



Climate Resilient Infrastructure and Green Financing

क्लायमेट रेसिलियन्ट सुविधा आणि वित्तीय उपाय

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CWAS CENTER FOR WATER AND SANITATION

CRDF CEPT RESEARCH AND DEVELOPMENT FOUNDATION

CEPT UNIVERSITY

What does History tell us? Civilization/Cities have collapsed due to lack of water..

इतिहास आपल्याला काय सांगतो? पाण्याच्या अभावामुळे संस्कृती आणि शहरे ह्यांचा हास झाला..

Mayan civilization: Drought led famine?



Indus Valley Civilization: From sewers and trade ports to abandoned cities



Fatehpur Sikri: Grand capital but dying water source



Modern disasters?

Mexico City Day Zero scare



Cape Town Day Zero

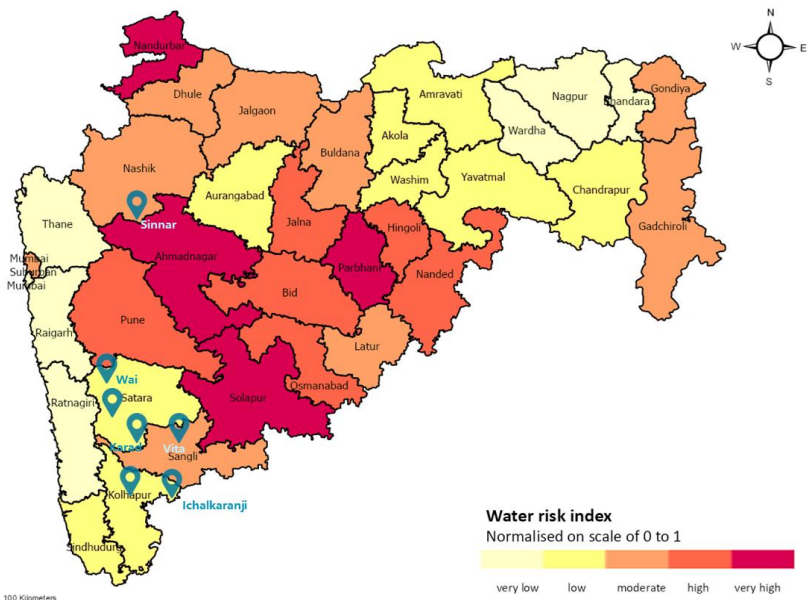


Chennai – Floods followed by drought



With low rainfall and limited water storage in the aquifers, central Maharashtra at high climate and water risk

कमी पाऊस आणि भूजल साठा यांच्या क्षमतेच्या मर्यादेमुळे मध्य महाराष्ट्रामध्ये हवामान प
समस्या उद्भवली आहे..



- In the state's 36 districts, **11 are water-stressed** (less than 1,700 cubic meters per capita per year), and **18 are water-scarce** (less than 1,000 cubic meters per capita per annum).
- The overall climate water risk is highest for districts in central Maharashtra and Marathwada, particularly **Ahilyanagar (Ahmednagar), Nandurbar, Parbhani, and Solapur.**
- Seasonal groundwater scarcity is prevalent in Vidarbha and Marathwada regions, mainly due to the hard rock aquifers which have **limited storage and low-yield potential.**

Table 4.6 Vulnerable districts of Maharashtra

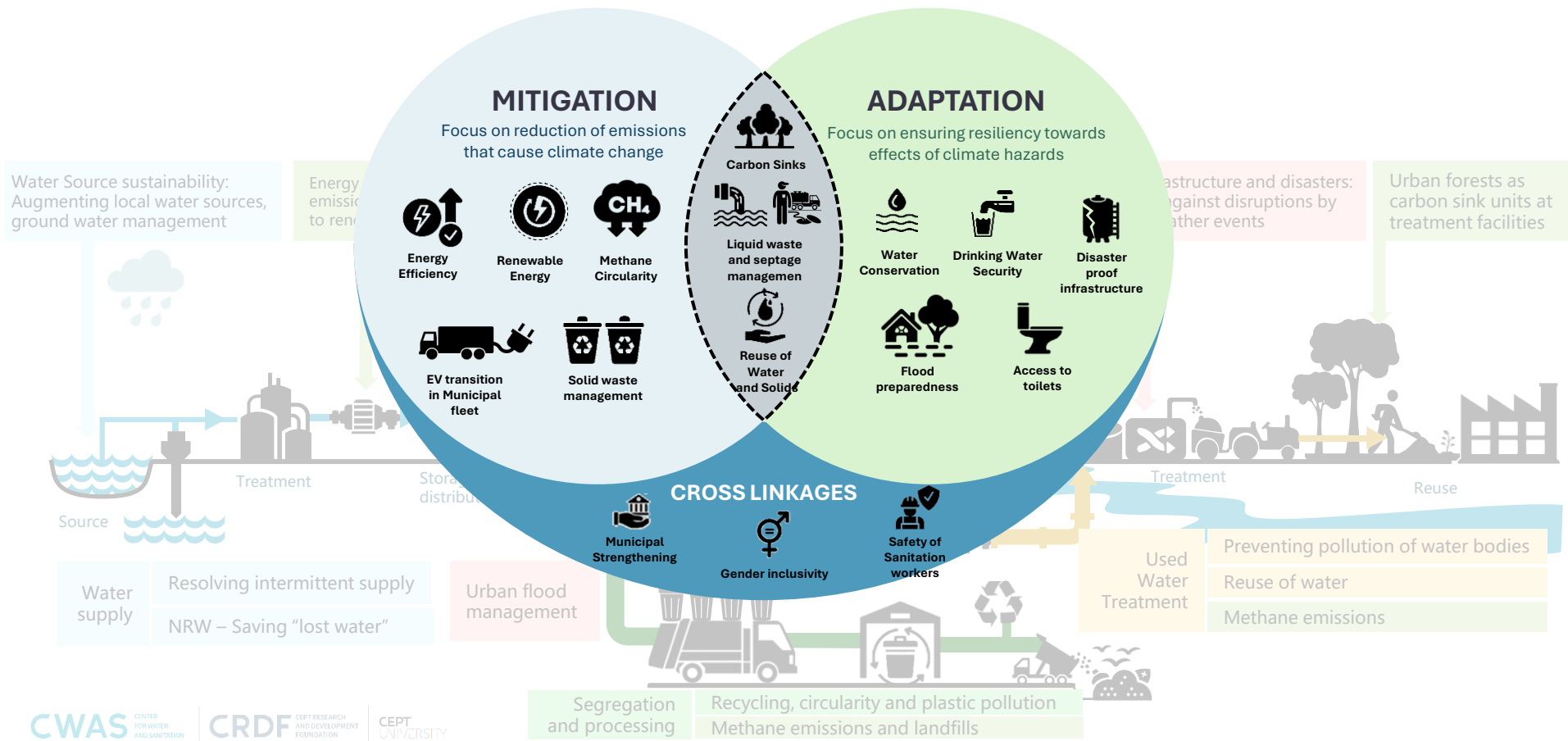
District	Event	Vulnerability
Sangli	Drought	Very high
Ahmednagar	Drought	Very high
Solapur	Drought	Very high
Dhule	Drought	Very high
Mumbai City	Flood & cyclone	Very high
Mumbai Suburban	Flood & cyclone	Very high
Buldhana	Drought	Very high
Hingoli	Drought	Very high
Jalgaon	Flood & drought	Very high
Osmanabad	Drought	High
Parbhani	Drought	High
Nandurbar	Drought	High
Nagpur	Drought	High
Satara	Drought	High
Akola	Drought	High
Nanded	Drought	High
Beed	Drought	High
Aurangabad	Flood & drought	High
Latur	Drought	Moderate
Pune	Flood & drought	Moderate
Amravati	Flood & drought	Moderate
Nashik	Flood & drought	Moderate
Jalna	Drought	Moderate
Gadchiroli	Drought	Moderate
Ratnagiri	Flood & cyclone	Moderate
Sindhudurg	Flood & cyclone	Moderate
Washim	Drought	Moderate
Raigad	Drought	Moderate
Chandrapur	Drought	Moderate
Gondia	Drought	Moderate
Wardha	Flood & drought	Low
Yavatmal	Drought	Low
Thane	Flood & cyclone	Low
Bhandara	Drought	Very low
Kolhapur	Drought	Very low

Source: [https://www.mahasac.in/uploads/reports/Revised_Maharashtra_State_Climate_Action_Plan_\(2021-2030\)_compressed_\(1\).pdf](https://www.mahasac.in/uploads/reports/Revised_Maharashtra_State_Climate_Action_Plan_(2021-2030)_compressed_(1).pdf)

Source: Authors' analysis

What does climate-resilient WASH look like?

हवामान बदलाला तोंड देणारी पाणी, स्वच्छता आणि हायजिन सेवा कशी असायला हवी ?



Water resource sustainability

जलस्रोतांची शाश्वतता



घरगुती पातळीवर आणि शाळा/संस्थात्मक इमारतींमध्ये पावसाचे पाणी साठवणे व

पावसाचे पाणी शेतजमिनींमध्ये आणि विहिरींचे पुनर्भरण करण्यासाठी



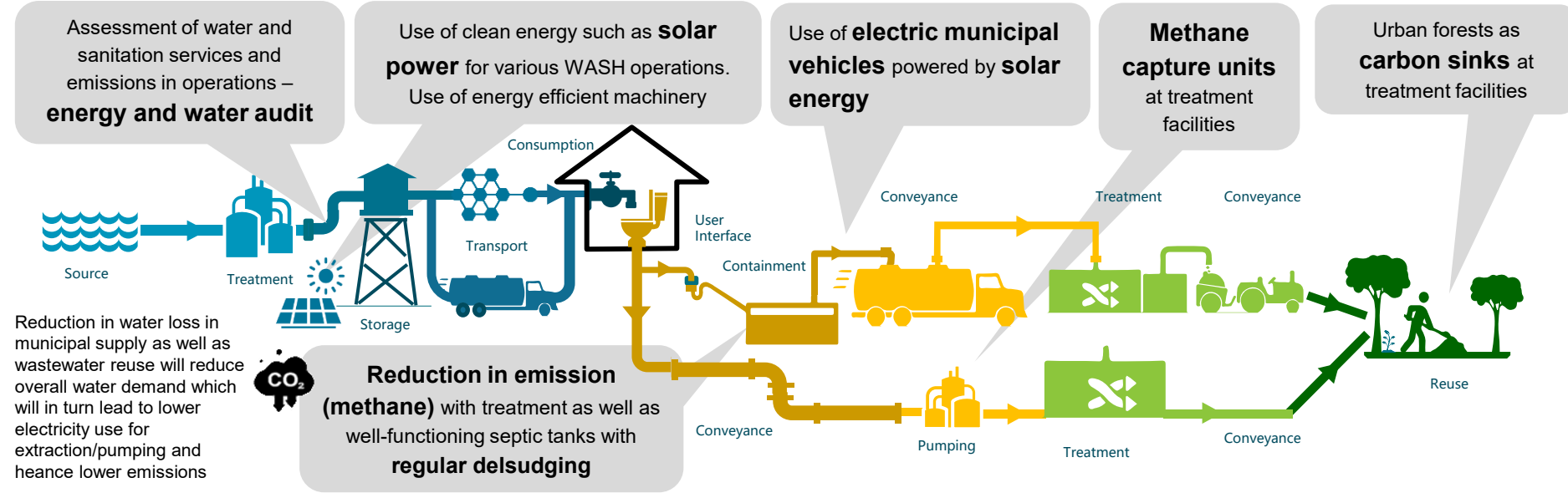
Mini-piped water supply scheme and community level purification systems

Revival of shallow wells



Emissions: “Greening” water and sanitation infrastructure for cities

उत्सर्जन कमी करणे: शहरांतील पाणी व स्वच्छता व्यवस्थेला पर्यावरणपूरक बनवणे



Scaling this to Maharashtra State through Majhi Vasundhara and SBM

Demonstration of renewable energy for WASH – Maharashtra

WASH सेवांसाठी शाश्वत ऊर्जा स्रोत यांची महाराष्ट्रातील उदाहरणे

Installations at Water Treatment Plant

Installation at Faecal Sludge treatment plant

Installations at Centralized and Decentralized Wastewater Treatment plants



Scaling this to Maharashtra State through Majhi Vasundhara and SBM

16 % Reduction in dependency on conventional energy source of municipal services
INR 60million: Projected Overall cost saving in 25 years:

Over 25 years:

Clean energy generation potential

 **8550** MWH

Emission reduction Potential

 **7,011** tons CO₂

* City population ranges between 50k – 400 K



Satara : 30 Kw



Karad : 72 Kw



Ichalkaranji : 81 Kw



Wai : 30 Kw



Sinnar : 15 Kw

Urban forests as carbon sinks – Nature based solutions

शहरी वन कार्बन शोषून घेतात आणि पर्यावरण सुधारण्यास मदत करतात – एक प्रभावी उपाययोजना

- The treated wastewater is used to irrigate urban forests developed adjacent to treatment facilities.
- Urban forests involve planting saplings, primarily of local indigenous varieties, on clean land generally situated close to the FSTP/STP.
- Almost **19,764 Sq.mt.** barren area developed to urban forest in all the six cities with total **10,306 trees** planted, and **80 million liters** of fresh water has been saved.



“Disaster proofing” WASH infrastructure

आपत्ती-प्रतिरोधक पाणी व स्वच्छता सुविधा

Human Health – Floods, water contamination and diseases



Operational disruptions – Damage to water sanitation infrastructure



Energy self sufficiency for reducing disruptions from energy grids for critical infrastructure



Electric vehicles for WASH operations - Reducing dependency on fossil fuel based energy

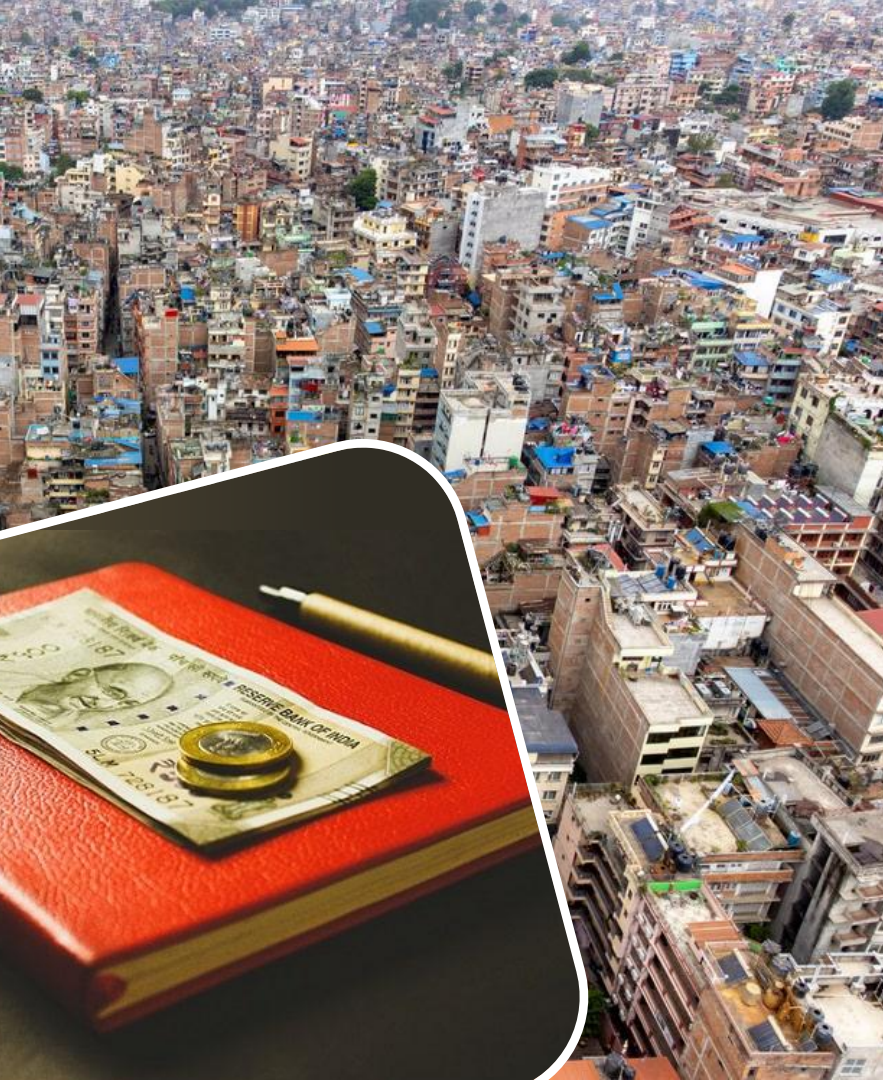


Flood-proofing critical infrastructure – Ichalkaranji STP on stilts



Regular and inclusive desludging services – keeping septic tanks at efficiency





Financing for Climate Resilient WASH in Indian ULBs

भारतातील स्थानिक स्वराज्य संस्थांसाठी क्लायमेट रेसिलियन्ट वॉश - वित्तीय सुविधा

Innovative financing mechanisms for Urban Infrastructure are emerging

शहरी विकासासाठी नाविन्यपूर्ण वित्तीय उपाय..

Urban infrastructure has been generally financed through public funds however, innovative financing mechanisms need to be explored for additional and more effective funding

Own sources,
Transfers and programs

Taxes, fees,
user charges

Public sector
programs

State and
Central
Transfers

Grants from
Finance
Commissions



Philanthropic
Funding, social
impact investors

Private sector
investment

Capital Market
Borrowing

Results Based
Finance

Blended Finance

Green / Municipal
Bonds

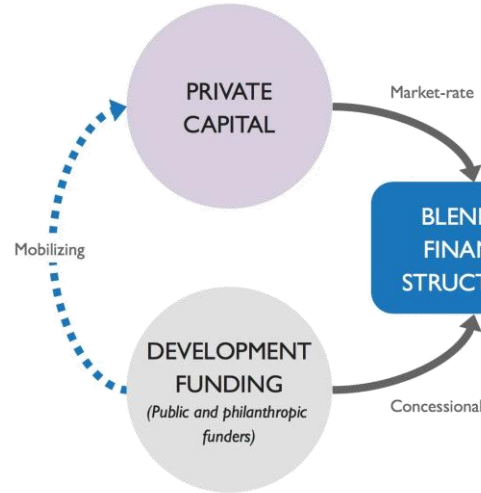


Blended finance

ब्लेंडेड फायनान्स

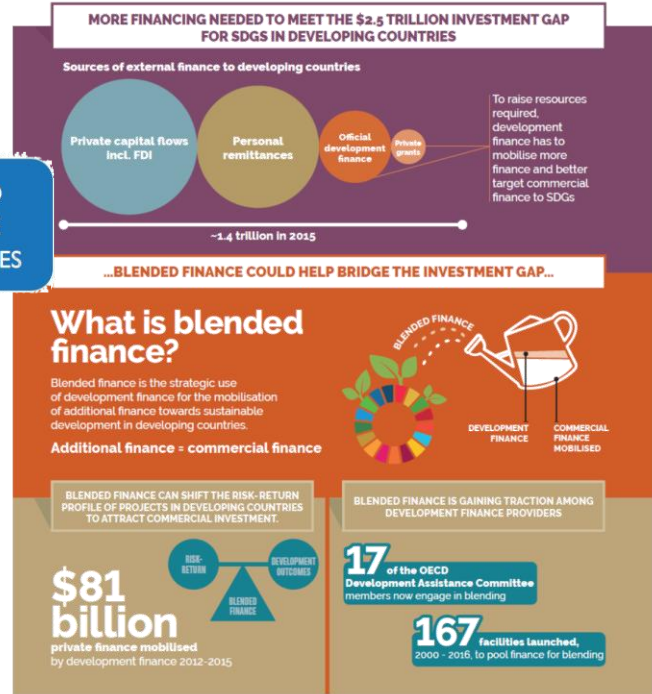
What is blended finance?

- “Strategic use of development finance and philanthropic funds to mobilize private capital flows to emerging and frontier markets” (OECD)
- Blended finance can help risk-return profile of projects to attract private and commercial finance to project and activities that help achieve SDGs in different sectors



BLENDED FINANCE FOR THE SUSTAINABLE DEVELOPMENT GOALS BRINGING DEVELOPMENT AND COMMERCIAL FINANCE TOGETHER

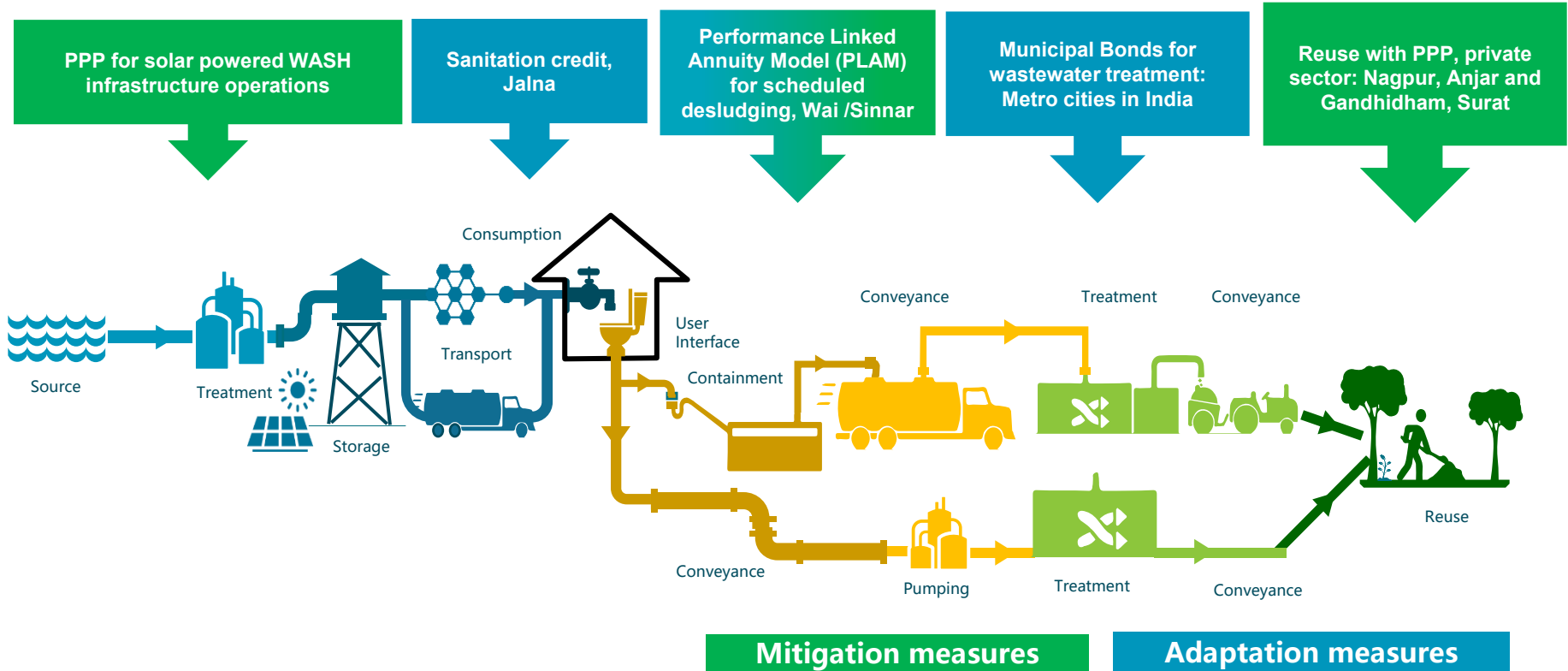
Blended finance could help bridge the investment gap for the Sustainable Development Goals in developing countries. Donor governments need to ensure blending approaches attract commercial sources of finance and directs these to development outcomes.



Source: OECD (2018), Making Blended Finance Work for the Sustainable Development Goals, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264288768-en>.

Blended Finance examples for water and sanitation

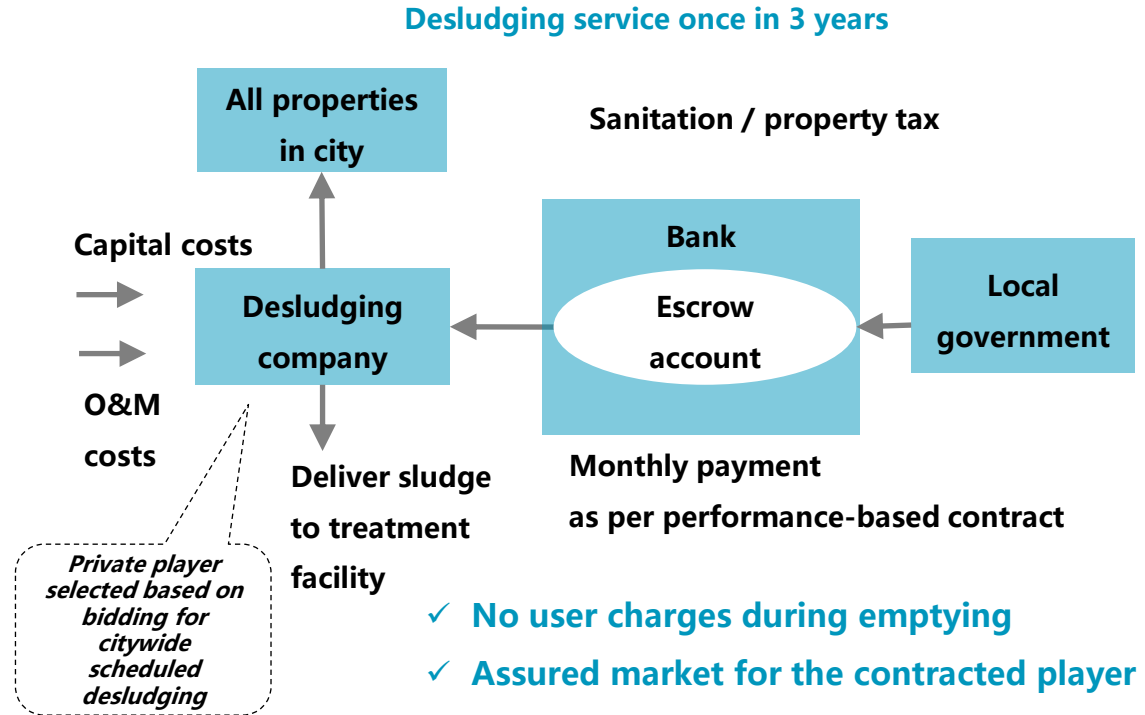
ब्लेंडेड फायनान्स उदाहरणे



Performance linked annuity model (PLAM) for engaging private operators in scheduled desludging services in Maharashtra

महाराष्ट्रमध्ये कालबद्ध पद्धतीने सेप्टिक टँक सफाई सेवांसाठी खाजगी ऑपरेटर सहभागी करून घेण्यासाठी त्यांच्या कामगिरीवर आधारित अन्युइटी मॉडेल वापरणे

- **Lack of ULB capacity** to implement scheduled desludging
- **Hired private operator** through **transparent bidding process** wherein Private operator need to bring in trucks and manpower
- **Finance through Sanitation Tax** - Households paying small sanitation tax to finance operations instead of high emptying charges.
- **Risk coverage through Escrow Mechanism** - Local government is supposed to keep 3 month payment in the account to mitigate private operator's payment risk.



Access to sanitation credit for individual household toilets

वैयक्तिक घरगुती शौचालयांसाठी कर्जाची उपलब्धता

Over **300 women of self-help groups (SHGs)** in the city of **Jalna, India**

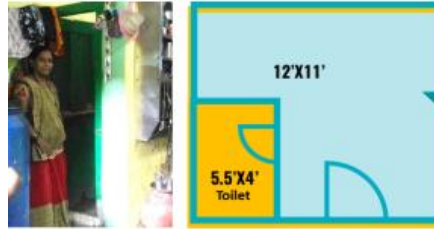
Access to Sanitation Credit



Banks/micro-finance institutions (MFIs) for construction of individual household toilets.



- ✓ Demand generation
- ✓ Mobilizing toilet loans from banks
- ✓ Overseeing toilet construction, and
- ✓ Ensuring loan repayment.



Impact

- Over **3500 loans** mobilized with loan amount of **USD 0.5 million (INR 5cr)**
- Based on this success, it is now being scaled up by **MAVIM**, a State agency with support from **water.org**.



Commercial Banks: ICICI

Monitoring and recovery activities are undertaken by the SHG, who ensure proper usage and payment to maintain bank. Repayment rates of mature SHGs are high. Scope for most banks having



Loan Borrowers: SHGs

The SHG members have opportunity to avail group loan and also availed benefit of interest subvention under the government of India's flagship program of Deendayal Antyodaya Yojana-National Urban Livelihoods Mission (**DAY-NULM**)



SHG Facilitators: MAVIM

The SHG facilitators have scope in addressing the collective demand for toilets through SHGs. They could earn through charging a fee on the sanctioned loan amount as well as on the repayment. Scope for local NGOs who work with SHGs

Source: CWAS (2018), Mobilizing Sanitation Credit through Urban SHGs - A Case of MAVIM, Maharashtra, <https://cwas.org.in/cwas-resources/mobilizing-sanitation-credit-through-urban-shgs-a-case-of-mavim-maharashtra>

In India, USD 490 million mobilized through municipal and green bonds for water and sanitation projects

भारतामध्ये पाणी व स्वच्छता प्रकल्पांसाठी नगरपालिका व ग्रीन बाँड्सद्वारे ४९० दशलक्ष (= ₹४,६०६ कोटी (अंदाजे) जर \$१ = ₹९४ पकडून) अमेरिकन डालर निधी उभारण्यात आले आहे

35 municipal bonds
by
14 Urban Local Governments
+
2 state development authorities raised pooled bonds to implement 23 WASH projects

Type of projects



Augmentation of water supply projects



Development of sewage treatment systems

FY 1997- 2017



Total **USD 288 million** mobilized for WASH projects

FY 2017-2023



USD 202 million mobilized for WASH projects + **USD 21 million** leveraged in the form incentive-based grants offered by GoI to raise bonds

128 USD million for Wastewater treatment

Type of investors



Retail investors



Institutional investors

Source: SEBI (2023), Retrieved from SEBI database, available on <https://www.sebi.gov.in/>

Note: INR to USD calculated as base index of that particular year

Green bonds for WASH investments in India

भारतातील पाणी व स्वच्छता प्रकल्पांच्या निधी उभारणीसाठी ग्रीन बाँड्सचा वापर

Vadodara Municipal Corporation

Municipal Bond of INR 100 crore (FY 2023)

- **Sindhrot water supply project** for drinking water and liquid waste management
- Bid subscribed for **36 times**, Bond has **AA rating**.

Green Bond of INR 100 crore (FY 2024)

- **liquid wastewater management** - developing 2 STPS with drainage network.
- Bid subscribed for **44 times**, Bond has **AA+ Stable rating**.
- Recorded as the **first certified green municipal bond** for sustainable WASH infrastructure.



Pimpri Chinchwad Municipal Corporation

Green Municipal Bond of INR 200 crore (FY 2025)

- Funds are dedicated to sustainable mobility, specifically the Harit Setu project in Nigdi Pradhikaran, which enhances pedestrian and cycling infrastructure
- Bid subscribed for **5.13 times**
- Bond has **AA+ Stable rating**.

Green Building Tax Rebates: PCMC offers **5% to 10% rebates** on property tax for owners who install solar panels, rainwater harvesting, or vermicomposting systems.

Pune Municipal Corporation

Municipal Bond of INR 200 crore (FY 2017)

- Major water supply projects and **24X7 supply**
- PMC continues to integrate bonds into its **Capital Investment Plan 2030** to fund sustainable urban infrastructure.
- Bond has **AA+ rating**.



Creditworthiness assessment for cities

शहरांची कर्जपात्रता (क्रेडिटवर्थिनेस) तपासणी करून त्यांच्या आर्थिक क्षमतेचे मूल्यांकन

Creditworthiness Assessment Framework for cities

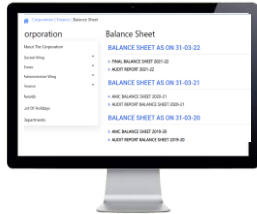
Cities can use a **creditworthiness self-assessment tool** as a pre-cursor to formal credit rating

Our Framework uses both **financial performance indicators and service level indicators**

It uses **publicly available datasets**

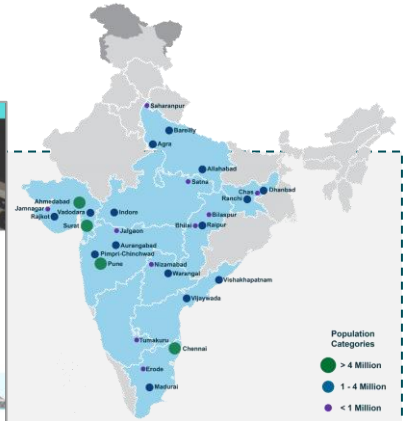
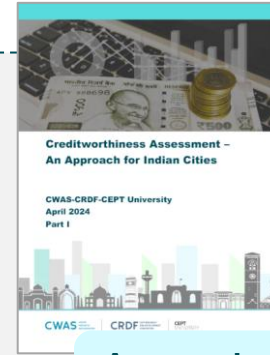


WASH and administrative Data – Performance Assessment System (www.pas.org)



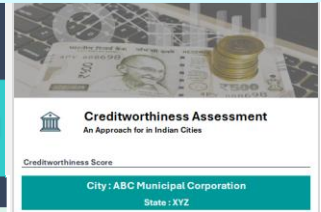
City Balance sheets, Audited account statements and City Budgets

Both larger and smaller cities have 'significantly' higher potential to borrow compared to their actual borrowings



Approach and framework for 30 Indian Cities

A Simple Excel Based Tool to assess creditworthiness and borrowing capacity of a city

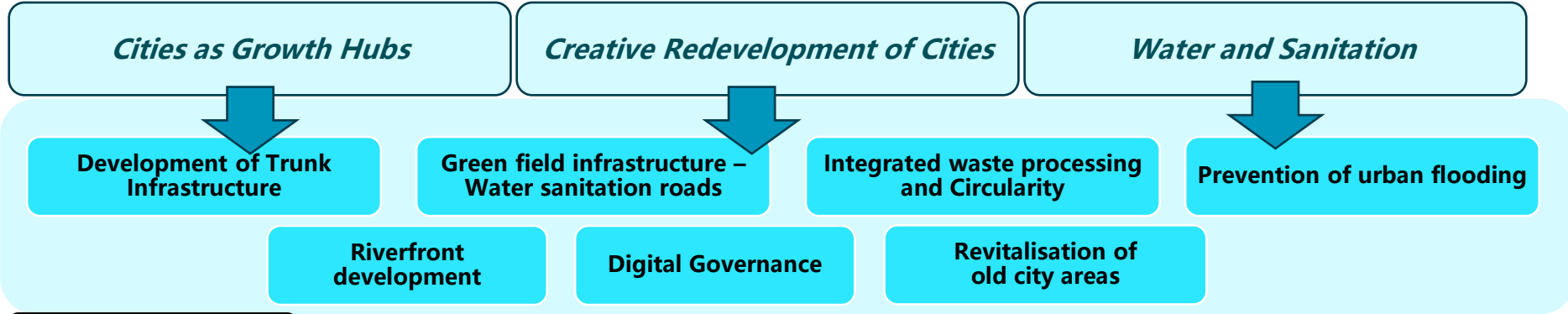


Urban Challenge Fund – An opportunity

शहरी विकासासाठी अर्बन चॅलेंज फंड – एक महत्त्वाची संधी

Central assistance of Rs 1,00,000 crore for FY 2025–26 to 2030–31

Access funds for:



Project funding

25% → Central Government

50% → Market leverage - municipal bonds, bank loans, PPPs

25% → State Government, ULB or additional market funding

- **Grant-based financing to market-linked, reform-driven, and outcome-oriented urban development**
- **Create bankable urban infrastructure projects**
- **Challenge-based approach**

Need for caution in PPPs with the UCF

UCF अंतर्गत PPP प्रकल्प राबवताना काळजीपूर्वक नियोजन आणि अंमलबजावणीची आवश्यकता

Failure of large-scale PPP water projects

The Promise of Small-Scale, Scalable Water and Sanitation Projects

While PPPs can bring private sector efficiency, innovation, and capital to public service delivery, the global experience with large-scale PPPs in the water and sanitation sector has been mixed.

LifeStraw Project in Kenya



Biosand Filter in Haiti

Solar Water Purification in India



Sub-Saharan Africa

- 13 out of 28 countries that implemented such partnerships experienced failures
- drivers included inadequate institutional capacity, poor project design, and issues related to tariff adjustments and affordability

UCF's Role in Leveraging Smaller Projects for Inclusive Growth



Increase Access for the Poor



Improve Service Delivery Efficiency



Foster Local Innovation and Ownership



De-risk Investments



Promote Climate Resilience

Mobilising commercial finance with Results-based partial subsidies

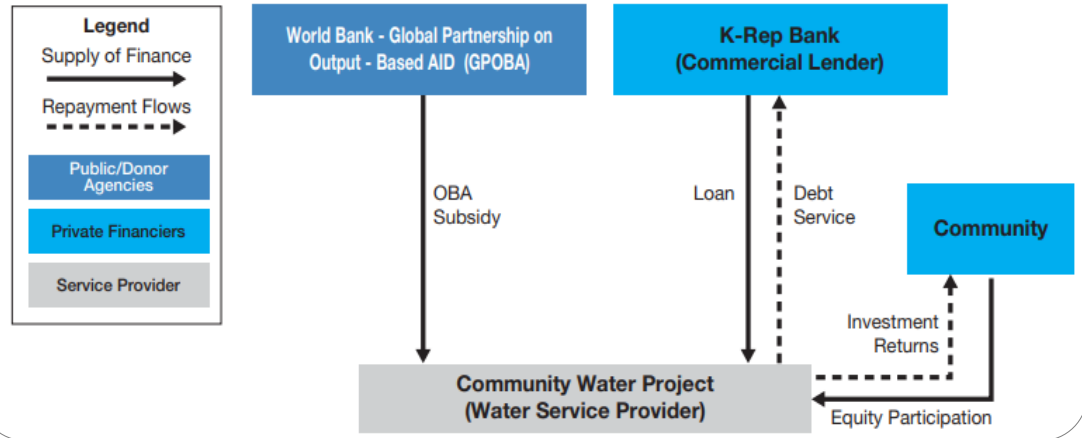
कामगिरीवर आधारित खासगी गुंतवणूक आकर्षित करणे

- The World Bank launched the **pilot loan program in 2007 with K-Rep Bank**, a Kenyan commercial bank specializing in microfinance lending.
- The objective was to **incentivize rural and peri-urban communities to access loan financing** so as to rehabilitate and expand small-piped water systems.
- By 2012, **35 communities** had borrowed **US\$3.4 million** from K-Rep Bank, raised **US \$1.2 million of equity**, and accessed **OBA grants of US \$2.8 million**. This enabled provision of access to 190,000 people.

Scaled up countrywide through the Kenya Water Sector Trust Fund



Scaling Up Blended Financing for Water and Sanitation in Kenya: Maji ni Maisha Financial Structure



Cities are the economic base and need a share of GST

शहरे ही अर्थव्यवस्थेचा पाया आहेत आणि त्यांना **GST** मधील वाटा मिळणे आवश्यक आहे

- Vijay Kelkar highlighted the **vertical imbalance in India's federalist structure** and advocated for a greater share of GST resources for the Third Tier by allocating **"1/6th of this with the 3rd Tier"**.
- He also highlighted **equitable sharing of the GST with the third tier** will go a long way in strengthening the fiscal base of our urban governments" (Dhoot 2024).
- The **net GST** collected in FY 2024-25 was **INR 19.5 lakh crore**. Sharing ratio of PRIs: ULB as 50:50) would amount of **Rs. 1.6 lakh crore per annum** for ULBs. This would help to nearly **double the current level of IGT allocations**.
- Local governments currently have no formal representation in GST decision-making to raise these issues..



India's cities contribute almost 60% of the GDP, yet cities do not get any benefit from their economic vibrancy

Rich cities, poor city governments!!!

Strong fiscal governance leads to strong leaders!!

मजबूत आर्थिक प्रशासनामुळे सक्षम नेतृत्व निर्माण होते!!

Mumbai and New York – a comparative of financial capitals

	Mumbai	New York
Land Area Share	~0.01% of India's land	~1% of USA's land
GDP Contribution	~6.6% of national GDP	~8% of national GDP
Population	~12 million	~14 million
Budget/capita (FY25-26)	~INR 23,500	~INR 2,20,000
Executive Authority	Municipal Commissioner Elected Mayor role is limited	Mayor led Powers to change organization structure, levy and amend taxes High Global Visibility!
Budgetary spending	900 municipal employees per 100,000 citizens Spending on core civic services: water and sewerage, road maintenance, public health clinics, garbage collection, schools, and transport services like BEST buses.	5300 municipal employees per 100,000 citizens Able to spend on people-centred services, such as education, social safety nets, childcare, and quality-of-life programs, not only civic infrastructure.

**Enabling
India's next :-**



Dadabhai Naoroji
President, Bombay
Municipal Corporation
(BMC)



Sarojini Naidu
Governor of the
United Provinces
(now Uttar
Pradesh)



Vallabhbhai Patel
President,
Ahmedabad
Municipality

In summary

सारांश..

Promote climate resilience
for own water sources and
exploring alternative sources



Focus on enhancing
public funds and
leveraging innovative
financing mechanisms



Promote PPPs for small
scale scalable water and
sanitation projects for
inclusive growth



Thank you धन्यवाद

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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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