA	Ellenabad	26182	18820	47	5321	4866	13	0	0	57	55306
124	SIRSA	NathusariChopta	41785	48120	172	6470	6067	78	10226	33330	1058	147306
125	SIRSA	Odhan	25799	29426	73	1448	7767	152	0	2787	29	67481
126	SIRSA	Rania	35409	31139	50	3439	4760	95	19	57760	48	132719
127	SIRSA	Sirsa	45898	64635	250	5998	8473	724	66357	72821	52	265208
128	SONIPAT	Ganaur	21808	38205	91	804	861	2712	673810	0		732041
129	SONIPAT	Gohana	8226	35232	80	1059	953	607	0	0		39907
130	SONIPAT	Kathura	9208	22142	55	975	603	345	0	0		27078
131	SONIPAT	Kharkhoda	17838	32118	95	520	890	7315	30060	32000		114586
132	SONIPAT	Mundlana	11204	36969	45	1030	643	1125	22091	0		66857
133	SONIPAT	Murthal	7443	13712	32	250	571	300	0	0		16058
134	SONIPAT	Rai	13654	16278	150	227	221	338	0	15000		39618
135	SONIPAT	Sonipat	19239	32781	87	917	1103	802	72000	0		120679
136	YAMUNANAGAR	Bilaspur	14591	17911	102	663	1244	409	219350	34500		288770
137	YAMUNANAGAR	Chhachhrauli	16368	18417	105	351	1162	95	5300	196650		238448
138	YAMUNANAGAR	Jagadhri	19939	22699	60	1115	1331	429	148000	275150		468723
139	YAMUNANAGAR	Pratap Nagar	6251	9236	155	775	320	58	NA	112000		128795
140	YAMUNANAGAR	Saraswati Nagar	13389	19526	70	3161	773	611	0	27000		64530
141	YAMUNANAGAR	Radaur	28359	22999	95	1901	964	884	124500	523200		702902
142	YAMUNANAGAR	Sadaura (part)	6948	12557	90	70	179	17	0	375500		395361

Source: Department of Husbandry and Dairying, Haryana

Annexure 1.3 Block-wise Area under Fisheries and Annual Production (2021-22)

Sr. No.	District	Block	Area (Ha)	Production (Tonne)
1	AMBALA	Ambala I	131.60	1225.00
2	AMBALA	Ambala II	30.10	267.00
3	AMBALA	Barara	106.80	890.00
4	AMBALA	Naraingarh	67.30	620.00
5	AMBALA	Saha	55.60	505.70
6	AMBALA	Shazadpur	76.70	764.00
7	BHIWANI	Bawani Khera	282.00	2971.00
8	BHIWANI	Behal	0.00	0.00
9	BHIWANI	Bhiwani	441.00	4551.00
10	BHIWANI	Kairu	0.00	0.00
11	BHIWANI	Loharu	5.00	50.00
12	BHIWANI	Siwani	93.00	283.00
13	BHIWANI	Tosham	115.00	1108.00
14	CHARKHI DADRI	Badhra	35.00	95.00
15	CHARKHI DADRI	Baund kalan	55.00	140.00
16	CHARKHI DADRI	Dadri	150.00	440.00
17	CHARKHI DADRI	Jhojhu	45.00	120.00
18	FARIDABAD	Ballabhgarh	250.00	3100.00
19	FARIDABAD	Faridabad	120	1010.00
20	FARIDABAD	Tigon	68	629.00
21	FATEHABAD	Bhattu kalan	516.00	4747.20
22	FATEHABAD	Bhunna	446.00	4103.20
23	FATEHABAD	Fatehabad	226.00	2079.20
24	FATEHABAD	Jhakal	115.25	1060.30
25	FATEHABAD	Nagpur	288.00	2649.60
26	FATEHABAD	Ratia	243.00	2235.60
27	FATEHABAD	Tohana	227.00	2088.40
28	GURUGRAM	Farukhnagar	85.40	320.00
29	GURUGRAM	Gurugram	16.50	114.00
30	GURUGRAM	Pataudi	49.00	459.00
31	GURUGRAM	Sohna	240.50	3171.80
32	HISAR	Adampur	70.40	1078.00
33	HISAR	Agroha	75.40	904.80
34	HISAR	Barwala	165.00	1963.50
35	HISAR	Hansi-I	231.00	2748.90
36	HISAR	Hansi-II	252.50	3004.75
37	HISAR	Hisar-I	205.50	2445.45
38	HISAR	Hisar-II	196.00	2332.40
39	HISAR	Narnaund	132.00	1570.80
40	HISAR	Uklana	98.00	1078.00
41	JHAJJAR	Badli	156.00	1855.76
42	JHAJJAR	Bahadurgarh	271.00	3251.26
43	JHAJJAR	Beri	180.00	2152.80
44	JHAJJAR	Jhajjar	290.00	3478.50
45	JHAJJAR	Machhrauli	91.00	1096.13
46	JHAJJAR	Matanhail	185.00	2202.60
47	JHAJJAR	Salhawas	115.00	1378.40
48	JIND	Alewa	12.80	94.40

Sr. No.	District	Block	Area (Ha)	Production (Tonne)
49	JIND	Jind	36.20	267.00
50	JIND	Julana	201.00	1482.60
51	JIND	Narwana	121.50	896.22
52	JIND	Pillukhera	61.00	449.90
53	JIND	Safidon	140.00	1032.60
54	JIND	Uchana	60.00	442.50
55	JIND	Ujhana	30.00	221.20
56	KAITHAL	dhand	120.00	1320.00
57	KAITHAL	guhla cheeka	70.00	770.00
58	KAITHAL	kaithal	206.00	2301.00
59	KAITHAL	kalayat	160.00	1760.00
60	KAITHAL	pundri	152.00	1672.00
61	KAITHAL	rajaund	105.00	1207.00
62	KAITHAL	siwan	30.00	330.00
63	KARNAL	Assandh	134.51	1331.65
64	KARNAL	Gharaunda	58.41	578.35
65	KARNAL	Indri	115.85	1146.91
66	KARNAL	Karnal	42.16	417.00
67	KARNAL	Kunjpura	44.00	435.50
68	KARNAL	Munak	100.80	997.92
69	KARNAL	Nilokhei	180.00	1782.00
70	KARNAL	Nissing	160.27	1586.67
71	KURUKSHETRA	Babain	65.00	750.00
72	KURUKSHETRA	Ismilabad	86.00	980.00
73	KURUKSHETRA	Ladwa	55.00	634.00
74	KURUKSHETRA	Pehowa	93.00	1116.00
75	KURUKSHETRA	Pipli	60.00	720.00
76	KURUKSHETRA	Shahbad	70.00	840.00
77	KURUKSHETRA	Thanesar	95.00	1140.00
78	MAHENDRAGARH	Ateli	21.00	179.00
79	MAHENDRAGARH	Kanina	49.00	402.00
80	MAHENDRAGARH	Mahendergarh	25.00	188.00
81	MAHENDRAGARH	Nangal Choudary	12.00	91.00
82	MAHENDRAGARH	Narnaul	24.00	191.00
83	MAHENDRAGARH	Nizampur	13.00	94.00
84	MAHENDRAGARH	Satnail	3.00	22.00
85	MAHENDRAGARH	Sihma	19.00	142.00
86	NUH	Firojpur Jhirka	211.00	2371.00
87	NUH	Indri	351.66	3946.00
88	NUH	Nagina	70.33	789.00
89	NUH	Nuh	439.56	4933.00
90	NUH	Pingwan	263.72	2959.00
91	NUH	Punahana	351.66	3946.00
92	NUH	Tauru	70.33	789.00
93	PALWAL	Badoli	1.00	0.00
94	PALWAL	Hassanpur	200.00	2500.00
95	PALWAL	Hathin	598.64	7811.00
96	PALWAL	Hodal	119.00	1440.00
97	PALWAL	Palwal	150.00	1800.00
98	PALWAL	Prithla	10.00	120.00

Sr. No.	District	Block	Area (Ha)	Production (Tonne)
99	PANCHKULA	Barwala	28.20	141.00
100	PANCHKULA	Morni	3.40	17.30
101	PANCHKULA	Pinjore	2.60	15.50
102	PANCHKULA	Raipur Rani	85.60	690.50
103	PANIPAT	Baopli	110.00	1259.00
104	PANIPAT	Israna	230.00	2029.00
105	PANIPAT	Madlauda	201.00	1895.00
106	PANIPAT	Panipat	120.00	1280.13
107	PANIPAT	Samalkha	160.00	1645.00
108	PANIPAT	Sanauli Khurd	90.45	1034.00
109	REWARI	Bawal	95.00	1050.00
110	REWARI	Dahina	100.00	1100.00
111	REWARI	Dharuhera	65.00	720.00
112	REWARI	Jatusana	140.00	1553.00
113	REWARI	Khol	10.75	118.00
114	REWARI	Nahar	105.00	1155.00
115	REWARI	Rewari	115.00	1275.00
116	ROHTAK	Kalanaur	97.16	1459.00
117	ROHTAK	Lakhanmajra	153.08	1798.00
118	ROHTAK	Meham	172.11	1599.00
119	ROHTAK	Rohtak	181.19	2274.00
120	ROHTAK	Sampla	122.00	1474.00
121	SIRSA	Baragudha	168.08	1490.00
122	SIRSA	Dabwali	166.05	1468.00
123	SIRSA	Ellenabad	149.85	1359.00
124	SIRSA	Nalhusarai Chopta	155.925	1426.00
125	SIRSA	Odhan	173.745	1780.00
126	SIRSA	Rania	159.975	1725.00
127	SIRSA	Sirsa	142.155	1614.00
128	SONIPAT	Ganaur	135.00	1906.00
129	SONIPAT	Gohana	203.00	3045.00
130	SONIPAT	Kathura	165.00	2310.00
131	SONIPAT	Kharkhoda	185.00	2690.00
132	SONIPAT	Mundlana	140.00	2060.00
133	SONIPAT	Murthal	32.00	448.00
134	SONIPAT	Rai	80.00	1200.00
135	SONIPAT	Sonepat	150.00	2350.00
136	YAMUNANAGAR	Bilaspur	74.60	790.00
137	YAMUNANAGAR	Chhachhrauli	46.60	494.00
138	YAMUNANAGAR	Jagadhri	19.00	202.00
139	YAMUNANAGAR	Partap Nagar	108.50	1147.00
140	YAMUNANAGAR	Radaur	25.30	268.00
141	YAMUNANAGAR	Sadhaura	41.00	434.00
142	YAMUNANAGAR	Saraswati Nagar	42.00	445.00

Source: Fisheries Department, Haryana

Annexure 2.1 Yamuna Data at Tajewala/ HKB from 1968 to 2020

Year	Data (Cumecs Day)	DON*	Year	Data (Cumecs Day)	DON*
1968	110016.26	19	1995	135265.63	12
1969	108412.5	21	1996	123428.62	16
1970	98095	29	1997	98715.37	27
1971	170253.28	2	1998	167233.06	3
1972	89779.08	36	1999	86381.11	41
1973	122304.28	17	2000	96569.81	32
1974	76525.97	48	2001	82396.36	44
1975	165006.67	4	2002	89191.14	37
1976	135918.68	11	2003	91389.81	34
1977	146817.61	8	2004	64564.2	52
1978	218167.9	1	2005	98184.59	28
1979	97955.16	31	2006	71510.1	50
1980	95733.93	33	2007	74918.51	49
1981	103652.52	25	2008	105197.87	24
1982	125359.21	15	2009	59985.16	53
1983	139743.57	9	2010	163797.23	5
1984	81175.19	47	2011	138011.67	10
1985	109848.66	20	2012	88510.81	33
1986	106352.03	23	2013	160929.25	6
1987	65547.54	51	2014	87498.15	39
1988	155507.18	7	2015	86852.85	40
1989	115679.55	18	2016	81727.89	45
1990	129054.94	14	2017	9093.68	35
1991	83808.99	43	2018	102180.1	26
1992	107213.28	22	2019	86248.2	42
1993	97661.1	30	2020	81356.74	46
1994	133846.65	13			

Source: I&WRD, Haryana

*DON: Descending Order No

25% dependability = (53+1) 0.25 = 13.5th value

= AV. Of 13th + 14th = (133846.65+129054.94)/2

= 131450.80 cumecs day =11357.35 MCM = 11.357 BCM

50% dep: (53+1) *0.5 = 27th value

= 98715.37 cumecs day = 8529 MCM = 8.529 BCM

75% dep: (53+1) *0.75 = 40.5th value

= Av of 40th and 41th = (86852.85+86381.11)/2

= 86616.98 cumecs days = 7483.7 MCM = 7.484 BCM

90% dep. = 54*0.9 = 48.6th value

= 76525.97 – (76525.97-74918.51)0.6

= 75561.49 cumecs days= 6528.5 MCM = 6.529 BCM

Annexure 2.2 Water Outfalling in Yamuna River from Various Drains

Sr. No.	District	Name of Drain	Volume of water outfall in Yamuna River in a year (MCM)
1	Faridabad	Buriya Nalla & all link drain	59.88
2	Jhajjar	Outfall in drain No. 8	14.08
3	Karnal	Dhanaura escape	2.94
4	Palwal	Gaunchhi main drain	74.73
5	Panipat	Main drain No.2	60.90
6	Rohtak	Kutana Chuddni Bupnia (KCB) drain	92.10
7	Sonipat	Diversion drain No.8	1220.90
		TOTAL	**1525.53**
			Say 1.53 MCM

Source: District Water Resources Plans

Annexure 2.3 List of Chronic Tails

Sr. No.	Name of Channels	Cost of Scheme (INR in Lacs)	District
	Lift Canals Unit		
1	Rehabilitation of Kheri Bura Minor RD 0 to 20500	140.00	Charkhi Dadri
2	Rehabilitation of Dadri S.Minor RD 0 to 8694	60.00	Charkhi Dadri
3	Rehabilitation of Barhaloo Mr. RD 0 to 34200	25.00	Bhiwani
4	Rehabilitation of Bass Lift Minor No – II RD 0 to 12500	150.00	Charkhi Dadri
5	Rehabilitation of Kural Disty. RD 0 to 74500	769.30	Charkhi Dadri
6	Rehabilitation of Pichopa Minor from RD 0 to 17000	90.65	Charkhi Dadri
7	Rehabilitation of Balance work of Gudana Minor from RD 12075 to 21000	77.34	Charkhi Dadri
8	Rehabilitation of Rehrodi Minor from RD 0 to 17500	276.31	Charkhi Dadri
9	Rehabilitation of Bohka Disty.	60.00	Rewari
10	Rehabilitation of 1-R Noona Majra Minor RD 0 to 16000	137.86	Jhajjar
11	Rehabilitation of Chhochhi Minor RD 0 to 7210	39.00	Jhajjar
12	Rehabilitation of Rampuri Disty. Kms. 0.000 to 22.098	270.00	Mahendragarh
13	Rehabilitation of Nangal Disty. Kms. 0.000 to 15.122	300.00	Mahendragarh
14	Rehabilitation of Jhapoli Disty. Kms. 0.000 to 1.600	51.00	Mahendragarh
15	Rehabilitation of Bhandor Disty. Kms. 0.00 to 5.490	107.00	Mahendragarh
16	Rehabilitation of Ramgarh Disty. Kms. 0.00 to 14.936	253.00	Mahendragarh
17	Rehabilitation of Bass Disty. Kms. 0.00 to 7.11	50.00	Mahendragarh
18	Rehabilitation of Badrai Disty. Kms. 0.00 to 3.550	40.00	Mahendragarh
19	Rehabilitation of Bijana Minor from RD 0 to 14000.	90.00	Charkhi Dadri
20	Rehabilitation of Manheru Minor from RD 0 to 8700 and RD 35500 to 45000	227.80	Bhiwani
	Total	3214.26	
BWS Unit			
21	Basra Sub Minor No. –II RD 0-23050	200.00	Hisar
	Total	200.00	
YWS Unit (S)			
22	Banarsi Disty. At RD.0-99315	401.00	Nuh
23	Uleta Disty. at RD.0-34046	283.00	Nuh
	Total	684.00	
YWS Unit (N)			
24	Remodeling of Dhani Mahu Sub Minor from RD 0 to 13000 off-taking at RD 38300-R Kairu Minor (Pipeline)	126.75	Bhiwani
25	Remodeling of Kusumbhi Sub Minor from RD 0 to 13500 off-taking at RD 21300-R Kairu Minor (Pipeline)	69.25	Bhiwani
26	Remodeling of 1-R Kairu Sub Minor from RD 0 to 14000 off-taking at RD 34255-R Kairu Minor (Pipeline)	33.25	Bhiwani
27	Remodeling of Rewasa Sub Minor from RD 0 to 12450 off-taking at RD 25350-R Kairu Minor (Pipeline)	141.15	Bhiwani
28	Remodeling of Kohar Sub Minor from RD 0 to 9250 off-taking at RD 16100-L Kairu Minor.	51	Bhiwani
29	Remodeling of Khera Minor from RD 0-12500	353.95	Bhiwani
30	Remodeling of Dhani Miran Disty. From RD 0-17500	398.23	Bhiwani
31	Special repair & conversion of pipe culvert into Box type bridges of Isharwal Sub Minor from RD 0-24500.	259	Bhiwani
32	Remodeling of Sherpura Disty. from RD 0- 52500	1030	Bhiwani
33	Remodeling of Dhani Dhirja Minor from RD 0- 13840	208.09	Bhiwani
34	Remodeling of Saleempur Minor from RD 0- 11600	292.37	Bhiwani
35	Remodeling of Siwani Canal from RD 0- 75600	2217.61	Bhiwani
36	Remodeling of Badola Minor from RD 0- 30500	540.3	Bhiwani

Sr. No.	Name of Channels	Cost of Scheme (INR in Lacs)	District
37	Remodeling of Balawas Disty. from RD 14150-35500	535.76	Bhiwani
38	Project estimate for Rehabilitation of 1-R Sub Minor from RD 0 to 8580	41.23	Bhiwani
39	Project estimate for Rehabilitation of Dinod Sub Minor from RD 0 to 9345	53.08	Bhiwani
40	Project estimate for rehabilitation of Patherwail Minor RD 34313 to 57400-Tail off-take RD 67750.L Jui Canal.	189.1	Bhiwani
41	Rehabilitation of Sahlewala Sub Minor from RD 0 to 5050	75.69	Bhiwani
42	Rehabilitation of Talwani Sub Minor from RD 0 to 21675 & Gosainwala Minor from RD 0 to 6000	424.83	Bhiwani
43	Remodeling of Kanwari Minor from RD 0 to 26200	320.26	Bhiwani
44	Rehabilitation of Bidhnoi Sub Minor RD 0 to 20750 off-take RD 1650-R Gokalpura Minor	178.99	Bhiwani
45	Rehabilitation of Bardu Sub Minor RD 0 to 10500-Tail off-take RD 2930-R Bijlana Sub Minor	65.75	Bhiwani
46	Rehabilitation of Devrala Sub Minor RD 0 to 10750-Tail Off-take RD 11450-R Obra Minor	69.59	Bhiwani
47	Rehabilitation of 3-R Sub Minor RD 0 to 1300-Tail off-take RD 13850-R Gokalpura Minor	93.07	Bhiwani
48	Rehabilitation of Saleempur Disty from RD 0 to 46000	379.42	Bhiwani
49	Rehabilitation of Dhani Bhakran Minor from RD 0 to 12465	115.16	Bhiwani
50	Rehabilitation of Sidhanwa Minor from RD 0 to RD 18350	162.92	Bhiwani
51	Rehabilitation of Talwandi Rukka Disty from RD 0 to 24576	545.47	Bhiwani
52	Rehabilitation of Mithy Disty from RD 0 to RD 63000	948.16	Bhiwani
53	Remodeling of Kanwari Sub Minor from RD 0 to 20200	250.00	Bhiwani
54	Kiwana Minor from RD 0 to 6150	78.00	Panipat
	Total	**10247.43**	
	Grand Total	**14345.69**	

Source: I&WRD, Haryana

Annexure 3.1 Categorization of Villages on the basis of Depth to Water Level, June 2020

S.No.	District	Block	Categorization of Blocks as per GWRE, 2020	No. of Villages	Number of Villages						
					0.0-1.5 (mbgl	1.51-3.0 (mbgl)	3.01-5.0 (mbgl)	5.01-10.0 (mbgl)	10.01-20.0 (mbgl)	20.01-30.0 (mbgl)	30.01 (mbgl)& Above
1	Ambala	Ambala-1	Critical	141	1	20	52	47	19	2	
		Ambala-2	Semi-Critical	57		16	23	7	11		
		Barara	Over-Exploited	79			10	29	10	3	26
		Saha	Over-Exploited	70			18	20	28	2	2
		Naraingarh	Over-Exploited	105			1	14	53	37	
		Shahzadpur	Critical	87		0	5	41	34	6	
		Total		**539**	**1**	**36**	**109**	**158**	**155**	**50**	**28**
2	Bhiwani	Bhiwani	Semi-Critical	74		12	31	19	3	6	3
		B.Khera	Semi-Critical	32		11	11	6	4		
		Tosham	Over-Exploited	53		2	7	14	24	5	1
		Loharu	Over-Exploited	49							49
		Kairu	Over-Exploited	35				4	15	5	11
		Behal	Over-Exploited	31							31
		Siwani	Safe	37					11	19	7
		Total		**311**	**0**	**25**	**49**	**43**	**57**	**35**	**102**
3	Ch. Dadri	Badhra	Over-Exploited	60							60
		Bond	Safe	25	1	10	13	1			
		Ch. Dadri	Safe	54	5	14	14	5	7	8	1
		Jhojhu	Over-Exploited	49				2	15	2	30
		Total		**188**	**6**	**24**	**27**	**8**	**22**	**10**	**91**
4	Faridabad	Faridabad	Over-Exploited	53			1		30	22	
		Tigaon	Over-Exploited	44					25	19	
		Ballabgarh	Over-Exploited	50			5	9	29	7	
		Total		**147**	**0**	**0**	**6**	**9**	**84**	**48**	**0**
5	Fatehabad	Fatehabad	Over-Exploited	51	1	2	3	2	5	5	33

S.No.	District	Block	Categorization of Blocks as per GWRE, 2020	No. of Villages	Number of Villages						
					0.0-1.5 (mbgl)	1.51-3.0 (mbgl)	3.01-5.0 (mbgl)	5.01-10.0 (mbgl)	10.01-20.0 (mbgl)	20.01-30.0 (mbgl)	30.01 (mbgl)& Above
		Ratia	Over-Exploited	59							59
		Tohana	Over-Exploited	57				7	11	9	30
		Jakhal	Over-Exploited	26							26
		Bhuna	Critical	34		1	2	8	6	8	9
		Bhattu Kalan	Over-Exploited	28	2	3	6	9	2	4	2
		Nagpur	Over-Exploited	41				1	1	1	38
		Total		**296**	**3**	**6**	**11**	**27**	**25**	**27**	**197**
6	Gurugram	Gurgaon	Over-Exploited	38			1	4	2	7	24
		F.Nagar	Over-Exploited	50				2	10	31	7
		Pataudi	Over-Exploited	83					2	14	67
		Sohna	Over-Exploited	46				3	18	19	6
		Total		**217**	**0**	**0**	**1**	**9**	**32**	**71**	**104**
7	Hisar	Adampur	Critical	26			9	8	9		
		Agroha	Critical	22			2	12	8		
		Bass	Semi-Critical	24	2	10	7	5			
		Barwala	Over-Exploited	42		6	14	20	2		
		Hansi	Safe	48	3	7	19	17	2		
		Hisar-1	Semi-Critical	52	2	6	23	15	6		
		Hisar-2	Semi-Critical	45		2	5	20	17		1
		Narnaund	Over-Exploited	30				9	21		
		Uklana	Safe	23			3	13	7		
		Total		**312**	**7**	**31**	**82**	**119**	**72**	**0**	**1**
8	Jhajjar	Beri	Safe	33	5	25	3				
		Sahlawas	Safe	29	8	9	9	1	2		
		Bahadurgarh	Safe	47	4	12	20	9	2		
		Matanhail	Safe	48	4	14	12	5	12	1	
		Jhajjar	Safe	43	2	4	28	7	1	1	

S.No.	District	Block	Categorization of Blocks as per GWRE, 2020	No. of Villages	Number of Villages						
					0.0-1.5 (mbgl)	1.51-3.0 (mbgl)	3.01-5.0 (mbgl)	5.01-10.0 (mbgl)	10.01-20.0 (mbgl)	20.01-30.0 (mbgl)	30.01 (mbgl)& Above
		Machhrauli	Safe	22	3	3	8	4	3	1	
		Badli	Semi-Critical	35		3	15	16	1		
		Total		**257**	**26**	**70**	**95**	**42**	**21**	**3**	**0**
9	Jind	Ujhana	Over-Exploited	21				3	3	4	11
		Jind	Over-Exploited	72		1	2	7	21	35	6
		Julana	Safe	39	5	16	12	3	3		
		Uchana	Over-Exploited	48			1	4	36	7	
		Safidon	Over-Exploited	45			2	9	26	8	
		Narwana	Safe	40			5	28	7		
		Alewa	Over-Exploited	18					1	12	5
		P.Khera	Semi-Critical	29		3	6	7	7	6	
		Total		**312**	**5**	**20**	**28**	**61**	**104**	**72**	**22**
10	Kaithal	Gulha	Over-Exploited	89							89
		Kaithal	Over-Exploited	66					7	22	37
		Pundri	Over-Exploited	29					1	10	18
		Rajaund	Over-Exploited	26					22	3	1
		Kalayat	Over-Exploited	28			1	11	14	1	1
		Sewan	Over-Exploited	49							49
		Dhand	Over-Exploited	26						2	24
		Total		**313**	**0**	**0**	**1**	**11**	**44**	**38**	**219**
11	Karnal	Karnal	Over-Exploited	71				2	39	30	
		Kunjpura	Over-Exploited	41			4	4	29	4	
		Munak	Over-Exploited	34				1	15	17	1
		Indri	Semi-Critical	101			4	29	45	14	9
		Nilokheri	Over-Exploited	85						79	6

S.No.	District	Block	Categorization of Blocks as per GWRE, 2020	No. of Villages	Number of Villages						
					0.0-1.5 (mbgl)	1.51-3.0 (mbgl)	3.01-5.0 (mbgl)	5.01-10.0 (mbgl)	10.01-20.0 (mbgl)	20.01-30.0 (mbgl)	30.01 (mbgl)& Above
		Nissing	Over-Exploited	45					1	27	17
		Gharaunda	Over-Exploited	60				1	23	18	18
		Assandh	Over-Exploited	49					2	44	3
		Total		**486**	**0**	**0**	**8**	**37**	**154**	**233**	**54**
12	Kurukshetra	Thanesar	Over-Exploited	77						1	76
		Shahbad	Over-Exploited	90							90
		Pehowa	Over-Exploited	77							77
		Ladwa	Over-Exploited	55					1	9	45
		Babain	Over-Exploited	48							48
		Ismailabad	Over-Exploited	54							54
		Pipli	Over-Exploited	54							54
		Total		**455**	**0**	**0**	**0**	**0**	**1**	**10**	**444**
13	M.Garh	Ateli	Critical	48							48
		Kanina	Over-Exploited	58				1	6	12	39
		M.Garh	Over-Exploited	73					4	2	67
		Narnaul	Safe	62					6	5	51
		N/Choudhary	Safe	52						10	42
		Shima	Over-Exploited	30					1	10	19
		Nizampur	Safe	30					8	4	18
		Satnali	Semi-Critical	28							28
		Total		**381**	**0**	**0**	**0**	**1**	**25**	**43**	**312**
14	Nuh	Taoru	Over-Exploited	81					3	41	37
		Nuh	Safe	69		10	22	28	9		
		Nagina	Safe	56		1	21	32	2		
		F.P.Jhirka	Critical	68			1	6	49	11	1
		Punhana	Critical	68		1	11	25	31		

S.No.	District	Block	Categorization of Blocks as per GWRE, 2020	No. of Villages	Number of Villages						
					0.0-1.5 (mbgl)	1.51-3.0 (mbgl)	3.01-5.0 (mbgl)	5.01-10.0 (mbgl)	10.01-20.0 (mbgl)	20.01-30.0 (mbgl)	30.01 (mbgl)& Above
		Indri	Semi-Critical	51		1	10	38	2		
		Pingwan	Safe	54			8	25	21		
		Total		**447**	**0**	**13**	**73**	**154**	**117**	**52**	**38**
15	Palwal	Palwal	Critical	49	1	0	2	14	25	7	
		Pirthala	Over-Exploited	38		1	4	13	12	8	
		Hodal	Semi-Critical	38		2		3	32	1	
		Hassanpur	Critical	38			1	1	34	2	
		Badoli	Over-Exploited	41				1	32	8	
		Hathin	Safe	89		7	11	27	37	6	1
		Total		**293**	**1**	**10**	**18**	**59**	**172**	**32**	**1**
16	Panchkula	Pinjore	Safe	139				10	83	37	9
		Barwala	Safe	57				16	25	6	10
		Raipur Rani	Critical	43				5	21	17	
		Total		**239**	**0**	**0**	**0**	**31**	**129**	**60**	**19**
17	Panipat	Panipat	Over-Exploited	41				1	4	9	27
		Samalkha	Over-Exploited	35				1	7	7	20
		Madlouda	Over-Exploited	37				11	18	8	
		Israna	Over-Exploited	32			1	10	14	6	1
		Bapoli	Over-Exploited	26					12	5	9
		Sanoli	Over-Exploited	23				2	16	3	2
		Total		**194**	**0**	**0**	**1**	**25**	**71**	**38**	**59**
18	Rewari	Bawal	Over-Exploited	76					27	35	14
		Jatusana	Over-Exploited	68				21	39	8	
		Khol	Over-Exploited	59					1	6	52
		Nahar	Over-Exploited	43				2	28	12	1
		Rewari	Over-Exploited	102				41	50	10	1
		Dahina	Critical	40					13	7	20

S.No.	District	Block	Categorization of Blocks as per GWRE, 2020	No. of Villages	Number of Villages						
					0.0-1.5 (mbgl)	1.51-3.0 (mbgl)	3.01-5.0 (mbgl)	5.01-10.0 (mbgl)	10.01-20.0 (mbgl)	20.01-30.0 (mbgl)	30.01 (mbgl)& Above
		Dharuhera	Over-Exploited	47				10	21	9	7
		Total		**435**	**0**	**0**	**0**	**74**	**179**	**87**	**95**
19	Rohtak	Kalanaur	Safe	26	6	9	10	1			
		Meham	Safe	27	1	13	6	4	3		
		Sampla	Safe	23	2	9	8	4			
		Lakhan Majra	Safe	15	1	5	5	2	2		
		Rohtak	Safe	53	14	24	7	5	3		
		Total		**144**	**24**	**60**	**36**	**16**	**8**	**0**	**0**
20	Sirsa	Baragudha	Semi-Critical	48				18	30		
		Dabwali	Over-Exploited	52				8	43	1	
		NathushriChopta	Over-Exploited	53		4	16	13	13	4	3
		Ellanabad	Over-Exploited	37				3	9	5	20
		Odhan	Over-Exploited	40				4	36		
		Sirsa	Over-Exploited	61					1	9	51
		Rania	Over-Exploited	49					6	11	32
		Total		**340**	**0**	**4**	**16**	**46**	**138**	**30**	**106**
21	Sonipat	Ganaur	Over-Exploited	57		1	3	4	19	17	13
		Kathura	Safe	18	2	5	8	1	2		
		Mudhlana	Over-Exploited	34	6	5	1	19	3		
		Gohana	Safe	33	5	11	4	10	3		
		Kharkhoda	Safe	40	1	6	12	21			
		Rai	Over-Exploited	54		3	1	11	19	20	
		Sonipat	Over-Exploited	47	1	3	4	25	10	4	
		Murthal	Over-Exploited	52				1	16	13	22
		Total		**335**	**15**	**34**	**33**	**92**	**72**	**54**	**35**
22	Yamunagar	Jagadhari	Over-Exploited	95			10	25	43	17	
		Mustafabad	Over-Exploited	92				26	28	29	9

S.No.	District	Block	Categorization of Blocks as per GWRE, 2020	No. of Villages	Number of Villages						
					0.0-1.5 (mbgl	1.51-3.0 (mbgl)	3.01-5.0 (mbgl)	5.01-10.0 (mbgl)	10.01-20.0 (mbgl)	20.01-30.0 (mbgl)	30.01 (mbgl)& Above
		Radour	Over-Exploited	86			6	25	18	26	11
		Sadhoura	Critical	64			4	33	26	1	
		Chachrauli	Over-Exploited	111			4	72	35		
		Bilaspur	Over-Exploited	124				71	43	10	
		Khizrabad	Over-Exploited	73				30	28	15	
		Total		**645**	**0**	**0**	**24**	**282**	**221**	**98**	**20**
Total No. of Villages				**7287**	**88**	**333**	**618**	**1304**	**1903**	**1093**	**1948**

Source: Ground Water Cell, I&WRD, Haryan

Annexure 3.2 Block-wise Dynamic Groundwater Resources of Haryana, 2020

Sr. No.	District	Block	Total Area of Assessment Unit (Ha)	Recharge Worthy Area (Ha)	Groundwater Recharge from Rainfall (MCM)		Ground water Recharge from other sources (MCM)	Total Annual Ground Recharge (MCM)	Total Natural Discharges (MCM)	Annual Extractable Ground water Resource (MCM)	Annual Ground water Extraction (MCM)	Stage of GW Extraction (%)	Category of Assessment Unit
					Monsoon	Non-Monsoon							
1	AMBALA	Ambala-I	19318.00	19318.00	44.00	8.00	65.00	117.00	12.00	105.00	102.00	97.00	Critical
2	AMBALA	Ambala-II	35123.00	35123.00	56.00	10.00	14.00	80.00	8.00	72.00	63.00	88.00	Semi Critical
3	AMBALA	Barara	23038.00	23038.00	37.00	7.00	22.00	66.00	7.00	59.00	82.00	138.00	Over Exploited
4	AMBALA	Naraingarh	27729.00	27729.00	44.00	12.00	27.00	83.00	8.00	74.00	117.00	157.00	Over Exploited
5	AMBALA	Saha	25848.00	25848.00	41.00	8.00	23.00	71.00	7.00	64.00	116.00	180.00	Over Exploited
6	AMBALA	Shahzadpur	20150.00	20150.00	37.00	12.00	15.00	64.00	6.00	57.00	56.00	98.00	Critical
7	BHIWANI	Bawani Khera	40587.23	29834.00	11.22	0.40	45.02	55.88	5.59	50.29	37.46	74.00	Semi Critical
8	BHIWANI	Behal	29577.64	25500.00	16.27	0.76	32.06	34.52	3.45	31.07	44.68	144.00	Over Exploited
9	BHIWANI	Bhiwani	85484.60	68032.00	43.67	4.88	54.65	102.26	5.11	97.15	87.43	90.00	Semi Critical
10	BHIWANI	Kairu	28708.96	18513.00	10.27	1.23	19.87	24.19	2.42	21.77	40.81	187.00	Over Exploited
11	BHIWANI	Loharu	36729.22	35214.00	24.54	2.78	23.35	50.49	5.05	45.44	65.31	144.00	Over Exploited
12	BHIWANI	Siwani	56757.83	41567.00	18.91	0.58	49.15	64.51	6.45	58.06	28.03	48.00	Safe
13	BHIWANI	Tosham	51881.92	48836.00	32.51	3.25	52.51	86.21	8.62	77.59	115.73	149.00	Over Exploited
14	CHARKI DADRI	Badhra	36774.38	36585.38	20.82	1.33	44.30	66.45	6.65	59.81	146.04	244.00	Over exploited
15	CHARKI DADRI	Baund	23436.54	23436.54	19.80	2.08	24.09	42.35	4.24	38.12	11.92	31.00	Safe
16	CHARKI DADRI	Charkhi Dadri	43137.09	43137.09	27.81	3.35	13.86	43.07	4.31	38.76	25.15	65.00	Safe
17	CHARKI DADRI	Jhojhu	34001.67	34001.67	21.15	2.55	19.46	41.64	4.16	37.48	59.07	158.00	Over exploited
18	FARIDABAD	Ballabgarh	21678.72	13305.72	14.95	1.53	23.70	40.18	2.01	38.17	58.28	1.53	Over Exploited
19	FARIDABAD	Faridabad	39146.95	30966.96	25.82	18.10	50.08	93.99	9.40	84.59	97.87	1.16	Over Exploited
20	FARIDABAD	Tigaon	13458.74	13458.74	11.22	7.86	9.47	28.55	2.86	25.70	31.08	1.21	Over Exploited
21	FATEHABAD	Bhattu Kalan	36362.06	36204.06	10.38	0.82	29.65	40.88	4.09	36.79	41.29	112.23	Over exploited
22	FATEHABAD	Bhuna	38581.50	38077.50	18.81	2.89	49.54	71.26	7.13	64.14	62.14	96.89	critical
23	FATEHABAD	Fatehabad	55434.14	55434.14	27.39	4.21	38.36	70.06	7.01	63.06	116.73	185.11	Over exploited
24	FATEHABAD	Jakhal	15291.22	15291.22	7.56	1.61	63.94	73.13	7.31	65.82	144.85	220.07	Over exploited
25	FATEHABAD	Nagpur	28808.70	28808.70	11.38	2.19	38.66	52.26	5.23	47.03	117.14	249.07	Over exploited

Sr. No.	District	Block	Total Area of Assessment Unit (Ha)	Recharge Worthy Area (Ha)	Groundwater Recharge from Rainfall (MCM)		Ground water Recharge from other sources (MCM)	Total Annual Ground Recharge (MCM)	Total Natural Discharges (MCM)	Annual Extractable Ground water Resource (MCM)	Annual Ground water Extraction (MCM)	Stage of GW Extraction (%)	Category of Assessment Unit
					Monsoon	Non-Monsoon							
26	FATEHABAD	Ratia	37788.00	37788.00	14.83	1.80	94.57	111.22	11.12	100.10	215.72	215.51	Over exploited
27	FATEHABAD	Tohana	40246.77	40246.77	23.89	4.24	147.80	175.94	17.59	158.35	210.69	133.06	Over exploited
28	GURUGRAM	Farrukh Nagar	28639.95	28608.95	19.64	3.47	18.99	42.10	4.21	37.89	60.21	159.00	Over Exploited
29	GURUGRAM	Gurgaon	32948.05	5080.45	97.66	29.64	31.18	81.70	8.17	73.53	194.09	264.00	Over Exploited
30	GURUGRAM	Pataudi	27547.78	27502.78	24.65	4.35	24.83	53.61	5.36	48.25	83.29	173.00	Over Exploited
31	GURUGRAM	Sohna	35610.74	33185.73	20.91	3.69	24.91	49.50	4.95	44.55	76.64	172.00	Over Exploited
32	HISAR	Adampur	36692.79	36692.79	9.49	1.68	33.23	44.41	4.44	39.97	36.70	91.82	Critical
33	HISAR	Agroha	32989.38	32989.38	12.22	1.66	47.49	61.39	3.06	58.32	55.58	95.30	Critical
34	HISAR	Barwala	50633.26	50633.26	21.20	2.52	75.42	99.16	9.91	89.24	106.77	119.64	Over Exploted
35	HISAR	Hansi-I	58827.60	58827.60	18.65	4.02	44.92	67.60	6.76	60.84	49.09	80.69	Semi-Critical
36	HISAR	Hansi-II	29922.61	29922.61	14.12	1.08	43.16	58.37	2.91	55.45	35.79	64.54	Safe
37	HISAR	Hisar-I	62292.97	62292.97	39.16	4.54	42.82	86.53	8.65	77.87	59.35	76.21	Semi-Critical
38	HISAR	Hisar-II	72208.82	72208.82	56.58	6.70	19.14	82.43	8.24	74.19	58.08	78.28	Semi-Critical
39	HISAR	Narnaund	40985.50	40985.50	23.31	1.84	28.93	54.10	5.41	48.69	78.31	160.85	Over Exploted
40	HISAR	Uklana	22974.36	22974.36	11.36	2.42	20.98	34.76	3.47	31.29	6.35	20.29	Safe
41	JHAJJAR	Badli	20877.44	20877.44	18.29	2.47	11.71	32.47	3.25	29.22	20.77	71.00	Semi Critical
42	JHAJJAR	Bahadurgarh	39644.16	30408.16	25.69	3.93	59.53	85.72	4.29	81.43	39.67	49.00	Safe
43	JHAJJAR	Beri	32791.16	26802.16	19.08	3.03	54.14	70.44	3.52	66.92	22.29	33.00	Safe
44	JHAJJAR	Jhajjar	30829.17	23570.17	22.10	3.12	32.75	55.97	5.60	50.37	26.16	52.00	Safe
45	JHAJJAR	Machhrauli	16846.85	12984.85	9.46	2.55	9.74	21.75	2.18	19.58	12.83	66.00	Safe
46	JHAJJAR	Matanhail	36214.35	29299.35	17.00	2.75	43.95	58.24	5.82	52.42	17.75	34.00	Safe
47	JHAJJAR	Salhawas	16261.65	9717.65	5.64	0.91	41.76	44.97	4.50	40.48	18.41	45.00	Safe
48	JIND	Alewa	23546.97	23546.97	23.87	3.58	44.00	64.88	6.48	58.39	72.07	123.44	Over Exploited
49	JIND	Jind	47698.48	47698.48	48.36	7.25	159.71	205.56	20.56	185.00	227.28	122.85	Over Exploited
50	JIND	Julana	35171.88	35171.88	31.99	4.80	40.01	66.73	6.67	60.06	29.88	49.76	Safe
51	JIND	Narwana	33294.78	33294.78	21.19	3.18	39.18	51.39	5.14	46.25	30.48	65.90	Safe
52	JIND	Pillukhera	21549.57	21549.57	17.40	2.61	75.58	87.84	8.78	79.05	62.83	79.48	Semi-Critical

Sr. No.	District	Block	Total Area of Assessment Unit (Ha)	Recharge Worthy Area (Ha)	Groundwater Recharge from Rainfall (MCM)		Ground water Recharge from other sources (MCM)	Total Annual Ground Recharge (MCM)	Total Natural Discharges (MCM)	Annual Extractable Ground water Resource (MCM)	Annual Ground water Extraction (MCM)	Stage of GW Extraction (%)	Category of Assessment Unit
					Monsoon	Non-Monsoon							
53	JIND	Safidon	31433.77	31433.77	25.59	3.84	117.86	133.59	13.36	120.23	174.07	144.78	Over Exploited
54	JIND	Uchana	50720.53	50720.53	35.96	5.39	132.24	163.01	16.30	146.71	167.82	114.39	Over Exploited
55	JIND	Ujhana	31675.47	31675.47	32.11	4.82	58.01	83.63	8.36	75.26	105.51	140.18	Over Exploited
56	KAITHAL	Dhand	21998.58	21998.58	14.50	2.94	33.79	51.23	25.62	48.67	109.82	226.00	Over Exploited
57	KAITHAL	Guhla	39160.07	39160.07	23.95	5.77	70.08	99.81	99.81	89.83	217.19	242.00	Over Exploited
58	KAITHAL	Kaithal	51093.04	51093.04	48.24	6.82	102.63	157.71	157.71	141.94	291.12	205.00	Over Exploited
59	KAITHAL	Kalayat	32689.11	32689.11	16.11	2.55	60.38	86.57	86.57	77.91	165.18	212.00	Over Exploited
60	KAITHAL	Pundri	30757.73	30757.73	29.04	4.11	46.38	79.54	79.54	71.39	121.78	170.00	Over Exploited
61	KAITHAL	Rajound	24482.79	24482.79	10.51	1.64	49.07	61.23	30.62	58.17	107.20	184.00	Over Exploited
62	KAITHAL	Siwan	27232.84	27232.84	20.82	4.01	41.21	66.05	66.05	59.44	124.30	209.00	Over Exploited
63	KARNAL	Assandh	39297.43	39111.43	42.56	1.84	48.57	92.97	4.65	88.32	168.86	191.19	Over Exploited
64	KARNAL	Gharaunda (Part)	28625.50	28625.50	32.04	1.51	69.19	102.75	10.27	92.47	135.33	146.35	Over Exploited
65	KARNAL	Indri	24300.78	24300.78	36.02	2.75	112.47	151.23	15.12	136.11	102.68	75.44	Semi Critical
66	KARNAL	Karnal	28811.80	28811.80	38.34	1.52	78.76	118.61	11.86	106.75	170.49	159.70	Over Exploited
67	KARNAL	Kunjpura	23092.29	23092.29	30.73	1.22	27.40	59.34	5.93	53.41	92.52	173.24	Over Exploited
68	KARNAL	Munak	27113.30	27113.30	25.29	1.43	39.33	66.05	6.61	59.45	140.78	236.82	Over Exploited
69	KARNAL	Nilokheri	39957.54	39957.54	54.50	2.69	67.29	124.47	12.45	112.02	242.62	216.58	Over Exploited
70	KARNAL	Nissing at Chirao	35853.05	35853.05	39.34	3.06	49.11	91.51	9.15	82.36	174.57	211.96	Over Exploited
71	KURUKSHETRA	Babain	13395.59	13395.59	10.36	1.83	19.98	32.17	3.22	28.95	82.37	285.00	Over Exploited
72	KURUKSHETRA	Ismailabad	20106.69	20106.69	15.55	2.75	22.27	40.57	4.06	36.52	93.49	256.00	Over Exploited
73	KURUKSHETRA	Ladwa	15675.04	15675.04	12.13	2.14	20.74	35.01	3.50	31.50	89.67	285.00	Over Exploited
74	KURUKSHETRA	Pehowa	42413.27	42413.27	39.61	6.99	54.48	101.08	10.11	90.97	168.14	185.00	Over Exploited
75	KURUKSHETRA	Pipli	17732.00	17732.00	14.30	2.53	26.03	42.86	2.14	40.72	93.09	229.00	Over Exploited
76	KURUKSHETRA	Shahbad	27598.08	27598.08	21.35	3.77	35.18	60.30	6.03	54.27	134.52	248.00	Over Exploited
77	KURUKSHETRA	Thanesar	31499.61	31499.61	24.37	4.30	48.52	77.19	7.72	69.47	205.51	296.00	Over Exploited
78	MAHENDRAGARH	Ateli Nangal	22313.00	21405.00	21.80	1.09	27.38	49.18	4.91	44.26	40.41	91.00	Critical
79	MAHENDRAGARH	Kanina	35364.00	35364.00	24.47	1.22	44.19	67.07	6.70	60.36	104.87	174.00	Over exploited

Sr. No.	District	Block	Total Area of Assessment Unit (Ha)	Recharge Worthy Area (Ha)	Groundwater Recharge from Rainfall (MCM)		Ground water Recharge from other sources (MCM)	Total Annual Ground Recharge (MCM)	Total Natural Discharges (MCM)	Annual Extractable Ground water Resource (MCM)	Annual Ground water Extraction (MCM)	Stage of GW Extraction (%)	Category of Assessment Unit
					Monsoon	Non-Monsoon							
80	MAHENDRAGARH	Mahendragarh	35883.00	34865.00	29.39	1.47	11.77	41.17	4.12	37.05	42.30	114.00	Over exploited
81	MAHENDRAGARH	Nangal Chaudhry	25040.00	24670.00	26.27	1.31	5.13	31.41	3.14	28.27	17.41	62.00	Safe
82	MAHENDRAGARH	Narnaul	21103.00	21103.00	22.29	1.11	3.28	25.57	2.56	23.01	10.40	45.00	Safe
83	MAHENDRAGARH	Nizampur	16841.00	16841.00	12.38	0.62	0.72	13.09	1.31	11.78	3.38	29.00	Safe
84	MAHENDRAGARH	Satnali	23714.00	23714.00	18.90	0.95	5.09	24.00	2.40	21.60	16.22	75.00	Semi Critical
85	MAHENDRAGARH	Sihma	13826.00	1382.00	11.51	0.58	21.69	32.20	3.32	29.88	37.69	126.00	Over exploited
86	NUH	Ferozepur Jhirka	27643.47	22435.47	20.88	3.68	14.47	38.10	3.81	34.29	31.10	91.00	Critical
87	NUH	Indri	17149.70	17149.70	12.75	2.25	3.91	18.92	1.89	17.03	12.02	71.00	Semi Critical
88	NUH	Nagina	17742.63	16280.63	8.15	1.44	8.93	15.46	1.55	13.92	5.99	43.00	Safe
89	NUH	Nuh	29345.12	26050.12	13.49	2.38	27.21	35.40	3.54	31.86	11.51	36.00	Safe
90	NUH	Pingwan	15546.90	15546.90	12.75	2.25	2.02	16.68	1.67	15.01	5.89	39.00	Safe
91	NUH	Punahana	20838.62	20838.62	6.45	1.14	30.40	37.99	3.80	34.20	31.95	93.00	Critical
92	NUH	Taoru	21965.76	18604.76	13.00	2.30	17.96	33.27	3.33	29.94	43.95	147.00	Over Exploited
93	PALWAL	Badoli	18082.03	18082.03	12.65	1.94	18.95	33.54	3.35	30.19	67.38	223.22	Over exploited
94	PALWAL	Hassanpur	15459.92	15459.92	10.21	1.83	52.36	64.39	6.44	57.95	57.91	99.92	Critical
95	PALWAL	Hathin	36019.79	30169.79	23.21	1.08	61.53	85.82	8.58	77.24	49.89	64.59	Safe
96	PALWAL	Hodal	30054.35	27303.35	16.65	3.21	63.87	83.72	8.37	75.35	64.89	86.12	Semi critical
97	PALWAL	Palwal	19956.34	12622.34	11.97	2.60	74.06	88.62	8.86	79.76	61.79	77.47	Semi critical
98	PALWAL	Prithla	16382.74	16382.74	16.52	1.97	12.77	31.26	3.13	28.13	42.65	151.59	Over exploited
99	PANCHKULA	Barwala	21740.00	21740.00	43.26	3.09	9.70	56.00	6.00	50.00	33.67	67.00	Safe
100	PANCHKULA	Morni	NA										
101	PANCHKULA	Pinjore	29204.00	18104.00	45.48	5.90	3.80	55.00	6.00	50.00	16.10	31.00	Safe
102	PANCHKULA	Raipur Rani	14028.00	10828.00	26.01	4.64	10.64	41.00	4.00	37.00	36.71	99.00	Critical
103	PANIPAT	Bapoli	15669.39	15669.39	17.12	1.23	28.66	47.02	4.70	42.31	93.44	221.00	Over Exploited
104	PANIPAT	Israna	27393.77	26757.77	26.54	2.51	38.41	67.47	6.75	60.72	85.50	141.00	Over Exploited
105	PANIPAT	Madlauda	36386.01	36386.01	33.68	3.02	54.20	90.89	9.09	81.80	112.77	138.00	Over Exploited

Sr. No.	District	Block	Total Area of Assessment Unit (Ha)	Recharge Worthy Area (Ha)	Groundwater Recharge from Rainfall (MCM)		Ground water Recharge from other sources (MCM)	Total Annual Ground Recharge (MCM)	Total Natural Discharges (MCM)	Annual Extractable Ground water Resource (MCM)	Annual Ground water Extraction (MCM)	Stage of GW Extraction (%)	Category of Assessment Unit
					Monsoon	Non-Monsoon							
106	PANIPAT	Panipat	21280.28	21280.28	21.39	1.54	46.25	69.17	6.92	62.25	120.06	193.00	Over Exploited
107	PANIPAT	Samalkha	18920.24	18920.24	14.36	1.59	42.38	58.34	5.83	52.50	121.29	231.00	Over Exploited
108	PANIPAT	Sanauli Khurd	10623.50	10623.50	12.81	0.77	9.55	23.13	2.31	20.81	31.78	153.00	Over Exploited
109	REWARI	BAWAL	24005.00	23285.00	26.13	3.92	23.51	49.20	4.92	44.28	49.96	113.00	over_exploited
110	REWARI	DAHINA	21016.00	19810.00	21.25	3.19	28.84	60.09	6.01	54.08	49.85	92.00	critical
111	REWARI	DHARUHERA	20127.00	20127.00	23.24	3.49	10.23	28.46	3.35	30.12	43.75	142.00	over_exploited
112	REWARI	JATUSANA	20601.00	19395.00	20.81	3.13	17.99	37.97	3.80	34.17	56.79	166.00	over_exploited
113	REWARI	KHOL AT REWARI	18910.00	17322.00	16.64	2.50	12.50	29.14	2.91	26.22	34.77	133.00	over_exploited
114	REWARI	NAHAR	23430.00	23430.00	20.29	3.05	19.61	39.58	3.96	35.62	61.70	173.00	over_exploited
115	REWARI	REWARI	22799.00	22799.00	26.32	3.95	34.17	59.77	5.98	53.79	67.40	107.00	over_exploited
116	ROHTAK	Kalanaur	28521.04	28521.04	20.69	6.09	37.30	59.62	5.96	53.65	14.67	27.00	safe
117	ROHTAK	Lakhan Majra	12689.09	12689.09	3.96	0.83	25.50	26.72	1.34	25.38	13.07	52.00	safe
118	ROHTAK	Maham	44704.29	44704.29	27.01	4.38	56.30	84.46	4.22	80.23	43.02	54.00	safe
119	ROHTAK	Rohtak	58318.89	58318.89	44.45	13.08	52.50	106.53	10.66	95.88	52.25	54.00	safe
120	ROHTAK	Sampla	22673.80	22673.80	17.36	5.11	25.40	47.02	4.70	42.32	24.67	58.00	safe
121	SIRSA	Baragudha	53384.36	49675.36	28.26	1.81	95.95	125.97	12.59	113.34	86.49	76.31	Semi critical
122	SIRSA	Dabwali	80125.71	62375.71	35.49	12.27	93.96	131.72	13.17	118.55	146.06	123.20	Over Exploited
123	SIRSA	Ellenabad	52786.70	45825.70	20.86	1.67	43.74	69.27	6.93	62.34	152.41	244.47	Over Exploited
124	SIRSA	Nathusari Chopta	75703.95	58716.95	33.41	2.13	16.59	52.14	5.21	46.94	50.01	106.57	Over Exploited
125	SIRSA	Odhan	51579.91	35175.91	16.64	1.28	29.73	47.65	2.38	45.27	92.75	204.87	Over Exploited
126	SIRSA	Rania	58955.35	46062.35	26.21	1.68	60.68	88.57	8.86	79.70	117.58	147.52	Over Exploited
127	SIRSA	Sirsa	54456.78	54267.78	30.88	1.97	57.48	90.33	9.03	81.30	173.59	213.50	Over Exploited
128	SONIPAT	Ganaur	27210.10	27210.10	22.84	4.65	51.99	79.48	7.95	71.53	102.14	143.00	Over exploited
129	SONIPAT	Gohana	31544.21	31544.21	27.94	5.16	70.82	98.42	9.84	88.58	45.90	52.00	Safe
130	SONIPAT	Kathura	19608.78	19608.78	12.67	3.23	51.46	63.48	3.17	60.30	26.74	44.00	Safe
131	SONIPAT	Kharkhoda	30754.62	30754.62	22.45	4.59	48.48	73.43	7.34	66.08	39.97	60.00	Safe
132	SONIPAT	Mundlana	29086.88	29086.88	18.76	4.08	91.78	125.12	6.26	118.86	143.19	120.00	Over exploited

Sr. No.	District	Block	Total Area of Assessment Unit (Ha)	Recharge Worthy Area (Ha)	Groundwater Recharge from Rainfall (MCM)		Ground water Recharge from other sources (MCM)	Total Annual Ground Recharge (MCM)	Total Natural Discharges (MCM)	Annual Extractable Ground water Resource (MCM)	Annual Ground water Extraction (MCM)	Stage of GW Extraction (%)	Category of Assessment Unit
					Monsoon	Non-Monsoon							
133	SONIPAT	Murthal	19038.36	19038.36	18.31	3.44	24.58	46.32	6.63	41.69	84.67	203.00	Over exploited
134	SONIPAT	Rai	21677.20	21677.20	14.82	3.81	21.53	40.17	2.01	38.16	74.38	195.00	Over exploited
135	SONIPAT	Sonipat	36802.17	36802.17	35.26	6.63	78.48	120.38	12.04	108.34	137.69	127.00	Over exploited
136	YAMUNA NAGAR	Bilaspur	27563.00	26463.00	38.80	9.60	21.65	70.05	8.00	62.05	79.00	127.30	Over Exploited
137	YAMUNA NAGAR	Chhachhrauli	25979.00	12779.00	18.75	4.64	110.90	134.29	13.90	120.39	125.00	103.80	Over Exploited
138	YAMUNA NAGAR	Jagadhri	29986.00	29986.00	44.00	10.88	44.26	99.14	11.00	88.14	160.00	181.53	Over Exploited
139	YAMUNA NAGAR	Pratap Nagar	28186.00	14986.00	21.00	5.44	30.18	56.62	6.30	50.32	65.00	129.10	Over Exploited
140	YAMUNA NAGAR	Saraswati Nagar	20545.00	20545.00	30.15	7.45	33.71	71.31	7.90	63.41	115.00	181.30	Over Exploited
141	YAMUNA NAGAR	Radaur	24654.00	24654.00	36.14	8.94	59.02	104.10	11.30	92.80	195.00	210.10	Over Exploited
142	YAMUNA NAGAR	Sadaura (part)	14865.00	13865.00	24.60	4.64	9.22	38.46	4.30	34.16	33.00	96.60	Critical

Annexure 3.3 Block-wise Annual Groundwater Extraction (Sector-wise), 2020

Sr. No.	District	Block	Groundwater Extraction for Irrigation Use (MCM)	Groundwater Extraction for Industrial Use (MCM)	Groundwater Extraction for Domestic Use (MCM)	Total Groundwater Extraction (MCM)
1	AMBALA	Ambala-I	83.00	3.30	16.19	102.49
2	AMBALA	Ambala-II	44.00	4.50	14.61	63.11
3	AMBALA	Barara	68.00	0.45	13.24	81.69
4	AMBALA	Naraingarh	83.00	26.55	7.36	116.91
5	AMBALA	Saha	69.00	36.00	10.64	115.64
6	AMBALA	Shahzadpur	47.00	4.95	4.44	56.39
7	BHIWANI	Bawani Khera	35.98	0.16	1.32	37.46
8	BHIWANI	Behal	42.28	0.00	2.40	44.68
9	BHIWANI	Bhiwani	83.99	0.00	3.44	87.43
10	BHIWANI	Kairu	39.05	0.88	0.88	40.81
11	BHIWANI	Loharu	59.23	0.40	5.68	65.31
12	BHIWANI	Siwani	25.95	0.00	2.08	28.03
13	BHIWANI	Tosham	105.41	0.00	10.32	115.73
14	CHARKI DADRI	Badhra	138.83	0.28	6.94	146.04
15	CHARKI DADRI	Baund	11.25	0.00	0.67	11.92
16	CHARKI DADRI	Charkhi Dadri	24.44	0.00	0.71	25.15
17	CHARKI DADRI	Jhojhu	54.93	0.00	4.14	59.07
18	FARIDABAD	Ballabgarh	46.73	8.00	3.56	58.28
19	FARIDABAD	Faridabad	52.55	41.36	3.96	97.87
20	FARIDABAD	Tigaon	27.41	2.00	1.68	31.08
21	FATEHABAD	Bhattu Kalan	39.50	0.00	1.79	41.29
22	FATEHABAD	Bhuna	61.50	0.00	0.64	62.14
23	FATEHABAD	Fatehabad	113.75	0.40	2.58	116.72
24	FATEHABAD	Jakhal	142.01	0.00	2.84	144.85
25	FATEHABAD	Nagpur	115.03	0.00	2.10	117.66
26	FATEHABAD	Ratia	211.48	0.57	3.68	215.72
27	FATEHABAD	Tohana	207.68	0.39	2.63	210.69
28	GURUGRAM	Farrukh Nagar	37.14	0.44	4.41	41.99
29	GURUGRAM	Gurgaon	32.43	159.21	16.96	208.60
30	GURUGRAM	Pataudi	76.09	0.02	10.85	86.96
31	GURUGRAM	Sohna	73.54	0.00	10.13	83.67
32	HISAR	Adampur	36.55	0.00	0.15	36.70
33	HISAR	Agroha	55.45	0.00	0.13	55.58
34	HISAR	Barwala	106.41	0.00	0.36	106.77
35	HISAR	Hansi-I	48.73	0.03	0.32	49.08
36	HISAR	Hansi-II	35.36	0.00	0.43	35.79
37	HISAR	Hisar-I	56.55	2.26	0.54	59.35
38	HISAR	Hisar-II	57.65	0.00	0.43	58.08
39	HISAR	Narnaund	78.21	0.00	0.11	78.32
40	HISAR	Uklana	5.15	0.00	1.20	6.35
41	JHAJJAR	Badli	17.18	0.00	0.58	17.75
42	JHAJJAR	Bahadurgarh	39.20	0.44	0.03	39.67
43	JHAJJAR	Beri	21.70	0.00	0.59	22.29
44	JHAJJAR	Jhajjar	20.58	0.00	0.20	20.77

Sr. No.	District	Block	Groundwater Extraction for Irrigation Use (MCM)	Groundwater Extraction for Industrial Use (MCM)	Groundwater Extraction for Domestic Use (MCM)	Total Groundwater Extraction (MCM)
45	JHAJJAR	Machhrauli	17.65	0.27	0.49	18.41
46	JHAJJAR	Matannail	25.12	0.15	0.89	26.16
47	JHAJJAR	Salhawas	12.47	0.00	0.36	12.83
48	JIND	Alewa	66.44	0.24	5.39	72.07
49	JIND	Jind	215.42	2.57	9.29	227.28
50	JIND	Julana	28.56	0.16	1.16	29.88
51	JIND	Narwana	29.01	0.81	0.66	30.48
52	JIND	Pillukhera	59.32	0.37	3.14	62.83
53	JIND	Safidon	166.13	0.21	7.73	174.07
54	JIND	Uchana	163.87	0.25	3.70	167.82
55	JIND	Ujhana	102.99	0.00	2.52	105.51
56	KAITHAL	Dhand	103.42	0.09	6.31	109.82
57	KAITHAL	Guhla	209.13	1.05	7.02	217.19
58	KAITHAL	Kaithal	279.94	3.96	12.21	290.82
59	KAITHAL	Kalayat	163.02	0.04	2.13	165.18
60	KAITHAL	Pundri	114.65	0.43	6.71	121.79
61	KAITHAL	Rajound	105.41	0.05	1.73	107.20
62	KAITHAL	Siwan	118.59	0.29	5.60	124.30
63	KARNAL	Assandh	161.45	0.48	6.94	168.86
64	KARNAL	Gharaunda (Part)	126.70	2.40	6.23	135.33
65	KARNAL	Indri	96.00	1.32	5.36	102.68
66	KARNAL	Karnal	158.16	7.60	4.73	170.49
67	KARNAL	Kunjpura	85.47	2.72	4.34	92.52
68	KARNAL	Munak	131.50	1.60	7.69	140.78
69	KARNAL	Nilokheri	220.68	3.88	18.06	242.62
70	KARNAL	Nissing at Chirao	163.81	1.80	8.97	174.57
71	KURUKSHETRA	Babain	61.68	4.05	16.64	82.37
72	KURUKSHETRA	Ismailabad	68.56	14.05	10.88	93.49
73	KURUKSHETRA	Ladwa	68.96	16.05	4.65	89.67
74	KURUKSHETRA	Pehowa	146.39	15.20	6.54	168.14
75	KURUKSHETRA	Pipli	76.67	8.85	7.57	93.09
76	KURUKSHETRA	Shahbad	108.89	14.05	11.59	134.52
77	KURUKSHETRA	Thanesar	146.65	53.50	5.36	205.51
78	MAHENDRAGARH	Ateli Nangal	36.96	0.00	3.45	40.41
79	MAHENDRAGARH	Kanina	102.24	0.00	2.63	104.87
80	MAHENDRAGARH	Mahendragarh	38.95	0.00	3.35	42.30
81	MAHENDRAGARH	Nangal Chaudhry	9.69	0.30	7.52	17.41
82	MAHENDRAGARH	Narnaul	7.39	0.01	3.00	10.40

Sr. No.	District	Block	Groundwater Extraction for Irrigation Use (MCM)	Groundwater Extraction for Industrial Use (MCM)	Groundwater Extraction for Domestic Use (MCM)	Total Groundwater Extraction (MCM)
83	MAHENDRAGARH	Nizampur	1.80	0.00	1.58	3.38
84	MAHENDRAGARH	Satnali	14.69	0.00	1.53	16.22
85	MAHENDRAGARH	Sihma	35.99	0.00	1.70	37.69
86	NUH	Ferozepur Jhirka	28.47	0.00	6.55	31.10
87	NUH	Indri	11.25	0.00	2.08	12.02
88	NUH	Nagina	5.14	0.00	1.96	5.99
89	NUH	Nuh	7.64	1.81	4.01	16.13
90	NUH	Pingwan	4.37	0.00	3.33	5.89
91	NUH	Punahana	30.32	0.00	6.32	31.95
92	NUH	Taoru	38.07	0.02	6.09	43.95
93	PALWAL	Badoli	58.28	1.49	7.61	67.38
94	PALWAL	Hassanpur	53.80	0.00	4.10	57.90
95	PALWAL	Hathin	46.31	0.20	3.38	49.89
96	PALWAL	Hodal	58.21	0.16	6.52	64.89
97	PALWAL	Palwal	49.19	3.52	9.09	61.79
98	PALWAL	Prithla	38.71	1.44	2.48	42.63
99	PANCHKULA	Barwala	30.00	0.24	3.43	33.67
100	PANCHKULA	Morni	NA	NA	NA	NA
101	PANCHKULA	Pinjore	10.00	0.66	5.44	16.10
102	PANCHKULA	Raipur Rani	33.00	0.00	3.71	36.71
103	PANIPAT	Bapoli	89.60	0.36	3.48	93.44
104	PANIPAT	Israna	82.07	0.28	3.15	85.50
105	PANIPAT	Madlauda	110.21	0.36	2.20	112.77
106	PANIPAT	Panipat	109.34	4.80	5.91	120.06
107	PANIPAT	Samalkha	113.43	0.56	7.29	121.29
108	PANIPAT	Sanauli Khurd	29.41	0.00	2.37	31.78
109	REWARI	BAWAL	41.37	4.88	3.71	49.96
110	REWARI	DAHINA	46.81	0.24	2.80	49.85
111	REWARI	DHARUHERA	34.70	5.36	3.69	43.75
112	REWARI	JATUSANA	54.78	0.24	1.77	56.79
113	REWARI	KHOL AT REWARI	32.28	0.12	2.37	34.77
114	REWARI	NAHAR	59.31	0.16	2.23	61.70
115	REWARI	REWARI	60.08	3.52	3.80	67.40
116	ROHTAK	Kalanaur	13.94	0.21	0.53	14.67
117	ROHTAK	Lakhan Majra	12.77	0.12	0.18	13.07
118	ROHTAK	Maham	42.72	0.12	0.18	43.02
119	ROHTAK	Rohtak	48.17	0.88	3.20	52.25
120	ROHTAK	Sampla	24.07	0.33	0.27	24.67
121	SIRSA	Baragudha	86.27	0.00	0.21	86.48
122	SIRSA	Dabwali	145.18	0.00	0.88	146.06
123	SIRSA	Ellenabad	146.35	0.40	5.66	152.41

Sr. No.	District	Block	Groundwater Extraction for Irrigation Use (MCM)	Groundwater Extraction for Industrial Use (MCM)	Groundwater Extraction for Domestic Use (MCM)	Total Groundwater Extraction (MCM)
124	SIRSA	Nathusari Chopta	49.93	0.00	0.08	50.01
125	SIRSA	Odhan	92.31	0.00	0.44	92.75
126	SIRSA	Rania	111.04	0.47	60.70	172.21
127	SIRSA	Sirsa	167.62	0.76	5.20	173.58
128	SONIPAT	Ganaur	93.04	2.25	6.86	102.14
129	SONIPAT	Gohana	45.31	0.33	0.26	45.90
130	SONIPAT	Kathura	26.31	0.05	0.38	26.74
131	SONIPAT	Kharkhoda	35.79	0.15	4.03	39.97
132	SONIPAT	Mundlana	140.93	0.15	2.11	143.19
133	SONIPAT	Murthal	76.50	1.85	6.33	84.67
134	SONIPAT	Rai	67.52	2.73	4.14	74.38
135	SONIPAT	Sonipat	134.74	1.88	1.06	137.69
136	YAMUNANAGAR	Bilaspur	66.72	0.00	12.69	79.41
137	YAMUNANAGAR	Chhachhrauli	91.86	22.50	10.40	124.76
138	YAMUNANAGAR	Jagadhri	137.87	0.30	22.31	160.48
139	YAMUNANAGAR	Pratap Nagar	56.06	0.60	8.67	65.32
140	YAMUNANAGAR	Saraswati Nagar	104.73	0.00	10.01	114.74
141	YAMUNANAGAR	Radaur	184.87	0.00	9.93	194.81
142	YAMUNANAGAR	Sadaura (part)	29.00	0.00	3.99	32.99

Source: Dynamic Ground Water Resources of Haryana 2020, CGWB

Annexure 3.4 Block-wise Depth to Water Level in Haryana, June 2020

Sr. No.	District	Block	Minimum Water Level (m)	Maximum Water Level (m)
1	AMBALA	Ambala-1	1.25	23.83
		Ambala-2	4.20	16.29
		Barara	3.70	36.26
		Saha	4.40	37.62
		Naraingarh	8.03	26.25
		Shahzadpur	3.92	25.60
2	BHIWANI	Bhiwani	1.85	32.53
		B.Khera	1.77	11.44
		Tosham	3.22	37.10
		Loharu	39.55	76.42
		Siwani	10.18	41.00
		Bahal	43.00	95.00
		Kairu	7.88	48.55
3	CHARKI DADRI	Bond	1.45	5.46
		Dadri	1.00	32.51
		Badhra	35.72	83.50
		Jhojhu	9.15	91.80
4	FARIDABAD	Faridabad	13.70	62.65
		Ballabgarh	3.05	30.20
		Tigaon	14.75	28.70
5	FATEHABAD	Fatehabad	1.40	62.48
		Nagpur	23.21	65.72
		Ratia	31.98	71.99
		Tohana	9.14	57.31
		Jakhal	31.05	48.20
		Bhuna	2.64	69.70
		Bhattu Kalan	0.50	21.68
6	GURUGRAM	Gurgaon	2.80	112.70
		F.Nagar	12.95	32.70
		Pataudi	27.45	50.35
		Sohna	6.05	37.20
7	HISAR	Adampur	3.15	18.90
		Agroha	4.10	17.05
		Bass	1.25	8.14
		Barwala	1.80	18.55
		Hansi	0.58	12.30
		Hisar-1	1.05	14.59
		Hisar-2	3.50	39.50
		Narnaund	5.30	17.20
		Uklana	4.77	16.16
8	JIND	Ujhana	7.55	48.10
		Jind	2.50	33.70
		Julana	0.23	15.70
		Uchana	3.10	29.30
		Safidon	3.30	21.99
		Narwana	3.40	13.75
		Alewa	17.40	42.80
		P.Khera	2.48	12.26

Sr. No.	District	Block	Minimum Water Level (m)	Maximum Water Level (m)
9	JHAJJAR	Beri	0.43	4.12
		Sahlawas	0.44	14.10
		Bahadurgarh	1.03	13.24
		Matanhail	1.38	21.64
		Jhajjar	1.45	11.12
		Badli	2.55	9.15
		Machroli	0.75	21.35
10	KAITHAL	Gulha	31.43	58.63
		Kaithal	13.60	56.70
		Pundri	19.30	41.46
		Rajaund	15.60	22.10
		Kalayat	5.00	44.20
		Sewan	42.90	61.65
		Dhand	27.20	38.30
11	KARNAL	Karnal	9.08	25.20
		Kunjpura	9.17	20.73
		Munak	7.85	28.41
		Indri	4.62	37.65
		Nilokheri	20.40	30.95
		Nissing	10.90	35.45
		Gharaunda	7.30	34.43
		Assandh	13.37	30.00
12	KURUKSHETRA	Thanesar	29.30	48.70
		Shahbad	34.51	55.90
		Pehowa	32.70	45.02
		Ladwa	20.64	41.94
		Babain	39.48	44.23
		Ismailabad	41.89	46.93
		Pipli	38.20	45.11
13	MAHENDRAGAR H	Ateli	58.35	80.00
		Kanina	9.68	61.80
		M.Garh	17.50	111.20
		Narnaul	10.65	98.00
		N/Choudhary	25.60	88.65
		Shima	20.15	68.00
		Nizampur	10.99	66.20
		Satnali	40.50	88.30
14	NUH	Taoru	14.00	40.05
		Nuh	2.60	17.05
		Nagina	2.08	13.95
		F.P.Jhirka	6.25	25.20
		Punhana	2.20	18.10
		Indri	3.25	12.05
		Pingwan	4.10	16.30
15	PALWAL	Palwal	1.50	30.00
		Pirthala	3.20	26.40
		Hodal	6.95	17.07
		Hassanpur	4.25	22.55
		Hathin	1.60	21.10
		Badoli	11.20	24.40

Sr. No.	District	Block	Minimum Water Level (m)	Maximum Water Level (m)
16	PANCHKULA	Pinjore	5.55	38.69
		Barwala	5.39	36.95
		Raipur Rani	5.85	26.99
17	PANIPAT	Panipat	5.40	57.49
		Samalkha	11.34	35.71
		Madlouda	7.69	25.81
		Israna	3.78	25.95
		Bapoli	14.30	39.35
		Sanoli Khurd	9.95	19.53
18	REWARI	Bawal	13.70	56.55
		Jatusana	5.40	29.90
		Khol	22.60	79.00
		Nahar	8.27	35.17
		Rewari	6.65	23.00
		Dahina	16.90	73.10
		Dharuhera	10.25	38.70
19	ROHTAK	Kalanaur	0.84	6.24
		Meham	1.43	12.50
		Sampla	1.39	6.12
		Lakhan Majra	0.30	12.09
		Rohtak	0.40	13.97
20	SONIPAT	Ganaur	5.12	38.32
		Kathura	0.57	10.07
		Mundlana	0.80	11.79
		Gohana	0.59	18.74
		Kharkhoda	0.73	9.99
		Rai	2.21	28.76
		Sonipat	1.33	28.15
		Murthal	9.67	42.16
21	SIRSA	Baragudha	7.04	19.30
		Dabwali	8.00	21.00
		Nathushri Chopta	3.00	33.53
		Ellanabad	8.50	50.30
		Odhan	8.50	19.00
		Sirsa	21.34	80.79
		Rania	12.19	51.50
22	YAMUNANAGAR	Jagadhari	3.34	22.52
		Mustafabad/Pratap Nagar	6.55	30.25
		Radour	4.87	32.61
		Sadhoura	6.90	21.25
		Chachrauli	3.97	16.40
		Bilaspur	6.20	27.72
		Khizrabad/Saraswati Nagar	9.80	27.01

Source: Ground Water Cell, I&WRD, Haryana

Annexure 3.5 Block-wise Water Logged Area in Haryana, June 2020

Sr. No.	District/Block	Water Logged Area (Ha)	
		Depth to Water Level (0-1.5 m)	Depth to Water Level (1.5-3 m)
1	**AMBALA**		
	Shahzadpur	-	-
	Ambala-1	1102	4807
	Ambala-2	-	508
	Barara	-	-
	Naraingarh	-	-
	Saha	-	-
	TOTAL	**1102**	**5315**
2	**BHIWANI**		
	Siwani	-	-
	Bawani Khera		11276
	Bhiwani		34628
	Behal	-	-
	Loharu	-	-
	Tosham		1524
	Kairu	-	-
	TOTAL	**0**	**47428**
3	**CH. DADRI**		
	Dadri	4270	6774
	Jhoju	-	-
	Bond	884	7366
	Badhra	-	-
	Total	**5154**	**14140**
4	**FARIDABAD**		
	Faridabad	-	-
	Ballabgarh	-	-
	TOTAL	**0**	**0**
5	**FATEHABAD**		
	Fatehabad	-	2744
	Tohana	-	-
	Ratia	-	-
	Bhattu Kalan	1935	5526
	Bhuna	-	3430
	Jakhal	-	-
	Nagpur	-	-
	TOTAL	**1935**	**11700**
6	**GURGAON**		
	F. Nagar	-	-
	Pataudi	-	-
	Gurgaon	-	1102
	Sohna	-	-
	TOTAL	**0**	**1102**
7	**HISAR**		
	Adampur	-	-
	Barwala	-	3338
	Hansi	523	5236
	Hansi-Bass	1507	9042
	Hisar-1	490	2225

Sr. No.	District/Block	Water Logged Area (Ha)	
		Depth to Water Level (0-1.5 m)	Depth to Water Level (1.5-3 m)
	Hisar-2	-	-
	Narnaund	-	-
	Agroha	-	-
	Uklana	-	-
	TOTAL	**2520**	**19841**
8	**JIND**		
	Alewa		-
	Julana	7461	12228
	Narwana	-	-
	Pillukhera	-	3514
	Safidon	-	-
	Uchana	-	-
	Ujhana	-	-
	Jind	504	1345
	TOTAL	**7965**	**17087**
9	**JHAJJAR**		
	Bahadurgarh	2607	17049
	Beri	2436	29802
	Jhajjar	954	1336
	Matanhail	3755	5049
	Sahlawas	4434	7348
	TOTAL	**14186**	**60584**
10	**K. KSHETRA**		
	Thanesar	-	-
	Shahabad	-	-
	Pehowa	-	-
	Ladwa	-	-
	Ismailabad	-	-
	Babain	-	-
	Pipli	-	-
	TOTAL	**0**	**0**
11	**KAITHAL**		
	Guhla	-	-
	Kaithal	-	-
	Pundri	-	-
	Dhand	-	-
	Kalayat	-	-
	Rajound	-	-
	Siwan	-	-
	TOTAL	**0**	**0**
12	**KARNAL**		
	Karnal	-	-
	Indri	-	-
	Gharaunda	-	-
	Nilokheri	-	-
	Assandh	-	-
	Nissing	-	-
	Kunjpura	-	-
	Munak	-	-
	TOTAL	**0**	**0**

Sr. No.	District/Block	Water Logged Area (Ha)	
		Depth to Water Level (0-1.5 m)	Depth to Water Level (1.5-3 m)
13	**M. GARH**		
	Ateli	-	-
	Kanina	-	-
	M.garh	-	-
	N. Chaudhary	-	-
	Narnaul	-	-
	Nizampur	-	-
	Sihma	-	-
	Satnali	-	-
	TOTAL	**0**	**0**
14	**MEWAT**		
	F.P.Zhirka	-	-
	Nuh	-	-
	Nagina	-	-
	Punhana	-	-
	Taoru	-	-
	TOTAL	**0**	**0**
15	**PALWAL**		
	Palwal	373	560
	Hodel	-	-
	Hasanpur	-	-
	Hathin	-	-
	Pirthala	-	-
	TOTAL	**373**	**560**
16	**PANIPAT**		
	Panipat		
	Israna	-	-
	Samalkha	-	-
	Madlauda	-	-
	Bapoli	-	-
	Saloni Khurd	-	-
	TOTAL	**0**	**0**
17	**PANCHKULA**		
	Pinjore	-	-
	Barwala	-	-
	R.P.Rani	-	-
	Morni	-	-
	TOTAL	**0**	**0**
18	**ROHTAK**		
	Rohtak	7245	29112
	Meham	1812	26621
	Kalanaur	2326	16280
	Lakhan Majra	4399	6284
	Sampla	1042	12241
	TOTAL	**16824**	**90538**
19	**REWARI***		
	Bawal	-	-
	Jatusana	-	-
	Khol	-	-
	Rewari	-	-

Sr. No.	District/Block	Water Logged Area (Ha)	
		Depth to Water Level (0-1.5 m)	Depth to Water Level (1.5-3 m)
	Nahar	-	-
	Dahina	-	-
	TOTAL	**0**	**0**
20	**SONEPAT**		
	Gohana	6225	9897
	Rai	-	4848
	Kharkhoda	361	9747
	Sonepat	612	4488
	Ganaur	-	575
	Kathura	3007	17336
	Mundlana	9524	7008
	TOTAL	**19729**	**53899**
21	**SIRSA***		
	Ellenabad	-	-
	Odhan	-	-
	Dabwali	-	300
	N.S.Chopta	-	500
	Baragudha	-	300
	Sirsa	-	-
	Rania	-	-
	TOTAL	**0**	**1100**
22	**Y. NAGAR**		
	Jagadhari	-	-
	Bilaspur	-	-
	Chhachhrauli	-	-
	Sadhaura	-	-
	Radhaur	-	-
	Mustafabad	-	-
	Khizrabad	-	-
	TOTAL	**0**	**0**

Source: Ground Water Cell, I&WRD, Haryana

Annexure 3.6 Block-wise Area affected with Groundwater Salinity in Haryana, June 2020

Sr. No.	District/Block	Area Affected by Groundwater Salinity (Ha)			
		Fresh 0-2000 µS/cm	Sub-Marginal 2000-4000 µS/cm	Marginal 4000-6000 µS/cm	Saline > 6000 µS/cm
1	**AMBALA**				
	Shahzadpur	28500	-	-	-
	Ambala-1	39697	-	-	-
	Ambala-2	14700	-	-	-
	Barara	25650	-	-	-
	Naraingarh	26771	-	-	-
	Saha	23967	-	-	-
	TOTAL	**159285**			
2	**BHIWANI**				
	Siwani	16278	19624	8355	9596
	Bawani Khera	12342	16016	8036	1516
	Bhiwani	4160	49195	18755	7910
	Behal	-	14432	12249	3699
	Loharu	7524	28991	356	
	Tosham	21347	27990	2830	275
	Kairu	-	21324	8995	930
	TOTAL	**61651**	**177572**	**59576**	**23926**
3	**CH. DADRI**				
	Dadri	4258	28377	5596	2798
	Jhoju	5803	23619	2927	-
	Bond		11638	10165	1621
	Badhra	20908	16543	-	-
	Total	**30969**	**80177**	**18688**	**4419**
4	**FARIDABAD**				
	Faridabad	9836	16720	3934	-
	Ballabgarh	21290	11612	1936	-
	TOTAL	**31126**	**28332**	**5870**	**0**
5	**FATEHABAD**				
	Fatehabad	29727	13720	1609	678
	Tohana	15986	15358	-	-
	Jakhal	16434	508	-	-
	Ratia	24772	13339	-	-
	Bhattu Kalan	9573	23931	6527	3480
	Bhuna	11175	30943	860	-
	Nagpur	22867	6707	916	-
	TOTAL	**130534**	**104506**	**9912**	**4158**
6	**GURGAON**				
	F. Nagar	27978	-	-	-
	Pataudi	7862	19654	-	-
	Gurgaon	30866	1764	1544	-
	Sohna	23922	7554	-	-
	TOTAL	**90628**	**28972**	**1544**	**0**
7	**HISAR**				
	Adampur	5081	14114	7057	1976
	Barwala	14305	28609	4768	-
	Hansi	15708	30893	5236	524
	Hansi-Bass	5425	21098	3617	-

Sr. No.	District/Block	Area Affected by Groundwater Salinity (Ha)			
		Fresh 0-2000 µS/cm	Sub-Marginal 2000-4000 µS/cm	Marginal 4000-6000 µS/cm	Saline > 6000 µS/cm
	Hisar-1	16860	24793	7438	496
	Hisar-2	36148	34675	1475	1475
	Narnaund	10579	20803	3526	353
	Agroha	14738	21056	6316	-
	Uklana	13993	12917	-	-
	TOTAL	**132837**	**208958**	**39433**	**4824**
8	**JIND**				
	Alewa	2865	17598	3069	
	Julana	5388	18653	12642	1658
	Narwana	6065	11151	14086	2739
	Pillukhera	8700	9034	2677	2175
	Safidon	13036	11456	2568	1975
	Uchana	9478	36426	5018	
	Ujhana	18765	6255	3496	1472
	Jind	20509	21686	1177	672
	TOTAL	**84806**	**132259**	**44733**	**10691**
9	**JHAJJAR**				
	Bahadurgarh	11810	26730	9324	2279
	Beri	8204	9085	7325	7910
	Jhajjar	10721	29225	4496	5361
	Matanhail	7965	8607	11305	5267
	Sahlawas	3460	9713	7318	665
	TOTAL	**42160**	**83360**	**39768**	**21482**
10	**K. KSHETRA**				
	Thanesar	29350	-	-	-
	Shahabad	28648	-	-	-
	Pehowa	43669	-	-	-
	Ladwa	14652	-	-	-
	Babain	14530	-	-	-
	Ismailabad	20572	-	-	-
	Pipli	16832	-	-	-
	TOTAL	**168253**	**0**	**0**	**0**
11	**KAITHAL**				
	Guhla	41769	-	-	-
	Kaithal	44938	7518	-	-
	Pundri	26167	-	-	-
	Kalayat	24081	7870	335	-
	Rajound	23667	4872	-	-
	Siwan	26140	-	-	-
	Dhand	21049	-	-	-
	TOTAL	**207811**	**20260**	**335**	**0**
12	**KARNAL**				
	Karnal	28703	-	-	-
	Indri	25801	-	-	-
	Gharaunda	32237	-	-	-
	Nilokheri	39491	-	-	-
	Assandh	40085	-	-	-
	Nissing	35157	-	-	-
	Kunjpura	21522	-	-	-

Sr. No.	District/Block	Area Affected by Groundwater Salinity (Ha)			
		Fresh 0-2000 µS/cm	Sub-Marginal 2000-4000 µS/cm	Marginal 4000-6000 µS/cm	Saline > 6000 µS/cm
	Munak	24116	-	-	-
	TOTAL	**247112**	-	-	-
13	**M. GARH**				
	Ateli	11493	8133	-	-
	Kanina	20002	13993	1885	-
	M.garh	9073	27328	-	-
	N. Chaudhary	21892	-	-	-
	Narnaul	24328	1250	-	-
	Nizampur	15985	-	-	-
	Sihma	7750	4172	-	-
	Satnali	20257	1760	-	-
	TOTAL	**130780**	**56636**	**1885**	**-**
14	**MEWAT**				
	F.P.Zhirka	16326	8164	1020	2041
	Nuh	-	7832	13704	21535
	Nagina	2015	4032	13102	1007
	Punhana	6330	15372	1809	2712
	Taoru	18170	956	-	-
	TOTAL	**42841**	**36356**	**29635**	**27295**
15	**PALWAL**				
	Palwal	7462	18658	8396	-
	Hassanpur	2244	17960	-	-
	Hodel	9139	21322	-	-
	Hathin	10742	14322	7161	3580
	Pirthala	3835	6712	2873	1920
	TOTAL	**33422**	**78974**	**18430**	**5500**
16	**PANIPAT**				
	Panipat	17927	2570	-	-
	Israna	24139	4259	-	-
	Samalkha*	17617	2140		
	Madlauda	32697	1590	-	-
	Bapoli	11464	-	-	
	Sanoli Khurd	10585	-	-	-
	TOTAL	**114429**	**10559**		
17	**PANCHKULA**				
	Pinjore	10660	-	-	-
	Barwala	18401	-	-	-
	R.P.Rani	10498	-	-	-
	Morni	4056	-	-	-
	TOTAL	**43615**	-	-	-
18	**ROHTAK**				
	Rohtak	16328	29572	8941	1415
	Meham	9098	24830	8024	-
	Kalanaur	4595	10009	11047	3626
	Lakhan Majra	2655	6578	5295	2125
	Sampla	10172	10200	1570	717
	TOTAL	**42848**	**81189**	**34877**	**7883**
19	**REWARI***				
	Bawal	5807	23750	1008	-

Sr. No.	District/Block	Area Affected by Groundwater Salinity (Ha)			
		Fresh 0-2000 µS/cm	Sub-Marginal 2000-4000 µS/cm	Marginal 4000-6000 µS/cm	Saline > 6000 µS/cm
	Jatusana	1550	23026	1290	-
	Khol	7205	8456	-	-
	Rewari	1504	30392	870	668
	Nahar	6911	20239	497	-
	Dahina	7964	12455	-	-
	TOTAL	**30941**	**118318**	**3665**	**668**
20	**SONEPAT**				
	Gohana	14208	7423	4350	3850
	Rai	27297	662	-	-
	Kharkhoda	12304	10911	2802	1600
	Sonepat	36831	3558	-	-
	Ganaur	31942	3726	-	-
	Kathura	8110	11610	8540	929
	Mundlana	16258	17466	1676	-
	TOTAL	**146950**	**55356**	**17368**	**6379**
21	**SIRSA***				
	Ellenabad	1533	46181	4975	2246
	Odhan	4028	22950	14004	8040
	Dabwali	4132	40735	27353	11672
	N.S.Chopta	3598	23588	23619	21589
	Baragudha	-	21984	13769	16338
	Sirsa	7554	44538	5097	531
	Rania	6698	28793	21070	985
	TOTAL	**27543**	**228769**	**109887**	**61401**
22	**Y. NAGAR**				
	Jagadhari	27270	-	-	-
	Bilaspur	29022	-	-	-
	Chhachhrauli	25232	-	-	-
	Sadhaura	14270	-	-	-
	Radhaur	29101	-	-	-
	Mustafabad	20682	-	-	-
	Khizrabad	14724	-	-	-
	TOTAL	**160301**	**-**	**-**	**-**

Source: Ground Water Cell, I&WRD, Haryana

Annexure 4.1 Block-wise STPs Waste Water Generation and its Reuse Status, 2022

Sr. No.	District	Block	No. of STPs	Total Capacity of STPs (MCM)	Name of Owner Department	Present Generation of TWW from STP (MCM)	Present use of TWW from the STP (MCM)							Balance Quantity of TWW not being reused but discharged into drains etc. (MCM)
							Thermal Power Plants	Industries	Construction	Agriculture	Horticulture	Other Uses (If any)	Total	
1	AMBALA	Ambala-I	10	13.51	PHED	8.07	0	0	0	0	0	0	0	8.07
2	AMBALA	Ambala-II	1	0.73	HSVP	0.55	0	0	0	0	0	0	0	0.55
3	AMBALA	Barara	1	1.46	PHED	0.85	0	0	0	0	0	0	0	0.85
4	AMBALA	Naraingarh	1	1.10	PHED	0.44	0	0	0	0	0	0	0	0.44
5	BHIWANI	Bawani Khera	1	1.64	PHED	0.73	0	0	0	0	0	0	0	0.73
6	BHIWANI	Bhiwani	5	21.90	PHED-4, HSVP-1	14.24	0	0	0	0	0	0	0	14.24
7	BHIWANI	Loharu	1	1.28	PHED	0.73	0	0	0	0	0	0	0	0.73
8	BHIWANI	Siwani	1	1.46	PHED	1.00	0	0	0	0	0	0	0	1.00
9	BHIWANI	Tosham	1	1.10	PHED	0.59	0	0	0	0	0	0	0	0.59
10	CHARKI DADRI	Charkhi Dadri	2	3.65	PHED	2.19	0	0	0	0	0	0	0	2.19
11	FARIDABAD	Faridabad	1	16.43	ULBD/MCF	11.68	0	0	0	1.825	1.095	0	2.92	8.76
12	FATEHABAD	Bhuna	1	2.92	PHED	0.55	0	0	0	0	0	0	0	0.55
13	FATEHABAD	Fatehabad	3	9.13	PHED-2, HSVP-1	5.48	0	0	0	0	0	0	0	5.48
14	FATEHABAD	Jakhal	1	1.10	PHED	0.55	0	0	0	0	0	0	0	0.55
15	FATEHABAD	Ratia	1	2.37	PHED	1.64	0	0	0	0	0	0	0	1.64
16	FATEHABAD	Tohana	1	3.65	PHED	2.99	0	0	0	0	0	0	0	2.99
17	GURUGRAM	Farrukh Nagar	1	1.10	PHED	0.68	0	0	0	0	0	0	0	0.68
18	GURUGRAM	Gurgaon	48	142.39	GMDA -7,MCG - 41	80.34	0	1.83	2.19	27.38	7.70	1.10	40.19	40.15
19	GURUGRAM	Pataudi	2	3.65	PHED	2.04	0	0	0	0	0	0	0	2.04
20	GURUGRAM	Sohna	1	2.19	PHED	1.64	0	0	0	0	0	0	0	1.64
21	HISAR	Barwala	1	2.19	PHED	1.64	0	0	0	0	0	0	0	1.64
22	HISAR	Hansi-I	3	6.94	PHED	4.75	0	0	0	0	0	0	0	4.75
23	HISAR	Hisar-I	4	27.01	PHED-3, HSVP-1	23.73	0	0	0	0	0	0	0	23.73
24	HISAR	Narnaund	1	1.46	PHED	0.78	0	0	0	0	0	0	0	0.78
25	HISAR	Uklana	1	2.37	PHED	1.28	0	0	0	0	0	0	0	1.28
26	JHAJJAR	Bahadurgarh	3	23.36	PHED-2, HSVP-1	10.07	0.00	0.00	0.00	0.00	0.00	1.83	1.83	8.25
27	JHAJJAR	Beri	1	0.73	PHED	0.63	0	0	0	0	0	0	0	0.63
28	JHAJJAR	Jhajjar	2	3.83	PHED	2.35	0	0	0	0	0	0	0	2.35
29	JIND	Jind	4	13.51	PHED-3, HSVP-1	8.94	0	0	0	0	0	0	0	8.94

Sr. No.	District	Block	No. of STPs	Total Capacity of STPs (MCM)	Name of Owner Department	Present Generation of TWW from STP (MCM)	Present use of TWW from the STP (MCM)								Balance Quantity of TWW not being reused but discharged into drains etc. (MCM)
							Thermal Power Plants	Industries	Construction	Agriculture	Horticulture	Other Uses (If any)	Total		
30	JIND	Julana	1	1.46	PHED	0.84	0	0	0	0	0	0	0		0.84
31	JIND	Narwana	3	3.38	PHED	2.57	0	0	0	0	0	0	0		2.57
32	JIND	Safidon	1	3.29	PHED	1.17	0	0	0	0	0	0	0		1.17
33	JIND	Uchana	2	1.28	PHED	1.00	0	0	0	0	0	0	0		1.00
34	KAITHAL	Guhla	1	3.65	PHED	2.01	0	0	0	0	0	0	0		2.01
35	KAITHAL	Kaithal	4	13.69	PHED-1, HSVP-1	9.13	0	0	0	0	0	0	0		9.13
36	KAITHAL	Kalayat	1	1.83	PHED	1.28	0	0	0	0	0	0	0		1.28
37	KAITHAL	Pundri	1	1.28	PHED	1.19	0	0	0	0	0	0	0		1.19
38	KARNAL	Assandh	1	1.83	PHED	1.39	0	0	0	0	0	0	0		1.39
39	KARNAL	Gharaunda	1	2.56	PHED	1.72	0	0	0	0	0	0	0		1.72
40	KARNAL	Indri	1	1.46	PHED	0.86	0	0	0	0	0	0	0		0.86
41	KARNAL	Karnal	4	27.74	ULBD	22.27	0	0	0	0	0	0	0		22.27
42	KARNAL	Nilokheri	2	4.20	PHED	2.66	0	0	0	0	0	0	0		2.66
43	KARNAL	Nissing	1	1.46	PHED	0.84	0	0	0	0	0	0	0		0.84
44	KURUKSHETRA	Ladwa	1	2.56	PHED	1.83	0	0	0	1.83	0	0	0		0
45	KURUKSHETRA	Pehowa	1	2.92	PHED	2.01	0	0	0	2.01	0	0	0		0
46	KURUKSHETRA	Shahbad	1	4.20	PHED	2.37	0	0	0	2.37	0	0	0		0
47	KURUKSHETRA	Thanesar	2	14.60	PHED-1, HSVP-1	11.32	0	0	0	0	0	0	0		11.32
48	MAHENDRAGARH	Ateli Nangal	1	0.73	PHED	0.42	0	0	0	0	0	0	0		0.42
49	MAHENDRAGARH	Kanina	1	1.10	PHED	0.32	0	0	0	0	0	0	0		0.32
50	MAHENDRAGARH	Mahendragarh	1	2.37	PHED	1.64	0	0	0	0	0	0	0		1.64
51	MAHENDRAGARH	Narnaul	3	6.75	PHED-1, HSVP-1, ULBD-1	3.85	0	0	0	0	0	0	0		3.85
52	NUH	Ferozepur Jhirka	1	1.83	PHED	0.89	0	0	0	0	0	0	0		0.89
53	NUH	Nuh	1	1.31	PHED	0.84	0	0	0	0	0	0	0		0.84
54	NUH	Punahana	1	1.64	PHED	0.46	0	0	0	0	0	0	0		0.46
55	NUH	Taoru	1	1.64	PHED	0.95	0	0	0	0	0	0	0		0.95
56	PALWAL	Hassanpur	1	1.10	PHED	0.46	0	0	0	0	0	0	0		0.46
57	PALWAL	Hathin	1	1.64	PHED	0.76	0	0	0	0	0	0	0		0.76
58	PALWAL	Hodal	1	3.29	PHED	1.68	0	0	0	0	0	0	0		1.68
59	PALWAL	Palwal	1	3.29	PHED	3.29	0	0	0	0	0	0	0		3.29
60	PANCHKULA	Pinjore	5	29.84	PHED-3, HSVP-2	15.35	0	0	0	0	5.29	0	5.29		10.06

Sr. No.	District	Block	No. of STPs	Total Capacity of STPs (MCM)	Name of Owner Department	Present Generation of TWW from STP (MCM)	Present use of TWW from the STP (MCM)							Balance Quantity of TWW not being reused but discharged into drains etc. (MCM)
							Thermal Power Plants	Industries	Construction	Agriculture	Horticulture	Other Uses (If any)	Total	
61	PANIPAT	Panipat	7	51.76	ULBD-4, HSVP-3	27.23	0	0	0	0	0.004	0	0.004	27.23
62	PANIPAT	Samalkha	1	1.83	PHED	1.46	0	0	0	0	0	0	0	1.46
63	REWARI	Bawal	1	1.10	PHED	0.73	0	0	0	0	0	0	0	0.73
64	REWARI	Dharuhera	2	5.29	PHED-1, HSVP-1	1.92	0	0	0	0	0.45	0	0.46	1.46
65	REWARI	Nahar	1	1.10	PHED	0.73	0	0	0	0	0	0	0	0.73
66	REWARI	Rewari	3	11.13	PHED	7.30	0	0	0	0	0	0	0	7.30
67	ROHTAK	Kalanaur	1	1.28	PHED	0.91	0	0	0	0	0	0	0	0.91
68	ROHTAK	Maham	1	1.83	PHED	0.97	0	0	0	0	0	0	0	0.97
69	ROHTAK	Rohtak	5	33.95	PHED-4, HSVP-1	21.43	0	0	0	0	0	0	0	21.43
70	ROHTAK	Sampla	1	1.46	PHED	0.97	0	0	0	0	0	0	0	0.97
71	SIRSA	Dabwali	1	6.02	PHED	4.93	0	0	0	0	0	0	0	4.93
72	SIRSA	Ellenabad	1	2.74	PHED	2.19	0	0	0	0	0	0	0	2.19
73	SIRSA	Rania	1	2.19	PHED	0.95	0	0	0	0	0	0	0	0.95
74	SIRSA	Sirsa	5	19.89	PHED	11.68	0	0	0	0	0	0	0	11.68
75	SONIPAT	Ganaur	1	2.56	PHED	2.01	0	0	0	0	0	0	0	2.01
76	SONIPAT	Gohana	2	4.12	PHED	3.18	0	0	0	0	0	0	0	3.18
77	SONIPAT	Kharkhoda	1	1.64	PHED	0.73	0	0	0	0	0	0	0	0.73
78	SONIPAT	Sonipat	3	22.81	ULBD-2, HSVP-1	11.02	0	0	0	1.825	1.533	1.82	5.18	5.84
79	YAMUNANAGAR	Chhachhrauli	1	1.10	PHED	0.64	0	0	0	0	0	0	0	0.64
80	YAMUNANAGAR	Jagadhri	5	32.49	PHED	21.72	0	0	0	0	0	0	0	21.72
81	YAMUNANAGAR	Radaur	1	1.28	PHED	0.73	0	0	0	0	0	0	0	0.73

Source: PHED

Annexure 4.2 Block-wise CETPs Waste Water Generation from Industrial Estates and its Reuse Status, 2022

Sr. No.	District	Block	Estate	No. of Large-Scale Industries in the Estate	No. of MSMEs in the Estate	No. of CETP	Present treatment Capacity of CETP (MCM)	Present Generation of TWW from CETP (MCM)	Present reuse of TWW (MCM)						Balance Quantity of TWW not being reused but discharged into drains etc. (MCM)	Point(s) of Disposal of TWW from CETP not being reused
									Within the same Industries	Construction Activities	Agriculture	Horticulture	Other uses, if any	Total		
1	AMBALA	Ambala-II	IE Ambala Cantt.	0	127	1	0.18	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.13	River
2	AMBALA	Saha	IGC Saha	4	370	1	1.83	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.99	Land
3	FARIDABAD	Faridabad	IMT Faridabad	6	340	1	3.83	3.29	0.00	0.00	0.00	0.18	0.00	0.18	3.10	Nearby drain
4	GURUGRAM	Gurgaon	NA	NA	NA	1	20.08	16.43	0.00	1.46	0.00	1.83	0.00	3.29	13.14	Najafgarh drain
5	JHAJJAR	Bahadurgarh	IE Bahadurgarh	13	0	1	4.56	0.73	0.00	0.00	0.00	0.73	0.00	0.73	0.00	None
6	JIND	Jind	IE Jind	0	78	1	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	Land
7	PANCHKULA	Barwala	IE Barwala	0	335	1	0.18	0.15	0.00	0.00	0.00	0.04	0.00	0.04	0.11	River
8	REWARI	Bawal	IMT Bawal	120	330	1	8.21	2.56	0.91	0.00	0.00	0.73	0.00	1.64	0.91	Land
9	ROHTAK	Rohtak	IMT Rohtak IE Kutana	19	447	2	4.75	1.83	0.00	0.00	0.00	1.10	0.37	1.46	0.37	Nearby Drain
10	SONIPAT	Ganaur	IEBarhi	0	650	1	5.84	4.93	0.00	0.00	0.00	0.55	0.00	0.55	4.38	Nearby drain
11	SONIPAT	Murthal	IE Murthal	1	155	1	0.07	0.07	0.00	0.00	0.00	0.07	0.00	0.07	0.00	Nearby Drain
12	SONIPAT	Rai	IE Rai	0	750	1	1.83	1.64	0.00	0.00	0.09	0.09	0.00	0.18	1.46	Nearby drain
13	SONIPAT	Sonipat	IE Kundli	0	1244	1	1.46	1.28	0.00	0.00	0.00	0.04	0.00	0.04	1.24	Nearby drain

Source: HSIIDC

Annexure 6.1 Effective Rainfall of the State for Agriculture Crops

Sr. No.	District	Effective Rainfall Used by Agriculture Crops in a Year (Ha mm)
1	AMBALA	65683680.90
2	BHIWANI	51399997.00
3	CHARKHI DADRI	22096122
4	FARIDABAD	13381670.00
5	FATEHABAD	31091539.50
6	GURUGRAM	13265847.20
7	HISAR	94452014.10
8	JHAJJAR	23772133.00
9	JIND	67681065.40
10	KAITHAL	36717610.00
11	KARNAL	87896370.20
12	KURUKSHETRA	43965999.50
13	MAHENDRAGARH	30060785.40
14	NUH	17577386.20
15	PALWAL	26954377.17
16	PANCHKULA	5902515.00
17	PANIPAT	26451205.00
18	REWARI	30725880.00
19	ROHTAK	29937963.00
20	SIRSA	80365619.90
21	SONIPAT	46320069
22	YAMUNANAGAR	59983461.6
Total Effective rainfall in MCM		**905683311.07**
		Say 9057 MCM
Total Effective Rainfall in Crore Litres		**905700**

Source: District Water Resources Plans

Annexure 6.2 District-wise Volume of Horticulture Crop Water Requirement with and without Effective Rainfall

Sr. No.	District	Total Crop Water Requirement including Effective Rainfall 2020-2021 (MCM)	Horticulture Crop Water Requirement excluding Effective Rainfall 2020-2021 (MCM)
1.	AMBALA	148.9	97
2.	BHIWANI	109.7	91.43
3.	CHARKHI DADRI	7.7	7.07
4.	FARIDABAD	37.2	26.58
5.	FATEHABAD	99.6	88.76
6.	GURUGRAM	50.5	35.77
7.	HISAR	95.5	74.38
8.	JHAJJAR	64.3	55.2
9.	JIND	76.2	61.61
10.	KAITHAL	39.6	39.56
11.	KARNAL	133.3	87.02
12.	KURUKSHETRA	110.4	92.6
13.	MAHENDRAGARH	57.5	41.54
14.	NUH	159.8	96.84
15.	PALWAL	103.6	76.8
16.	PANCHKULA	38.2	14.09
17.	PANIPAT	229.4	216.09
18.	REWARI	40.0	26.09
19.	ROHTAK	85.0	59.4
20.	SIRSA	207.5	187.6
21.	SONIPAT	78.1	50.9
22.	YAMUNANAGAR	257.2	122.05
	HARYANA	**2229.14**	**1648.38**

Source: Horticulture Department (HQ), Haryana

Effective Rainfall during the year 2020-21 = 2229.14 – 1648.38 = 580.76 MCM

Say 580 MCM

Annexure 7.1 Block-wise Water Availability, Water Demand and Water Gap in 2021

Sr. No.	District	Blocks	Surface Water Availability * (MCM)	Groundwater Recharge (MCM)	Total Water Availability from all Resources (MCM)	Water Demand in 2021 (MCM)	Water Gap in 2021 (MCM)
1	AMBALA	Ambala-I	100.68	127.00	227.68	295.76	-68.08
		Ambala-II	15.19	86.83	102.02	139.34	-37.32
		Barara	0.13	71.64	71.77	264.73	-192.96
		Saha	0.23	78.15	78.38	124.92	-46.54
		Naraingarh	0.29	90.09	90.38	199.41	-109.03
		Shahzadpur	0.29	69.47	69.76	173.9	-104.14
		TOTAL	116.80	523.18	639.98	1198.06	-558.08
2	BHIWANI	Loharu	55.95	72.92	128.87	175.14	-46.27
		Siwani	56.65	93.17	149.82	180.53	-30.71
		Behal	49.84	49.85	99.69	150.16	-50.47
		Kairu	32.12	34.94	67.06	140.88	-73.82
		Bawani Khera	93.89	80.70	174.59	306.59	-132.00
		Bhiwani	210.04	147.69	357.73	654.26	-296.53
		Tosham	156.64	124.51	281.15	227.17	53.98
		TOTAL	655.13	603.78	1258.91	1834.73	-575.82
3	CHARKHI DADRI	Charkhi Dadri	68.47	59.23	127.70	143.87	-16.17
		Badhra	56.61	91.38	147.99	152.83	-4.84
		Baund Kalan	31.31	58.24	89.55	101.57	-12.02
		Jhojhu Kalan	42.39	57.26	99.65	118.86	-19.22
		TOTAL	198.77	266.11	464.88	517.13	-52.25
4	FARIDABAD	Ballabgarh	25.62	47.29	72.91	206.5	-133.59
		Faridabad	6.06	110.63	116.69	213.55	-96.86
		Tigaon	2.83	33.60	36.43	112.16	-75.73
		TOTAL	34.51	191.52	226.03	532.21	-306.18
5	FATEHABAD	Tohana	94.19	217.14	311.33	512.43	-201.10
		Jakhal	28.17	90.25	118.42	211.49	-93.07
		Ratia	132.90	137.26	270.16	488.68	-218.52
		BHuna	101.51	87.95	189.46	397.98	-208.52
		Bhattu kalan	94.99	50.45	145.44	253.19	-107.75
		Fatehabad	191.33	86.47	277.80	546.48	-268.68
		Nagpur	185.26	64.50	249.76	336.86	-87.10
		TOTAL	828.34	734.02	1562.36	2747.11	-1184.75
6	GURUGRAM	Gurugram	222.09	93.62	315.71	454.59	-138.88
		Sohna	46.90	56.72	103.62	147.35	-43.73
		Farukh Nagar	16.31	48.24	64.55	115.12	-50.57
		Pataudi	26.37	61.43	87.80	141.75	-53.95
		TOTAL	311.67	260.01	571.68	858.81	-287.13
7	HISAR	Narnaund	134.76	75.34	210.10	317.87	-107.77
		Hansi - I	197.89	94.13	292.02	473.77	-181.75
		Hansi - II	75.77	81.28	157.05	314.8	-157.75
		Adampur	86.35	61.84	148.19	93.12	55.07
		Agroha	79.01	85.49	164.50	153.22	11.28

		Hisar- I	238.77	120.50	359.27	417.46	-58.19
		Hisar - II	95.28	114.79	210.07	178.38	31.69
		Barwala	123.38	138.08	261.46	286.69	-25.24
		Uklana	53.13	48.40	101.53	142.04	-40.51
		TOTAL	1084.34	819.85	1904.19	2377.35	-473.16
8	JHAJJAR	Jhajjar	58.18	71.64	129.82	182.73	-52.91
		Bahadurgarh	63.41	109.72	173.13	247.74	-74.61
		Matanhail	361.51	74.55	436.06	377.43	58.63
		Salhawas	31.64	57.56	89.20	68.16	21.04
		Beri	103.56	90.16	193.72	292.11	-98.39
		Badli	126.13	41.56	167.69	111.43	56.26
		Machhrauli	37.13	27.84	64.97	84.12	-19.15
		TOTAL	781.55	473.03	1254.58	1363.72	-109.14
9	JIND	Alewa	38.14	75.90	114.04	233.56	-119.52
		Jind	148.85	240.48	389.33	457.46	-68.13
		Julana	135.01	78.07	213.08	345.78	-132.70
		Pillu Khera	53.35	102.76	156.11	250.46	-94.36
		Safidon	78.63	156.29	234.92	363.35	-128.43
		Narwana	64.22	60.12	124.34	316.55	-192.21
		Uchana	115.76	190.71	306.47	418.82	-112.35
		Ujhana	64.09	97.84	161.93	327.07	-165.14
		TOTAL	698.05	1002.17	1700.22	2713.05	-1012.83
10	KAITHAL	Dhand	14.47	62.28	76.75	226	-149.25
		Guhla	19.34	121.34	140.68	594.38	-453.70
		Kaithal	83.39	191.73	275.12	678.16	-403.05
		Kalayat	88.07	105.24	193.31	416.4	-223.09
		Pundri	42.99	96.70	139.69	395.17	-255.48
		Rajound	53.61	74.44	128.05	286.92	-158.87
		Siwan	18.43	80.30	98.73	170.22	-71.49
		TOTAL	320.30	732.03	1052.33	2767.25	-1714.92
11	KARNAL	Assandh	104.31	105.14	209.45	474.02	-264.57
		Gharaunda	23.27	116.21	139.48	346.81	-207.33
		Indri	20.59	171.03	191.62	269.78	-78.16
		Karnal	40.97	134.14	175.11	354.01	-178.90
		Kunjpura	14.29	67.11	81.40	266.37	-184.97
		Munak	21.59	74.70	96.29	255.61	-159.32
		Nilokheri	109.02	140.77	249.79	450.88	-201.09
		Nissing	68.24	103.49	171.73	367.76	-196.03
		TOTAL	402.28	912.59	1314.87	2785.24	-1470.37
12	KURUKSHETRA	Ladwa	0.00	39.96	39.96	175.91	-135.95
		Shahbad	0.86	68.82	69.68	309.73	-240.05
		Babain	0.00	36.72	36.72	139.73	-103.01
		Pipli	0.00	48.92	48.92	195.07	-146.15
		Thanesar	11.10	88.10	99.20	355.3	-256.10
		Pehowa	16.07	115.36	131.43	514.92	-383.49
		Ismailabad	7.14	46.30	53.44	201.91	-148.47
		TOTAL	35.17	444.18	479.35	1892.57	-1413.22
13	MAHENDRAGARH	Ateli Nangal	36.35	65.19	101.54	76.88	24.66
		Kanina	67.58	88.91	156.49	135.21	21.28

		Mahendragarh	72.99	54.58	127.57	113.05	14.52
		Narnaul	61.20	33.90	95.10	87.47	7.63
		Nangal Choudhary	24.54	41.64	66.18	42.56	23.62
		Nizampur	8.74	17.35	26.09	42.99	-16.90
		Sihama	26.43	42.68	69.11	46.24	22.87
		Satnali	17.26	31.81	49.07	75.5	-26.43
		TOTAL	315.09	376.06	691.15	619.9	71.25
14	NUH	F.P. Jhirka	2.82	47.08	49.90	104.71	-54.81
		Nuh	108.33	43.74	152.07	196.99	-44.92
		Taoru	3.03	41.11	44.14	85.42	-41.28
		Punhana	48.91	46.94	95.85	89.45	6.40
		Pinangwan	16.35	20.61	36.96	120.06	-83.10
		Nagina	9.35	19.10	28.45	97.25	-68.80
		Indri	17.66	23.38	41.04	159.3	-118.26
		TOTAL	206.45	241.96	448.41	853.18	-404.77
15	PALWAL	Badoli	13.14	36.43	49.57	95.33	-45.76
		Hassanpur	25.84	69.93	95.77	106.62	-10.85
		Hathin	52.73	93.21	145.94	136.9	9.04
		Palwal	31.48	96.25	127.73	228.78	-101.05
		Prithla	16.78	33.95	50.73	96.36	-45.63
		Hodal	48.45	90.93	139.38	137.07	2.31
		TOTAL	188.42	420.70	609.12	801.06	-191.94
16	PANCHKULA	Pinjore	30.39	61.65	92.04	97.49	-5.45
		Raipur Rani	0.31	46.13	46.44	158.46	-112.02
		Barwala	13.12	62.62	75.74	186.07	-110.33
		Morni	0.37		0.37	17.39	-17.02
		TOTAL	44.19	170.40	214.59	459.41	-244.82
17	PANIPAT	Panipat	20.75	79.32	100.07	449.54	-349.47
		Israna	51.67	77.37	129.04	291.04	-162.00
		Madlauda	94.10	104.23	198.33	396.96	-198.63
		Samalkha	12.36	66.90	79.26	291.99	-212.73
		Bapoli	0.00	53.92	53.92	184.64	-130.72
		Sanoli	0.00	26.52	26.52	119.62	-93.10
		TOTAL	178.88	408.26	587.14	1733.79	-1146.65
18	REWARI	Nahar	51.34	49.82	101.16	132.65	-31.49
		Dahina	46.30	75.63	121.93	189.1	-67.17
		Jattu Sana	64.00	47.79	111.79	157.13	-45.34
		Khol	26.54	36.68	63.22	86.63	-23.41
		Rewari	83.04	75.23	158.27	133.96	24.31
		Bawal	57.33	61.93	119.26	129.19	-9.93
		Dharuhera	7.55	35.82	43.37	77.25	-33.88
		TOTAL	336.10	382.90	719.00	905.91	-186.91
19	ROHTAK	Rohtak	167.91	135.28	303.19	455.21	-152.02
		Meham	134.50	107.25	241.75	352.6	-110.85
		Kalanaur	84.61	75.71	160.32	211.1	-50.78
		Lakhan Majra	78.85	33.93	112.78	185.05	-72.27
		Sampla	31.13	59.71	90.84	136.59	-45.75
		TOTAL	496.99	411.88	908.88	1340.55	-431.67
20	SIRSA	Baraguda	162.24	175.00	337.24	411.59	-74.35
		Dabwali	191.49	182.98	374.47	643.1	-268.63

		Ellenabad	349.14	96.23	445.37	517.95	-72.58
		Nathusari Chopta	244.43	72.43	316.86	453.42	-136.56
		Odhan	123.85	66.19	190.04	346.81	-156.77
		Rania	262.03	123.04	385.07	539.13	-154.06
		Sirsa	293.83	125.49	419.32	605.45	-186.13
		TOTAL	1627.01*	841.36	2468.37	3517.45	-1049.08
21	SONIPAT	Mundlana	71.46	132.95	204.41	258.53	-54.12
		Kathura	47.11	78.13	125.24	191.56	-66.32
		Gohana	71.83	120.54	192.37	236.11	-43.74
		Ganaur	77.55	92.19	169.74	294.9	-125.16
		Rai	4.41	46.58	50.99	166.47	-115.48
		Sonipat	57.82	139.62	197.44	392.45	-195.01
		Kharkhoda	91.20	87.60	178.80	182.09	-3.29
		Murthal	0.28	53.74	54.02	12.79	41.23
		TOTAL	421.66	751.35	1173.01	1734.9	-561.89
22	YAMUNANAGAR	S. Nagar	0.00	76.11	76.11	184.33	-108.22
		Radaur	0.00	111.11	111.11	264.09	-152.98
		Jagadhri	7.90	105.82	113.72	312.05	-198.33
		Sadaura	0.01	41.05	41.06	131.05	-90.00
		Bilaspur	0.00	74.77	74.77	232.21	-157.44
		Chhachhrauli	8.33	143.34	151.67	147.7	3.97
		P.Nagar	58.02	60.43	118.45	137.69	-19.24
		TOTAL	74.26	612.63	686.89	1409.12	-722.23
	Total in MCM		**9355.96**	**11579.97**	**20935.97**	**34962.50**	**-14026.53**
	Total in Crore Litres		**935596**	**1157997**	**2093597**	**3496250**	**1402653**

* Surface Water Availability includes outlets, rice shoots, ponds, special channels, drains, thermal power plants, surface water bodies and treated wastewater being reused.

*Ghaggar water in Sirsa District

Source: District Water Resources Plans

Annexure 10.1 Block-wise Action Plan of Water Savings and Conservation for 2023-26 for the Haryana State

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
AMBALA	Ambala I	Check Dams (No.)	0.03		1		0.00				0.00				0.03	0.00	1.00	0
AMBALA	Ambala II	Check Dams (No.)	0.08		4		0.00				0.00				0.08	0.00	4.00	0
AMBALA	Saha	Check Dams (No.)	0.03		1		0.00				0.00				0.03	0.00	1.00	0
AMBALA	Naraingarh	Check Dams (No.)	0.11		1		0.00				0.00				0.11	0.00	1.00	0
AMBALA	Shahzadpur	Check Dams (No.)	0.03		5		0.00				0.00				0.03	0.00	5.00	0
AMBALA	Ambala I	Crop Diversification (Ha)	1.88	250.00			1.88	250.00			1.88	250.00			5.63	750.00	0.00	0
AMBALA	Ambala II	Crop Diversification (Ha)	1.88	250.00			1.88	250.00			1.88	250.00			5.63	750.00	0.00	0
AMBALA	Barara	Crop Diversification (Ha)	1.88	250.00			1.88	250.00			1.88	250.00			5.63	750.00	0.00	0
AMBALA	Saha	Crop Diversification (Ha)	1.88	250.00			1.88	250.00			1.88	250.00			5.63	750.00	0.00	0
AMBALA	Naraingarh	Crop Diversification (Ha)	1.88	250.00			1.88	250.00			1.88	250.00			5.63	750.00	0.00	0
AMBALA	Shahzadpur	Crop Diversification (Ha)	1.88	250.00			1.88	250.00			1.88	250.00			5.63	750.00	0.00	0
AMBALA	Ambala I	Direct Seeded Rice (Ha)	0.98	526.50			0.98	526.50			0.98	526.50			2.94	1579.50	0.00	0
AMBALA	Ambala II	Direct Seeded Rice (Ha)	0.53	283.50			0.53	283.50			0.53	283.50			1.58	850.50	0.00	0
AMBALA	Barara	Direct Seeded Rice (Ha)	0.83	445.50			0.83	445.50			0.83	445.50			2.48	1336.50	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
AMBALA	Saha	Direct Seeded Rice (Ha)	0.83	445.50			0.83	445.50			0.83	445.50			2.48	1336.50	0.00	0
AMBALA	Naraingarh	Direct Seeded Rice (Ha)	1.05	567.00			1.05	567.00			1.05	567.00			3.16	1701.00	0.00	0
AMBALA	Shahzadpur	Direct Seeded Rice (Ha)	1.05	567.00			1.05	567.00			1.05	567.00			3.16	1701.00	0.00	0
AMBALA	Ambala I	Groundwater Recharge* (No.)	0.80		8		0.00		5		2.60		10		3.40	0.00	23.00	0
AMBALA	Ambala II	Groundwater Recharge* (No.)	0.01		3		1.71		3		2.81		8		4.52	0.00	14.00	0
AMBALA	Barara	Groundwater Recharge* (No.)	2.52		4		3.01		7		3.52		3		9.04	0.00	14.00	0
AMBALA	Saha	Groundwater Recharge* (No.)	0.21		4		1.11		6		1.32		3		2.63	0.00	13.00	0
AMBALA	Naraingarh	Groundwater Recharge* (No.)	2.91		7		5.31		3		7.52		2		15.73	0.00	12.00	0
AMBALA	Shahzadpur	Groundwater Recharge* (No.)	3.10		8		4.80		1		6.30		1		14.20	0.00	10.00	0
AMBALA	Ambala I	Micro Irrigation (Ha)	0.04	55.44			4.63	3872.00			4.63	3866.00			9.30	7793.44	0.00	0
AMBALA	Ambala II	Micro Irrigation (Ha)	0.39	592.39			0.02	23.47							0.41	615.86	0.00	0
AMBALA	Barara	Micro Irrigation (Ha)	0.01	11.73			0.01	19.00			0.00				0.02	30.73	0.00	0
AMBALA	Saha	Micro Irrigation (Ha)	0.13	19.00			0.00				0.00	3.64			0.13	22.64	0.00	0
AMBALA	Naraingarh	Micro Irrigation (Ha)	0.01	15.28			0.00				0.01	20.00			0.02	35.28	0.00	0
AMBALA	Shahzadpur	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
AMBALA	Ambala I	Modernization of Channels and Water Courses (Ha.)	4.25	3298.20			0.57	400.00			0.26	390.00			5.08	4088.20	0.00	0
AMBALA	Ambala II	Modernization of Channels and Water Courses (Ha.)	6.32	5170.88			0.06	356.00			0.14	326.00			6.52	5852.88	0.00	0
AMBALA	Barara	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
AMBALA	Saha	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
AMBALA	Naraingarh	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
AMBALA	Shahzadpur	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
AMBALA	Ambala I	Pond Rejuvenation (No.)	0.11		23		0.08		23		0.09		23		0.28	0.00	69.00	0
AMBALA	Ambala II	Pond Rejuvenation (No.)	0.03		11		1.13		11		1.63		11		2.79	0.00	33.00	0
AMBALA	Barara	Pond Rejuvenation (No.)	0.05		16		0.14		16		0.04		16		0.23	0.00	48.00	0
AMBALA	Saha	Pond Rejuvenation (No.)	0.85		20		1.85		20		2.75		20		5.44	0.00	60.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
AMBALA	Naraingarh	Pond Rejuvenation (No.)	3.01		8		5.01		8		7.51		8		15.54	0.00	24.00	0
AMBALA	Shahzadpur	Pond Rejuvenation (No.)	2.40		3		4.70		3		7.70		3		14.81	0.00	9.00	0
AMBALA	Ambala I	Reuse of Treated Waste Water (MCM)	0.80			0.80	2.41			2.41	7.16			7.16	10.37	0.00	0.00	10
AMBALA	Ambala II	Reuse of Treated Waste Water (MCM)	0.00			0.00	1.60			1.60	1.80			1.80	3.40	0.00	0.00	3
AMBALA	Barara	Reuse of Treated Waste Water (MCM)	4.39			4.39	6.59			6.59	8.89			8.89	19.87	0.00	0.00	20
AMBALA	Saha	Reuse of Treated Waste Water (MCM)	1.20			1.20	1.90			1.90	2.50			2.50	5.60	0.00	0.00	6
AMBALA	Naraingarh	Reuse of Treated Waste Water (MCM)	2.68			2.68	4.08			4.08	5.20			5.20	11.96	0.00	0.00	12
AMBALA	Shahzadpur	Reuse of Treated Waste Water (MCM)	2.51			2.51	3.61			3.61	4.41			4.41	10.53	0.00	0.00	11
BHIWANI	Bhiwani	Conservation Tillage (Ha)	14.40	3000.00			21.60	4500.00			28.80	6000.00			64.80	13500.00	0.00	0
BHIWANI	B. Khera	Conservation Tillage (Ha)	3.36	700.00			5.04	1050.00			6.72	1400.00			15.12	3150.00	0.00	0
BHIWANI	Bhiwani	Crop Diversification (Ha)	9.62	1074.00			14.43	1611.00			19.25	2148.00			43.30	4833.00	0.00	0
BHIWANI	B. Khera	Crop Diversification (Ha)	5.14	574.00			7.71	861.00			10.29	1148.00			23.14	2583.00	0.00	0
BHIWANI	Behal	Crop Diversification (Ha)	0.15	25.00			0.23	37.50			0.30	50.00			0.68	112.50	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
BHIWANI	Kairu	Crop Diversification (Ha)	0.15	31.00			0.22	46.50			0.29	62.00			0.65	139.50	0.00	0
BHIWANI	Loharu	Crop Diversification (Ha)	0.27	45.00			0.41	67.50			0.54	90.00			1.22	202.50	0.00	0
BHIWANI	Tosham	Crop Diversification (Ha)	0.39	75.00			0.59	112.50			0.78	150.00			1.76	337.50	0.00	0
BHIWANI	Siwani	Crop Diversification (Ha)	0.21	35.00			0.32	52.50			0.42	70.00			0.95	157.50	0.00	0
BHIWANI	Bhiwani	Groundwater Recharge* (No.)	0.49				0.74		0		0.98		0		2.21	0.00	0.00	0
BHIWANI	B. Khera	Groundwater Recharge* (No.)	0.49				0.74		0		0.98		0		2.21	0.00	0.00	0
BHIWANI	Behal	Groundwater Recharge* (No.)	0.66		28		0.99		30		1.32		32		2.97	0.00	90.00	0
BHIWANI	Kairu	Groundwater Recharge* (No.)	0.65		33		0.98		35		1.30		40		2.93	0.00	108.00	0
BHIWANI	Loharu	Groundwater Recharge* (No.)	0.69		44		1.04		30		1.38		50		3.11	0.00	124.00	0
BHIWANI	Tosham	Groundwater Recharge* (No.)	0.45		51		0.68		55		0.90		58		2.03	0.00	164.00	0
BHIWANI	Siwani	Groundwater Recharge* (No.)	0.49		20		0.73		25		0.98		35		2.20	0.00	80.00	0
BHIWANI	Bhiwani	Micro Irrigation (Ha)	3.56	600.00			5.34	900.00			7.12	1200.00			16.02	2700.00	0.00	0
BHIWANI	B. Khera	Micro Irrigation (Ha)	1.95	306.00			2.93	459.00			3.90	612.00			8.78	1377.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
BHIWANI	Behal	Micro Irrigation (Ha)	4.90	863.00			7.34	1294.50			9.79	1726.00			22.03	3883.50	0.00	0
BHIWANI	Kairu	Micro Irrigation (Ha)	5.40	925.00			8.09	1387.50			10.79	1850.00			24.28	4162.50	0.00	0
BHIWANI	Loharu	Micro Irrigation (Ha)	4.66	812.00			6.99	1218.00			9.32	1624.00			20.97	3654.00	0.00	0
BHIWANI	Tosham	Micro Irrigation (Ha)	5.27	910.00			7.91	1365.00			10.54	1820.00			23.72	4095.00	0.00	0
BHIWANI	Siwani	Micro Irrigation (Ha)	5.05	870.00			7.58	1305.00			10.10	1740.00			22.73	3915.00	0.00	0
BHIWANI	Bhiwani	Modernization of Channels and Water Courses (Ha.)	1.98	308.00			2.97	462.00			3.96	616.00			8.91	1386.00	0.00	0
BHIWANI	B. Khera	Modernization of Channels and Water Courses (Ha.)	5.00	1000.00			7.50	1500.00			10.00	2000.00			22.50	4500.00	0.00	0
BHIWANI	Behal	Modernization of Channels and Water Courses (Ha.)	1.00	125.00			1.50	187.50			2.00	250.00			4.50	562.50	0.00	0
BHIWANI	Kairu	Modernization of Channels and Water Courses (Ha.)	2.12	155.00			3.18	232.50			4.24	310.00			9.54	697.50	0.00	0
BHIWANI	Loharu	Modernization of Channels and Water Courses (Ha.)	0.47	125.00			0.71	187.50			0.94	250.00			2.12	562.50	0.00	0
BHIWANI	Tosham	Modernization of Channels and Water Courses (Ha.)	0.95	237.00			1.43	355.50			1.90	474.00			4.28	1066.50	0.00	0
BHIWANI	Siwani	Modernization of Channels	0.40	299.00			0.60	448.50			0.80	598.00			1.80	1345.50	0.00	0

District	Block	Proposed Interventions	2023-24 Proposed Water Savings in MCM	2023-24 Proposed Target Area (ha)	2023-24 Proposed Target Number	2023-24 Proposed Target Volume in MCM	2024-25 Proposed Water Savings in MCM	2024-25 Proposed Target Area (ha)	2024-25 Proposed Target Number	2024-25 Proposed Target Volume in MCM	2025-26 Proposed Water Savings in MCM	2025-26 Proposed Target Area (ha)	2025-26 Proposed Target Number	2025-26 Proposed Target Volume in MCM	2023-26 Total Water Savings in 3 years (MCM)	2023-26 Proposed Target Area (ha)	2023-26 Proposed Target Number	2023-26 Proposed Target Volume in MCM
		and Water Courses (Ha.)																
BHIWANI	Bhiwani	Pond Rejuvenation (No.)	1.20		1		1.80		1		2.40		1		5.40	0.00	3.00	0
BHIWANI	B. Khera	Pond Rejuvenation (No.)	1.20		1		1.80		1		2.40		1		5.40	0.00	3.00	0
BHIWANI	Behal	Pond Rejuvenation (No.)	1.20		28		1.80		1		2.40		1		5.40	0.00	30.00	0
BHIWANI	Kairu	Pond Rejuvenation (No.)	1.20		33		1.80		1		2.40		1		5.40	0.00	35.00	0
BHIWANI	Loharu	Pond Rejuvenation (No.)	1.20		44		1.80		1		2.40		1		5.40	0.00	46.00	0
BHIWANI	Tosham	Pond Rejuvenation (No.)	1.20		51		1.80		1		2.40		1		5.40	0.00	53.00	0
BHIWANI	Siwani	Pond Rejuvenation (No.)	1.20		10		1.80		1		2.40		1		5.40	0.00	12.00	0
BHIWANI	Bhiwani	Reuse of Treated Waste Water (MCM)	5.90			5.90	8.85			8.85	11.79			11.79	26.54	0.00	0.00	27
BHIWANI	B. Khera	Reuse of Treated Waste Water (MCM)	0.76			0.76	1.14			1.14	1.58			1.58	3.48	0.00	0.00	3
BHIWANI	Behal	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
BHIWANI	Kairu	Reuse of Treated Waste Water (MCM)	0.50			0.50	0.75			0.75	1.00			1.00	2.25	0.00	0.00	2

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
BHIWANI	Loharu	Reuse of Treated Waste Water (MCM)	0.70			0.70	1.05			1.05	1.40			1.40	3.15	0.00	0.00	3
BHIWANI	Tosham	Reuse of Treated Waste Water (MCM)	0.13			0.13	0.20			0.20	0.26			0.26	0.59	0.00	0.00	1
BHIWANI	Siwani	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
CHARKHI DADRI	Charkhi Dadri	Crop Diversification (Ha)	5.67	630.00			5.67	630.00			5.67	630.00			17.01	1890.00	0.00	0
CHARKHI DADRI	Badhra	Crop Diversification (Ha)													0.00	0.00	0.00	0
CHARKHI DADRI	Baund Kalan	Crop Diversification (Ha)	6.84	760.00			6.84	760.00			6.84	760.00			20.52	2280.00	0.00	0
CHARKHI DADRI	Jhojhu Kalan	Crop Diversification (Ha)													0.00	0.00	0.00	0
CHARKHI DADRI	Charkhi Dadri	Groundwater Recharge* (No.)	0.0013		23		0.0020		23		0.0020		23		0.01	0.00	69.00	0
CHARKHI DADRI	Badhra	Groundwater Recharge* (No.)	0.0033		11		0.0033		11		0.0033		11		0.01	0.00	33.00	0
CHARKHI DADRI	Baund Kalan	Groundwater Recharge* (No.)													0.00	0.00	0.00	0
CHARKHI DADRI	Jhojhu Kalan	Groundwater Recharge* (No.)	0.0019		11		0.0020		11		0.0020		11		0.01	0.00	33.00	0
CHARKHI DADRI	Charkhi Dadri	Micro Irrigation (Ha)	0.90	150.00			1.02	170.00			1.08	180.00			3.00	500.00	0.00	0
CHARKHI DADRI	Badhra	Micro Irrigation (Ha)	0.60	100.00			0.66	110.00			0.69	115.00			1.95	325.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
CHARKHI DADRI	Baund Kalan	Micro Irrigation (Ha)	0.54	90.00			0.60	100.00			0.72	120.00			1.86	310.00	0.00	0
CHARKHI DADRI	Jhojhu Kalan	Micro Irrigation (Ha)	0.48	80.00			0.54	90.00			0.60	100.00			1.62	270.00	0.00	0
CHARKHI DADRI	Charkhi Dadri	Modernization of Channels and Water Courses (Ha.)	0.96	240.00			1.02	255.00			1.06	265.00			3.04	760.00	0.00	0
CHARKHI DADRI	Badhra	Modernization of Channels and Water Courses (Ha.)													0.00	0.00	0.00	0
CHARKHI DADRI	Baund Kalan	Modernization of Channels and Water Courses (Ha.)	0.48	120.00			0.53	132.00			0.65	162.00			1.66	414.00	0.00	0
CHARKHI DADRI	Jhojhu Kalan	Modernization of Channels and Water Courses (Ha.)													0.00	0.00	0.00	0
CHARKHI DADRI	Charkhi Dadri	Pond Rejuvenation (No.)			8				8				8		0.00	0.00	24.00	0
CHARKHI DADRI	Badhra	Pond Rejuvenation (No.)			3				3				3		0.00	0.00	9.00	0
CHARKHI DADRI	Baund Kalan	Pond Rejuvenation (No.)			10				10				10		0.00	0.00	30.00	0
CHARKHI DADRI	Charkhi Dadri	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.01			0.01	0.00			0.00	0.01	0.00	0.00	0
CHARKHI DADRI	Badhra	Reuse of Treated Waste Water (MCM)													0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
CHARKHI DADRI	Baund Kalan	Reuse of Treated Waste Water (MCM)													0.00	0.00	0.00	0
CHARKHI DADRI	Jhojhu Kalan	Reuse of Treated Waste Water (MCM)													0.00	0.00	0.00	0
FARIDABAD	Faridabad	Crop Diversification (Ha)	4.50	450.00			6.10	610.00			6.90	690.00			17.50	1750.00	0.00	0
FARIDABAD	Ballabgarh	Crop Diversification (Ha)	0.80	80.00			10.12	1012.00			12.15	1215.00			23.07	2307.00	0.00	0
FARIDABAD	Tigaon	Crop Diversification (Ha)	6.10	610.00			6.90	690.00			8.10	810.00			21.10	2110.00	0.00	0
FARIDABAD	Faridabad	Groundwater Recharge* (No.)	0.98		345		1.06		365		1.06		378		3.09	0.00	1088.00	0
FARIDABAD	Ballabgarh	Groundwater Recharge* (No.)	0.81		240		0.89		250		0.89		263		2.58	0.00	753.00	0
FARIDABAD	Tigaon	Groundwater Recharge* (No.)	0.81		102		0.81		90		0.81		90		2.43	0.00	282.00	0
FARIDABAD	Faridabad	Micro Irrigation (Ha)	0.53	279.35			0.90	452.00			1.00	490.00			2.43	1221.35	0.00	0
FARIDABAD	Ballabgarh	Micro Irrigation (Ha)	0.59	297.89			0.98	506.00			1.23	640.00			2.80	1443.89	0.00	0
FARIDABAD	Tigaon	Micro Irrigation (Ha)	0.52	280.37			0.87	401.32			1.10	480.00			2.49	1161.69	0.00	0
FARIDABAD	Faridabad	Modernization of Channels and Water Courses (Ha.)	0.50	45.00			0.50	45.00			0.50	45.00			1.50	135.00	0.00	0
FARIDABAD	Ballabgarh	Modernization of Channels	0.25				0.25				0.25				0.75	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
		and Water Courses (Ha.)																
FARIDABAD	Tigaon	Modernization of Channels and Water Courses (Ha.)	0.27				0.27				0.27				0.80	0.00	0.00	0
FARIDABAD	Faridabad	Pond Rejuvenation (No.)	2.23		31		2.17		19		2.18		22		6.58	0.00	72.00	0
FARIDABAD	Ballabgarh	Pond Rejuvenation (No.)	2.23		29		2.16		20		2.18		23		6.57	0.00	72.00	0
FARIDABAD	Tigaon	Pond Rejuvenation (No.)	0.92		7		0.96		7		0.96		8		2.84	0.00	22.00	0
FARIDABAD	Faridabad	Reuse of Treated Waste Water (MCM)	8.03			8.03	8.03			8.03	8.03			8.03	24.09	0.00	0.00	24
FARIDABAD	Ballabgarh	Reuse of Treated Waste Water (MCM)	3.83			3.83	10.40			10.40	13.73			13.73	27.96	0.00	0.00	28
FARIDABAD	Tigaon	Reuse of Treated Waste Water (MCM)	0.00			0.00	5.26			5.26	8.25			8.25	13.51	0.00	0.00	14
FATEHABAD	Fatehabad	Conservation Tillage (Ha)	46.96	12900.00			50.60	14100.00			54.20	15400.00			151.76	42400.00	0.00	0
FATEHABAD	Tohana	Conservation Tillage (Ha)	15.65	4300.00			16.01	4600.00			16.38	4900.00			48.04	13800.00	0.00	0
FATEHABAD	Bhattu Kalan	Conservation Tillage (Ha)	35.67	9800.00			39.31	10900.00			42.95	12000.00			117.93	32700.00	0.00	0
FATEHABAD	Bhuna	Conservation Tillage (Ha)	32.76	9000.00			36.40	10200.00			40.04	11400.00			109.20	30600.00	0.00	0
FATEHABAD	Ratia	Conservation Tillage (Ha)	13.47	3700.00			13.83	4100.00			14.20	4500.00			41.50	12300.00	0.00	0
FATEHABAD	Jakhal	Conservation Tillage (Ha)	4.91	1350.00			4.95	1460.00			4.98	1570.00			14.84	4380.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
FATEHABAD	Nagpur	Conservation Tillage (Ha)	16.38	4500.00			18.20	5200.00			20.02	5800.00			54.60	15500.00	0.00	0
FATEHABAD	Fatehabad	Crop Diversification (Ha)	2.46	447.00			2.73	497.00			3.01	547.00			8.20	1491.00	0.00	0
FATEHABAD	Tohana	Crop Diversification (Ha)	3.69	1164.48			4.24	771.00			4.79	871.00			12.72	2806.48	0.00	0
FATEHABAD	Bhattu Kalan	Crop Diversification (Ha)	2.07	376.00			2.34	426.00			2.62	476.00			7.03	1278.00	0.00	0
FATEHABAD	Bhuna	Crop Diversification (Ha)	7.55	1372.00			8.65	1572.00			9.20	1672.00			25.39	4616.00	0.00	0
FATEHABAD	Ratia	Crop Diversification (Ha)	2.73	497.00			3.59	653.00			4.14	753.00			10.47	1903.00	0.00	0
FATEHABAD	Jakhal	Crop Diversification (Ha)	0.56	101.00			0.64	116.00			0.72	131.00			1.91	348.00	0.00	0
FATEHABAD	Nagpur	Crop Diversification (Ha)	2.85	518.00			3.40	618.00			3.95	718.00			10.20	1854.00	0.00	0
FATEHABAD	Fatehabad	Direct Seeded Rice (Ha)	1.95	650.00			2.03	675.00			2.10	700.00			6.08	2025.00	0.00	0
FATEHABAD	Tohana	Direct Seeded Rice (Ha)	1.50	815.78			1.58	525.00			3.85	550.00			6.93	1890.78	0.00	0
FATEHABAD	Bhattu Kalan	Direct Seeded Rice (Ha)	0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0
FATEHABAD	Bhuna	Direct Seeded Rice (Ha)	1.35	450.00			1.43	475.00			1.50	500.00			4.28	1425.00	0.00	0
FATEHABAD	Ratia	Direct Seeded Rice (Ha)	3.00	1000.00			3.15	1050.00			3.30	1100.00			9.45	3150.00	0.00	0
FATEHABAD	Jakhal	Direct Seeded Rice (Ha)	1.20	400.00			1.28	425.00			1.35	450.00			3.83	1275.00	0.00	0
FATEHABAD	Nagpur	Direct Seeded Rice (Ha)	1.80	600.00			1.88	625.00			1.95	650.00			5.63	1875.00	0.00	0

District	Block	Proposed Interventions	2023-24				2024-25				2025-26				2023-26			
			Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
FATEHABAD	Fatehabad	Groundwater Recharge* (No.)	0.55		5		1.10		5		1.65		5		3.30	0.00	15.00	0
FATEHABAD	Tohana	Groundwater Recharge* (No.)	0.55		5		1.10		5		1.65		5		3.30	0.00	15.00	0
FATEHABAD	Bhattu Kalan	Groundwater Recharge* (No.)	0.55				1.10				1.65				3.30	0.00	0.00	0
FATEHABAD	Bhuna	Groundwater Recharge* (No.)	0.00		5		0.00		5		0.00		5		0.00	0.00	15.00	0
FATEHABAD	Ratia	Groundwater Recharge* (No.)	0.55		5		1.10		5		1.65		5		3.30	0.00	15.00	0
FATEHABAD	Jakhal	Groundwater Recharge* (No.)	0.55		5		1.10		5		1.65		5		3.30	0.00	15.00	0
FATEHABAD	Nagpur	Groundwater Recharge* (No.)	0.55		5		1.10		5		1.65		5		3.30	0.00	15.00	0
FATEHABAD	Fatehabad	Micro Irrigation (Ha)	0.00	123.00			0.13	135.00			0.13	150.00			0.26	408.00	0.00	0
FATEHABAD	Tohana	Micro Irrigation (Ha)	0.68	391.21			0.06	65.00			0.06	95.00			0.80	551.21	0.00	0
FATEHABAD	Bhattu Kalan	Micro Irrigation (Ha)	0.00				0.07	70.00			0.07	100.00			0.14	170.00	0.00	0
FATEHABAD	Bhuna	Micro Irrigation (Ha)	0.00				0.00				0.07	70.00			0.07	70.00	0.00	0
FATEHABAD	Ratia	Micro Irrigation (Ha)	0.00				0.00				0.07	70.00			0.07	70.00	0.00	0
FATEHABAD	Jakhal	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
FATEHABAD	Nagpur	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
FATEHABAD	Fatehabad	Modernization of Channels													0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
		and Water Courses (Ha.)																
FATEHABAD	Tohana	Modernization of Channels and Water Courses (Ha.)													0.00	0.00	0.00	0
FATEHABAD	Bhattu Kalan	Modernization of Channels and Water Courses (Ha.)													0.00	0.00	0.00	0
FATEHABAD	Bhuna	Modernization of Channels and Water Courses (Ha.)	0.00				0.70	286.00			0.70	286.00			1.40	572.00	0.00	0
FATEHABAD	Ratia	Modernization of Channels and Water Courses (Ha.)	0.00				1.41	557.00			1.41	557.00			2.82	1114.00	0.00	0
FATEHABAD	Jakhal	Modernization of Channels and Water Courses (Ha.)													0.00	0.00	0.00	0
FATEHABAD	Nagpur	Modernization of Channels and Water Courses (Ha.)													0.00	0.00	0.00	0
FATEHABAD	Fatehabad	Pond Rejuvenation (No.)	15.42		15		15.42		15		15.42		15		46.26	0.00	45.00	0
FATEHABAD	Tohana	Pond Rejuvenation (No.)	12.08		134		12.08		134		12.08		134		36.24	0.00	402.00	0
FATEHABAD	Bhattu Kalan	Pond Rejuvenation (No.)	19.71		13		19.71		13		19.71		13		59.13	0.00	39.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
FATEHABAD	Bhuna	Pond Rejuvenation (No.)	10.29		7		10.29		7		10.29		7		30.87	0.00	21.00	0
FATEHABAD	Ratia	Pond Rejuvenation (No.)	17.36		10		17.36		10		17.36		10		52.08	0.00	30.00	0
FATEHABAD	Jakhal	Pond Rejuvenation (No.)	5.94		3		5.94		3		5.94		3		17.82	0.00	9.00	0
FATEHABAD	Nagpur	Pond Rejuvenation (No.)	8.87		5		8.87		5		8.87		5		26.61	0.00	15.00	0
FATEHABAD	Fatehabad	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.02			0.02	0.02			0.02	0.03	0.00	0.00	0
FATEHABAD	Tohana	Reuse of Treated Waste Water (MCM)					0.01			0.01	0.01			0.01	0.03	0.00	0.00	0
FATEHABAD	Bhattu Kalan	Reuse of Treated Waste Water (MCM)													0.00	0.00	0.00	0
FATEHABAD	Bhuna	Reuse of Treated Waste Water (MCM)					0.01			0.01	0.01			0.01	0.02	0.00	0.00	0
FATEHABAD	Ratia	Reuse of Treated Waste Water (MCM)	0.01			0.01	0.01			0.01	0.01			0.01	0.03	0.00	0.00	0
FATEHABAD	Jakhal	Reuse of Treated Waste Water (MCM)					0.00			0.00	0.00			0.00	0.01	0.00	0.00	0
FATEHABAD	Nagpur	Reuse of Treated Waste Water (MCM)	0.00			0.00									0.00	0.00	0.00	0
FATEHABAD	Fatehabad	Varietal interventions (Ha)	3.83	1800.00			4.26	2000.00			4.68	2200.00			12.77	6000.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
FATEHABAD	Tohana	Varietal interventions (Ha)	6.39	3000.00			6.81	3200.00			7.45	3500.00			20.65	9700.00	0.00	0
FATEHABAD	Bhattu Kalan	Varietal interventions (Ha)	0.17	80.00			0.21	100.00			0.27	125.00			0.65	305.00	0.00	0
FATEHABAD	Bhuna	Varietal interventions (Ha)	3.19	1500.00			3.62	1700.00			4.26	2000.00			11.07	5200.00	0.00	0
FATEHABAD	Ratia	Varietal interventions (Ha)	6.39	3000.00			6.81	3200.00			7.45	3500.00			20.65	9700.00	0.00	0
FATEHABAD	Jakhal	Varietal interventions (Ha)	2.77	1300.00			3.19	1500.00			3.62	1700.00			9.58	4500.00	0.00	0
FATEHABAD	Nagpur	Varietal interventions (Ha)	3.62	1700.00			4.26	2000.00			4.68	2200.00			12.56	5900.00	0.00	0
GURUGRAM	Gurugram	Check Dams (No.)	0.65		5		0.65		5		0.65		5		1.95	0.00	15.00	0
GURUGRAM	Sohna	Check Dams (No.)	2.10		21		2.10		21		2.10		21		6.30	0.00	63.00	0
GURUGRAM	Gurugram	Conservation Tillage (Ha)	0.00	5.00			0.00	5.00			0.00	5.00			0.01	15.00	0.00	0
GURUGRAM	Sohna	Conservation Tillage (Ha)	0.57	1000.00			0.86	1500.00			1.28	2250.00			2.71	4750.00	0.00	0
GURUGRAM	Farukhnagar	Conservation Tillage (Ha)	1.43	2500.00			2.14	3750.00			3.21	5625.00			6.78	11875.00	0.00	0
GURUGRAM	Pataudi	Conservation Tillage (Ha)	0.86	1500.00			1.28	2250.00			1.92	3375.00			4.06	7125.00	0.00	0
GURUGRAM	Gurugram	Crop Diversification (Ha)	0.14	176.00			1.00	176.00			1.16	205.00			2.30	557.00	0.00	0
GURUGRAM	Sohna	Crop Diversification (Ha)	0.19	292.00			1.05	256.00			1.22	300.00			2.46	848.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
GURUGRAM	Farukhnagar	Crop Diversification (Ha)	0.14	182.00			1.20	192.00			1.18	231.00			2.52	605.00	0.00	0
GURUGRAM	Pataudi	Crop Diversification (Ha)	0.16	200.00			1.04	233.00			1.20	272.00			2.40	705.00	0.00	0
GURUGRAM	Gurugram	Groundwater Recharge* (No.)	0.42		29		0.46		28		0.51		20		1.39	0.00	77.00	0
GURUGRAM	Sohna	Groundwater Recharge* (No.)	0.03		91		0.03		90		0.03		75		0.09	0.00	256.00	0
GURUGRAM	Farukhnagar	Groundwater Recharge* (No.)	0.03		165		0.04		164		0.04		90		0.11	0.00	419.00	0
GURUGRAM	Pataudi	Groundwater Recharge* (No.)	0.01		206		0.01		206		0.01		120		0.03	0.00	532.00	0
GURUGRAM	Gurugram	Micro Irrigation (Ha)	0.60	95.00			0.75	87.00			0.75	87.00			2.10	269.00	0.00	0
GURUGRAM	Sohna	Micro Irrigation (Ha)	1.33	312.00			2.30	373.00			2.80	478.00			6.43	1163.00	0.00	0
GURUGRAM	Farukhnagar	Micro Irrigation (Ha)	1.70	386.00			2.10	441.00			2.30	572.00			6.10	1399.00	0.00	0
GURUGRAM	Pataudi	Micro Irrigation (Ha)	1.90	425.00			3.90	517.00			4.50	683.00			10.30	1625.00	0.00	0
GURUGRAM	Pataudi	Modernization of Channels and Water Courses (Ha.)	3.54	1028.00			5.46	2892.00			0.94	101.00			9.94	4021.00	0.00	0
GURUGRAM	Gurugram	Pond Rejuvenation (No.)	2.13		153		2.13		153		2.13		153		6.39	0.00	459.00	0
GURUGRAM	Sohna	Pond Rejuvenation (No.)	1.53		87		1.53		87		1.53		87		4.59	0.00	261.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
GURUGRAM	Farukhnagar	Pond Rejuvenation (No.)	2.94		77		2.94		77		2.94		77		8.82	0.00	231.00	0
GURUGRAM	Pataudi	Pond Rejuvenation (No.)	2.55		136		2.55		136		2.55		136		7.65	0.00	408.00	0
GURUGRAM	Gurugram	Reuse of Treated Waste Water (MCM)	14.61			14.61	25.55			25.55	27.38			27.38	67.54	0.00	0.00	68
GURUGRAM	Sohna	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.01			0.01	0.01	0.00	0.00	0
GURUGRAM	Farukhnagar	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
GURUGRAM	Pataudi	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
GURUGRAM	Gurugram	Varietal interventions (Ha)	0.00	3.00			0.00	3.00			0.00	3.00			0.01	9.00	0.00	0
GURUGRAM	Sohna	Varietal interventions (Ha)	0.46	700.00			0.68	1050.00			1.03	1575.00			2.17	3325.00	0.00	0
GURUGRAM	Farukhnagar	Varietal interventions (Ha)	0.46	700.00			0.68	1050.00			1.03	1575.00			2.17	3325.00	0.00	0
GURUGRAM	Pataudi	Varietal interventions (Ha)	0.46	700.00			0.68	1050.00			1.03	1575.00			2.17	3325.00	0.00	0
HISAR	Adampur	Crop Diversification (Ha)	0.47	217.00			1.04	267.00			0.42	302.00			1.92	786.00	0.00	0
HISAR	Agroha	Crop Diversification (Ha)	0.53	237.02			0.67	257.00			0.89	305.00			2.09	799.02	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
HISAR	Hansi-I	Crop Diversification (Ha)	24.24	3455.00			25.86	3765.00			27.42	3974.00			77.52	11194.00	0.00	0
HISAR	Hansi-II	Crop Diversification (Ha)	13.18	1848.00			17.33	2407.00			19.61	2716.00			50.11	6971.00	0.00	0
HISAR	Barwala	Crop Diversification (Ha)	6.24	1039.00			6.41	1105.00			7.61	1258.00			20.26	3402.00	0.00	0
HISAR	Hisar-I	Crop Diversification (Ha)	7.46	1111.00			8.50	1196.00			9.21	1359.00			25.18	3666.00	0.00	0
HISAR	Hisar-II	Crop Diversification (Ha)	0.11	216.00			0.25	246.00			0.32	269.00			0.68	731.00	0.00	0
HISAR	Narnaud	Crop Diversification (Ha)	15.24	2185.00			16.74	2394.00			18.99	2703.00			50.97	7282.00	0.00	0
HISAR	Uklana	Crop Diversification (Ha)	4.50	711.00			5.25	819.00			7.13	1075.00			16.88	2605.00	0.00	0
HISAR	Adampur	Direct Seeded Rice (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
HISAR	Agroha	Direct Seeded Rice (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
HISAR	Hansi-I	Direct Seeded Rice (Ha)	1.27	513.54			1.66	671.49			1.99	805.95			4.92	1990.98	0.00	0
HISAR	Hansi-II	Direct Seeded Rice (Ha)	3.06	1237.68			3.51	1423.17			3.00	1707.48			9.57	4368.33	0.00	0
HISAR	Barwala	Direct Seeded Rice (Ha)	0.70	283.50			0.81	326.03			0.97	391.23			2.48	1000.76	0.00	0
HISAR	Hisar-I	Direct Seeded Rice (Ha)	0.80	324.00			0.92	372.60			1.10	447.12			2.82	1143.72	0.00	0
HISAR	Hisar-II	Direct Seeded Rice (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
HISAR	Narnaud	Direct Seeded Rice (Ha)	1.23	496.53			1.60	649.22			1.92	779.22			4.75	1924.97	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
HISAR	Uklana	Direct Seeded Rice (Ha)	0.95	384.75			1.50	607.50			1.80	729.00			4.25	1721.25	0.00	0
HISAR	Adampur	Fisheries Water Use Efficiency (Ha)	0.02	3.00			0.03	3.00			0.04	3.00			0.09	9.00	0.00	0
HISAR	Agroha	Fisheries Water Use Efficiency (Ha)	0.01	3.00			0.02	3.00			0.02	3.00			0.05	9.00	0.00	0
HISAR	Hansi-I	Fisheries Water Use Efficiency (Ha)	0.18	10.00			0.27	10.00			0.36	10.00			0.80	30.00	0.00	0
HISAR	Hansi-II	Fisheries Water Use Efficiency (Ha)	0.18	10.00			0.28	10.00			0.37	10.00			0.83	30.00	0.00	0
HISAR	Barwala	Fisheries Water Use Efficiency (Ha)	0.07	7.00			0.10	7.00			0.13	5.00			0.29	19.00	0.00	0
HISAR	Hisar-I	Fisheries Water Use Efficiency (Ha)	0.07	5.00			0.11	6.00			0.32	8.00			0.50	19.00	0.00	0
HISAR	Hisar-II	Fisheries Water Use Efficiency (Ha)	0.06	5.00			0.09	6.00			0.12	8.00			0.26	19.00	0.00	0
HISAR	Narnaud	Fisheries Water Use Efficiency (Ha)	0.07	10.00			0.10	10.00			0.13	10.00			0.30	30.00	0.00	0
HISAR	Uklana	Fisheries Water Use Efficiency (Ha)	0.02	3.00			0.00	4.00			0.03	5.00			0.05	12.00	0.00	0
HISAR	Adampur	Groundwater Recharge* (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
HISAR	Agroha	Groundwater Recharge* (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
HISAR	Hansi-I	Groundwater Recharge* (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
HISAR	Hansi-II	Groundwater Recharge* (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
HISAR	Barwala	Groundwater Recharge* (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
HISAR	Hisar-I	Groundwater Recharge* (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
HISAR	Hisar-II	Groundwater Recharge* (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
HISAR	Narnaud	Groundwater Recharge* (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
HISAR	Uklana	Groundwater Recharge* (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
HISAR	Adampur	Micro Irrigation (Ha)	0.40	400.00			0.50	500.00			0.60	600.00			1.50	1500.00	0.00	0
HISAR	Agroha	Micro Irrigation (Ha)	0.40	400.00			0.50	500.00			0.60	600.00			1.50	1500.00	0.00	0
HISAR	Hansi-I	Micro Irrigation (Ha)	0.20				0.25				0.30				0.75	0.00	0.00	0
HISAR	Hansi-II	Micro Irrigation (Ha)	0.20				0.25				0.30				0.75	0.00	0.00	0
HISAR	Barwala	Micro Irrigation (Ha)	0.40	400.00			0.50	500.00			0.60	600.00			1.50	1500.00	0.00	0
HISAR	Hisar-I	Micro Irrigation (Ha)	0.80	800.00			1.00	1000.00			1.20	1200.00			3.00	3000.00	0.00	0
HISAR	Hisar-II	Micro Irrigation (Ha)	0.80	800.00			1.00	1000.00			1.20	1200.00			3.00	3000.00	0.00	0
HISAR	Narnaud	Micro Irrigation (Ha)	0.20	200.00			0.25	250.00			0.30	300.00			0.75	750.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
HISAR	Uklana	Micro Irrigation (Ha)	0.80	800.00			1.00	1000.00			1.20	1200.00			3.00	3000.00	0.00	0
HISAR	Adampur	Modernization of Channels and Water Courses (Ha.)	1.55	1194.30			2.95	539.17			0.20	200.00			4.70	1933.47	0.00	0
HISAR	Agroha	Modernization of Channels and Water Courses (Ha.)	0.14	143.00			0.13	130.00			0.78	1610.77			1.05	1883.77	0.00	0
HISAR	Hansi-I	Modernization of Channels and Water Courses (Ha.)	0.16	771.50			0.36	5288.64			0.08	75.00			0.60	6135.14	0.00	0
HISAR	Hansi-II	Modernization of Channels and Water Courses (Ha.)	0.08	187.00			0.18	170.00			0.14	170.00			0.40	527.00	0.00	0
HISAR	Barwala	Modernization of Channels and Water Courses (Ha.)	0.21	209.00			0.19	190.00			0.59	7339.11			0.99	7738.11	0.00	0
HISAR	Hisar-I	Modernization of Channels and Water Courses (Ha.)	0.26	689.00			2.31	16325.43			0.50	5694.62			3.07	22709.04	0.00	0
HISAR	Hisar-II	Modernization of Channels and Water Courses (Ha.)	0.19				0.28	2149.68			0.24	1505.71			0.71	3655.39	0.00	0
HISAR	Narnaud	Modernization of Channels and Water Courses (Ha.)	0.17	165.00			0.20	1457.98			0.53	7263.93			0.89	8886.90	0.00	0
HISAR	Uklana	Modernization of Channels	1.36	635.00			0.18	175.00			0.18	175.00			1.72	985.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
		and Water Courses (Ha.)																
HISAR	Adampur	Pond Rejuvenation (No.)	0.07		11		0.05		11		0.06		11		0.17	0.00	33.00	0
HISAR	Agroha	Pond Rejuvenation (No.)	0.04		8		0.04		8		0.05		8		0.13	0.00	24.00	0
HISAR	Hansi-I	Pond Rejuvenation (No.)	0.08		12		0.11		12		0.06		12		0.26	0.00	36.00	0
HISAR	Hansi-II	Pond Rejuvenation (No.)	0.04		4		0.06		4		0.04		4		0.15	0.00	12.00	0
HISAR	Barwala	Pond Rejuvenation (No.)	0.03		4		0.02		4		0.03		4		0.08	0.00	12.00	0
HISAR	Hisar-I	Pond Rejuvenation (No.)	0.09		20		0.10		20		0.09		20		0.28	0.00	60.00	0
HISAR	Hisar-II	Pond Rejuvenation (No.)	0.05		4		0.06		4		0.04		4		0.15	0.00	12.00	0
HISAR	Narnaud	Pond Rejuvenation (No.)	0.06		5		0.06		5		0.06		5		0.18	0.00	15.00	0
HISAR	Uklana	Pond Rejuvenation (No.)	0.05		16		0.05		16		0.06		16		0.15	0.00	48.00	0
HISAR	Adampur	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
HISAR	Agroha	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
HISAR	Hansi-I	Reuse of Treated Waste Water (MCM)	0.02			0.02	0.02			0.02	0.02			0.02	0.05	0.00	0.00	0
HISAR	Hansi-II	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
HISAR	Barwala	Reuse of Treated Waste Water (MCM)	0.35			0.35	0.35			0.35	0.35			0.35	1.04	0.00	0.00	1
HISAR	Hisar-I	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
HISAR	Hisar-II	Reuse of Treated Waste Water (MCM)	0.53			0.53	0.55			0.55	0.56			0.56	1.64	0.00	0.00	2
HISAR	Narnaud	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.01	0.00	0.00	0
HISAR	Uklana	Reuse of Treated Waste Water (MCM)	0.01			0.01	0.01			0.01	0.01			0.01	0.02	0.00	0.00	0
JHAJJAR	Bahadurgarh	Conservation Tillage (Ha)	6.75	1800.00			8.63	2300.00			12.01	3200.00			27.39	7300.00	0.00	0
JHAJJAR	Jhajjar	Conservation Tillage (Ha)	7.13	1900.00			8.07	2150.00			8.63	2300.00			23.83	6350.00	0.00	0
JHAJJAR	Beri	Conservation Tillage (Ha)	9.38	2500.00			12.38	3300.00			16.98	4525.00			38.74	10325.00	0.00	0
JHAJJAR	Matanhail	Conservation Tillage (Ha)	7.50	2000.00			8.26	2200.00			11.63	3100.00			27.39	7300.00	0.00	0
JHAJJAR	Badli	Conservation Tillage (Ha)	6.38	1700.00			7.13	1900.00			7.88	2100.00			21.39	5700.00	0.00	0
JHAJJAR	Salhawas	Conservation Tillage (Ha)	7.88	2100.00			8.63	2300.00			9.38	2500.00			25.89	6900.00	0.00	0
JHAJJAR	Machraulli	Conservation Tillage (Ha)	5.63	1500.00			6.38	1700.00			7.13	1900.00			19.14	5100.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
JHAJJAR	Bahadurgarh	Crop Diversification (Ha)	4.94	405.00			2.47	466.00			2.47	486.00			9.88	1357.00	0.00	0
JHAJJAR	Jhajjar	Crop Diversification (Ha)	3.09	304.00			3.71	350.00			1.85	365.00			8.65	1019.00	0.00	0
JHAJJAR	Beri	Crop Diversification (Ha)	0.62	101.00			0.62	116.00			0.62	121.00			1.85	338.00	0.00	0
JHAJJAR	Matanhail	Crop Diversification (Ha)	2.47	405.00			4.94	466.00			2.47	486.00			9.88	1357.00	0.00	0
JHAJJAR	Badli	Crop Diversification (Ha)	1.24	203.00			3.09	233.00			1.24	244.00			5.56	680.00	0.00	0
JHAJJAR	Salhawas	Crop Diversification (Ha)	1.24	154.00			1.24	177.00			1.24	185.00			3.71	516.00	0.00	0
JHAJJAR	Machraulli	Crop Diversification (Ha)	0.62	80.00			0.06	92.00			1.24	96.00			1.91	268.00	0.00	0
JHAJJAR	Bahadurgarh	Direct Seeded Rice (Ha)	1.24	100.00			1.24	100.00			1.24	100.00			3.71	300.00	0.00	0
JHAJJAR	Jhajjar	Direct Seeded Rice (Ha)	2.47	200.00			2.47	200.00			2.47	200.00			7.41	600.00	0.00	0
JHAJJAR	Matanhail	Direct Seeded Rice (Ha)	2.47	200.00			2.47	200.00			2.47	200.00			7.41	600.00	0.00	0
JHAJJAR	Badli	Direct Seeded Rice (Ha)	0.62	50.00			0.62	50.00			0.62	50.00			1.85	150.00	0.00	0
JHAJJAR	Salhawas	Direct Seeded Rice (Ha)	4.94	400.00			4.94	400.00			4.94	400.00			14.82	1200.00	0.00	0
JHAJJAR	Bahadurgarh	Groundwater Recharge* (No.)	0.00		1		0.00		1		0.00		2		0.01	0.00	4.00	0
JHAJJAR	Jhajjar	Groundwater Recharge* (No.)	0.00		1		0.00		1		0.00		1		0.01	0.00	3.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
JHAJJAR	Beri	Groundwater Recharge* (No.)	1.00		2		1.00		2		1.00		2		3.01	0.00	6.00	0
JHAJJAR	Matanhail	Groundwater Recharge* (No.)	0.00		1		0.00		1		0.00		1		0.01	0.00	3.00	0
JHAJJAR	Badli	Groundwater Recharge* (No.)	0.00		2		0.00		2		0.00		2		0.01	0.00	6.00	0
JHAJJAR	Salhawas	Groundwater Recharge* (No.)	0.00		1		0.00		1		0.00		1		0.01	0.00	3.00	0
JHAJJAR	Machraulli	Groundwater Recharge* (No.)	0.01		1		0.01		1		0.02		1		0.04	0.00	3.00	0
JHAJJAR	Bahadurgarh	Micro Irrigation (Ha)	1.00	20.00			1.00	15.00			1.00	17.00			3.01	52.00	0.00	0
JHAJJAR	Jhajjar	Micro Irrigation (Ha)	1.20	143.00			1.13	20.00			1.13	15.00			3.46	178.00	0.00	0
JHAJJAR	Beri	Micro Irrigation (Ha)	0.91	25.00			0.97	135.00			0.96	115.00			2.83	275.00	0.00	0
JHAJJAR	Matanhail	Micro Irrigation (Ha)	1.83	131.00			1.84	151.00			1.77	20.00			5.44	302.00	0.00	0
JHAJJAR	Badli	Micro Irrigation (Ha)	1.42	25.00			1.42	15.00			1.42	20.00			4.26	60.00	0.00	0
JHAJJAR	Salhawas	Micro Irrigation (Ha)	1.84	150.00			1.82	120.00			1.83	130.00			5.49	400.00	0.00	0
JHAJJAR	Machraulli	Micro Irrigation (Ha)	0.85	25.00			0.84	15.00			0.84	20.00			2.53	60.00	0.00	0
JHAJJAR	Beri	Modernization of Channels and Water Courses (Ha.)	0.00	4853.00			0.00				0.00				0.00	4853.00	0.00	0
JHAJJAR	Matanhail	Modernization of Channels and Water Courses (Ha.)	3.79	2865.00			0.00				3.79				7.58	2865.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
JHAJJAR	Badli	Modernization of Channels and Water Courses (Ha.)		9312.00											0.00	9312.00	0.00	0
JHAJJAR	Machraulli	Modernization of Channels and Water Courses (Ha.)	0.00	2140.00			0.00				0.00				0.00	2140.00	0.00	0
JHAJJAR	Jhajjar	Reuse of Treated Waste Water (MCM)	2.83			2.83	0.00			0.00	0.00			0.00	2.83	0.00	0.00	3
JHAJJAR	Badli	Reuse of Treated Waste Water (MCM)	68.84			68.84	68.84			68.84	68.84			68.84	206.52	0.00	0.00	207
JHAJJAR	Bahadurgarh	Varietal interventions (Ha)	1.64	525.00			2.61	835.00			4.22	1350.00			8.47	2710.00	0.00	0
JHAJJAR	Jhajjar	Varietal interventions (Ha)	1.25	400.00			1.41	450.00			1.50	480.00			4.16	1330.00	0.00	0
JHAJJAR	Beri	Varietal interventions (Ha)	3.19	1020.00			4.07	1300.00			5.16	1650.00			12.41	3970.00	0.00	0
JHAJJAR	Matanhail	Varietal interventions (Ha)	2.50	800.00			2.81	900.00			4.53	1450.00			9.85	3150.00	0.00	0
JHAJJAR	Badli	Varietal interventions (Ha)	1.13	360.00			1.25	400.00			1.33	425.00			3.71	1185.00	0.00	0
JHAJJAR	Salhawas	Varietal interventions (Ha)	1.06	340.00			1.22	390.00			1.31	420.00			3.60	1150.00	0.00	0
JHAJJAR	Machraulli	Varietal interventions (Ha)	0.88	280.00			1.13	360.00			1.28	410.00			3.28	1050.00	0.00	0
JIND	Alewa	Conservation Tillage (Ha)	14.72	7314.93			17.43	7314.93			21.48	7314.93			53.63	21944.80	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
JIND	Jind	Conservation Tillage (Ha)	15.02	10990.86			17.79	10990.86			21.92	10990.86			54.73	32972.58	0.00	0
JIND	Julana	Conservation Tillage (Ha)	20.40	9498.96			24.16	9498.96			29.77	9498.96			74.33	28496.88	0.00	0
JIND	Pillukhera	Conservation Tillage (Ha)	20.72	8063.22			24.55	8063.22			30.24	8063.22			75.51	24189.67	0.00	0
JIND	Narwana	Conservation Tillage (Ha)	17.32	8180.74			20.52	8180.74			25.28	8180.74			63.12	24542.23	0.00	0
JIND	Safidon	Conservation Tillage (Ha)	28.21	12174.39			34.13	12174.39			42.05	12174.39			104.39	36523.17	0.00	0
JIND	Uchana	Conservation Tillage (Ha)	23.22	10966.42			27.51	10966.42			33.89	10966.42			84.62	32899.26	0.00	0
JIND	Ujhana	Conservation Tillage (Ha)	22.64	8810.47			26.82	8810.47			33.05	8810.47			82.51	26431.41	0.00	0
JIND	Alewa	Crop Diversification (Ha)	1.86	662.50			2.34	728.75			2.49	801.63			6.69	2192.88	0.00	0
JIND	Jind	Crop Diversification (Ha)	1.29	477.50			1.56	525.25			1.66	577.78			4.52	1580.53	0.00	0
JIND	Julana	Crop Diversification (Ha)	0.81	252.50			1.13	277.75			1.21	305.53			3.14	835.78	0.00	0
JIND	Pillukhera	Crop Diversification (Ha)	0.63	245.00			0.74	269.50			0.79	296.45			2.15	810.95	0.00	0
JIND	Narwana	Crop Diversification (Ha)	5.29	1600.00			7.47	1760.00			8.01	1936.00			20.77	5296.00	0.00	0
JIND	Safidon	Crop Diversification (Ha)	0.34	87.50			0.52	96.25			0.56	105.88			1.41	289.63	0.00	0
JIND	Uchana	Crop Diversification (Ha)	4.00	1347.50			5.19	1482.25			5.54	1630.50			14.73	4460.25	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
JIND	Ujhana	Crop Diversification (Ha)	1.56	152.50			3.12	167.75			3.38	184.53			8.06	504.78	0.00	0
JIND	Alewa	Direct Seeded Rice (Ha)	0.63	467.50			1.16	860.20			1.26	935.00			3.05	2262.70	0.00	0
JIND	Jind	Direct Seeded Rice (Ha)	0.42	312.50			0.78	575.00			0.84	625.00			2.04	1512.50	0.00	0
JIND	Julana	Direct Seeded Rice (Ha)	0.31	228.75			0.57	420.90			0.62	457.50			1.50	1107.15	0.00	0
JIND	Pillukhera	Direct Seeded Rice (Ha)	0.20	148.75			0.37	273.70			0.40	297.50			0.97	719.95	0.00	0
JIND	Narwana	Direct Seeded Rice (Ha)	2.02	1500.00			3.72	2760.00			4.05	3000.00			9.79	7260.00	0.00	0
JIND	Safidon	Direct Seeded Rice (Ha)	0.14	102.50			0.26	188.60			0.28	205.00			0.67	496.10	0.00	0
JIND	Uchana	Direct Seeded Rice (Ha)	1.39	1032.50			2.57	1899.80			2.79	2065.00			6.75	4997.30	0.00	0
JIND	Ujhana	Direct Seeded Rice (Ha)	0.85	626.25			1.56	1152.30			1.69	1252.50			4.09	3031.05	0.00	0
JIND	Alewa	Groundwater Recharge* (No.)	0.22		31		0.22		31		0.22		30		0.67	0.00	92.00	0
JIND	Jind	Groundwater Recharge* (No.)	0.54		82		0.52		78		0.47		71		1.53	0.00	231.00	0
JIND	Julana	Groundwater Recharge* (No.)	0.02		3		0.00		1		0.00		1		0.02	0.00	5.00	0
JIND	Pillukhera	Groundwater Recharge* (No.)	0.03		6		0.00		0		0.00		0		0.03	0.00	6.00	0
JIND	Narwana	Groundwater Recharge* (No.)	0.11		13		0.08		10		0.00		0		0.19	0.00	23.00	0
JIND	Safidon	Groundwater Recharge* (No.)	0.00		1		0.00		1		0.00		2		0.01	0.00	4.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
JIND	Uchana	Groundwater Recharge* (No.)	0.31		61		0.31		61		0.31		61		0.94	0.00	183.00	0
JIND	Ujhana	Groundwater Recharge* (No.)	0.05		7		0.00		1		0.00		2		0.06	0.00	10.00	0
JIND	Alewa	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Jind	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Julana	Micro Irrigation (Ha)	0.21	100.00			0.19	89.00			0.00				0.40	189.00	0.00	0
JIND	Pillukhera	Micro Irrigation (Ha)	0.00				0.21	100.00			0.53	250.00			0.74	350.00	0.00	0
JIND	Narwana	Micro Irrigation (Ha)	0.09	40.00			0.10	45.00			0.12	55.00			0.30	140.00	0.00	0
JIND	Safidon	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Uchana	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Ujhana	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Alewa	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Jind	Modernization of Channels and Water Courses (Ha.)	0.33	404.60			0.35	381.00			0.06	400.70			0.74	1186.30	0.00	0
JIND	Julana	Modernization of Channels and Water Courses (Ha.)	0.46	382.61			0.94	750.00			0.80	710.00			2.20	1842.61	0.00	0
JIND	Pillukhera	Modernization of Channels	1.26	950.00			1.88	1207.60			0.67	723.00			3.81	2880.60	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
		and Water Courses (Ha.)																
JIND	Narwana	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Safidon	Modernization of Channels and Water Courses (Ha.)	0.79	594.00			0.80	925.00			0.34	500.00			1.92	2019.00	0.00	0
JIND	Uchana	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Ujhana	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Alewa	Pond Rejuvenation (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Jind	Pond Rejuvenation (No.)	4.29		10		0.01		10		0.02		10		4.33	0.00	30.00	0
JIND	Julana	Pond Rejuvenation (No.)	0.01		4		0.01		4		0.04		4		0.06	0.00	12.00	0
JIND	Pillukhera	Pond Rejuvenation (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Narwana	Pond Rejuvenation (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Safidon	Pond Rejuvenation (No.)	0.00		3		0.00		3		0.02		3		0.03	0.00	9.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
JIND	Uchana	Pond Rejuvenation (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Ujhana	Pond Rejuvenation (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
JIND	Alewa	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
JIND	Jind	Reuse of Treated Waste Water (MCM)	5.42			5.42	5.91			5.91	6.90			6.90	18.23	0.00	0.00	18
JIND	Julana	Reuse of Treated Waste Water (MCM)	0.80			0.80	0.88			0.88	1.02			1.02	2.70	0.00	0.00	3
JIND	Pillukhera	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
JIND	Narwana	Reuse of Treated Waste Water (MCM)	1.86			1.86	2.03			2.03	2.36			2.36	6.25	0.00	0.00	6
JIND	Safidon	Reuse of Treated Waste Water (MCM)	1.81			1.81	1.97			1.97	2.30			2.30	6.08	0.00	0.00	6
JIND	Uchana	Reuse of Treated Waste Water (MCM)	0.70			0.70	0.77			0.77	0.89			0.89	2.36	0.00	0.00	2
JIND	Ujhana	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KAITHAL	Kaithal	Conservation Tillage (Ha)	24.04	2427.68			43.72	4046.13			63.87	6069.19			131.63	12543.00	0.00	0
KAITHAL	Pundri	Conservation Tillage (Ha)	21.03	2409.05			36.23	3613.85			50.12	4835.12			107.38	10858.02	0.00	0
KAITHAL	Guhla	Conservation Tillage (Ha)	39.03	3641.51			60.37	5664.58			81.62	788.95			181.02	10095.04	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
KAITHAL	Rajound	Conservation Tillage (Ha)	10.00	1790.64			17.04	2508.60			27.15	3479.67			54.19	7778.91	0.00	0
KAITHAL	Dhand	Conservation Tillage (Ha)	8.99	1213.84			19.95	223.06			27.36	3236.90			56.30	4673.80	0.00	0
KAITHAL	Kalayat	Conservation Tillage (Ha)	6.50	2483.97			13.50	3725.95			26.94	4967.93			46.94	11177.85	0.00	0
KAITHAL	Siwan	Conservation Tillage (Ha)	6.40	809.23			10.00	1213.84			13.91	1213.84			30.31	3236.91	0.00	0
KAITHAL	Kaithal	Crop Diversification (Ha)	7.18	708.07			8.11	1092.45			9.05	1416.14			24.34	3216.66	0.00	0
KAITHAL	Pundri	Crop Diversification (Ha)	3.06	445.70			3.85	667.61			4.60	950.84			11.51	2064.15	0.00	0
KAITHAL	Guhla	Crop Diversification (Ha)	4.45	647.38			5.23	971.07			5.99	1294.76			15.67	2913.21	0.00	0
KAITHAL	Rajound	Crop Diversification (Ha)	5.05	323.69			5.81	364.15			6.75	566.46			17.61	1254.30	0.00	0
KAITHAL	Dhand	Crop Diversification (Ha)	2.48	208.38			3.24	343.92			4.01	526.00			9.73	1078.30	0.00	0
KAITHAL	Kalayat	Crop Diversification (Ha)	21.89	433.87			21.77	650.81			22.12	867.74			65.78	1952.42	0.00	0
KAITHAL	Siwan	Crop Diversification (Ha)	1.54	202.31			2.30	303.46			3.06	364.15			6.90	869.92	0.00	0
KAITHAL	Kaithal	Direct Seeded Rice (Ha)	2.97	1031.76			4.55	1577.99			5.94	2063.52			13.46	4673.27	0.00	0
KAITHAL	Pundri	Direct Seeded Rice (Ha)	1.86	647.38			2.80	971.07			3.90	1355.45			8.56	2973.90	0.00	0
KAITHAL	Guhla	Direct Seeded Rice (Ha)	3.96	1375.68			5.83	2023.06			7.58	2629.98			17.37	6028.72	0.00	0
KAITHAL	Rajound	Direct Seeded Rice (Ha)	1.35	468.89			1.40	485.54			2.33	809.23			5.08	1763.66	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
KAITHAL	Dhand	Direct Seeded Rice (Ha)	0.99	343.92			1.52	526.00			1.98	687.84			4.49	1557.76	0.00	0
KAITHAL	Kalayat	Direct Seeded Rice (Ha)	0.76	263.00			1.14	394.50			1.52	526.00			3.42	1183.50	0.00	0
KAITHAL	Siwan	Direct Seeded Rice (Ha)	0.79	275.15			1.19	412.73			1.59	550.31			3.57	1238.19	0.00	0
KAITHAL	Kaithal	Groundwater Recharge* (No.)	3.80		581		3.82		581		3.84		581		11.46	0.00	1743.00	0
KAITHAL	Pundri	Groundwater Recharge* (No.)	2.24		321		2.97		321		2.67		321		7.88	0.00	963.00	0
KAITHAL	Guhla	Groundwater Recharge* (No.)	3.17		483		3.17		483		3.17		483		9.52	0.00	1449.00	0
KAITHAL	Rajound	Groundwater Recharge* (No.)	1.54		239		1.54		239		1.54		239		4.62	0.00	717.00	0
KAITHAL	Dhand	Groundwater Recharge* (No.)	1.14		169		1.82		169		1.82		169		4.78	0.00	507.00	0
KAITHAL	Kalayat	Groundwater Recharge* (No.)	2.23		331		2.14		331		2.13		331		6.50	0.00	993.00	0
KAITHAL	Siwan	Groundwater Recharge* (No.)	1.08		140		1.08		140		1.27		140		3.43	0.00	420.00	0
KAITHAL	Kaithal	Micro Irrigation (Ha)	0.19	155.00			0.17	138.00			0.07	61.00			0.43	354.00	0.00	0
KAITHAL	Pundri	Micro Irrigation (Ha)	0.11	91.00			0.12	26.00			0.00				0.23	117.00	0.00	0
KAITHAL	Guhla	Micro Irrigation (Ha)	0.14	122.00			1.16	477.00			0.23	191.00			1.53	790.00	0.00	0
KAITHAL	Rajound	Micro Irrigation (Ha)	0.10				0.14	40.00			0.08	58.00			0.32	98.00	0.00	0
KAITHAL	Dhand	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0

District	Block	Proposed Interventions	2023-24 Proposed Water Savings in MCM	2023-24 Proposed Target Area (ha)	2023-24 Proposed Target Number	2023-24 Proposed Target Volume in MCM	2024-25 Proposed Water Savings in MCM	2024-25 Proposed Target Area (ha)	2024-25 Proposed Target Number	2024-25 Proposed Target Volume in MCM	2025-26 Proposed Water Savings in MCM	2025-26 Proposed Target Area (ha)	2025-26 Proposed Target Number	2025-26 Proposed Target Volume in MCM	2023-26 Total Water Savings in 3 years (MCM)	2023-26 Proposed Target Area (ha)	2023-26 Proposed Target Number	2023-26 Proposed Target Volume in MCM
KAITHAL	Kalayat	Micro Irrigation (Ha)	0.10	78.00			0.06	47.00			0.04	31.00			0.20	156.00	0.00	0
KAITHAL	Siwan	Micro Irrigation (Ha)	0.00				0.04	29.00			0.00				0.04	29.00	0.00	0
KAITHAL	Kaithal	Modernization of Channels and Water Courses (Ha.)	5.79	4390.00			2.39	1818.50			0.00				8.18	6208.50	0.00	0
KAITHAL	Pundri	Modernization of Channels and Water Courses (Ha.)	2.97	2250.00			0.24	193.50			0.00				3.21	2443.50	0.00	0
KAITHAL	Guhla	Modernization of Channels and Water Courses (Ha.)	2.62	1982.00			2.67	2017.00			4.78	3613.00			10.07	7612.00	0.00	0
KAITHAL	Rajound	Modernization of Channels and Water Courses (Ha.)	13.38	10131.50			2.30	1751.50			0.00				15.68	11883.00	0.00	0
KAITHAL	Dhand	Modernization of Channels and Water Courses (Ha.)	4.36	3300.00			0.09	69.90			0.00				4.45	3369.90	0.00	0
KAITHAL	Kalayat	Modernization of Channels and Water Courses (Ha.)	0.21	175.80			1.32	1009.32			0.00				1.53	1185.12	0.00	0
KAITHAL	Siwan	Modernization of Channels and Water Courses (Ha.)	0.18	148.80			12.68	9592.20			0.00				12.86	9741.00	0.00	0
KAITHAL	Kaithal	Reuse of Treated Waste Water (MCM)	6.19			6.19	11.46			11.46	15.33			15.33	32.98	0.00	0.00	33

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
KAITHAL	Pundri	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KAITHAL	Guhla	Reuse of Treated Waste Water (MCM)	0.91			0.91	1.83			1.83	2.74			2.74	5.48	0.00	0.00	5
KAITHAL	Rajound	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KAITHAL	Dhand	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KAITHAL	Kalayat	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KAITHAL	Siwan	Reuse of Treated Waste Water (MCM)													0.00	0.00	0.00	0
KARNAL	Assandh	Conservation Tillage (Ha)	15.17	31601.00			20.08	41824.00			23.79	49570.00			59.04	122995.00	0.00	0
KARNAL	Gharunda	Conservation Tillage (Ha)	10.30	21450.00			10.30	21450.00			12.46	25954.50			33.05	68854.50	0.00	0
KARNAL	Indri	Conservation Tillage (Ha)	4.41	9180.00			6.48	13500.00			7.91	16470.00			18.79	39150.00	0.00	0
KARNAL	Karnal	Conservation Tillage (Ha)	5.82	12120.00			6.11	12726.00			7.66	15958.00			19.59	40804.00	0.00	0
KARNAL	Kunjpura	Conservation Tillage (Ha)	13.85	30621.00			15.12	33276.00			18.27	38055.00			47.24	101952.00	0.00	0
KARNAL	Munak	Conservation Tillage (Ha)	10.98	22875.00			10.98	22875.00			10.98	22875.00			32.94	68625.00	0.00	0
KARNAL	Nilokheri	Conservation Tillage (Ha)	15.18	31627.18			15.92	33162.48			18.72	38996.62			49.82	103786.28	0.00	0
KARNAL	Nissing	Conservation Tillage (Ha)	16.66	34716.00			18.07	37646.40			22.90	47520.00			57.63	119882.40	0.00	0
KARNAL	Assandh	Crop Diversification (Ha)	3.55	296.00			11.15	929.43			18.22	1518.07			32.92	2743.50	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
KARNAL	Gharunda	Crop Diversification (Ha)	4.56	380.00			7.72	643.50			10.30	858.00			22.58	1881.50	0.00	0
KARNAL	Indri	Crop Diversification (Ha)	3.46	288.00			4.86	405.00			6.48	540.00			14.80	1233.00	0.00	0
KARNAL	Karnal	Crop Diversification (Ha)	4.08	340.00			7.27	606.00			9.70	808.00			21.05	1754.00	0.00	0
KARNAL	Kunjpura	Crop Diversification (Ha)	0.53	44.00			8.50	708.00			11.68	973.50			20.71	1725.50	0.00	0
KARNAL	Munak	Crop Diversification (Ha)	0.95	79.20			4.39	366.00			6.59	549.00			11.93	994.20	0.00	0
KARNAL	Nilokheri	Crop Diversification (Ha)	2.34	195.20			11.05	921.18			14.74	1228.24			28.14	2344.62	0.00	0
KARNAL	Nissing	Crop Diversification (Ha)	1.37	114.00			9.50	792.00			12.67	1056.00			23.54	1962.00	0.00	0
KARNAL	Assandh	Direct Seeded Rice (Ha)	3.74	1040.00			5.58	1549.05			7.81	2168.67			17.13	4757.72	0.00	0
KARNAL	Gharunda	Direct Seeded Rice (Ha)	2.87	798.00			3.86	1072.50			4.79	1329.90			11.52	3200.40	0.00	0
KARNAL	Indri	Direct Seeded Rice (Ha)	0.84	232.00			2.43	675.00			2.92	810.00			6.18	1717.00	0.00	0
KARNAL	Karnal	Direct Seeded Rice (Ha)	1.71	476.00			3.64	1010.00			4.36	1212.00			9.71	2698.00	0.00	0
KARNAL	Kunjpura	Direct Seeded Rice (Ha)	0.84	234.00			3.82	1062.00			4.72	1309.80			9.38	2605.80	0.00	0
KARNAL	Munak	Direct Seeded Rice (Ha)	0.84	232.00			0.92	256.20			0.99	274.50			2.75	762.70	0.00	0
KARNAL	Nilokheri	Direct Seeded Rice (Ha)	1.05	292.40			5.53	1535.30			6.63	1842.36			13.21	3670.06	0.00	0
KARNAL	Nissing	Direct Seeded Rice (Ha)	1.00	276.80			4.75	1320.00			5.70	1584.00			11.45	3180.80	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
KARNAL	Assandh	Groundwater Recharge* (No.)	0.03		28		0.03		28		0.03		28		0.09	0.00	84.00	0
KARNAL	Gharunda	Groundwater Recharge* (No.)	0.07		28		0.08		28		0.09		28		0.25	0.00	84.00	0
KARNAL	Indri	Groundwater Recharge* (No.)	0.03		28		0.04		28		0.04		28		0.11	0.00	84.00	0
KARNAL	Karnal	Groundwater Recharge* (No.)	0.15		28		0.17		28		0.19		28		0.51	0.00	84.00	0
KARNAL	Kunjpura	Groundwater Recharge* (No.)	0.04		28		0.04		28		0.05		28		0.13	0.00	84.00	0
KARNAL	Munak	Groundwater Recharge* (No.)	0.00		28		0.00		28		0.00		28		0.01	0.00	84.00	0
KARNAL	Nilokheri	Groundwater Recharge* (No.)	0.03		28		0.03		28		0.03		28		0.09	0.00	84.00	0
KARNAL	Nissing	Groundwater Recharge* (No.)	0.04		28		0.04		28		0.04		28		0.12	0.00	84.00	0
KARNAL	Assandh	Micro Irrigation (Ha)	3.49	3751.00			3.94	4008.00			6.16	5216.00			13.59	12975.00	0.00	0
KARNAL	Gharunda	Micro Irrigation (Ha)	6.24	6607.00			6.67	6894.00			8.66	8330.00			21.57	21831.00	0.00	0
KARNAL	Indri	Micro Irrigation (Ha)	4.71	4560.00			6.15	5776.00			7.59	6992.00			18.44	17328.00	0.00	0
KARNAL	Karnal	Micro Irrigation (Ha)	6.74	6611.00			8.51	8080.00			10.28	9548.00			25.53	24239.00	0.00	0
KARNAL	Kunjpura	Micro Irrigation (Ha)	4.32	3787.00			5.25	4329.00			6.37	5004.00			15.95	13120.00	0.00	0
KARNAL	Munak	Micro Irrigation (Ha)	4.20	4528.04			4.21	4530.04			4.24	4547.04			12.65	13605.12	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
KARNAL	Nilokheri	Micro Irrigation (Ha)	5.98	6279.00			7.14	7098.00			8.30	7917.00			21.42	21294.00	0.00	0
KARNAL	Nissing	Micro Irrigation (Ha)	2.97	2458.00			3.37	2668.00			4.09	3125.00			10.43	8251.00	0.00	0
KARNAL	Assandh	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
KARNAL	Gharunda	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
KARNAL	Indri	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
KARNAL	Karnal	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
KARNAL	Kunjpura	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
KARNAL	Munak	Modernization of Channels and Water Courses (Ha.)	0.00				12.05	4697.92			12.05				24.10	4697.92	0.00	0
KARNAL	Nilokheri	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
KARNAL	Nissing	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
KARNAL	Assandh	Pond Rejuvenation (No.)	0.93		19		0.93		19		0.93		19		2.79	0.00	57.00	0
KARNAL	Gharunda	Pond Rejuvenation (No.)	0.25		11		0.25		11		0.25		11		0.75	0.00	33.00	0
KARNAL	Indri	Pond Rejuvenation (No.)	0.32		12		0.32		12		0.32		12		0.95	0.00	36.00	0
KARNAL	Karnal	Pond Rejuvenation (No.)	0.14		2		0.14		2		0.14		2		0.41	0.00	6.00	0
KARNAL	Kunjpura	Pond Rejuvenation (No.)	0.08		4		0.08		4		0.08		4		0.24	0.00	12.00	0
KARNAL	Munak	Pond Rejuvenation (No.)	0.45		8		0.45		8		0.45		8		1.35	0.00	24.00	0
KARNAL	Nilokheri	Pond Rejuvenation (No.)	0.74		18		0.74		18		0.74		18		2.23	0.00	54.00	0
KARNAL	Nissing	Pond Rejuvenation (No.)	0.12		1		0.12		1		0.12		1		0.35	0.00	3.00	0
KARNAL	Assandh	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KARNAL	Gharunda	Reuse of Treated Waste Water (MCM)	0.00			0.00	7.21			7.21	7.21			7.21	14.42	0.00	0.00	14
KARNAL	Indri	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KARNAL	Karnal	Reuse of Treated Waste Water (MCM)	4.94			4.94	11.76			11.76	12.13			12.13	28.83	0.00	0.00	29

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
KARNAL	Kunjpura	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KARNAL	Munak	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KARNAL	Nilokheri	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.01	0.00	0.00	0
KARNAL	Nissing	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KURUKSHETRA	Thanesar	Conservation Tillage (Ha)	10.52	4121.00			10.52	4121.00			10.52	4121.00			31.56	12363.00	0.00	0
KURUKSHETRA	Pipli	Conservation Tillage (Ha)	6.26	2451.00			6.26	2451.00			6.26	2451.00			18.78	7353.00	0.00	0
KURUKSHETRA	Ladwa	Conservation Tillage (Ha)	4.21	1650.00			4.21	1650.00			4.21	1650.00			12.63	4950.00	0.00	0
KURUKSHETRA	Shahbad	Conservation Tillage (Ha)	8.48	3322.00			8.48	3322.00			8.48	3322.00			25.44	9966.00	0.00	0
KURUKSHETRA	Babain	Conservation Tillage (Ha)	3.58	1402.00			3.58	1402.00			3.58	1402.00			10.74	4206.00	0.00	0
KURUKSHETRA	Pehowa	Conservation Tillage (Ha)	16.55	6483.00			16.55	6483.00			16.55	6483.00			49.65	19449.00	0.00	0
KURUKSHETRA	Ismailabad	Conservation Tillage (Ha)	5.57	2184.00			5.57	2184.00			5.57	2184.00			16.71	6552.00	0.00	0
KURUKSHETRA	Thanesar	Crop Diversification (Ha)	7.01	2050.00			7.01	2050.00			7.01	2050.00			21.03	6150.00	0.00	0
KURUKSHETRA	Pipli	Crop Diversification (Ha)	4.17	1219.00			4.17	1219.00			4.17	1219.00			12.51	3657.00	0.00	0
KURUKSHETRA	Ladwa	Crop Diversification (Ha)	2.81	821.00			2.81	821.00			2.81	821.00			8.43	2463.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
KURUKSHETRA	Shahbad	Crop Diversification (Ha)	5.65	1653.00			5.65	1653.00			5.65	1653.00			16.95	4959.00	0.00	0
KURUKSHETRA	Babain	Crop Diversification (Ha)	2.39	697.00			2.39	697.00			2.39	697.00			7.17	2091.00	0.00	0
KURUKSHETRA	Pehowa	Crop Diversification (Ha)	11.04	3225.00			11.04	3225.00			11.04	3225.00			33.12	9675.00	0.00	0
KURUKSHETRA	Ismailabad	Crop Diversification (Ha)	3.71	1086.00			3.71	1086.00			3.71	1086.00			11.13	3258.00	0.00	0
KURUKSHETRA	Thanesar	Direct Seeded Rice (Ha)	1.35	772.14			1.35	772.14			1.35	772.14			4.05	2316.42	0.00	0
KURUKSHETRA	Pipli	Direct Seeded Rice (Ha)	0.81	459.35			0.81	459.35			0.81	459.35			2.43	1378.05	0.00	0
KURUKSHETRA	Ladwa	Direct Seeded Rice (Ha)	0.54	309.28			0.54	309.28			0.54	309.28			1.62	927.84	0.00	0
KURUKSHETRA	Shahbad	Direct Seeded Rice (Ha)	1.09	622.56			1.09	622.56			1.09	622.56			3.27	1867.68	0.00	0
KURUKSHETRA	Babain	Direct Seeded Rice (Ha)	0.46	262.63			0.46	262.63			0.46	262.63			1.38	787.89	0.00	0
KURUKSHETRA	Pehowa	Direct Seeded Rice (Ha)	2.13	1214.85			2.13	1214.85			2.13	1214.85			6.39	3644.55	0.00	0
KURUKSHETRA	Ismailabad	Direct Seeded Rice (Ha)	0.72	409.22			0.72	409.22			0.72	409.22			2.16	1227.66	0.00	0
KURUKSHETRA	Thanesar	Groundwater Recharge* (No.)	0.45		70		0.45		70		0.45		70		1.35	0.00	210.00	0
KURUKSHETRA	Pipli	Groundwater Recharge* (No.)	0.45		70		0.45		70		0.45		70		1.35	0.00	210.00	0
KURUKSHETRA	Ladwa	Groundwater Recharge* (No.)	0.34		70		0.34		70		0.34		70		1.02	0.00	210.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
KURUKSHETRA	Shahbad	Groundwater Recharge* (No.)	0.27		70		0.27		70		0.27		70		0.81	0.00	210.00	0
KURUKSHETRA	Babain	Groundwater Recharge* (No.)	0.38		70		0.38		70		0.38		70		1.14	0.00	210.00	0
KURUKSHETRA	Pehowa	Groundwater Recharge* (No.)	0.44		70		0.44		70		0.44		70		1.32	0.00	210.00	0
KURUKSHETRA	Ismailabad	Groundwater Recharge* (No.)	0.57		70		0.57		70		0.57		70		1.71	0.00	210.00	0
KURUKSHETRA	Thanesar	Micro Irrigation (Ha)	3.72	1046.00			9.47	2276.00			12.32	1997.00			25.51	5319.00	0.00	0
KURUKSHETRA	Pipli	Micro Irrigation (Ha)	1.90	499.00			3.12	369.00			5.53	482.00			10.55	1350.00	0.00	0
KURUKSHETRA	Ladwa	Micro Irrigation (Ha)	2.20	697.00			2.56	428.00			3.97	420.00			8.73	1545.00	0.00	0
KURUKSHETRA	Shahbad	Micro Irrigation (Ha)	1.87	395.00			4.36	548.00			7.50	653.00			13.73	1596.00	0.00	0
KURUKSHETRA	Babain	Micro Irrigation (Ha)	0.72	146.00			1.78	211.00			3.17	276.00			5.67	633.00	0.00	0
KURUKSHETRA	Pehowa	Micro Irrigation (Ha)	4.39	1076.00			13.97	3216.00			18.89	2948.00			37.25	7240.00	0.00	0
KURUKSHETRA	Ismailabad	Micro Irrigation (Ha)	2.12	612.00			5.41	1359.00			7.72	1527.00			15.25	3498.00	0.00	0
KURUKSHETRA	Thanesar	Modernization of Channels and Water Courses (Ha.)	4.19	1294.98			4.10	1294.98			4.08	1294.98			12.37	3884.94	0.00	0
KURUKSHETRA	Pipli	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
KURUKSHETRA	Ladwa	Modernization of Channels	0.00				0.00				0.00				0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
		and Water Courses (Ha.)																
KURUKSHETRA	Shahbad	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
KURUKSHETRA	Babain	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
KURUKSHETRA	Pehowa	Modernization of Channels and Water Courses (Ha.)	4.47	1491.00			4.38	1491.00			4.36	1491.00			13.21	4473.00	0.00	0
KURUKSHETRA	Ismailabad	Modernization of Channels and Water Courses (Ha.)	0.57				0.51				0.49				1.57	0.00	0.00	0
KURUKSHETRA	Thanesar	Pond Rejuvenation (No.)	0.11		18		0.00				0.00				0.11	0.00	18.00	0
KURUKSHETRA	Pipli	Pond Rejuvenation (No.)	0.10		20		0.00				0.00				0.10	0.00	20.00	0
KURUKSHETRA	Ladwa	Pond Rejuvenation (No.)	0.05		11		0.00				0.00				0.05	0.00	11.00	0
KURUKSHETRA	Shahbad	Pond Rejuvenation (No.)	0.02		5		0.00				0.00				0.02	0.00	5.00	0
KURUKSHETRA	Babain	Pond Rejuvenation (No.)	0.02		7		0.00				0.00				0.02	0.00	7.00	0
KURUKSHETRA	Pehowa	Pond Rejuvenation (No.)	0.04		9		0.00				0.00				0.04	0.00	9.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
KURUKSHETRA	Ismailabad	Pond Rejuvenation (No.)	0.01		5		0.00				0.00				0.01	0.00	5.00	0
KURUKSHETRA	Thanesar	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KURUKSHETRA	Pipli	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KURUKSHETRA	Ladwa	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.01	0.00	0.00	0
KURUKSHETRA	Shahbad	Reuse of Treated Waste Water (MCM)	0.30			0.30	0.30			0.30	0.30			0.30	0.91	0.00	0.00	1
KURUKSHETRA	Babain	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KURUKSHETRA	Pehowa	Reuse of Treated Waste Water (MCM)	0.53			0.53	0.53			0.53	0.53			0.53	1.58	0.00	0.00	2
KURUKSHETRA	Ismailabad	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
KURUKSHETRA	Thanesar	Varietal interventions (Ha)	6.06	2375.00			12.13	4750.00			24.25	9500.00			42.44	16625.00	0.00	0
KURUKSHETRA	Pipli	Varietal interventions (Ha)	3.61	1413.00			7.21	2826.00			14.43	5652.00			25.25	9891.00	0.00	0
KURUKSHETRA	Ladwa	Varietal interventions (Ha)	2.43	951.00			4.86	1902.00			9.71	3805.00			17.00	6658.00	0.00	0
KURUKSHETRA	Shahbad	Varietal interventions (Ha)	4.89	1915.00			9.78	3830.00			19.55	7660.00			34.22	13405.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
KURUKSHETRA	Babain	Varietal interventions (Ha)	2.06	808.00			4.12	1616.00			8.25	3231.00			14.43	5655.00	0.00	0
KURUKSHETRA	Pehowa	Varietal interventions (Ha)	9.54	3737.00			19.08	7473.00			38.16	14947.00			66.78	26157.00	0.00	0
KURUKSHETRA	Ismailabad	Varietal interventions (Ha)	3.21	1259.00			6.43	2517.00			12.85	5035.00			22.49	8811.00	0.00	0
MAHENDRAGARH	Nangal Chowdhary	Check Dams (No.)	0.06		6		0.00				0.00				0.06	0.00	6.00	0
MAHENDRAGARH	Ateli	Crop Diversification (Ha)	0.05	35.00			0.06	42.00			0.07	50.00			0.18	127.00	0.00	0
MAHENDRAGARH	Kanina	Crop Diversification (Ha)	0.04	35.00			0.05	42.00			0.06	50.00			0.15	127.00	0.00	0
MAHENDRAGARH	Mahendergarh	Crop Diversification (Ha)	0.01	10.00			0.02	15.00			0.03	20.00			0.06	45.00	0.00	0
MAHENDRAGARH	Narnaul	Crop Diversification (Ha)	0.42	350.00			0.49	410.00			0.60	500.00			1.52	1260.00	0.00	0
MAHENDRAGARH	Nangal Chowdhary	Crop Diversification (Ha)	0.01	10.00			0.01	15.00			0.01	20.00			0.03	45.00	0.00	0
MAHENDRAGARH	Nizampur	Crop Diversification (Ha)	0.01	16.00			0.01	18.00			0.01	20.00			0.04	54.00	0.00	0
MAHENDRAGARH	Sihma	Crop Diversification (Ha)	0.21	16.00			0.26	20.00			0.33	25.00			0.80	61.00	0.00	0
MAHENDRAGARH	Satnali	Crop Diversification (Ha)	0.76	525.00			0.89	610.00			1.02	700.00			2.67	1835.00	0.00	0

District	Block	Proposed Interventions	2023-24 Proposed Water Savings in MCM	2023-24 Proposed Target Area (ha)	2023-24 Proposed Target Number	2023-24 Proposed Target Volume in MCM	2024-25 Proposed Water Savings in MCM	2024-25 Proposed Target Area (ha)	2024-25 Proposed Target Number	2024-25 Proposed Target Volume in MCM	2025-26 Proposed Water Savings in MCM	2025-26 Proposed Target Area (ha)	2025-26 Proposed Target Number	2025-26 Proposed Target Volume in MCM	2023-26 Total Water Savings in 3 years (MCM)	2023-26 Proposed Target Area (ha)	2023-26 Proposed Target Number	2023-26 Proposed Target Volume in MCM
MAHENDRAGARH	Kanina	Groundwater Recharge* (No.)	0.10		13		0.28		13		0.56		13		0.94	0.00	39.00	0
MAHENDRAGARH	Mahendergarh	Groundwater Recharge* (No.)	0.06		18		0.00		0		0.00		0		0.06	0.00	18.00	0
MAHENDRAGARH	Narnaul	Groundwater Recharge* (No.)	0.03		9		0.00		0		0.00		0		0.03	0.00	9.00	0
MAHENDRAGARH	Nangal Chowdhary	Groundwater Recharge* (No.)	0.18		30		0.00		25		0.00		30		0.18	0.00	85.00	0
MAHENDRAGARH	Nizampur	Groundwater Recharge* (No.)	0.88		7		0.00		0		0.00		0		0.88	0.00	7.00	0
MAHENDRAGARH	Sihma	Groundwater Recharge* (No.)	0.00				0.00								0.00	0.00	0.00	0
MAHENDRAGARH	Satnali	Groundwater Recharge* (No.)	0.00				0.00								0.00	0.00	0.00	0
MAHENDRAGARH	Ateli	Micro Irrigation (Ha)	0.03	600.00			0.35	662.00			0.47	788.00			0.85	2050.00	0.00	0
MAHENDRAGARH	Kanina	Micro Irrigation (Ha)	0.33	975.00			0.55	1037.00			0.60	1162.00			1.48	3174.00	0.00	0
MAHENDRAGARH	Mahendergarh	Micro Irrigation (Ha)	0.05	850.00			0.08	912.00			0.63	1037.00			0.76	2799.00	0.00	0
MAHENDRAGARH	Narnaul	Micro Irrigation (Ha)	0.01	475.00			0.38	537.00			0.50	663.00			0.89	1675.00	0.00	0
MAHENDRAGARH	Nangal Chowdhary	Micro Irrigation (Ha)	0.13	1000.00			0.45	1063.00			0.55	1189.00			1.13	3252.00	0.00	0
MAHENDRAGARH	Nizampur	Micro Irrigation (Ha)	0.75	450.00			1.80	512.00			2.23	637.00			4.78	1599.00	0.00	0
MAHENDRAGARH	Sihma	Micro Irrigation (Ha)	0.11	250.00			0.38	312.00			0.70	437.00			1.19	999.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
MAHENDRAGARH	Satnali	Micro Irrigation (Ha)	1.62	900.00			2.15	965.00			3.18	1087.00			6.95	2952.00	0.00	0
MAHENDRAGARH	Ateli	Modernization of Channels and Water Courses (Ha.)	0.21				0.07				0.08				0.36	0.00	0.00	0
MAHENDRAGARH	Kanina	Modernization of Channels and Water Courses (Ha.)	0.34	1433.00			0.35				0.41				1.10	1433.00	0.00	0
MAHENDRAGARH	Mahendergarh	Modernization of Channels and Water Courses (Ha.)	0.04	902.00			0.14				0.97				1.15	902.00	0.00	0
MAHENDRAGARH	Narnaul	Modernization of Channels and Water Courses (Ha.)	0.40	39712.00			0.25				0.39				1.04	39712.00	0.00	0
MAHENDRAGARH	Nangal Chowdhary	Modernization of Channels and Water Courses (Ha.)	0.30	27183.00			0.46				0.66				1.42	27183.00	0.00	0
MAHENDRAGARH	Nizampur	Modernization of Channels and Water Courses (Ha.)	0.84	5902.00			1.92				2.73				5.49	5902.00	0.00	0
MAHENDRAGARH	Sihma	Modernization of Channels and Water Courses (Ha.)	0.56				0.68				0.74				1.98	0.00	0.00	0
MAHENDRAGARH	Satnali	Modernization of Channels and Water Courses (Ha.)	1.74				3.15				4.05				8.94	0.00	0.00	0
MAHENDRAGARH	Ateli	Pond Rejuvenation (No.)	0.06		4		0.04		4		0.09		4		0.19	0.00	12.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
MAHENDRAGARH	Mahendergarh	Pond Rejuvenation (No.)	0.06		1										0.06	0.00	1.00	0
MAHENDRAGARH	Narnaul	Pond Rejuvenation (No.)	0.01		1										0.01	0.00	1.00	0
MAHENDRAGARH	Nangal Chowdhary	Pond Rejuvenation (No.)	0.00		1										0.00	0.00	1.00	0
MAHENDRAGARH	Nizampur	Pond Rejuvenation (No.)	0.45		1										0.45	0.00	1.00	0
MAHENDRAGARH	Ateli	Reuse of Treated Waste Water (MCM)	0.02			0.02	0.00			0.00	0.00			0.00	0.02	0.00	0.00	0
MAHENDRAGARH	Kanina	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
MAHENDRAGARH	Mahendergarh	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
MAHENDRAGARH	Narnaul	Reuse of Treated Waste Water (MCM)	0.01			0.01	0.00			0.00	0.00			0.00	0.01	0.00	0.00	0
MAHENDRAGARH	Nangal Chowdhary	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
MAHENDRAGARH	Nizampur	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
MAHENDRAGARH	Sihma	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
MAHENDRAGARH	Satnali	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
NUH	F.P.Jhirka	Check Dams (No.)	2.20		3		3.40		4		4.25		5		9.85	0.00	12.00	0
NUH	Nagina	Check Dams (No.)	1.80		3		2.00		4		2.30		5		6.10	0.00	12.00	0
NUH	F.P.Jhirka	Conservation Tillage (Ha)	0.06	500.00			0.06	500.00			0.06	500.00			0.17	1500.00	0.00	0
NUH	Indri	Conservation Tillage (Ha)	0.06	500.00			0.06	500.00			0.06	500.00			0.17	1500.00	0.00	0
NUH	Nagina	Conservation Tillage (Ha)	0.06	500.00			0.06	500.00			0.06	500.00			0.17	1500.00	0.00	0
NUH	Nuh	Conservation Tillage (Ha)	0.06	500.00			0.06	500.00			0.06	500.00			0.17	1500.00	0.00	0
NUH	Pinangwan	Conservation Tillage (Ha)	0.06	500.00			0.06	500.00			0.06	500.00			0.17	1500.00	0.00	0
NUH	Taoru	Conservation Tillage (Ha)	0.06	500.00			0.06	500.00			0.06	500.00			0.17	1500.00	0.00	0
NUH	Punhana	Conservation Tillage (Ha)	0.06	500.00			0.06	500.00			0.06	500.00			0.17	1500.00	0.00	0
NUH	F.P.Jhirka	Crop Diversification (Ha)	0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0
NUH	Indri	Crop Diversification (Ha)	0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0
NUH	Nagina	Crop Diversification (Ha)	0.01	28.33			0.01	28.33			0.01	28.33			0.04	84.99	0.00	0
NUH	Nuh	Crop Diversification (Ha)	0.07	141.64			0.07	141.64			0.07	141.64			0.21	424.93	0.00	0
NUH	Pinangwan	Crop Diversification (Ha)	0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0
NUH	Taoru	Crop Diversification (Ha)	0.00	6.07			0.00	6.07			0.00	6.07			0.01	18.21	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
NUH	Punhana	Crop Diversification (Ha)	0.09	182.11			0.09	182.11			0.09	182.11			0.27	546.34	0.00	0
NUH	F.P.Jhirka	Fisheries Water Use Efficiency (Ha)	0.09	2.02			0.09	2.02							0.18	4.04	0.00	0
NUH	Indri	Fisheries Water Use Efficiency (Ha)	0.91	20.23			0.91	20.23							1.82	40.46	0.00	0
NUH	Nagina	Fisheries Water Use Efficiency (Ha)	0.45	10.12			0.45	10.12							0.90	20.24	0.00	0
NUH	Nuh	Fisheries Water Use Efficiency (Ha)	0.91	20.23			0.91	20.23							1.82	40.46	0.00	0
NUH	Taoru	Fisheries Water Use Efficiency (Ha)	0.09	2.02			0.09	2.02							0.18	4.04	0.00	0
NUH	Punhana	Fisheries Water Use Efficiency (Ha)	0.45	10.12			0.45	10.12							0.90	20.24	0.00	0
NUH	F.P.Jhirka	Groundwater Recharge* (No.)	1.92		81		3.22		54		4.90		108		10.04	0.00	243.00	0
NUH	Indri	Groundwater Recharge* (No.)	10.59		254		17.16		379		24.31		537		52.06	0.00	1170.00	0
NUH	Nagina	Groundwater Recharge* (No.)	4.08		104		6.60		140		11.47		253		22.14	0.00	497.00	0
NUH	Nuh	Groundwater Recharge* (No.)	2.99		182		6.04		97		6.81		142		15.84	0.00	421.00	0
NUH	Pinangwan	Groundwater Recharge* (No.)	7.99		197		12.08		267		16.39		362		36.45	0.00	826.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
NUH	Taoru	Groundwater Recharge* (No.)	3.00		105		4.87		108		6.83		151		14.71	0.00	364.00	0
NUH	Punhana	Groundwater Recharge* (No.)	8.96		48		0.00		0		0.05		0		9.01	0.00	48.00	0
NUH	F.P.Jhirka	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
NUH	Indri	Micro Irrigation (Ha)	0.00	2032.00			0.00	1075.00			0.00	1470.00			0.00	4577.00	0.00	0
NUH	Nagina	Micro Irrigation (Ha)	0.00				0.00	650.80			0.00	650.80			0.00	1301.60	0.00	0
NUH	Nuh	Micro Irrigation (Ha)	0.00	666.30			0.00	835.80			0.00	891.00			0.00	2393.10	0.00	0
NUH	Pinangwan	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
NUH	Taoru	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
NUH	Punhana	Micro Irrigation (Ha)	0.00				0.00				0.00				0.00	0.00	0.00	0
NUH	Indri	Modernization of Channels and Water Courses (Ha.)	0.34	11330.00											0.34	11330.00	0.00	0
NUH	Nagina	Modernization of Channels and Water Courses (Ha.)	0.30	1735.00			1.21	1450.00			0.00				1.50	3185.00	0.00	0
NUH	Nuh	Modernization of Channels and Water Courses (Ha.)	0.49	3659.00			0.00				2.62	952.00			3.11	4611.00	0.00	0
NUH	Pinangwan	Modernization of Channels and Water Courses (Ha.)					0.17				0.26	1095.00			0.43	1095.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
NUH	F.P.Jhirka	Pond Rejuvenation (No.)	0.05		6		0.00		1		0.01		2		0.06	0.00	9.00	0
NUH	Indri	Pond Rejuvenation (No.)	0.02		2		0.03		3		0.05		6		0.10	0.00	11.00	0
NUH	Nagina	Pond Rejuvenation (No.)	0.01		1		0.02		6		0.16		7		0.19	0.00	14.00	0
NUH	Nuh	Pond Rejuvenation (No.)	0.06		4		0.08		9		0.20		13		0.35	0.00	26.00	0
NUH	Pinangwan	Pond Rejuvenation (No.)	0.01		2		0.07		8		0.00				0.08	0.00	10.00	0
NUH	Taoru	Pond Rejuvenation (No.)	0.01		2		0.02		4		0.03		3		0.05	0.00	9.00	0
NUH	Punhana	Pond Rejuvenation (No.)	0.20		13		0.08		14		0.17		7		0.44	0.00	34.00	0
NUH	F.P.Jhirka	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.01	0.00	0.00	0
NUH	Nagina	Reuse of Treated Waste Water (MCM)													0.00	0.00	0.00	0
NUH	Nuh	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.01	0.00	0.00	0
NUH	Pinangwan	Reuse of Treated Waste Water (MCM)													0.00	0.00	0.00	0
NUH	Taoru	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.01	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
NUH	Punhana	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.01	0.00	0.00	0
NUH	F.P.Jhirka	Varietal interventions (Ha)	0.60	10000.00			0.60	10000.00			0.60	10000.00			1.80	30000.00	0.00	0
NUH	Indri	Varietal interventions (Ha)	0.60	10000.00			0.60	10000.00			0.60	10000.00			1.80	30000.00	0.00	0
NUH	Nagina	Varietal interventions (Ha)	0.60	10000.00			0.60	10000.00			0.60	10000.00			1.80	30000.00	0.00	0
NUH	Nuh	Varietal interventions (Ha)	0.60	10000.00			0.60	10000.00			0.60	10000.00			1.80	30000.00	0.00	0
NUH	Pinangwan	Varietal interventions (Ha)	0.60	10000.00			0.60	10000.00			0.60	10000.00			1.80	30000.00	0.00	0
NUH	Taoru	Varietal interventions (Ha)	0.60	10000.00			0.60	10000.00			0.60	10000.00			1.80	30000.00	0.00	0
NUH	Punhana	Varietal interventions (Ha)	0.60	10000.00			0.60	10000.00			0.60	10000.00			1.80	30000.00	0.00	0
PALWAL	Palwal	Conservation Tillage (Ha)	0.33	1215.00			0.35	1275.75			0.36	1336.50			1.04	3827.25	0.00	0
PALWAL	Hassanpur	Conservation Tillage (Ha)	0.11	405.00			0.12	445.50			0.13	486.00			0.36	1336.50	0.00	0
PALWAL	Badoli	Conservation Tillage (Ha)	0.33	1215.00			0.35	1275.75			0.36	1336.50			1.04	3827.25	0.00	0
PALWAL	Hathin	Conservation Tillage (Ha)	0.33	1215.00			0.35	1275.75			0.36	1336.50			1.04	3827.25	0.00	0
PALWAL	Prithla	Conservation Tillage (Ha)	0.33	1215.00			0.35	1275.75			0.36	1336.50			1.04	3827.25	0.00	0
PALWAL	Hodal	Conservation Tillage (Ha)	0.33	1215.00			0.35	1275.75			0.36	1336.50			1.04	3827.25	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
PALWAL	Palwal	Crop Diversification (Ha)	7.01	934.40			12.02	1603.00			16.49	2199.00			35.52	4736.40	0.00	0
PALWAL	Hassanpur	Crop Diversification (Ha)	0.41	54.50			0.41	55.00			0.41	55.00			1.23	164.50	0.00	0
PALWAL	Badoli	Crop Diversification (Ha)	3.45	460.25			4.85	647.00			7.34	978.00			15.64	2085.25	0.00	0
PALWAL	Hathin	Crop Diversification (Ha)	0.41	54.50			0.41	55.00			0.41	55.00			1.23	164.50	0.00	0
PALWAL	Prithla	Crop Diversification (Ha)	4.31	575.25			6.59	878.00			9.17	1222.00			20.06	2675.25	0.00	0
PALWAL	Hodal	Crop Diversification (Ha)	0.41	54.50			0.41	55.00			0.98	130.00			1.80	239.50	0.00	0
PALWAL	Palwal	Direct Seeded Rice (Ha)	0.00	0.00			0.08	44.55			0.11	60.75			0.20	105.30	0.00	0
PALWAL	Hassanpur	Direct Seeded Rice (Ha)	0.00	0.00			0.02	10.13			0.04	20.25			0.06	30.38	0.00	0
PALWAL	Badoli	Direct Seeded Rice (Ha)	0.00	0.00			0.03	17.01			0.05	24.30			0.08	41.31	0.00	0
PALWAL	Hathin	Direct Seeded Rice (Ha)	0.00	0.00			0.02	10.13			0.05	28.35			0.07	38.48	0.00	0
PALWAL	Prithla	Direct Seeded Rice (Ha)	0.00	0.00			0.06	30.38			0.08	40.50			0.13	70.88	0.00	0
PALWAL	Hodal	Direct Seeded Rice (Ha)	0.00	0.00			0.03	15.39			0.05	28.35			0.08	43.74	0.00	0
PALWAL	Palwal	Groundwater Recharge* (No.)	0.05		2		0.08		2		0.00		2		0.13	0.00	6.00	0
PALWAL	Hassanpur	Groundwater Recharge* (No.)	0.00		2		0.00		2		0.01		2		0.02	0.00	6.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
PALWAL	Badoli	Groundwater Recharge* (No.)	0.00				0.00								0.00	0.00	0.00	0
PALWAL	Hathin	Groundwater Recharge* (No.)	0.51		2		0.73		3		0.01		3		1.25	0.00	8.00	0
PALWAL	Prithla	Groundwater Recharge* (No.)	0.00				0.00								0.00	0.00	0.00	0
PALWAL	Hodal	Groundwater Recharge* (No.)	0.00		2		0.02		8		0.01		6		0.03	0.00	16.00	0
PALWAL	Palwal	Micro Irrigation (Ha)	0.18	218.69			0.60	495.48			0.81	892.38			1.59	1606.55	0.00	0
PALWAL	Hassanpur	Micro Irrigation (Ha)	0.18	217.07			0.49	329.43			0.48	362.64			1.14	909.14	0.00	0
PALWAL	Badoli	Micro Irrigation (Ha)	0.27	170.48			0.83	415.45			0.87	633.96			1.96	1219.89	0.00	0
PALWAL	Hathin	Micro Irrigation (Ha)	0.51	231.21			1.23	517.28			0.73	597.34			2.46	1345.82	0.00	0
PALWAL	Prithla	Micro Irrigation (Ha)	0.11	95.58			0.44	248.44			0.48	395.86			1.02	739.87	0.00	0
PALWAL	Hodal	Micro Irrigation (Ha)	0.32	252.70			0.93	580.50			0.98	935.30			2.23	1768.50	0.00	0
PALWAL	Palwal	Modernization of Channels and Water Courses (Ha.)	1.01	66.25			0.16	132.51			0.21	198.76			1.39	397.52	0.00	0
PALWAL	Hassanpur	Modernization of Channels and Water Courses (Ha.)	0.05	49.03			0.43	98.05			0.16	147.08			0.64	294.16	0.00	0
PALWAL	Badoli	Modernization of Channels and Water Courses (Ha.)	0.04	35.93			0.35	71.86			0.12	107.78			0.50	215.57	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
PALWAL	Hathin	Modernization of Channels and Water Courses (Ha.)	0.38	308.13			0.87	616.26			1.61	924.39			2.87	1848.78	0.00	0
PALWAL	Prithla	Modernization of Channels and Water Courses (Ha.)	0.00	0.58			0.00	1.17			0.00	1.75			0.00	3.50	0.00	0
PALWAL	Hodal	Modernization of Channels and Water Courses (Ha.)	0.12	110.30			0.24	220.61			0.36	330.91			0.71	661.82	0.00	0
PALWAL	Palwal	Pond Rejuvenation (No.)	0.25		12		0.25		12		0.25		12		0.74	0.00	36.00	0
PALWAL	Hassanpur	Pond Rejuvenation (No.)	0.05		17		0.05		17		0.05		17		0.14	0.00	51.00	0
PALWAL	Badoli	Pond Rejuvenation (No.)	0.02		9		0.02		9		0.02		9		0.06	0.00	27.00	0
PALWAL	Hathin	Pond Rejuvenation (No.)	0.09		15		0.09		15		0.09		15		0.27	0.00	45.00	0
PALWAL	Prithla	Pond Rejuvenation (No.)	0.03		6		0.03		6		0.03		6		0.08	0.00	18.00	0
PALWAL	Hodal	Pond Rejuvenation (No.)	0.08		16		0.09		16		0.09		16		0.25	0.00	48.00	0
PALWAL	Palwal	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
PALWAL	Hassanpur	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
PALWAL	Badoli	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
PALWAL	Hathin	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
PALWAL	Prithla	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
PALWAL	Hodal	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
PALWAL	Palwal	Varietal interventions (Ha)	0.60	4050.00			0.63	4252.50			0.66	4455.00			1.89	12757.50	0.00	0
PALWAL	Hassanpur	Varietal interventions (Ha)	0.30	2025.00			0.32	2126.25			0.33	2227.50			0.95	6378.75	0.00	0
PALWAL	Badoli	Varietal interventions (Ha)	0.60	4050.00			0.63	4252.50			0.66	4455.00			1.89	12757.50	0.00	0
PALWAL	Hathin	Varietal interventions (Ha)	0.60	4050.00			0.63	4252.50			0.66	4455.00			1.89	12757.50	0.00	0
PALWAL	Prithla	Varietal interventions (Ha)	0.60	4050.00			0.63	4252.50			0.66	4455.00			1.89	12757.50	0.00	0
PALWAL	Hodal	Varietal interventions (Ha)	0.60	4050.00			0.63	4252.50			0.66	4455.00			1.89	12757.50	0.00	0
PANCHKULA	Pinjore	Crop Diversification (Ha)	0.46	60.00			0.77	100.00			1.16	150.00			2.39	310.00	0.00	0
PANCHKULA	Morni	Crop Diversification (Ha)	0.10	10.00			0.21	20.00			0.31	30.00			0.62	60.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
PANCHKULA	Raipur Rani	Crop Diversification (Ha)	3.15	300.00			5.22	500.00			7.35	700.00			15.72	1500.00	0.00	0
PANCHKULA	Barwala	Crop Diversification (Ha)	3.15	300.00			4.73	450.00			6.30	600.00			14.18	1350.00	0.00	0
PANCHKULA	Pinjore	Groundwater Recharge* (No.)	2.93		97		3.82		90		21.72		99		28.47	0.00	286.00	0
PANCHKULA	Morni	Groundwater Recharge* (No.)	20.51		103		20.75		123		1.55		145		42.81	0.00	371.00	0
PANCHKULA	Raipur Rani	Groundwater Recharge* (No.)	22.98		67		21.72		90		2.69		88		47.39	0.00	245.00	0
PANCHKULA	Barwala	Groundwater Recharge* (No.)	46.47		92		44.38		99		2.08		87		92.93	0.00	278.00	0
PANCHKULA	Pinjore	Micro Irrigation (Ha)													0.00	0.00	0.00	0
PANCHKULA	Morni	Micro Irrigation (Ha)	1.80				1.80				1.80				5.40	0.00	0.00	0
PANCHKULA	Raipur Rani	Micro Irrigation (Ha)	1.15				0.69								1.84	0.00	0.00	0
PANCHKULA	Barwala	Micro Irrigation (Ha)													0.00	0.00	0.00	0
PANCHKULA	Pinjore	Reuse of Treated Waste Water (MCM)	2.53			2.53	2.54			2.54	2.54			2.54	7.61	0.00	0.00	8
PANCHKULA	Morni	Reuse of Treated Waste Water (MCM)													0.00	0.00	0.00	0
PANCHKULA	Raipur Rani	Reuse of Treated Waste Water (MCM)													0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
PANCHKULA	Barwala	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.01	0.00	0.00	0
PANIPAT	Panipat	Check Dams (No.)	15.00				23.25				37.20				75.45	0.00	0.00	0
PANIPAT	Madlauda	Check Dams (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
PANIPAT	Samalkha	Check Dams (No.)	13.00				20.15				32.24				65.39	0.00	0.00	0
PANIPAT	Sanoli	Check Dams (No.)	5.00				7.75				12.40				25.15	0.00	0.00	0
PANIPAT	Bapoli	Check Dams (No.)	9.00				13.00				17.00				39.00	0.00	0.00	0
PANIPAT	Panipat	Crop Diversification (Ha)	3.00	500.00			3.00	500.00			3.00	500.00			9.00	1500.00	0.00	0
PANIPAT	Israna	Crop Diversification (Ha)	1.20	200.00			1.20	200.00			1.20	200.00			3.60	600.00	0.00	0
PANIPAT	Madlauda	Crop Diversification (Ha)	1.32	110.00			1.32	110.00			1.32	110.00			3.96	330.00	0.00	0
PANIPAT	Samalkha	Crop Diversification (Ha)	0.66	110.00			0.66	110.00			0.66	110.00			1.98	330.00	0.00	0
PANIPAT	Sanoli	Crop Diversification (Ha)	0.36	60.00			0.36	60.00			0.36	60.00			1.08	180.00	0.00	0
PANIPAT	Bapoli	Crop Diversification (Ha)	0.37	62.00			0.37	62.00			0.37	62.00			1.12	186.00	0.00	0
PANIPAT	Panipat	Direct Seeded Rice (Ha)	3.01	1620.00			3.01	1620.00			3.01	1620.00			9.04	4860.00	0.00	0
PANIPAT	Israna	Direct Seeded Rice (Ha)	0.53	283.50			0.53	283.50			0.53	283.50			1.58	850.50	0.00	0
PANIPAT	Madlauda	Direct Seeded Rice (Ha)	0.15	81.00			0.15	81.00			0.15	81.00			0.45	243.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
PANIPAT	Samalkha	Direct Seeded Rice (Ha)	0.45	243.00			0.45	243.00			0.45	243.00			1.36	729.00	0.00	0
PANIPAT	Sanoli	Direct Seeded Rice (Ha)	0.23	121.50			0.23	121.50			0.23	121.50			0.68	364.50	0.00	0
PANIPAT	Bapoli	Direct Seeded Rice (Ha)	0.15	81.00			0.15	81.00			0.15	81.00			0.45	243.00	0.00	0
PANIPAT	Panipat	Groundwater Recharge* (No.)	2.00		7		2.20		7		2.44		7		6.64	0.00	21.00	0
PANIPAT	Israna	Groundwater Recharge* (No.)	0.05		25		0.01		25		0.01		25		0.07	0.00	75.00	0
PANIPAT	Madlauda	Groundwater Recharge* (No.)	0.13		5		0.02		5		0.02		5		0.16	0.00	15.00	0
PANIPAT	Samalkha	Groundwater Recharge* (No.)	0.04		5		0.01		5		0.01		5		0.06	0.00	15.00	0
PANIPAT	Sanoli	Groundwater Recharge* (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
PANIPAT	Bapoli	Groundwater Recharge* (No.)	0.03		3		0.01		3		0.01		3		0.05	0.00	9.00	0
PANIPAT	Panipat	Micro Irrigation (Ha)	3.00	1000.00			6.00	1000.00			5.00	1000.00			14.00	3000.00	0.00	0
PANIPAT	Israna	Micro Irrigation (Ha)	0.05	185.00			0.03	179.00			0.14	405.00			0.22	769.00	0.00	0
PANIPAT	Madlauda	Micro Irrigation (Ha)	2.00	155.00			3.00	155.00			4.00	500.00			9.00	810.00	0.00	0
PANIPAT	Samalkha	Micro Irrigation (Ha)	4.00	2000.00			6.50	2000.00			8.00	1000.00			18.50	5000.00	0.00	0
PANIPAT	Sanoli	Micro Irrigation (Ha)	5.50	2000.00			6.00	2000.00			6.00	2000.00			17.50	6000.00	0.00	0
PANIPAT	Bapoli	Micro Irrigation (Ha)	5.50	2000.00			8.00	2000.00			9.00	2000.00			22.50	6000.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
PANIPAT	Panipat	Modernization of Channels and Water Courses (Ha.)	2.00	13457.00			2.30	14069.00			2.40	14681.00			6.70	42207.00	0.00	0
PANIPAT	Israna	Modernization of Channels and Water Courses (Ha.)	15.50	36905.00			20.73	38446.00			24.80	39988.00			61.03	115339.00	0.00	0
PANIPAT	Madlauda	Modernization of Channels and Water Courses (Ha.)	17.00	33230.00			23.45	34626.00			30.60	36023.00			71.05	103879.00	0.00	0
PANIPAT	Samalkha	Modernization of Channels and Water Courses (Ha.)	4.00	9939.00			4.30	10368.00			4.40	10797.00			12.70	31104.00	0.00	0
PANIPAT	Sanoli	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
PANIPAT	Bapoli	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
PANIPAT	Panipat	Pond Rejuvenation (No.)	0.05		11		0.05		11		0.05		11		0.15	0.00	33.00	0
PANIPAT	Israna	Pond Rejuvenation (No.)	0.02		7		0.02		7		0.02		7		0.07	0.00	21.00	0
PANIPAT	Madlauda	Pond Rejuvenation (No.)	0.05		11		0.05		11		0.05		11		0.14	0.00	33.00	0
PANIPAT	Samalkha	Pond Rejuvenation (No.)	0.07		22		0.07		22		0.07		22		0.20	0.00	66.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
PANIPAT	Sanoli	Pond Rejuvenation (No.)	0.02		5		0.02		5		0.02		5		0.06	0.00	15.00	0
PANIPAT	Bapoli	Pond Rejuvenation (No.)	0.05		19		0.05		19		0.05		19		0.14	0.00	57.00	0
PANIPAT	Panipat	Reuse of Treated Waste Water (MCM)	9.15			9.15	13.73			13.73	20.60			20.60	43.48	0.00	0.00	43
PANIPAT	Israna	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
PANIPAT	Madlauda	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
PANIPAT	Samalkha	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
PANIPAT	Sanoli	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
PANIPAT	Bapoli	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
REWARI	Jatusana	Crop Diversification (Ha)	2.50	500.00			2.50	500.00			2.50	500.00			7.50	1500.00	0.00	0
REWARI	Dahina	Crop Diversification (Ha)	0.50	100.00			0.50	100.00			0.50	100.00			1.50	300.00	0.00	0
REWARI	Khol	Crop Diversification (Ha)	0.25	50.00			0.25	50.00			0.25	50.00			0.75	150.00	0.00	0
REWARI	Rewari	Crop Diversification (Ha)	1.50	300.00			1.50	300.00			1.50	300.00			4.50	900.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
REWARI	Nahar	Crop Diversification (Ha)	0.25	50.00			0.25	50.00			0.25	50.00			0.75	150.00	0.00	0
REWARI	Bawal	Crop Diversification (Ha)	0.50	100.00			0.50	100.00			0.50	100.00			1.50	300.00	0.00	0
REWARI	Dharuhera	Crop Diversification (Ha)	0.40	80.00			0.40	80.00			0.40	80.00			1.20	240.00	0.00	0
REWARI	Jatusana	Groundwater Recharge* (No.)	0.72		133		2.45		60		2.48		78		5.65	0.00	271.00	0
REWARI	Dahina	Groundwater Recharge* (No.)	1.22		25		0.55		6		9.70		25		11.47	0.00	56.00	0
REWARI	Khol	Groundwater Recharge* (No.)	0.19		49		0.10		81		0.13		45		0.42	0.00	175.00	0
REWARI	Rewari	Groundwater Recharge* (No.)	1.16		171		1.70		171		1.03		105		3.89	0.00	447.00	0
REWARI	Nahar	Groundwater Recharge* (No.)	0.77		195		2.65		201		2.85		201		6.27	0.00	597.00	0
REWARI	Bawal	Groundwater Recharge* (No.)	1.00		119		0.64		67		1.77		54		3.41	0.00	240.00	0
REWARI	Dharuhera	Groundwater Recharge* (No.)	0.62		30		0.50		8		1.30		19		2.42	0.00	57.00	0
REWARI	Jatusana	Micro Irrigation (Ha)	1.89	107.00			1.24	250.00			5.24	300.00			8.37	657.00	0.00	0
REWARI	Dahina	Micro Irrigation (Ha)	3.43	368.00			6.48	580.00			6.79	538.00			16.70	1486.00	0.00	0
REWARI	Khol	Micro Irrigation (Ha)	3.75	0.00			3.92	0.00			7.09	0.00			14.76	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
REWARI	Rewari	Micro Irrigation (Ha)	4.48	310.00			4.23	115.00			5.42	763.00			14.13	1188.00	0.00	0
REWARI	Nahar	Micro Irrigation (Ha)	5.26	234.00			2.62	270.00			5.20	415.00			13.08	919.00	0.00	0
REWARI	Bawal	Micro Irrigation (Ha)	5.00	439.00			2.63	283.00			5.81	283.00			13.44	1005.00	0.00	0
REWARI	Dharuhera	Micro Irrigation (Ha)	2.29	118.00			1.54	0.00			2.26	268.00			6.09	386.00	0.00	0
REWARI	Jatusana	Modernization of Channels and Water Courses (Ha.)	2.48	1677.00			1.41	2001.00			0.00	0.00			3.89	3678.00	0.00	0
REWARI	Dahina	Modernization of Channels and Water Courses (Ha.)	0.01	0.00			0.14	387.00			1.53	1321.00			1.68	1708.00	0.00	0
REWARI	Khol	Modernization of Channels and Water Courses (Ha.)	0.00				0.26				0.00				0.26	0.00	0.00	0
REWARI	Rewari	Modernization of Channels and Water Courses (Ha.)	0.49	2140.00			0.58	367.00			3.32	2510.00			4.38	5017.00	0.00	0
REWARI	Nahar	Modernization of Channels and Water Courses (Ha.)	1.17	1586.00			0.13	513.00			0.00	190.00			1.29	2289.00	0.00	0
REWARI	Bawal	Modernization of Channels and Water Courses (Ha.)	2.79	5746.00			3.72	8786.00			1.28	1310.00			7.79	15842.00	0.00	0
REWARI	Dharuhera	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
REWARI	Jatusana	Pond Rejuvenation (No.)	0.10		15		0.95		30		1.20		20		2.25	0.00	65.00	0
REWARI	Dahina	Pond Rejuvenation (No.)	2.90		9		7.01		7		0.00		0		9.91	0.00	16.00	0
REWARI	Khol	Pond Rejuvenation (No.)	0.05		10		0.60		15		0.70		15		1.35	0.00	40.00	0
REWARI	Rewari	Pond Rejuvenation (No.)	0.01		4		0.00		0		0.00		0		0.01	0.00	4.00	0
REWARI	Nahar	Pond Rejuvenation (No.)	0.20		22		0.80		37		0.90		2		1.90	0.00	61.00	0
REWARI	Bawal	Pond Rejuvenation (No.)	0.05		5		0.08		5		0.08		12		0.21	0.00	22.00	0
REWARI	Dharuhera	Pond Rejuvenation (No.)	1.00		10		3.30		15		3.90		15		8.20	0.00	40.00	0
REWARI	Jatusana	Reuse of Treated Waste Water (MCM)	0.04			0.04	0.45			0.45	0.50			0.50	0.99	0.00	0.00	1
REWARI	Dahina	Reuse of Treated Waste Water (MCM)	0.68			0.68	0.30			0.30	0.13			0.13	1.11	0.00	0.00	1
REWARI	Khol	Reuse of Treated Waste Water (MCM)	0.93			0.93	0.06			0.06	0.00			0.00	0.99	0.00	0.00	1
REWARI	Rewari	Reuse of Treated Waste Water (MCM)	0.46			0.46	1.46			1.46	0.37			0.37	2.29	0.00	0.00	2
REWARI	Nahar	Reuse of Treated Waste Water (MCM)	0.13			0.13	0.46			0.46	0.13			0.13	0.72	0.00	0.00	1

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
REWARI	Bawal	Reuse of Treated Waste Water (MCM)	1.83			1.83	4.40			4.40	5.51			5.51	11.74	0.00	0.00	12
REWARI	Dharuhera	Reuse of Treated Waste Water (MCM)	0.10			0.10	0.17			0.17	0.11			0.11	0.39	0.00	0.00	0
ROHTAK	Rohtak	Crop Diversification (Ha)	1.20	205.00			12.00	1288.00			24.00	2491.00			37.20	3984.00	0.00	0
ROHTAK	Maham	Crop Diversification (Ha)	1.00	171.00			5.00	573.00			10.00	1075.00			16.00	1819.00	0.00	0
ROHTAK	Sampla	Crop Diversification (Ha)	0.70	109.00			2.00	241.00			4.00	441.00			6.70	791.00	0.00	0
ROHTAK	Kalanaur	Crop Diversification (Ha)	0.90	166.00			2.00	278.00			4.00	480.00			6.90	924.00	0.00	0
ROHTAK	Lakhan Majra	Crop Diversification (Ha)	0.50	62.00			4.00	414.00			8.00	817.00			12.50	1293.00	0.00	0
ROHTAK	Rohtak	Direct Seeded Rice (Ha)	0.58	232.00			3.75	1500.00			7.50	3000.00			11.83	4732.00	0.00	0
ROHTAK	Maham	Direct Seeded Rice (Ha)	0.68	272.00			2.50	1000.00			5.00	2000.00			8.18	3272.00	0.00	0
ROHTAK	Sampla	Direct Seeded Rice (Ha)	0.27	109.00			1.00	400.00			2.00	800.00			3.27	1309.00	0.00	0
ROHTAK	Kalanaur	Direct Seeded Rice (Ha)	0.69	276.00			1.25	500.00			2.50	1000.00			4.44	1776.00	0.00	0
ROHTAK	Lakhan Majra	Direct Seeded Rice (Ha)	0.16	66.00			1.75	700.00			3.50	1400.00			5.41	2166.00	0.00	0
ROHTAK	Rohtak	Groundwater Recharge* (No.)	0.07		2		0.03		1		0.37		1		0.48	0.00	4.00	0
ROHTAK	Maham	Groundwater Recharge* (No.)	0.34		7		0.33		8		0.80		8		1.46	0.00	23.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
ROHTAK	Sampla	Groundwater Recharge* (No.)	0.02		2		0.01		1		0.04		1		0.07	0.00	4.00	0
ROHTAK	Kalanaur	Groundwater Recharge* (No.)	0.41		7		0.48		6		0.74		6		1.63	0.00	19.00	0
ROHTAK	Lakhan Majra	Groundwater Recharge* (No.)	0.03		2		0.03		1		0.03		1		0.08	0.00	4.00	0
ROHTAK	Rohtak	Micro Irrigation (Ha)	0.98	146.06			0.99	0.00			1.00	0.00			2.98	146.06	0.00	0
ROHTAK	Maham	Micro Irrigation (Ha)	0.67	74.87			0.68	0.00			0.69	0.00			2.05	74.87	0.00	0
ROHTAK	Sampla	Micro Irrigation (Ha)	0.43	94.00			0.43	0.00			0.44	0.00			1.30	94.00	0.00	0
ROHTAK	Kalanaur	Micro Irrigation (Ha)	0.64	100.77			0.65	0.00			0.65	0.00			1.94	100.77	0.00	0
ROHTAK	Lakhan Majra	Micro Irrigation (Ha)	0.26	26.00			1.09	195.05			1.12	0.00			2.46	221.05	0.00	0
ROHTAK	Rohtak	Modernization of Channels and Water Courses (Ha.)	0.76	1438.00			7.11	2227.00			8.35	1011.00			16.22	4676.00	0.00	0
ROHTAK	Maham	Modernization of Channels and Water Courses (Ha.)	3.85	1872.00			10.24	3273.00			10.24	0.00			24.33	5145.00	0.00	0
ROHTAK	Sampla	Modernization of Channels and Water Courses (Ha.)	0.21	347.00			1.71	1431.00			1.71	0.00			3.63	1778.00	0.00	0
ROHTAK	Kalanaur	Modernization of Channels and Water Courses (Ha.)	8.64	8355.00			12.10	2573.00			12.10	0.00			32.84	10928.00	0.00	0
ROHTAK	Lakhan Majra	Modernization of Channels	1.83	782.00			4.34	1066.00			17.10	5433.00			23.27	7281.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
		and Water Courses (Ha.)																
ROHTAK	Rohtak	Pond Rejuvenation (No.)													0.00	0.00	0.00	0
ROHTAK	Maham	Pond Rejuvenation (No.)													0.00	0.00	0.00	0
ROHTAK	Sampla	Pond Rejuvenation (No.)													0.00	0.00	0.00	0
ROHTAK	Kalanaur	Pond Rejuvenation (No.)													0.00	0.00	0.00	0
ROHTAK	Lakhan Majra	Pond Rejuvenation (No.)													0.00	0.00	0.00	0
ROHTAK	Rohtak	Reuse of Treated Waste Water (MCM)	0.00			0.00	2.80			2.80	2.80			2.80	5.59	0.00	0.00	6
ROHTAK	Maham	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.01	0.00	0.00	0
ROHTAK	Sampla	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.01			0.01	0.01			0.01	0.02	0.00	0.00	0
ROHTAK	Kalanaur	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.01	0.00	0.00	0
ROHTAK	Lakhan Majra	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
SIRSA	Raina	Conservation Tillage (Ha)	3.30	4593.00			4.04	5706.00			4.32	6200.00			11.66	16499.00	0.00	0
SIRSA	Ellenabad	Conservation Tillage (Ha)	2.10	3451.00			2.51	4057.00			2.66	4283.00			7.27	11791.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
SIRSA	Baragudha	Conservation Tillage (Ha)	2.22	3991.00			3.45	4493.00			5.07	7332.00			10.74	15816.00	0.00	0
SIRSA	Nathusari Chopta	Conservation Tillage (Ha)	2.35	3727.00			3.21	4956.00			3.88	6991.00			9.44	15674.00	0.00	0
SIRSA	Odhan	Conservation Tillage (Ha)	3.07	4861.00				5791.00			3.88	7052.00			6.95	17704.00	0.00	0
SIRSA	Sirsa	Conservation Tillage (Ha)	2.21	3972.00			2.74	4660.00			2.92	4905.00			7.87	13537.00	0.00	0
SIRSA	Dabwali	Conservation Tillage (Ha)	6.35	4681.00			6.86	4813.00			8.21	6318.00			21.42	15812.00	0.00	0
SIRSA	Raina	Construction of Trenches in Kharif Channel (No.)													0.00	0.00	0.00	0
SIRSA	Ellenabad	Construction of Trenches in Kharif Channel (No.)													0.00	0.00	0.00	0
SIRSA	Baragudha	Construction of Trenches in Kharif Channel (No.)													0.00	0.00	0.00	0
SIRSA	Nathusari Chopta	Construction of Trenches in Kharif Channel (No.)			20				41				50		0.00	0.00	111.00	0
SIRSA	Odhan	Construction of Trenches in Kharif Channel (No.)			0				35				60		0.00	0.00	95.00	0
SIRSA	Sirsa	Construction of Trenches in Kharif Channel (No.)			0				0				20		0.00	0.00	20.00	0
SIRSA	Dabwali	Construction of Trenches in													0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
		Kharif Channel (No.)																
SIRSA	Raina	Crop Diversification (Ha)	4.64	1063.00			5.25	1222.00			5.78	1358.00			15.67	3643.00	0.00	0
SIRSA	Ellenabad	Crop Diversification (Ha)	2.10	461.00			2.32	509.00			2.58	580.00			7.00	1550.00	0.00	0
SIRSA	Baragudha	Crop Diversification (Ha)	2.57	567.00			3.85	850.00			5.14	1348.00			11.56	2765.00	0.00	0
SIRSA	Nathusari Chopta	Crop Diversification (Ha)	1.37	480.00			2.48	629.00			4.12	1029.00			7.97	2138.00	0.00	0
SIRSA	Odhan	Crop Diversification (Ha)	1.90	201.00			3.03	231.00			4.50	241.00			9.43	673.00	0.00	0
SIRSA	Sirsa	Crop Diversification (Ha)	3.04	1551.00			3.89	1784.00			5.37	1261.00			12.30	4596.00	0.00	0
SIRSA	Dabwali	Crop Diversification (Ha)	4.92	711.00			7.10	841.00			11.87	877.00			23.89	2429.00	0.00	0
SIRSA	Raina	Direct Seeded Rice (Ha)	2.46	1025.00			5.90	2083.00			7.70	2480.00			16.06	5588.00	0.00	0
SIRSA	Ellenabad	Direct Seeded Rice (Ha)	0.94	398.00			1.72	716.00			2.01	801.00			4.67	1915.00	0.00	0
SIRSA	Baragudha	Direct Seeded Rice (Ha)	2.15	895.00			3.54	1908.00			4.90	2637.00			10.59	5440.00	0.00	0
SIRSA	Nathusari Chopta	Direct Seeded Rice (Ha)	3.45	1437.00			5.70	2375.00			7.84	3267.00			16.99	7079.00	0.00	0
SIRSA	Odhan	Direct Seeded Rice (Ha)	2.45	1046.00			4.70	1745.00			6.02	2506.00			13.17	5297.00	0.00	0
SIRSA	Sirsa	Direct Seeded Rice (Ha)	2.12	2122.00			5.38	2242.00			9.64	4002.00			17.14	8366.00	0.00	0
SIRSA	Dabwali	Direct Seeded Rice (Ha)	4.50	1875.00			8.74	3629.00			12.62	5248.00			25.86	10752.00	0.00	0

District	Block	Proposed Interventions	2023-24				2024-25				2025-26				2023-26			
			Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
SIRSA	Raina	Groundwater Recharge* (No.)	0.78		25		1.45		63		1.49		76		3.72	0.00	164.00	0
SIRSA	Ellenabad	Groundwater Recharge* (No.)	0.63		28		0.85		54		1.54		60		3.02	0.00	142.00	0
SIRSA	Baragudha	Groundwater Recharge* (No.)	1.25		55		0.31		50		0.42		70		1.97	0.00	175.00	0
SIRSA	Nathusari Chopta	Groundwater Recharge* (No.)	1.00		29		1.10		35		1.20		42		3.30	0.00	106.00	0
SIRSA	Odhan	Groundwater Recharge* (No.)	1.05		48		1.37		63		1.44		81		3.86	0.00	192.00	0
SIRSA	Sirsa	Groundwater Recharge* (No.)	0.83		47		1.29		68		1.55		36		3.67	0.00	151.00	0
SIRSA	Dabwali	Groundwater Recharge* (No.)	0.96		34		1.30		29		1.50		33		3.76	0.00	96.00	0
SIRSA	Raina	Micro Irrigation (Ha)	2.97	1079.00			3.42	1240.00			3.56	1293.00			9.95	3612.00	0.00	0
SIRSA	Ellenabad	Micro Irrigation (Ha)	2.41	795.00			3.00	1023.00			2.85	1102.00			8.26	2920.00	0.00	0
SIRSA	Baragudha	Micro Irrigation (Ha)	3.66	1274.00			4.20	1465.00			5.39	1650.00			13.25	4389.00	0.00	0
SIRSA	Nathusari Chopta	Micro Irrigation (Ha)	4.10	1393.00			4.79	1574.00			6.39	2221.00			15.28	5188.00	0.00	0
SIRSA	Odhan	Micro Irrigation (Ha)	3.37	1163.00			3.83	1338.00			4.07	1399.00			11.27	3900.00	0.00	0
SIRSA	Sirsa	Micro Irrigation (Ha)	3.61	1257.00			3.90	1696.00			5.13	2021.00			12.64	4974.00	0.00	0
SIRSA	Dabwali	Micro Irrigation (Ha)	4.03	1742.00			5.02	2004.00			5.33	2080.00			14.38	5826.00	0.00	0
SIRSA	Raina	Modernization of Channels	2.02	1501.00			2.85	2743.00			7.90	8399.00			12.76	12643.00		0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
		and Water Courses (Ha.)																
SIRSA	Raina	Modernization of Channels and Water Courses (Ha.)													0.00	0.00		0
SIRSA	Ellenabad	Modernization of Channels and Water Courses (Ha.)	0.93	286.00			2.00	767.00			2.17	287.00			5.10	1340.00		0
SIRSA	Ellenabad	Modernization of Channels and Water Courses (Ha.)													0.00	0.00		0
SIRSA	Baragudha	Modernization of Channels and Water Courses (Ha.)	3.01	2441.00			2.86	1415.00			2.74	78.00			8.61	3934.00		0
SIRSA	Baragudha	Modernization of Channels and Water Courses (Ha.)													0.00	0.00		0
SIRSA	Nathusari Chopta	Modernization of Channels and Water Courses (Ha.)	3.02	1734.00			5.69	2857.00			6.86	3248.00			15.57	7839.00		0
SIRSA	Nathusari Chopta	Modernization of Channels and Water Courses (Ha.)													0.00	0.00		0
SIRSA	Odhan	Modernization of Channels and Water Courses (Ha.)	2.49	855.00			4.90	932.00			8.09	3136.00			15.48	4923.00		0
SIRSA	Odhan	Modernization of Channels													0.00	0.00		0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
		and Water Courses (Ha.)																
SIRSA	Sirsa	Modernization of Channels and Water Courses (Ha.)	0.73	0.00			2.12	1985.00			3.53	1173.00			6.38	3158.00		0
SIRSA	Sirsa	Modernization of Channels and Water Courses (Ha.)													0.00	0.00		0
SIRSA	Dabwali	Modernization of Channels and Water Courses (Ha.)	4.55	1347.00			11.28	771.00			14.50	1238.00			30.33	3356.00		0
SIRSA	Dabwali	Modernization of Channels and Water Courses (Ha.)													0.00	0.00		0
SIRSA	Raina	Pond Rejuvenation (No.)	0.45		31		0.42		34		0.67		36		1.54	0.00	101.00	0
SIRSA	Ellenabad	Pond Rejuvenation (No.)	0.24		19		0.42		20		0.64		24		1.30	0.00	63.00	0
SIRSA	Baragudha	Pond Rejuvenation (No.)	0.44		35		0.44		35		0.39		30		1.26	0.00	100.00	0
SIRSA	Nathusari Chopta	Pond Rejuvenation (No.)	0.45		15		0.61		40		0.94		55		2.00	0.00	110.00	0
SIRSA	Odhan	Pond Rejuvenation (No.)	0.44		21		0.54		32		1.60		40		2.57	0.00	93.00	0
SIRSA	Sirsa	Pond Rejuvenation (No.)	0.33		22		0.46		31		0.61		11		1.40	0.00	64.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
SIRSA	Dabwali	Pond Rejuvenation (No.)	0.75		17		0.75		18		1.05		15		2.55	0.00	50.00	0
SIRSA	Raina	Reuse of Treated Waste Water (MCM)	1.50			1.50	1.60			1.60	2.40			2.40	5.50	0.00	0.00	6
SIRSA	Ellenabad	Reuse of Treated Waste Water (MCM)	2.33			2.33	2.44			2.44	2.74			2.74	7.51	0.00	0.00	8
SIRSA	Baragudha	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
SIRSA	Nathusari Chopta	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
SIRSA	Odhan	Reuse of Treated Waste Water (MCM)	1.41			1.41	2.82			2.82	3.42			3.42	7.65	0.00	0.00	8
SIRSA	Sirsa	Reuse of Treated Waste Water (MCM)	11.64			11.64	14.55			14.55	17.46			17.46	43.65	0.00	0.00	44
SIRSA	Dabwali	Reuse of Treated Waste Water (MCM)	3.67			3.67	4.51			4.51	5.68			5.68	13.86	0.00	0.00	14
SIRSA	Raina	Varietal interventions (Ha)	1.28	1782.00			1.60	2228.00			1.64	2406.00			4.52	6416.00	0.00	0
SIRSA	Ellenabad	Varietal interventions (Ha)	0.54	774.00			0.78	980.00			0.73	1019.00			2.05	2773.00	0.00	0
SIRSA	Baragudha	Varietal interventions (Ha)	0.56	775.00			0.64	892.00			0.67	927.00			1.87	2594.00	0.00	0
SIRSA	Nathusari Chopta	Varietal interventions (Ha)	0.46	635.00			0.69	952.00			0.92	1270.00			2.07	2857.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
SIRSA	Odhan	Varietal interventions (Ha)	1.27	1803.00			1.45	1902.00			1.85	3356.00			4.57	7061.00	0.00	0
SIRSA	Sirsa	Varietal interventions (Ha)	0.77	1261.00			1.22	3071.00			1.46	3323.00			3.45	7655.00	0.00	0
SIRSA	Dabwali	Varietal interventions (Ha)	1.86	1097.00			2.42	1984.00			2.29	2215.00			6.57	5296.00	0.00	0
SONIPAT	Sonipat	Conservation Tillage (Ha)	24.47	6600.00			27.20	7140.00			30.89	7980.00			82.56	21720.00	0.00	0
SONIPAT	Ganaur	Conservation Tillage (Ha)	28.37	7900.00			30.06	8270.00			31.31	8990.00			89.74	25160.00	0.00	0
SONIPAT	Gohana	Conservation Tillage (Ha)	11.39	3000.00			12.96	3480.00			13.19	3600.00			37.53	10080.00	0.00	0
SONIPAT	Kharkhoda	Conservation Tillage (Ha)	10.57	3000.00			12.66	3500.00			14.17	3800.00			37.40	10300.00	0.00	0
SONIPAT	Kathura	Conservation Tillage (Ha)	15.11	4100.00			16.33	4470.00			16.80	4600.00			48.24	13170.00	0.00	0
SONIPAT	Mundlana	Conservation Tillage (Ha)	10.52	3000.00			11.66	3200.00			12.96	3400.00			35.14	9600.00	0.00	0
SONIPAT	Rai	Conservation Tillage (Ha)	19.34	5400.00			21.29	6000.00			23.55	6700.00			64.18	18100.00	0.00	0
SONIPAT	Sonipat	Crop Diversification (Ha)	4.27	1140.00			4.74	1350.00			5.28	1500.00			14.28	3990.00	0.00	0
SONIPAT	Ganaur	Crop Diversification (Ha)	0.70	200.00			1.23	350.00			1.37	390.00			3.31	940.00	0.00	0
SONIPAT	Gohana	Crop Diversification (Ha)	0.53	150.00			1.06	300.00			1.48	420.00			3.06	870.00	0.00	0
SONIPAT	Kharkhoda	Crop Diversification (Ha)	0.53	150.00			0.88	170.00			0.98	220.00			2.39	540.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
SONIPAT	Kathura	Crop Diversification (Ha)	0.53	150.00			0.60	250.00			0.77	280.00			1.90	680.00	0.00	0
SONIPAT	Mundlana	Crop Diversification (Ha)	0.53	150.00			0.70	200.00			0.95	270.00			2.18	620.00	0.00	0
SONIPAT	Rai	Crop Diversification (Ha)	0.35	100.00			0.53	150.00			0.69	190.00			1.57	440.00	0.00	0
SONIPAT	Sonipat	Direct Seeded Rice (Ha)	1.21	690.00			1.23	700.00			1.26	720.00			3.70	2110.00	0.00	0
SONIPAT	Ganaur	Direct Seeded Rice (Ha)	1.00	570.00			1.03	590.00			1.07	610.00			3.10	1770.00	0.00	0
SONIPAT	Gohana	Direct Seeded Rice (Ha)	0.86	490.00			0.89	510.00			0.93	530.00			2.68	1530.00	0.00	0
SONIPAT	Kharkhoda	Direct Seeded Rice (Ha)	0.28	190.00			0.35	230.00			0.39	260.00			1.02	680.00	0.00	0
SONIPAT	Kathura	Direct Seeded Rice (Ha)	0.33	160.00			0.40	200.00			0.46	220.00			1.19	580.00	0.00	0
SONIPAT	Mundlana	Direct Seeded Rice (Ha)	0.47	270.00			0.56	320.00			0.63	360.00			1.66	950.00	0.00	0
SONIPAT	Rai	Direct Seeded Rice (Ha)	0.11	60.00			0.18	100.00			0.21	120.00			0.49	280.00	0.00	0
SONIPAT	Sonipat	Groundwater Recharge* (No.)	0.00		25		0.00		25		0.00		25		0.00	0.00	75.00	0
SONIPAT	Ganaur	Groundwater Recharge* (No.)	0.00		50		0.00		50		0.00		50		0.00	0.00	150.00	0
SONIPAT	Gohana	Groundwater Recharge* (No.)	0.00		10		0.00		10		0.04		10		0.04	0.00	30.00	0
SONIPAT	Kharkhoda	Groundwater Recharge* (No.)	0.00		15		0.00		15		0.00		15		0.00	0.00	45.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
SONIPAT	Kathura	Groundwater Recharge* (No.)	0.00		10		0.00		10		0.00		10		0.00	0.00	30.00	0
SONIPAT	Mundlana	Groundwater Recharge* (No.)	0.13		10		0.13		10		0.13		10		0.40	0.00	30.00	0
SONIPAT	Rai	Groundwater Recharge* (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
SONIPAT	Sonipat	Micro Irrigation (Ha)	1.88	427.28			1.89	442.00			1.82	271.00			5.59	1140.28	0.00	0
SONIPAT	Ganaur	Micro Irrigation (Ha)	2.03	151.00			2.01	100.00			2.03	177.00			6.08	428.00	0.00	0
SONIPAT	Gohana	Micro Irrigation (Ha)	2.01				2.01				2.01				6.04	0.00	0.00	0
SONIPAT	Kharkhoda	Micro Irrigation (Ha)	2.14	769.01			1.92	179.00			1.85	0.00			5.91	948.01	0.00	0
SONIPAT	Kathura	Micro Irrigation (Ha)	1.83				1.83				1.83				5.50	0.00	0.00	0
SONIPAT	Mundlana	Micro Irrigation (Ha)	1.98	155.00			1.92	0.00			1.92	0.00			5.82	155.00	0.00	0
SONIPAT	Rai	Micro Irrigation (Ha)	1.92				1.92				1.92				5.75	0.00	0.00	0
SONIPAT	Sonipat	Modernization of Channels and Water Courses (Ha.)	5.58	3444.00			53.63	0.00			0.10	0.00			59.31	3444.00	0.00	0
SONIPAT	Ganaur	Modernization of Channels and Water Courses (Ha.)	0.06				0.04				0.06				0.16	0.00	0.00	0
SONIPAT	Gohana	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
SONIPAT	Kharkhoda	Modernization of Channels	2.46	714.00			0.07	0.00			0.00	0.00			2.53	714.00	0.00	0

District	Block	Proposed Interventions	2023-24				2024-25				2025-26				2023-26			
			Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
		and Water Courses (Ha.)																
SONIPAT	Kathura	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.00				0.00	0.00	0.00	0
SONIPAT	Mundlana	Modernization of Channels and Water Courses (Ha.)	0.06				0.00				0.00				0.06	0.00	0.00	0
SONIPAT	Rai	Modernization of Channels and Water Courses (Ha.)	0.00				0.00				0.04				0.04	0.00	0.00	0
SONIPAT	Sonipat	Pond Rejuvenation (No.)	0.02		10		0.02				0.02				0.07	0.00	10.00	0
SONIPAT	Ganaur	Pond Rejuvenation (No.)	0.06		13		0.06		13		0.06		13		0.18	0.00	39.00	0
SONIPAT	Gohana	Pond Rejuvenation (No.)	0.04		6		0.04		6		0.04		6		0.11	0.00	18.00	0
SONIPAT	Kharkhoda	Pond Rejuvenation (No.)	0.04		17		0.04		17		0.04		16		0.11	0.00	50.00	0
SONIPAT	Kathura	Pond Rejuvenation (No.)	0.06		8		0.06		8		0.06		8		0.19	0.00	24.00	0
SONIPAT	Mundlana	Pond Rejuvenation (No.)	0.08		18		0.08		18		0.08		18		0.24	0.00	54.00	0
SONIPAT	Rai	Pond Rejuvenation (No.)	0.04		9		0.04		12		0.00		12		0.07	0.00	33.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
SONIPAT	Sonipat	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
SONIPAT	Ganaur	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
SONIPAT	Gohana	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
SONIPAT	Kharkhoda	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
SONIPAT	Kathura	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
SONIPAT	Mundlana	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
SONIPAT	Rai	Reuse of Treated Waste Water (MCM)	0.73			0.73	1.10			1.10	1.83			1.83	3.65	0.00	0.00	4
SONIPAT	Sonipat	Varietal interventions (Ha)	1.52	600.00			1.77	700.00			1.90	750.00			5.18	2050.00	0.00	0
SONIPAT	Ganaur	Varietal interventions (Ha)	1.01	400.00			1.14	450.00			1.26	500.00			3.41	1350.00	0.00	0
SONIPAT	Gohana	Varietal interventions (Ha)	1.77	700.00			1.90	750.00			2.02	800.00			5.69	2250.00	0.00	0
SONIPAT	Kharkhoda	Varietal interventions (Ha)	1.26	500.00			1.39	550.00			1.52	600.00			4.17	1650.00	0.00	0
SONIPAT	Kathura	Varietal interventions (Ha)	1.01	400.00			1.14	450.00			1.26	500.00			3.41	1350.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
SONIPAT	Mundlana	Varietal interventions (Ha)	1.26	500.00			1.39	550.00			1.52	600.00			4.17	1650.00	0.00	0
SONIPAT	Rai	Varietal interventions (Ha)	0.76	300.00			0.88	350.00			1.01	400.00			2.65	1050.00	0.00	0
YAMUNA NAGAR	Bilaspur	Check Dams (No.)	0.00				0.00				0.90				0.90	0.00	0.00	0
YAMUNA NAGAR	Chhachhrauli	Check Dams (No.)	0.00				0.00				0.90				0.90	0.00	0.00	0
YAMUNA NAGAR	Jagadhri	Check Dams (No.)	0.00				0.00				0.90				0.90	0.00	0.00	0
YAMUNA NAGAR	P.Nagar	Check Dams (No.)	0.00				0.00				0.90				0.90	0.00	0.00	0
YAMUNA NAGAR	S.Nagar	Check Dams (No.)	0.00				0.00				0.90				0.90	0.00	0.00	0
YAMUNA NAGAR	Radaur	Check Dams (No.)	0.00				0.00				0.90				0.90	0.00	0.00	0
YAMUNA NAGAR	Sadaura	Check Dams (No.)	0.00				0.00				0.90				0.90	0.00	0.00	0
YAMUNA NAGAR	Bilaspur	Construction of Dams (No.)	0.00				0.00				0.10		1		0.10	0.00	1.00	0
YAMUNA NAGAR	Chhachhrauli	Construction of Dams (No.)	0.00				0.00				0.10		1		0.10	0.00	1.00	0
YAMUNA NAGAR	Jagadhri	Construction of Dams (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
YAMUNA NAGAR	P.Nagar	Construction of Dams (No.)	0.00				0.00				0.40		1		0.40	0.00	1.00	0
YAMUNA NAGAR	S.Nagar	Construction of Dams (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
YAMUNA NAGAR	Radaur	Construction of Dams (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0
YAMUNA NAGAR	Sadaura	Construction of Dams (No.)	0.00				0.00				0.00				0.00	0.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
YAMUNA NAGAR	Bilaspur	Crop Diversification (Ha)	3.21	355.00			4.00	711.00			4.00	711.00			11.21	1777.00	0.00	0
YAMUNA NAGAR	Chhachhrauli	Crop Diversification (Ha)	6.61	826.00			0.50	89.00			0.50	89.00			7.61	1004.00	0.00	0
YAMUNA NAGAR	Jagadhri	Crop Diversification (Ha)	7.33	432.00			5.30	942.00			5.30	942.00			17.93	2316.00	0.00	0
YAMUNA NAGAR	P.Nagar	Crop Diversification (Ha)	6.65	915.00			0.75	133.00			0.75	133.00			8.15	1181.00	0.00	0
YAMUNA NAGAR	S.Nagar	Crop Diversification (Ha)	3.56	299.00			5.00	888.00			5.00	888.00			13.56	2075.00	0.00	0
YAMUNA NAGAR	Radaur	Crop Diversification (Ha)	3.83	290.00			8.40	1492.00			8.40	1492.00			20.63	3274.00	0.00	0
YAMUNA NAGAR	Sadaura	Crop Diversification (Ha)	2.03	236.00			1.50	267.00			1.50	267.00			5.03	770.00	0.00	0
YAMUNA NAGAR	Bilaspur	Direct Seeded Rice (Ha)	0.10	27.00			6.00	2500.00			9.50	3959.00			15.60	6486.00	0.00	0
YAMUNA NAGAR	Chhachhrauli	Direct Seeded Rice (Ha)	0.00	95.00			4.50	1875.00			7.00	2917.00			11.50	4887.00	0.00	0
YAMUNA NAGAR	Jagadhri	Direct Seeded Rice (Ha)	0.10	22.50			6.00	2500.00			9.50	3952.00			15.60	6474.50	0.00	0
YAMUNA NAGAR	P.Nagar	Direct Seeded Rice (Ha)	0.00	6.00			4.50	1875.00			7.00	2917.00			11.50	4798.00	0.00	0
YAMUNA NAGAR	S.Nagar	Direct Seeded Rice (Ha)	0.04	16.00			6.00	2500.00			9.50	3959.00			15.54	6475.00	0.00	0
YAMUNA NAGAR	Radaur	Direct Seeded Rice (Ha)	0.06	27.00			6.00	2500.00			9.50	3950.00			15.56	6477.00	0.00	0
YAMUNA NAGAR	Sadaura	Direct Seeded Rice (Ha)	0.00	5.00			4.50	1875.00			7.00	2917.00			11.50	4797.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	Block	Proposed Interventions	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Proposed Water Savings in MCM	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM	Total Water Savings in 3 years (MCM)	Proposed Target Area (ha)	Proposed Target Number	Proposed Target Volume in MCM
YAMUNA NAGAR	Bilaspur	Groundwater Recharge* (No.)	2.00		50		2.00		50		2.00		50		6.00	0.00	150.00	0
YAMUNA NAGAR	Chhachhrauli	Groundwater Recharge* (No.)	2.00		50		2.00		50		2.00		50		6.00	0.00	150.00	0
YAMUNA NAGAR	Jagadhri	Groundwater Recharge* (No.)	2.00		50		2.00		50		2.00		50		6.00	0.00	150.00	0
YAMUNA NAGAR	P.Nagar	Groundwater Recharge* (No.)	2.00		50		2.00		50		2.00		50		6.00	0.00	150.00	0
YAMUNA NAGAR	S.Nagar	Groundwater Recharge* (No.)	2.00		50		2.00		50		2.00		50		6.00	0.00	150.00	0
YAMUNA NAGAR	Radaur	Groundwater Recharge* (No.)	2.00		50		2.00		50		2.00		50		6.00	0.00	150.00	0
YAMUNA NAGAR	Sadaura	Groundwater Recharge* (No.)	1.00		25		1.00		25		1.00		25		3.00	0.00	75.00	0
YAMUNA NAGAR	Bilaspur	Micro Irrigation (Ha)	0.16	20.00			0.17	21.00			0.10	12.00			0.43	53.00	0.00	0
YAMUNA NAGAR	Chhachhrauli	Micro Irrigation (Ha)	0.10	8.00			0.00	0.00			1.00	130.00			1.10	138.00	0.00	0
YAMUNA NAGAR	Jagadhri	Micro Irrigation (Ha)	6.93	1767.00			7.23	1739.00			6.83	1752.00			20.99	5258.00	0.00	0
YAMUNA NAGAR	P.Nagar	Micro Irrigation (Ha)	6.20	1173.00			14.00	2650.00			9.34	1776.00			29.54	5599.00	0.00	0
YAMUNA NAGAR	S.Nagar	Micro Irrigation (Ha)	6.27	1626.00			6.87	1703.00			6.77	1690.00			19.91	5019.00	0.00	0
YAMUNA NAGAR	Radaur	Micro Irrigation (Ha)	7.20	1910.00			7.50	1942.00			7.80	1983.00			22.50	5835.00	0.00	0
YAMUNA NAGAR	Sadaura	Micro Irrigation (Ha)	3.64	951.00			3.58	943.00			3.58	943.00			10.80	2837.00	0.00	0

			2023-24				2024-25				2025-26				2023-26			
District	**Block**	**Proposed Interventions**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Proposed Water Savings in MCM**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**	**Total Water Savings in 3 years (MCM)**	**Proposed Target Area (ha)**	**Proposed Target Number**	**Proposed Target Volume in MCM**
YAMUNA NAGAR	Bilaspur	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
YAMUNA NAGAR	Chhachhrauli	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
YAMUNA NAGAR	Jagadhri	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
YAMUNA NAGAR	P.Nagar	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
YAMUNA NAGAR	S.Nagar	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
YAMUNA NAGAR	Radaur	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0
YAMUNA NAGAR	Sadaura	Reuse of Treated Waste Water (MCM)	0.00			0.00	0.00			0.00	0.00			0.00	0.00	0.00	0.00	0

Annexure 10.2 Block-wise Action Plan for Land Reclamation for 2023-26 for the Haryana State

District	Block	Proposed Interventions	Proposed Area for Land Reclamation (2023-24) (ha)	Proposed Area for Land Reclamation (2024-25) (ha)	Proposed Area for Land Reclamation (2025-26) (ha)	Proposed Area for Land Reclamation (2023-26) (ha)
BHIWANI	Bhiwani	Horizontal Drainage	400.00	600.00	800.00	1800.00
BHIWANI	Bhiwani	Biodrainage	10.00	15.00	20.00	45.00
BHIWANI	B. Khera	Biodrainage	5.00	7.00	10.00	22.00
BHIWANI	Tosham	Biodrainage	10.00	15.00	20.00	45.00
BHIWANI	Tosham	Saline Water Aquaculture	10.00	15.00	20.00	45.00
BHIWANI	Behal	Saline Water Aquaculture	20.00	30.00	40.00	90.00
BHIWANI	Kairu	Saline Water Aquaculture	10.00	15.00	20.00	45.00
BHIWANI	Siwani	Saline Water Aquaculture	100.00	150.00	200.00	450.00
CHARKHI DADRI	Charkhi Dadri	Sub Surface Drainage	600.00	580.00	576.00	1756.00
CHARKHI DADRI	Bond Kalan	Sub Surface Drainage	500.00	700.00	760.00	1960.00
FATEHABAD	Fatehabad	Vertical Drainage	144.00	216.00	288.00	648.00
FATEHABAD	Tohana	Vertical Drainage	46.00	69.00	92.00	207.00
FATEHABAD	Bhattu Kalan	Vertical Drainage	85.60	128.40	171.20	385.20
FATEHABAD	Bhuna	Vertical Drainage	44.00	66.00	88.00	198.00
HISAR	Hisar-I	Vertical Drainage	782.10	1173.15	1564.20	3519.45
HISAR	Hisar-II	Vertical Drainage	40.00	60.00	80.00	180.00
HISAR	Hansi-I	Vertical Drainage	445.00	667.50	890.00	2002.50
HISAR	Hansi-II	Vertical Drainage	255.00	382.50	510.00	1147.50
HISAR	Adampur	Vertical Drainage	110.00	165.00	220.00	495.00
HISAR	Barwala	Vertical Drainage	140.00	210.00	280.00	630.00
HISAR	Narnaund	Vertical Drainage	375.00	562.50	750.00	1687.50
HISAR	Uklana	Vertical Drainage	39.00	58.50	78.00	175.50
HISAR	Agroha	Vertical Drainage	50.00	75.00	100.00	225.00
JHAJJAR	Jhajjar	Biodrainage	100.00	50.00	50.00	200.00
JHAJJAR	Jhajjar	Green Manuring	100.00	50.00	50.00	200.00
JHAJJAR	Jhajjar	Gypsum Application	25.00	25.00	0.00	50.00
JHAJJAR	Jhajjar	Surface/sub-surface / Vertical drainage	200.00	0.00		200.00
JHAJJAR	Jhajjar	Saline Water Aquaculture	32.38	48.58	64.77	145.73
JHAJJAR	Bahadurgarh	Biodrainage	10.00	20.00	0.00	30.00
JHAJJAR	Bahadurgarh	Green Manuring	50.00	50.00	100.00	200.00
JHAJJAR	Bahadurgarh	Gypsum Application	10.00	10.00	10.00	30.00
JHAJJAR	Bahadurgarh	Surface/sub-surface / Vertical drainage	0.00	0.00	0.00	0.00
JHAJJAR	Bahadurgarh	Saline Water Aquaculture	20.24	36.43	52.63	109.30
JHAJJAR	Matanhail	Biodrainage	20.00	20.00	10.00	50.00
JHAJJAR	Matanhail	Green Manuring	50.00	25.00	25.00	100.00
JHAJJAR	Matanhail	Gypsum Application	10.00	10.00	0.00	20.00
JHAJJAR	Matanhail	Surface/sub-surface / Vertical drainage	0.00	0.00	0.00	0.00
JHAJJAR	Matanhail	Saline Water Aquaculture	24.29	30.36	36.43	91.08
JHAJJAR	Salhawas	Biodrainage	30.00	50.00	20.00	100.00
JHAJJAR	Salhawas	Green Manuring	50.00	50.00	100.00	200.00
JHAJJAR	Salhawas	Gypsum Application	10.00	10.00	10.00	30.00
JHAJJAR	Salhawas	Surface/sub-surface / Vertical drainage	25.00	25.00	50.00	100.00

District	Block	Proposed Interventions	Proposed Area for Land Reclamation (2023-24) (ha)	Proposed Area for Land Reclamation (2024-25) (ha)	Proposed Area for Land Reclamation (2025-26) (ha)	Proposed Area for Land Reclamation (2023-26) (ha)
JHAJJAR	Salhawas	Saline Water Aquaculture	24.29	36.43	48.58	109.30
JHAJJAR	Beri	Biodrainage	100.00	50.00	100.00	250.00
JHAJJAR	Beri	Green Manuring	25.00	25.00	50.00	100.00
JHAJJAR	Beri	Gypsum Application	10.00	10.00	0.00	20.00
JHAJJAR	Beri	Surface/sub-surface / Vertical drainage	1200.00	0.00	0.00	1200.00
JHAJJAR	Beri	Saline Water Aquaculture	48.58	60.73	73.00	182.31
JHAJJAR	Badli	Biodrainage	10.00	10.00	0.00	20.00
JHAJJAR	Badli	Green Manuring	25.00	25.00	50.00	100.00
JHAJJAR	Badli	Gypsum Application	10.00	10.00	0.00	20.00
JHAJJAR	Badli	Surface/sub-surface / Vertical drainage	0.00	0.00	0.00	0.00
JHAJJAR	Badli	Saline Water Aquaculture	20.24	24.00	28.00	72.24
JHAJJAR	Machhrauli	Biodrainage	10.00	10.00	0.00	20.00
JHAJJAR	Machhrauli	Green Manuring	25.00	25.00	0.00	50.00
JHAJJAR	Machhrauli	Gypsum Application	10.00	10.00	0.00	20.00
JHAJJAR	Machhrauli	Surface/sub-surface / Vertical drainage	0.00	0.00	0.00	0.00
JHAJJAR	Machhrauli	Saline Water Aquaculture	12.15	18.22	24.29	54.66
JIND	Alewa	Biodrainage	385.00	442.75	531.30	1359.05
JIND	Alewa	Green Manuring	1320.00	1518.00	1821.60	4659.60
JIND	Alewa	Gypsum Application	55.00	63.25	75.90	194.15
JIND	Alewa	Surface/Sub-surface/Vertical Drainage	0.00	0.00	0.00	0.00
JIND	Alewa	Saline Water Aquaculture	0.00	0.00	0.00	0.00
JIND	Jind	Biodrainage	605.00	695.75	834.90	2135.65
JIND	Jind	Green Manuring	880.00	1012.00	1214.40	3106.40
JIND	Jind	Gypsum Application	77.00	88.55	106.26	271.81
JIND	Jind	Surface/Sub-surface/Vertical Drainage	487.00	730.00	974.00	2191.00
JIND	Jind	Saline Water Aquaculture	25.00	25.00	25.00	75.00
JIND	Julana	Biodrainage	275.00	316.25	379.50	970.75
JIND	Julana	Green Manuring	1320.00	1518.00	1821.60	4659.60
JIND	Julana	Gypsum Application	99.00	113.85	136.62	349.47
JIND	Julana	Surface/Sub-surface/Vertical Drainage	792.00	910.80	1092.96	2795.76
JIND	Julana	Saline Water Aquaculture	0.00	0.00	0.00	0.00
JIND	Narwana	Biodrainage	341.00	392.15	470.58	1203.73
JIND	Narwana	Green Manuring	990.00	1138.50	1366.20	3494.70
JIND	Narwana	Gypsum Application	440.00	506.00	607.20	1553.20
JIND	Narwana	Surface/Sub-surface/Vertical Drainage	0.00	0.00	0.00	0.00
JIND	Narwana	Saline Water Aquaculture	25.00	25.00	25.00	75.00
JIND	Ujhana	Biodrainage	181.50	208.73	250.47	640.70
JIND	Ujhana	Green Manuring	550.00	632.50	759.00	1941.50
JIND	Ujhana	Gypsum Application	396.00	455.40	546.48	1397.88
JIND	Ujhana	Surface/Sub-surface/Vertical Drainage	0.00	0.00	0.00	0.00
JIND	Ujhana	Saline Water Aquaculture	0.00	0.00	0.00	0.00
JIND	Uchana	Biodrainage	324.50	373.18	447.81	1145.49
JIND	Uchana	Green Manuring	849.20	976.58	1171.90	2997.68
JIND	Uchana	Gypsum Application	259.60	298.54	358.25	916.39
JIND	Uchana	Surface/Sub-surface/Vertical Drainage	0.00	0.00	0.00	0.00
JIND	Uchana	Saline Water Aquaculture	0.00	1.00	1.00	2.00
JIND	Safidon	Biodrainage	121.00	139.15	166.98	427.13

District	Block	Proposed Interventions	Proposed Area for Land Reclamation (2023-24) (ha)	Proposed Area for Land Reclamation (2024-25) (ha)	Proposed Area for Land Reclamation (2025-26) (ha)	Proposed Area for Land Reclamation (2023-26) (ha)
JIND	Safidon	Green Manuring	1760.00	2024.00	2428.80	6212.80
JIND	Safidon	Gypsum Application	99.00	113.85	136.62	349.47
JIND	Safidon	Surface/Sub-surface/Vertical Drainage	132.00	151.80	182.16	465.96
JIND	Safidon	Saline Water Aquaculture	0.00	0.00	0.00	0.00
JIND	Pillukhera	Biodrainage	77.00	88.55	106.26	271.81
JIND	Pillukhera	Green Manuring	1540.00	1771.00	2125.20	5436.20
JIND	Pillukhera	Gypsum Application	66.00	75.90	91.08	232.98
JIND	Pillukhera	Surface/Sub-surface/Vertical Drainage	220.00	253.00	303.60	776.60
JIND	Pillukhera	Saline Water Aquaculture	0.00	0.00	0.00	0.00
NUH	Indri	Vertical/sub surface drainage	116.00	174.60	232.80	523.40
NUH	Nagina	Vertical/sub surface drainage	92.20	138.30	184.40	414.90
NUH	Nuh	Vertical/sub surface drainage	589.00	538.90	1177.20	2305.10
NUH	Punhana	Vertical/sub surface drainage	131.00	196.50	262.00	589.50
PALWAL	Hathin	Saline Water Aquaculture	22.00	25.00	30.00	77.00
ROHTAK	Meham	Biodrainage	0.00			0.00
ROHTAK	Meham	Green Manuring	0.21			0.21
ROHTAK	Meham	Surface/sub surface/vertical Drainage	2.25	4.65	6.30	13.20
ROHTAK	Meham	Saline Water Aquaculture	0.80	0.88	1.25	2.93
ROHTAK	Kalanaur	Biodrainage	8.00			8.00
ROHTAK	Kalanaur	Green Manuring	1150.00			1150.00
ROHTAK	Kalanaur	Surface/sub surface/vertical Drainage	650.00	1716.00	2288.00	4654.00
ROHTAK	Kalanaur	Saline Water Aquaculture	2.60	4.00	3.20	9.80
ROHTAK	Sampla	Biodrainage	4.00			4.00
ROHTAK	Sampla	Green Manuring	1050.00			1050.00
ROHTAK	Sampla	Surface/sub surface/vertical Drainage	1550.00	1716.00	2288.00	5554.00
ROHTAK	Sampla	Saline Water Aquaculture	10.60	12.60	15.00	38.20
ROHTAK	Rohtak	Biodrainage	6.00			6.00
ROHTAK	Rohtak	Green Manuring	1850.00			1850.00
ROHTAK	Rohtak	Surface/sub surface/vertical Drainage	550.00	1683.00	2244.00	4477.00
ROHTAK	Rohtak	Saline Water Aquaculture	6.00	6.50	8.20	20.70
ROHTAK	L.Majra	Biodrainage	4.00			4.00
ROHTAK	L.Majra	Green Manuring	750.00			750.00
ROHTAK	L.Majra	Surface/sub surface/vertical Drainage	1750.00	1604.00	2138.00	5492.00
ROHTAK	L.Majra	Saline Water Aquaculture	0.80	1.00	1.60	3.40
SIRSA	N. Chopta	Vertical Drainage	1137.00	1706.00	2275.00	5118.00
SIRSA	N. Chopta	Sub Surface Drainage	1137.00	1706.00	2275.00	5118.00
SONIPAT	Gohana	Vertical Drainage	1200.00	350.00	400.00	1950.00
SONIPAT	Kathura	Vertical Drainage	200.00	250.00	300.00	750.00
SONIPAT	Mundlana	Vertical Drainage	170.00	250.00	280.00	700.00
SONIPAT	kharkhoda	Vertical Drainage	100.00	140.00	150.00	390.00
SONIPAT	Ganaur	Vertical Drainage	50.00	50.00	50.00	150.00

BIBLIOGRAPHY

- Department of Economic and Statistical Affairs. 2023*. Economic Survey of Haryana 2022-23.* Department of Economic and Statistical Affairs, Haryana.
- Ground Water Cell, Department of Irrigation & Water Resources and Central Ground Water Board. 2021. *Report on Dynamic Ground Water Resources of Haryana State as on 31st March 2020*. Ground Water Cell, Department of Irrigation & Water Resources, Haryana and Central Ground Water Board North Western Region Chandigarh.
- Central Ground Water Board. 2016. *Aquifer Mapping and Management Plan, Yamunanagar District, Haryana*. Central Ground Water Board, Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti, Government of India.
- Central Ground Water Board. 2015. *Aquifer Mapping and Management Plan, National Capital Region (NCR), Haryana*. Central Ground Water Board, Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India.
- Central Ground Water Board. 2021. *Ground Water Year Book of Haryana State 2020-21*. Central Ground Water Board, Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti, Government of India.
- Central Ground Water Board. 2020. *Master Plan of Artificial Recharge to Groundwater.* Central Ground Water Board, Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti, Government of India.
- Indian Meteorological Department. 2020. *Observed Monsoon Rainfall Variability and Changes during Recent 30 years (1989-2018).* Indian Meteorological Department, Climate Research and Services (CRS) Division, Pune. Ministry of Earth Sciences, Government of India.
- Indian Water Resources Information System. National Water Informatics Centre. Department of Water Resources, River Development and Ganga Rejuvenation, Ministry of Jal Shakti, Government of India. https://indiawris.gov.in/wris/#/rainfall

Publisher	-	Haryana Water Resources Authority
Date of Publication	-	February, 2023

| Citation | - | (2023). Integrated Water Resources Plan Haryana 2023-26
Haryana Water Resources Authority |

HWRA

Haryana Water Resources Authority
Rear Building, 3rd Floor, HSVP, Sector-6,
Panchkula, Haryana 134109
Website: https://hwra.org.in/