GLOBAL BEST PRACTICES IN

Greywater Management

What global experience means for rural India

International Water Week • 23 September 2026

From greywater as a waste stream to a managed water resource

Rural India • global evidence • financing • technology • governance



Greywater at scale: India’s challenge is also an opportunity

Rural India generates greywater at a scale comparable with national water systems.

30.6 bn L/day

estimated rural greywater generation

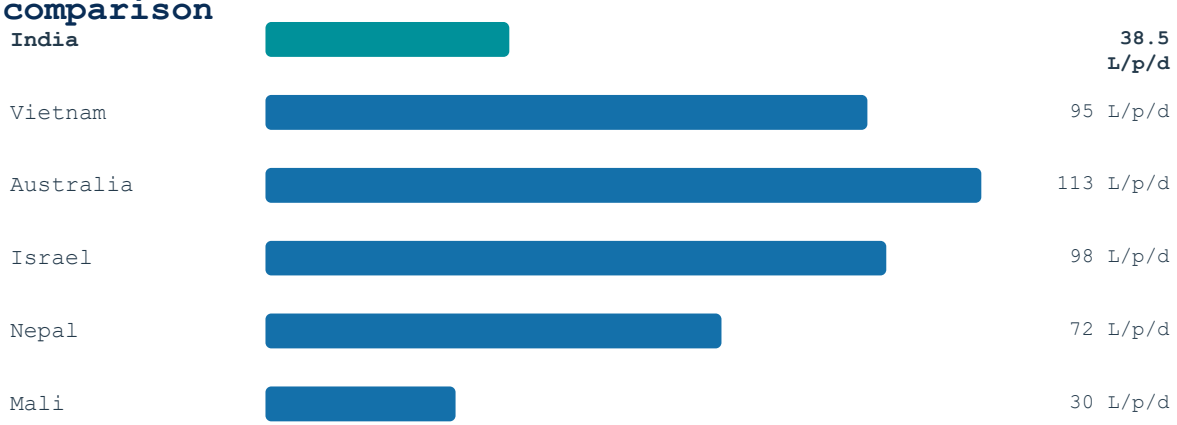
38.5 L/person/day

estimated household rate

~32 crore people

freshwater-equivalent at 55 LPCD if reused

Illustrative international comparison



THE MESSAGE

At India’s scale, GWM is not only a niche sanitation issue.

It is a water-security, climate-resilience and resource-recovery agenda.

International comparison: how rural and household greywater is managed

Why examples span infiltration, productive reuse, nature-based treatment and regulated non-potable reuse.

Country / setting	What is documented	Technology / approach	Main destination
India	Village / household GWM	Soak, magic & leach pits; community systems	Recharge • safe disposal • reuse
Nepal	Rural household reuse	Drainage channel to kitchen gardens	Vegetable production
Ethiopia	Rural / semi-arid households	Keyhole & vertical gardens; gravel filtration	Food production
South Africa	Rural communities	Direct reuse + simple household treatment	Fruit trees • vegetables • gardens
Kenya	Household / peri-urban pilots	Settling + subsurface wetland with Vetiver	Irrigation • safe disposal
Burkina Faso	Rural Sahel household demo	Pre-filter + subsurface wetland with Vetiver	Treated household greywater
Australia	Rural / remote households	On-site diversion/treatment + subsurface irrigation	Landscaping • orchards • irrigation
Israel	Highly regulated reuse context	Treated systems; non-potable applications studied	Irrigation • toilet flushing
Bangladesh *	Management-gap evidence	Mostly drains / ground / waterbody; some DEWATS	Predominantly disposal

Global Examples: ASIA

India, Nepal and Bangladesh — from low-cost household systems to decentralised treatment

INDIA

Soak pits / Magic pits / Leach systems



Science: Physical filtration, adsorption and percolation into soil; natural microbial breakdown of organic matter.

Outcome: Groundwater recharge / safe disposal; low-cost and easy to maintain.

NEPAL

Drain to kitchen garden



Science: Soil filtration; plants uptake water and nutrients.

Outcome: Irrigation for vegetables (e.g., spinach, cauliflower, beans); improved household food security.

BANGLADESH

Mostly disposal (with some DEWATS)



Science: Minimal or no treatment in many areas; some decentralised systems (DEWATS) in pilot areas.

Outcome: Predominantly disposal to drains, ground or waterbodies; highlights the need for improved management.

ASIA: CONTEXT-SPECIFIC SOLUTIONS • SIMPLE TREATMENT • SAFE REUSE OR DISPOSAL

Global Examples: AFRICA

Ethiopia, South Africa, Kenya and Burkina Faso — nature-based and robust community-scale systems

ETHIOPIA

Keyhole and vertical gardens



Science: Soil and compost filter greywater; plant roots uptake water and nutrients; microbial processes in soil.

Outcome: Productive reuse for vegetables; suited to water-scarce, semi-arid areas.

SOUTH AFRICA

Household reuse for gardens



Science: Direct reuse with basic filtration; soil-plant-microbe system removes pollutants.

Outcome: Irrigation for fruit trees and vegetables; widely adopted in rural communities.

KENYA

Constructed wetland with Vetiver



Science: Sedimentation, filtration, microbial degradation and plant uptake in a subsurface-flow wetland.

Outcome: Treated greywater for irrigation or safe disposal.

BURKINA FASO

Pre-filter + subsurface constructed wetland



Science: Pre-filtration removes solids; subsurface wetland (Vetiver) uses physical, biological and plant processes.

Outcome: >90% removal of organic matter (documented); treated greywater for reuse.

Global Examples: OTHER COUNTRIES

Australia, Israel and Germany — engineered treatment and higher-control reuse applications

AUSTRALIA

On-site treatment and subsurface irrigation



Science: Settling/filtration followed by subsurface irrigation; soil acts as a biological filter; trees and plants use the water.

Outcome: Landscaping, orchards and irrigation, including in rural/remote communities.

ISRAEL

Treated systems for non-potable reuse



Science: Advanced treatment (filtration, disinfection) with strict water-quality standards and monitoring.

Outcome: Non-potable reuse (e.g., irrigation, toilet flushing); highly regulated.

GERMANY

Biofilm reactor (Rotating Biological Contactor)



Science: Microorganisms grow on a rotating media surface (biofilm) and break down organic matter in a continuous process.

Outcome: Reliable long-term operation; compact footprint; suitable for decentralised applications.

Four technology pathways seen internationally

Choose the pathway by settlement density, soil, groundwater, water scarcity, end use, affordability and O&M capacity.

1 INFILTRATE

Soak / leach / magic pit

Household → filter media → soil

Best where soils and groundwater conditions permit

India

2 PRODUCTIVE REUSE

Kitchen / keyhole garden

Household → simple conveyance → garden

Links WASH with nutrition and water security

Nepal • Ethiopia

3 NATURE-BASED TREATMENT

Constructed wetland / reedbed

Pre-filter → gravel bed → roots/microbes

Low-energy treatment for clustered flows

Kenya • Burkina Faso

4 ENGINEERED REUSE

Diversion / treatment + irrigation

Treatment → controlled non-potable end use

Higher assurance where O&M is strong

Australia • regulated contexts

Core principle: manage as close to source as feasible, and treat to the level required by the intended end use.

Financing Greywater Management

Sustainable greywater services require financing beyond capital investment. Countries are using innovative models with shared responsibility across government, private sector and communities.

AUSTRALIA – SHARED INVESTMENT MODEL

Decentralised systems in rural/remote communities



Government
40–50%
Capital grants and policy support

Private sector
30–40%
System design, supply and installation

Community/households
10–30%
Cash or in-kind contribution (e.g., labour, local materials)

IMPACT

- Decentralised systems functional in rural and remote areas.
- Shared investment builds ownership and ensures O&M.
- Creates local markets and jobs.

UAE / SHARJAH – PPP WITH USER CHARGES

Creating viable reuse markets



Government
Policy support, land and initial capital.

Private sector (PPP)
Design, build, operate and recover costs through user charges.

Users (municipalities/industries)
Pay for treated water for irrigation and landscaping.

IMPACT

- Viable reuse markets.
- Recovers O&M costs.
- Reduces demand on freshwater sources.

SINGAPORE – LONG-TERM ASSET FINANCE

Integrating capital and O&M



Government
Public investment and policy framework.

Private sector
Long-term financing, construction and O&M.

Users
Tariffs for treated water (e.g., industry).

IMPACT

- Reliable, high-quality reuse at scale.
- Long-term asset financing ensures sustainability.
- Supports water security and circular economy.

ISRAEL – COST SHARING WITH BENEFICIARIES

Linking treatment to agricultural reuse



Government
Capital support and regulatory framework.

Farmers / water users
Pay for treated water (water pricing).

Private sector
Design, construction and O&M (often through concession models).

IMPACT

- Creates a sustainable market for treated water.
- Strong alignment between users, farmers and public finance.
- Widely adopted for agricultural reuse.

EUROPEAN UNION – GREEN AND BLENDED FINANCE

Financing circular-water investments



EU / public funds
Grants and climate finance (e.g., Green Deal, cohesion funds).

Private sector
Co-financing and innovative finance.

Local authorities
Implementation and O&M.

Community
Participation and local co-financing (where applicable).

IMPACT

- Supports circular-water investments.
- Mobilises blended finance.
- Strengthens climate resilience.
- Enables innovation and replication.

SHARED FINANCING. LONG-TERM VALUE. HEALTHIER COMMUNITIES AND A MORE WATER-SECURE FUTURE.

Global lesson 1: governance makes reuse scalable

Treatment assets perform only when standards, institutions and operators work as one system.

01

REGULATE FOR REUSE

Set fit-for-purpose water-quality standards by end use.

02

COORDINATE INSTITUTIONS

Clarify roles across water, sanitation, health, environment and local government.

03

DESIGN FOR ADOPTION

Pair requirements with incentives, monitoring, awareness and trained operators.

INDIA IMPLICATION **A national/state GWM framework should define reuse categories, risk-based standards, monitoring, accountability and O&M/service-provider requirements.**

Sources: Shanableh et al. (2021); ADB, Improving Water Governance in Asia-Pacific; OECD (2025).

Global Lesson 2: Decentralised systems can work

Field examples show that simple, local and fit-for-context systems can deliver durable treatment.

JORDAN

Solar-powered filtration

100% E. coli removal

Local materials • decentralised • fit for purpose

BURKINA FASO

Household constructed wetland

>90% organic matter removed

Local materials • decentralised • fit for purpose

PAKISTAN

WaterAid DEWATS

324 m³/day capacity

Local materials • decentralised • fit for purpose

GERMANY

Biofilm reactor (RBC)

Long-term continuous operation

Local materials • decentralised • fit for purpose

COSTA RICA

Shared household reedbed

91–96% turbidity & coliform removal

Local materials • decentralised • fit for purpose

BRAZIL

Anaerobic filter + UV

100% E. coli inactivated (UV)

Local materials • decentralised • fit for purpose

COMMON THREAD → Match technology to context, build local O&M capability, and design for reuse from the start.

Sources retained from original deck: Abdallat et al. (2024); Compaoré et al. (2023); WaterAid Pakistan; Nolde (2000); Dallas et al. (2004); do Couto et al. (2015).

Where rural India leads—and where the next gap lies

India's decentralised architecture is a strength; performance assurance and safe reuse are the next frontier.

Dimension	Global practice	Rural India
Approach	Centralised, increasingly decentralized so that response time is low	Decentralised by design as PRIs have the mandate and also local presence
Financing	Utility / capital-heavy models	Per-capita grants + convergence (MGNREGA / CSR / FC) creating unique opportunities for its effective management at local
Ownership	Municipal / utility	Gram Panchayat-led which allows better planning, implementation and decentralized operations and maintenance
Monitoring & reuse	Risk-based standards emerging	Limited at village level but can easily be defined and put in practice as GPs have the mandate to regulate reuse and recycle

INDIA'S ADVANTAGE	**Scale + decentralised ownership**	NEXT LEAP	**Functionality + quality + safe reuse**

The opportunity

Turn greywater from a disposal problem into a local water resource.

Scale what works. Finance the lifecycle. Regulate for safe reuse. Build local capability.

Thank you

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