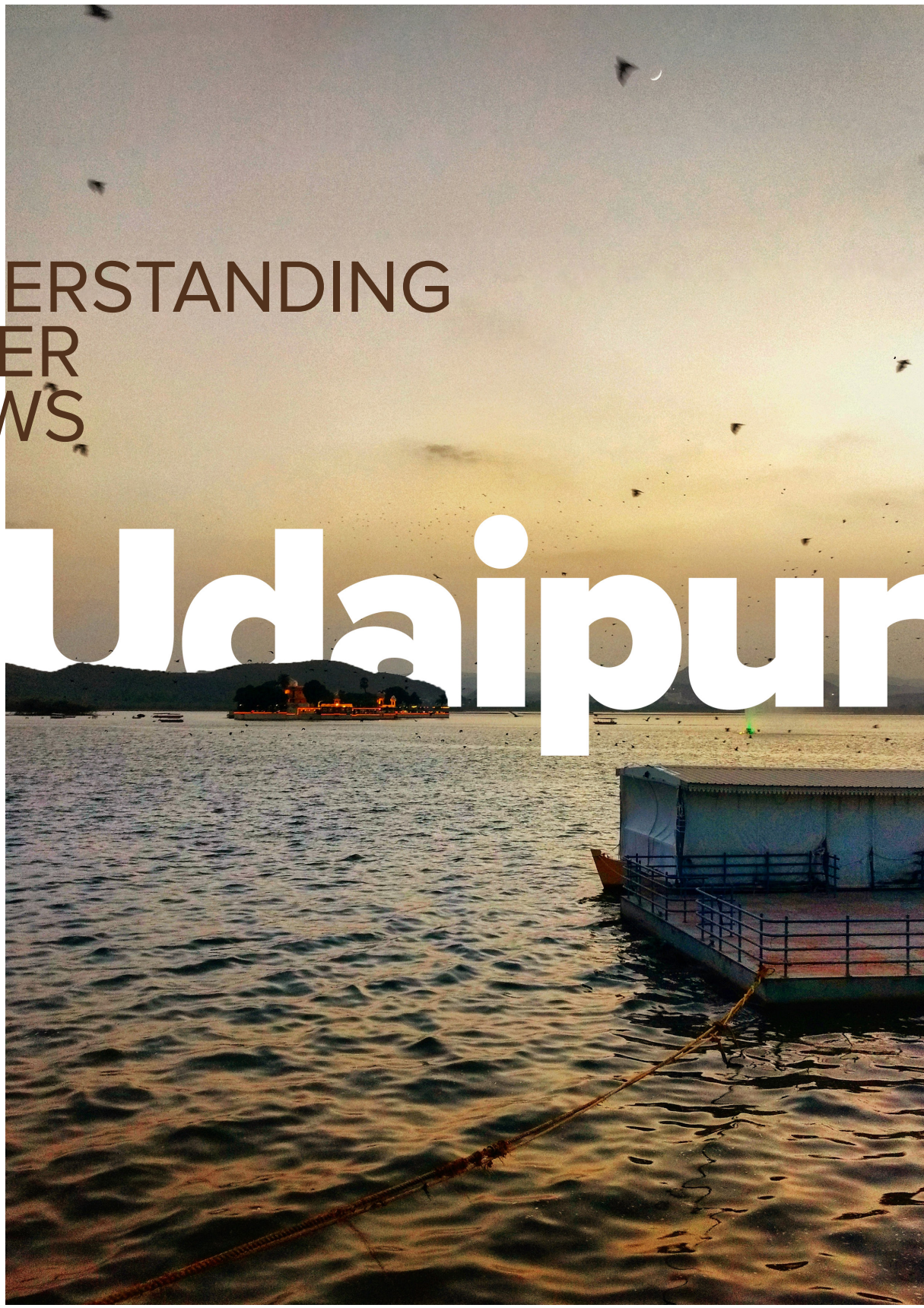
Development Alternatives

HEINRICH BÖLL STIFTUNG
INDIA

UNDERSTANDING WATER FLOWS IN Udaipur



STATUS AND POTENTIAL

The **Understanding Water Flows in Udaipur** report is jointly published
by the Heinrich Boll Foundation, Berlin, Germany and
Development Alternatives, New Delhi, India

About Heinrich Böll Foundation

HEINRICH BÖLL STIFTUNG
INDIA

The Heinrich Böll Stiftung/ Heinrich Boell Foundation is a German foundation and part of the Green political movement that has developed worldwide as a response to the traditional politics of socialism, liberalism, and conservatism. We are a green think-tank and an international policy network, our main tenets are ecology and sustainability, democracy and human rights, self-determination and justice. We place particular emphasis on gender democracy, meaning social emancipation and equal rights for women and men. We are also committed to equal rights for cultural and ethnic minorities. Finally, we promote non-violence and proactive peace policies. To achieve our goals, we seek strategic partnerships with others who share our values.

Our namesake, Heinrich Böll, personifies the values we stand for: protection of freedom, civic courage, tolerance, open debate, and the valuation of art and culture as independent spheres of thought and action.

Our India Liaison Office was established in 2002 in New Delhi. Working with governmental and non-governmental local project partners we support India's democratic governance through informed national and international dialogue processes with a view to enhance the diversity of green thinking.

For more information please contact us:
Heinrich Böll Foundation, India Office
C-20, 1st floor, Qutub Institutional Area
New Delhi 110016, India
phone +91-11-2685 4405, +91-11-2651 6695
fax +91-11-2696 2840
mail: info@in.boell.org
web: www.in.boell.org

About Development Alternatives

Development Alternatives

Development Alternatives (DA) is a premier social enterprise with a global presence in the fields of green economic development, social empowerment and environmental management. It is one of the leading Think Tanks in the field of Sustainable Development. DA is credited with numerous innovations in clean technology and delivery systems that help create sustainable livelihoods in the developing world. DA focuses on empowering communities through strengthening people's institutions and facilitating their access to basic needs. It enables economic opportunities through skill development for green jobs and enterprise creation and promotes greener pathways for development through natural resource management models and clean technology solutions. DA delivers environment friendly and economically viable eco-solutions to communities, entrepreneurs, government and corporate agencies through measures that foster the creation of sustainable livelihoods in large numbers.

Development Alternatives drives strategic change through Innovation of eco-solutions, Incubation of enterprise based business approaches, demonstration and capacity building for Implementation of solutions at scale and the Influence of policies for sustainable development.

Published by:

Heinrich Böll Foundation-India &Development Alternatives, India, October, 2018

Designed by:

Aspire Design, New Delhi

Disclaimer

This document is an outcome of a project titled; "Mapping water flows in Indian Cities" funded by HBF. The Report is intended for use by policy-makers, academics, media, government, non-government organisations and general public for guidance on matters of interest only and does not constitute professional advice. The opinions contained in this document are those of the authors only. However, the decision and responsibility to use the information contained in this paper lies solely with the reader. The author(s) and the publisher(s) are not liable for any consequences as a result of use or application of this document. Content may be used/quoted with due acknowledgement to Development Alternatives.

Understanding Water Flows in Udaipur

STATUS AND POTENTIAL

ACKNOWLEDGEMENTS

PROJECT FUNDER

HEINRICH BÖLL STIFTUNG

CORE PROJECT TEAM

DEVELOPMENT ALTERNATIVES
Pratibha Ruth Caleb, Deputy Manager (Urban Research)
Apurva Singh, Research Consultant

We are grateful for the support and guidance of our Advisory Panel members

ADVISORY PANEL

Development Alternatives
Dr. K Vijayalakshmi, Vice President
Gitika Goswami, Programme Director

EXPERT CONTRIBUTORS

Our special thanks go to the many experts from academia, government, non-profits, and research organisations who provided invaluable perspectives and expertise throughout the project.

Udaipur Municipal Corporation
Mr. Arun Vyas, Additional Chief Engineer

Public Health Engineering Department
Shri. Anand Prakash Meena, Superintendent Engineer
Mr. Kishor Kachhawa, Executive Engineer
Smt. Namita Mathur, Excutive Engineer

Urban Improvement Trust
Shri. Sanjeev Sharma, Executive Engineer

Water Distribution Management Committee
Smt. Rehana Germanwala, Chair person

Hindustan Zinc Limited
Mr. Vipin Arya, Associate Manager- Civil

Udaipur Smart City Ltd.
Mr. Prasoon Chaturvedy, Deputy Town Planner

LIST OF FIGURES

LIST OF TABLES

LIST OF MAPS

LIST OF IMAGES

LIST OF ACRONYMS

AMRUT	Atal Mission for Rejuvenation and Urban Transformation
BWS	Baseline Water Stress
CDP	City Development Plan
CSP	City Sanitation Plan
CSR	Corporate Social Responsibility
DA	Development Alternatives
GLSR	Ground Level Storage Reservoir
GoI	Government of India
GoR	Government of Rajasthan
HBF	Heinrich Böll Foundation
HZL	Hindustan Zinc Limited
KL	Kilo-Liter
Km	Kilometer
L&T	Larson & Toubro
LPCD	Liters per Capita Day
MCFT	Million Cubic feet
MHUA	Ministry of Housing and Urban Affair
MLD	Million Liter per Day
MoUD	Ministry of Urban Development
NRW	Non-revenue Water
O&M	Operations and Management
OHSR	Over-Head Storage Reservoir
PHED	Public Health Engineering Department
SDG	Sustainable Development Goals
STP	Sewage Treatment Plant
UIT	Urban Improvement Trust
ULB	Urban Local Bodies
UMC	Udaipur Municipal Corporation
UN	United Nations
WTP	Water Treatment Plant

About the Project

Cities are the epicenters of growth; however, the rising urbanization phenomenon has directly given rise to unchecked resources exploitation. Contamination of fresh water and scarcity of water resources are the first and foremost issues that occur as a result of over-exploitation and mismanagement of the city's water resources and has led to resource overuse and resource use conflict between various users.

With support from Heinrich Böll Foundation (HBF), this study is undertaken to explore and understand water resource flows in urban areas and accordingly draw lessons for more efficient urban water planning and management. The study attempts to enable a more holistic understanding of not only sources of water into a city and its use in the city, but also the quantity of resource and the different processes through which it flows before its final consumption, treatment and disposal. The key objective of the study is to highlight the need for viewing urban water management systems through the circular metabolism perspective and to identify areas where interventions can be made to ensure efficient water management.

Raw water, drinking water, waste water and urban eco-systems in the urban environments are often managed in isolation rather than as an integrated system. As a result, there is a gap in the methodology that can enable urban planners in designing water sufficient and efficient cities or retrofit existing cities in terms of infrastructure, water governance and water education. An urban water resource flow methodology is likely to provide tools for sustainable solutions to address the growing water demand and efficient water management in cities.

An understanding of urban water resource flows, integrating the principles of resource circularity into planning would add significant value to designing sustainable and resilient cities. The study would additionally support policy makers in developing strategies and actions for integrated water management for resource(water) security and resilience.

This report is the glimpse of the baseline scenario prevailing in the city of Udaipur. Following are the key aspects of the nature of water flows in Udaipur:

CHARACTERISTICS OF UDAIPUR'S WATER SOURCES

The Udaipur city is primarily dependent on the surface water sources to meet its water needs, apart from a few traditional wells. This is indicative of the fact that factors like average rainfall as well as qualitative of freshwater will be of importance for sustainable resource management in the future. Increasing the optimum usage of water extracted as well as ensuring quality treatment of wastewater will be highly recommended for the city of Udaipur.

POTENTIAL OF WASTE WATER AS A RESOURCE

On an average, Udaipur city generates about 60 MLD (Million litres per day) of wastewater. Currently, only one wastewater treatment plant in Udaipur, operated by Hindustan Zinc Ltd, treats 20 MLD of wastewater which is about 30 percent of the city's wastewater. Of the treated wastewater, 9.5 MLD is used by the Industrial Zinc Complex, 7.3 MLD is used for horticultural purposes and 1.1 MLD is released into the Ahar River. There are 2 other wastewater treatment plants proposed by the UIT and UMC of a combined capacity of 15MLD. Presently the remaining untreated wastewater is disposed in the lakes bodies indicating the huge unutilized resource with a potential of reducing the dependency on fresh water, if treated waste water is brought to reuse and preserving the lakes from water contamination.

NATURE OF GOVERNANCE IN WATER MANAGEMENT

Udaipur city has 55 wards under the jurisdiction of Udaipur Municipal Corporation (UMC) which have been divided among 7 water supply zones. UMC is the main administrative body for Udaipur city, under which various line departments function for operation and maintenance of urban services. The Urban Improvement Trust (UIT) is responsible for the implementation of development plans and infrastructure in the notified UIT areas. In addition, there are a number of line departments under the State authority, that provide support services like the Public Health and Engineering Department, Town Planning, Public Works Department, Rajasthan Housing Board, RSRTC, Tourism Department etc. With numerous bodies working together, it is important that the larger picture of sustainable urban water resource management is kept in mind.

EFFICIENT WATER DISTRIBUTION SYSTEM

Like many other cities, the Udaipur city is also facing the problem of distribution loss. Despite having sufficient water from both ground and surface sources, nearly 48% of the water goes unaccounted for, being categorised under non-revenue water which includes both physical and apparent losses. This indicates operation and management issues in the distribution system, with leakages from old pipes and unmetered or illegal connections being a leading cause of water loss. In 2017, more than 20% of the metered connections needed replacement as well in order to have correct meter reading. The need for efficient management of the water distribution system is apparent for the benefit of the city.

Udaipur

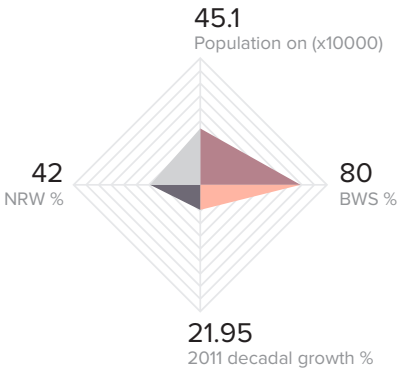


Figure 1: Status of Udaipur

Udaipur is known as the City of Lakes and is a popular tourism site with its Rajput palaces, and scenic nature. Udaipur city is the district headquarters of the Udaipur district. The city has witnessed multi-fold development in the last two decades. It acts as an industrial, administrative, and educational center of the region. Udaipur is dependent on its lake system, which is the life source of the city in terms of surface water resources, tourism and ecosystem at large.

Udaipur is the sixth largest city in the state of Rajasthan and has witnessed considerable population growth in the last 4 decades facilitated by a growing economy which is attributed to the large influx of tourists and the growing tourism industry.

CITY'S PRIORITIES

Udaipur's smart city proposal highlights that "water and sewerage" is the 2nd top most priority for citizens, first being "Tourism".

Udaipur city has a great natural drainage system as Ayad River, passing across the town and falling in the Udai sagar, carrying all the storm water of the city. The Ayad river bisects the city into two parts i.e. southern part and northern part with its river line at lowest level, all the nallas/drainage falls into the Ayad river.

Population
451,110

Density
7925 ppkm²

Growth Rate
21.95

Area (sq.km)
56.92 sq.km

Climate and Topography
Humid Subtropical

Demand

Population
451,110

Total water demand
115MLD (2011)
101MLD (estimated for 2021)

Floating Population
30,000

Major Industries
Marble, tourism, metallic and non-metallic mining,

REFERENCES

Smart city profile, Udaipur, 2016
City Development Plan for Udaipur, 2041, MoUD-GoI & The World Bank, Crisil Infrastrcuture Advisory, 2014

Slum Population (%)
14.36%

Baseline Water Stress
>80%

MoUD Scheme/ Programmes

AMRUT for improvement of water supply, sewerage, drainage, public transport and parking;

Supply

Total water supply (freshwater and ground water sources)
83.15 MLD

Avg water supply/person
155LPCD

NRW
48%

% households having in-house water supply connection
52%

33%
of slum households have legal water supply connections

Avg annual rainfall
637mm

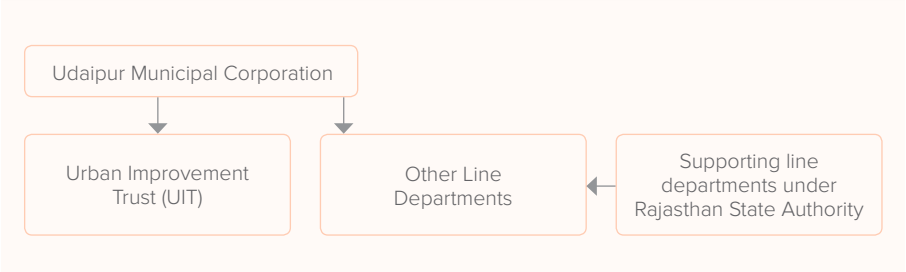
Freshwater Source
Lakes Pichola, Fateh Sagar, Jaisamand, Rivers Mansi and Wakal. 50 tube wells and 32 step wells. 180 panghats and 2650 hand pumps.

CURRENT SITUATION OF THE URBAN WATER CYCLE

ADMINISTRATIVE FRAMEWORK

Like in most cities in India, the Public Health and Engineering Department which falls under the State Government is responsible for the production and distribution of water both surface water and ground water. This entails planning, designing, construction, operation, and maintenance of the water supply system. There is tri-party agreement between the Udaipur Municipal Corporation (UMC), Urban Improvement Trust, Udaipur (UIT) and PHED. The UMC is responsible for providing basic services such as sewerage and sanitation (up to a certain extent mainly operation and maintenance) similar is the responsibility of UIT in their designated area. Other departments that are involved mentioned below.

Figure 2: Institutional set-up in Udaipur



DEPARTMENTS INVOLVED

Udaipur Municipal Corporation	**Smart City Ltd.**	**PHED**	**Urban Improvement Trust**	**Ground water division**	**Water distribution committee**

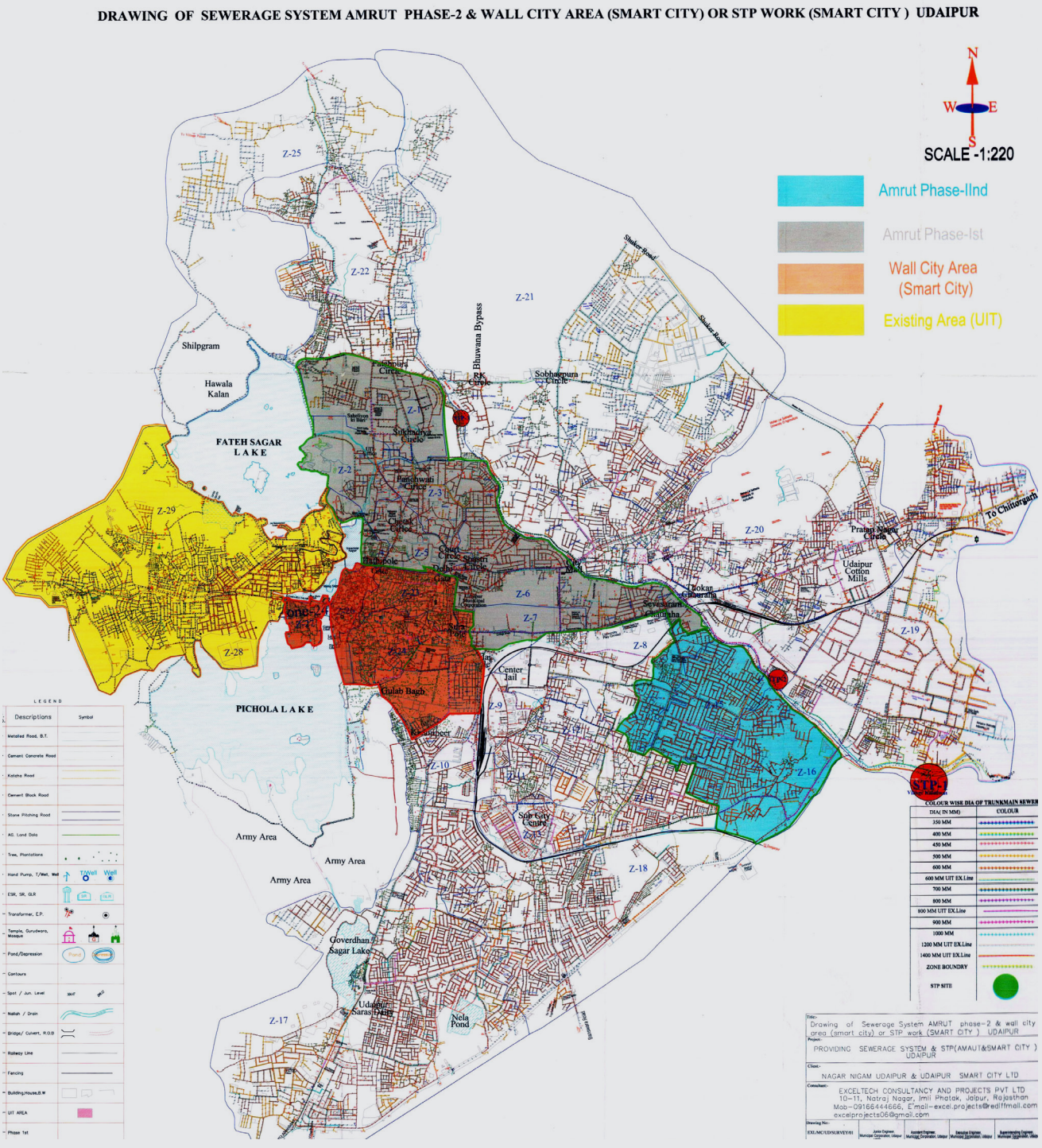
Table 1: Departments involved in the urban water management of Udaipur

Urban Infrastructure Service	Water supply	Sewerage
Planning and Design	PHED	UIT/PHE D/UMC
Construction/Implementation	PHED	UIT/PHED
Organisation and Management	PHED	UIT/UMC
Policy Making	GoR	GoR
Regulation	PHED	UIT

For effective management, Udaipur city has been divided into 9 divisions for the water supply zones, where the closest water source is considered for each ward/project. A total of 83.15MLD of water is produced for distribution in Udaipur city with an average 155 LPCD. Under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) project, 2 phases have been in operation that have primarily focused on integrated sewerage networks (see map below).

Table 2 Details of transmission and distribution zones

	Name of transmission and distribution zones
1	Doodh Talai water supply zone
2	Mansi Wakal water supply zone
3	Patel Circle water supply zone
4	Jhamar kotra water supply zone
5	Teetardhi water supply zone
6	Neemachmata water supply zone
7	Gulab bagh water supply zone
8	Fatehsagar water supply zone
9	Kanpur water supply zone



ABOUT SANKEY DIAGRAM

The source of extraction as depicted in the Sankey diagram for the city of Udaipur is both surface and ground water. These are mainly rain-fed sources, which include 5 artificial fresh water lakes and dam on perennial river.

As depicted in the above diagram:

1. 78.5MLD of surface water is extracted from Pichhola lake, Fatehsagar lake, Jaisamand lake, Badi Lake and the Mansi Wakal Dam. 5MLD of ground water is extracted to meet the total demand of the city from several tubewells and open wells which include several traditional baoris.
2. Raw water that is extracted is then sent for treatment (78.4MLD), with 5.1MLD of the raw water being directly transferred for distribution to the city without treatment.
3. Treated water is then sent to elevated reservoirs for storage (62.7 MLD) and 15.7 MLD is directly pumped into the distribution system. This distributional difference is due to the fact that in some parts of the city the pipelines are connected directed to the households.
4. In the case of water stored at the elevated reservoirs, 44.9MLD of the treated water is stored in in 35 Overhead Storage reservoirs and distributed

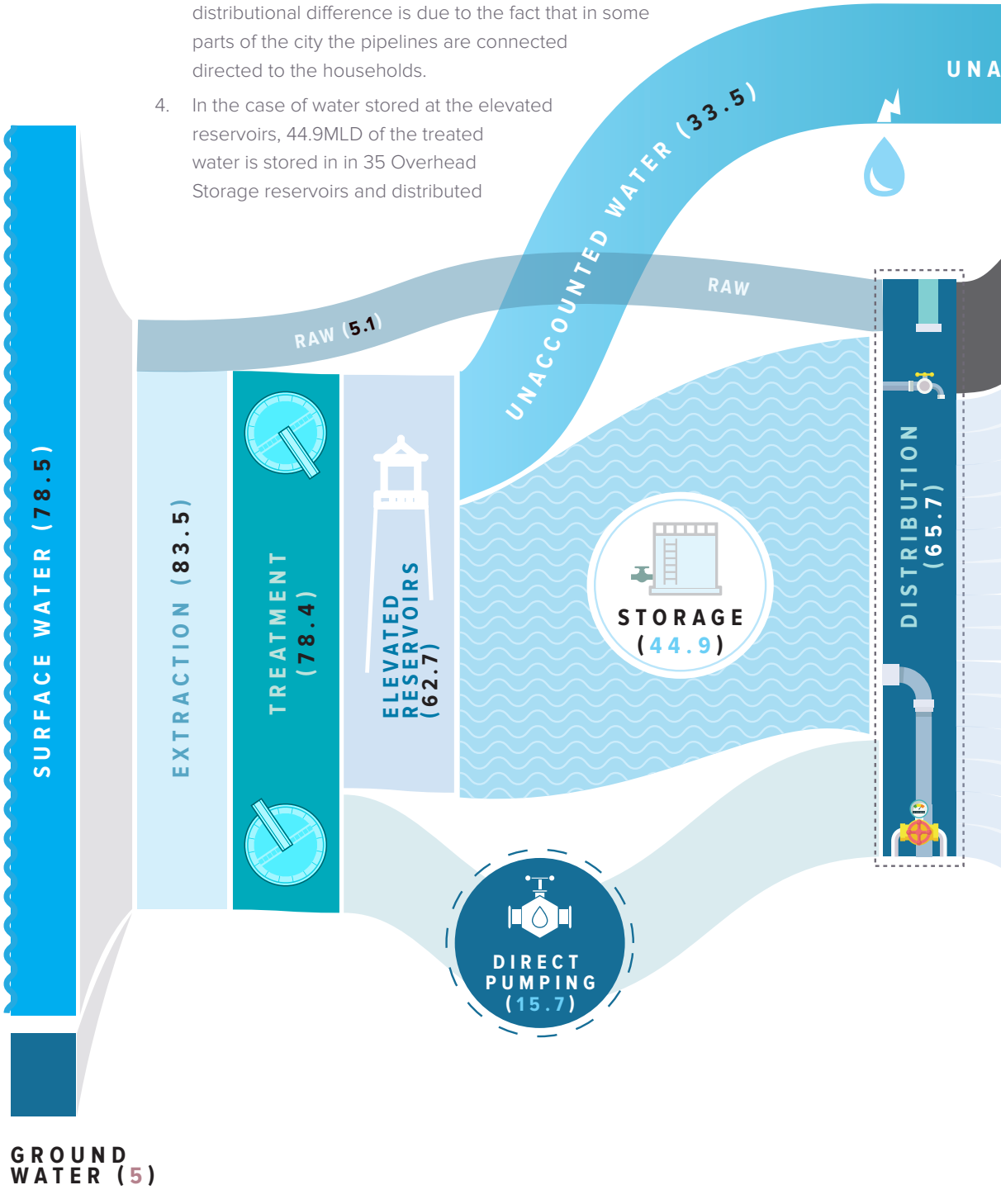
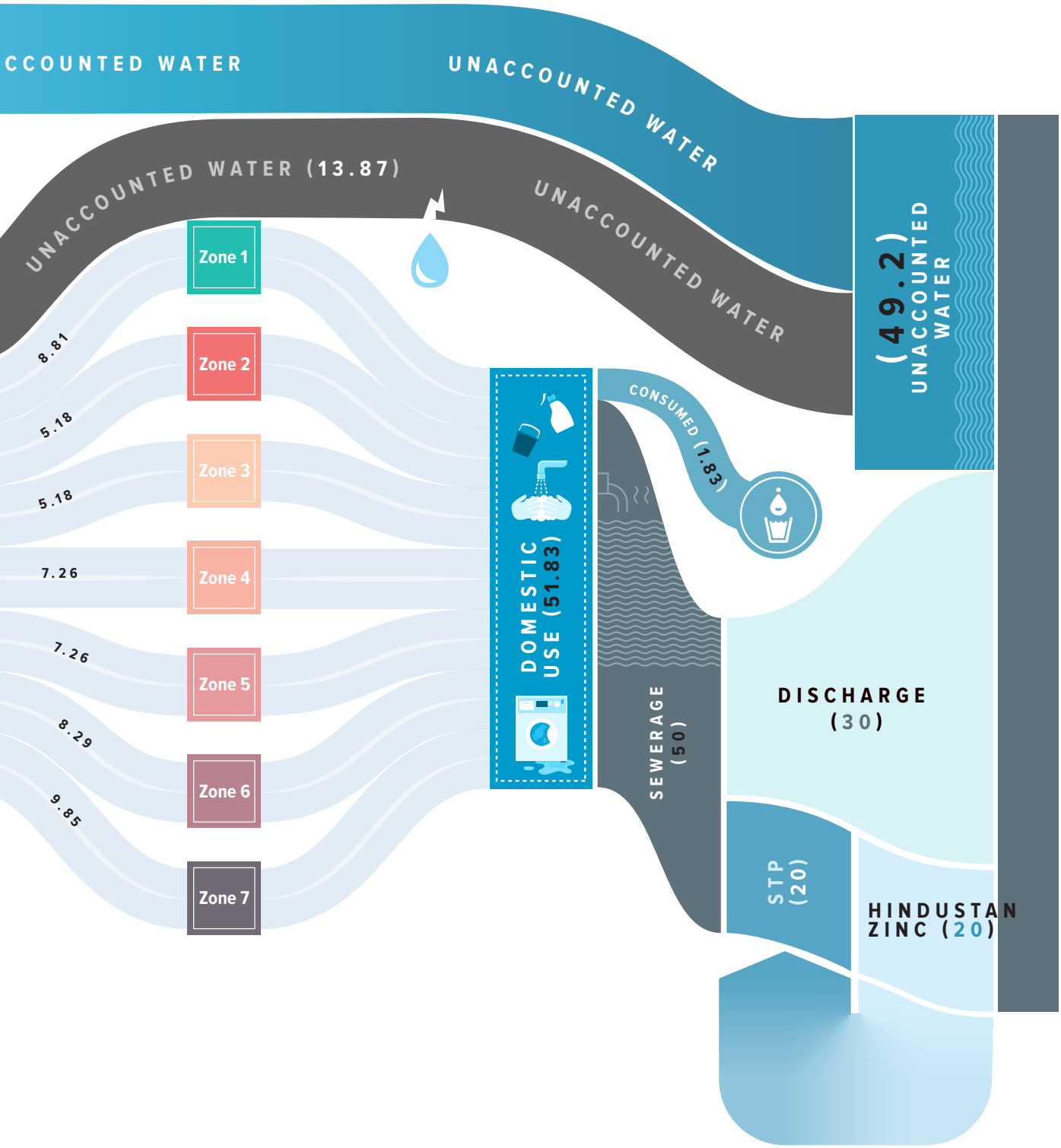


Figure 3: Sankey diagram of the current water flow scenario in Udaipur

to the households in the 7 zones, and 33.5 MLD of the water is unaccounted water. This proportion is unaccounted water, as its destination is uncertain. This could be due to transmission losses, evapotranspiration, industrial uses as well as unmetered connections or metered but unbilled connections

5. The PHED department then distributes the water to the 7 zones, the distributional amount is dependent on the population in zone. Thus total of 51.38 MLD is distributed for domestic use and 13.87 MLD is labelled as unaccounted water due to the assumptions mentioned above.
6. Assuming that 80% of the water utilized is let out as wastewater and based on the information provided the sewage generated is 50MLD.
7. Udaipur city has one sewage treatment plant of a capacity of 20MLD that is operated by Hindustan Zinc. 50% of this treated sewage water is re-used in the internal operation of the STP and 50% is disposed in the Ayad river. The remaining sewage water (30MLD) is discharged into the city water bodies or in the Ayad river, untreated.

The current urban water system in Udaipur clearly indicates the potential for efficient water management with strategic focus on the potential for reuse of treated waste water; an efficient water distribution as well as wastewater collection system.



ANALYSIS FRAME

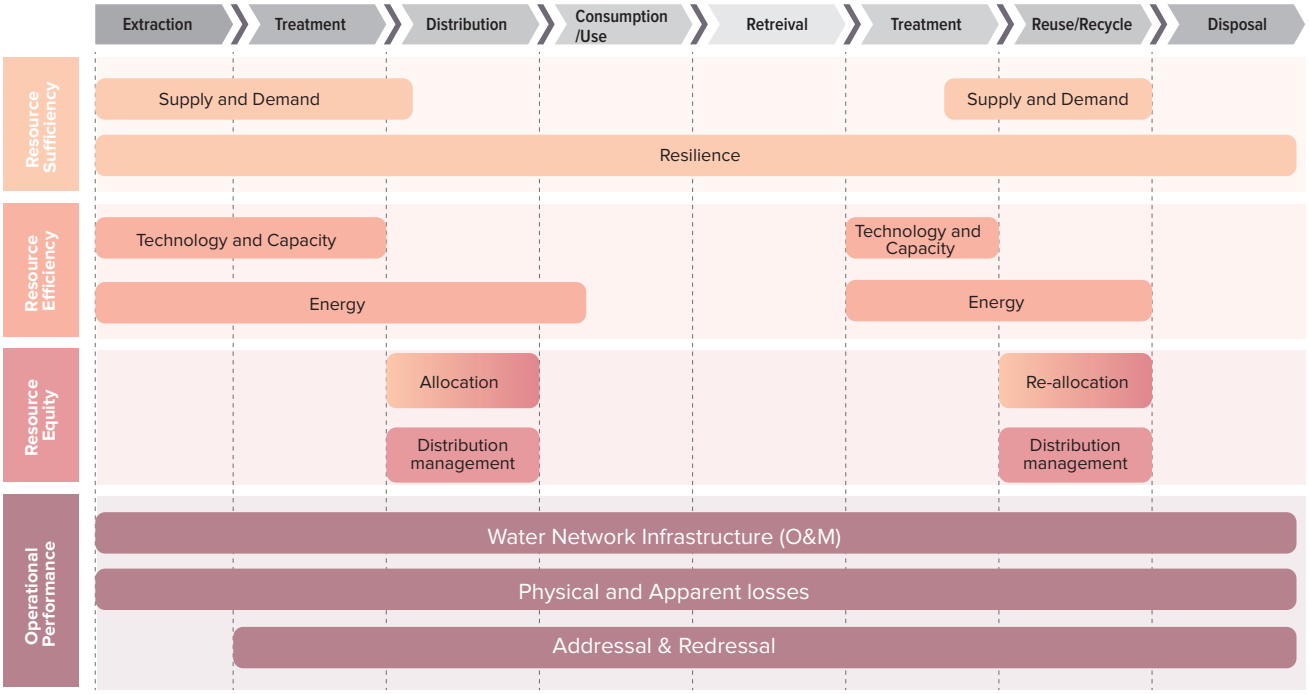


Figure 4: Analysis frame for understanding the urban water flow of cities

For an effective sustainable urban water system, the natural and anthropological parts of the urban water system have been explored from the lens of resource resilience and efficiency. Four domains have been identified to act as a lens to understand the urban water system. The four lenses through which the water flows in the city of Udaipur is looked through:

- **Resource Sufficiency:** This refers to the ability of ensuring continuity in consumption without constraints on the supply. The main drivers of increased self sufficiency are identified as shortage of available water, constrained infrastructure, high quality water demands and commercial and institutional pressures. Research studies have demonstrated that increases in self sufficiency ratios can be achieved upto 80% with contributions from recycled water, sea water desalination and rain water collection (Rygaard, Binning, & Albrechsten, 2011).
- **Operational performance:** This refers to the performance which is measured against standard or prescribed indicators of effectiveness, efficiency, and environmental responsibility such as cycle time, productivity, waste reduction and regulatory compliance.
- **Resource Efficiency:** Resource efficiency is defined as 'the ratio of resource inputs on one hand to economic outputs and social benefits on the other'. It is an innovative approach to resource consumption by reducing the total environmental impact of the production and consumption from raw material extraction to final use and disposal. It is plays a pivotal role in introducing

sustainable production and consumption patterns to residents of the city as well as municipal governments on the opportunity to improve resource efficiency, decrease CO2 emissions, reduce environmental risks and safeguard ecosystems.

- **Resource Equity:** This refers to ensuring equitable access to water, and to the benefits from water use, between women and men, rich people and poor, across different social and economic groups which involves issues of entitlement, access and control.

These lenses are used to understand the nature of water management in the city and identify key areas of intervention to support sustainable urban water system. This would further contribute towards achieving Sustainable Development Goal- Six (SDG-6) on clean water and sanitation for all. The progress on each of these lenses would contribute to specific indicators under SDG6 and targets laid under Ministry of Housing and Urban Affair's (MoHUA) programme- Smart Cities Mission.

The key SDG indicators include –

- **Target 6.1.1:** Proportion of population using safely managed drinking water services
- **Target 6.3.1:** Proportion of safely treated wastewater, for which India is yet to define some standards
- **Target 6.4.2:** Level of water stress (referred as BWS in this report) i.e. freshwater withdrawal as a proportion of available freshwater resources.

Areas with BWS above 20 percent may already begin to experience risks from stress to the environment[1] and a threshold of 40% signifies severely water-stressed conditions.[2] According to the UN Statistics India's national average of BWS was 44.53% in 2014.

Accordingly, this analysis framework would help identify the key points for intervention in the city water management practice and would contribute towards establishing efficient and resilient water management system in the city.

1 Although several groups have attempted to set minimum environmental ow requirements for healthy freshwater ecosystems, differences in eco- systems and hydrological regimes around the world hinder the creation of a meaningful global standard.

2 Vörösmarty et al., "Global Water Resources: Vulnerability from Climate Change and Population Growth."

RESOURCE SUFFICIENCY

SUPPLY

77%
% households having in-house water supply connection

16792.75 MCFT
Total availability of freshwater (surface and ground water)

83.50 MLD
Freshwater treatment and supply capacity of the city

DEMAND

451,100
Population (2011 Census)

115 MLD
Total water demand of the city (MLD)

RESILIENCE

92739 KL
Total storage capacity (city infrastructure)

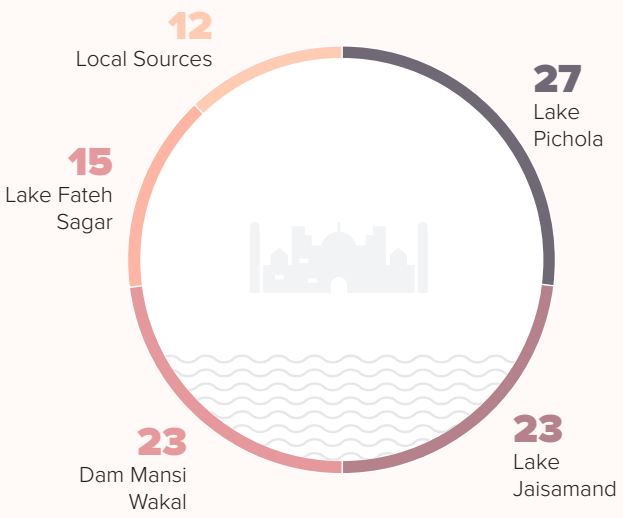


Figure 5: Sources of water supply in Udaipur

SUPPLY

The water supply in Udaipur is maintained by 5 surface sources, 4 open well, 16 Baories, 60 Tube Well, 199 Panghat and 2938 hand pumps.
The 5 surface water sources provide the city with a total of 78.50 MLD. The Capacity of surface sources of Pichhola lake, Fatehsagar Lake, Jaisamand lake, Badi Lake, Mansi Wakal dam are 483.00, 427.00, 14650.00, 370.75 and 862.00 MCFT respectively.

The city has 10 water treatment plants with total treatment capacity of 84.24MLD and 89% utilisation. Of the 10 treatment plants, 6 plants are based on rapid gravity filters (RGF), while 3 are based on pressure filters (PF).

Table 3: Existing water treatment plants in Udaipur

Sr. no	Name of water treatment plant	Capacity (MLD)	Source of raw water
1	Doodh Talai RGF	13.64	Pichola
2	Gulab Bagh RGF	4.54	Pichola
3	Gulab Bagh PF	2.27	Pichola
4	Doodh Talai PF	2.85	Pichola
5	Neemuch Mata RGF	11.35	Fatehsagar
6	Fatehsagar WTP	3.45	Fatehsagar
7	Fatehsagar PF	1.72	Fatehsagar
8	Nandeshwar RGF	23.35	Mansi-Wakal-I
9	Teetardi RGF	13.5	Jaisamand
10	Patel Circle RGF	7.57	Jaisamand/ Pichola
Total		84.24	

Source: Information provided by PHED

DEMAND

The total water demand for Udaipur city with a population of 451,100 (2011 Census) and a floating population of 30,000 is about 65 MLD, considering an average 135 lpcd water supply. However, the total water demand for the city includes that of domestic, industrial, institutional, tourist and floating population. As per the information provided by PHED, this amounts to 115 MLD. Assuming water supply loss to be 20% of the water supplied, the city calculates its per capita raw water demand to be 162 lpcd.

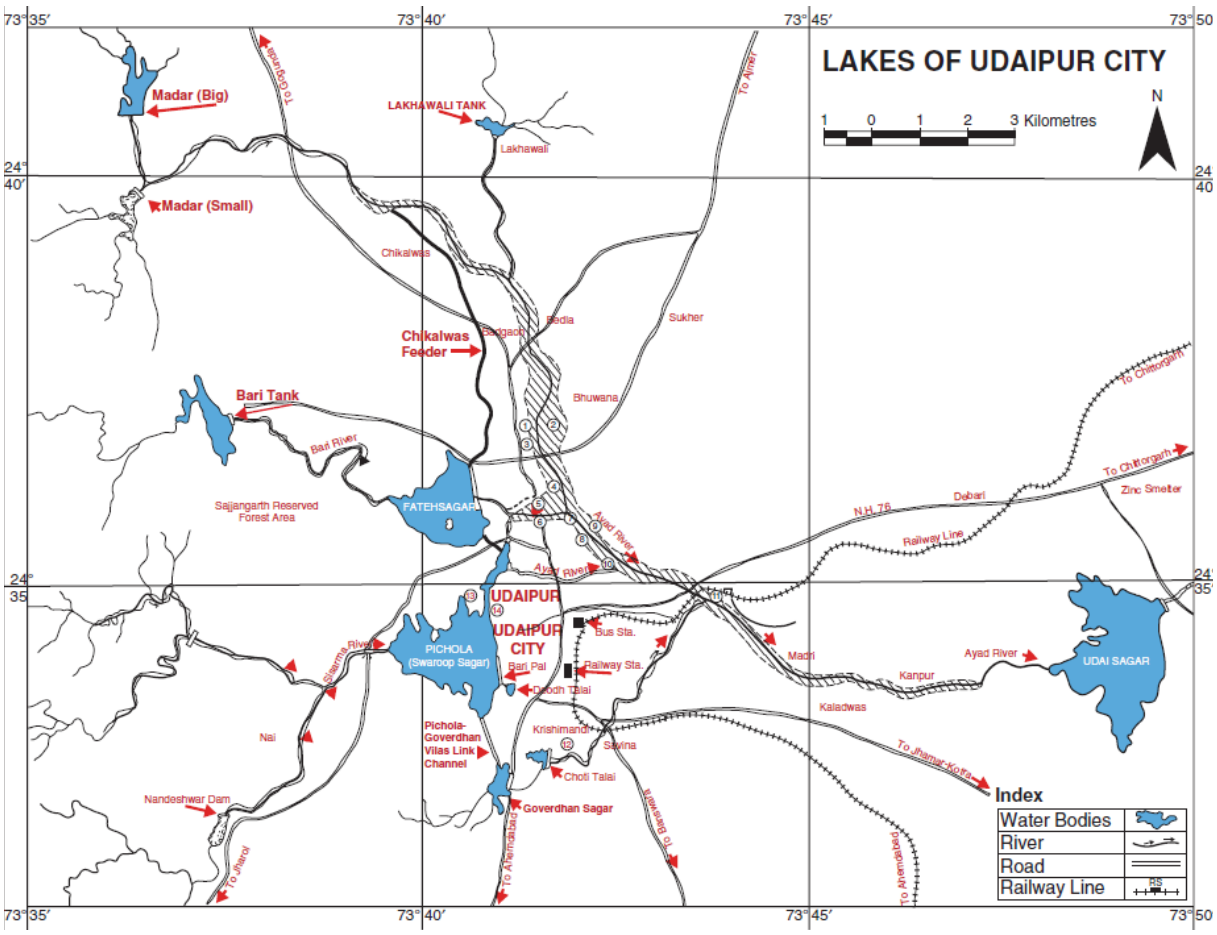
Based on population projections the city would require 101 MLD of raw water by 2021, 122 MLD by 2031 and 148 MLD by 2041. With the increasing population trends and unregulated consumption trends, it is pertinent that the city authorities think of more efficient means to supply this water demand.

DEMAND **115 MLD**

TOTAL PRODUC-TION **83.50 MLD**

STORAGE

There are 35 number OHSR having capacity 27188 KL & 19 GLSR having capacity 17711 KL and total capacity of storage reservoir is 44900kl or 44.90.ML. Water is supplied to consumers mostly through elevated reservoirs but in some part of city direct pumping is also used during supply hours, the ratio of these is 4:1.



OPERATIONAL PERFORMANCE

LOSSES

42%

Current NRW%

23.43%

% households dependent on ground water

50%
of the pipes require replacement

Distribution system

541 km

Length of distribution system

ADDRESSAL AND REDRESSAL

83%

% collection of water charges

70%

Efficiency in redressal of complaints

INFRASTRUCTURE MANAGEMENT

1 STP of 20MLD

Number and capacity of STPs

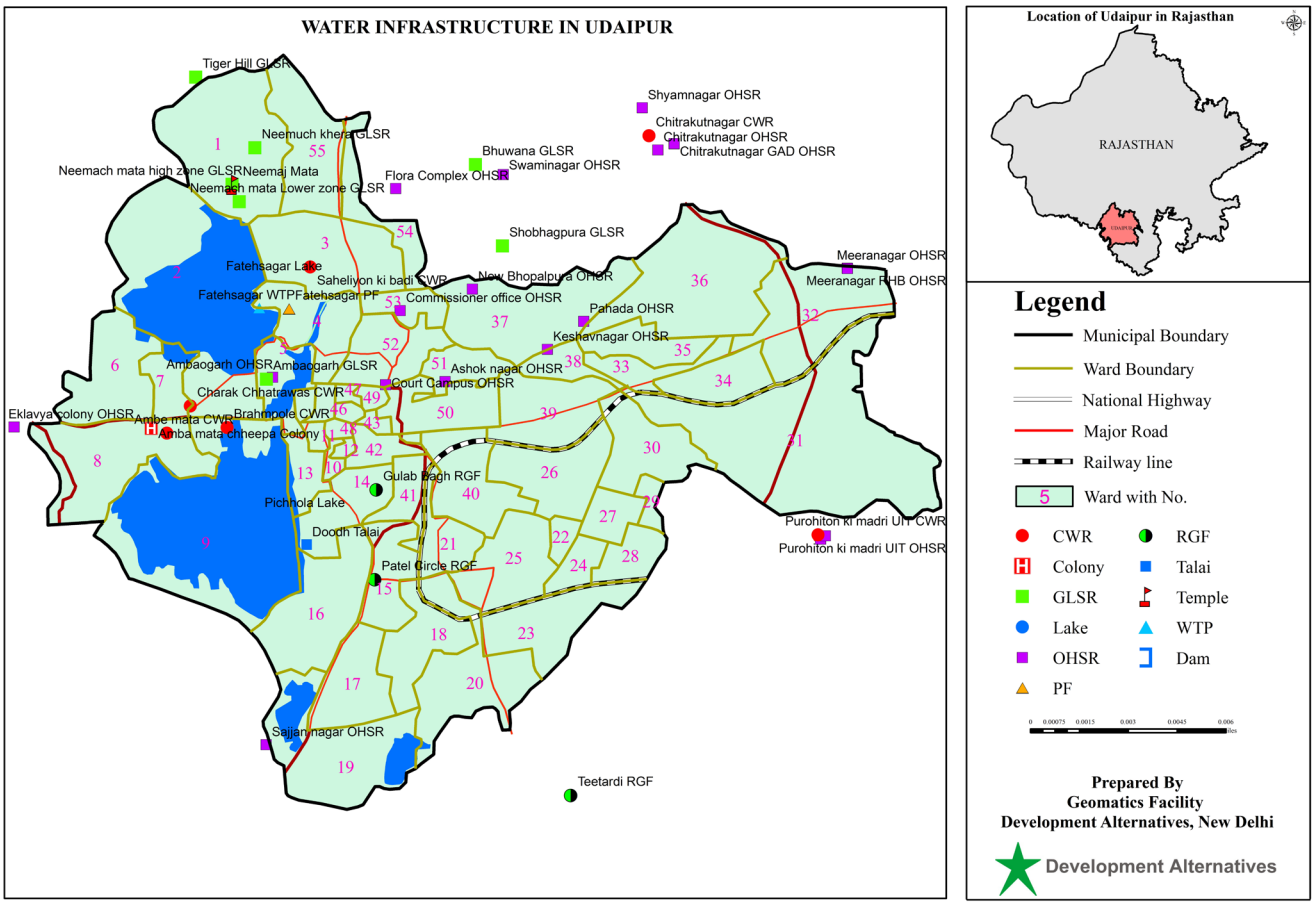
6 monthly

Frequency of operation and maintenance procedures within the supply network

The entire Udaipur water supply system is maintained and operated by the PHED. However, due to lack of man power, some of the activities have been outsourced such as leakage repair, cleaning of tanks, repairing of pumping sets etc. Of this system the PHED has setup a distribution pipeline of a total length of approximately 541 km.

There are total 17 Sewage Pumping and Lifting Stations and the length of the pumping mains is 6.9 km. In the year 2013-16, UIT with assistance of Hindustan Zinc Limited, laid a 7.78 KM trunk line of diameters varying from 800 mm to 1400 mm for conveying the waste water to STP of 20 MLD capacity at Ekingpura. This STP was based on MBBR technology. HZL has an already established 80km pipeline network to provide water to the industry from the STP.

Apart from the 20 MLD of waste water that is diverted to the STP, the rest of the city' waste water is disposed untreated into 139 drains in the city that flow into the Ayad river. Sewerage pipes are laid at 2.5 m depth and fresh water pipes at 4m depth. This has caused the leakages from the sewerage network to contaminate the fresh water supply at weak points.



1. Water bodies, Green area + topography (all within map boundary)
2. Sources: Surface only (The Capacity of surface sources of Pichhola lake , Fatehsagar Lake, Jaisamand lake , Badi Lake , Mansi Wakal dam are 483.00 , 427.00 , 14650.00 , 370.75 and 862.00 MCFT respectively).
3. Infrastructure: Pumping stations, Water treatment plants, Sewage treatment plant, Major drain, Industry (Hindustan Zinc Ltd). There are total 17 Sewage Pumping and Lifting Stations and the length of the pumping mains is 6.9 km
4. Zones (administrative)
5. Storage (amount if not location)
6. Current projects

RESOURCE EFFICIENCY

WATER STRESS

80%

Current Baseline Water Stress % (6.4.2)

78.5 MLD

Current total withdrawal from freshwater sources

QUALITATIVE ALLOCATION
(Use, Reuse, Recycle)

30%

Proportion of safely treated wastewater

Approx. 256000kW

Energy consumption at the STPs

Presently, one wastewater treatment plant (operated by Hindustan Zinc Ltd.) in Udaipur treats 20 million liters of wastewater per day, which is about 30 percent of the city's wastewater. In coming years, the intention is to establish treatment of the city's entire wastewater. Gas production has not been established, and due to insufficient supply from the public electricity network, the current wastewater treatment plant is operated on generators. However, the plan is for a future treatment plant to produce energy based on the resources contained in the wastewater. – Expresswater on "Aarhus vand eyes india's smart cities."

SEWERAGE

Integrated sewerage map has been developed by the UMC and UIT, after the lake conservation plan under the national lake revival plan established in 2013. 58km of sewerage network and a 7700m trunk line has been laid.

Udaipur has 80% area where storm water drainage system exists and for remaining area proposals are being submitted under the AMRUT scheme.

Considering the topography of the city, decentralize waste treatment system is necessary and therefore 2 STPs of 10 MLD capacities have been planned along Ayad river.

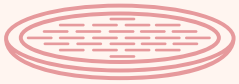
20 MLD STP has been set up by Hindustan Zinc as part of their CSR in April 2018 on their privately owned land. MBBR technology is being used. HZL had funded for the trunk line as well. The treated wastewater is being used for industrial purpose by Hindustan Zinc Ltd.

The Udaipur Improvement Trust (UIT) built sewerage system of 24 kms length for the following areas around the lakes in the year 2002-04, to avoid untreated sewage being discharged in to the lakes. The sewerage

About

50 MLD

sewerage is
generated in the city



network built under this scheme covers peripheral areas of lake Pichola as well as internal areas like Delhi Gate, Chandpole, etc. Approximately 6000 house service connections are provided through this system.

About 50 MLD sewerage is generated in the city. 12.5 MLD sewerage reaches the STP however the work of connecting outlet is under progress. Biological Oxygen Demand (BOD) of incoming wastewater is 250 mg/ ltr and outgoing sewage of STP is 10 mg/ ltr. Chemical Oxygen Demand (COD) of incoming is 400 mg/ ltr and outgoing sewage of STP is 50 mg/ ltr TSS of incoming is 250 mg/ ltr and outgoing sewage of STP is 5 mg/ ltr.

Integrated sewerage map has been developed by the UMC and UIT, after the lake conservation plan under the national lake revival plan established in 2013. 58km of sewerage network and a 7700m trunk line has been laid.

RESOURCE EQUITY

DISTRIBUTION

115

Municipal water supply per person per day

2-4 hours per day

Duration of water supply per day

ALLOCATION

Table 3

Zone wise allocation of water

ECONOMY

Rs. 8.6/KL

Cost of production (extraction and treatment)

29%

Cost recovery in water supply services

The city is divided in seven zones and 142 subzones. where the closest source is considered for each ward/project. The considerations are: closest source, enough pressure and if the water is reaching everyone or not. Alternate day water supply is maintained in town. The amount of ward population decides how much water is supplied per ward.

The funding is through AMRUT I & II, Smart City Ltd. And RUID. These aim at a 65% coverage by 2020. The smart city program with Hindustan Zinc Ltd. is construction 3 STPs of total 40 MLD of STPs: 5MLD plant near Kazrali House, 10MLD near FCI godown and 25MLD at Eklingpura (as an addition to 20MLD). At present, the sewerage plant covers 20.3% of the city, after completion of the project, the coverage will be 62.5%.

Table 4: Zone wise allocation of water to households

Zone No	MLD supplied per zone	Households with Water tap Connection	Households without water tap connections
I	8.81	14292	7708
II	5.18	7926	74
III	5.18	8515	35
IV	7.26	11263	5237
V	7.26	11604	2396
VI	8.29	12855	5145
VII	9.85	15511	4489
Total	**51.83**	**81966**	**25084**

Thus given the above situational analysis of the water supply system in Udaipur city, it is evident that the city has 2 critical aspects to address:

1. Replacement of old infrastructure to reduce leakages and identify causes for high NRW
2. Identify potential for re-use of treated wastewater. The city is largely dependent on the lakes for its water supply which is further dependent on the rain. Thus to ensure water resilience in the city of Udaipur, it is crucial that the 60% of the wastewater that is disposed into the Ayad river untreated, is collected and re-used within the city.

WAY FORWARD

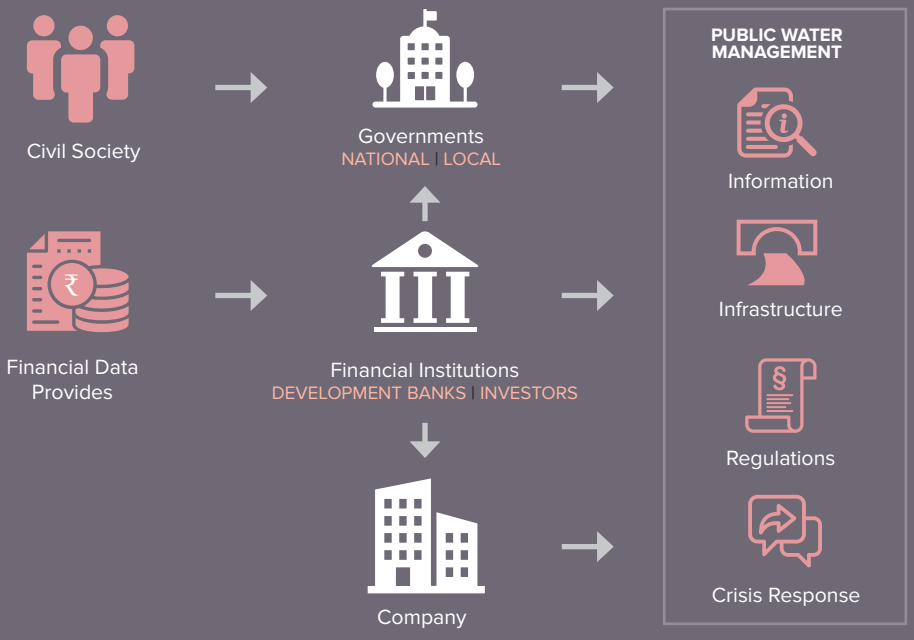
It is clear from the analysis above that the aspects of resource efficiency, equity, resilience and operational performance have been considered in a disaggregated manner in the Udaipur. Thus for sustainable urban water management to be ensured, a collaborative perspective on the 4 lens of sustainability is the need of the hour. It is important to reassert the fact that technology or infrastructure is useless without the policy as well as the capacity to back it up. There continues to be a disconnect between policy decisions made and the actual demand from the overall city ecosystem.

In the given situation, a framework for the integrated role of policy, business and civil society can potentially contribute to the sustainable development of the country in general and achieving targets listed under SDG 6 in particular. It is important to understand the co-benefits as well as the negative externalities of each stakeholder's decision towards effective management of the urban water system.

Further, credible informative data would drive a variety of users including government, financial institutions supporting infrastructure projects and industries to influence and improve public water management on a local or utility level.

Thus there is a need for a robust analysis to ensure that there is a strong integration of the policy, legislative and market ecosystem which is driven by sufficient information, required infrastructure, effective regulations and crisis response mechanism (see image below).

Figure 6: Theory of change



Source: Adapted from WRI Environment Democracy Index (Worker and de Silva 2015)

Note: The global geodatabase would drive a variety of users to influence and improve public water management on a local or utility level. Rather than offer a fixed set of activities that actors could take, this Technical Note documents the ecosystem of actors at play and focuses primarily on companies, as they are the primary data collection mechanisms.

With an overarching view of addressing diverse policy and practice issues, challenges, and transitions required for mainstreaming effective and efficient water management system in Udaipur, Development Alternatives with support from Heinrich Böll Foundation initiated a workshop on 'Understanding Water Flows in Udaipur, on Thursday, 25th October, 2018 at The Fern Residency, Udaipur. The workshop focused on presenting the status of the urban water system in Udaipur and the potential for improvement in the system.

The consultation provided a platform to bring together various stakeholders from the Government, civil society and academia to create multi-stakeholder dialogue and deliberate the importance of efficient water management and its co-benefits.

The workshop resulted in a dynamic discussion on data, impactful information, effective regulation and more importantly, the role of behavior change in influencing the practice of sustainable lifestyles with the community. Following are the key suggestions that were considered at the workshop, for efficient and effective urban water management in Udaipur:

Need for a policy document on water tariffs: A concern that the participants of the workshop spoke of was the issue of water tariffs and the lack of differential pricing depending on the volume of water consumed by a household. The participants were well aware of the fact that the official data claimed that Udaipur receives an average of 155 LPCD. Thus while certain zones may receive high volumes of water, other zones might barely receive the bare minimum. Hence while discussing the issues of water sufficiency and equity, it was suggested that the water tariffs should be reassessed to ensure regulation of consumption of water by users.

Development of a Water Bank: Building on the issue of sufficiency and efficiency and the lack of credible micro level data, especially in identifying the losses in water (i.e., Non-Revenue Water), it was suggested that a Water Bank should be developed. This Water Bank would act as a payment service for water and well as provide serves for dual pipe water connections to be made possible for use of recycled grey water.

Build community awareness on conservation through social media: While discussions on the supply side of efficiency and sufficiency of water was discussed, the issue of consumer awareness and education was still considered a more difficult problem to tackle. However, the participants did come to a consensus that one of the interventions for effective urban water management and especially with regard to the possible use of recycled wastewater was the need for addressing 'consumer behavior in re-shaping the demand and supply of water. In this regard, it was suggested that communication toolkits needed to be developed for especially the youth. Several social media platforms were suggested as being the key target for such communication tools to be presented.

B-32, Tara Crescent,
Qutub Institutional Area
New Delhi -110016.
India.
Email: mail@devalt.org
Website: www.devalt.org
Ph: 011-2654-4100, 011-2654-4200