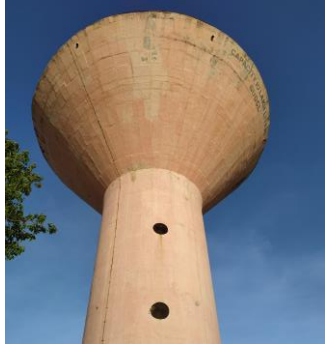

Moving towards water secure and climate resilient cities: Anjar

City's water assessment slide deck

Center for Water and Sanitation (CWAS)

January 2024

CWAS CENTER FOR WATER AND SANITATION | CRDF CEPT RESEARCH AND DEVELOPMENT FOUNDATION | CEPT UNIVERSITY | EMPOWERMENT FOUNDATION | dasra

Moving towards Water Secure and Climate Resilient Cities
Anjar

Water Security Assessment for Anjar is prepared by the Center for Water and Sanitation (CWAS),
at the Centre for Research and Development Foundation (CRDF), CEPT University
in partnership with Empowerment Foundation and Dasra to support Anjar Municipal Council
To move towards water secure and climate resilient cities.

Acknowledgment

Cities have become more susceptible to water scarcity than ever before. Climate change and resultant uncertain weather patterns are forcing cities to take extreme steps to combat severe water crisis, especially during summer months. Indian cities are no exceptions. Understanding the severity, GoI has launched AMRUT 2.0 (Atal Mission for Rejuvenation and Urban Transformation) which focuses on making cities water-secure and self-sufficient through circular economy of water.

Anjar city is located in the arid region at the Kachchh district, Gujarat. It receives around 430 mm of annual rainfall in comparison to the national average of 1152 mm. Large part of the Kachchh region including Anjar are water stressed with a severe shortage of drinking water in the summer and is characterized as a drought-prone areas. This situation has improved significantly since the long distant Narmada canal water has been made available as drinking water. However, change in rainfall pattern in Narmada catchment may result into water scarcity in Anjar, if the local water resources are not managed well.

In this context, CWAS at CEPT University in partnership with Empowerment Foundation and Dasra will support Anjar Municipal Council to move towards water security. The key support will include assessment of existing water scenario, developing water security plans for the city and demonstration of pilot projects like rain water harvesting, ground water recharge, revival of defunct wells and reuse of wastewater. A mix of secondary data provided by the city, primary surveys, and stakeholder interactions were done to prepare the assessment slide deck for both Anjar city.

CWAS team acknowledges excellent support by Anjar Municipal council officials. Discussions with other stakeholders such as private water suppliers, water sector experts, community groups and slum households have also helped assess existing water scenario in both the cities.

We thank the Dasra team for its support and Empowerment Foundation for its grant to CWAS for this activity.

Meera Mehta and Dinesh Mehta
Center Heads, CWAS

About the project...

Moving towards water secure and climate resilient cities – Anjar

CWAS-CEPT University in partnership with Dasra and Empowerment Foundation will support Anjar Municipal Council to move towards water security.

CWAS in consultation with Anjar Municipal Council(s), has carried out citywide assessment and will develop Water Security Action Plan for the city along with some pilot demonstration projects around rainwater harvesting, groundwater recharge / revival of defunct well and potential reuse of used water

The project is being funded by Empowerment Foundation.

What the project will bring in for the cities?

Water security action plan can benefit the cities to become water secure by augmenting water availability through harvesting and/or recharging, overcome water scarcity through demand management, behavioral changes in citizens on judicious use of water through community participation and bring in institutional accord through policy initiatives.

Thus, the study aims at moving Anjar towards water secure and climate resilient cities.

The project will develop a water security action plan for both Anjar and Gandhidham…

DEVELOP A WATER SECURITY ACTION PLAN

DEFINE	PLAN			IMPLEMENT			
							
Water Security Plan Objectives	Key Issues and Challenges	Stakeholder Consultation	Set Priorities	Design Initiatives	Implement Pilot Projects	Capacity Building	Engaging with local communities	Developing SoPs/ Guidelines

- Desk review of various Water security frameworks across the globe
- Assessment and in-depth understanding of current water situation
- Stakeholder consultation to bring accountability and owner ship towards the initiatives

WSAP

- Implement pilot projects such as RWH, GWR etc. to demonstrate reuse
- Capacity building of the ULB officials and other stakeholders involved in the projects
- Developing SoP's, guidelines for proper functioning of the pilot project and proposed initiatives

Documentation of activities undertaken in these cities and sharing with sector partners in India and globally

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5 Assessment of Existing Sanitation situation

6 Institutional and Regulatory Framework

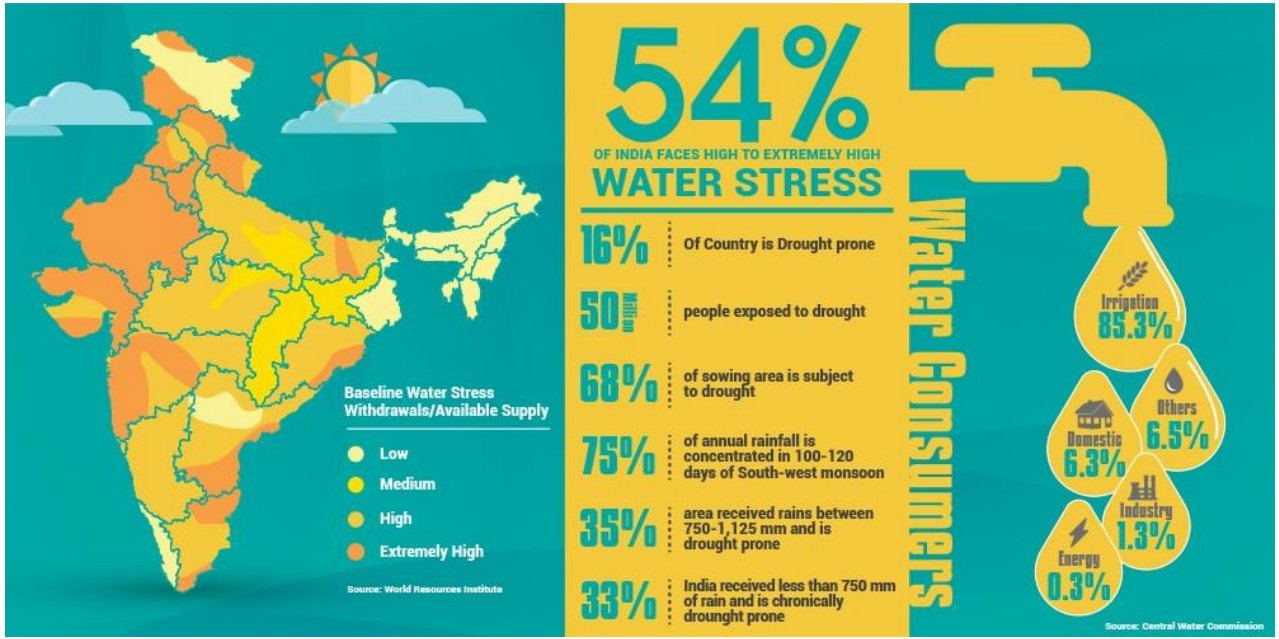
7 Key Findings

8 Way Forward

Overview of water scenario in India

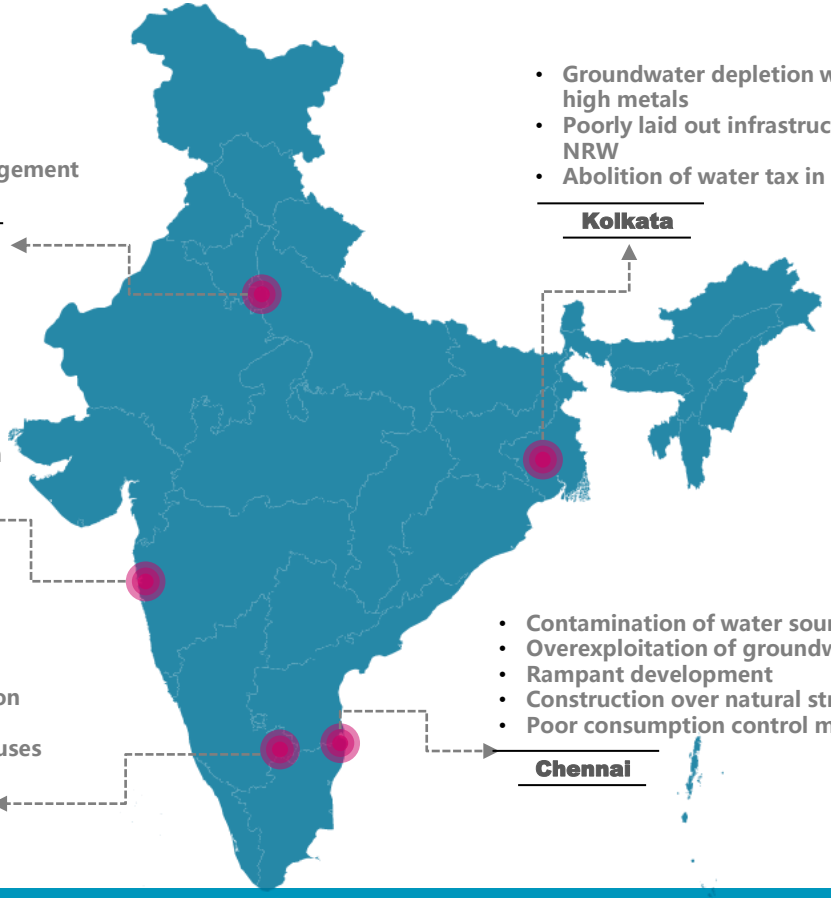
Water availability is becoming less predictable in many places with increased incidences of flooding and droughts.

Equitable access to safe drinking water continues to remain a challenge. Low-income communities, are most vulnerable



Source: World Resource Institute (WRI) https://www.wri.org/insights/3-maps-explain-indias-growing-water-risks; Central Water Commission

The threat of water scarcity or “Day Zero” is looming towards Indian Cities



Delhi

- High water loss
- High groundwater abstraction
- Rising demand and poor supply management
- Water source pollution

Kolkata

- Groundwater depletion with presence of high metals
- Poorly laid out infrastructure leads to high NRW
- Abolition of water tax in 2011

Mumbai

- Inequality between water supply hours
- Pollution of water source and groundwater due to improper industrial effluent discharge
- Poorly laid out infrastructure
- Minimal rainwater harvesting initiative implementation
- Rapid and unregulated urbanization

Bengaluru

- Poorly laid out infrastructure
- Delaying the groundwater rejuvenation
- High water loss
- Depletion of own sources and dependency on distant sources
- High percentage of concretization which causes flooding

Chennai

- Contamination of water sources
- Overexploitation of groundwater
- Rampant development
- Construction over natural streams
- Poor consumption control measures

Source: The Challenges of Urban Water Security and Growth – a working paper by Kubernein Initiative

Issues faced by urban water resources in India

Climate change and
Erratic rainfall patterns

Over- Exploited water sources

Increasing dependency
on distant sources

Rivers and lakes are
polluted and drying

Ageing and leaking infrastructure

Water Security is high on National and International agendas, cities too need to align towards these agendas

AMRUT 2.0
Making Cities Water Secure

अमृत
Atal Mission for Rejuvenation and Urban Transformation

Government of India has put a strong emphasis on water security – The Atal Mission for Rejuvenation and Urban Transformation 2.0 (AMRUT 2.0) has water security as the central theme

KET OBJECTIVES

Ensuring universal access to drinking water connection at household level

Focus on moving towards water secure cities

Conservation of waterbodies and urban aquifer management

Sustainable Development Goals (SDG 6)

- **Target 6.1: Achieve universal and equitable access to safe and affordable drinking water for all**
- **Target 6.6: Protect and restore water-related ecosystems, including rivers, aquifers and lakes**

Source: GoI, AMRUT 2.0 Guidelines: https://mohua.gov.in/upload/uploadfiles/files/AMRUT-Operational-Guidelines.pdf
Sustainable Development Goals (SDGs): https://sdgs.un.org/goals

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Definitions of water security across the globe focuses on quantity and quality of water

WATER is

Available in Quantity
Sufficient
Adequate
Safe
Reliable
Sustainable
Accessible
Affordable
Acceptable
Good Quality

to ATTAIN

Improved Livelihoods
Resilient Economies
Healthy Ecosystem
Human well-being
Peace
Political Stability
manage Water related risk

"Water Security is access of water for basic human needs in adequate quantity and quality, which is reliable and affordable."

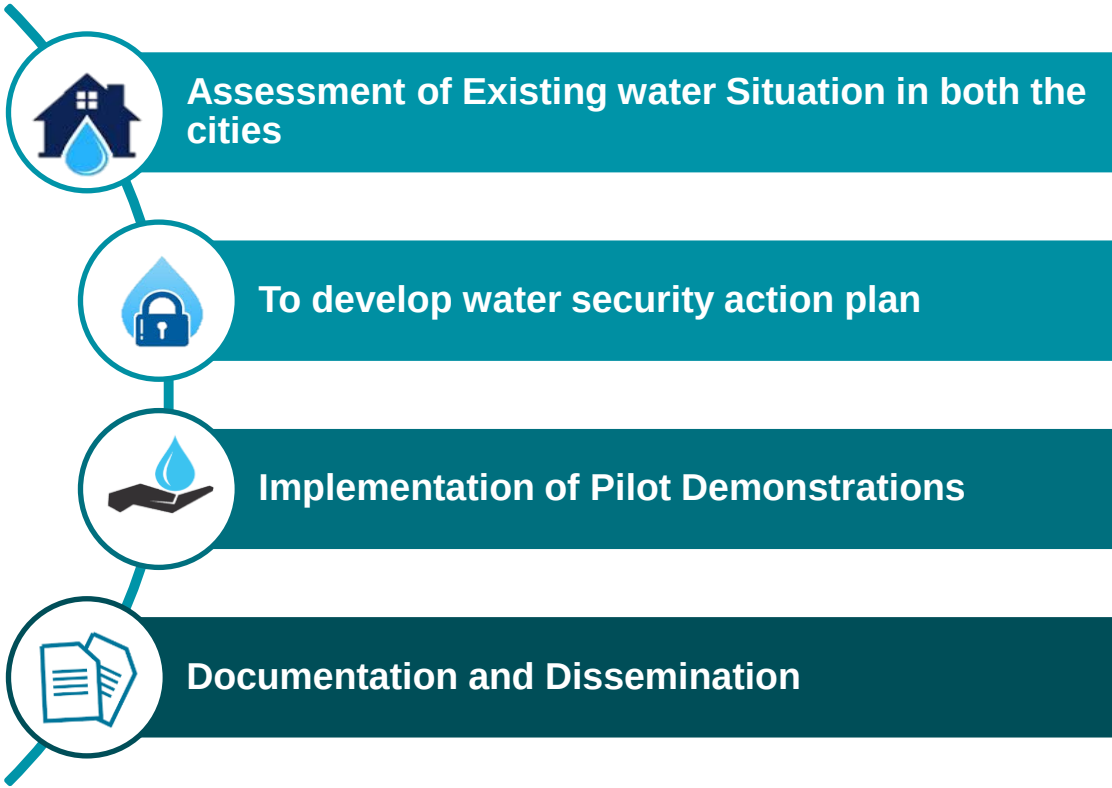
The frameworks are comprehensive, covering the various aspects associated with water and water governance, however water needs to be looked from regional context as the situation varies from place to place…

Source: ADB, United Nations – UN Water, WaterAid, Global Water Partnership and World Bank – Grey and Sadoff

Study Objectives

The study has four main objectives, which are as follows:

- **To Assess the Existing water situation in both the cities:** Existing water situation for both cities will be assessed through the lens of **Accessibility, Quantity, Quality, Reliability and Affordability**.
- **To develop Water Security Action Plan:** Water security action plan will be developed based on the water service chain assessment where **new initiatives** will be explored to make the **two cities water secure.**
- **To implement pilot demonstration projects:** The project also includes implementation of **action oriented pilot demonstration** around rainwater harvesting (RWH), ground water recharge (GWR), recharging urban flood spot etc.
- **To document and disseminate the work:** The complete project along with **scale up plan** will be documented.



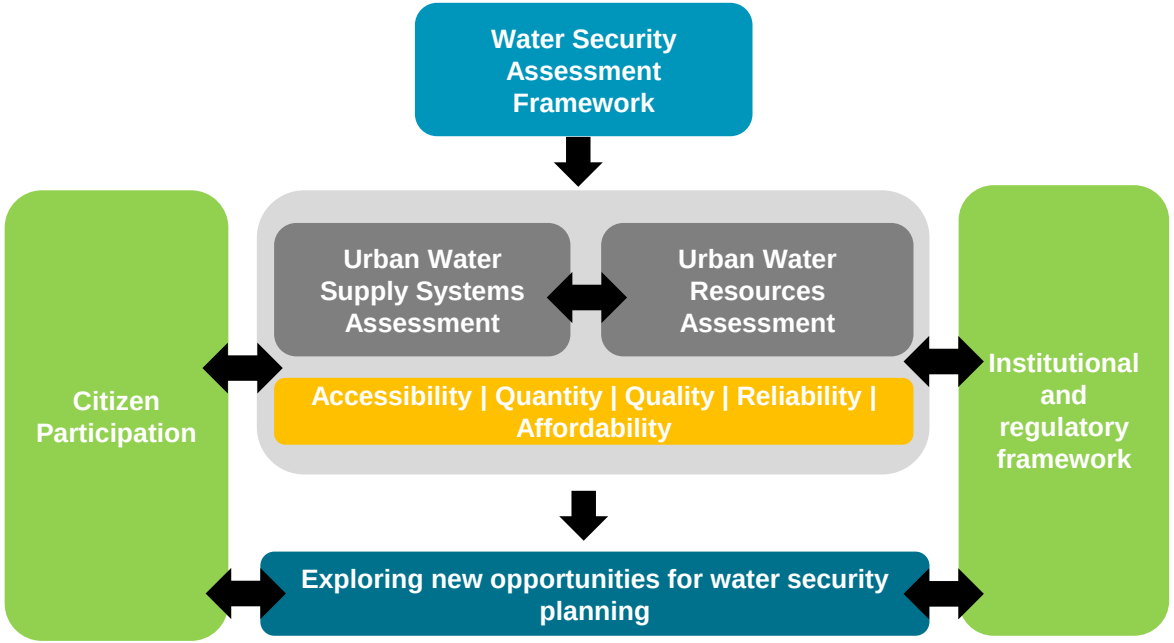
Water Security assessment framework focuses on four key aspects: Water source study, municipal water services, institutional framework and citizen participation

Water Security assessment framework is based on the **Urban Water Security Management Toolkit developed by CWAS** and is further **adapted.** The toolkit, assess the city' s existing water situation from **Urban water supply system** and **Urban water resources** perspective. The service chain is analyzed through the lens of five parameters viz., **Accessibility, Quantity, Quality, Reliability and Affordability.**

The **institutional and regulatory framework** adopted in the city plays a vital role in its **water management and service delivery.** Thus the same has been further examined for better understanding of the city' s water system.

Last but not least, **citizens**, the end user, of the water service must be included in the assessment process and hence the framework incorporate **assessing the existing water system from citizen perspective.**

Based on the above assessment framework, the **Water Security Action plan** for the two cities will be developed which will explore the new opportunity to make the cities water secure.



Source: Developed by CWAS based on Urban Water Security Management Toolkit (CWAS) and review of various guidelines and frameworks across the globe

Study Methodology

Desk review

Detailed desk review of **various Water security frameworks, toolkits** etc. adopted **across the globe** to make cities water secure

- ***Asian Development Bank: Asian Water Development Outlook (AWDO)***
- ***United Nation: UN's Framework for Water Security***
- ***WaterAid: Water Security Framework***
- ***CWAS: Urban Water Security Planning Toolkit based on Bhuj Experience***

Site Visit

- Site visits to all the **water and sanitation** related **infrastructures** in the entire city
- Survey of all the **slums** to develop **slum profile** and understand equity aspect in city systems
- **City survey** to understand the **urban fabric**

Discussion with ULB officials

- Discussion with **CO, President, department heads** and **engineers** to understand the **existing infrastructure and governance practices**
- Visited **various departments** of the ULB like **Water, sanitation**, IT, property tax etc.

Discussion with citizens (including Slum pockets)

Discussions with **Citizens, slum dwellers, Youth leaders, senior citizens** etc. has been conducted for better **understanding of the existing water and used water systems** in both the cities.

Source: ADB; United Nations; WaterAid Water Security Framework; CWAS – Urban water security planning toolkit

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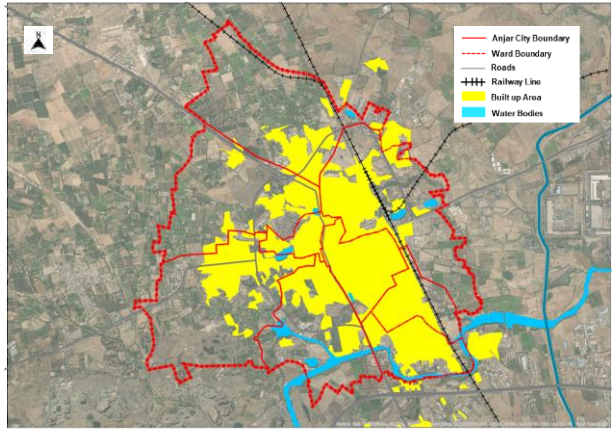
Anjar is a city located in Kachchh district of Gujarat...



17.81 Area (sq. Km)

9 Wards

1,09,238 Population (2021)

26,036 Households (2021)

29,214 Slum Population (2021)

29 slum pockets

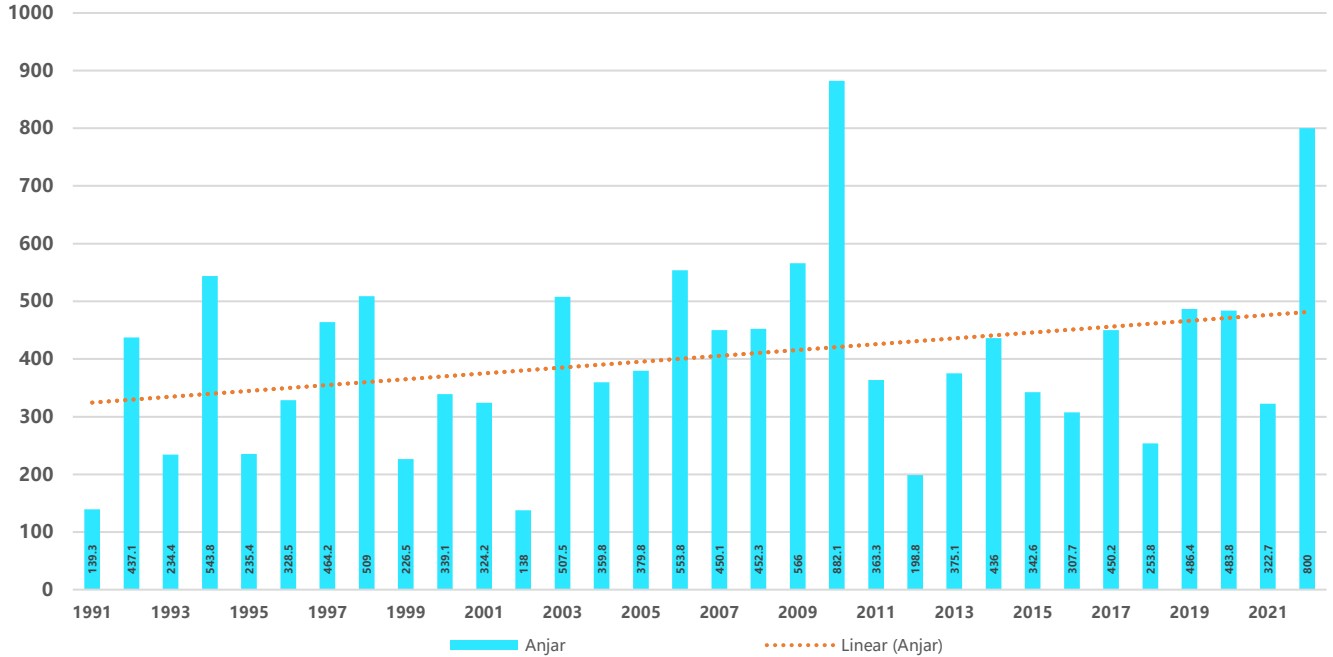
9,770 Slum HH (2021)

25% of total population

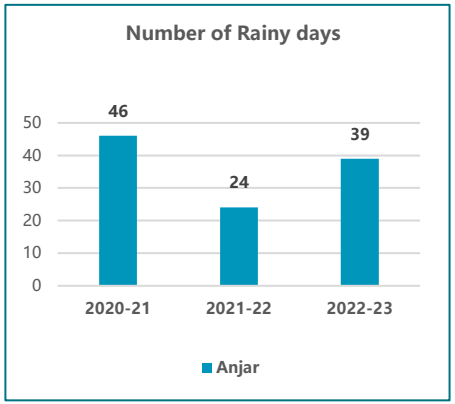
- **Kachchh** is a **largest district of Gujarat State**; spread over **45,674 km2** with **longest coast** line of about **406 kms** in the state
- Kachchh region falls under **arid-semi arid zone** (classified by **average annual rainfall of 250-500 mm**)
- Growing **economic and industrial** hub in the state. The key industries include **Engineering, Power, Steel Pipes, Cement, Handicrafts. Emerging industry sectors include Construction , Chemicals, Ceramics and Textiles**

Source: PAS (SLB)

The region is chronically drought prone with a frequency of once in every 2.5 years, however the rainfall shows increasing trends in past three decades



- Kachchh district has faced famine every **2.5 – 3 years**
- In last decade the region faced **sever drought in almost** every alternate year (2012,16 & 18)



- Number of **rainy days** has **increased** (~13 days)

However, in recent decades the rainfall pattern indicates increasing trends that can be tapped to augment the own water resource of the cities in Kachchh Region

Source: Gujarat State Disaster management Plan – 2016-17; and IMD; Economic and Political Weekly © 2002;IMD Grid data - https://crudata.uea.ac.uk/cru/data/hrg/cru_ts_4.06/ge/?_ga=2.66627182.1783822406.1667891824-833973110.1667891824; Kachchh Mitra (Local news paper, Kachchh) dated 9th September 2022; https://cdn.s3waas.gov.in/s32dace78f80bc92e6d7493423d729448e/uploads/2018/09/2018091226.pdf; Mamlatdar Office (AMC and GMC)

Anjar is the historical city, built around 650 AD...

Then..

Old map of Guzerat (Gujarat) & Sindh - published in London in 1814 AD

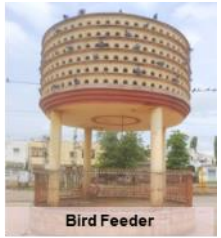
The city developed into various “fariyas” local name for neighborhoods with people of particular clans* - it now forms the Gamtal (Core City) area

Now..

Metal Knife

Jaisal Toral Samadhi

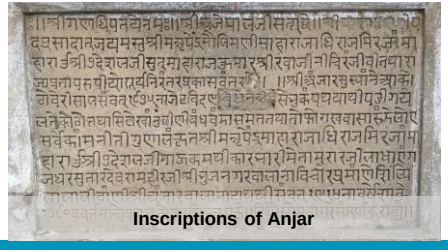
Veer Balak Memorial



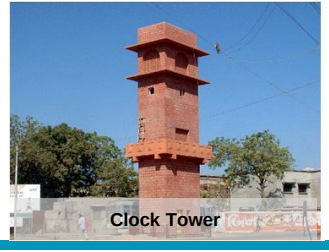
Bird Feeder

Anjar is rich in culture and handicrafts. It is known for metal knifes and torans.

City comprises of landmark buildings such as clock tower, Veer Balak Smarak- memorial for children who lost their lives in 2001 earthquake.



Inscriptions of Anjar

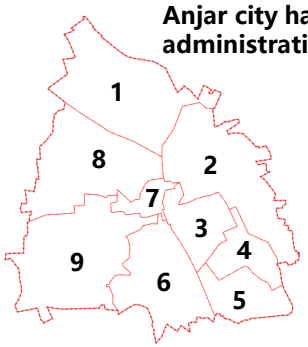


Clock Tower

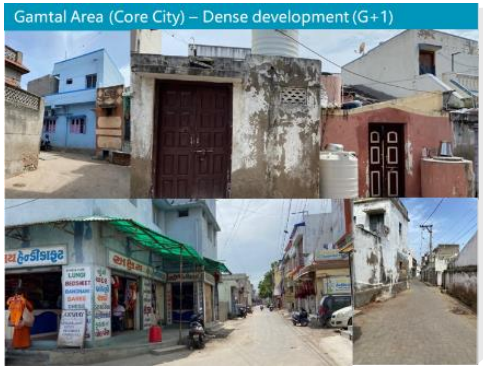
Hand Crafted Toran

Source: City visit; Livemint.com (https://www.livemint.com/news/india/pm-modi-to-inaugurate-veer-balak-memorial-in-gujarat-s-kutch-today-11661655390445.html)

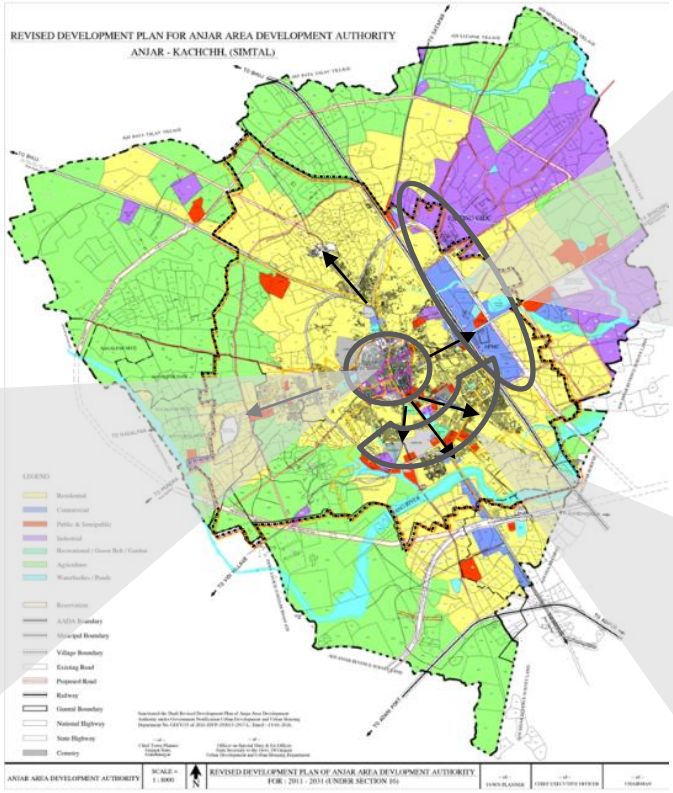
Anjar is organically grown town with development along the arterial roads

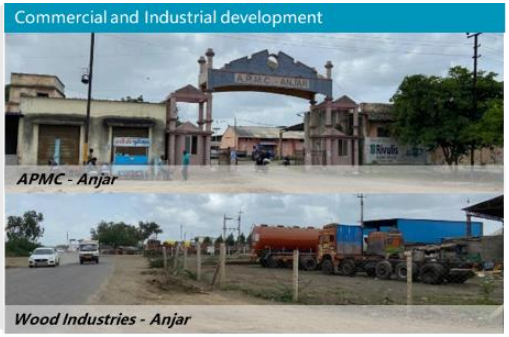


Anjar city has 9 administrative wards



The old city comprises of gamtal area which is densely populated with mix development.





Anjar is also known for its APMC market and has a large wood based industry along with commercial setups such as cloth mills/ factories and art and craft products.

The growth corridors are on the arterial roads of the city where major commercial and residential development is observed

Source: Base map from AADA website and images from Primary survey

Anjar is enriched in Water bodies, which acts as an important infrastructure of urban landscape

- The **Sang River** lies along the **southern part** of the city
- The city has **8 major lakes**
- The water bodies comprise approximately **2.7% of the entire city area**
- **Savasar lake –** was rejuvenated under the AMRUT program, which now is a major recreational zone of the city.


Savasar Lake


Sidasar Lake


Bahucharji Mandir Lake

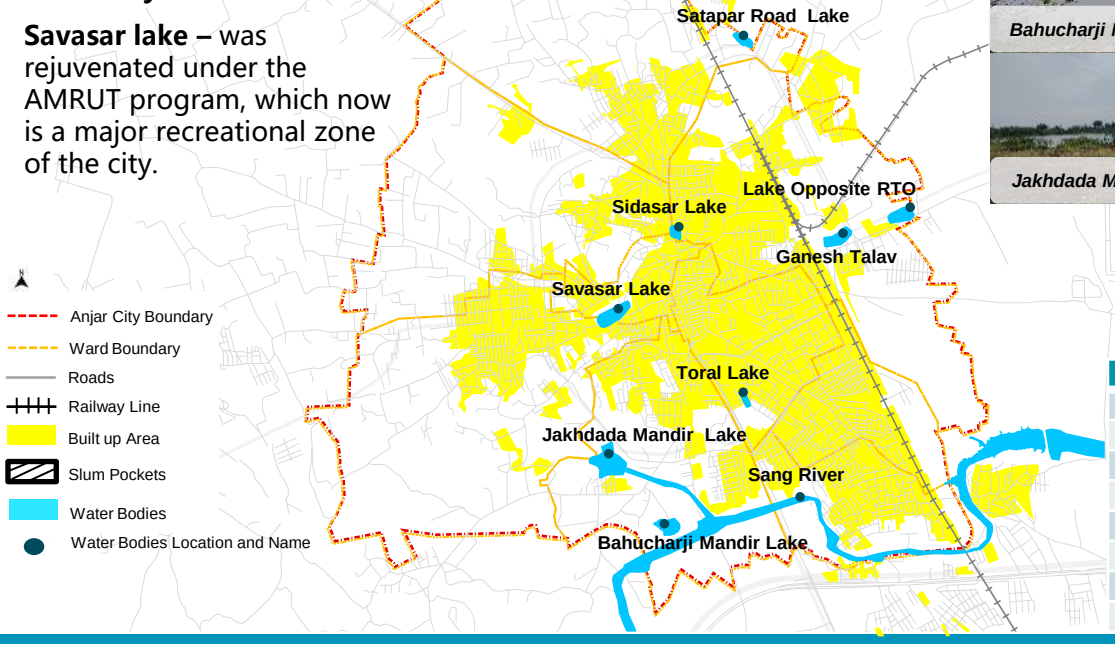

Jakhdada Mandir Lake


Lake opposite Anjar RTO


Ganesh Talav


Toral Lake

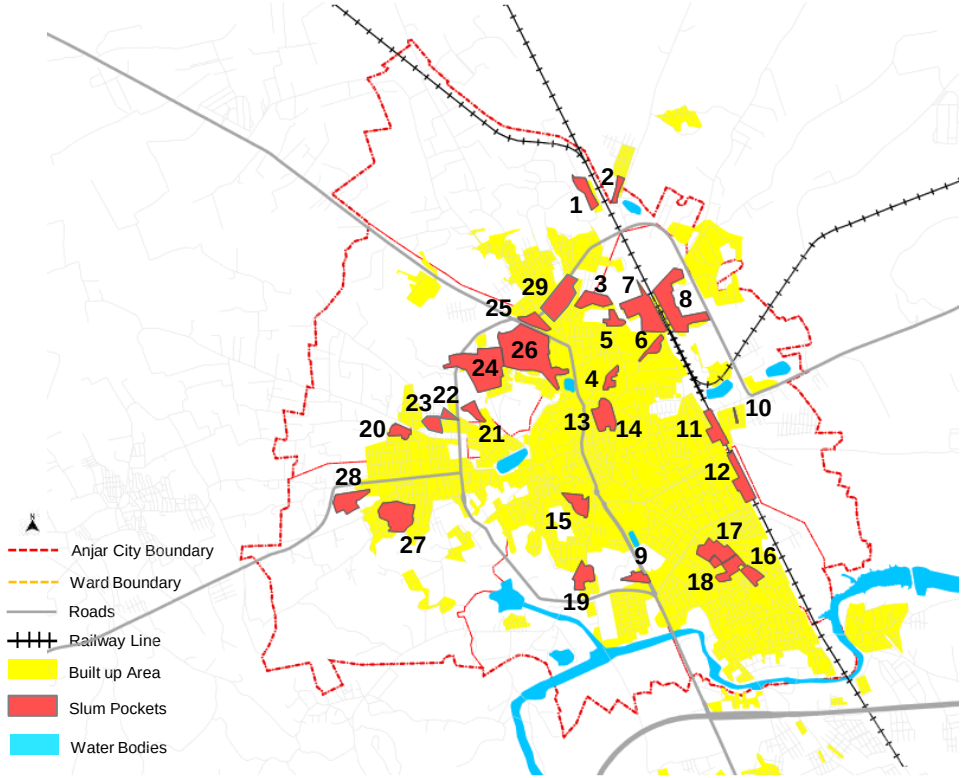

Satapar Road Lake



Sl.	Name of Lake	Area (Ha)	Use/ Condition
1	Savasar Lake	3.0	Recreation
2	Sidsar Lake	0.5	Poor Sanitation (Dumping Zone)
3	Bahucharji Mandir Lake	1.9	Not in Use
4	Jakhdada Mandir Lake	5.2	Not in Use
5	Lake Opposite RTO	1.6	Limited accessibility
6	Ganesh Talav	2.4	Not in Use
7	Toral Lake	0.8	Under Development (Recreation)
8	Satapar Road Lake	1.1	Not in Use

Source: Field Visit to Anjar city

~25% population of Anjar reside in its Slum Areas



29
Slums

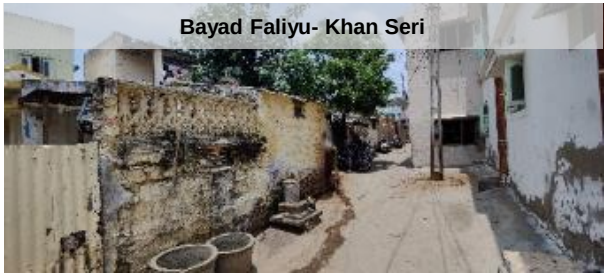
29,2014
Population

9770
Households

Anjar city has **29 notified** slums. The **slum population** ranges from **200 – 2500 +** (as per census 2011). The slums have mix of **partly kacha and pucca** houses with basic **water and sanitation** facilities provided by the **municipality.**

Visual assessment of slums- Anjar

Roads



End to end concrete roads with under ground drainage connection is observed in majority of the area

Housing Typology

Some slum areas has pakka G or G+1 structures, some slums have more like hutments (temporary structures)

Source: Primary Survey

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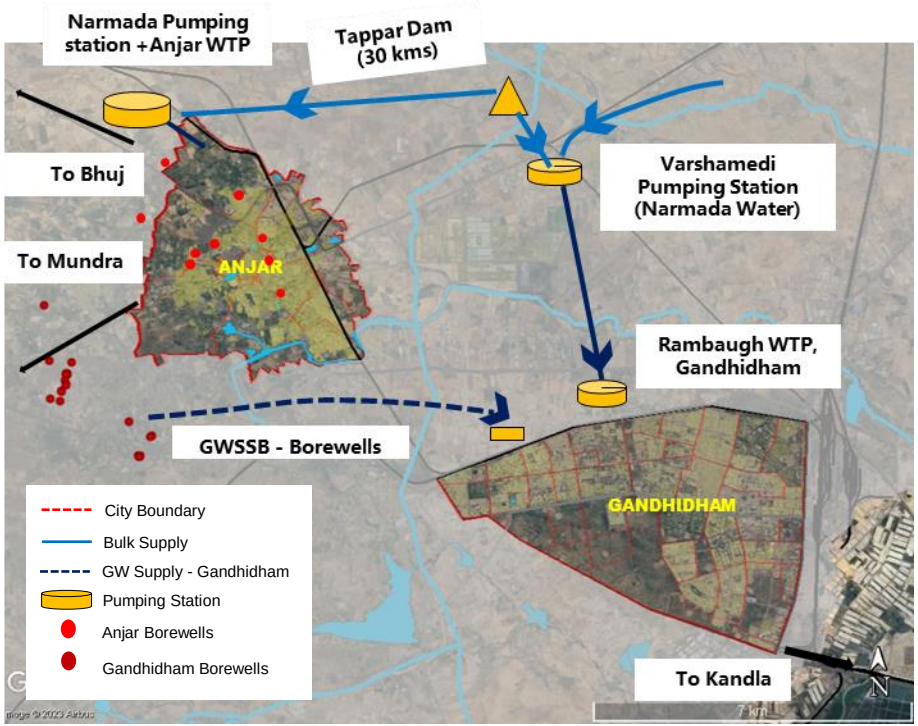
The water source for the cities has made a radical shift from ground water to distant surface water source, post implementation of Narmada Project



Surface Water

ANJAR – 9 MLD

Anjar has **50%** dependency Narmada water

Ground Water

Anjar has **50%** dependency on **ground water**, which is now **depleting**

ANJAR – 10MLD

ANJAR (Total Supply 19 MLD)

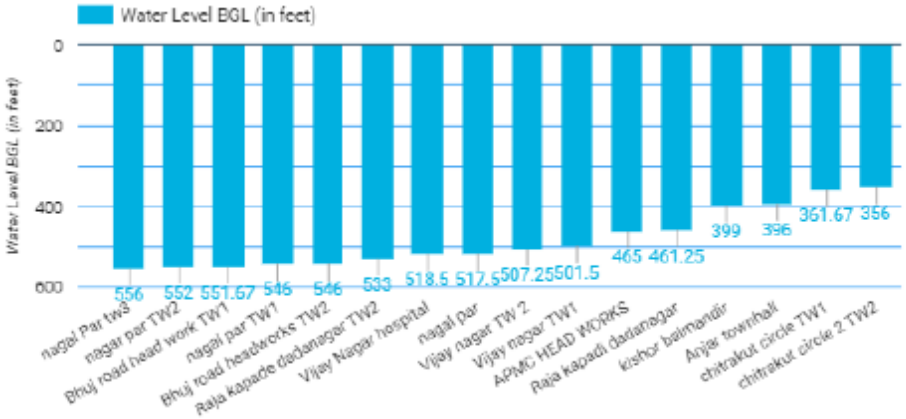
- **Before Narmada**, Anjar had **major dependency** on **ground water**, which the municipality supplied through its **own borewells**

Also the cities are planning to shift to surface water (Narmada water) over a period of 5-8 years

*Source: CGWB Report, Discussion with GWIL, GWSSB, Anjar and Gandhidham Municipality officials and Filed visits; CWBP**

Anjar's has 50% dependency upon ground water..

- Anjar Municipality has **29 borewells**, and drafts around **10 MLD ground water** every day
- **Depth of ULB borewells** varies from **530 feet to 630 feet** (Anjar Municipality)
- To test the water level in existing borewells – **Pilot project with Bhujal App – Waterlab was conducted (8th October 2022)**
- As per the app the **depth varies from 356 feet to 556 feet**
- Operating hours of municipal borewells ranged from **12 hours to 24 hours** indicating **good yields** by the borewells.
- **Over exploitation of Ground water** is observed in Anjar.
- No control, regulation or monitoring on ground water draft in Anjar.

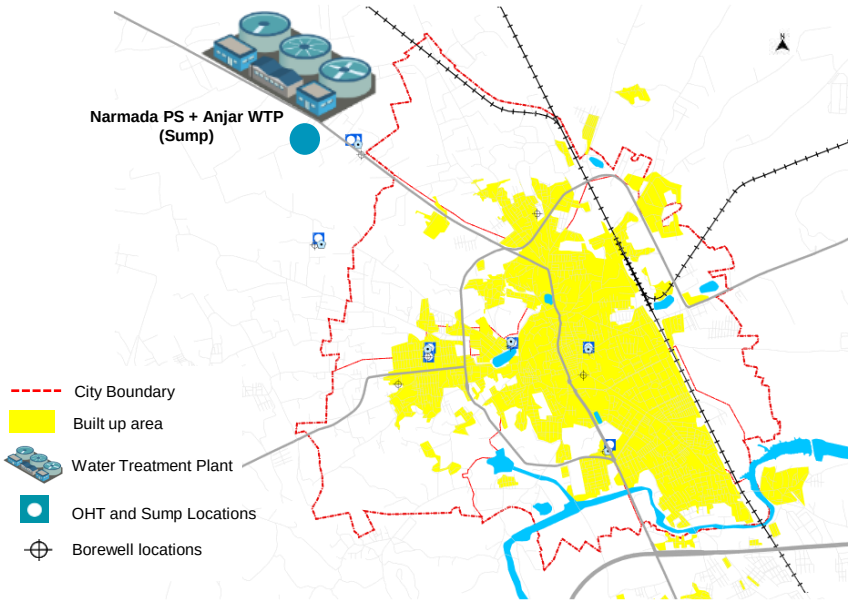


As discussed with ULB officials, few **municipal borewells** have reported to have **depletion trends** and the **operators lower the pumps** to extract the depleted water

To understand the geo-hydrological features of the region, CWAS has taken up detailed study of Geo-hydrological assessment to characterize aquifers in Anjar with ACT organization

Source: Field Survey and discussion with pump operators, Anjar City; Bhujal App – Waterlab; CGWB Report 2022

Anjar has installed Water Treatment Plant (WTP) of 4.5MLD capacity

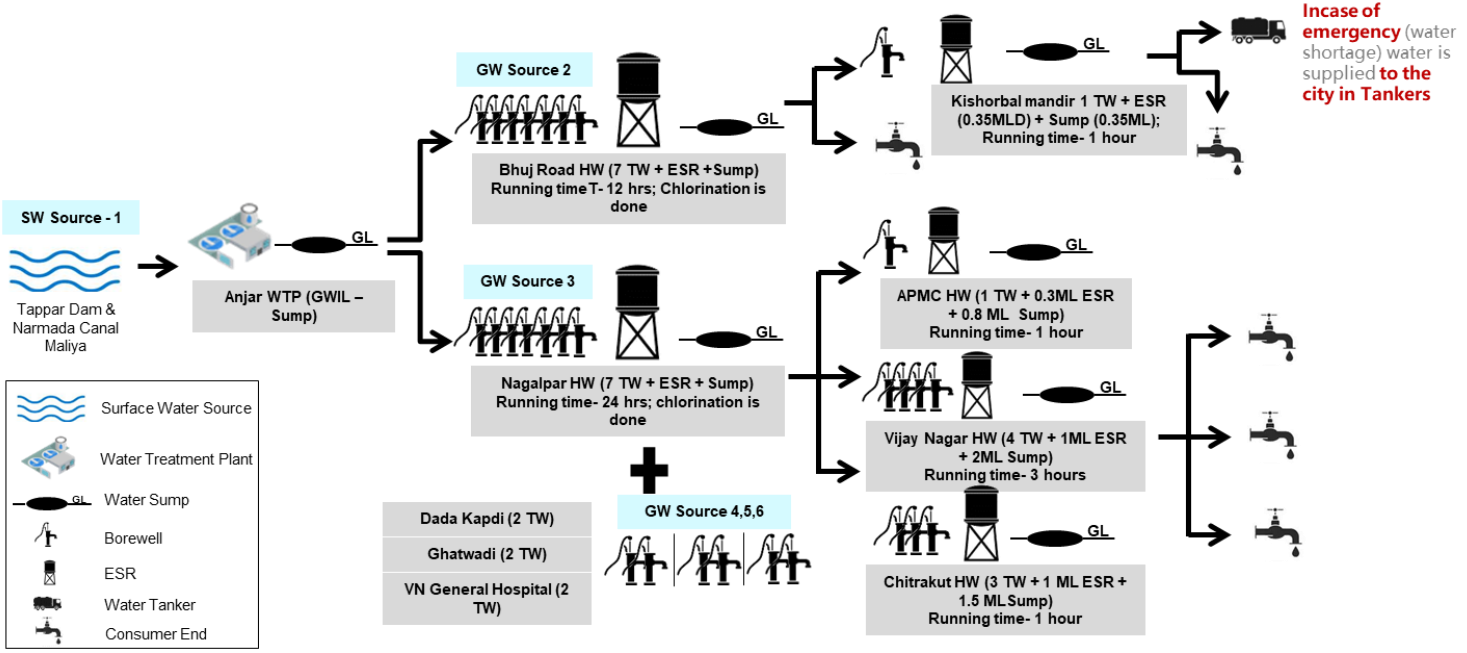


- Anjar has **4.5 MLD Water Treatment Plant (technology – Rapid Sand Filter)** which treats Narmada water and supply to the headworks
- Anjar is **augmenting its treatment capacity** by **15 MLD** under "**Nal se Jal**" Project at Nagalpar headworks

Source: field visit and discussion with WTP operators, Anjar officials

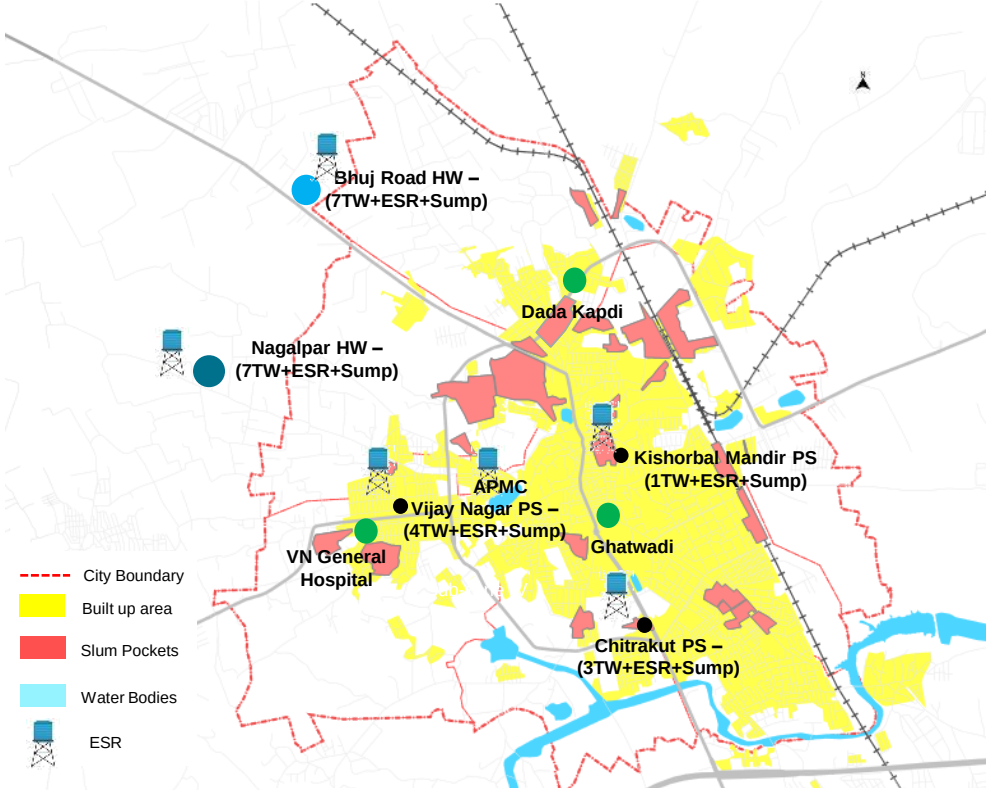
Anjar has ~5 ML ESR and ~14 ML Sump storage capacity which distributes water across the city(1/2)

- Anjar has **6 Elevated Service Reservoirs (ESRs) with total 5.1 Million Liters (ML)** capacity
- Anjar has **7 Under Ground (UG) sumps with total 14.35 ML** storage capacity (sumps are additional storage structures which does not supply water directly to the system)
- All the **ESR locations** has **additional ground water source** (bore wells) to augment their water system
- The city has additional ground water borewells at **Dada Kapdi, Vijaynagar General hospital and Ghatwadi** (field office and town hall)



Source: field visit

Anjar has ~5 ML ESR and ~14 ML Sump storage capacity which distributes water across the city(2/2)



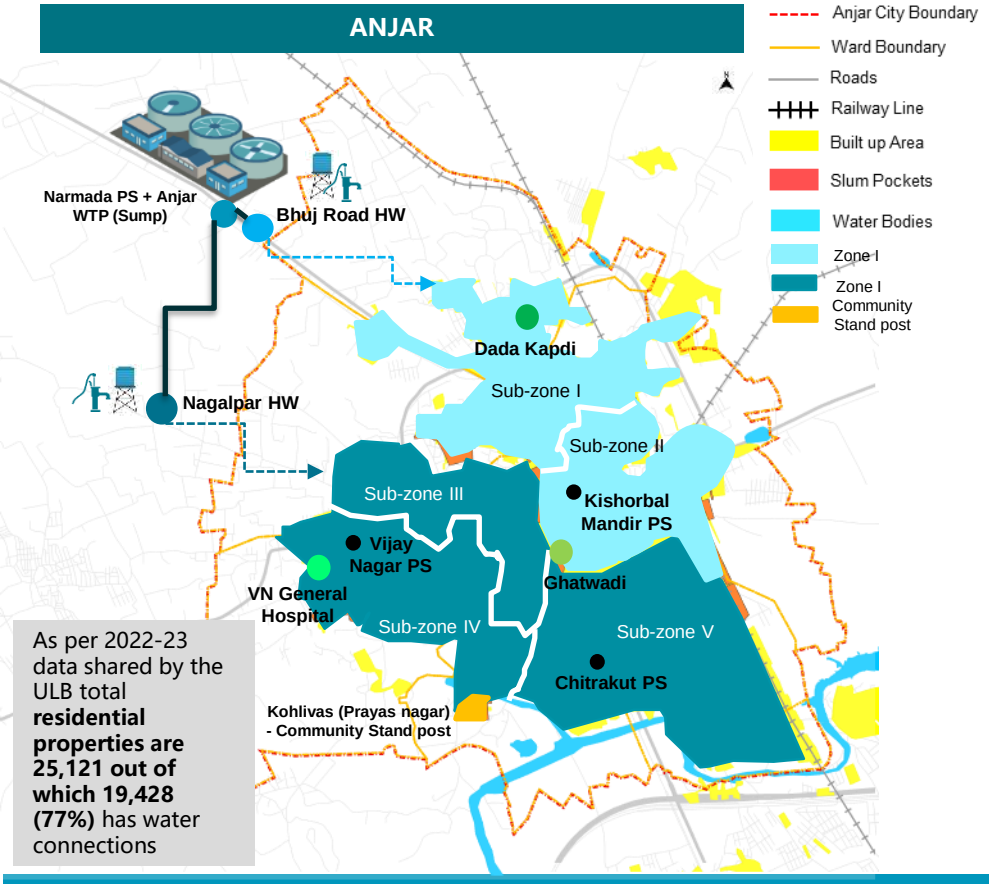
As per MoHUA, the **required storage for daily supply is ~6 ML** which the city suffice

Calculation (based on Pune 24X7 water supply case study the storage capacity is 1/3 times the demand)
Anjar Pop: 109238;Demand : 140 lpcd+15% UAW X Pop = 17.5MLD

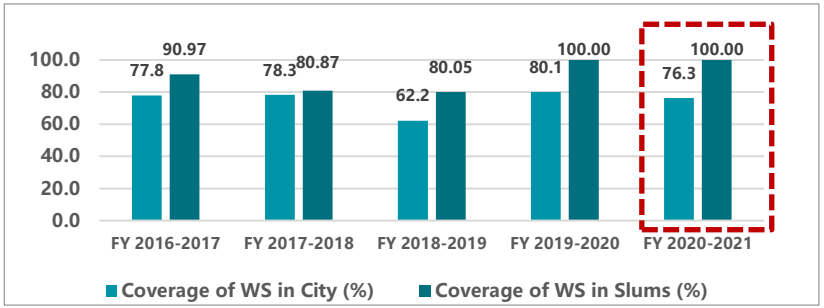
The city needs to emphasize on management of water supply system, As the city is further strengthening their storage capacity by 5.8 ML under "Nal se Jal" project

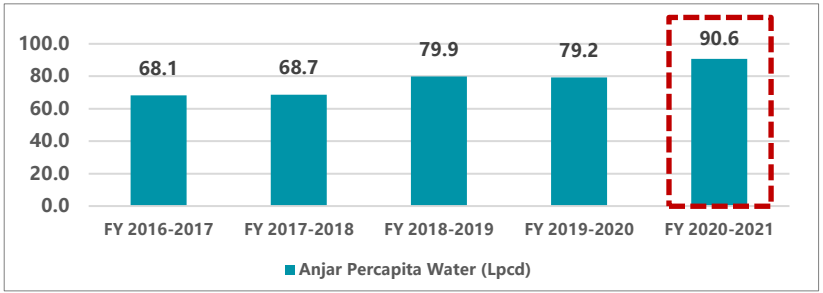
Source: Guidelines for Planning, Design and Implementation of 24x7 Water Supply Systems, MoHUA, https://mohua.gov.in/pdf/624eb498862a7Guidelines-for-Planning-Design-and-Implementation-of-24x7-Water-Supply-Systems.pdf; DPR – "Nal se Jal"

Anjar city have good coverage of water supply with Per Capita water supply of 91 lpcd



As per 2022-23 data shared by the ULB total **residential properties are 25,121 out of which 19,428 (77%)** has water connections



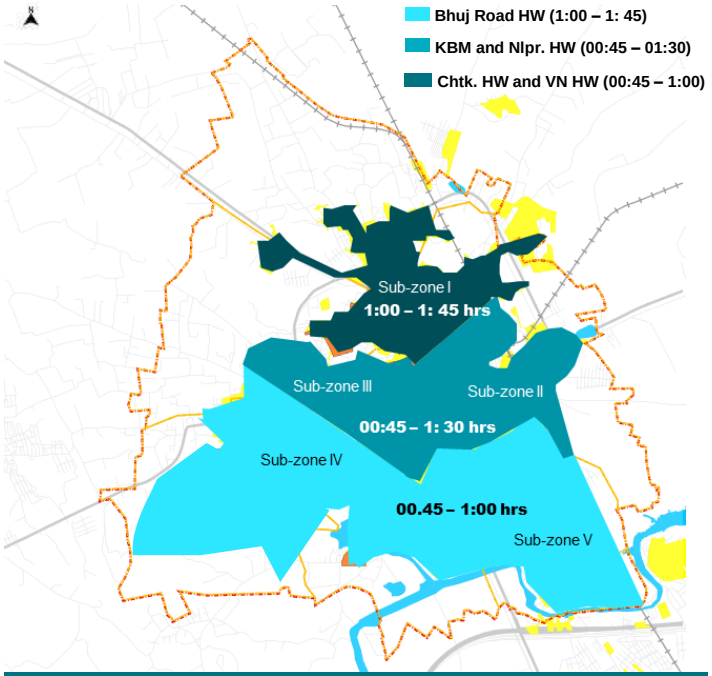


- The reported **residential coverage of water supply connection is 76%**, however **on field the city seems to be fully covered with WS connections**
- The **per capita supply** has **increased from 68 to 91 LPCD** over the period of **5 years** mainly due to **increase in bulk supply** from Narmada

Source: 100 lpcd as per SJMMSVY; PAS (2016-21), Field Survey and discussion with ULB Officials, Anjar City

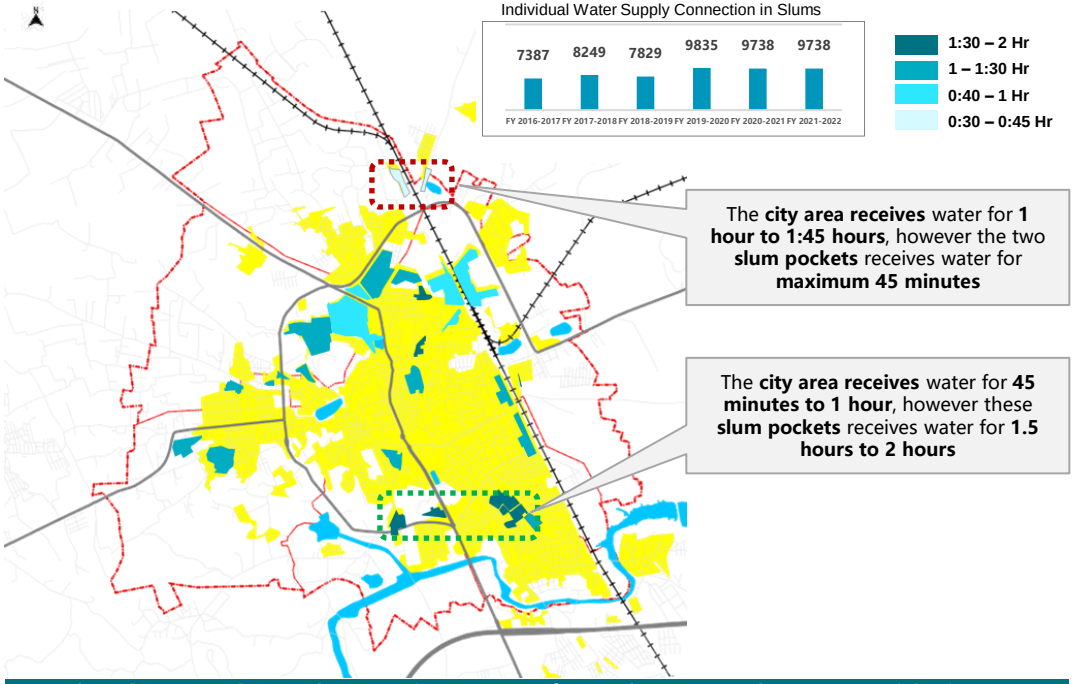
Anjar city has intermittent supply system with alternate day supply and the supply hours vary from 45 minutes to 1 hour 45 minutes

ANJAR – City Area Supply Hours



- The water is distributed in **3 water zones** with total **5 subzones**; supply hour varying from **45 minutes to 1:45 hours**

ANJAR – Slum pockets Supply Hours



- The **slum pockets** also receives water from these supply zones, with time variation of **30 minutes to 2 hours**
- Supply hours for slum pockets matches with that of city area, however in **there are few slums in tail end which receives water at very low pressure**

Source: Field Survey and discussion with ULB Officials, Anjar City

Leakage in the system is the major cause of Non Revenue Water(NRW) in Anjar

<table>
<tr><td rowspan="5">ANJAR
System Input Volume
(19 MLD)</td><td rowspan="3">Authorized Consumption
(11.95 MLD)

62.89 %</td><td rowspan="2">Billed Authorized Consumption
(10.15 MLD)
53.42 %</td><td>Billed Metered Consumption
(NA)</td><td rowspan="2">Revenue Water

(10.15 MLD)
53.42 %</td></tr>
<tr><td>Billed Unmetered Consumption
(10.15 MLD)
53.42 %</td></tr>
<tr><td rowspan="2">Unbilled Authorized Consumption
(1.80 MLD)
9.47 %</td><td>Unbilled Metered Consumption
(NA)</td><td rowspan="4">Non-Revenue Water

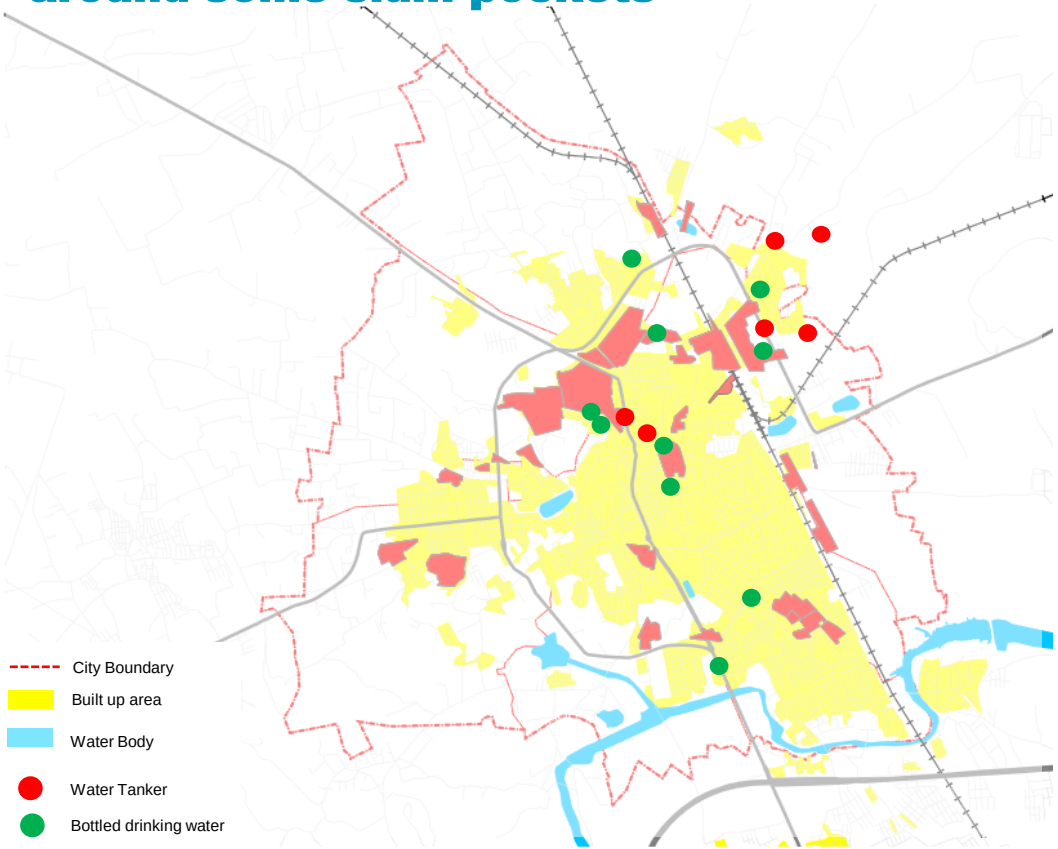
(7 MLD)
37.10 %</td></tr>
<tr><td rowspan="3">Water Losses
(7 MLD)

37.10 %</td><td>Unbilled Unmetered Consumption
1.80 MLD)
9.47 %</td></tr>
<tr><td rowspan="2">Apparent Losses
0 %</td><td>Unauthorized-Consumption
0%</td></tr>
<tr><td>Metering Inaccuracies
(NA)</td></tr>
<tr><td>Real Losses
(7 MLD)
37.10 %</td><td>Leakage on Transmission and/or Distribution mains
(7 MLD)
37.10 %</td></tr>
</table>

- **Anjar' s (online) complaint redressal** system also indicates that most of the complaints are related to **leakages** in the system.
- Need to **switch from ad-hoc to permanent** solutions which can be identified by conducting **water audits.**

Source: PAS-SLB (2016-2022)

Private water market has limited supply in Anjar, which can be seen in and around some slum pockets



Tanker water supplier near Ganga naka

Tanker water supplier in slum areas

- There are **6-8 tanker water suppliers** in Anjar
- Source of water is **either Municipal supply or ground water** with water availability at **400 to 600 feet** depth
- **Private bottled system** in Anjar is very **limited**, as people rely on Municipal supply
- There are 11 municipality registered suppliers, however there is **no monitoring on ground water draft and quality** of water

Source: Field visit

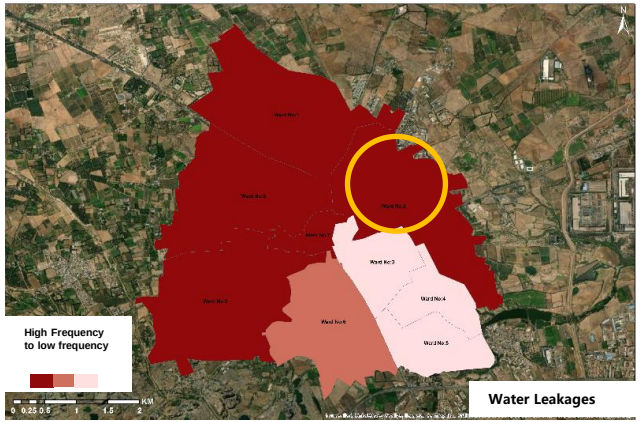
People are also dependent upon private water supplier for drinking purpose

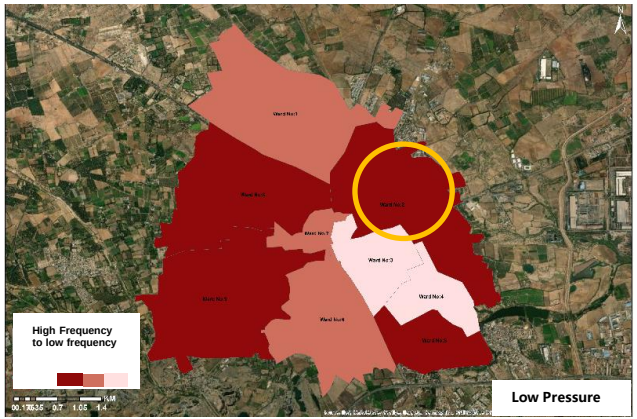
Water Quality Testing Report of Gandhidham and Anjar								
Report Generation Date:		16-09-2022						
Sample Received Date:		02-09-2022						
Sr.No.	Saplmle Location	pH	Turbidity, NTU	Total Dissolved Solids (TDS), mg/l	Chloride, mg/l	Alkalinity, mg/l	Hardness, mg/l	E. Coli
	Drinking Water Standards (IS 10500 : 2012)	6.5 - 8.5	1	500	250	200	200	Shall not be Detectable in 100 ml sample
1	Khodiyar Nagar Borewell, G.DM - GMC	7.5	0.1	1650	660	30	1030	Not Detectable
2	A. V. Joshi Slum (Municipal Supply), Sector 10, GIDC	7.8	0.6	378	175	15	545	Detectable
3	Sector 10, Gandhidham Municiapl Corporation (GMC)	7.8	0.4	335	157	15	330	Detectable
4	Municipal Supply, Sector - 10, GIDC, Gandhidham	7.7	0.2	401	167	10	625	Not Detectable
5	Municipal Water Supply of Gandhidham School, GIDC, Sector 10	8.0	0.1	378	170	10	195	Not Detectable
6	Ward No.5 Borewell, Gandhidham	6.9	0.1	2941	1859	55	995	Not Detectable
7	GM, Sector - 10	7.7	0.4	351	172	25	530	Detectable
8	Municiapl Water Supply, A. V. Joshi Colony, Sector - 10	8.0	0.7	396	182	10	290	Not Detectable
9	Anjar Ward No. 9, Vijaynagar	8.0	0.5	510	207	15	470	Not Detectable
10	Anjar Ward No. 2, APMC	7.6	0	571	222	25	1095	Not Detectable
11	Anjar Ward No. 6, Mahadevnagar	7.4	1.3	531	217	20	330	Not Detectable

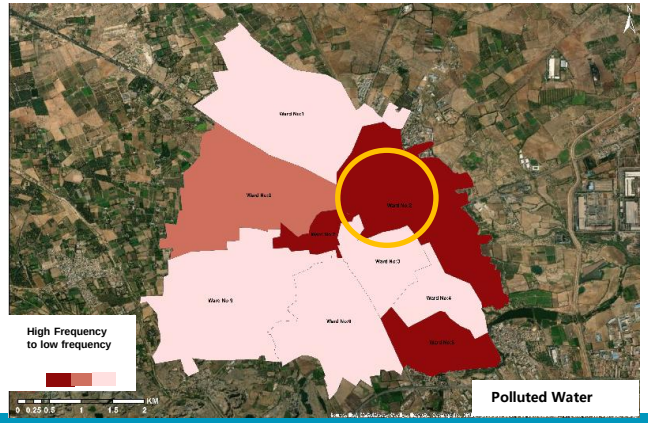
Based on pilot water testing we found that water in Anjar is fit for drinking purpose

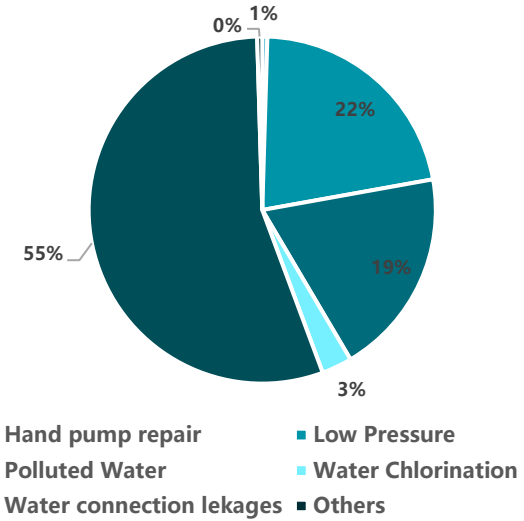
- Considering the **perception** over drinking the Municipality supplied water, it is important to **assess the water quality across** the **water service chain**, thus **CWAS is undertaking** Water quality testing study across different areas of city.

In Anjar the complaints are spatially distributed across the city ..









- **Water connection leakages** is the **major issue** which the city incur.
- **Spatial mapping indicates ward number 2** is the **most vulnerable** ward **facing** all the **major issues**

Source: Complaint redressal department – Anjar Municipality

Human stories for understanding water situation from stakeholder perspective

Citizen perspective

Lilaben –
Resident Zundviastar;
Anjar

> *...We are completely satisfied with the municipality service... specially post Narmada ...*

- **Individual municipal water connection**
- Water is available **every alternate** day for **1 hour** at **good pressure**
- **Quality** of water has also **improved**
- Lilaben is **happy** with the **Municipal service**

Shakina –
Resident Paridhivas; Anjar

> *...poor municipal services, pressure is low ...so we often procure water from pvt. water tankers*

- **New individual municipal water connection**
- Water is available for **alternate day** for **1 hour** at **low pressure**
- The water collected is **insufficient** for their daily needs
- Prefer **private water tankers** than municipal water

Service provider perspective

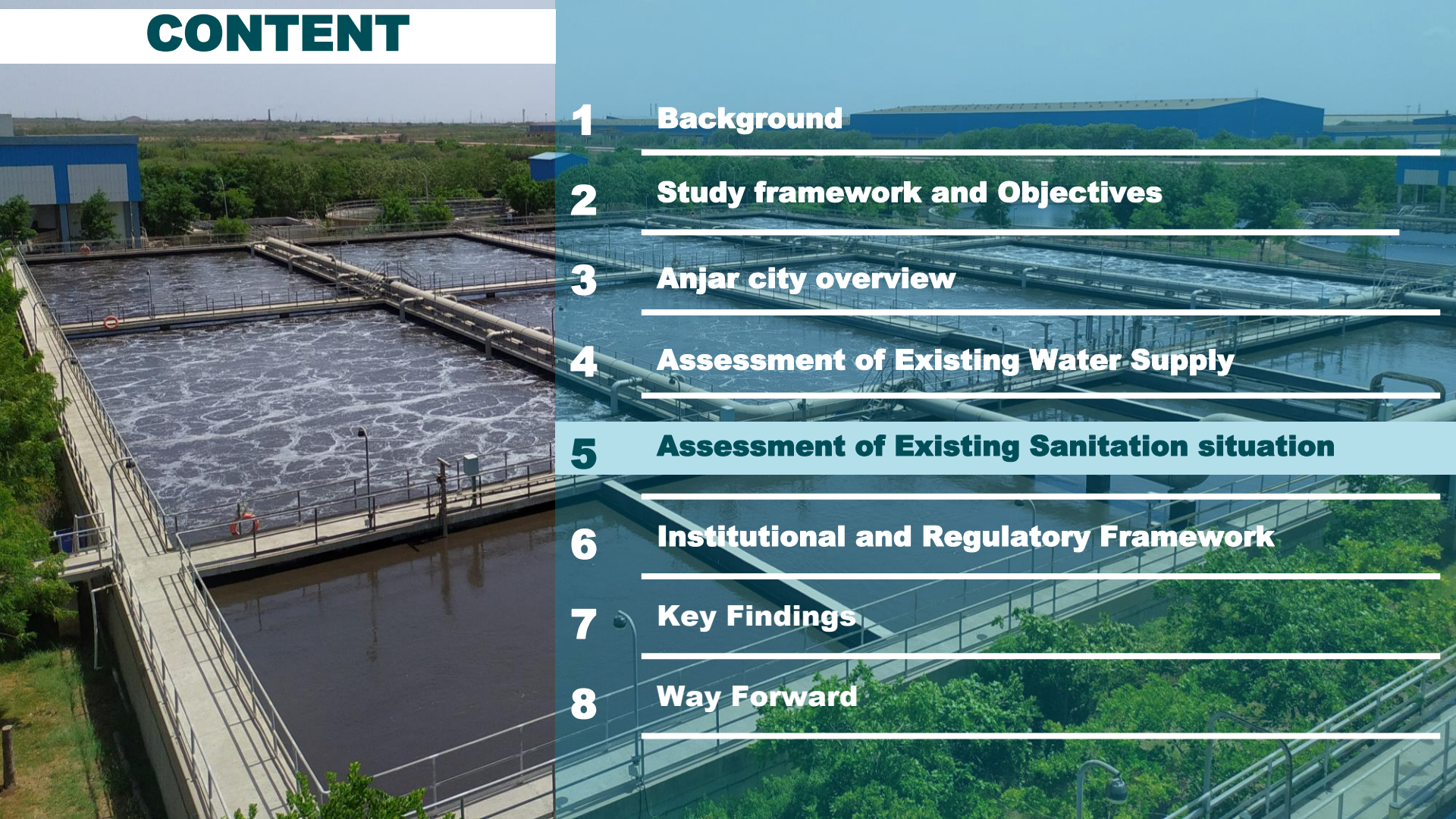
Bore operator –
Chitrakut; Anjar
Municipality

> *...the ground water level is depleting...every year we have to lower the pump...*

- Municipality has **50% dependency on ground water**
- Ground water is available **at 400 to 600 feet depth**
- The **ground water** is **depleting ever year**
- Municipality has to **lower the pumps every year** due to this
- We soon may **run out of ground water**

Mixed perception and responses from stakeholders . . .

CONTENT



1 Background

2 Study framework and Objectives

3 Anjar city overview

4 Assessment of Existing Water Supply

5 Assessment of Existing Sanitation situation

6 Institutional and Regulatory Framework

7 Key Findings

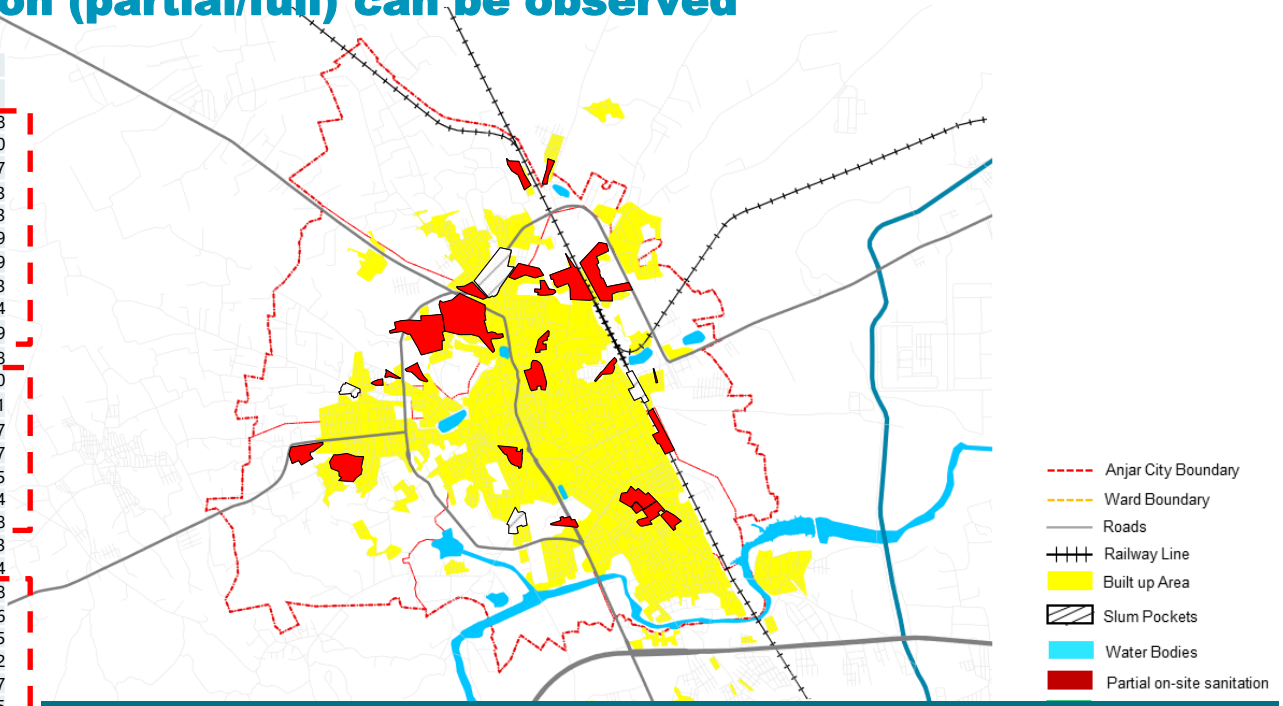
8 Way Forward

The city areas in Anjar city have 100% sewered network, however in slum pockets onsite sanitation (partial/full) can be observed

ANJAR SLUMS			
SR.NO.	SLUM AREA	POP.	HHs.
1	DANTNIYAVAS, SATAPAR ROAD	1067	218
2	WARD-1 KOLIVAS	516	100
3	WARD-1 MAFATNAGAR	2536	517
4	ZUND VISTAR	437	93
5	LUNAGNAGAR-1	437	93
6	NAVANAGAR-1, NEAR SCHOOL NO 8	507	109
7	NAVANAGAR-2, RAMDEV NAGAR	449	109
8	NAVANAGAR-2, BHUJ BYPASS	442	93
9	PARADHIVAS/ SHEIKH FALIYA	800	174
10	PARADHIVAS/ NAVANAGAR 2	588	129
11	MOMAI NAGAR-1	845	208
12	MOMAI NAGAR-2	1170	250
13	KOLIVAS OPP MUNICIPALITY	470	101
14	HARIJANVAS OPP MUNICIPALITY	618	117
15	KHANIYA SERI, NEAR SCHOOL 6	394	97
16	GOKUL NAGAR	740	165
17	RAHEMATNAGAR	597	144
18	PRAJAPATI CHATRALAY AREA	793	188
19	SONI & MISTRI SAMAJ HANGAMI AAVAS	282	83
20	VIJAYNAGAR DATANIYA VAS	623	124
21	KOLIVAS- NEAR NARSARI	234	78
22	WARD-7 KOLIVAS	309	106
23	KOLIVAS- NEAR MADHI	349	75
24	HEMLAI FALIYA	1051	222
25	WARD-8 KOLIVAS	773	147
26	DANTNIYAVAS	896	185
27	LIZ VISTAR NEAR SCHOOL NO 7	488	124
28	KAMADIYA VAS, BEHIND HOSPITAL	396	75
29	MATYA NAGAR*	1200	200
TOTAL		20007	4324

PLEASE NOTE- DATA AS PER CENSUS 2011

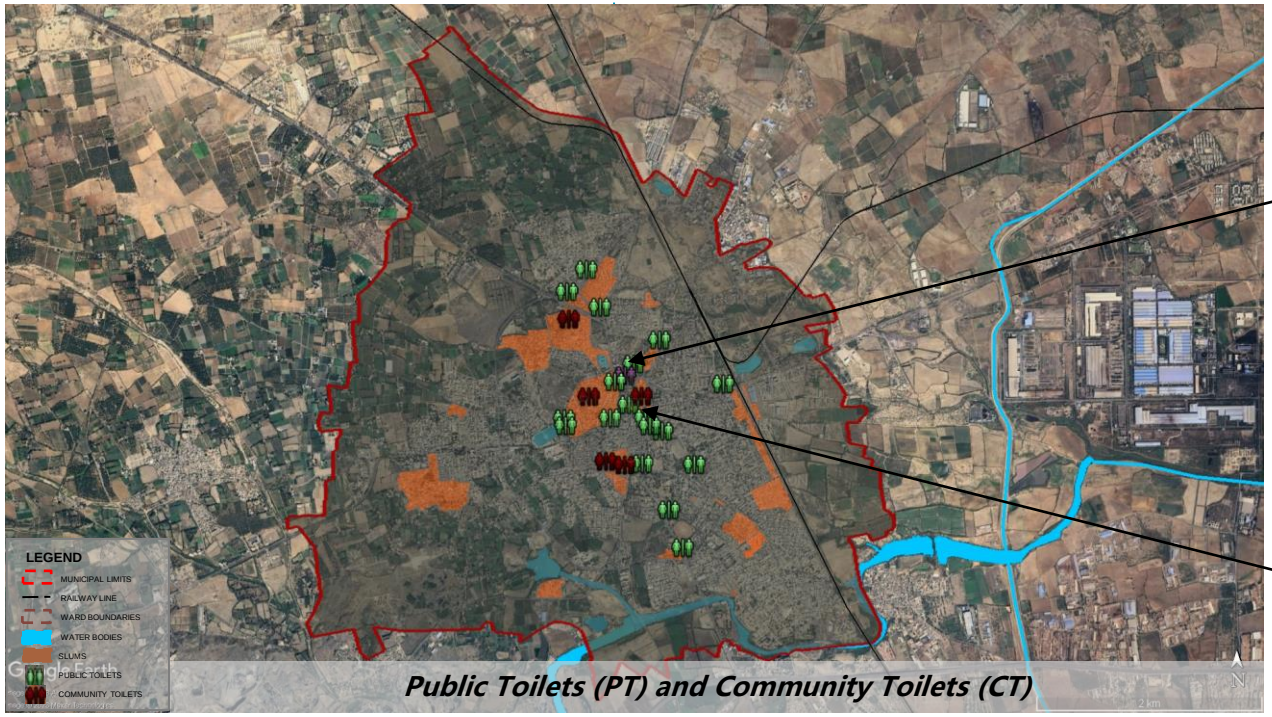
*NON- NOTIFIED SLUMS ;



- 9.6 MLD Sewage Generated in Anjar City
- Around 86% of slum population has either partial or full onsite sanitation system

Source: Anjar Municipality and Field Surveys

Anjar city has achieved ODF++ status since 2018, Anjar has either demolished its community toilets or converted them into public toilets



Public Toilets (PT) and Community Toilets (CT)

- **16 active Public Toilets** and **7 Demolished community toilets** were found in Anjar Municipal limits.
- Pay and use toilets are maintained by **Shree Harsidhdhi Mahakali Seva Sangh** and **Ekta Safai Kamdar Seva Trust.**
- Anjar achieved **ODF++ status in year 2018**

Some of the Slum pockets have partial or full on-site sanitation system in Anjar, which are dependent upon on demand desludging system

Desludging by ULBs	Free of cost for slum areas
	Rs.250/- for non-slum areas
	Rs.1000/- for non-slum areas (out of city boundary)
Desludging by Pvt. operators	Rs. 750-850/- per trip

- Anjar Municipality has its **own 3 desludging vehicles of 5KL capacity** and approx. average **3 daily trips for desludging** are being done
- Emptying is either done at oxidation pond or at main chamber of area
- Pumping Station – within the **city limits**

Desludging on demand basis is observed in the city, hence scheduling of the same can be considered for systematic operation of on-site sanitation management

Source: Gandhidham Municipality, Field visits and discussions with Pvt. Operators

The cities showcase 100% reuse in Circular economy of wastewater management...

- **Anjar and Gandhidham Municipalities** have entered in a **concession agreement** with **WIL** (Welspun India Limited) for a period of **35 years**
- Welspun has used a **Design, Build, Finance and Operate** (DBFO) model for this Sewage Treatment Plant
- Welspun is paying **40 Paisa/KLD** to the municipalities through which Cities receive a **revenue of Rs. 62 lakhs per year**
- Sewage from both the cities is **treated in the STP**, further the treated water is **used by the textile industry** (Welspun)
- Benefits of the project:
  - ✓ Elimination of dumping of untreated sewage into the Nakti Creek
  - ✓ Revenue to municipalities through royalty from Welspun
  - ✓ Entire waste water is being recycled for production activities at Welspun
  - ✓ Zero water pollution and sludge generation
  - ✓ Excess bio-sludge is used as manure for plantation

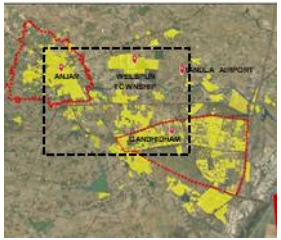
Good Practice by the cities for reuse of wastewater in partnership with private entity...

Anjar Municipal Council	Transmission of raw sewage and desludging septage from cities to treatment plant
Sewage Treatment Plant (STP) (Capacity 40MLD)	Design, Built, Finance, Operate and Maintain, by Welspun
Reuse in Power plants, textile industries and for gardening purpose	Environmental, financial and social impact

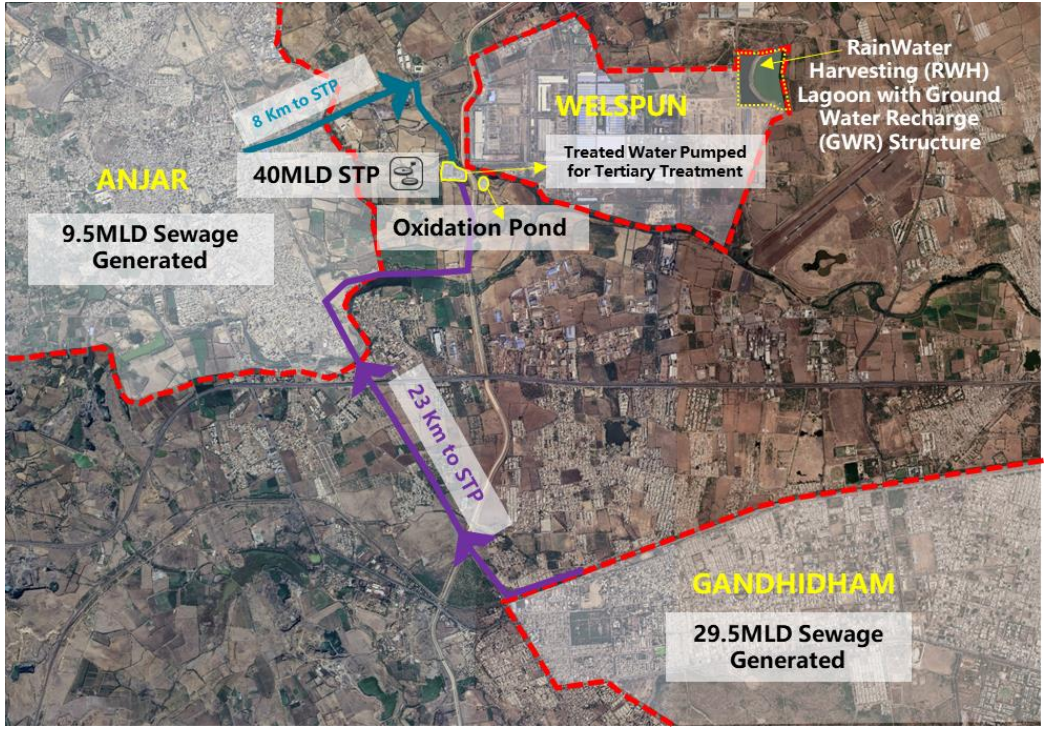
- 100% Reuse of treated water and bi-products
- Zero procurement of blue water (Narmada water)
- Revenue for the cities (Rs. 62 lakhs per year at the rate of Rs. 0.4/KL for the raw sewage)

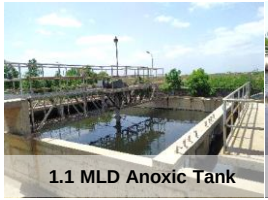
Source: Field visit to Welspun, discussion with authorities and city officials

Anjar and Gandhidham have common STP, owned and operated by Welspun, which has reduced burden on blue water use by the industry



Map showing STP location near Anjar and Gandhidham





Sewage Treatment Plant - Welspun

Source: Field Visit and Discussion with Municipality and Welspun officials

Anjar and Gandhidham have a common STP, Built, Owned and Operated by Welspun, which has reduced burden on blue water use by the industry from Narmada

Responsibility of ULBs*

Responsibility of Concessionaire**

Transmission from Pumping Station in Gandhidham

Pumping Station

Gandhidham

29 MLD Sewage Generated

Anjar

9.5 MLD Sewage Generated

Oxidation Pond

Transmission from Pumping Station and Desludging service by the ULB in Anjar

Operate, Maintain and Augment the Sewer Network of the City*

23 km long Transmission line from Gandhinagar to STP

Collection Company**
(Welspun lifting Raw Sewage from Pumping Stations in Gandhidham and from Oxidation Ponds in Anjar)

8 km long Transmission line from Anjar to STP

Sewage Treatment Plant (STP)
(Capacity 40MLD)

Design, Built, Finance, Operate and Maintain, Recycle and Reuse by Project Facility**

30 MLD for Treated Waste Water in Textile Industry

6.5 MLD treated water is being reused at Vanakbori power plant

Sludge is used as compost for gardening

Design, Built and Finance the Distribution System for transporting Industrial Treated Water to potential Customer

Revenue: 61.9 Lakh per Annum at the rate of Rs. 0.4/KL Sewage Collection + 50% of Revenue Generated from Sale of Carbon Credit

Capital: 20Lakh for Technical and Legal Support for Implementation of Project

*The respective ULBs ensure that Sewer generated by citizens is free from Industrial waste, hazardous material, prohibited and restricted material

Welspun Infrastructure Ltd and Technology Providing Partner **Ion Exchange Ltd (Concessionaire).

*** Sewage Pumping Station other than GNP Facility, network of bulk transmission of sewage from Designated location to STP proposed by Concessionaire.

Source: Field Visit and Discussion with Municipality and Welspun officials

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Water Sector institutional set up of Anjar city

Agency/ Authority	Jurisdiction	Roles and Responsibilities
Sardar Sarovar Narmada Nigam Limited (SSNNL)	State Level	• Bulk supply of Narmada water
Gujarat Water Infrastructure Limited (GWIL)	State Level	• Establish bulk water Infrastructure projects across the state for drinking water • To prepare, promote, execute, finance, implement and operate and maintain water supply projects in the state
Gujarat Water Supply and Sewerage Board (GWSSB)	State Level	• Development and proper regulation of water and sewerage services in the state; Implementation of state government schemes on water and sanitation
• **Anjar Municipal Council** • **Industrial estates (GIDC)**	City Level	• Water service provider • Operation and maintenance • Levying and collecting taxes and user charges

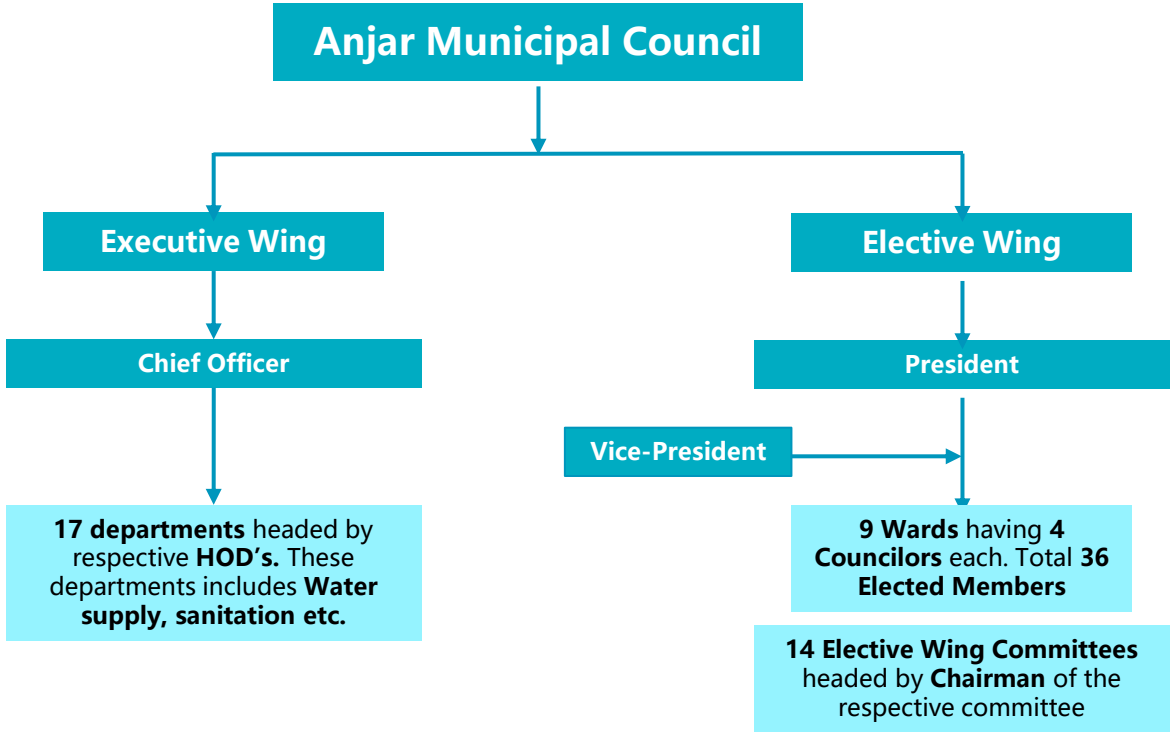
Source: Website – GWIL; GWSSB, SSNNL; GIDB

Anjar Municipal Council was established in 1951

Anjar Municipality was established post partition in the year 1951. There are two wings in Anjar Nagarpalika- **Executive wing and Elective wing**.

- **Executive wing** is mainly the part of government which enforces law and has overall responsibility. The key person here is **Chief Officer (CO)**. There are **17 departments in Anjar Nagarpalika** mainly water supply, sanitation, Public Health, PWD, Taxation etc. each of these departments are headed by respective HOD' s.

- **Elective wing** comprises of elected members from each ward of the city. The key person is **President along with Vice President.** There are **9 wards with 4 councilors** in each ward so a total of 36 elected members. There are **14 committees** mainly water works, social welfare etc. that are headed by chairman of respective committee.



Anjar has dedicated water department, however the dept. head raised concerns over lack of records of city's water supply network (no maps are available), as he is the only knowledgeable person in this regard who is due for retirement in coming months, thus the city should address the issue on urgent basis

Institutional Set-up of Anjar Municipal Council

Agency/ Authority	Jurisdiction	Category	Roles and Responsibilities
Anjar Municipality	City Level	Urban Local Body	• Infrastructure and Services within the area of jurisdiction • Property tax collection within the area of jurisdiction • All functions and services as per Gujarat Municipalities Act
Anjar Area Development Authority (AADA)	Regional Level (Master plan Area)	Development Authority	• Regional plan preparation • Development control and planning • Building Approval and development permission • Road network layout and development

Source: Water and Green Growth case study report, Gujarat State Portal, GIDB Website

Anjar Municipality takes around 3-4 weeks time for new water and sewerage connections

Approximate time taken for complete procedure – 3 – 4 weeks

Application form

Approval from ULB Worker (Mistri)- PWD

Approval of the application

Property Tax Dept.
Water Supply Dept.
Sanitation Dept.

For Slums –

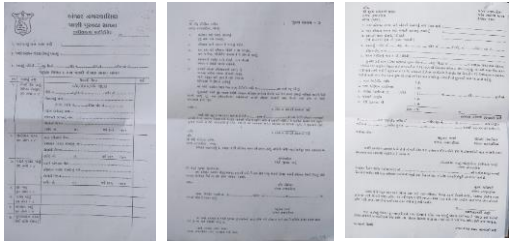
- Submission of Kararnama (Rs.100 Stamp Duty Certificate)
- Submission of Adhar Card, Ration Card (BPL Proof) and Electricity Bill (Document Verification)

Water Connection: Approval from Water Supply Supervisor

Sewer Connection: Approval from Sanitation Supervisor/ Inspector

Approval from Chief Officer

Approval from ULB Worker (Mistri) – PWD/ Approval from registered Plumber



Water and wastewater Application

Additional Documents submitted by Slum Dwellers

Few slum dwellers, with **no individual water connections** stated that submission of multiple documents makes it difficult to apply for the same, thus **city can simplify the process** in terms of number of documents

Source: Anjar Municipality

Anjar Municipality has online as well as offline complaint redressal systems, however Anjar transfers all the online complaints to the online system

FILLING — Filing of complaint

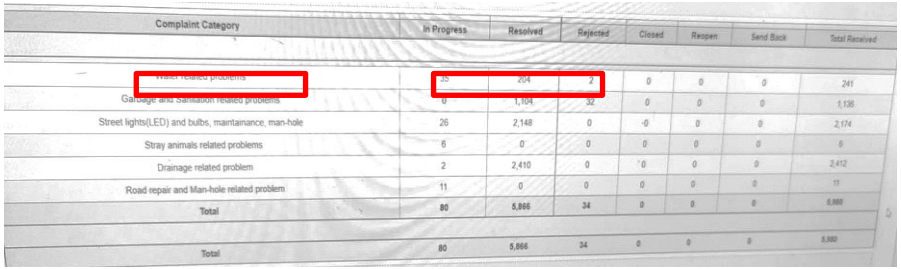
Anjar: Complaints and Grievances Department/ Web Portal/Mobile Application

GENERATION — Receipt of Complaint Application generated online

TRASFER — Complaint forwarded to respective Department HODs by Complaints and Grievances Deptt.

RESOLVE — Supervisors from respective departments resolve the complaint

Anjar: Timeframe for redressal – approximately 1 week



Complaint Category	In Progress	Resolved	Rejected	Closed	Reopen	Send Back	Total Received
Water related problems	35	204	2	0	0	0	241
Garbage and Sanitation related problems	0	1,104	32	0	0	0	1,136
Street lights(LED) and bulbs, maintainance, man-hole	26	2,148	0	-0	0	0	2,174
Stray animals related problems	6	0	0	0	0	0	6
Drainage related problem	2	2,410	0	0	0	0	2,412
Road repair and Man-hole related problem	11	0	0	0	0	0	11
Total	80	5,866	34	0	0	0	5,980
Total	80	5,866	34	0	0	0	5,980

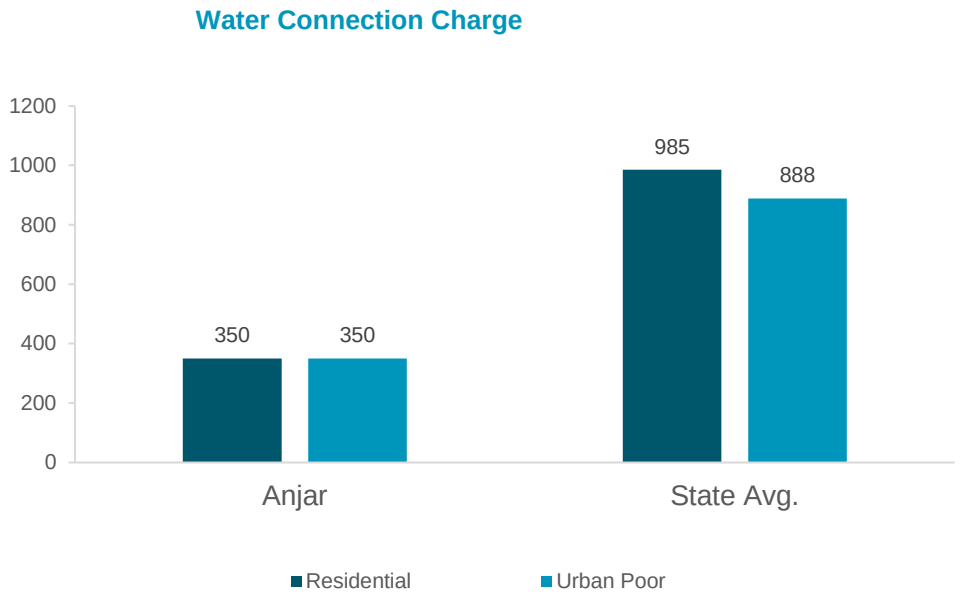
- The complaint can be **tracked online**
- Three **types of water related complaints that** can be registered:
  - **Water Leakages**
  - **Mix Water**
  - **Not getting water**

- **Anjar city use state portal E-nagar** for managing its online complaints.

Source: Anjar Municipality

Anjar has low water connection charges compare to state average

Water Connection Charges – One time charge in INR



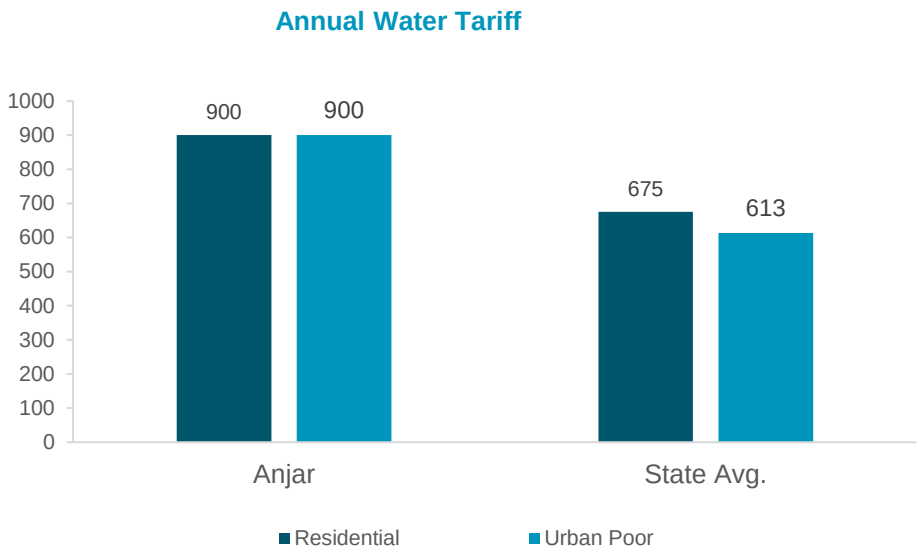
Anjar connection cost –
100 – connection charges
100 – Deposit
50 – Drainage
100 – road cutting per feet

- The **state average** for water connection charges is **Rs. 985/- and Rs. 888/-** for residential and urban poor respectively
- **Anjar have low connection charges** and it **levies equal charges** from both sections of the society

Source: PAS; Anjar Municipality

Anjar has flat annual water tariffs

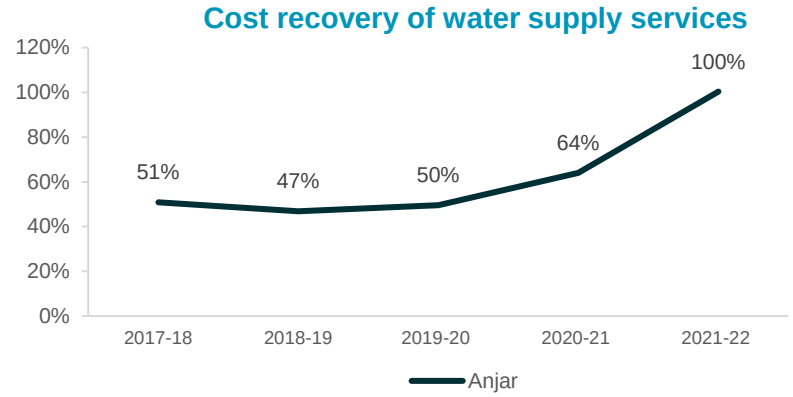
Water Tarrif – Annual Charge in INR

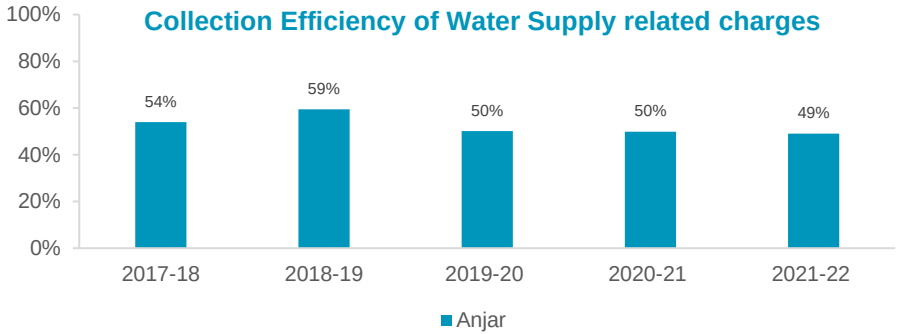


- The **city charge Rs. 900/- annually**, which is **higher than the state average**
- The city also **levy same tariff from the urban poor**, which otherwise varies in their respective peer cities
- City can pass special circular or GR to reduce water tariff for urban poor or link it with property tax to have **progressive tax system**. This will allow the tax to be more equitable as those with larger and better properties pay a higher property tax and water tax.

Source: PAS; Anjar Municipality

Anjar has high cost recovery of water services while collection efficiency is low



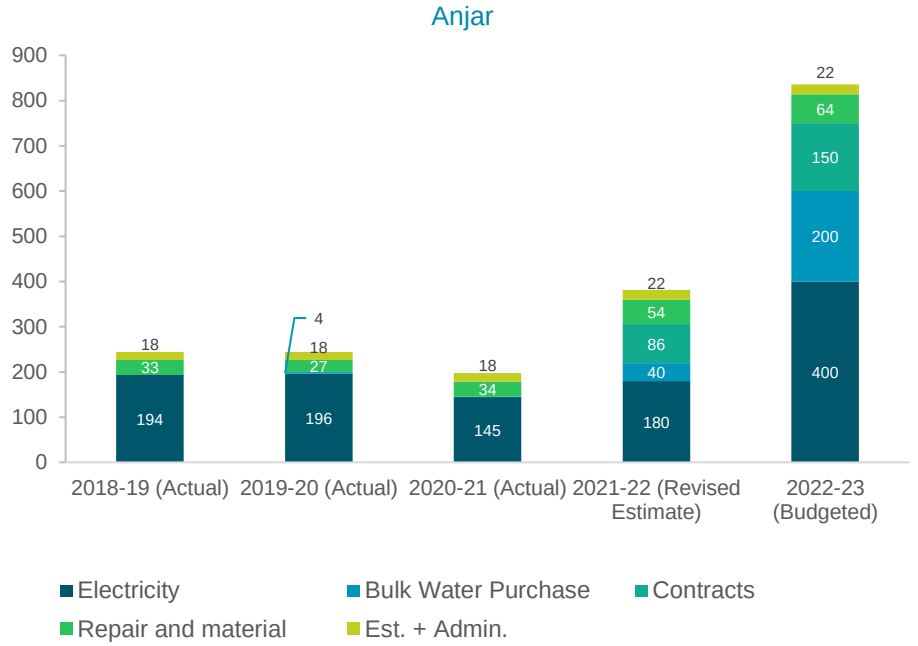


- Anjar's cost recovery for water supply service has been consistently rising since 2018-19 with **64% in year 2020-21** and 100% in year 2021-22
- In Anjar, Water tax collection efficiency has been consistently at 50% which is lower than state average of 62%.
- Anjar city should revise water tax to **recover operation and maintenance cost** and move from flat rate charge to % property tax to make it equitable and inclusive.
- City can introduce One Time Settlement Schemes to collect its property tax and water tax arrears.
- City can also organise arrear collection drives and can offer rebates or relax the penalties.

Source: PAS; Anjar and Gandhidham Municipality

Revenue Expenditure for Water Supply- Anjar

- Electricity makes the largest contribution to Anjar's revenue expenditure on water supply.
- Electricity expense increased by more than 100% in 2022-23 budget.
- Bulk water purchase and contract expenses were nil till 2020-21.
- 400% increase in bulk water purchase and 75% increase in contract expenses in 2022-23 budget compared to previous year's estimate.

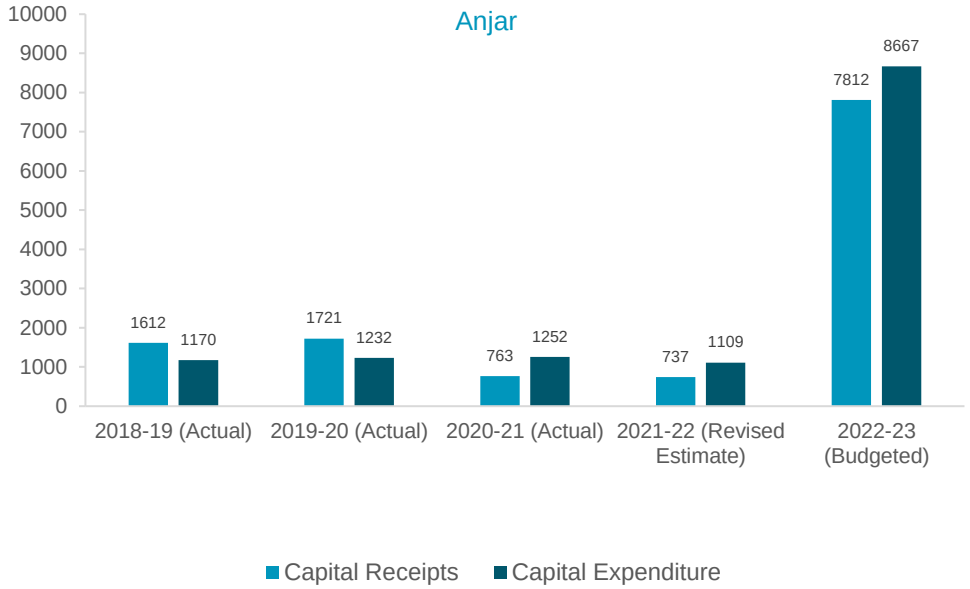


All figures in INR lakhs

Source: Anjar Municipality Budget Document of FY 2021-22 and FY 2022-23

Capital Receipts and Expenditure- Anjar

- From 2018-19 to 2021-22, capital receipts have gradually declined whereas capital expenditure remained consistent.
- In the 2022-23 budget there is a tenfold increase in the capital receipts and sevenfold increase in the capital expenditure from the 2021-22 revised estimate.
- In the 2022-23 budget, Nal se Jal scheme makes the largest contribution (56%) to capital expenditure for water supply followed by GUDM Water Supply and Sewerage (WSS) scheme (42%) and SJMMSVY.



All figures in INR lakhs

Source: Anjar Municipality Budget Document of FY 2021-22 and FY 2022-23

Policy level initiatives have been taken by Anjar Authority to augment own water resources however ground implementation is very limited

Inclusion of Rainwater Harvesting in Building Permission...

- **Anjar Area Development Authority (AADA)**
- Inclusion of Rainwater harvesting as part of **Environment Management** (Adapted **GDCR**)

«

Rain water harvesting is mandatory for all buildings with ground coverage of 80 sq.mts and above

Building Plot Area (Sq.km)	Harvest Infrastructure Type
Between 80 to 500	Percolation Pit or Bore Recharge
Between 500 to 1500	Percolating Well with Rain Water Harvesting System
Between 1500 to 4000	Percolating Well with Rain Water Harvesting System (up to ground second river)
4000 and above	Percolating Well with Rain Water Harvesting System (up to ground second river) for every 4000 sq.mt area

- **Online** building approval system
- **No records** available on **RWH structures** approved under the plan
- **No ground** implementation **monitoring** practiced

Policy initiatives needs to be supported by **ground level monitoring system and incentives for property owners to invest in RWH . . .**

Source: Anjar Area Development Authority

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Key findings across water supply service chain

Key Findings Across the Water Supply Service Chain

Quantity

Water Source (MLD)

Anjar has **50%** dependency Narmada (distant) water

Anjar has **50%** dependency on **ground water**, which is **depleting**

City is further planning to shift to **100%** Narmada (distant) water under "Nal se Jal" project in next 5 years

City authority has **no plans** to **augment own water sources**

Accessibility

Coverage

Anjar has **75%** individual water supply connections

The city will achieve **100%** individual **WS connections** post implementation of **"Nal se Jal" Project under AMRUT 2.0**

The per capita supply in Anjar has increased from **68 to 91 LPCD** over the period of 5 years

City authorities has **plans** to provide **140 LPCD** on daily basis

Quality

Water Treatment Plant

Anjar has **4.5** MLD Treatment capacity

The city is augmenting their treatment capacities by **15** MLD (Anjar)

GWSSB **does not conducts regular water quality** testing in Anjar

Reliability

Intermittent supply

Anjar
Supply days –
Alternate Days
Supply Hours –
1 to 1:45 hours

Distribution is **not uniform** in terms of supply **across the city**

Presence of **private water** suppliers can be observed

Affordability

Cost Recovery 2021-22

ANJAR – 100%

Collection Efficiency 2021-22

ANJAR – 50%

Water Connection Charges

ANJAR – Rs. 350/-

Water Tariff

ANJAR – Rs. 900/-

Connection charges and **tariff are same** for **city area and slum** pockets

Key Findings across water supply chain for Anjar City

Water Source

Quantity

- **50% of water is sourced from ground water** indicating city's reliance on its own water source, **however over draft** of ground water may lead to **ground water depletion** if **not regulated and monitored properly**, causing **ground water depletion** and further **stress on surface water** source. The situation is **further aggravated** by the fact that the neighboring city, **Gandhidham** is also **dependent** upon **Anjar's aquifer**
- The city has **natural water bodies** which can be **leveraged** by constructing **GW recharge structure** in and around the lakes and developing **buffer zone to control urban flood**
- The city is planning to **shift 100% on Narmada(distant source) water supply under "Nal se Jal"** project in next 5 years.
- City authorities has **no plans** to **augment own water** sources

Coverage

Accessibility

- Anjar has **75% Individual water supply connections**, however the cities will achieve **100%** individual water supply connections **post implementation of "Nal se Jal"** project under AMRUT 2.0.
- The **per capita water supply** has **increased** over the period **from 68 LPCD (2016-17) to 91LPCD (2020-21)**
- City authorities have plan to provide **140 LPCD on daily basis**

Key Findings across supply chain for Anjar City

Water Treatment

Quality

- Anjar has **4.5 MLD treatment capacity**, which the city is **augmenting to 15 MLD** capacity unde “Nal se Jal”
- **Water quality testing regime** is required to be followed by city administration so as **to ensure safe supply**, however the city does **not follow any quality testing regime** apart from chlorination at Head Work level.

Intermittentt Supply

Reliability

- In Anjar, water is supplied every **alternate days**, with supply hours ranging from **1 hour to 2 hours**.
- There is **partial dependency** on private tankers as observed in **few slum pockets**
- **Distribution is uniform** in terms of supply hours across the city

Cost Recovery

Affordability

- In Anjar, **water tariff is Rs. 900/- annually** for household connection with connection charges of Rs. 350/- and same charges are applicable in slum areas
- **Cost recovery is 100**% in Anjar

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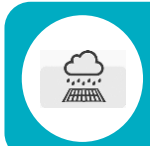
Key recommendations to explore in the Water Security Action Plan...(1/2)

Findings	Possible recommendations to be explored
High dependency of distant water	**AUGMENTATION OF OWN WATER RESORCES** • Implementation of **RWH/ GWR structures** • Initiating the implementation from **educational buildings, public buildings, parks and gardens** and further scaleup to **community and individual HH Levels** • **Strengthening existing policy** frameworks for successful **implementation and monitoring** • **Building awareness** for Government officials, experts and citizens
Intermittent water supply	**MOVING FROM INTERMITTENT TO DAILY SUPPLY** • **Technical evaluation** of existing water infrastructure to move towards daily supply • **Awareness generation** towards **benefits of daily water supply** over intermittent water supply – Reduced NRW, less wastage of water due to excess storage, contamination reduction etc. – to **change perception** issues and **behavioural pattern** • Explore **automation of valve operations** (pilot water supply zone) to address resource crunch

Key recommendations to explore in the Water Security Action Plan...(2/2)

Findings	Possible recommendations to be explored
 **Issues related to Water supply in Slum pockets**	**COMMUNITY WATER SUPPLY SYSTEM FOR 24X7 - SLUMS** • Though the coverage of water supply connections in slums is 100%, **issues** related to water supply such as **intermittent water supply, pressure issues at tail end HH, odd supply timings** etc. were identified, **community ESRs/ reservoirs** can be developed for pilot slum • The system will **provide water to the slum dwellers for 24X7**, thus resolving the issues faced on day to day basis • **Good practices** from across the globe supports such community systems
 **Urban Flood due to changing climate pattern**	**MITIGATION MEASURE TO ADDRESS CLIMATE CHANGE** • Identification of **urban flooding spots** in the entire city • **Strategic approach to mitigate urban flooding**: **Institutional measures**– pre monsoon cleaning of stormwater drains; **Awareness** – pre monsoon cleaning drive; citizen engagement; **GWR structures** (low-cost structures in slums identified with water logging situation, society level GWR structures) • **Community participation** for O&M of structures to develop a sustainable system

THANK YOU

CWAS CENTER FOR WATER AND SANITATION | CRDF CEPT RESEARCH AND DEVELOPMENT FOUNDATION | CEPT UNIVERSITY

About us

The Center for Water and Sanitation (CWAS) is a part of CEPT Research and Development Foundation (CRDF) at CEPT University. CWAS undertakes action-research, implementation support, capacity building and advocacy in the field of urban water and sanitation. Acting as a thought catalyst and facilitator, CWAS works closely with all levels of governments - national, state and local to support them in delivering water and sanitation services in an efficient, effective and equitable manner.

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