GREYWATER MANAGEMENT

IDENTIFYING THE SOLUTIONS FOR DIVERSE GEOGRAPHIC TERRAINS OF UTTAR PRADESH

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GREYWATER

Greywater is lightly contaminated household wastewater from baths, sinks, and laundry that can be treated and reused for non-drinking purposes.

Bathroom Sources (Major Contributor)

- Showers
- Bathtubs
- Bathroom wash basins

Laundry Water

- Washing machines
- Hand-washing clothes

Kitchen Water *(Sometimes Classified Separately)*

- Kitchen sinks
- Dishwashing

Utility Sinks / Cleaning Water

- Floor washing
- Cleaning activities

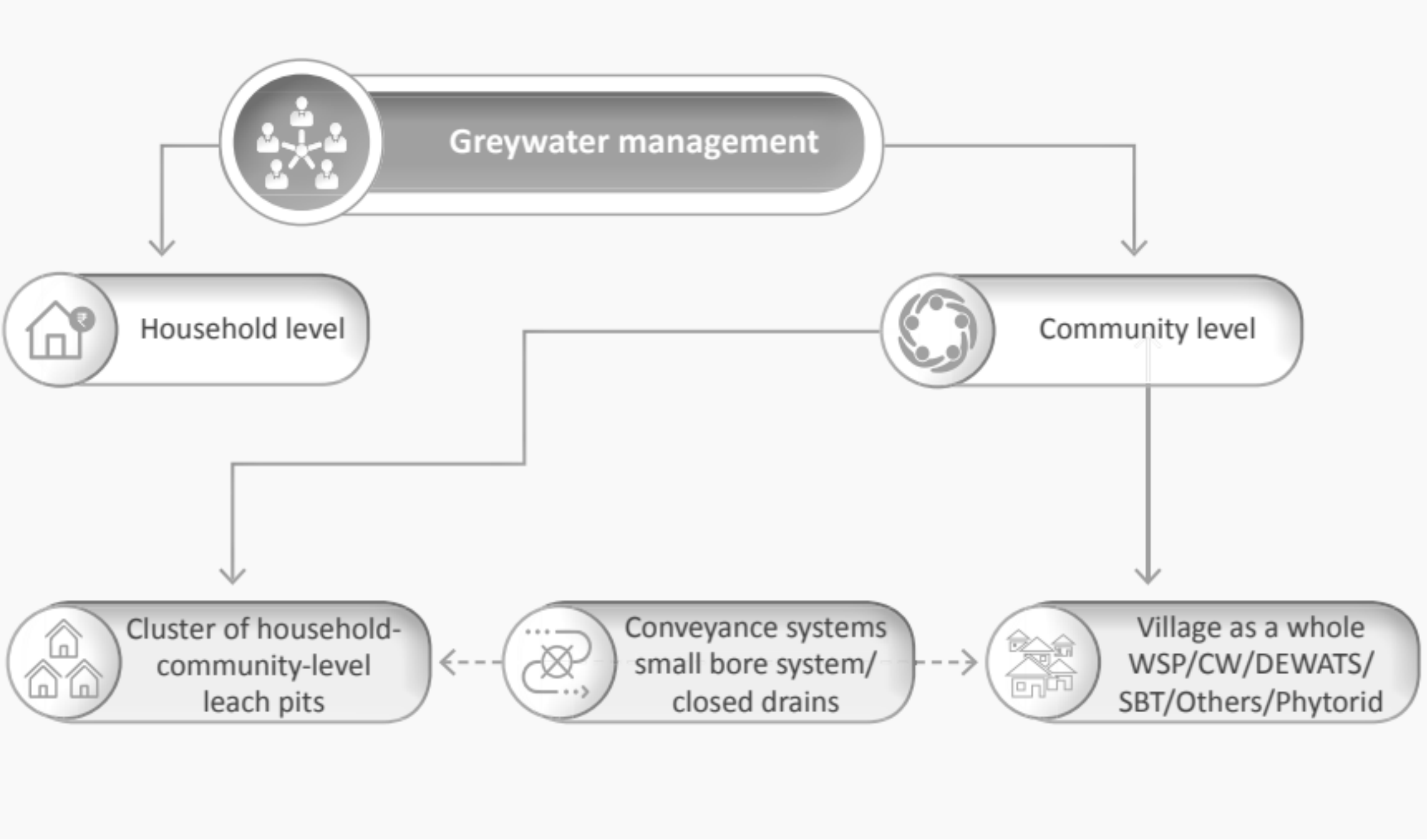
GREYWATER VS BLACKWATER

Greywater

- Household wastewater generated from shower, baths and washing machine.
- It can be recycled on-site for irrigation, toilet flushing and laundry due to lower levels of contaminants.

Blackwater

- Household wastewater generated from toilets, dishwashers and the kitchen.
- It contains a high concentration of organic matter and bacteria so it needs to be treated appropriately by biological and chemical methods.


Greywater management
Household level
Community level
Cluster of household-community-level leach pits
Conveyance systems small bore system/ closed drains
Village as a whole WSP/CW/DEWATS/ SBT/Others/Phytorid

IMPORTANCE OF DECENTRALIZED WATER MANAGEMENT

Community Participation & Awareness

Encourages local ownership
Builds awareness about water conservation
Creates local employment in maintenance

Promotes Water Reuse

•Reduces dependence on freshwater sources
•Especially important in water-stressed regions

Reduces Pressure on Central Infrastructure

•Minimizes load on municipal sewer systems
•Reduces need for large-scale treatment plants
•Prevents overburdening during peak demand or heavy rainfall

Cost-Effective in the Long Run

•Lower pumping and transmission costs
•Reduced infrastructure investment
•Savings on water bills

Environmental Benefits

•Reduces wastewater discharge into rivers
•Lowers energy consumption for pumping
•Minimizes groundwater depletion

The Goal 6 of United Nations (UN) Sustainable Development Goals of Agenda 2030 aims to "ensure availability and sustainable management of water and sanitation for all". It is one of the 17 Sustainable Development Goals adopted by the United Nations General Assembly (UNGA) in 2015.

Target 6.1 seeks to secure safe and affordable drinking water for all.

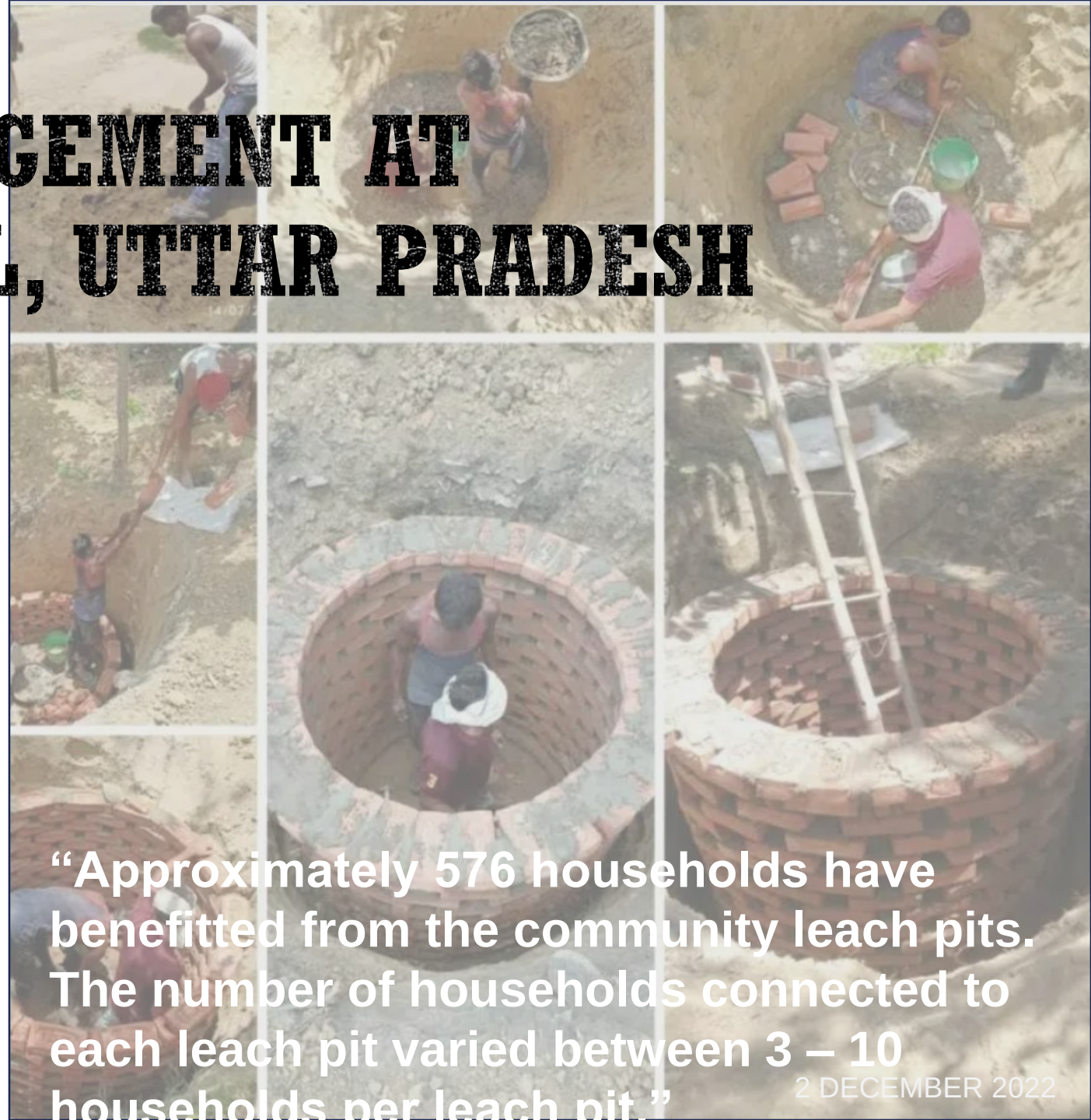
Target 6.2 aims to provide people access to sanitation in diverse ways.

India, being a signatory to Agenda 2030, aims to achieve sustainable development by fulfilling Goal 6, with the help of JJM and SBM (G) Phase-II. While JJM focuses on providing a functional tap connection (FHTC), SBM (G) Phase-II focuses on providing sanitation services at the grass-roots level by managing waste at the source or community level.

GREYWATER MANAGEMENT AT COMMUNITY LEVEL, UTTAR PRADESH

The United Nations Office for project Services, (UNOPS) is providing strategic technical support to the government of India for Hon'ble Prime Minister's national flagship programme, Jal Jeevan Mission (JJM).

UNOPS constructed 101 leach pits spread across 34 villages in 10 districts (Sonbhadra, Prayagraj, Mirzapur, Lalitpur, Kaushambi, Jhansi, Jalaun, Hamirpur, Chitrakoot and Banda) of Uttar Pradesh.



"Approximately 576 households have benefitted from the community leach pits. The number of households connected to each leach pit varied between 3 – 10 households per leach pit."

2 DECEMBER 2022

Gangetic Alluvial Plains

- Dominant central and eastern part of the state
- Flat fertile plains formed by the Ganga and tributaries
- High agricultural productivity

Terai Region (Northern Foothills)

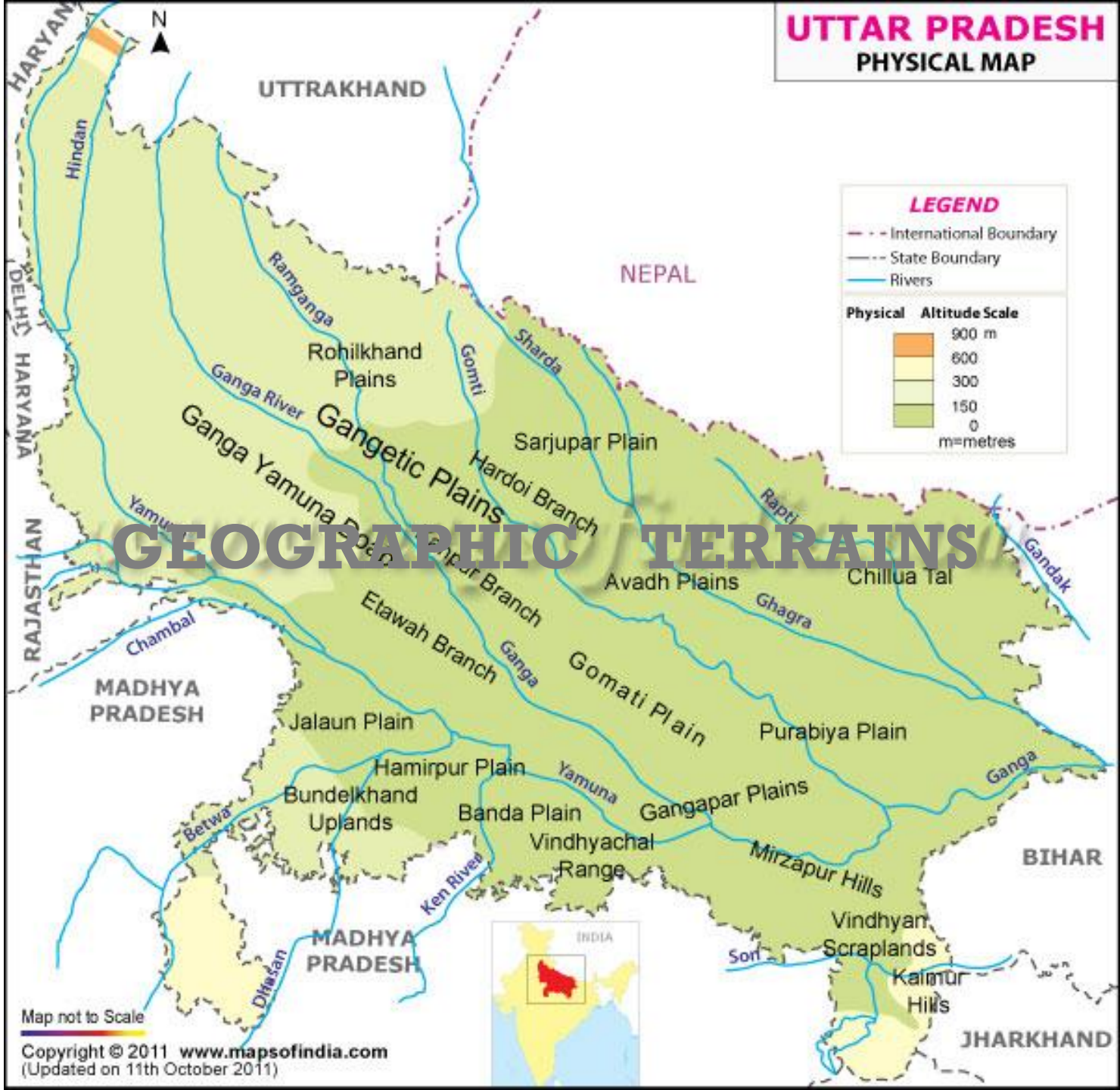
- Along the foothills of the Himalayas
- Marshy and water-logged soils
- High groundwater table

Bundelkhand Plateau (Southern UP)

- Uplands with rocky terrain, low soil depth
- Water scarcity and drought-prone areas

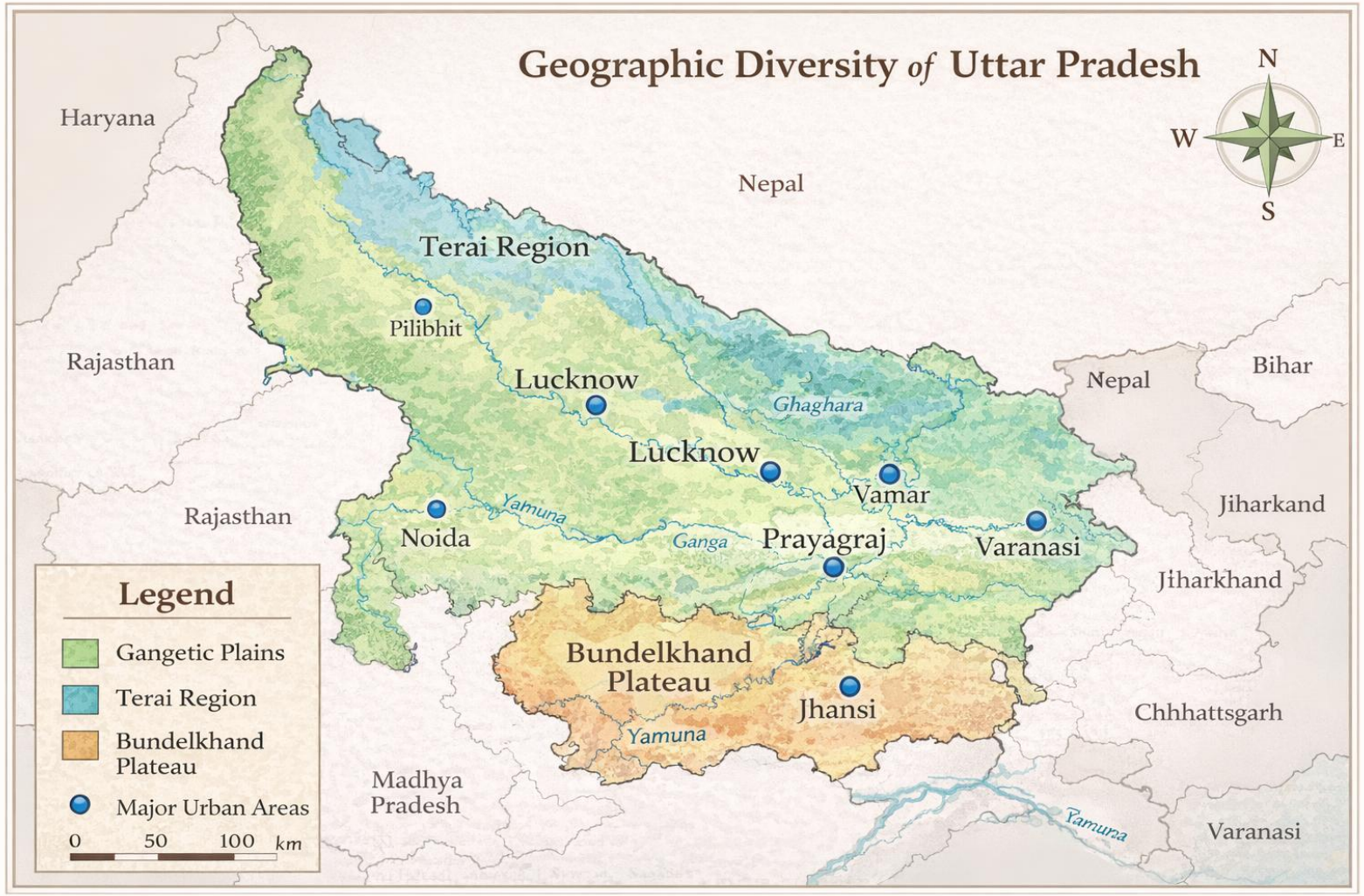
Urban & Peri-Urban Zones *(often spatially mapped separately)*

- Fast-growing cities such as Lucknow, Kanpur, Varanasi
- Higher greywater generation and infrastructure stress



Urban Zones

Challenge- Overloaded sewage
Greywater Strategy Focus- Onsite recycling, dual plumbing



Gangetic Plains

Challenge- Poor drainage, high water table
Greywater Strategy Focus- Constructed wetlands, decentralized units

Bundelkhand

Challenge- Water scarcity, rocky soil
Greywater Strategy Focus- Greywater reuse for gardens, ET beds

Terai

Challenge- Waterlogging, saturation
Greywater Strategy Focus- Raised reed beds, controlled flow vegetated systems

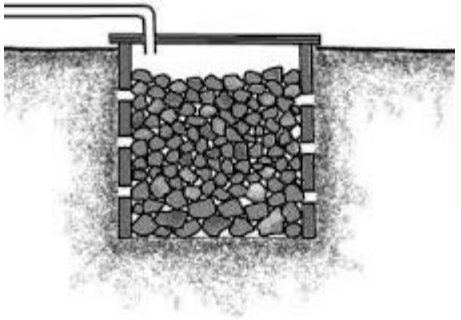
TERRAIN OVERVIEW

Terrain Type	Key Problem	Recommended Technology	Cost Level	Maintenance Level
Gangetic Plains (Alluvial)	Poor drainage, high water table, direct discharge to drains and open water channels	• Constructed wetlands• Reed bed systems• Community filtration gardens	Moderate	Medium(periodic cleaning of vegetation beds)
Terai Region (Wet & Waterlogged)	Waterlogging, mosquito breeding, saturated soils	• Raised reed beds• Aquatic polishing ponds• Subsurface flow wetlands	Moderate	High(plant care + seasonal desilting)
Bundelkhand Plateau (Water-Scarce)	Scarce water, rocky soil, low infiltration	• Evapotranspiration (ET) beds• Greywater reuse for backyard gardens• Storage + reuse tanks	Low	Low-Medium(occasional cleaning + reuse checks)
Urban Zones (Lucknow, Kanpur, Varanasi)	Overloaded sewer systems, mixed wastewater, high greywater volume	• Apartment / building–level greywater systems• Dual plumbing + modular STP links• Filter + reuse for flushing/landscape	High	Medium-High(system checks, pump care)

SUSTAINABLE AND LOW-COST TECHNOLOGIES

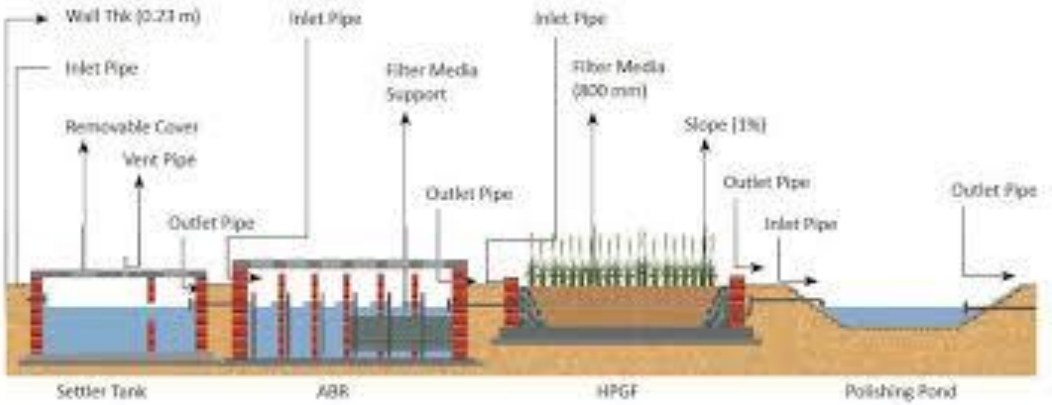
Household-level Interventions

- Soak Pit
- Leach Pit
- Magic Pit
- Kitchen Garden



Community-level Interventions

- Community Leach Pit
- Waste Stabilization Pond (WSP)
- Decentralized Wastewater Treatment System (DEWATS)
- Constructed Wetland (CW)
- Phytorid Technology



Conveyance Systems

- Closed Drains
- Small Bore Pipe System

PLATEAU (WATER-SCARCE)

Algarwadi village, Latur district, Maharashtra

Adopted the installation of soak pits at the *household level*.

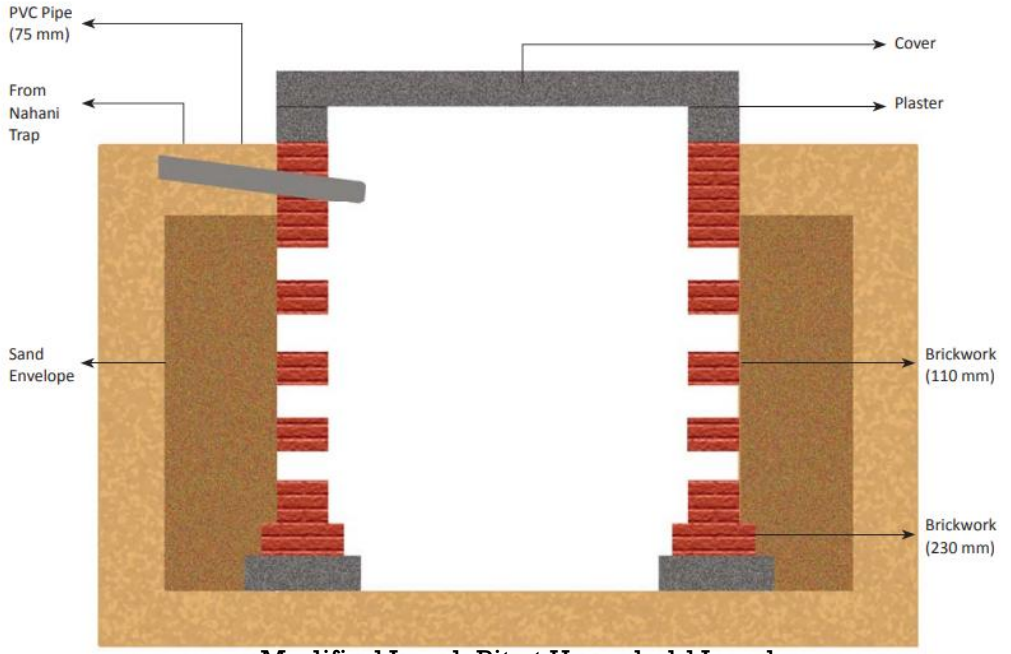
Resulted in-

- extensive coverage of soak pits
- no stagnant greywater anywhere in the village
- broken the reproduction chain of mosquitoes, and kept the vector-borne diseases in check
- improved health conditions in the village

ALLUVIAL PLAIN TERRAIN

Basara village, Panipat district, Haryana

Around 221 households (94 per cent of total households) have been provided with individual leach pits.



Modified Leach Pit at Household Level

- The average cost of construction of one leach pit is Rs 4,000-5,000 and the material cost was procured from MGNREGA.
- The groundwater table is recharged by approximately 300–400 litres per household.
- The remaining waste water is diverted to either kitchen gardens or pits.

PLATEAU WITH RIVER BASIN INFLUENCE

Mayurbhanj, Keonjhar and Sambalpur districts of Orissa

Backyard Nutritional Kitchen Gardening: A Success Story of Odisha

Household-Level Water Reuse

- Wastewater from kitchens reused for backyard (bari) irrigation
- Reduced dependence on freshwater sources

Decentralized System

- Managed at individual household level
- No centralized infrastructure required
- Low-cost and locally manageable

Resource Optimization

- Greywater utilized for seasonal vegetables and fruit crops
- Improved soil moisture retention
- Reduced water wastage

Nutritional & Economic Benefits

- 900 kg annual vegetable production (example case)
- 650 kg household consumption
- 250 kg sold in local market
- Additional annual income generation

Women Empowerment

- Increased participation of farm women
- Income control at household level
- Enhanced decision-making capacity

PLATEAU WITH RIVER BASIN INFLUENCE

Mayurbhanj, Keonjhar and Sambalpur districts of Orissa

Backyard Nutritional Kitchen Gardening: A Success Story of Odisha

- Greywater treated as a resource, not waste
- Simple reuse for irrigation is effective in rural plateau regions
- Low-cost, decentralized reuse systems are viable
- Supports food security, water conservation, and livelihood generation

ALLUVIAL PLAIN TERRAIN

Mahendragarh District, Haryana

Community Ownership
•Initiative led by local self-help groups
•Collective action model
Decentralized Treatment System
•Construction of **community leach pits**
•3–6 households connected to one pit
•Covered drains connected to pits
Primary Treatment Mechanism
•Greywater passed through boulder-filled chambers (3–5 inch stones)
•Provided partial filtration before leaching

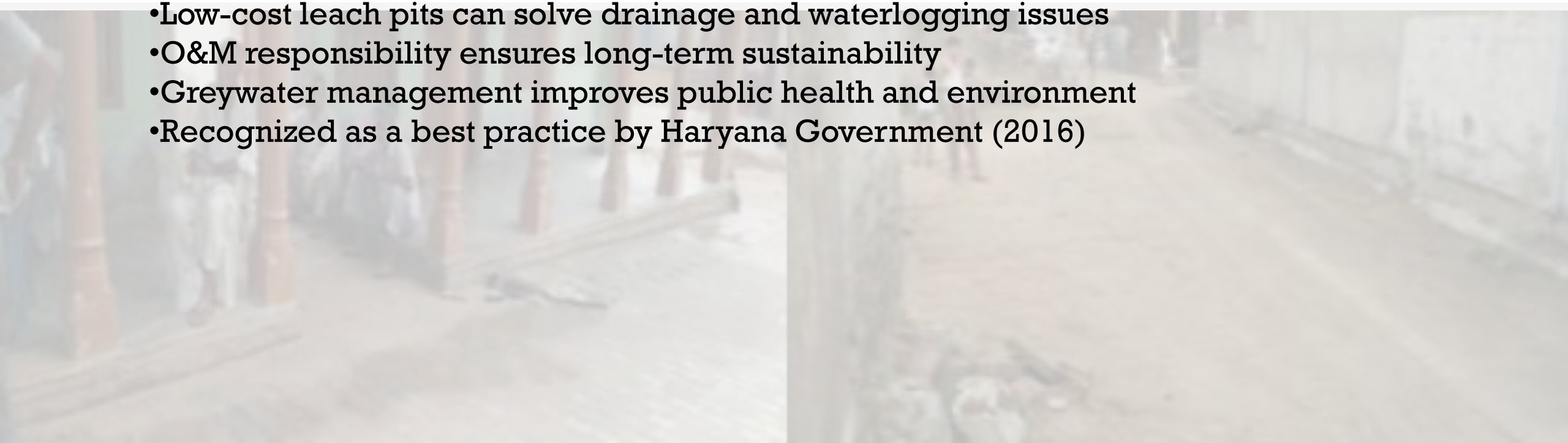
Institutional Support
•Gram Panchayat assigned staff for operation & maintenance
•Formal monitoring and maintenance system established
Environmental Enhancement
•Tree plantation integrated with social events
•Visible improvement in cleanliness

ALLUVIAL PLAIN TERRAIN

Mahendragarh District, Haryana

Highlights:

- Community-led decentralized systems are highly effective
- Low-cost leach pits can solve drainage and waterlogging issues
- O&M responsibility ensures long-term sustainability
- Greywater management improves public health and environment
- Recognized as a best practice by Haryana Government (2016)



POLICY RECOMMENDATIONS FOR TERRAIN-BASED GREYWATER MANAGEMENT IN UTTAR PRADESH

Integrate into State Policy Framework

- ✓ Include greywater reuse in building bylaws (urban & rural)
- ✓ Align with Jal Jeevan Mission & Swachh Bharat Mission
- ✓ Mandate decentralized systems in new housing schemes

Terrain-Specific Technical Guidelines

- ✓ Develop district-wise greywater manuals
- ✓ Issue standard design templates for different terrains
- ✓ Promote locally adaptable technologies

Financial Incentives & Support

- ✓ Subsidies for household-level systems
- ✓ CSR partnerships for community DEWATS
- ✓ Performance-based grants for Gram Panchayats

Capacity Building & Community Engagement

- ✓ Training programs for masons & local engineers
- ✓ Awareness campaigns on safe reuse
- ✓ Community-led monitoring mechanisms

Monitoring & Regulatory Framework

- ✓ Periodic water quality testing
- ✓ Local governance responsibility allocation
- ✓ Integration with climate resilience planning

“GREYWATER IS NOT A WASTE PROBLEM — IT IS A DESIGN OPPORTUNITY.”

If we align technology with terrain, policy with practice, and infrastructure with community participation, Uttar Pradesh can transform domestic wastewater into a resilient water resource.

The future of water security- decentralized, terrain-sensitive systems at the household and community level. Sustainable greywater management is not optional — it is essential for ecological balance, public health, and climate resilience.