Ministry of Environmental Protection

המשרד להגנת הסביבה

Municipal Wastewater Treatment in Israel

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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

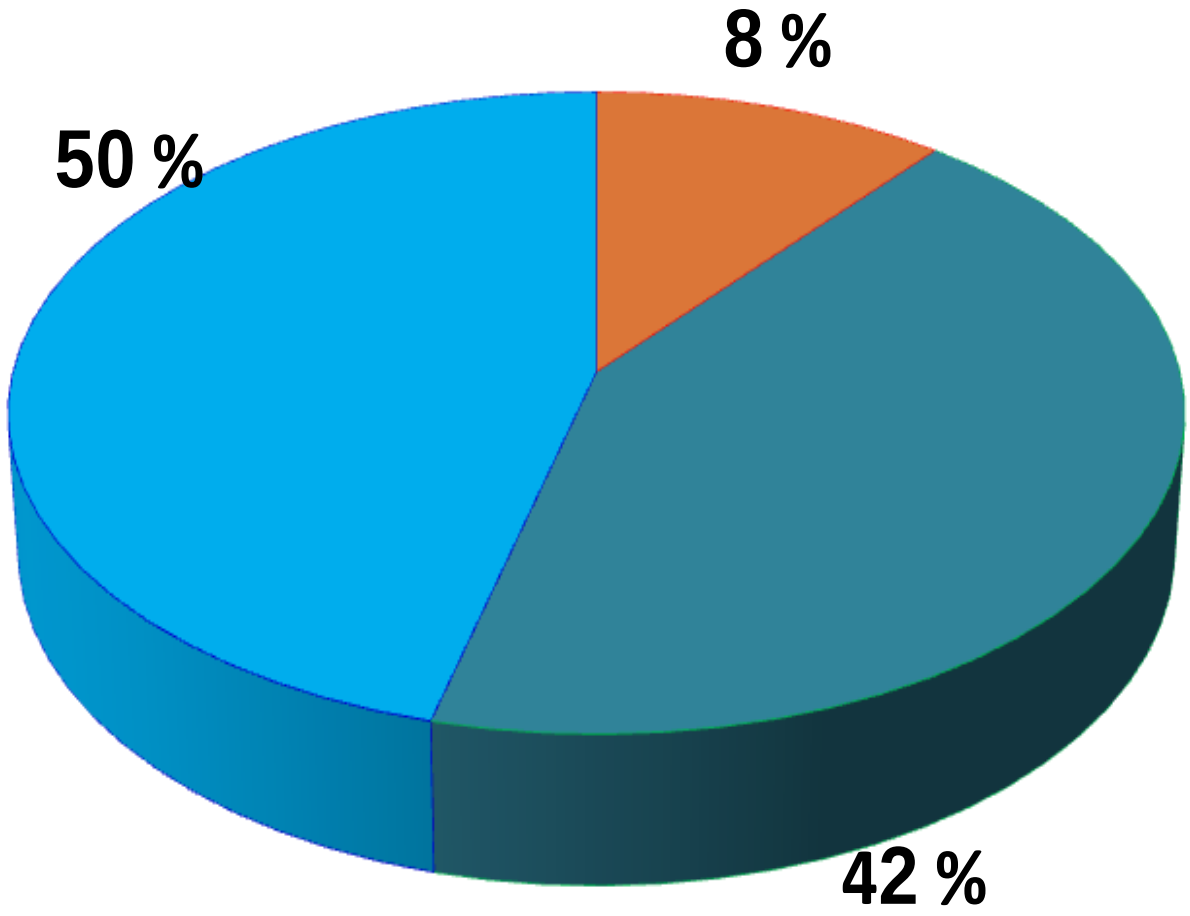
97% is treated:

82% is reclaimed for reuse

18% is released to the rivers or sea

Effluent quality

- primery treatment: BOD5 >20 mg/L; TSS >30 mg/L
- secondary tretment: BOD5 ≤20 mg/L; TSS ≤30 mg/L
- tertiary treatment: BOD5 ≤10 mg/L; TSS ≤10 mg/L; effluent disinfection; N&P reduction



Definitions

PRIMARY TREATMENT

OECD and AQUASTAT:

BOD5 removal of at least 20% and TSS removal of at least 50%

Israel: BOD5 >20 mg/L; TSS >30 mg/L

SECONDARY TREATMENT

OECD and AQUASTAT:

BOD removal of at least 70% and COD removal of at least 75%

Israel: BOD5 ≤20 mg/L; TSS ≤30 mg/L

TERTIARY TREATMENT

OECD and AQUASTAT:

BOD removal of at least 95% and COD removal of at least 85%

and at least one of the following: nitrogen removal of at least 70%;

phosphorus - at least 80%; faecal coliform density less than 1000 in 100 ml

Israel: BOD5 ≤10 mg/L; TSS ≤10 mg/L; F.Coli - 10/100 ml (for irrigation) and 200/100ml (for discharge to rivers) and nitrogen and phosphorus removal

Current Database System for WWTP

Regulation and business license requires:
Wastewater, Effluent and Sludge sampling and analyzes by WWTP laboratories and by independent laboratories

WWTP send analyzes results (excel files formats) to MoEP and to the other regulators

MoEP: Database System
Ministry of Health & Water Authority has a different database

MoEP: Reports of WWTP wastewater, effluent and sludge amount and quality

New Database System for WWTP (in developing)

Owners: MoEP - Ministry of Health - Water Authority

Wastewater, Effluent and Sludge sampling and analyzes by WWTP laboratories and by independent laboratories

Independent Laboratories and WWTP send analyzes results directly to the new Database System

New Database System

Regulators: Reports of WWTP wastewater, effluent and sludge amount and quality

Wastewater Reuse

National policy calls

for the gradual replacement of

freshwater allocations to agriculture

by reclaimed effluent

Wastewater Reuse

can cause significant risks to:

1. **Public health**
2. **Groundwater**
3. **Rivers and Sea**
4. **Soil and to agricultural crops**

Potential impacts of wastewater components

Water Sources & Public Health

- Organic pollutants
- Nitrogen, Phosphorus
- Chlorides
- Toxic compounds (heavy metals, organochlorines, etc.)

Plants & Soil

- High Salinity
- Sodification of the soil (SAR)
- Excess Boron
- Excess Nitrogen & Phosphorus

Israeli standards for effluent quality

- *Standards for 36 parameters*

- *The standards take into consideration: Environmental, Agricultural, Flora, Public Health & Hydro-geological Aspects*

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 (supply domestic water <150 ppm Cl^-); Desalination of treated effluent; Source separation – sea disposal***
- ***Boron*** — ***Supply of domestic water <0.2 ppm B; Reduce B content in detergents***

Effluent quality standards (Average)

Parameter	*Units*	Irrigation	Stream
BOD_5	*mg/L*	10	10
TSS	*mg/L*	10	10
COD	*mg/L*	100	70
Total Nitrogen	*mg/L*	25	10
Ammonia	*mg/L*	10	1.5
Total phosphorus	*mg/L*	5	1.0
Dissolved Oxygen	*mg/L*	>0.5	>3
pH		6.5-8.5	7.0-8.5
Fecal *Coliforms*	*MPN/100mL*	10	200
Residual Chlorine	*mg/L*	0.8-1.5	0.05

Treatment at the WWTP

Effluent quality standards - Heavy Metals

Parameter	*Units*	Irrigation	Stream
Arsenic	*mg/L*	0.1	0.01
Mercury	*mg/L*	0.002	0.0005
Chromium	*mg/L*	0.1	0.05
Nickel	*mg/L*	0.2	0.05
Lead	*mg/L*	0.1	0.008
Cadmium	*mg/L*	0.01	0.005
Zinc	*mg/L*	2	0.2
Copper	*mg/L*	0.2	0.02
Manganese	*mg/L*	0.2	
Cobalt	*mg/L*	0.05	

Treatment at the source

Effluent quality standards

Parameter	*Units*	Irrigation	Stream
Vanadium	*mg/L*	0.1	
Iron	*mg/L*	2	
Selenium	*mg/L*	0.02	
Aluminum	*mg/L*	5	
Molybdenum	*mg/L*	0.01	
Beryllium	*mg/L*	0.1	
Lithium	*mg/L*	2.5	
Cyanide	*mg/L*	0.1	0.005
Hydrocarbons	*mg/L*		1.0
Anionic surfactants	*mg/L*	2.0	0.5

Effluent quality standards - Salts

Parameter	*Units*	Irrigation	Stream
Electrical Conductivity	*dS/m*	1.4	
SAR	$(mmol/L)^{0.5}$	5	
Chloride	*mg/L*	250	400
Sodium	*mg/L*	150	200
Boron	*mg/L*	0.4	
Fluoride	*mg/L*	2	

Treatment at the source

Treatment processes for upgrading WWTPs

Nitrogen removal:

- anoxic/aerobic biological processes

Phosphorus removal:

- anaerobic/aerobic biological processes
- chemical precipitation

Residual constituents removal:

- coagulation/flocculation
- filtration (depth and membrane)

Effluent disinfection:

- chlorination (and dechlorination)
- UV

Centralized or Decentralized Wastewater Treatment ?

National policy calls for the traditional concept of wastewater management:

wastewater collection systems

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wastewater and sludge treatment in central treatment plants

Wastewater treatment processes used in Israel

Preliminary treatment:

- **Screening: coarse screens (10-25 mm) and fine screens (1-6 mm)**
- **Grit removal**
- **Flow equalization**

Wastewater treatment processes used in Israel

Primary sedimentation (circular and rectangular tanks)
Detention time: 1.5 – 2.3 hr;
Removal efficiency: TSS 55 – 65% BOD_5 25 – 28%

Wastewater treatment processes used in Israel

- Biological treatment:

- **Activated-sludge processes (conventional activated-sludge process; extended aeration; SBR- sequencing batch reactor;**
- **Fixed-film reactor – rotating biological contactor**
- **MBBR -Moving Bed Biofilm Reactor (Aqwise biomass carriers)**
- **Membrane Bioreactor (MBR) systems**
- **Multi Stage Biological System**
- **Stabilization ponds - for small WWTPs**

Activated-sludge

Rotating biological contactor

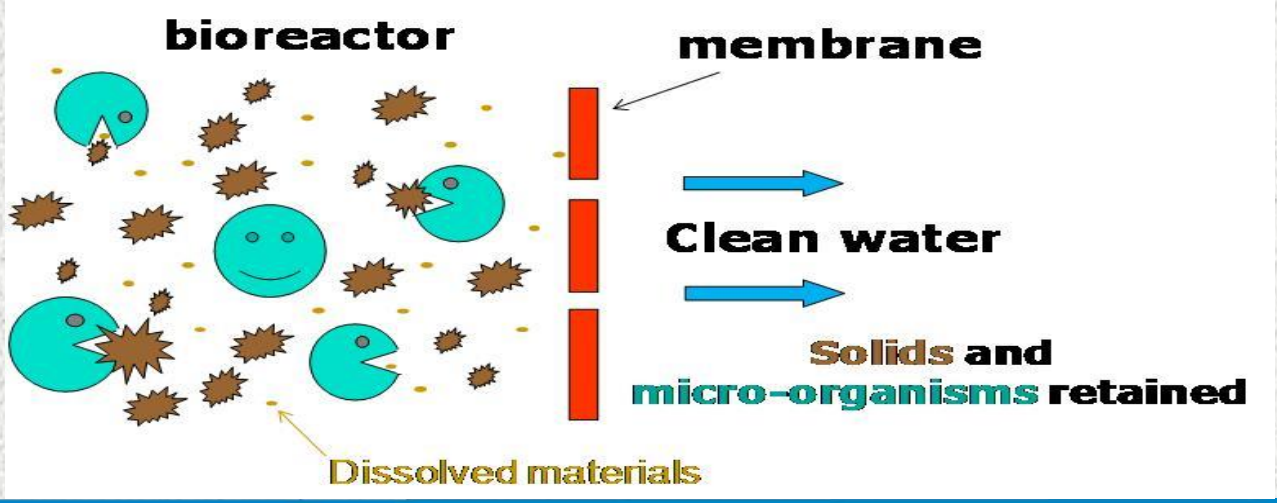
Aqwise biomass carriers

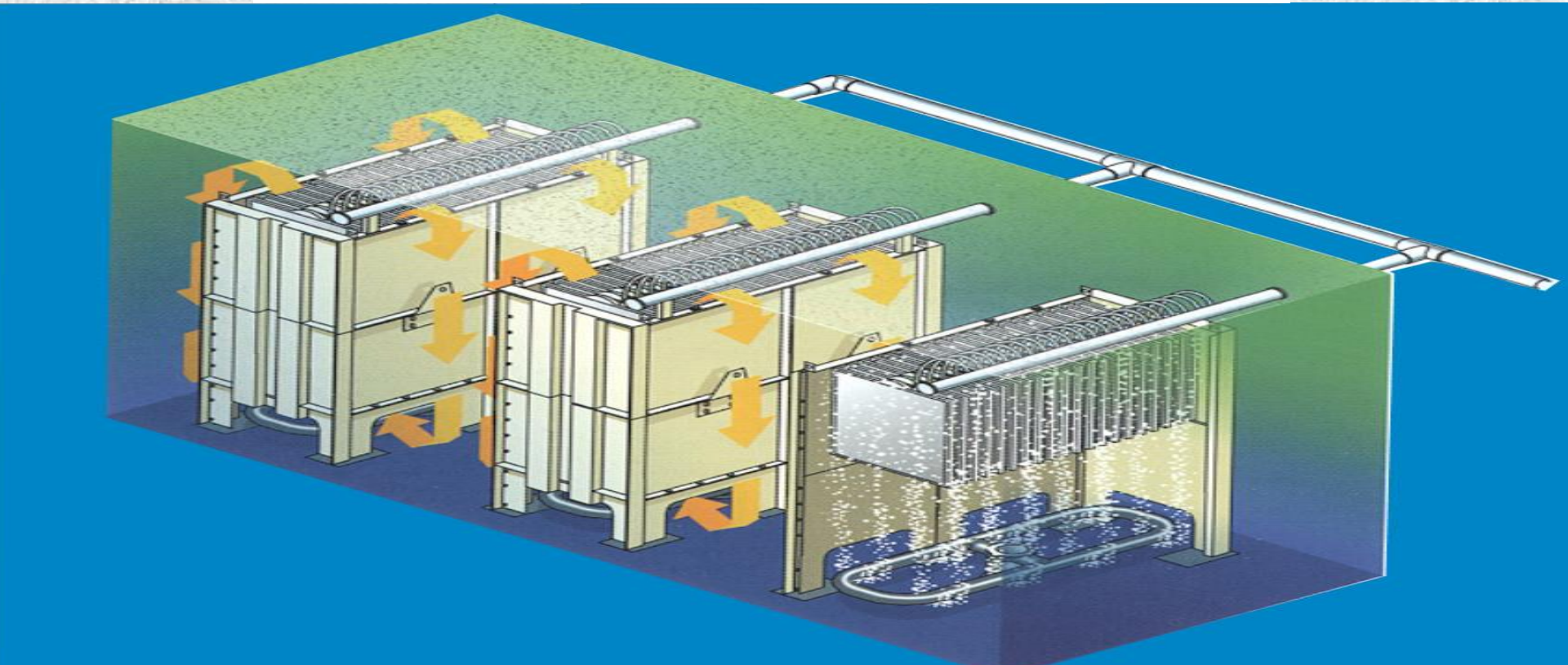
Populated and new biomass carrier

Wastewater treatment processes used in Israel

- Secondary clarification (circular and rectangular tanks)
- Effluent filtration (gravity granular-media filtration and pressure filtration)
- Effluent disinfection (chlorination and UV)

Membrane Bioreactor (MBR)





Waste stabilization ponds

Widespread method for small WWTPs in Israel

Anaerobic ponds: **BOD5 volumetric loading rate: 150 – 350 g/m^{3}d**

Facultative ponds: **BOD5 surface loading rate: 15 – 35 g/m^{2}d**

Aerobic ponds: **BOD5 surface loading rate: 5 – 15 g/m^{2}d**

Aerated ponds: **BOD5 volumetric loading rate: 40 – 150 g/m^{3}d**

Secondary Effluent Filtration

- Granular media filtration
- Membrane filtration (MF and UF)
- Soil-aquifer treatment (SAT) system

Effluent Disinfection

- Chlorination
- Ultraviolet Radiation


THANK YOU