

SUSTAINABLE WATER MANAGEMENT IN A *Changing Climate*

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Wastewater treatment in Israel

from nuisance and hazard to an alternative water resource

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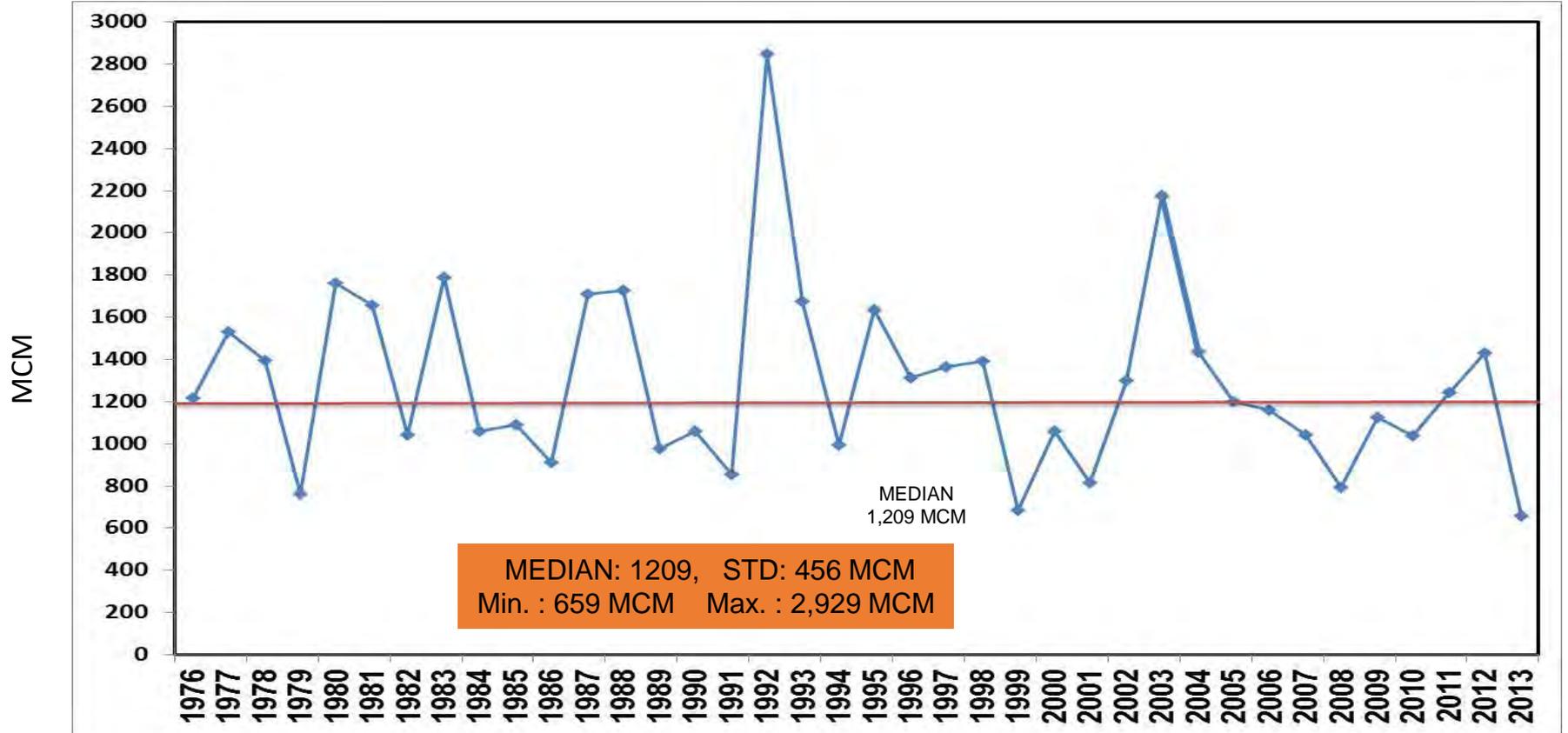


Outline

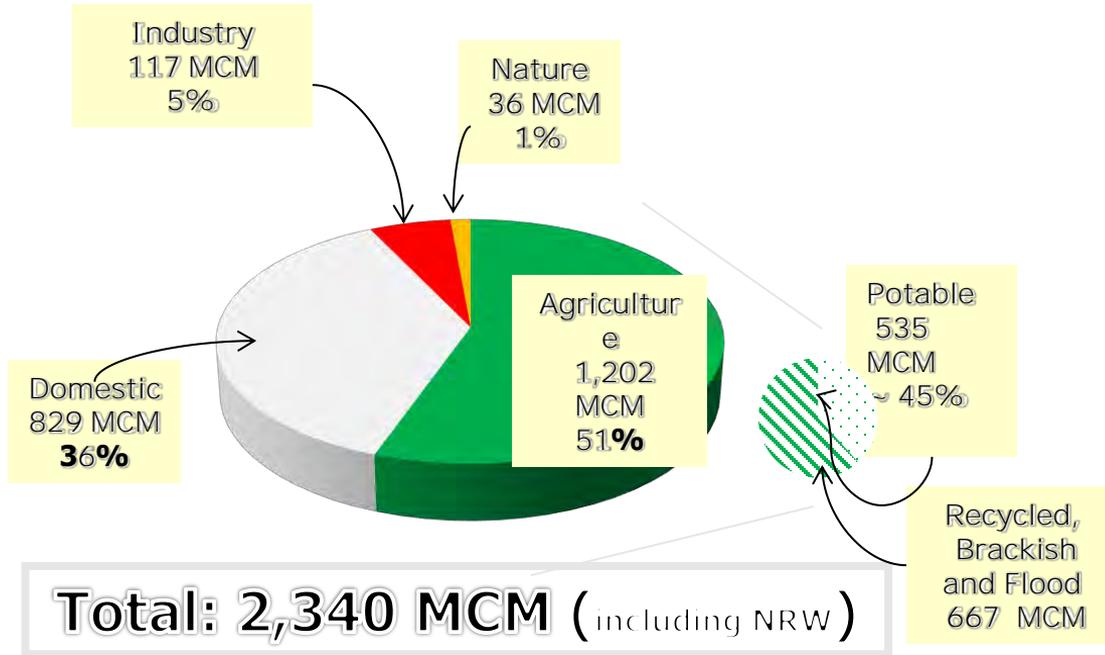
- Israel water scarcity
- Wastewater collection in Israel – historical review and Ecological damage from untreated wastewater
- The development of wastewater treatment industry – Israel as a model
- Technologies implemented
- Effluent quality and reuse

Israel water scarcity

Recharge from Rainfall along years: 1975-2013



Israel Annual Water Consumption



Supply to PA – 70 MCM (West Bank) + 20 MCM (Gaza Strip)
Supply to Kingdom of Jordan – 55 MCM

Wastewater collection in Israel – historical review

Israel Population growth

- Israel is a rapidly growing country: the country reached its first million in 1949, growing to about 3 million by 1970 and surpassing 10 million for the first time in 2024
- Israel is one of the most highly urbanized countries globally.
- Only 8.7% of Israel's population lives in rural areas—the lowest among OECD countries.
- This concentration created immense pressure on urban water and sanitation infrastructure

Early Collection Systems (1950s-1960s)

- During the 1950s and early 1960s, Israel rapidly built central sewage collection systems in expanding cities, but wastewater treatment infrastructure was not developed at the time
- By the late 1950s, sewage spilled into the public realm

Transformation of Natural Streams (1960s-1970s)

- By the 1960s, Israel's intermittent streams—became actually sewage channels with local aquatic habitats decimated or changed beyond recognition.
- Many rivers and streams suffered severe pollution and decrease of natural water flow.

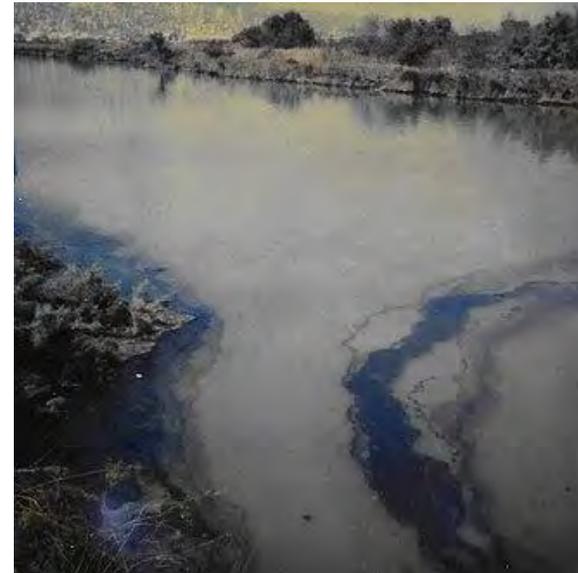
Polluted River in the 70s

Hadera River



Some of the rivers that flow through industrial area, also ended with contaminated river beds with heavy metals and inorganic chemical compounds.

Kishon River



Ecological damage from untreated wastewater

Ecosystem Collapse (1950s-1970s)

- Most biological systems in Israel's streams did not survive the 1950s and 1960s when they were transformed into channels for municipal sewage.
- Major Environmental Impacts were identified including :
 1. Pathogen Contamination leading to public health problems
 2. Chemical Contamination leading to groundwater contamination and wells closure
 3. nutrient pollution
 4. Heavy Metal and Toxic Sludge at river bases
 5. biodiversity loss as fish populations collapsed and wetland habitats lost.

The development of wastewater treatment industry

Early Treatment Infrastructure (1960s-1970s):

- The first municipal sewage treatment plant in Israel—the Haifa WWTP—was built in the early 1960s for a population of 225,000. This marked the beginning of centralized treatment
- Shafdan (Dan Region) Wastewater Treatment Plant was constructed in the 1970s , originally as a large oxidation ponds system with lime treatment and ammonia-stripping lagoons
- Shafdan became the foundation of Israel's modern wastewater reuse system when In 1989, the Third Line to the Negev was completed, delivering Shafdan's soil-aquifer treated (SAT) effluents for agricultural irrigation in southern Israel.

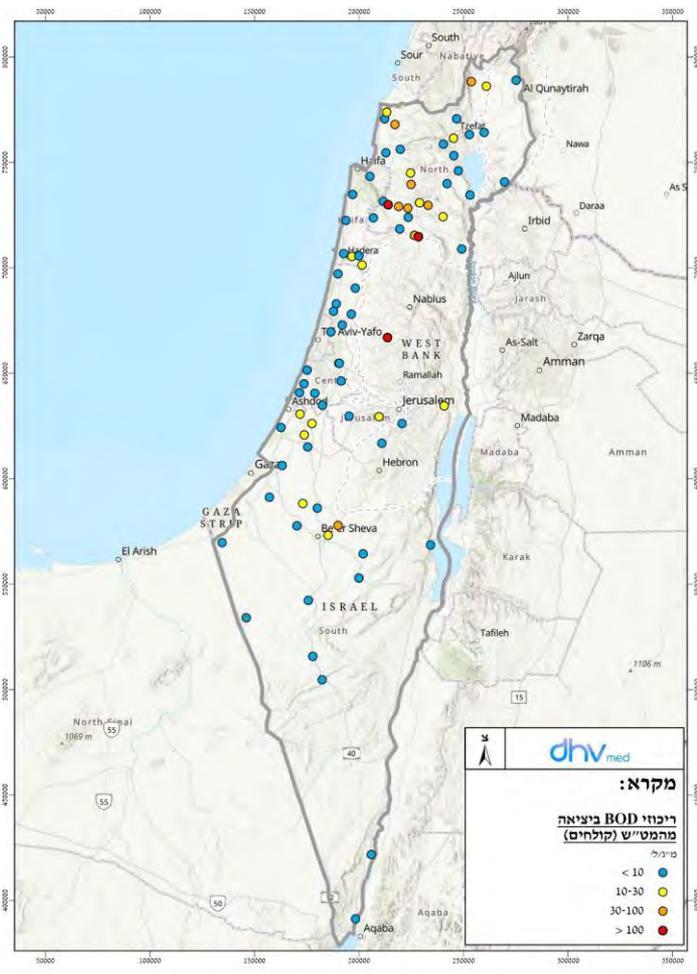
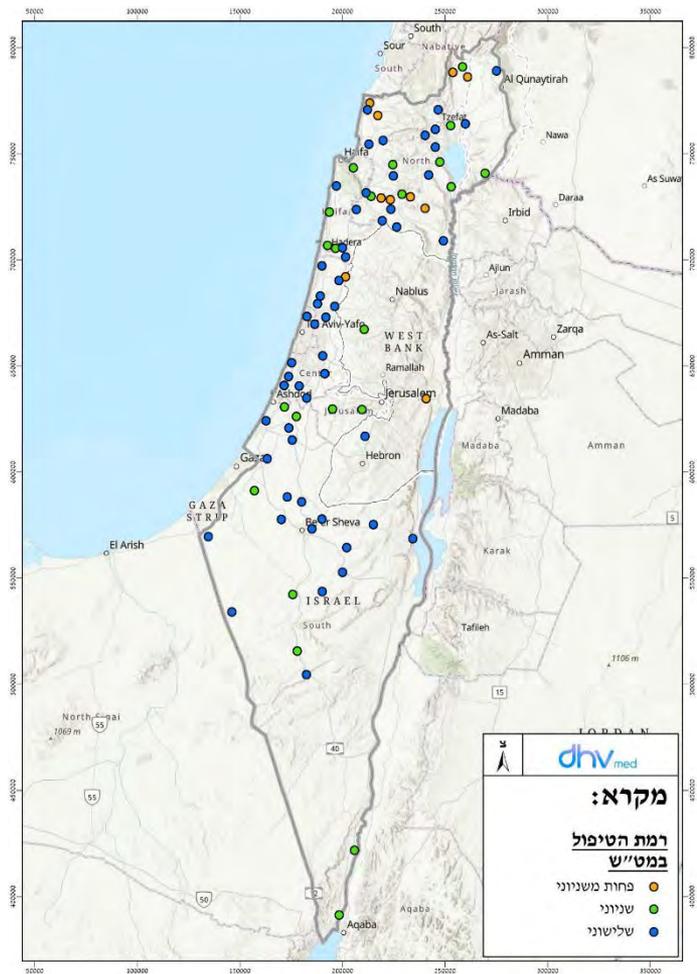
Wastewater treatment and reuse

- Sewage infrastructures have been developed and upgraded nationwide in the late 90's and 2000's
- New stringent standards for effluents quality (37 parameters).
- Nowadays reuse of more than 85% of the effluent.

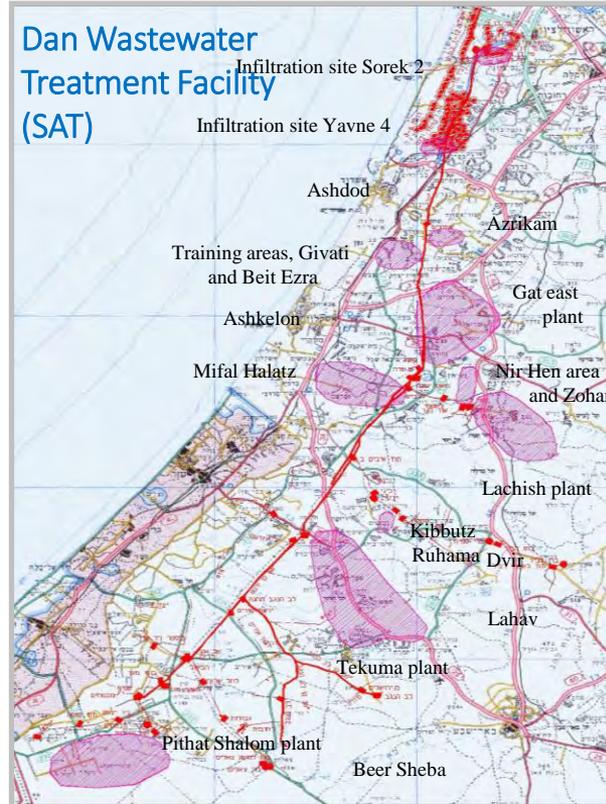
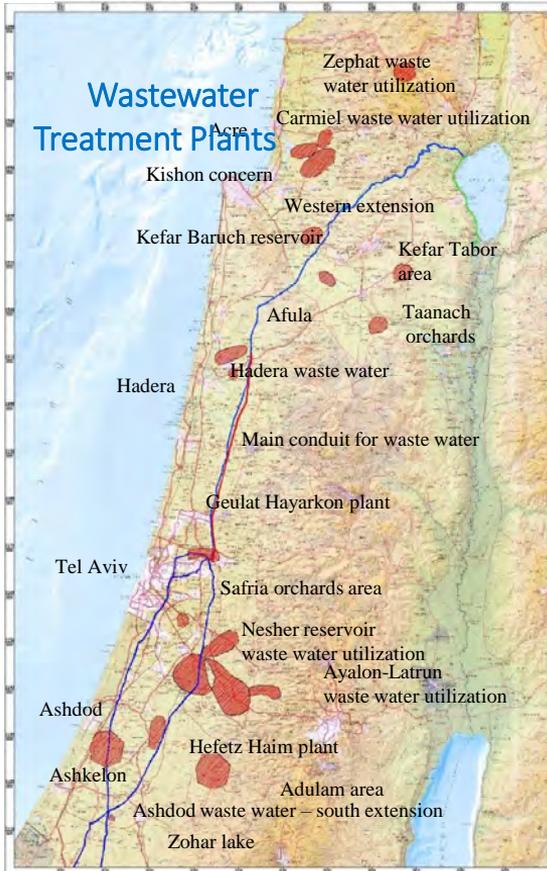
Wastewater treatment plans are only accepted if a full water reuse program is presented

No new municipal areas are developed until there is a definite solution to its wastewater

Treated Wastewater quality map



Treated Wastewater Reuse Map



Wastewater treatment and reuse

- Wastewater treatment plants are the core of local agricultural reuse systems.
- Connections between local reuse systems is part of the national reuse plan, enabling the discharge of high-quality effluent to areas with higher water demands.
- High quality effluent also used to guarantee the basic flow of rivers and irrigation of parks.
- Various technologies are implemented
- The majority of the system are centralized but decentralized system are implemented in remote communities

Some samples are specified in the following slides

Technologies implemented

Intensive centralized Wastewater treatment

Netanaya WWTP – A BNR activated sludge, with tertiary disinfection and filtration stage. Producing tertiary non-limited irrigation quality to the Heffer Valley agriculture



Ein Shemer regional WWTP

- The Plant was constructed as an activated sludge for secondary effluent quality
- An increase of population connected to the plant led to its upgrade.
- Wastewater treatment was converted to an MBR BNR process with excellent effluent quality and sludge is treated to class A quality



Og DPMCALS WWTP

- Designed in order to minimize maintenance requirements while producing secondary effluent quality.
- Wastewater is collected from cities and villages in the easter Jerusalem region but the effluent is reused in the Jordan valley
- Water is used for irrigation of palm trees and production of dates



Og WWTP – Sludge removal

- Sludge undergoes Benthic stabilization
- Sludge is removed from the bottom of the ponds in about two weeks every second year
- Sludge is dewatered in geotubes on site



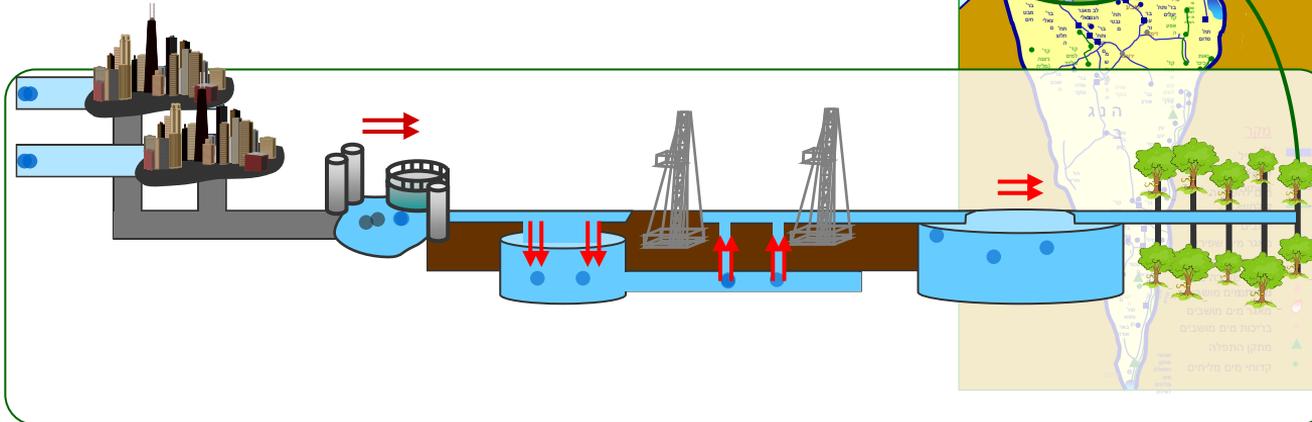
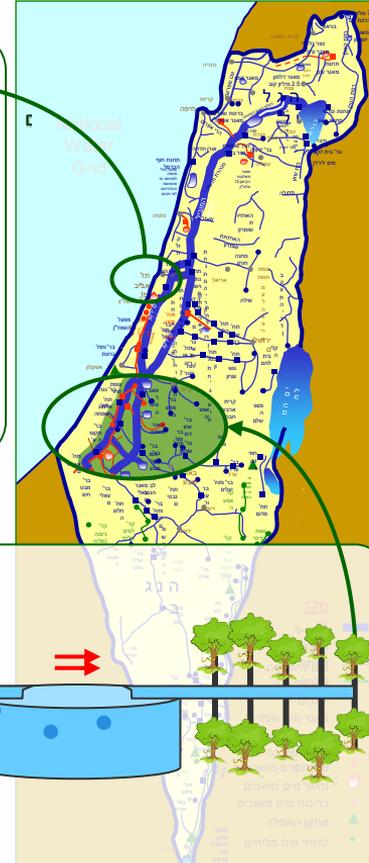
Shafdan Wastewater Treatment Plant

- Mekorot Operates at the Shafdan Wastewater Treatment Plant
- Treated water is delivered and infiltrates into hydrologically isolated aquifer
- In the aquifer the water undergoes further treatment through natural physico-chemical and biological processes
- These processes achieve highest quality recycled water that is supplied to farmers in the desert for the unrestricted irrigation



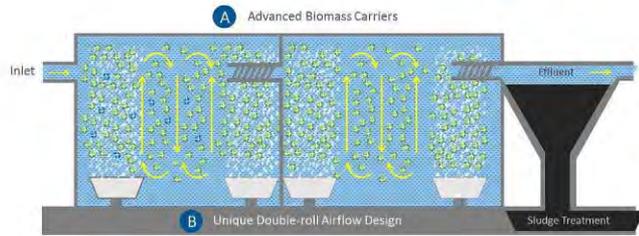
Reuse of all sewage effluents in Dan Region (Greater Tel Aviv) Wastewater Treatment plant (Shafdan) and the pipeline to Negev

- Sewage from the Greater Tel Aviv area – 150 MCM/Y
- Large-scale WWTP – Tertiary treatment quality
- Six infiltration fields
- Over 150 production and monitoring wells (quality permitted for “occasional drinking”)
- 90km pipeline to Negev



Decentralized small WWTPs

- Used in remote and small communities
- Some are based on traditional technologies but innovative Israeli technologies are becoming more and more popular



Program contribution for nature and society

The advanced treatment of wastewater and its reuse in agriculture and keeping a basic flow in some of the natural streams led to :

- Gradual improvement of water quality in natural water bodies
- Restoration of damaged ecological systems
- Development of recreation facilities around the restored water bodies

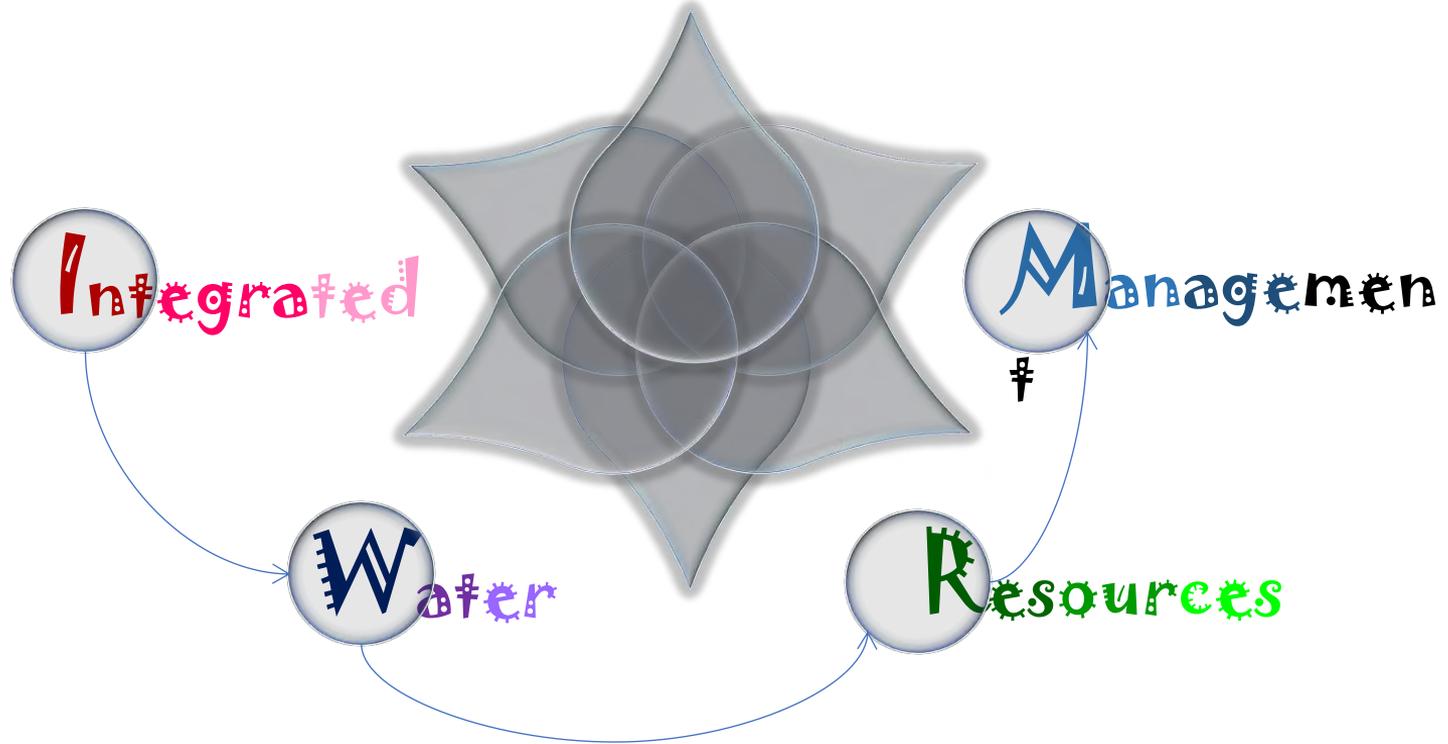
The future of the matter

Issues that professionals and decision makers should take into account :

1. Define clear national goals and develop a comprehensive strategic program to effectively achieve them
2. Identify and prioritize initiatives to ensure optimal outcomes and the fastest possible impact
3. Consultation with experienced professionals and reputable organizations and expert in order **to minimize mistakes**
4. Develop Tailored, Country-Specific Solutions
5. **Development of a modern wastewater sector must be accompanied by education of professionals**

Israeli

Model



Thank you for listening

With gratitude to the Israeli water
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presented in this lecture

