Managed Aquifer Recharge with Treated Wastewater

OLD LAWS FOR NEW USES
IN A CONTEXT OF CLIMATE CHANGE

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Defining Terms

- **Managed Aquifer Recharge (MAR):** artificial recharge of groundwater (under controlled conditions) via infiltration or injection of *recycled or natural water* into an aquifer
- Water banking or enhanced recharge
- Aquifer Storage (Transfer) & Recovery (AS(T)R)
- Water treatment technique (mid-1900, e.g. Israel)
- Soil Aquifer Treatment (SAT)
Identifying the issue

- Purposeful **recharge** of surplus water for later use or for environmental benefit vs **discharge** of wastewater into an aquifer
- **Conventional sources**: Surface water/ urban storm water
- **Non-conventional sources**: Treated wastewater/ desalinated water
- **Techniques**: infiltration, injection, dams, etc.
- **Intended use**: irrigation, landscaping, drinking water supply
- **Legislation & administration**: water quantity & quality
Climate Change & Variability

- Adaptation (and mitigation) strategy to achieve water security
- Reduce vulnerability to extreme events
- Water reserve in case of droughts
- Storage of excess water from floods
- Efficient water management by reusing treated wastewater
- Reduce pressure on water resources
- Efficiency could help reducing GHG emissions from pumping (energy use)
Legislation Case Studies

- Australia (W. Australia)
- Israel
- Spain
- South Africa
- USA (Arizona)
- Germany/ the Netherlands/ UAE/ Jordan/ Mexico/ India

Main requirements:
- Drilling permit
- Water abstraction permit
- Recharge facility permit
- TWW discharge permit
- TWW reuse permit
- Assessment and planning
Example: Western Australia

- Water Act, 2007
- National MAR Guidelines, 2009
- National Water Reuse Guidelines

- Western Australia MAR Policy, 2011
- Rights in Water & Irrigation Act, 1914
- Licence to take water + licence to construct bores
- Agreement needed if recharge & recovery by different operators
- Case-by-case hydrogeological assessment
- Approved operating strategy
- Health-related documentation for drinking water
Artificial recharge basin in Atlantis, South Africa (2014)
Water Rights Involved

- Right to **harvest source water**
  - Who owns the effluents?
  - Public: concessions/licensing; Private: negotiated contracts

- Right to **store and recharge treated wastewater to an aquifer**
  - Injection or infiltration? What is the required quality?
  - Excess water storage or recharge of depleted aquifer

- Right to **recover stored or recharged water from an aquifer** and **put it to final use**
  - Who recovers the water? MAR licence holder or third person
  - Inc. in MAR licence or as separate authorization – where, when & how much?
Integrated Licensing

- Right to **harvest, store and recover** treated wastewater
- **Prerequisites**: EIA, land use & health clearances, quality standards
- **Risk management plan** for MAR system’s operations
- Licence **duration & administrative fees**
- Licence **review, variation, suspension, termination**
- Water-related **tariffs & recharge costs**
- **Percentage** of stored water to be recovered (drought plans)
Risk Management Plan

- Protection of human health and the environment
- Prevention of hazards
- Identification, assessment & mitigation of relevant risks
- Water quality (compatibility, temperature) and quantity (balance)
- Attached to the MAR licence and enforceable
Institutional Aspects

- Administration (water, environment, health)
- Monitoring
- Enforcement
- Central and local authorities
- Consultation of basin organization & WUAs
Conclusions

- Licensing system established by unspecific legislation hinders investment
- GW abstraction & TWW legislation
- MAR scheme by policy & guidelines
  - Lack of legal certainty
  - Gaps in mandatory requirements
- Special legislation for integrated MAR licensing
- Promote climate-independent water sources
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