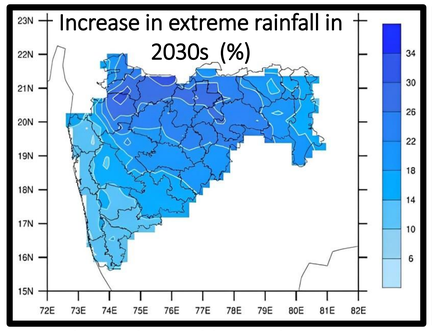
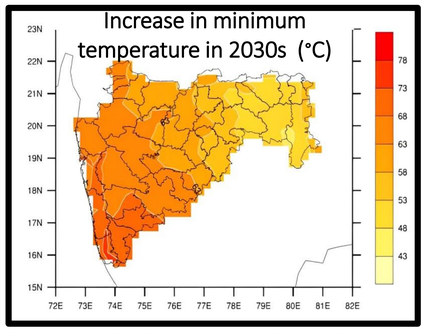
Climate-Resilient Sanitation Infrastructure: Unravelling Linkages, Adaptation, and Mitigation Strategies in Maharashtra, India

Mr. Manish Kulkarni, Research Associate, CWAS

Background:





Extreme rainfall events are likely to be observed in **northern part** of the state. i.e. Aurangabad, Amravati and Nashik division.

Increase in temperature is projected to increase particularly in **Konkan, Pune and Nashik** divisions.

(Source- MSAAPC, 2014)

Draught and Wind hazards are the second major **hydro meteorological** category for the natural disasters.

Sanitation Infrastructure & Investment in Maharashtra:

	User Interface	Containment & Disposal Systems	Conveyance	Treatment Facilities	Re-cycle and reuse
	- Individual Household Toilets (146 L HHs) - Community & Public Toilets (8.7 L HHs)	**HHs dependent on** - Single pit system (0.36 L) - Twin pit system (0.69 L) - Septic Tanks (68.44 L) - STs+Drain/Sewer(22.58 L) - STs+ Soak Pit (45.86 L)	- Desludging vehicles (2300+) - Sewer (54.3 L HHs) - Covered drains (16,825 km) - Open drains (20,303 km)	- Sewage Treatment Plants **STPs** (56) - Faecal Sludge Treatment Plants **FSTPs** (222)	No direct facilities
SBM 1.0	7,13,013 IHHTs- 912 Cr.		5,485 CTs- 358 Cr.	4,449 PTs- 290 Cr.	222 FSTPs- 50 Cr.
SBM 2.0	1,88,334 IHHLs- 241 Cr.		1185 CTs- 253 Cr.	573 PTs- 113 Cr.	222 FSTPs- 50 Cr. UWM Components- 6303 cr.

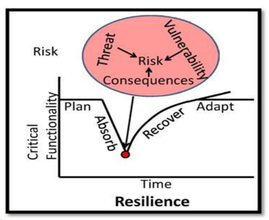
(Source: PAS Portal 2022-2023, SMMU)

Levels of Sensitivity to Climate Change and Resilience:

Sanitation Components	Short term & unpredictable events: Extreme precipitation	Short term & unpredictable events: Increase in temperature	Slow on-set events: Drought/reduced water availability	Slow on-set events: Wind	Slow on-set events: Fire	Sensitivity Score
IHHL & CTPT	4	1	3	2	2	12
Single pit system	4	2	2	0	0	8
Twin Pit system	4	1	2	0	0	7
STs+ Drain/Sewer	3	1	2	2	1	9
STs+ Soak Pit	4	1	4	2	1	12
Desludging vehicles	1	1	2	0	1	5
Sewer system	4	3	2	1	1	11
Covered drains	3	2	2	0	0	7
Open drains	4	3	3	3	0	13
STPs	4	3	4	3	2	16
FSTPs	4	4	3	4	3	18
	Not Sensitive	Low	Low-medium	Medium	High Sensitivity	
	0	1	2	3	4	

(Source- Expert's Opinion survey, 2024)

These events have the potential to diminish any hard-won gains in sanitation access.



Ability to cope with the external shocks and stresses, having in-built capacities (Source- Cutter et al, 2014)

Adaptation & Mitigation Strategies practiced for Identified linkages

	Risks	Climate Adaptation, and Mitigation Strategies
FSTP units SDB	Increased precipitation causes stagnant water in SDB, requires increased drying time, reduced efficiency during rainy seasons.	Shed over SDB, Dharangaon; additional settling tank/sump, Sinnar; Greenhouse solar dryer, Satara; Mechanical dewatering unit, Satara
PGF	Wind damages to the plants, Flooding of the PGF unit, contamination of treated water from transported waste by wind, Heat stress limits plant growth.	Trimming plants for root growth, Georai; Mesh & Shed on PGF, Dindori; Raised ABR, motor to lift stagnant water (Dindori); Watering during stress (Vita); Hinged covers, Bhor
ECU & Misc.	Interrupted power supply due to unpredictable climate related events, limiting access to the FSTP site due to heavy rain, reducing the quality of treated products, hampering the structural stability of civil components, aggravating the risk in absence of any skilled/dedicated personal for O&M	Alternative **Chlorine** arrangement, Deolali; Solar Panels at FSTP for power generation, Sinnar; Enclosed dried storage, Igatpuri; Vehicle cleaning platform, sinnar; Pucca access way & ramp to FSTP, Erandol & Yawal

- Damp proofing walls of SDB and PGF, Installation of vehicle cleaning platform.
- Inspection of each component after the unpredictable events.
- O&M of FSTP through external agency, allocation of budget.
- Dedicated operator for emergency measures.

(Source- Field observations, CWAS Team)

Resilience **does not depend on the number of adaptations possible**, **but the impact** of each adaptation & mitigation **in reducing vulnerability**.

Way Forward:

Resilience **assessment of each sanitation component**, through system's framework, need to be done to further devise the **strategies** for the state of Maharashtra.

Intensifying the adaptation and mitigation measures adopted by ULBs from different geo-climatic regions and **integrating** climate resilience into ongoing Swachha Maharashtra Sanitation Program.

Need to **incorporate post event operations**, particularly for O&M of FSTP, **in SoP** prepared by Maharashtra State Government

CWAS CENTER FOR WATER AND SANITATION
CRDF CEPT UNIVERSITY
BILL & MELINDA GATES foundation
FP FACULTY OF PLANNING