

**13th International Workshop on
Decentralized Domestic Wastewater Treatment in Asia
11th - 12th November 2025 in Tokyo, Japan**

O&M of Decentralized Wastewater Treatment in Developing Countries and Human Resource Development

**Roshan Shrestha, PhD, Deputy Director
Global Growth Opportunities, Water, Sanitation, and Hygiene**

11 November

Gates Foundation

Urbanization, Water, and Wastewater Management



2/3rd population lives in areas facing water scarcity for at least one month a year

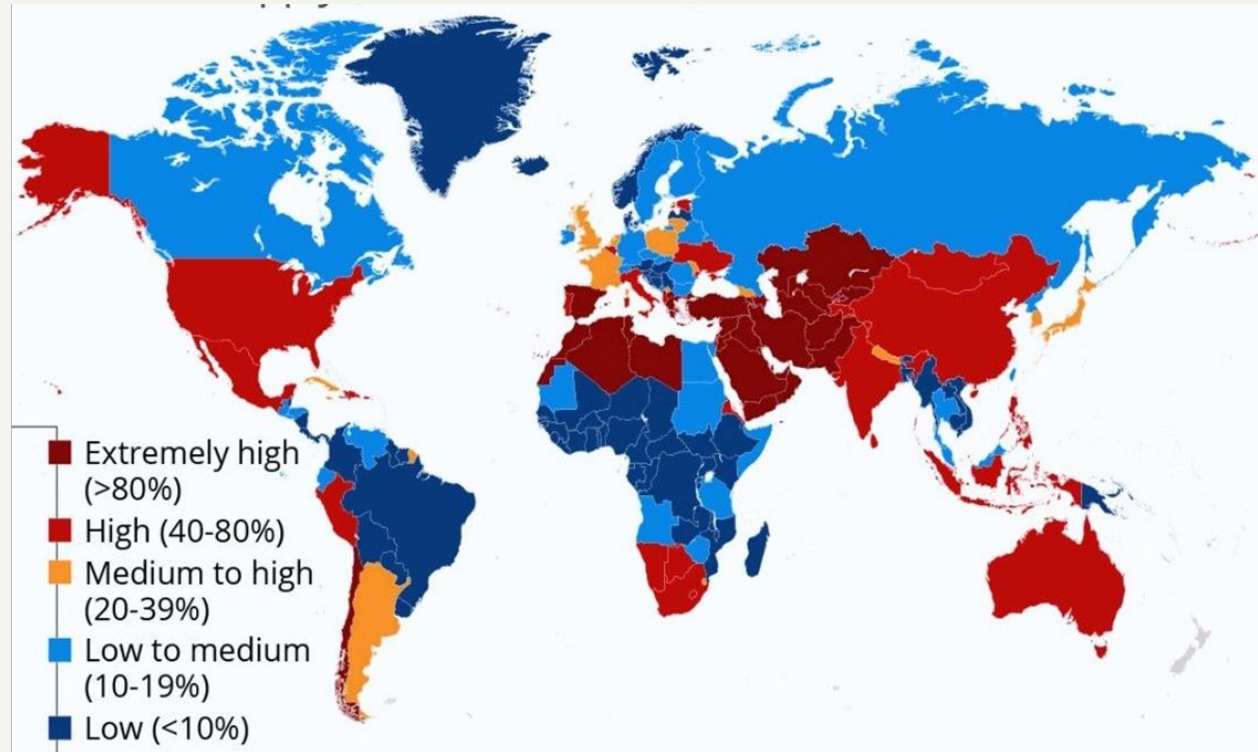


50% of people (more than 2.5 billion) facing water scarcity live in India and China

In developing countries, average sanitation coverage (56%) is far less than water coverage (85%)

Where Water Stress Will Be Highest by 2040

Projected ratio of water withdrawals to water supply (water stress level) in 2040



Source: World Resources Institute via The Economist Intelligence Unit

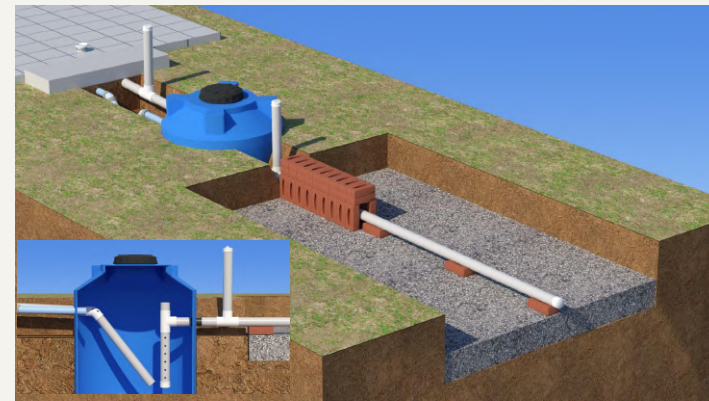
In 2020, **3.6 billion people** lacked safely managed sanitation services, 2.3 billion lacked basic hygiene services and **more than 2.5 billion** live in water-stressed countries with lack of access to safe drinking water.

Asia is home to 4.5 billion people, who use approx. **65% of the world's water supply**. Around **30% of the Asian population** is facing water scarcity.

Overview of Decentralized Wastewater Treatment Systems



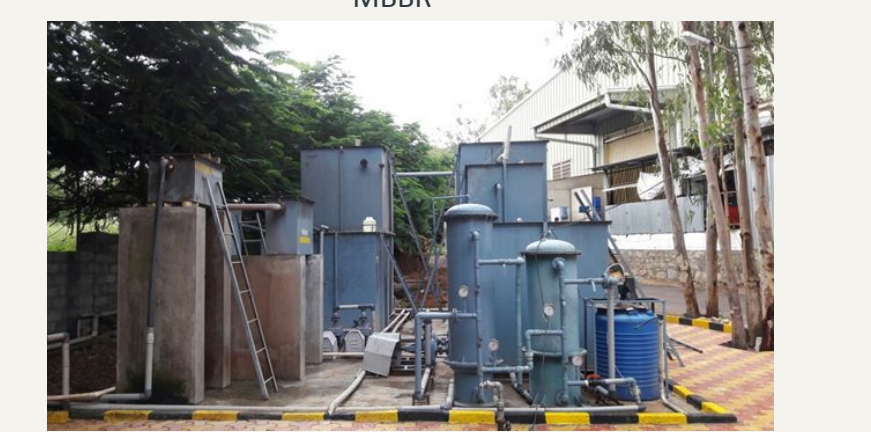
DAIKI AXIS: JAPANESE TECH DRIVING SUSTAINABLE WATER SOLUTIONS FOR A RESILIENT INDIA



Safewater garden



MBBR

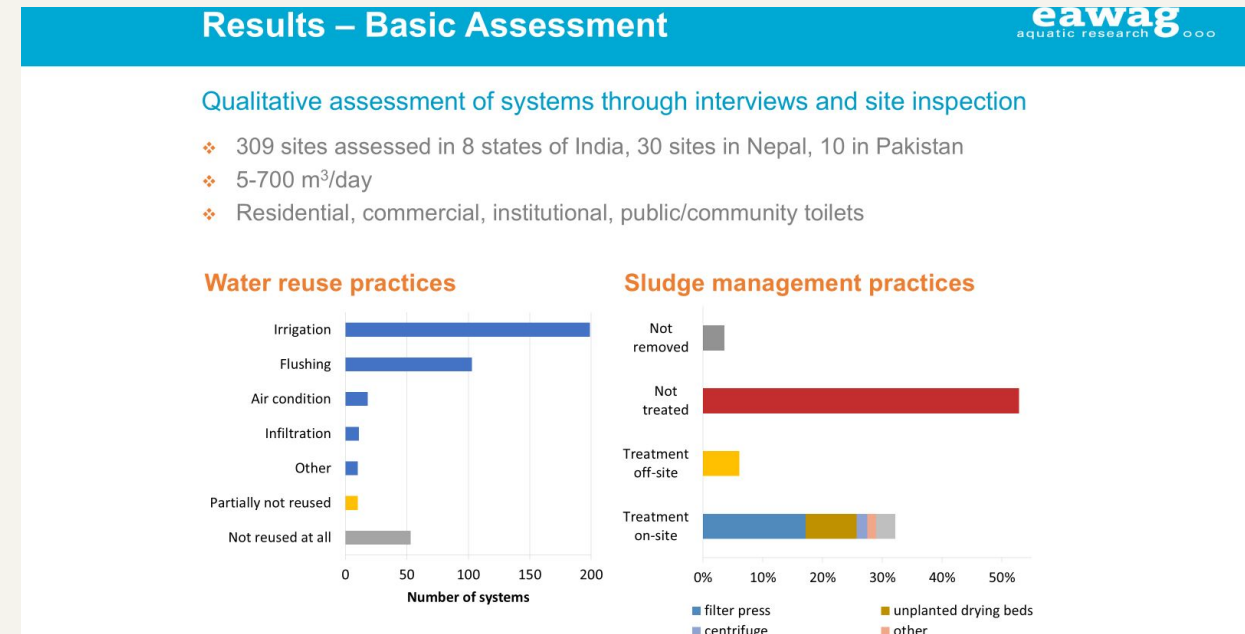


- Small-scale & decentralized sanitation can serve 10–1,000 households.
- Offer modular, flexible, low-cost solutions with local reuse potential.
- Over 20,000 small-scale plants installed in India; similar growth regionally.

Challenges in Decentralized Wastewater Treatment Systems – South Asia

Key challenges:

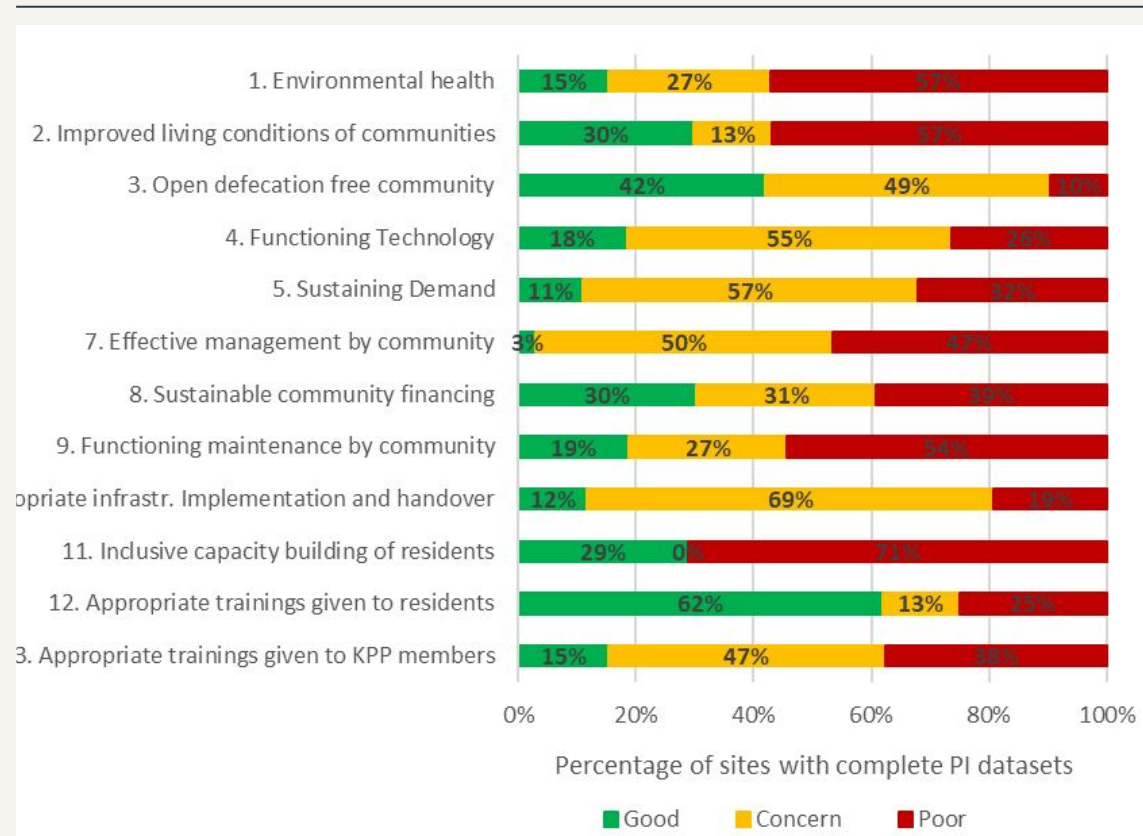
- **Untrained operators:** 40% had no formal training (South Asia)
- **Weak accountability:** unclear ownership after handover.
- **Minimal monitoring:** no flow meters or automation.
- **Underfunded O&M:** <60% cost recovery on average.
- **Unsafe sludge disposal:** untreated discharge common.
- **Spare parts gaps:** poor access outside cities
- O&M often handled by **Short-term private vendors** with limited expertise



Source:

<https://www.eawag.ch/en/departement/sandec/projects/sesp/4s-small-scale-sanitation-scaling-up/>

Indonesia Learning on Decentralized Wastewater Treatment



Source: https://www.isdb.org/sites/default/files/media/documents/2021-03/SANIMAS%20Model_as%20an%20Approach%20for%20Providing%20Decentralised%20Sanitation_March%202021.pdf

- Challenges are consistent across India, Nepal, Bangladesh, Indonesia, and the Philippines
- Systems fail due to weak institutions, poor monitoring, and lack of professionalized maintenance—not technological limits

Recommendations



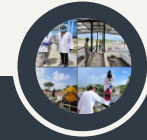
Professionalize O&M

- Establish **mandatory operator certification and licensing**.
- Create **regional training hubs**
- Develop **career progression pathways** for sanitation professionals.
- Include **hands-on modules** in biological processes, safety, and troubleshooting



Institutional Support

- Designate **“operators of last resort”** for failed systems.
- Deploy **backstopping engineers** for audits and technical support.
- Set up **municipal O&M support** units linked to wastewater treatment management.
- Define **clear accountability** between builders, owners, and regulators.



Digital Monitoring

- Require **flow meters, sensors, and remote data logging**.
- Build **national or regional dashboards** for system health tracking.
- Introduce **IoT-based alerts** for system failure.
- Use **traffic-light scorecards** to visualize compliance (Green = Good; Red = Poor).



Sustainable Financing

- Create dedicated **operations and maintenance (O&M) funds or escrow accounts**.
- **Adopt performance-based contracts** tied to effluent quality.
- Offer **tax rebates or reuse credits** for compliant systems.
- Blend **public, private, and user contributions for O&M continuity**.

Recommendations



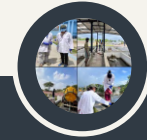
Sludge & Resource Management

- Build semi-centralized **sludge treatment hubs for multiple SSTPs**.
- Require **on-site dewatering or drying beds**.
- **Enable co-treatment** at FSM plants.
- **Develop reuse markets** for compost, biosolids, and biogas



Governance & Standards

- **Standardize design**, handover, and O&M documentation.
- **Mandate 5-year build–operate–train** contracts for new systems.
- **Empower utilities** to act as regulators/enablers, not just operators.
- **Implement fit-for-purpose reuse** and microbial standards.



Regional Collaboration Opportunities

- **Shared training and certification** frameworks.
- **Cross-country pilot exchanges:** Bangalore ↔ Jakarta ↔ Manila.
- **Regional database** and learning platform.
- **Partners:** GWSC, GSCOE, GSGS etc.



Global Sanitation Graduate School (GSGS)



Ambition 2019-2030:

10,000⁺

sanitation professionals educated by

100⁺ academic institutions.

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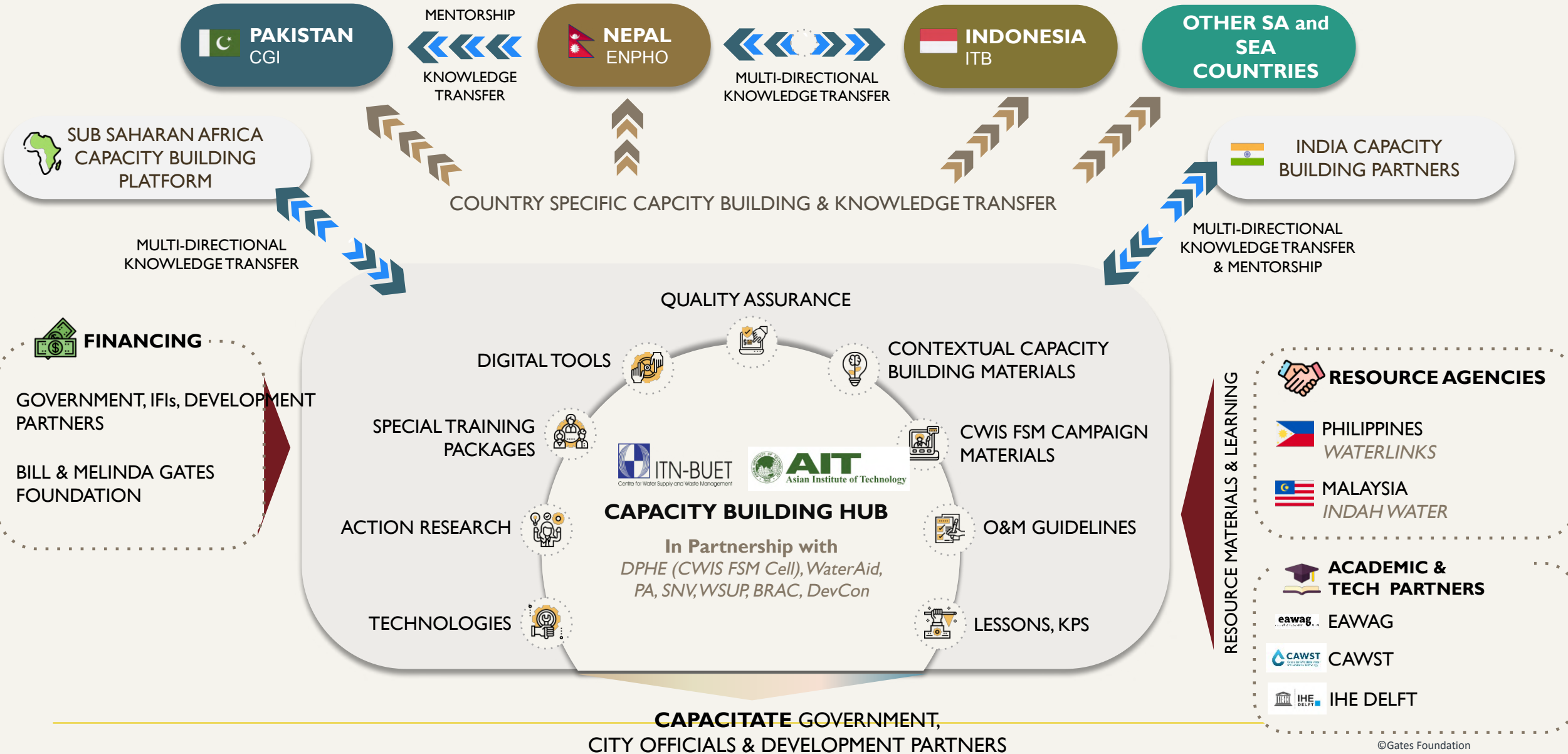
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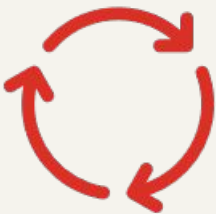
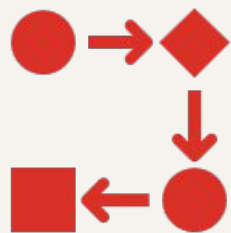


REGIONAL CAPACITY BUILDING HUB



Call to Action

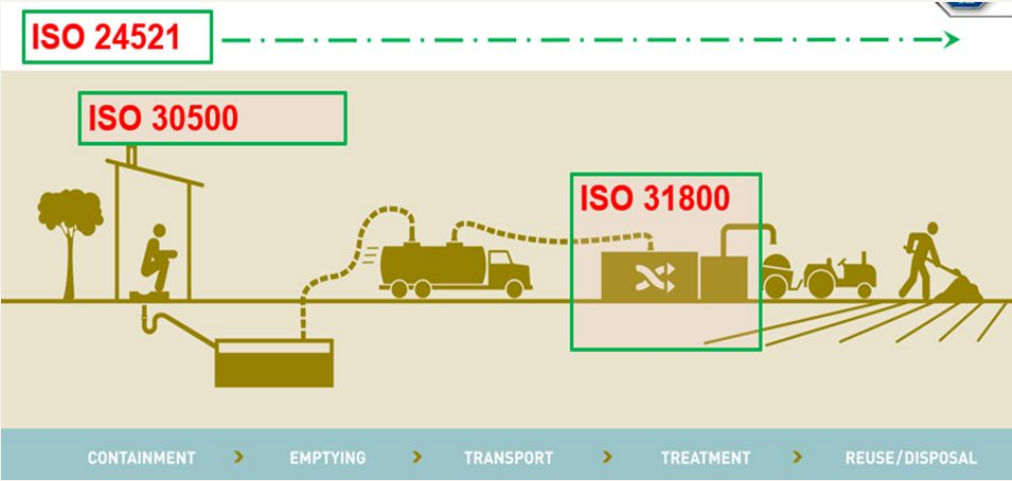
Invest in People, Systems, and Data — Not Just Infrastructure



Shift from **projects** to **programs**.

Align **O&M** and **reuse** standards and strategies.

Build a **regional ecosystem** for continuous learning and performance benchmarking.



If you want to go fast,
go alone.

If you want to go far,
go together.

—African Proverb

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