Managed Aquifer Recharge with Treated Wastewater

OLD LAWS FOR NEW USES?
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), Treated Sewage Wastewater (TSE)
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 (dams)/ urban storm water
- Non-conventional sources: Treated wastewater/ desalinated water

- Intended use: irrigation, landscaping, drinking water supply

- **Legislation & administration:** water quantity & quality aspects
Study Cases

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

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

- 2007 Water Act: GW includes pumped, diverted or released water
- 2009 National MAR Guidelines + National Guidelines for Water Reuse

- 2011 Western Australia MAR Policy
- 1914 Rights in Water & Irrigation Act
- Licence to take water (incl. ancillary storage) + Licence to construct bores
- Agreement to take water if recharge & recovery by different operators
- Case-by-case hydrogeological assessment
- Approved operating strategy
- Health-related documentation for drinking water
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 stds
- **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
Licensing system established by unspecific legislation
GW abstraction & TWW legislation
Policy and guidelines may elaborate a MAR scheme
  > Lack of legal certainty
  > Gaps in mandatory requirements
Special legislation for integrated MAR licensing
Thank you!

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