Stream rehabilitation, wastewater treatment and associated pollution prevention in Israel

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Ministry of Environmental protection
The Division goals and vision

- Protect water resources from pollution.
- Rehabilitate streams to be natural habitats, with water flowing from natural sources to be used as leisure resorts for public welfare.
- Prevent the spill of sewage and effluent into streams or the environment.
- Treat sludge and reuse it in agriculture.
- Treat Wastewater to higher quality and reuse it as a significant water resource in agriculture, while preserving the environment and human health.
Water Availability (& scarcity)

Israel: 160 m³/capita/year

‘Water scarcity’ as defined by the UN: (0-1000 m³/capita/y)

Current population ~ 8 million and growing

Natural water refill: 1170 MCM (per year)

Water consumption: 2150 MCM (per year)

Map source: http://www.unep.org/dewa/vitalwater/jpg/0221-waterstress-EN.jpg
Water Supply by Resources (MCM) in Israel 1998 - 2017

50% of the total supply are manufactured “new” water

- Desalinated Water
- Reclaimed Effluent
- Natural Saline Water
- Natural Potable Water

77% and 35%
Water Sources in the Agriculture Sector

about 50% of agriculture water are effluent & brackish
Wastewater, Effluent Qualities and Quantities

About 50% of the effluent are tertiary

With time all the big WWTP will produce tertiary effluent

544 million m\(^3\) → 93% is treated → 86% reused

World's leader in treating and reusing effluent!
The recent past: most Israeli streams were polluted

The main causes:
• Using streams as canals to discharge sewage and effluent.
• Utilizing water springs for drinking water and agriculture.
• Outdated technology for collecting and treating sewage.
• Incompatibility between the sewage capacity and the waste treatment plants and the effluent reservoirs.
• Flow of sewage from the Palestinian Authority.
• Contaminated agricultural runoff.
• Fish ponds output.
• Lack of awareness to the importance of rivers and streams.
Ministry of Environmental Protection

The Tool box

- Inspection
- Enforcement
- Information (Intelligence)
- Regulation (Legislation)

Nature elements:
- Plants
- Water
Toady:
most Israeli streams are much cleaner

- New regulations and enforcement.
- Long term monitoring and creating data base.
- Reform in the water sewage sector (water & sewage cooperation's) and huge investments.
- Effluents as a resource.
- Building many WWTP’s and reservoirs.
- Pretreatments of sewage in industry.
- And more...
Number of permanent pollutant sources to streams

Number of permanent sources of pollution

Year:
- 1994
- 2009
- 2012
- 2013
- 2014
- 2015
Pollutant loads in streams

- Total organic carbon
- Total nitrogen
- Total phosphorus

(ton/year)


-63%, -90%, -95%
Water National policy

- Ensuring sustainable supply of water for agriculture, industry, public gardening and discharge to streams.
- Creating “new” water – large scale sea water desalination and reusing effluent from wastewater treatment plants.
- Gradual replacement of freshwater by reclaimed effluent for irrigation.
- Wastewater and sludge treatment in central treatment plants.
- Cost-effective water supply.
The challenge

From nuisance to asset

500 BOD

10 BOD
Policy, Regulations and Standards

WATER LAW: WATER IS PROPERTY OF THE STATE
Sewage, according to the Israeli Water Law, is defined as a water source. Water price shall reflect its cost to ensure effective water use.

Wastewater quality for unrestricted irrigation (2010)

- Standards for 36 parameters.
- The standards take into consideration: Environmental, Agricultural, Flora, Public Health & Hydro-geological Aspects.

Wastewater quality for disposal to streams (2010)
Require stringed quality (more then for irrigation) and also a special permit.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Irrigation</th>
<th>Stream</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD5</td>
<td>mg/L</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>TSS</td>
<td>mg/L</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>COD</td>
<td>mg/L</td>
<td>100</td>
<td>70</td>
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<tr>
<td>Total Nitrogen</td>
<td>mg/L</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Ammonia</td>
<td>mg/L</td>
<td>10</td>
<td>1.5</td>
</tr>
<tr>
<td>Total phosphorus</td>
<td>mg/L</td>
<td>5</td>
<td>1.0</td>
</tr>
<tr>
<td>Dissolved Oxygen</td>
<td>mg/L</td>
<td>&gt;0.5</td>
<td>&gt;3</td>
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<tr>
<td>pH</td>
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<td>6.5-8.5</td>
<td>7.0-8.5</td>
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<tr>
<td>Fecal Coliforms</td>
<td>MPN/100mL</td>
<td>10</td>
<td>200</td>
</tr>
<tr>
<td>Residual Chlorine</td>
<td>mg/L</td>
<td>0.8-1.5</td>
<td>0.05</td>
</tr>
</tbody>
</table>

* 26 more standards for metals and other parameters
The way to achieve the new standards

- **Organics, TSS, N & P** - Tertiary Treatment (WWTP)
- **Pathogens** - Disinfection (WWTP)
- **Metals** - Treatment at the source (Industrial pre-treatment)
- **Salt Removal** - Treatment at the source; Industrial pre-treatment & sea disposal of the brine
**Policy, Regulations and Standards**

**Industrial effluent quality (2014)**

*Require pretreatment at the plant before discharging to the public sewerage.*

- Protect the sewage system from damage and clogging
- Protect the biological process in the WWTPs
- Reduce contaminants from sewage and effluent

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**Graph:**
- Reduction in pollutants load over the years 2012 to 2014.
- Reduction in Na Conc. (mg/l) from 2013 to 2017 for a Beverage factory.
  - **Beginning of enforcement** date indicated.

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**Legend:**
- **Zinc**
- **T-P**
- **T-N**
- **Ammonia**
- **TOC**
- **Chloride**
- **Sodium**
- **Mineral oil**
Intensive large (>1000 m³/day) municipal WWTP

1994: 7
1998: 20
2002: 29
2007: 35
2010: 48
2017: 88

investment of over 5 billion $ in sewage collection, treatment & reuse in 20 years
Treated and utilized wastewater over time

- Total wastewater
- Treated effluent
- Utilized effluent
Municipal Wastewater Treatment in Israel

Total municipal sewage - 540 MCM
99% of the sewage is centrally collected
1% is discharged to cesspools in rural areas
97% is treated:
82% is reclaimed for reuse
18% is released to the rivers or sea
Conclusion

Israel is the leading country in the world utilizing treated wastewater for irrigation.

The quality of treated wastewater is high.

The reuse of treated wastewater for irrigation serves two main goals:
- reliable water source for agriculture even in drought years.
- protecting water resources and prevent stream pollution.

The high reuse of effluent in Israel led to new innovative technologies for wastewater treatment.

Thanks