
Closing the Water Cycle - Water Reuse in Israel

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Israel – an overview

- A wide discrepancy between rainfall spread and consumption (time&space)
- A High probability of consecutive dry years
- Regional discrepancy in natural water resources location and consumption
- Conveying water outside the borders of the watershed
- Continuous population growth
- Geopolitical aspects – Cross border, shared water sources



A New Era in Water Resources and Supply

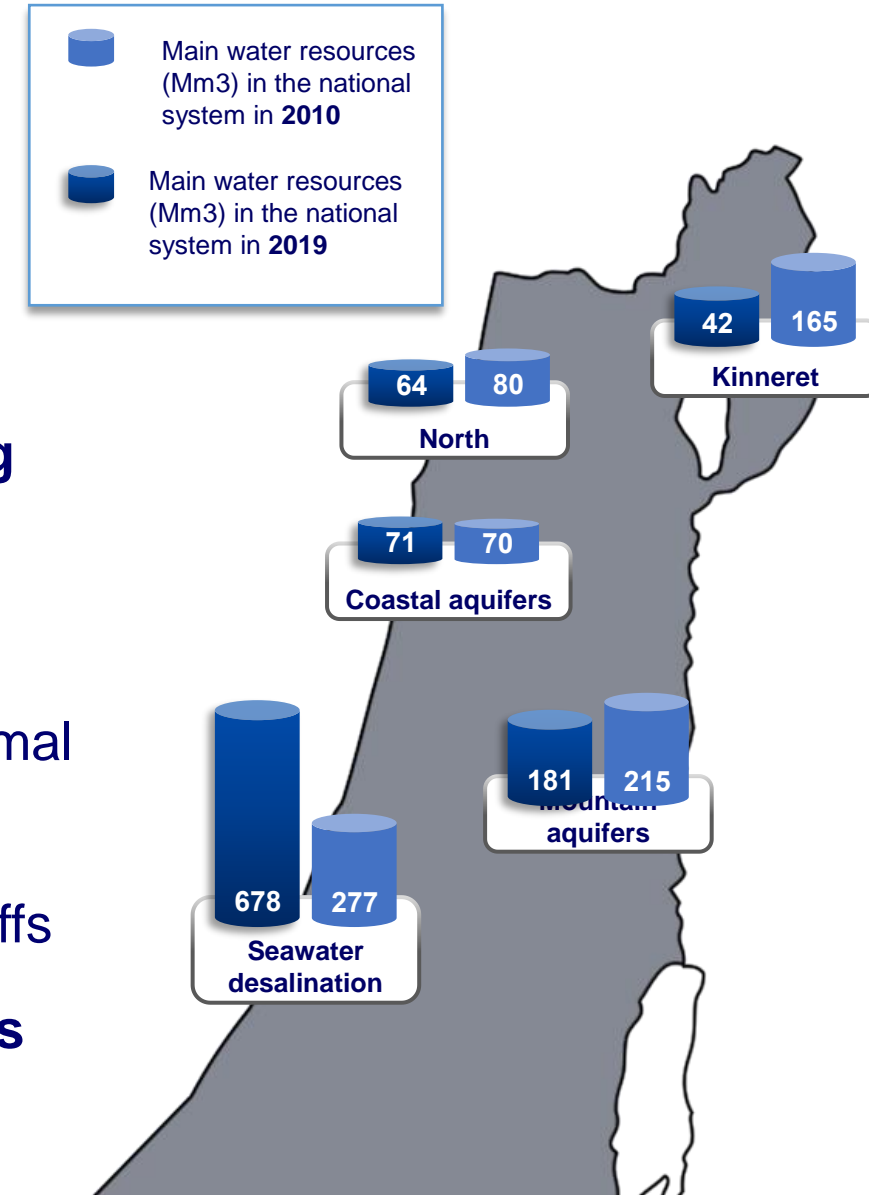
Optimal management of water resources

- Integrating several sources of water into the national system
- Varying availability of sources throughout the country
- Conveying water from one region to another

Minimizing operation and maintenance costs by implementing technological solutions and operational models:

- Advanced monitoring systems
- Automation programs and Computerized models for the optimal planning & operation of the water supply system
- Energy management by exploiting the variable electricity tariffs

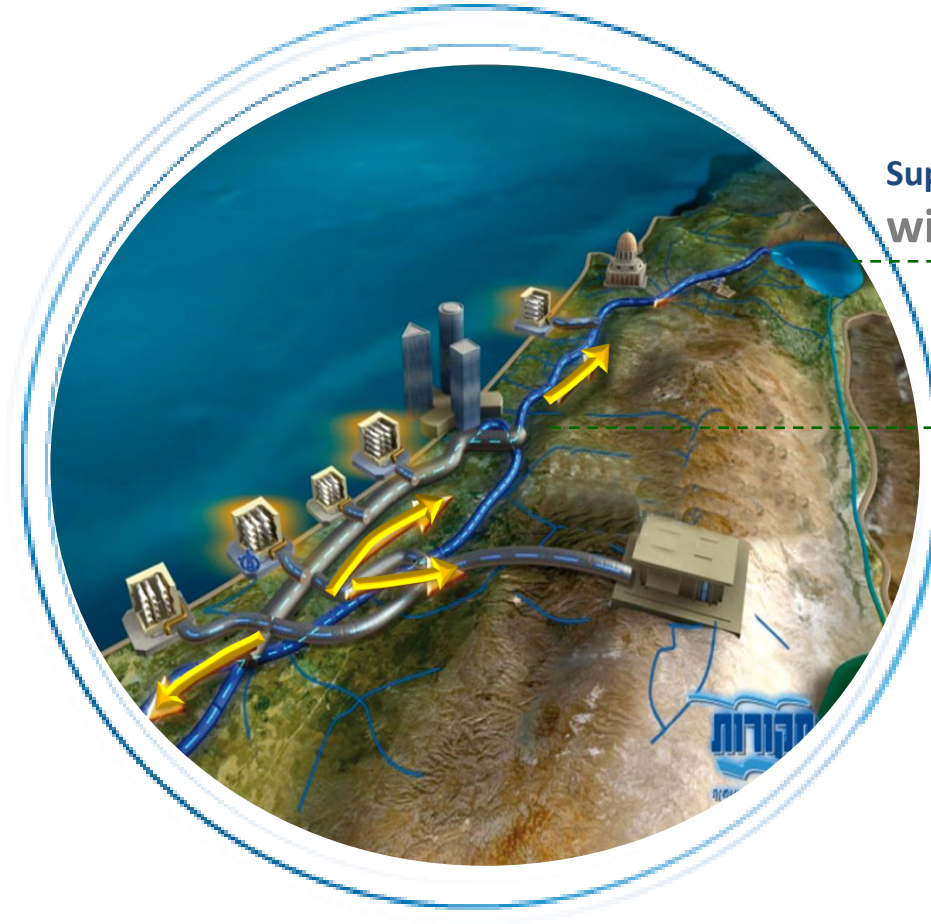
Water quality management in an environment that experiences daily changes in water composition and quality



Operating a national water supply system:

The inclusion of seawater desalination plants

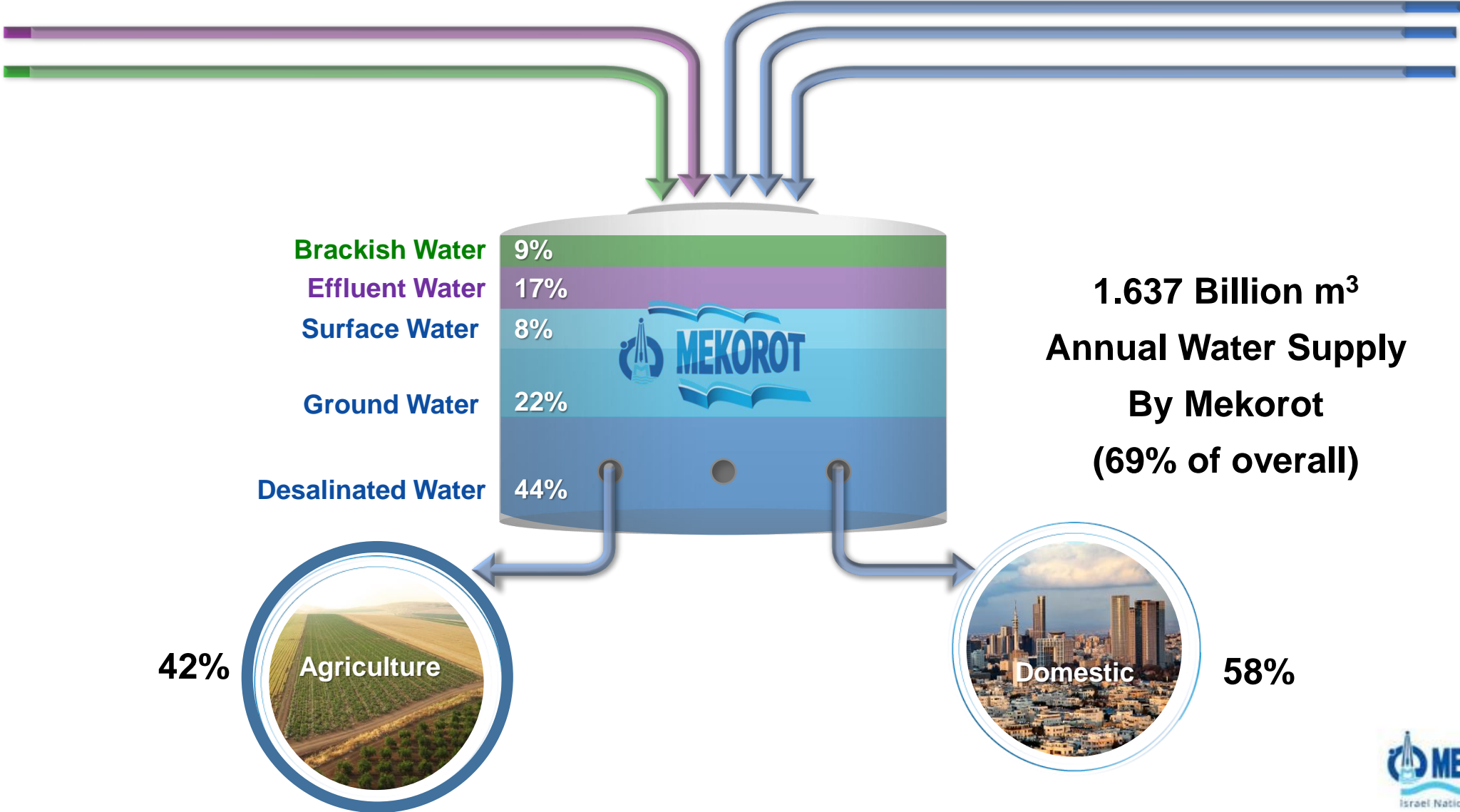
- ☐ Population hotspots as a major consideration for determining desalination plant location
- ☐ Operational agility under rigid production criteria
- ☐ Alternating flow direction



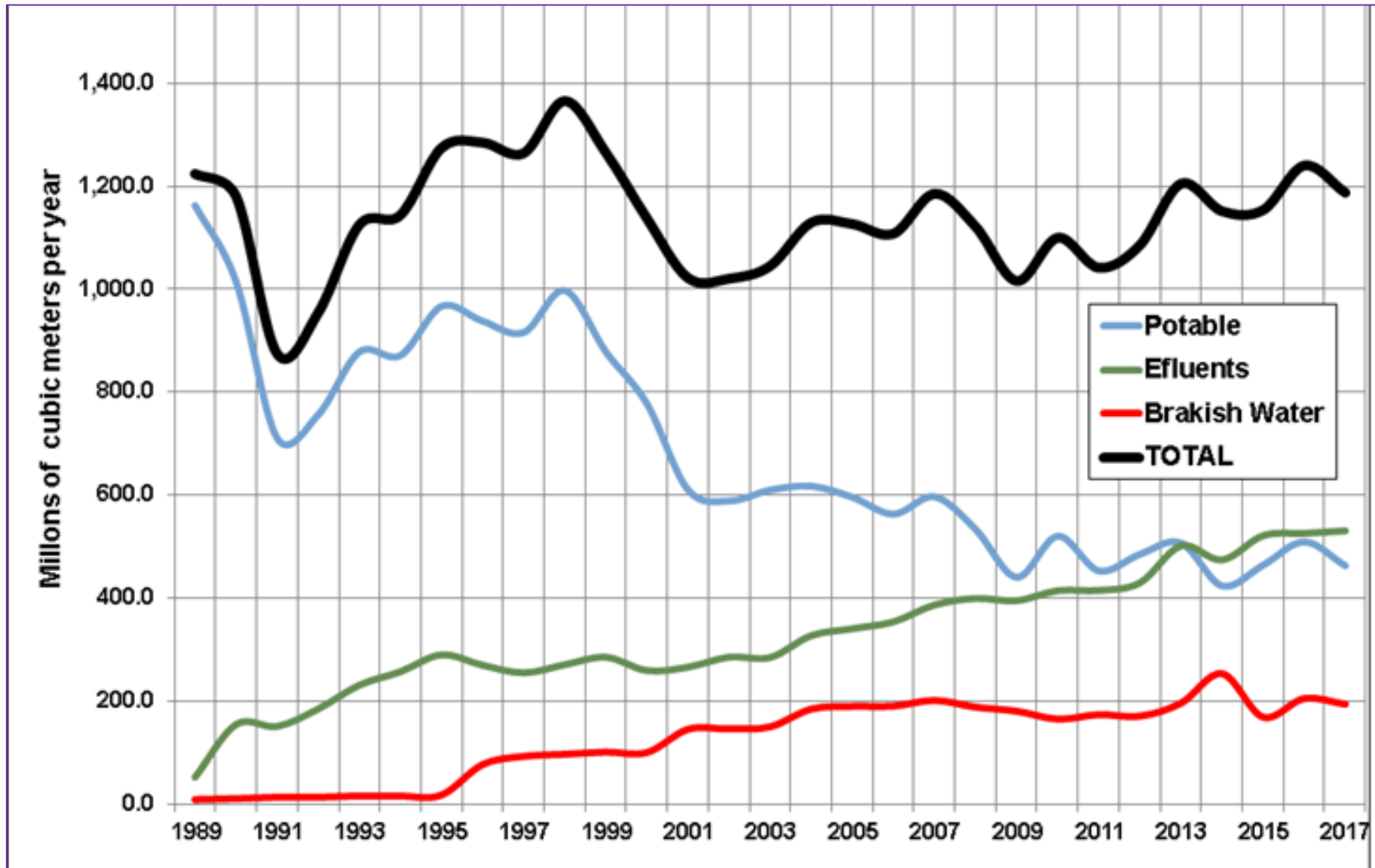
Supplying water from the Sea of Galilee
within 7 days

Supplying desalinated water
within 3 hours

Mekorot's water resources



Water sources for Agriculture in Israel



2017 data:

Potable ~ 38%

Reuse ~ 44%

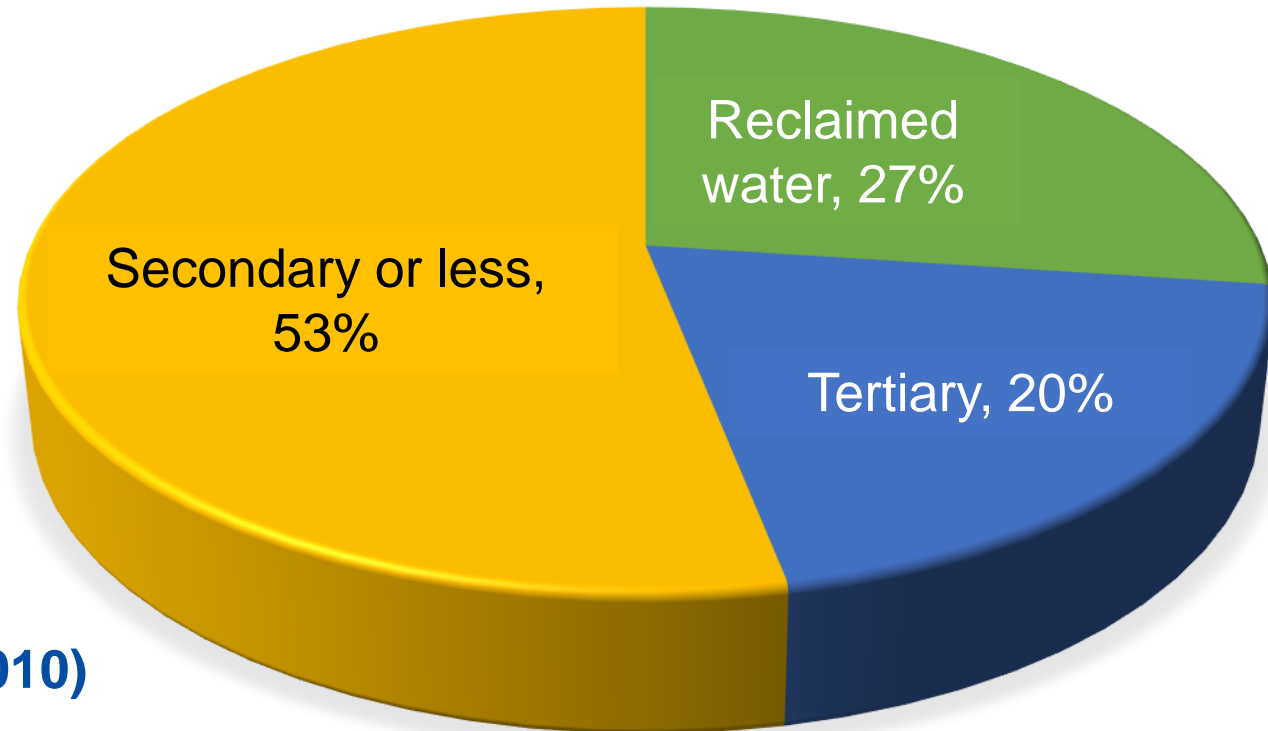
Brackish ~ 18%

Water Reuse in Israel

Reuse rate ~86%

Reuse water types:

- **Secondary effluent**
restricted irrigation
- **Tertiary effluent**
unrestricted irrigation (Inbar 2010)
- **Reclaimed water**

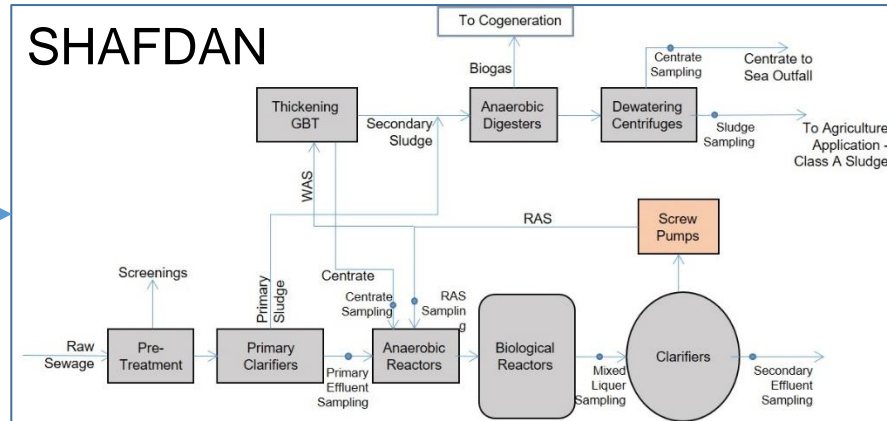


Reclaimed Water?!



Municipal wastewater

Greater Tel Aviv Area



Owned by IGUDAN, operated by Mekorot
Produces ca. 140M m³ secondary effluent annually



SAT infiltration basins

Rishon Le'Tziyon



Unrestricted irrigation

- ◇ Unrestricted irrigation
- ◇ Irrigation permit waived
- ◇ Protective radius waived
- ◇ Allowed in hydrologically sensitive areas
- ◇ Meets most drinking water criteria for decades

Wastewater, 2nd effluent and reclaimed water quality

Parameter	Units	Raw Sewage	Recharge Effluent	Reclaimed Water
SS	mg/l	385	5	<1
BOD	mg/l	345	5	<0.5
COD	mg/l	825	32	6
NH ₄ -N	mg/l	45	4	0.15
NO ₂ -N	mg/l		2	
TOC	mg/l		10	

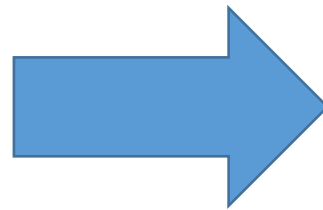
Parameter	Units	Raw Sewage	Recharge Effluent	Reclaimed Water
Total Bacteria	No./1 mL	2.7E+07	4.0E+05	4780
Coliforms	MPN/100 mL	2.3E+08	2.5E+05	0
Fecal Coliforms	MPN/100 mL	2.9E+07	1.1E+05	0
Streptococcus Fecalis	MPN/100 mL	4.5E+06	1.3E+04	0

Future goals

- 🚰 Increase reuse rate
- 🚰 Improve reused water quality
- 🚰 Make reclaimed water ubiquitous throughout the country

Current challenge: building capacity to meet future needs

- ❑ SAT is at capacity
- ❑ No land resources for expansion
- ❑ Effluent production increases at ~1.8% annually



Need for a supplemental solution to provide “SHAFDAN quality” water

An engineered solution declared equivalent to reclaimed water by the MoH

Immediate tasks:

- ☐ Identify a potential treatment train
- ☐ Pilot test the selected train

Pilot and treatment train considerations

- ❑ Steering committee led by the Israeli Water Authority
- ❑ Committee members: regulators (health, env. protection), Mekorot
- ❑ MoH requirements (compared to SHAFDAN 2nd eff):
 - 10 log removal for viruses; 8 log removal for *crypto.* and *giardia*
 - minimum 3 barriers of >1 LRV for viruses, *crypto.* and *giardia*
 - >80% removal of TOrCs from a pre-selected list
- ❑ Additional considerations:
 - Affordability
 - Minimal environmental impact

The selected treatment train

Pre-treatment

UF

+

Filtration
Cost
Simple

-

LRV?

IIMBR

+

Filtration
LRV
Nitrification
Impounding

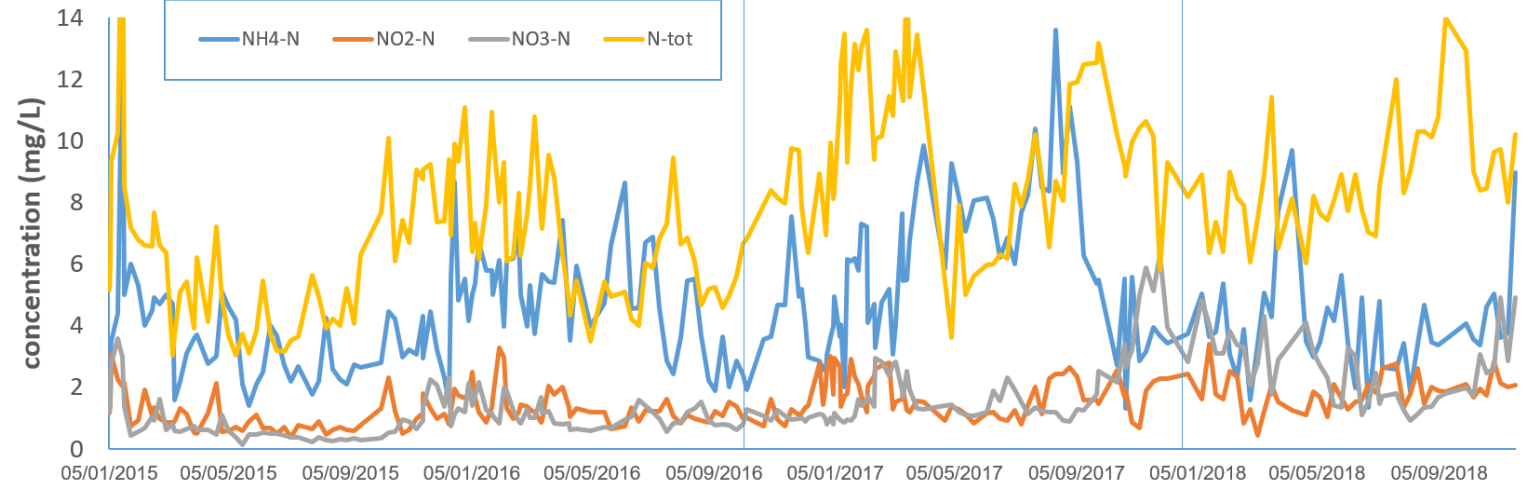
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Cost
Complexity

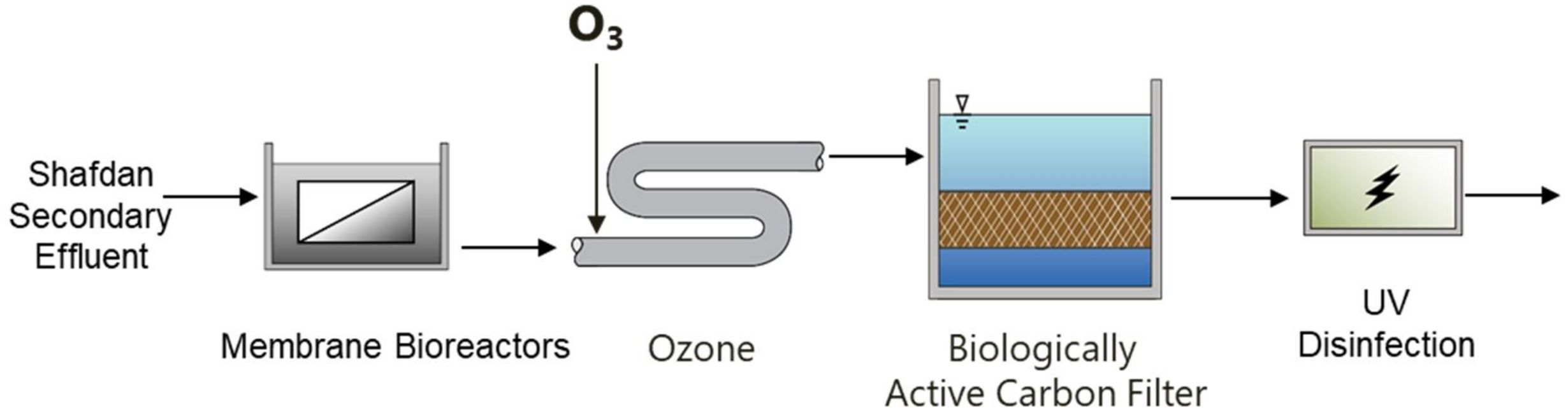
Remove pathogens and DOC

Reject stream returned to WWTP

Reject stream sent to sea



The selected treatment train



The Road to Decision Making

PROJECT MEMORANDUM

SITE VISIT AND PRELIMINARY EVALUATION – SHAFDAN WWTP EFFLUENT ENHANCED TREATMENT FOR IPR QUALITY PROJECT

Mekorot, Israel National Water Company

Prepared By: Andy Salveson, Jason Assouline, Randy Braley
To: Yoav Barkay, Mekorot
Subject: Shafdan WWTP Effluent Enhanced Treatment for IPR Quality Report



Date: June 25, 2019
Project No.: 11447A00



June 9, 2020

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Subject: NWRI Panel Meeting 1 Findings and Recommendations

Overview

The Proposed ATP Treatment is Robust and Protective of Public Health.

The Proposed ATP Treatment is an Appropriate Technical Decision.



Hamby Water Reclamation Facility, Abilene, TX



LA County Sanitation District, Whittier, CA



Joint Water Pollution Control
Plant (JWPCP), Carson, CA



Cabezón Water Reclamation
Facility, Rio Rancho, NM

Current status



From pilot to full scale – main challenges

- ❑ Current vs. 2028 2nd effluent quality at the SHAFDAN
- ❑ LRV for UF?
- ❑ TOC requirement?
- ❑ Which CECs will be used as proxy?

Thanks for your time and attention

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