Session 8: Water and treated used water connection - the opportunity for augmented water conservation and management

GROUNDWATER in the co-management of W and wW

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ACWADAM’s work: in the most hydrogeologically diverse setting in the world – based on partnership and collaboration.

We are a think-tank and action-research based organization, working on the science of groundwater and its applications to societal development. We work on the practice and policy of aquifer-based, participatory groundwater management.

- Aquifer-based groundwater management
- Training
- Action research and decision support
- Policy and programmes

Bringing aquifers and communities closer to each other…
Groundwater: some key points in urban water planning

Features that are important in urban water planning (India)

- Groundwater as a source and a sink
- Groundwater dependency is high but is seldom acknowledged
- Paucity in planning
- Groundwater beyond the reference to wells is hardly known in the urban sector – especially aquifers, their natural recharge zones, where and how they naturally discharge etc.
- Aquifers – urban watersheds – rivers (their myriad interconnections – hydrological, environmental and social)
Groundwater and leaking wastewater:

- Drop in natural groundwater recharge in cities often remains hidden behind this zero sum game...

- Reduction in surfaces that induce infiltration of rainwater

- Leaking mains and sewers
A business-as-usual scenario

Freshwater source - river

Supply

URBAN SETTLEMENT
- Consumption
- Wastewater

WATER BODIES, USUALLY LAKES & RIVERS
- Source for downstream uses
- Contamination

AQUIFER
- Depletion & contamination

Reduced and contaminated base flow

Groundwater

Supply
Closing the loop: reuse, recharge and recycle

Reuse of wastewater in supply, conservation and recharge

- Freshwater source
- Supply
- HABITATION or INDUSTRY
  - Consumption
  - Wastewater
- WATER BODIES, USUALLY LAKES, RIVERS and AQUIFERS
  - Source for downstream uses
  - Freshwater including better e-flows
- Treated wastewater
- Recharge
  - Treated water for MAR
  - Aquifer
  - Supply
Groundwater: the urban black box

• Aquifers: a source and a sink – largely unacknowledged

• Quantitative
  • Potential storage
  • Recharge (natural, engineered and incidental)
  • Extraction – pumped
  • Natural discharges – through springs and seeps – baseflow in streams and rivers

• Quality
  • Natural state of groundwater (local profiles)
  • Changes – seasonal and long-term
  • Contamination

How do we make the connection between water and wastewater in conservation, reuse and recharge?
Groundwater recharge and discharge: with reference to aquifers…

Recharge is not just about “pushing water into the ground”.

Pumping of wells

Recharge is the addition of water to the existing groundwater storage in the aquifer.

Groundwater in the form of springs and seeps discharges into stream and river channels. This part of the stream flow (groundwater discharge) is called base flow in a river.
Managed Aquifer Recharge (MAR)

- MAR is the intentional or designed recharge of water into aquifers for:
  - Subsequent recovery for meeting anthropogenic needs
  - Environmental benefit
- Hence, the managed process strives for adequate protection of human health and the environment
- Aquifers may be recharged by diversion of water into wells or infiltration of water through the floor of basins, galleries or rivers

- Local precipitation & stormwater
- Treated wastewater
Wastewater and groundwater

Treated wastewater
- AVAILABLE
- HOW MUCH?
- HOW GOOD?

Groundwater recharge
- ACCEPTABLE
- HOW MUCH?
- HOW GOOD?

HOW? WHERE?
Groundwater recharge and contamination are two sides of the same coin.

Pathways of groundwater contaminants and groundwater recharge are common…

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Recharge at different scales...

- Purpose of recharge
- Efficiency of watershed development and management plan
- Aquifer and watershed relation
- Communities and scale
- Scale of recharge – watersheds, aquifers...
- Upstream – downstream issues of equity
- Significance in the larger river basin water balance
- Strategic location of structures
- Efficiency of recharge structures
- Operation and maintenance of structures - sustainability

How, how much and where?

- Purpose of recharge
- Efficiency of watershed development and management plan
- Aquifer and watershed relation
- Communities and scale

Structure / water body

An area – open or built-up

Aquifer(s)

River Basin

Watershed

- Strategic location of structures
- Efficiency of recharge structures
- Operation and maintenance of structures - sustainability

Integrated into larger context of gwM and gwG
Natural groundwater recharge areas - Pune

After: ACWADAM, 2022
Thank you!

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