Greywater Recycling’s Impact on Israel’s Water and Energy Economy

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Israel’s water economy

water/energy nexus

greywater recycling

national energy and water impact

impact on individuals

summary
Israel leads the world in centralized WW reuse
But desalination is the fastest growing water source

What about decentralized reuse?
Decentralized water production saves water and energy.
Urban demand is the fastest growing consumption sector.
Population Growth – Driver of urban water demand increase

Population [Millions]

Specific Demand [m$^3$/(person·y)]

- Population
- Specific Wat. Demand (demand manage.)
- Specific Wat. Demand + GWR

30% penetration only new buildings (2050)

Population Annual Growth rate 2005-2030

Germany USA Israel China India

0 0.8 1.4 0.4 1.2
What is GWR and how can it effect Israel’s water economy?

Onsite reuse of light GW:
1. shower/bath
2. washbasin
3. washing machine

Reuse for:
1. Toilet flushing
2. Garden irrigation

What would happen if from 2013 all new apartment buildings were required to install GWR systems?
A typical installation in a multi-storey apartment building

Potable water top-up

One-way valve

Storage Tank

Basement

Treatment

Raw greywater – Separate collection

Vertical Shaft

Treated greywater conveyance

Treated greywater – Separate distribution

Storage Tank

Treatment
Urban consumption is the fastest growing segment of Israel’s water economy
GWR can **slow down** the growth rate of urban water demand.

By 2050 – 30% reuse only in buildings built after 2012

Urban Demand

Urban Demand with GWR

140 MCM (Avoided Desalination)

CAGR 1.45%
Agricultural water allocation is only marginally affected by GWR.
By 2050, 15 million people will require ~15 desal plants over just 200 km of coast.

GWR can replace 1-2 of these!
$\text{Energy}_{\text{GWR}} \approx \frac{1}{5} \text{Energy}_{\text{Desalination}}$

- 3.5 kWh/m³ Produce
- 1.5 kWh/m³ Convey
- Onsite GWR
- WWTP
- Desalination

30 km

30 m

300 m
Summary - GWR in Israel can:

~10% ✓ Reduce urban water demand by:
  • 40 MCM per year in 2025
  • 140 MCM per year in 2050

~0.5% ✓ Reduce national electricity consumption by:
  • 160 GWh per year in 2025
  • 560 GWh per year in 2050

~10% ✓ Avert construction of 1-2 desalination plants by 2050

✓ Prevent emission of $6-8 \cdot 10^6$ tonnes CO$_2$ by 2050

✓ Only marginally impact wastewater availability for agriculture