Urban Water Security and Climate Resilience in two arid cities of India

Center for Water and Sanitation (CWAS), CEPT University

UNC 2023 Water and Health Conference

24th October, 2023

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Water security an issue of extreme urgency

Population under water stress	
2016	2050
0.9 billion	1.7–2.4 billion

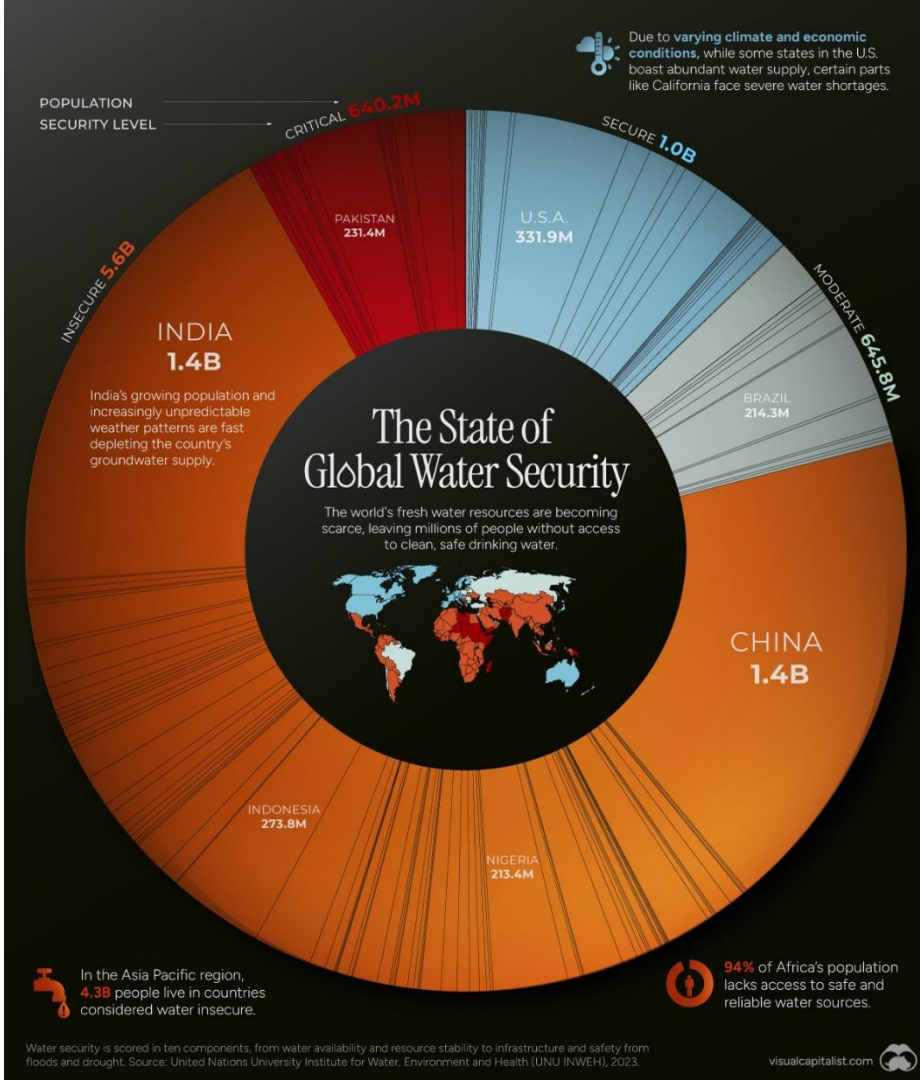
- **75%** of world population will be affected by **droughts by 2050 (UNCCD)**
- **12%** of India's population is already living the **'Day Zero' scenario, looming 21 cities of India**

Source: IPCC; : IUCN.ORG; UNCCD; WRI, 2019; UNESCO, 2023

In Asia Pacific region,

4.3B

people live in countries considered **water insecure**



Graphics by Visualcapitalist developed from study of United Nations University Institute for Water, Environment and Health, 2023.
It examines 10 different underlying components, ranging from water quality and sanitation to availability, resource stability, and climate-related risks.

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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 Pavilion at COP27** 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

COP27 SHARM EL-SHEIKH EGYPT 2022

Water Pavilion
Water for Climate

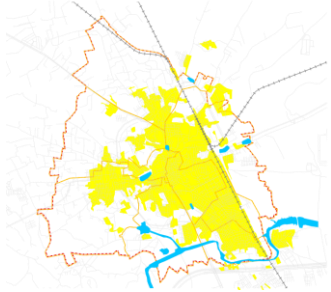
AMRUT 2.0
Making Cities Water Secure

अमृत
Atal Mission for Rejuvenation and Urban Transformation

Har Ghar Jal
Jal Jeevan Mission

Anjar and Gandhidham in Kachchh (Arid region) of Gujarat state, India

Anjar – 109, 238 population

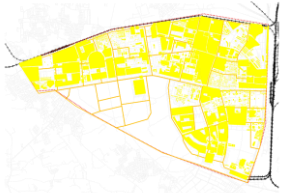


26,036 Households (2021)

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**


THE HINDU

Kutch in the grip of worst drought: Desert grit


AL JAZEERA

'We can only watch our animals die': A drought disaster in Kutch

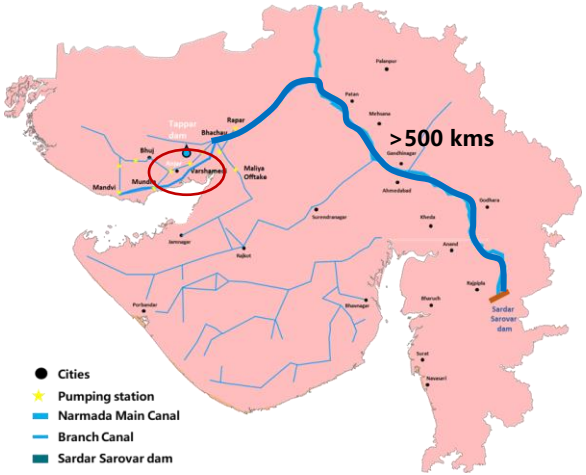
In Kutch, a northern Gujarat district, residents say their livelihoods are at risk as experts warn of a water crisis.


In Kutch, history has a habit of repeating itself

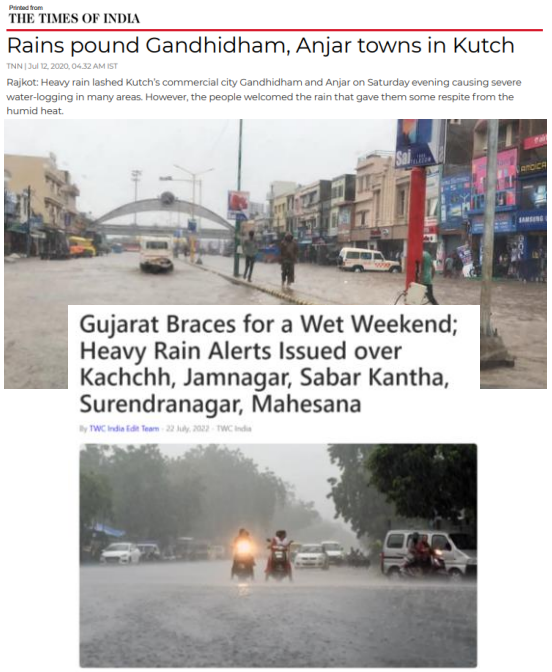
Rutam V Vora | Bhuj, March 28 | Updated On: Mar 28, 2019

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

- **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


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

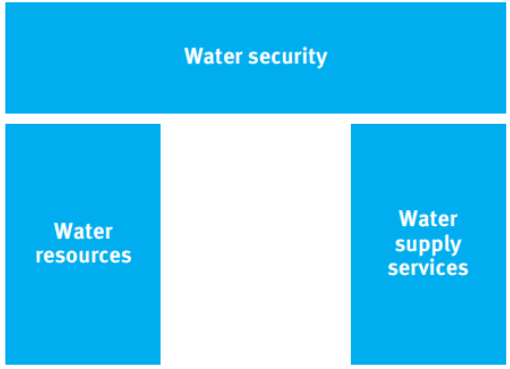
By TWC India Edit Team · 22 July, 2022 · TWC India

Various initiatives are taken in these cities to move towards water security

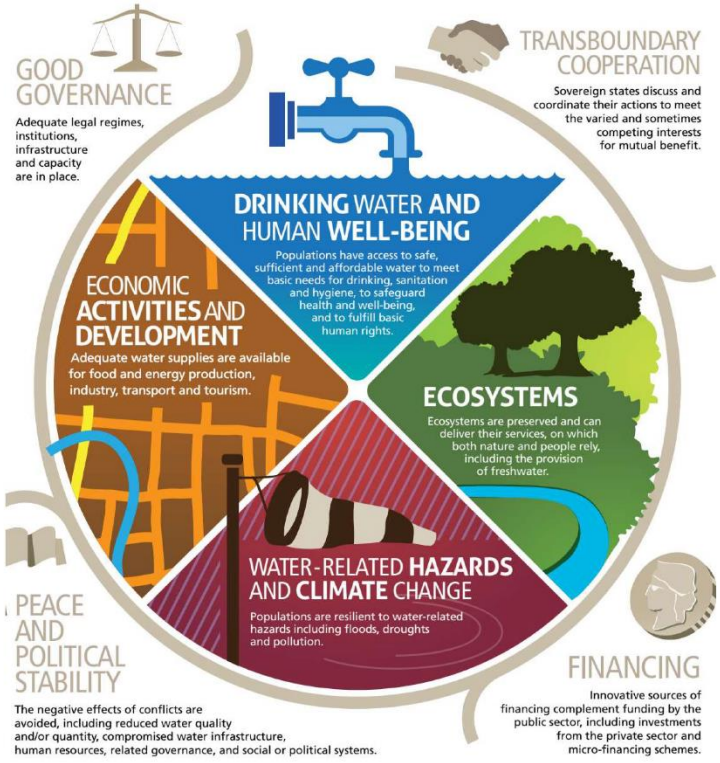
- Development of Water security assessment framework
- Use of innovative tools/ applications to monitor ground water level
- Geohydrological study for understanding aquifer and watershed of cities
- Pilot demonstrations for water security
- Composite water vulnerability index for urban poor
- Scaling up of the initiatives from city to state level

Many toolkits available focus on macro level planning

Wateraid toolkit

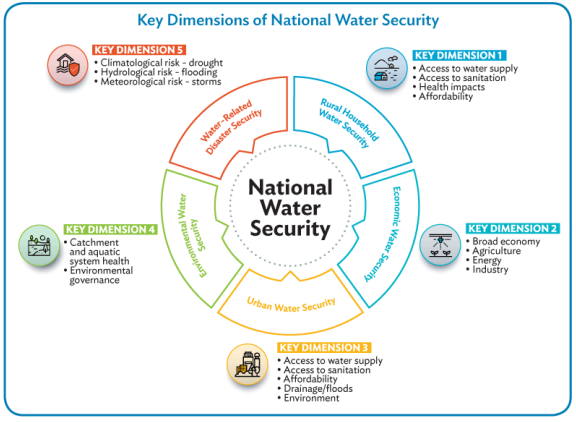


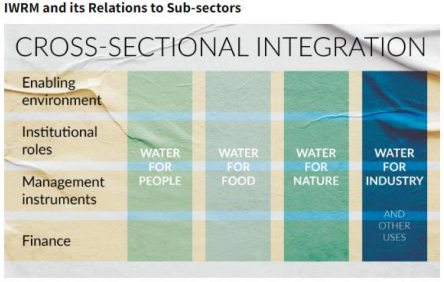
United Nations framework of water security



GWP toolkit

Asian Water Development Outlook (AWDO)





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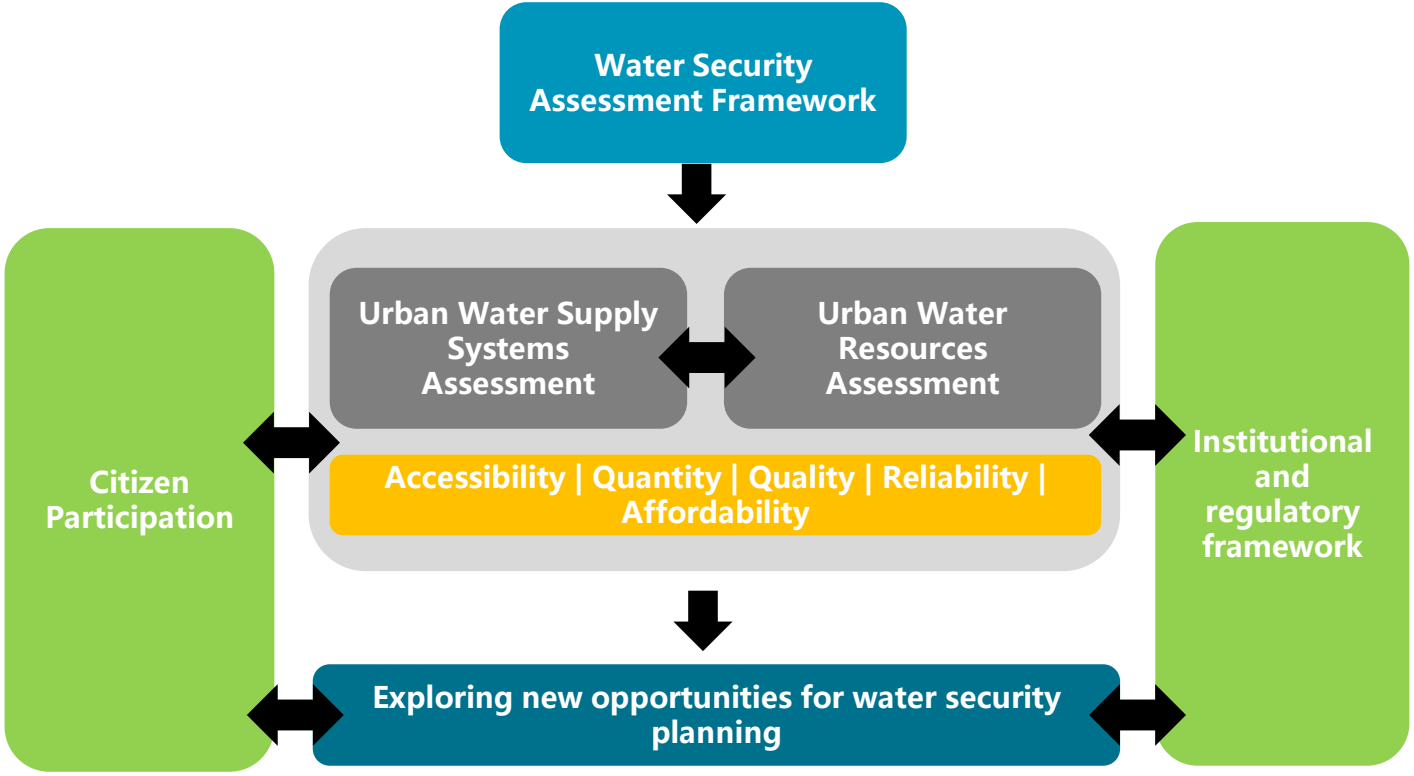
Urban Water Security Assessment Framework



Source: Adapted from CWAS Urban water security Planning toolkit

Cities have high dependence on distant source with water supply on alternate/ once in 3-4 days

Quantity

	Distant water source	Groundwater source
Anjar	50%	50%
G'dham	75%	Saline GW. Depends on Anjar's aquifer

Cities are further planning to shift to **100%** **to distant source** w/o augmenting own sources

Accessibility

	Pipe coverage	lpcd supply
Anjar	75%	68 to 91 LPCD
G'dham	64%	128 to 89 LPCD

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

Quality

	WTP (existing)	WTP (augmentation)
Anjar	4.5 MLD	15 MLD
G'dham	40 MLD	27 MLD

Gandhidham WTP **non-functional** more than a year

Reliability

	Days of supply
Anjar	Alternate Days
G'dham	Once in 3-4 Days

Presence of **private water suppliers** observed in Gandhidham

Affordability

	Cost recovery	Tariff
Anjar	100%	Rs. 900/annum
G'dham	41%	Rs. 900/annum

Additional expenditure on procuring water from **private supplier**

A study is ongoing to understand the situation of slum areas

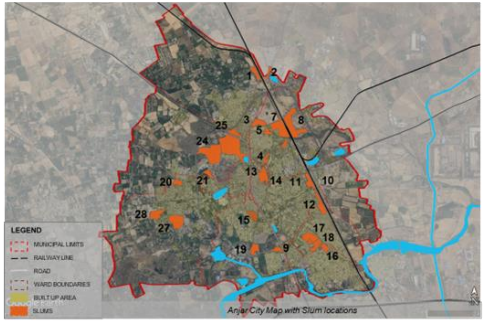
1. Collecting **Notified Slum** lists from Municipalities
2. Marking all **slum locations on city map**
3. **Data analysis** from **WASH** perspective

Preparing questionnaire to carry out Survey

Carrying out **slum surveys** by visiting individual slums

Developing **Spatial maps** and **Index**

Anjar Slum locations

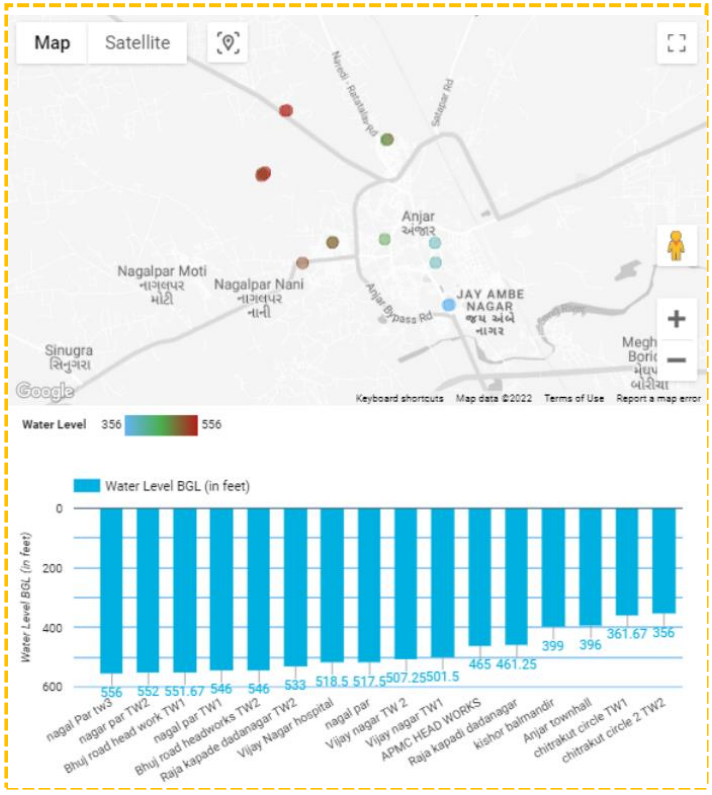


Gandhidham Slum locations

Parameters of the composite water vulnerability index

- **Availability**
- **Reliability**
- **Accessibility**
- **Quality**
- **Awareness and Affordability**

Use of innovative tools/ applications to monitor ground water level



- Use of **Bhujal App** – for Ground Water Monitoring
- The app is **empaneled** 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 ULBs**

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**

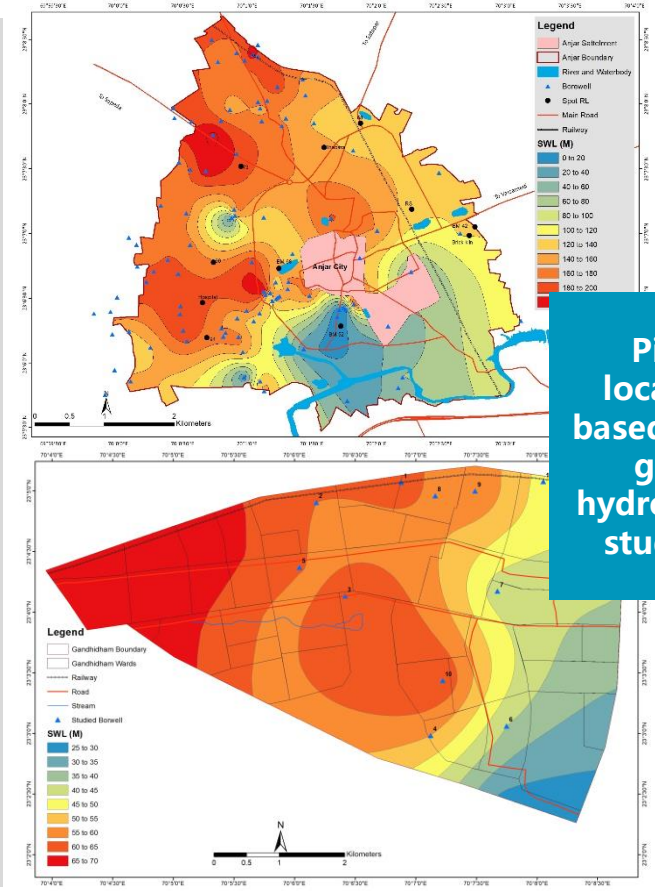
Source: Developed by Waterlabs for CWAS study; Waterlabs

Geohydrological study conducted for understanding aquifer and watershed of cities

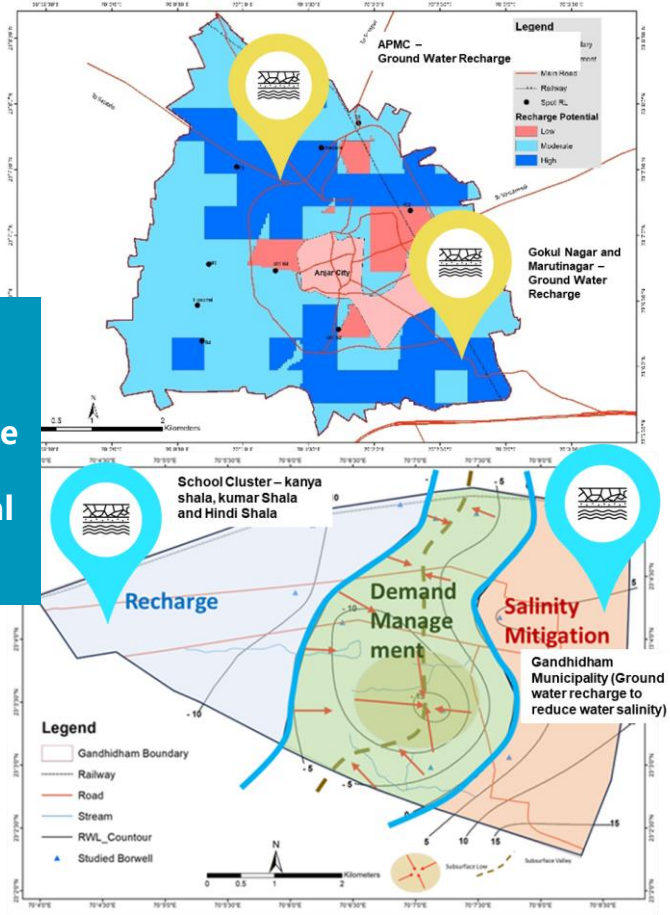
APPROACH FOR GEOHYDROLOGICAL STUDY

- **WATER SOURCE STUDY**
- **LITHOLOG AND AQUIFER STUDY WITH THEMATIC MAPS**
- **IDENTIFICATION OF POTENTIAL RECHARGE ZONES**

Ground water level and contour maps



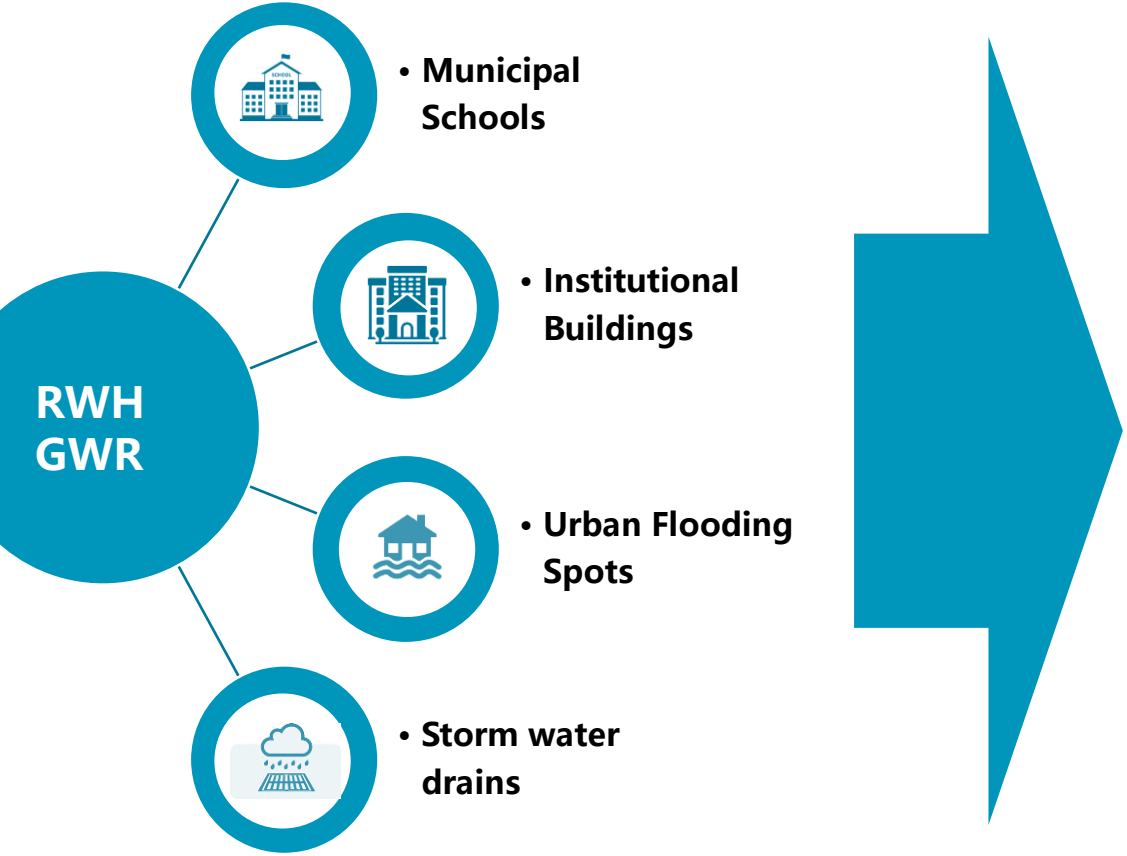
Potential recharge zones



Pilots locations based on the geo - hydrological study . . .

Source: Developed by ACT for CWAS study

Based on geohydrological studies, pilot projects were identified



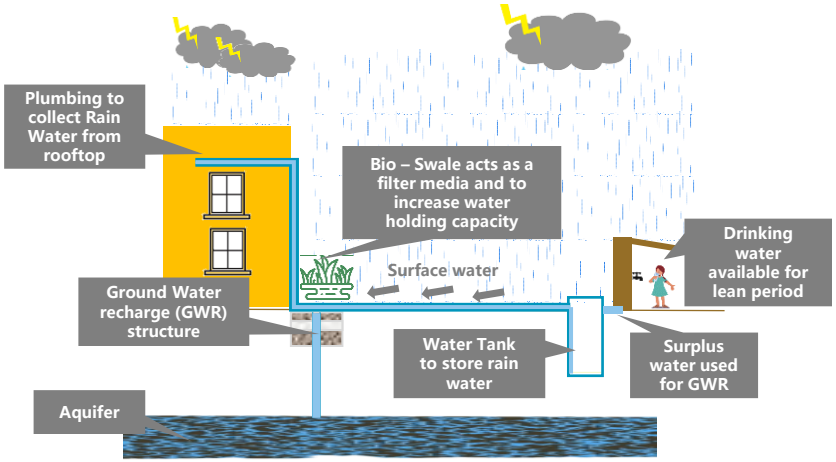
Impact

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

35 Million liters of ground water recharged during monsoon

RWH- Rain Water Harvesting
GWR- Ground Water Recharge

Rainwater harvesting and groundwater recharge structures constructed at municipal schools and institutional buildings



Salient features of the project

- Water conservation
- Water holding capacity
- Water – lean period
- Surplus Water - GWR
- No water logging

Plumbing Work

Bio-swale/ borewell

VJT – Mineralized tanks

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To maintain the RWH and GWR structures, a committee is formed at schools consisting of teachers and students

- A committee consisting of three faculty and 12 students was formed
- Students were taught the importance of rain water harvesting and groundwater recharge
- Trainings were provided to all on maintenance of these structures

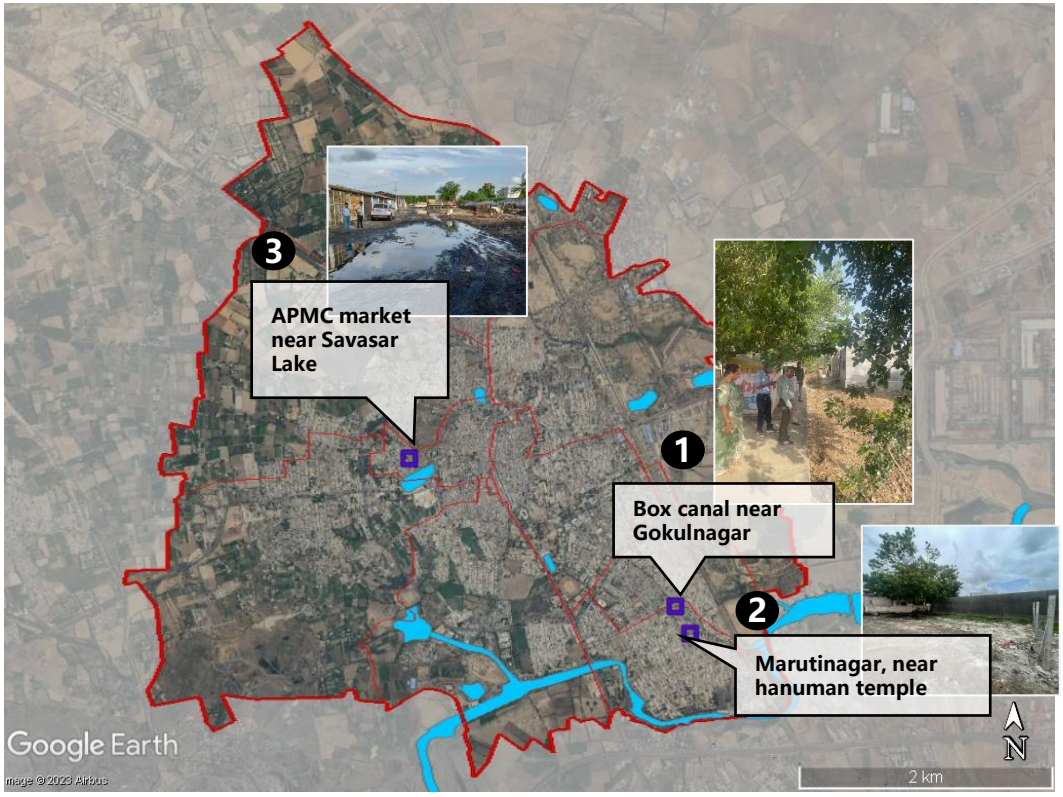
School witnessed and envisions positive impacts of these efforts

No water logging in school

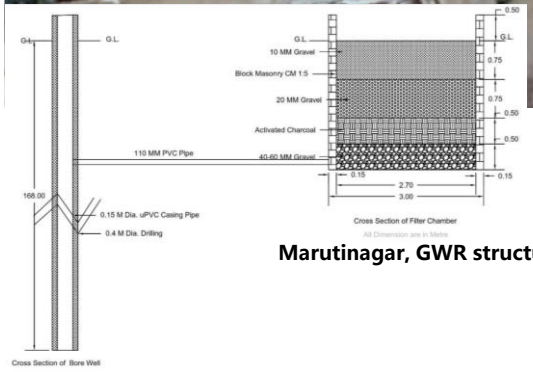
The school will be able to claim the additional funds from Government associated with implementation of RWH structures

Further, safe from water borne illness and free from mosquito breeding spaces

Ground water recharge structures also mitigated the urban flood scenario



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

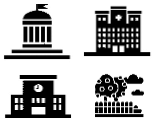


Marutinagar, GWR structure

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

Scaling up these practices

Where to implement?



Identifying potential location/ stakeholders

Through which media?

Awareness programme – Jal Samvad

Where is the fund?

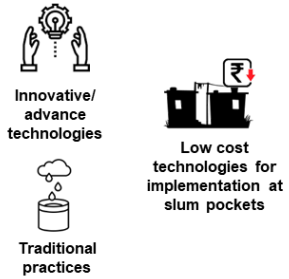
Identifying potential financing mechanism

What are the norms?

Development authority, ULBs, State /Central government, Good practices etc.

Identifying Innovative tools – subsidizing, incentivizing etc.

Which technology and who will build ?



Identifying various technologies for RWH/ GWR

Phase I - Engaging

Phase II - Strategizing

Phase III - Implementing

Outcomes of the project

Source sustainability

The cities will be able to augment their own water resources through rain water harvesting and ground water recharge

Climate Resilient

The cities will be able to cope with the impacts of changing climate in terms of water scarcity due variation in precipitation pattern or urban flooding situation through GWR structures

Community participation

Involving citizens to the system will further bring in the sense of ownership and will ensure sustainability of the systems, beyond project period

Policy level initiatives

The cities will be able to strengthen their policy frameworks, which in turn will help in successful implementation of projects at ground level

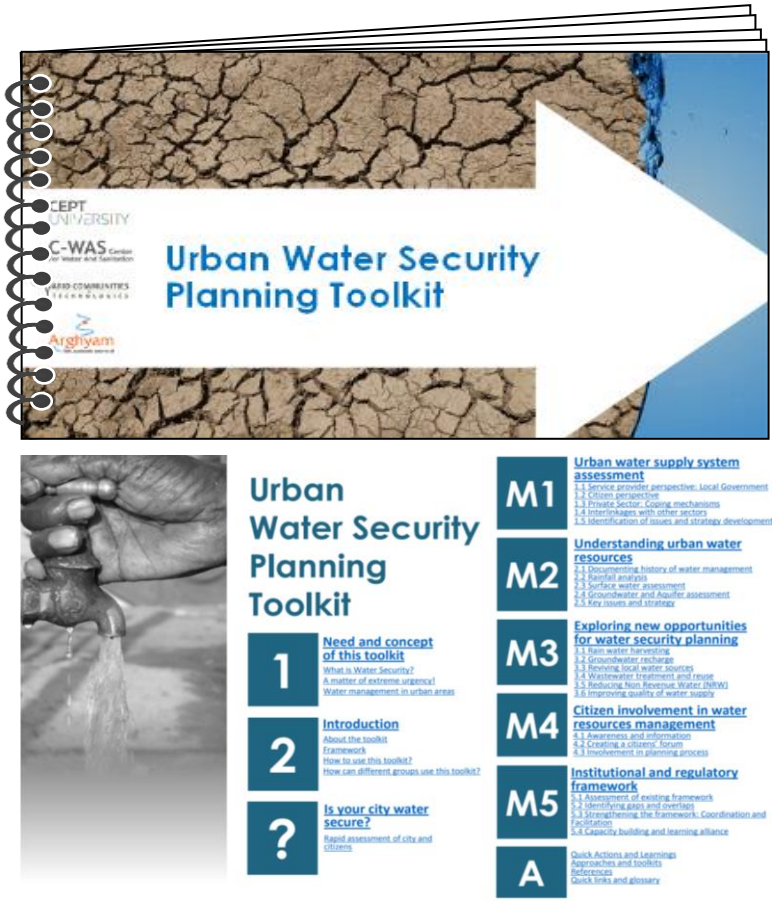
Capacity building

The cities will be empowered through capacity building and training workshops for actual implement and monitoring of the system

Scaling up

The action-oriented pilot projects developed in the study cities, will help to scale up such initiatives from city to state level

Key features of CWAS's 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 available at: https://cwas.org.in/resources/file_manager/urban_water_security_planning_toolkit_compressed.pdf

"Water is the primary vehicle through which we feel the impacts of climate change"

- World Meteorological Organization

Thank you

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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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Annex 1 : Elements of Water security framework ...

1. Urban Water Supply System Assessment

- Service Provider Perspective – ULBs, State Government etc.
- Citizen Perspective
- Private Player Perspective – Coping Mechanism
- Identification of issues and strategy development

2. Urban Water Resources Assessment

- Water dependency assessment
- Rainfall Analysis
- Surface Water and Ground water Assessment
- Aquifer Mapping
- Identification of issues and strategy

3. Exploring New Opportunities

- Rainwater harvesting
- Ground Water recharge
- Use of Storm water to Recharge GW
- Revival of dysfunctional wells/ borewell
- Concept of sponge street/ sponge campus
- Improving water quality
- Improving water services

4. Citizen Participation

- Citizen Awareness and information
- Citizen involvement in Water systems management
- Citizen participation on developing strategies

5. Institutional and regulatory framework

- Assessment of existing framework
- Identifying Gaps and Overlaps
- Strengthening the framework
- Building capacity

Multiple climatic impact-drivers are projected to change in all regions of the world
(Source: IPCC AR6 The Physical Science Basis Summary for Policymakers)