



## Water Security in Small and Medium Towns Due to Climate Change

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# Factors affecting water security



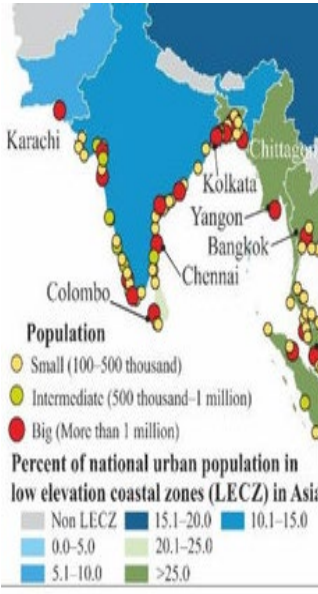
Drought and stress on water supply



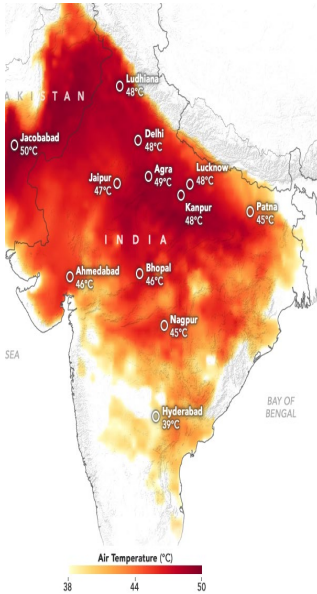
Floods and threat to life, infrastructure and economy



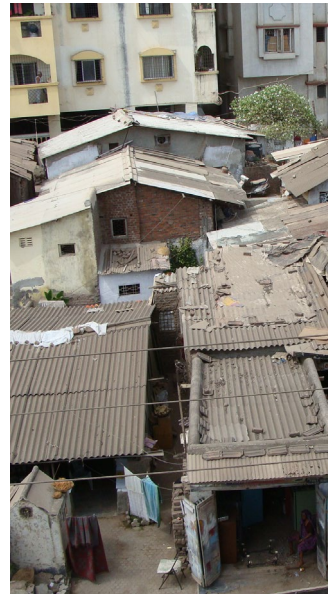
Sea level rise and threat to coastal cities



Heatwaves and carbon emissions

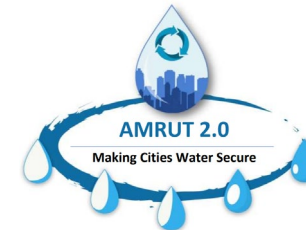


Inequality and resultant vulnerability

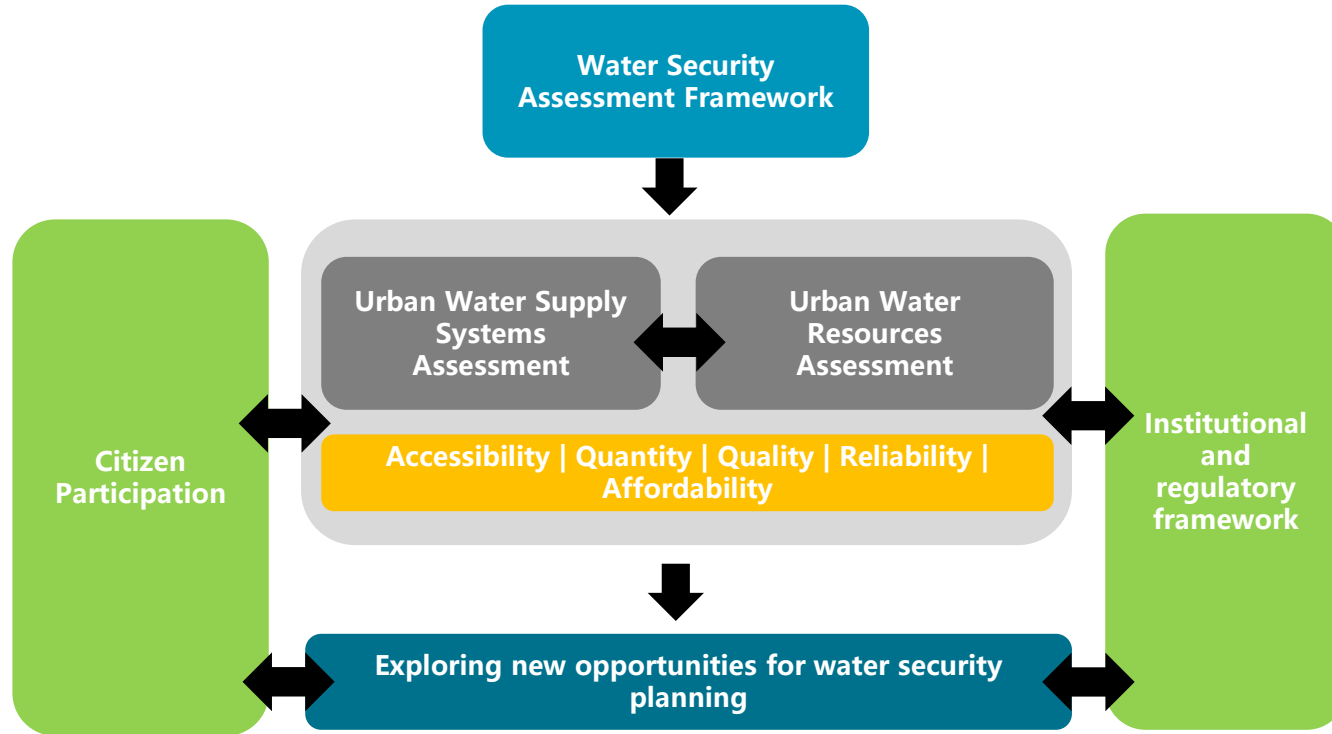


# WATER SECURITY A PRIORITY ON INTERNATIONAL AND NATIONAL AGENDAS

- **SDG 6 goal** with all its targets emphasizes to ensure availability and sustainable management of water and sanitation for all
- The **Water & Climate issued at COP28** stressed on **water resilience** to build **climate and socio-economic resilience**
- **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

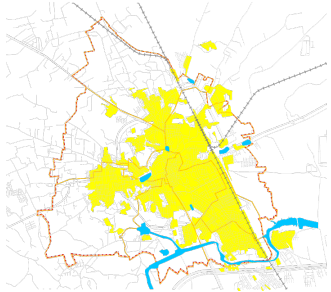


# URBAN WATER SECURITY ASSESSMENT FRAMEWORK



# ANJAR AND GANDHIDHAM IN KACHCHH (ARID REGION) OF GUJARAT STATE, INDIA

Anjar – 109, 238 population



**26,036**  
Households  
(2021)

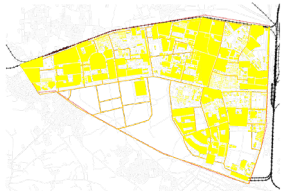


**17.81**  
Area  
(sq. Km)



**25% slum population**

Gandhidham- 410,000 population



**87,280**  
Households  
(2021)



**30.50**  
Area  
(sq. Km)



**17% slum population**



**Kachchh - Arid region**

**Drought every 2.5 Years**

**430mm Annual rainfall**

**406 km coast line**



Source: GoG - [District Profile](#), : Census 2011, Anjar and Gandhidham Municipalities

# THE REGION HAS HISTORICALLY FACED WATER CRISIS

**Chronically drought prone region with a frequency of once in every 2.5 years**

- **Over exploitation of ground water, which is further aggravated by salt water intrusion**
- **Dependent on distant source**

**Frequent Urban flooding scenario in major parts of the cities**

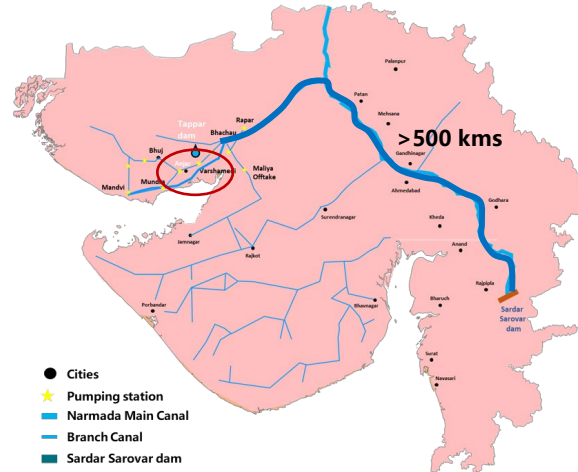


## In Kutch, history has a habit of repeating itself

Rutam V Vora | Bhuj, March 28 | Updated On: Mar 28, 2019



The region is witnessing its worst drought in 30 years; 16 of its 20 dams have gone dry; there is drinking water but nothing for cattle; and yet, its people remain resilient



Printed from THE TIMES OF INDIA

## Rains pound Gandhidham, Anjar towns in Kutch

TNN | Jul 12, 2020, 04:32 AM IST

Rajkot: Heavy rain lashed Kutch's commercial city Gandhidham and Anjar on Saturday evening causing severe water-logging in many areas. However, the people welcomed the rain that gave them some respite from the humid heat.



**Gujarat Braces for a Wet Weekend; Heavy Rain Alerts Issued over Kachchh, Jamnagar, Sabar Kantha, Surendranagar, Mahesana**

By TNN India Desk Team - 12 July 2022 - TNN India




# CITIES HAVE HIGH DEPENDENCE ON DISTANT SOURCE WITH WATER SUPPLY ON ALTERNATE/ ONCE IN 3-4 DAYS

	Quantity		Accessibility	
	Distant water source	Groundwater source	Pipe coverage	lpcd supply
<u>Anjar</u>	50%	50%	75%	
<u>G'dham</u>	75%	Saline GW. Depends on Anjar's aquifer	64%	
Cities are further planning to shift to <b>100% to distant source</b> w/o augmenting own sources		City authorities have <b>plans</b> to provide <b>140 LPCD</b> on daily basis		
	Quality		Reliability	Affordability
	WTP (existing)	WTP (augmentation)	Days of supply	Cost recovery
<u>Anjar</u>	4.5 MLD	15 MLD	Alternate Days	100%
<u>G'dham</u>	40 MLD	27 MLD	Once in 3-4 Days	41% Rs. 900/annum
Gandhidham WTP <b>non-functional</b> more than a year		Presence of <b>private water suppliers</b> observed in Gandhidham		<b>Additional expenditure</b> on procuring water from <b>private supplier</b>

# VARIOUS INITIATIVES ARE TAKEN IN THESE CITIES TO MOVE TOWARDS WATER SECURITY



Development of Water security assessment framework



Use of innovative tools/ applications to monitor ground water level



Geohydrological study for understanding aquifer and watershed of cities



Pilot demonstrations for water security



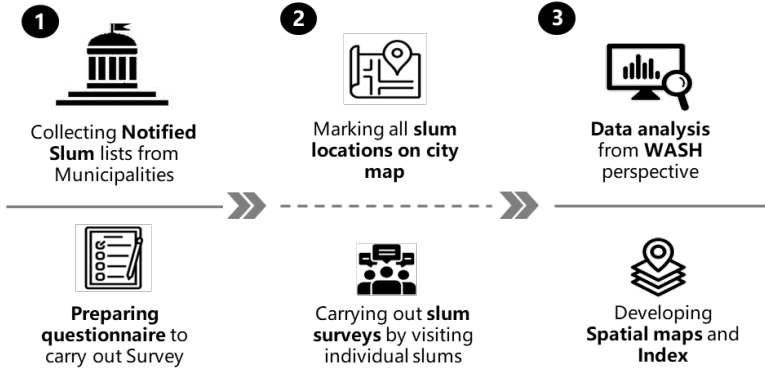
Composite water vulnerability index for urban poor



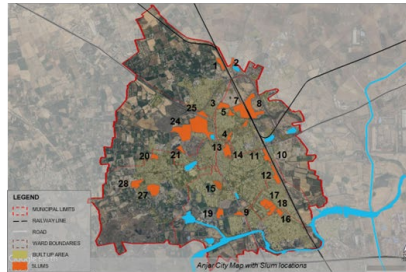
Scaling up of the initiatives from city to state level



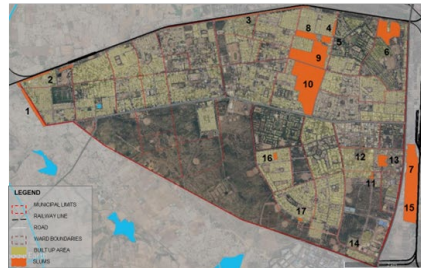
# WATER STRESS INDEX FOR SLUM AREAS



Anjar Slum locations



Gandhidham Slum locations



Parameters of the composite water vulnerability index



Availability



Reliability



Accessibility

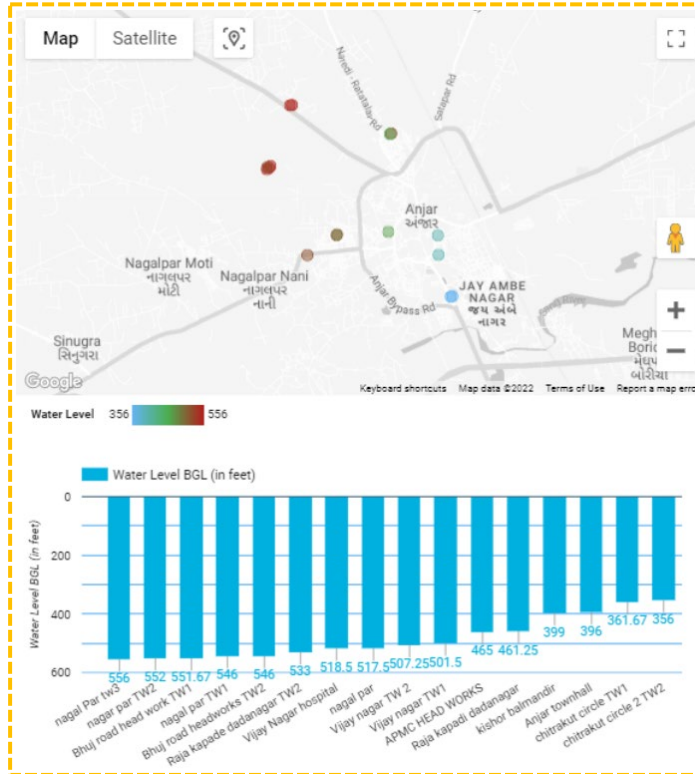


Quality



Awareness and Affordability

# USE OF MOBILE APP TO MONITOR GROUND WATER LEVEL



- Use of **Bhujal App** – for Ground Water Monitoring
- The app is **empowered** under **AMRUT 2.0** by MoHUA as a **Technology and Implementation partner**
- **22 locations Pilot testing** -16 borewells @ Anjar and 6 borewells @ Gandhidham
- The **test results** were **similar** to the **data provided by the utility**

## Benefits of such tools/applications

- ✓ Assess the **water demand**
- ✓ Measurements are **available in minutes**
- ✓ **Ease less** testing process
- ✓ **Community participation** in GW management
- ✓ Early identification of **drying borewells**

# GEOHYDROLOGICAL STUDY CONDUCTED FOR UNDERSTANDING AQUIFER AND WATERSHED OF CITIES

## APPROACH FOR GEOHYDROLOGICAL STUDY

WATER SOURCE STUDY

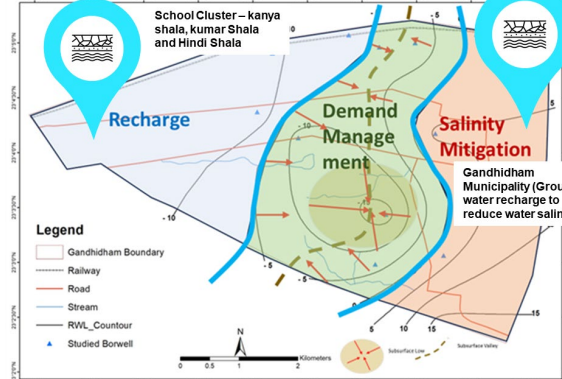
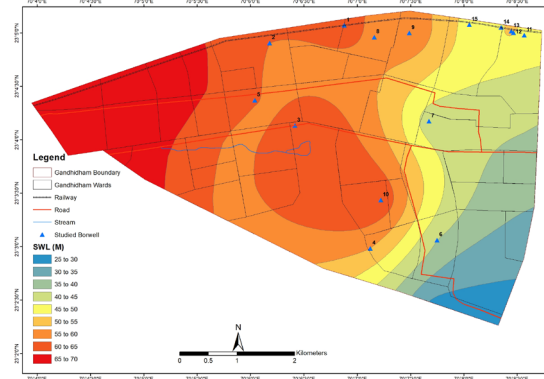
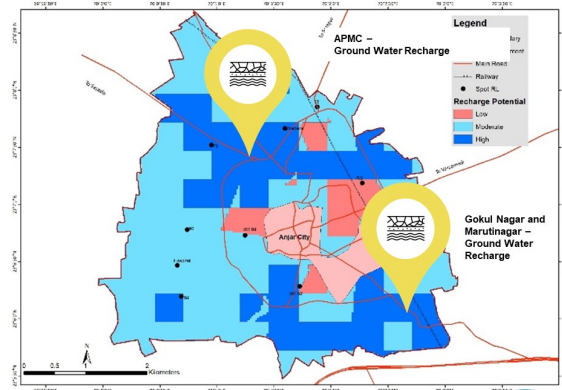
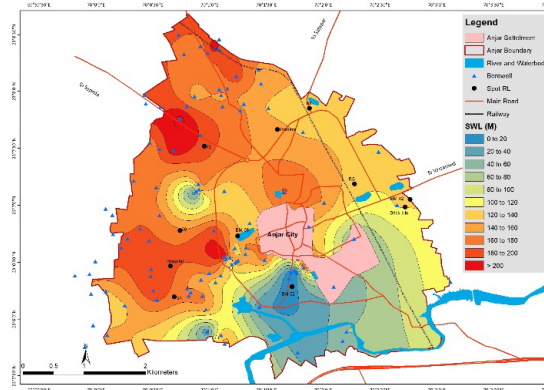


LITHOLOG AND AQUIFER STUDY WITH THEMATIC MAPS



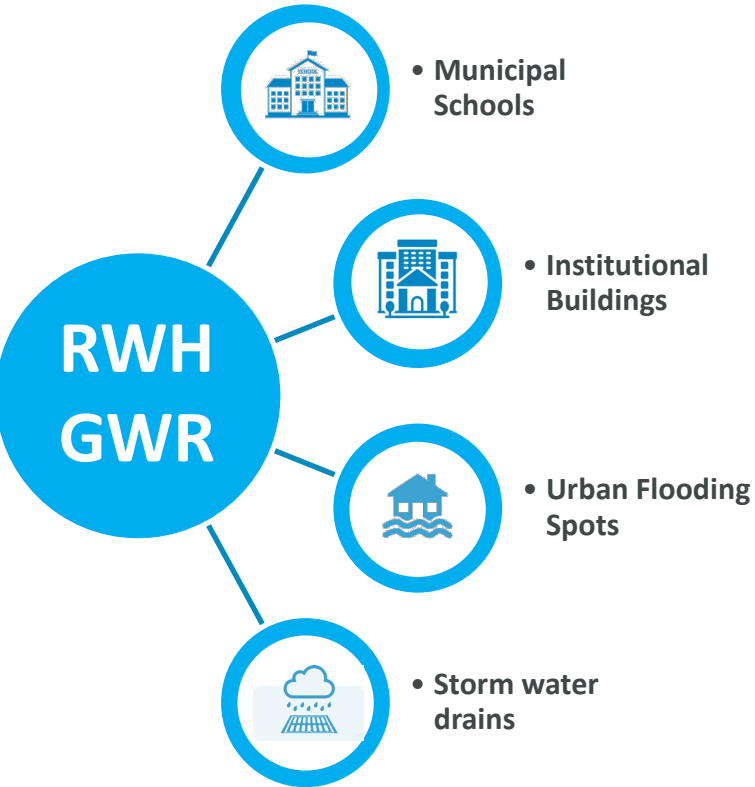
IDENTIFICATION OF POTENTIAL RECHARGE ZONES

Ground water level and contour maps



Source: Developed by ACT for CWAS study

# BASED ON GEOHYDROLOGICAL STUDIES, PILOT PROJECTS WERE IDENTIFIED

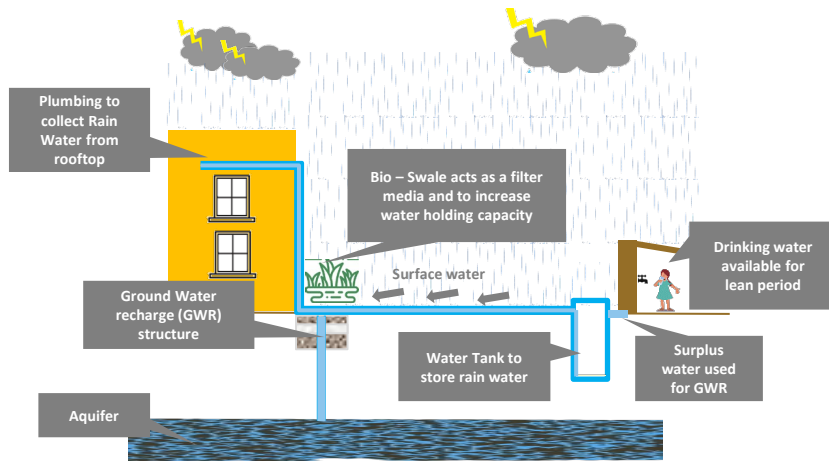


## Impact

**88 thousand liters**  
of Rainwater available for  
**3000+ students** during  
lean period

**35 Million liters** of  
ground water recharged during monsoon

# RWH AND GWR STRUCTURES CONSTRUCTED AT MUNICIPAL SCHOOLS AND INSTITUTIONAL BUILDINGS



## Salient features of the project

Water conservation



Water – lean period

Water holding capacity



Surplus Water - GWR



No water logging

## Plumbing Work



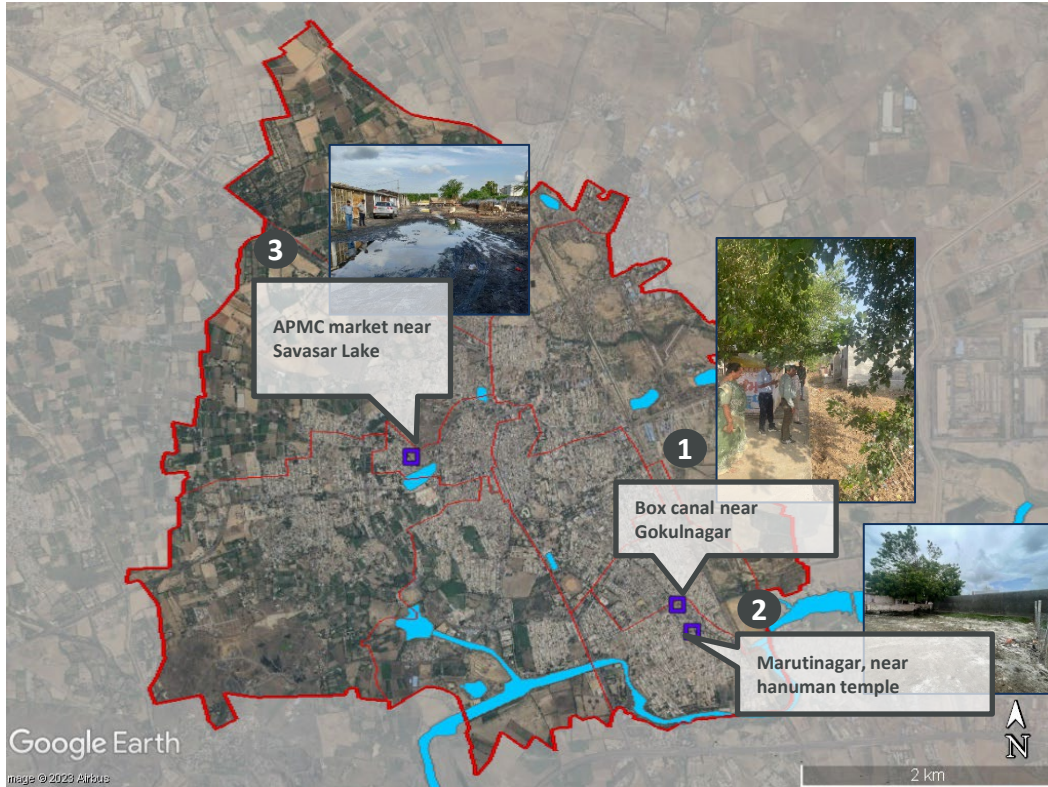
## Bio-swale/ borewell



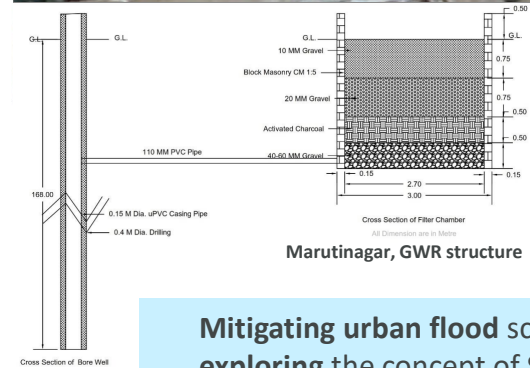
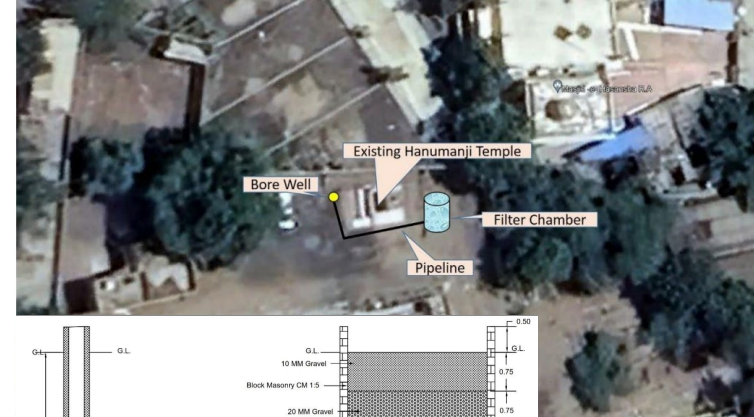
## VJT – Mineralized tanks



# GROUND WATER RECHARGE STRUCTURES TO MITIGATE THE URBAN FLOOD SCENARIO



Locations of Pilot on use of storm water for GWR and urban flood control in Anjar



Mitigating urban flood scenario, while exploring the concept of **Sponge cities** through ground water recharge structures

# URBAN WATER SECURITY PLANNING TOOLKIT



- The approach of toolkit is to prevent crisis and move the cities towards a secure future by becoming 'self-reliant' for water
- Begin with the conservation of local water resource rather than depending on distant sources
- This toolkit has been developed to pave the way for other cities to become water secure
- It can be adapted and tailored according to the context and needs of each city



## Urban Water Security Planning Toolkit

- 1** **Need and concept of this toolkit**  
What is Water Security?  
A matter of extreme urgency!  
Water management in urban areas
- 2** **Introduction**  
About the toolkit  
Framework  
How to use this toolkit?  
How can different groups use this toolkit?
- ?** **Is your city water secure?**  
Rapid assessment of city and citizens

<b>M1</b>	<b>Urban water supply system assessment</b> 1.1 Service provider perspective: Local Government 1.2 Citizens perspective 1.3 Private sector: Costing mechanisms 1.4 Interlinkages with other sectors 1.5 Identification of issues and strategy development
<b>M2</b>	<b>Understanding urban water resources</b> 2.1 Documenting history of water management 2.2 Spatial analysis 2.3 Surface water assessment 2.4 Groundwater and aquifer assessment 2.5 Key issues and strategy
<b>M3</b>	<b>Exploring new opportunities for water security planning</b> 3.1 Rainwater harvesting 3.2 Groundwater recharge 3.3 Reusing food waste streams 3.4 Wastewater treatment and reuse 3.5 Reducing Non Revenue Water (NRW) 3.6 Improving quality of water supply
<b>M4</b>	<b>Citizen involvement in water resources management</b> 4.1 Awareness and information 4.2 Creating a citizen forum 4.3 Involvement in planning process
<b>M5</b>	<b>Institutional and regulatory framework</b> 5.1 Assessment of existing framework 5.2 Identifying gaps and overlaps 5.3 Strengthening the framework: Coordination and integration 5.4 Capacity building and learning alliance
<b>A</b>	<b>Quick Actions and Learning Approaches and Toolkits</b> Background Quick links and glossary

Urban water security planning toolkit available at:  
[https://cwas.org.in/resources/file\\_manager/urban\\_water\\_security\\_planning\\_toolkit\\_compressed.pdf](https://cwas.org.in/resources/file_manager/urban_water_security_planning_toolkit_compressed.pdf)

# PARTNERSHIPS AND COLLABORATIONS



## Government Collabs



Gandhidham Municipality

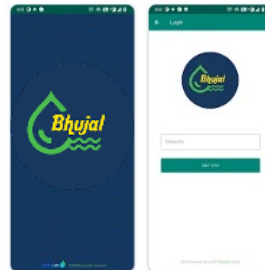


**GDA**



સત્યમેવ જયતે  
Government of Gujarat

## Technical partners



**ARID COMMUNITIES & TECHNOLOGIES**





# Thank you

**CWAS** CENTER  
FOR WATER  
AND SANITATION

**CRDF** CEPT RESEARCH  
AND DEVELOPMENT  
FOUNDATION

**CEPT**  
UNIVERSITY

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## 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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