SWIM and Horizon 2020

Working for a Sustainable Mediterranean, Caring for our Future

STEPS towards WATER SENSETIVE CITIES

Presented by: Dr Yaron Zinger, ISRAEL

Urban Runoff - Creating a Resource out of Nuisance

"Drought Risk Management (DRM) Mainstreaming" regional training

Athens, Greece, 14-15 December 2016

Key challenges to urban living

Water extremes & vulnerabilities

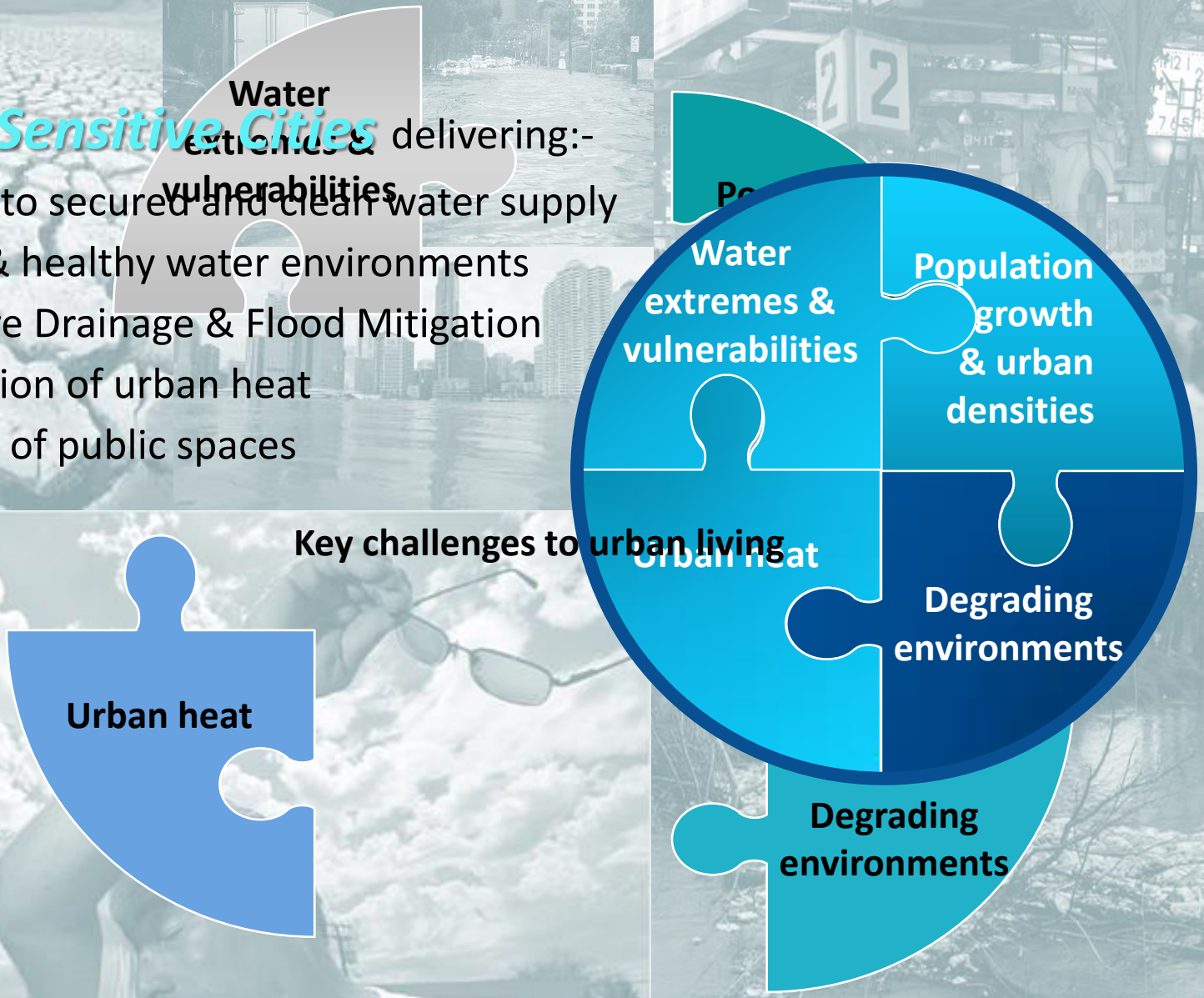
Uncontrolled population growth & poor urban planning

Urban heat

Degrading environments

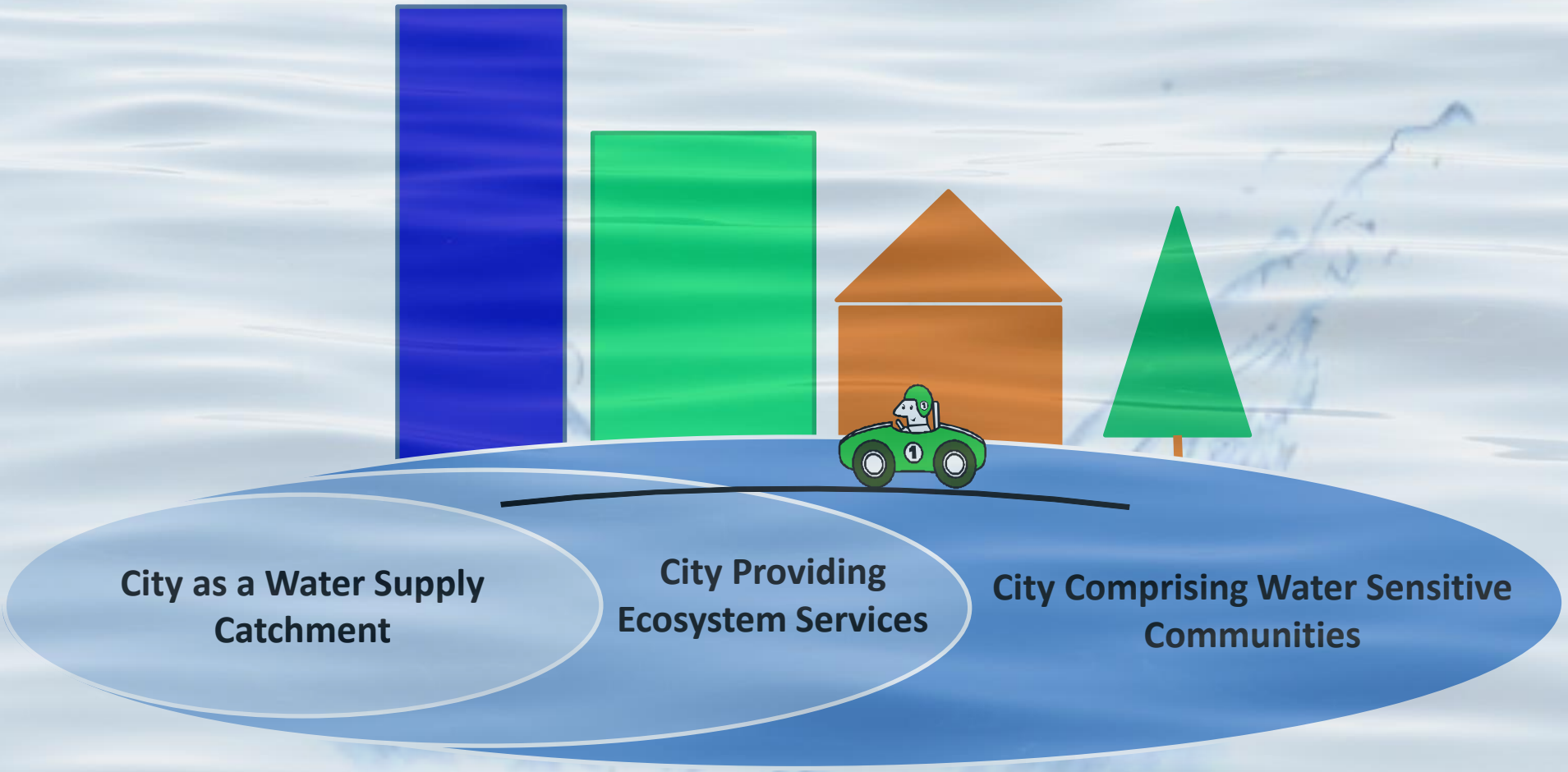
Water Sensitive Cities delivering:-

- Access to secured and clean water supply
- Clean & healthy water environments
- Effective Drainage & Flood Mitigation
- Mitigation of urban heat
- Quality of public spaces



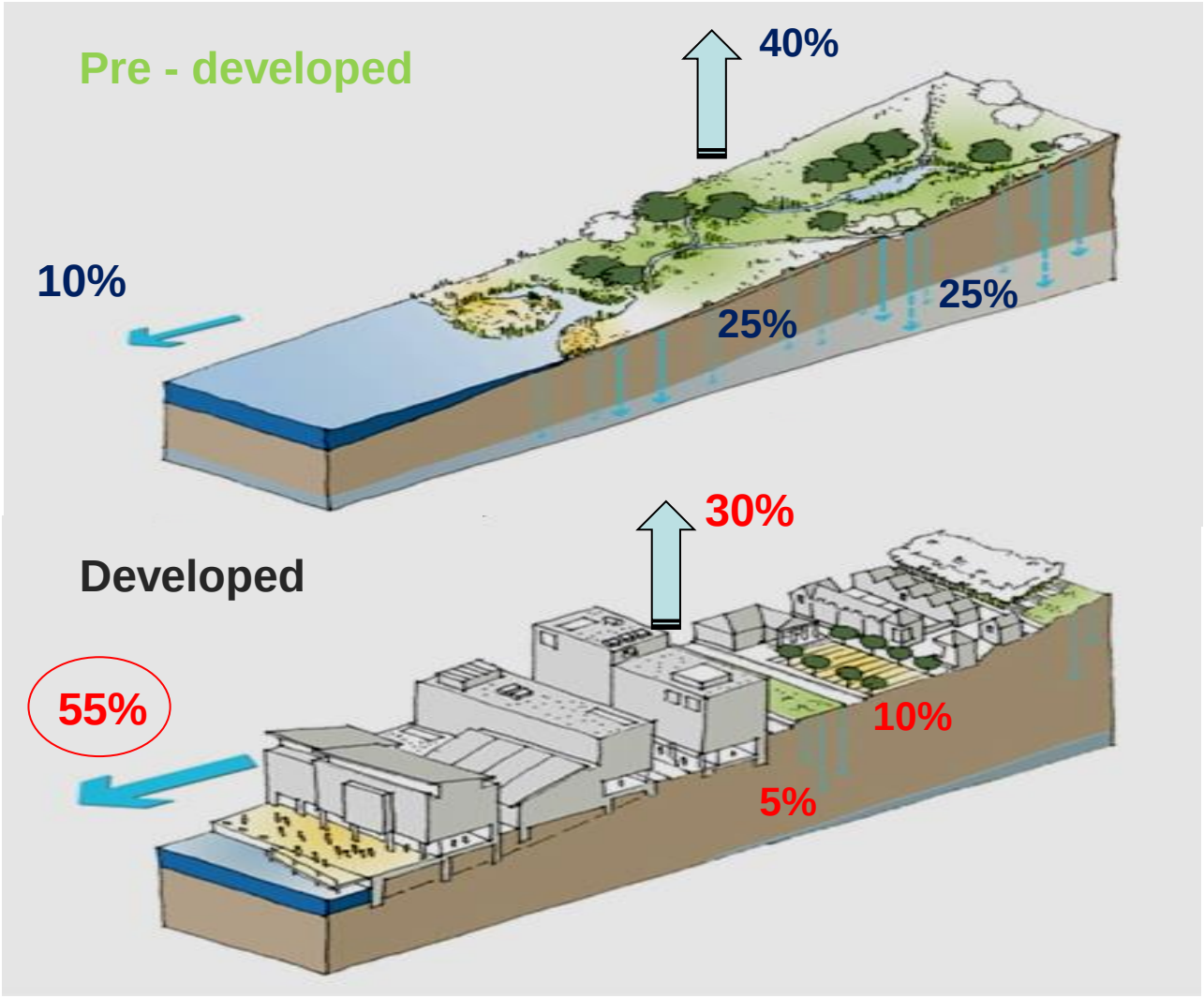
Key challenges to urban living

What is Water Sensitive City?

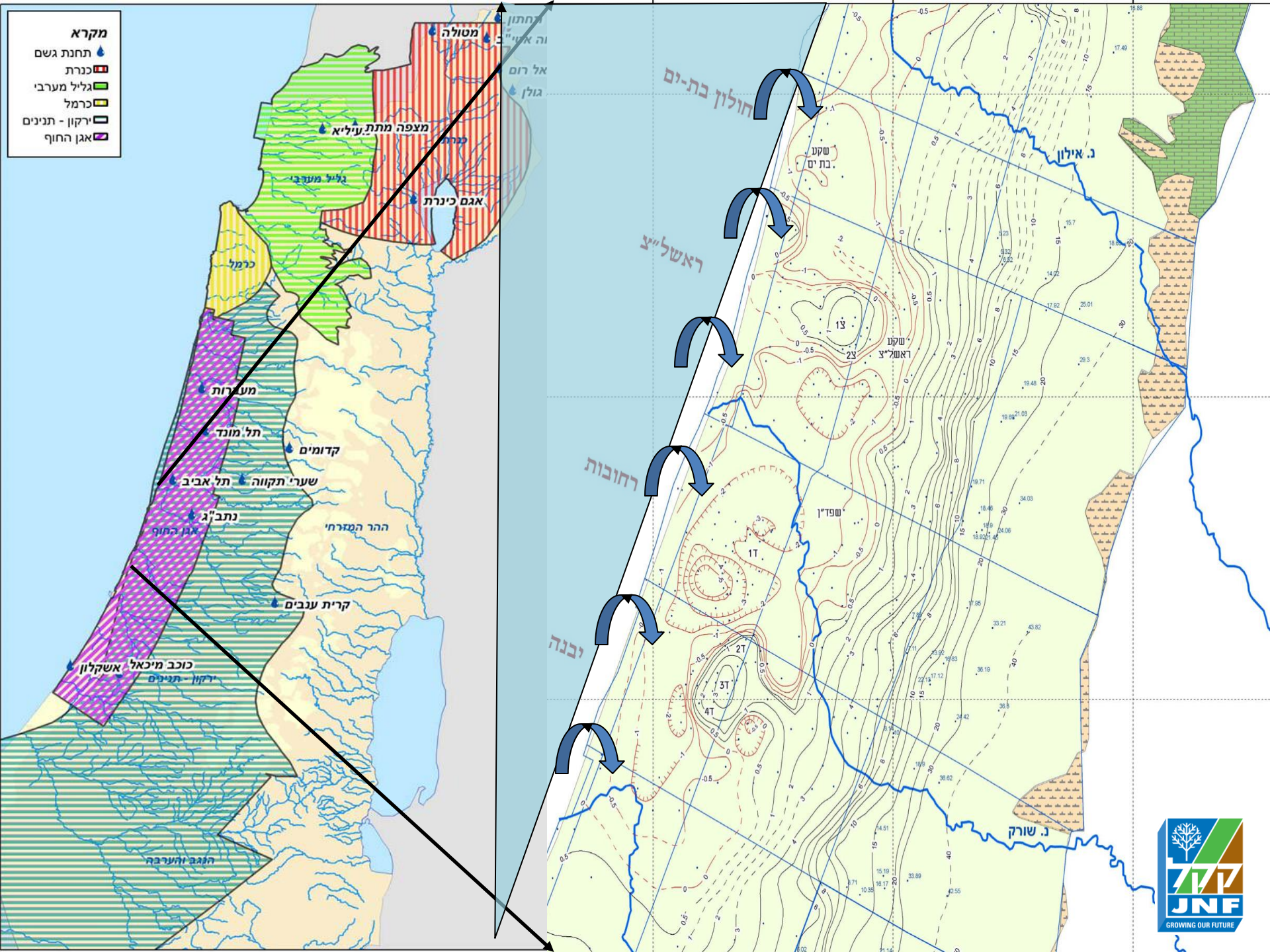


- 60% of the world's population will be urban by 2020 (80% by 2050)
- Urbanised area above the coastal aquifer is about to double its size from 250 to 500 km^2 by the year 2020 since the 90's producing ~ 120GL
- Annual rainfall in Israel is expected to decrease by 10%-15%
- Israel will become 1-1.5 degrees ^{C} hotter in the next few decades

Urban Hydrology - Cause



Stormwater discharge to the sea


מקרא
תחנת גשם
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מטולה
מצפה מתת
עילי"א
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גליל מערבי
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שערי תקווה
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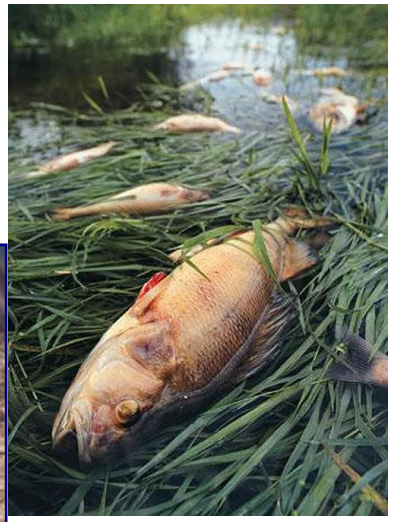
GROWING OUR FUTURE

Problem: Excess of **Nutrients** leads to **Eutrophication**

Excess of N & P in stormwater is considered the main causes of Eutrophication in Austra er bodies around the world



Excess of N, P

Algal bloo

O2 depletion

Animals suffocate

Eutrophication

Treating urban stormwater !

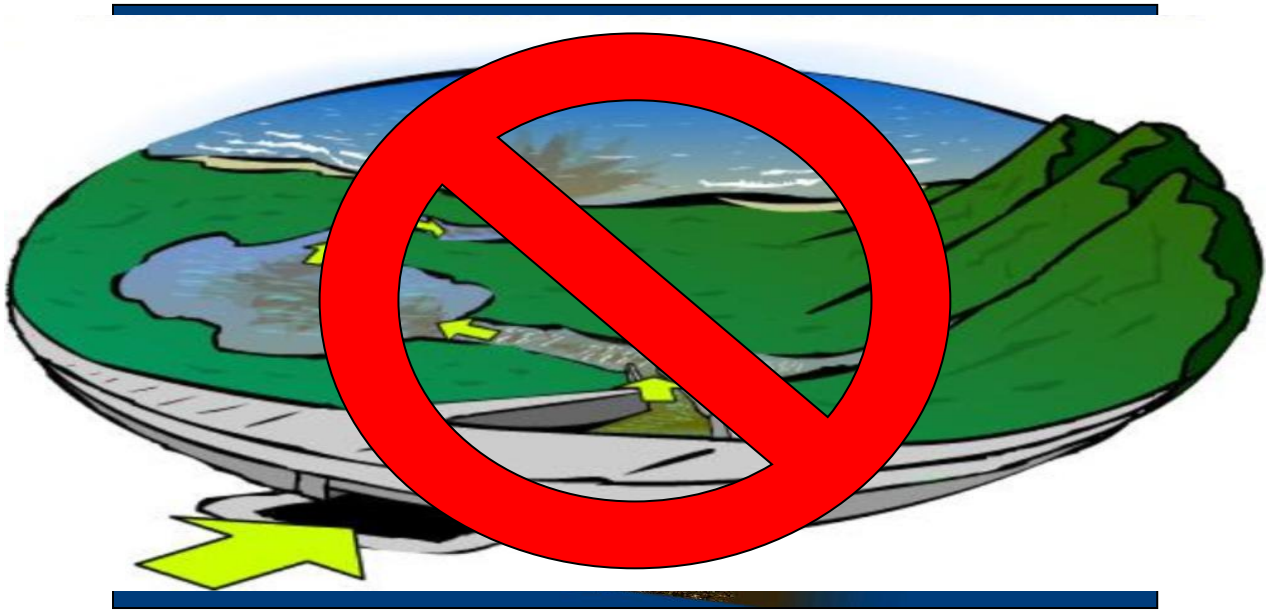
Northern & south eastern part of the Caspian Sea

Blue-green algal bloom

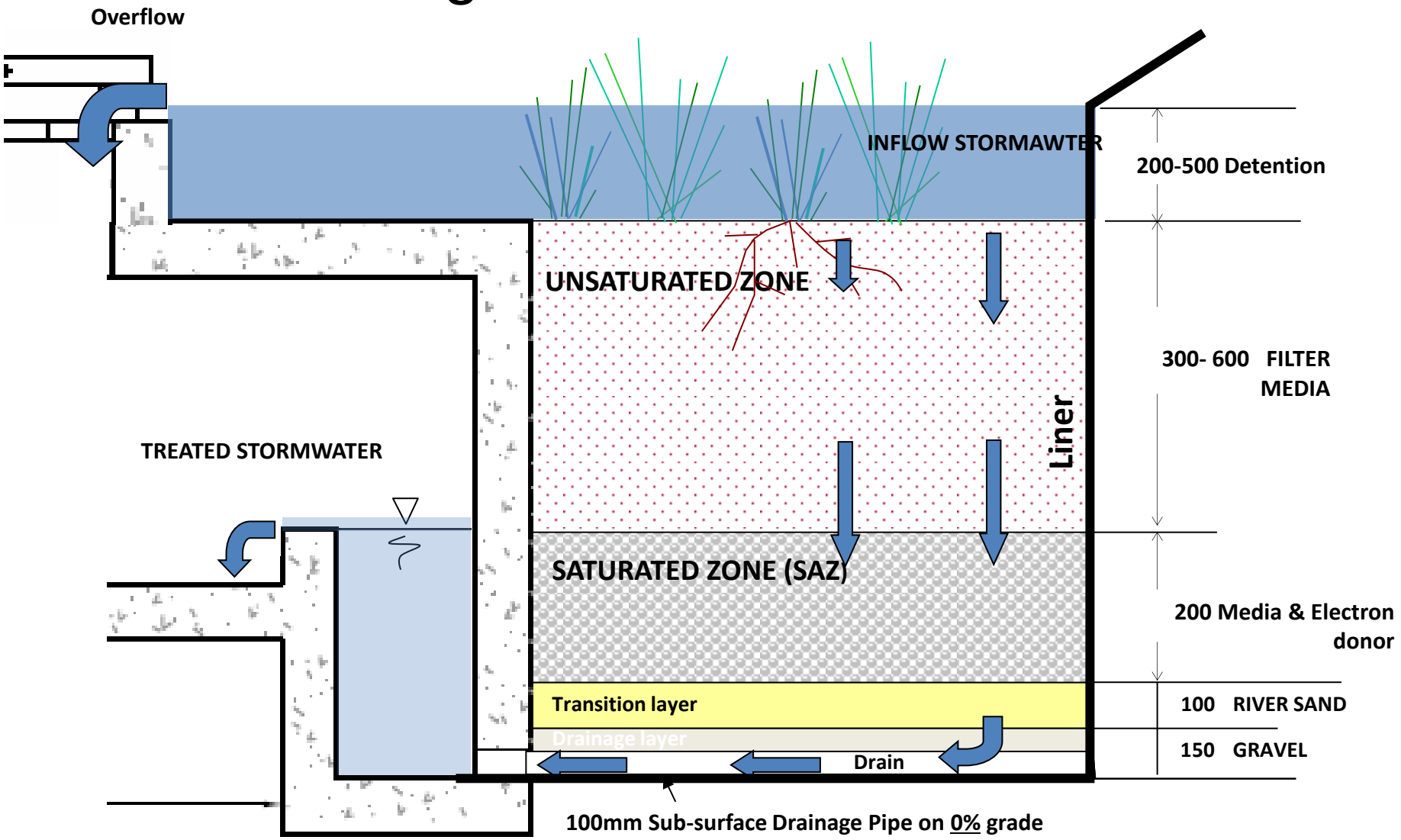
Problem: Urban Runoff water quality

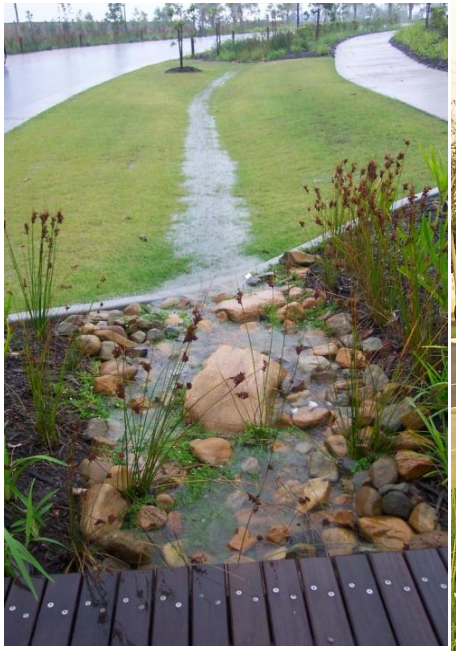
Stormwater contains high concentration of dissolved and particulate **Nutrients (N & P), range of Heavy metals** (e.g. **Cd, Pb, Zn and Cu), wide spectrum of Metals and Pathogens.**

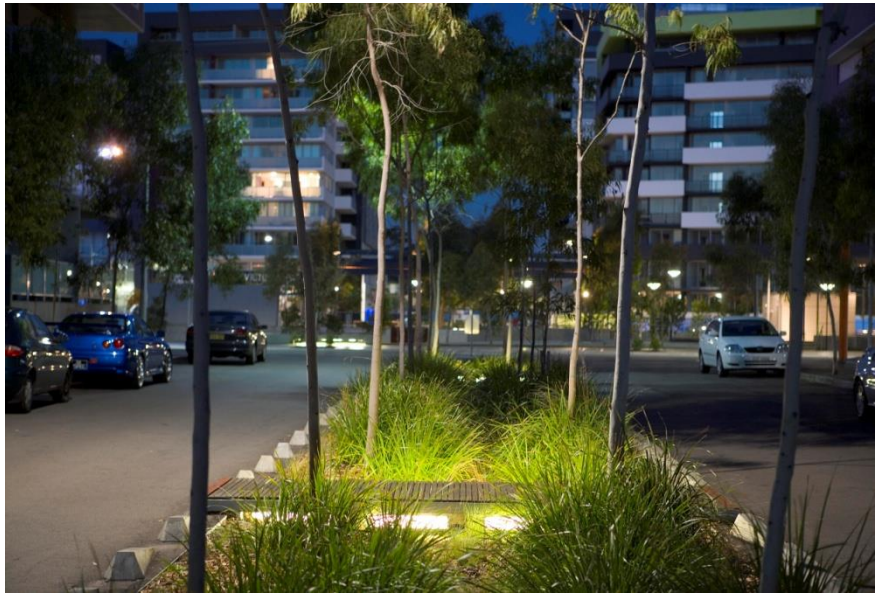
In ***biofilters***, those compounds could be removed mainly by treatment train via the biofilter layers



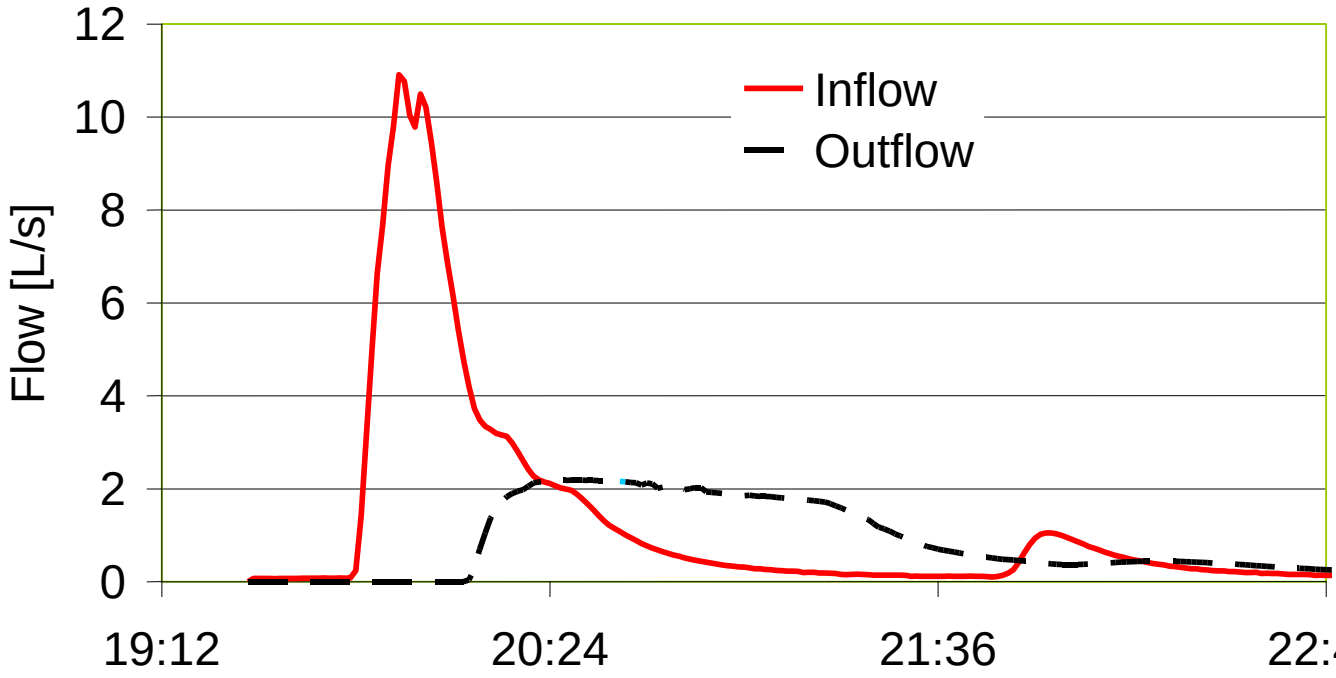
2nd generation Biofilters





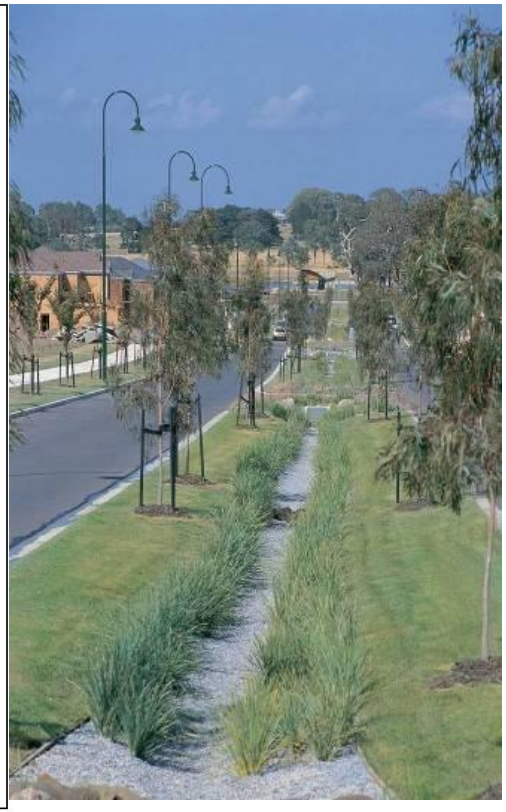



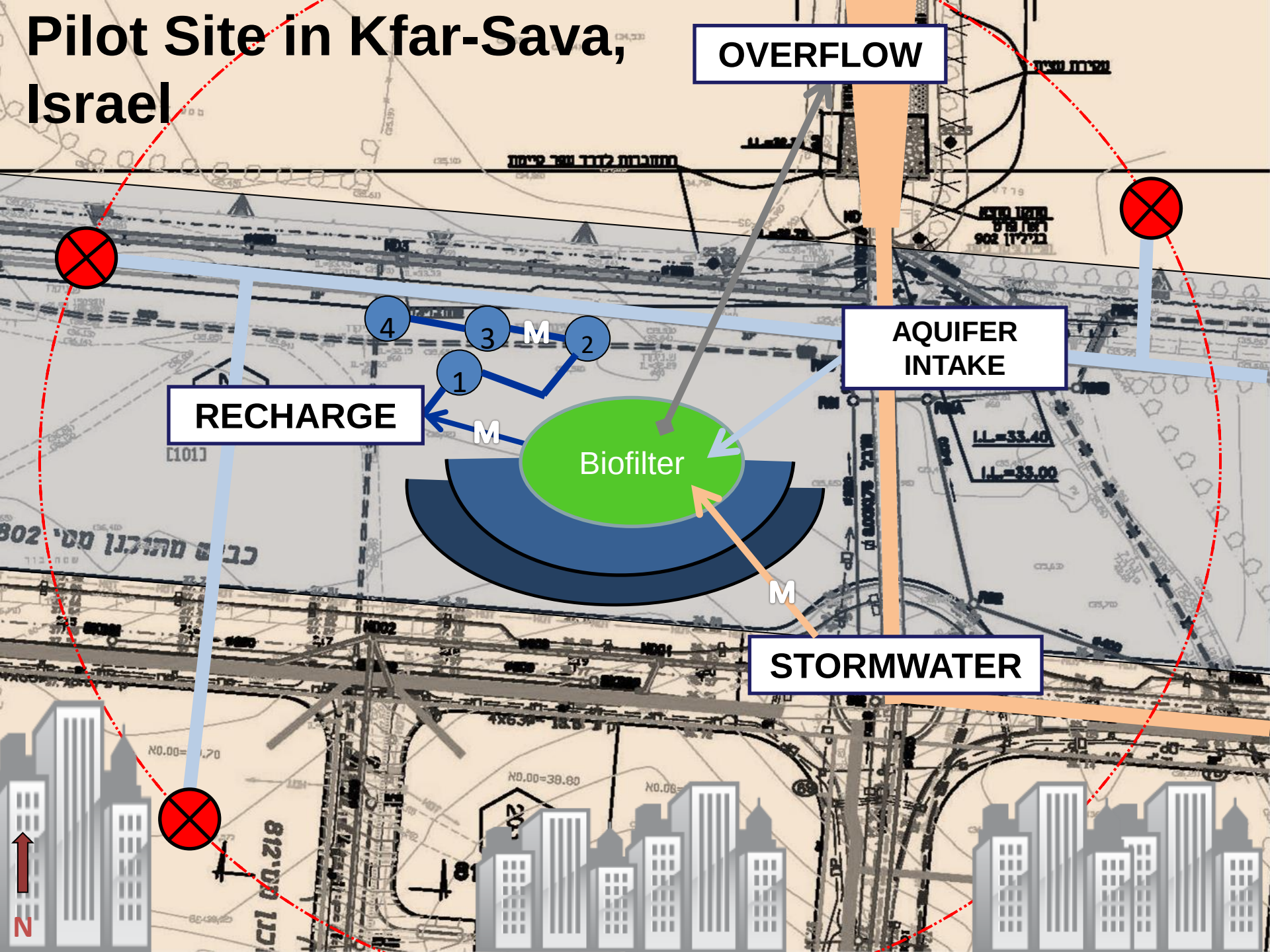

At source solution



Large scale biofilters:

The Lynbrook Estate stormwater management scheme, Melbourne AUS




Pilot Site in Kfar-Sava, Israel
OVERFLOW
AQUIFER INTAKE
RECHARGE
Biofilter
STORMWATER
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3
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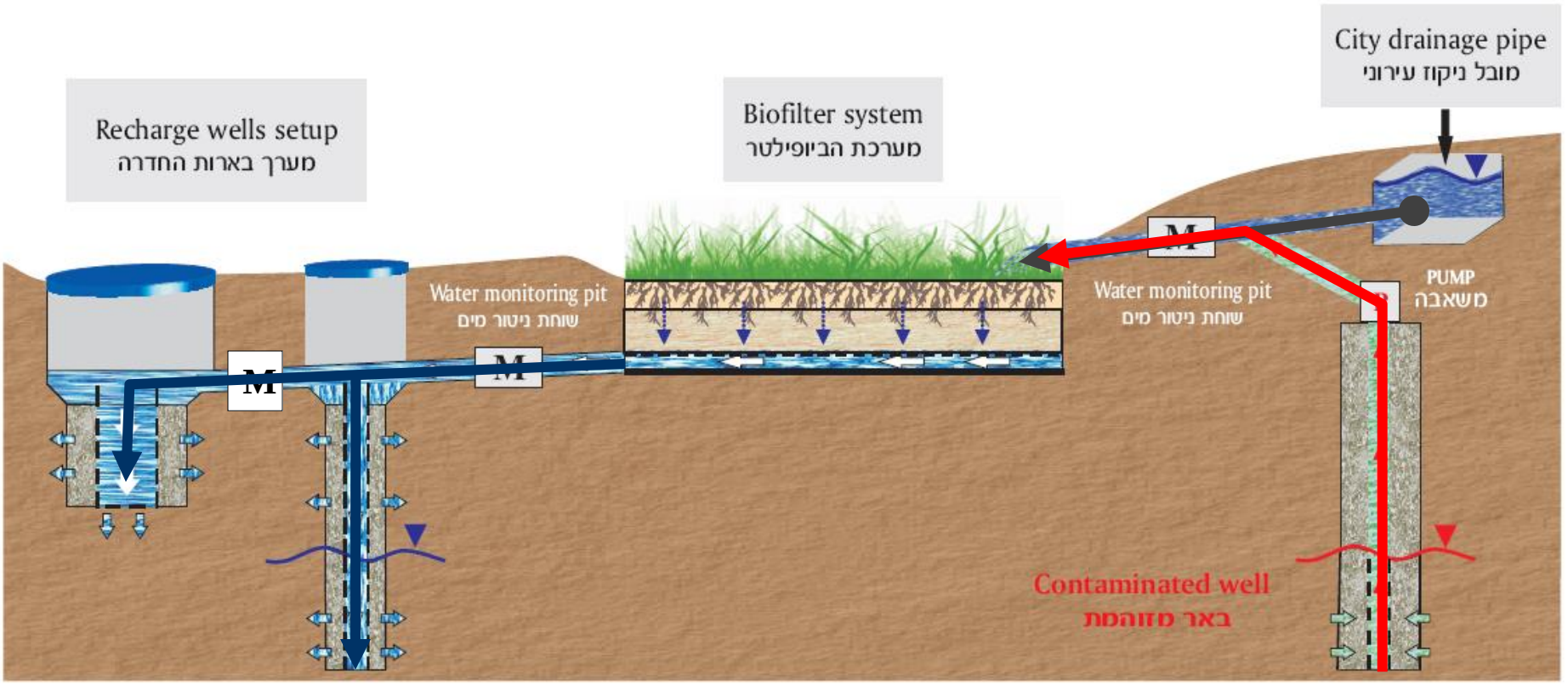
2
1
M
M
N

Dual mode operation:



Monitoring: EMC for Heavy metals (26 elements), TSS, TOC, TKN, NO_3, NO_2, NH_3, TP, PO_4, pH, EC and pathogen indicators
(*E.coli*, Faecal coliforms, and total coliforms).

Kfar-Sava Biofilter site

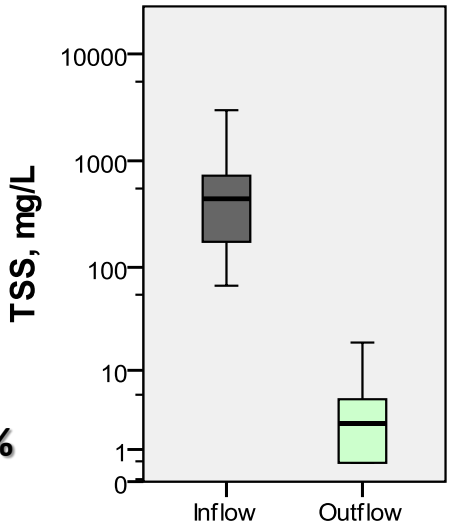
Results

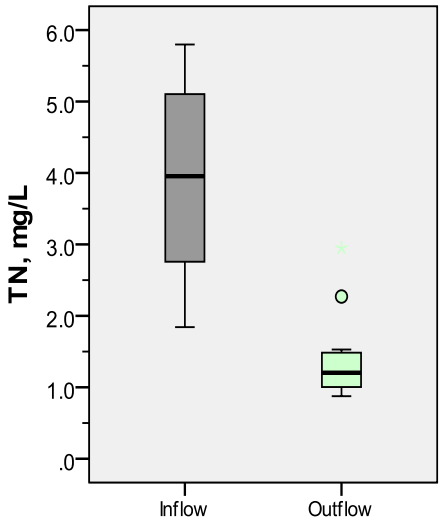
Monitoring: Oct' 2010 – May 2015

Bat-Yam biofilter

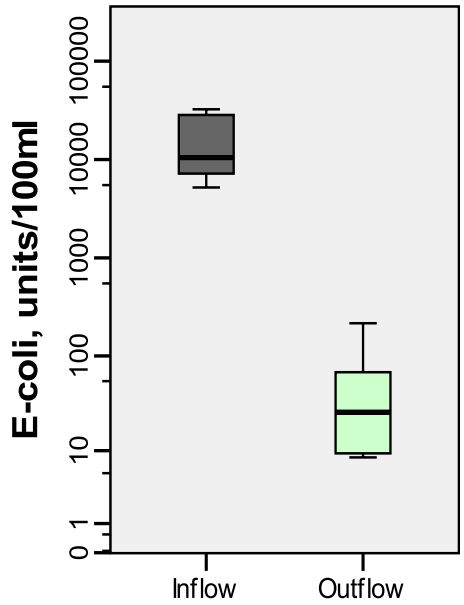
Kfar-Sava biofilter

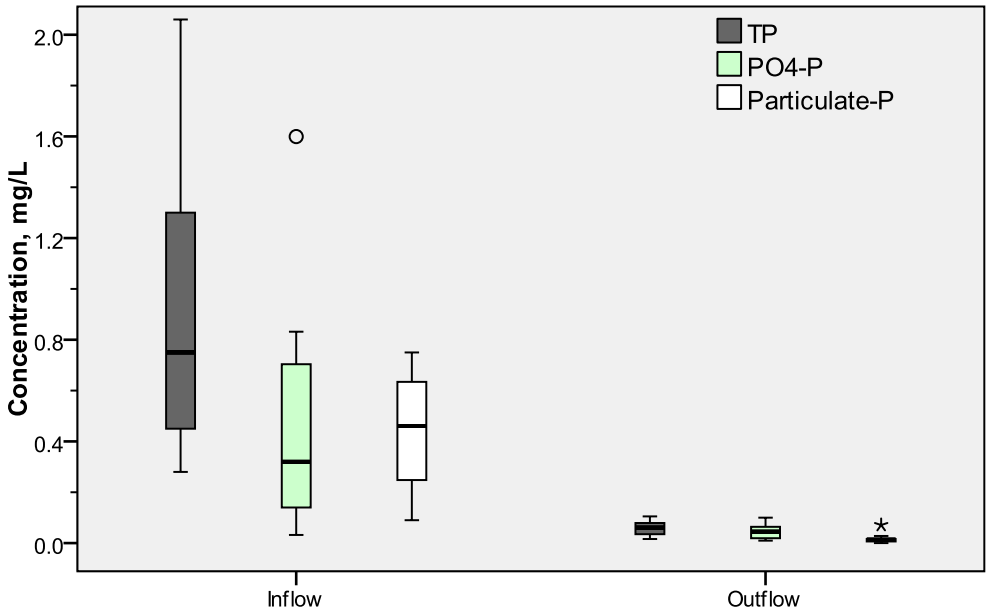
TSS median removal = **99.5%**





TN median removal = **70%**



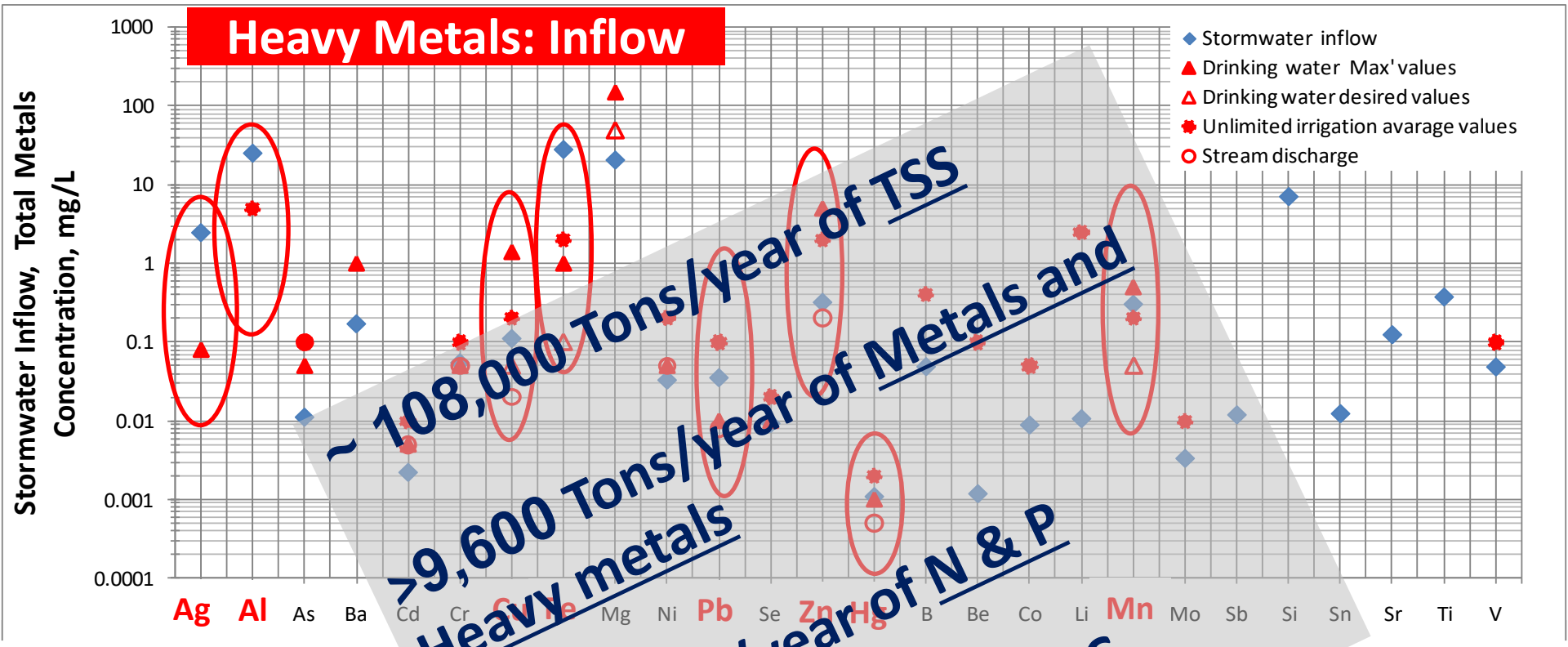


TP median removal = **92%**

PO_4 median removal = **88%**

>3.2 Log Reduction of **E-coli** and **Fecal Coliforms**

Heavy Metals: Inflow

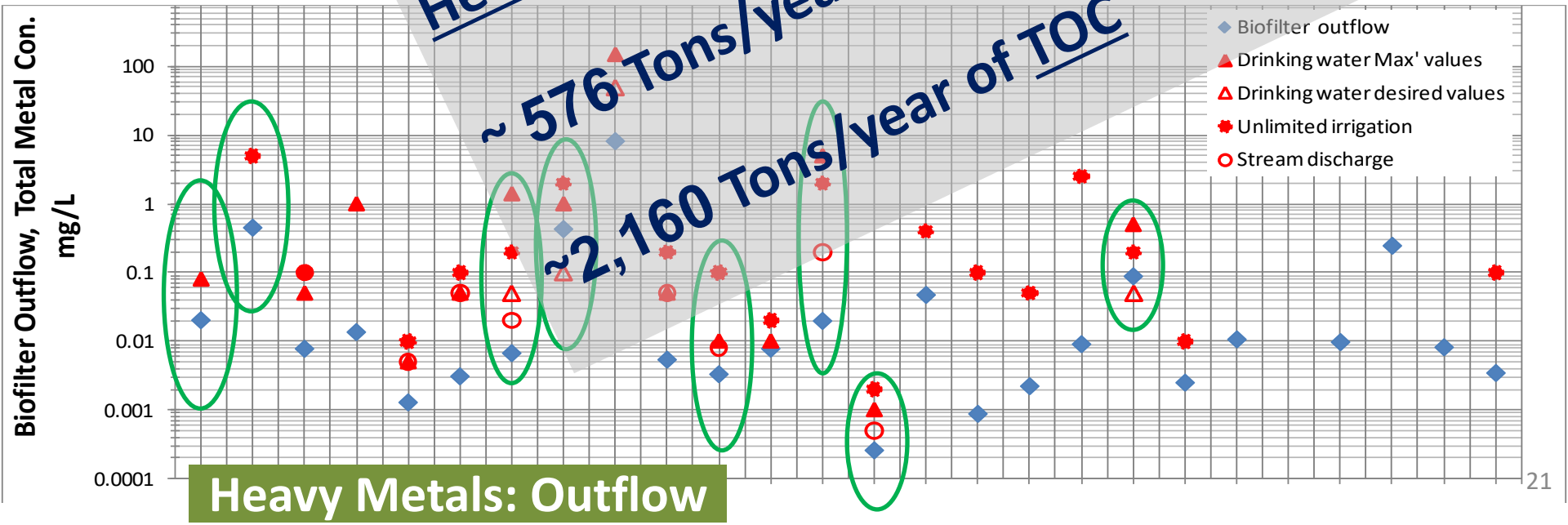


~ 108,000 Tons/year of TSS

>9,600 Tons/year of Metals and Heavy metals

~ 576 Tons/year of N & P

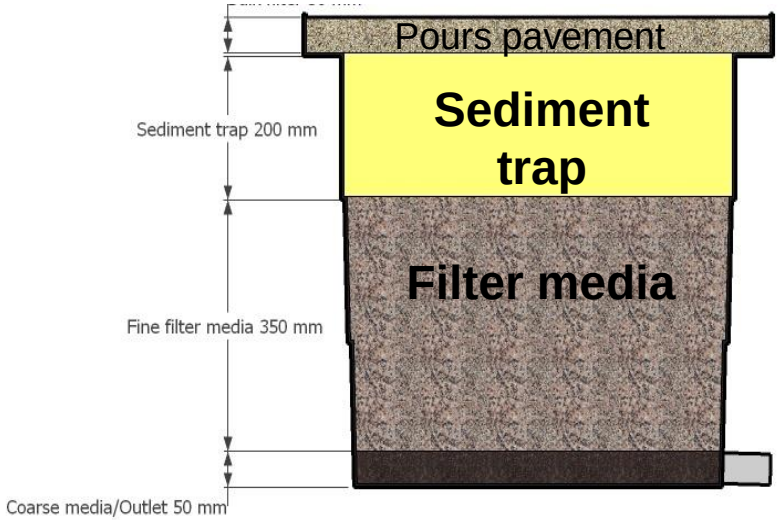
~2,160 Tons/year of TOC

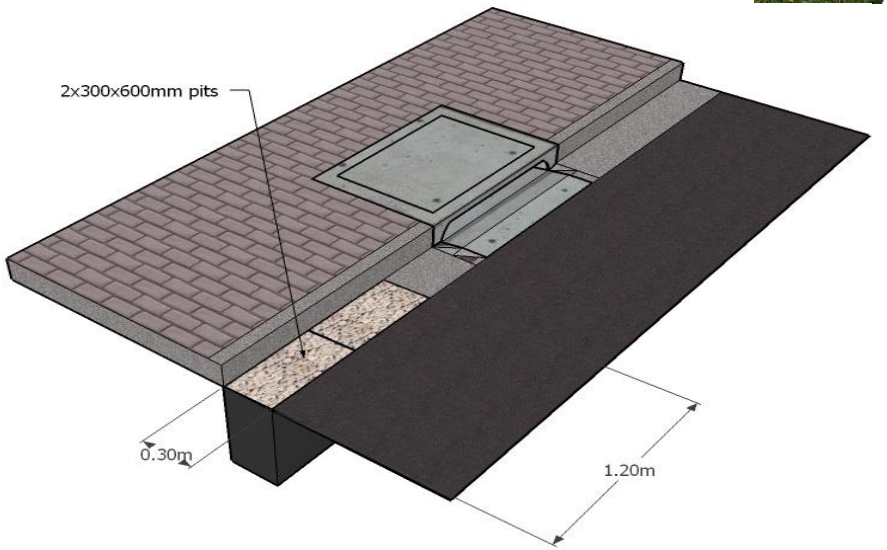


Heavy Metals: Outflow

Modular Biofiltration Systems

: Absorption removal principle





Modular Biofilters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Ramla Biofilter

20

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Fil

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Biofilter benefits

- **Protects receiving waters**:
- **Allows urban runoff reuse**
- **Green technology – natural and local materials, no energy involved**
- **Long life span which require refreshing every 25-35 years**
- **Adds to the urban landscape biodiversity and property value**
- **Reduces overall effluent** - reduced investment in Infrastructure;

Biofilter benefits

- **Versatile implementation** (e.g. pits, trenches, basin…etc')
- It can be easily **retrofitted** as well as **installed** in new developments;
- The biofiltration system can be **easily maintained** for extensive periods.
- **Reduce roads erosion - low maintenance**
- **Modular solutions (e.g. petrol stations)**
- **Reduction of Heat Island Effect via reduction surrounding temperature by 4 C°.**
- **Holds a social and educational benefits**

Main Conclusions and Perspectives:

1. **Urban Stormwater must be treated for discharge to streams and/or the sea, irrigation, aquifer recharge application.**

2. Biofilter treatment met water quality guidelines for streams and sea discharge and irrigation

3. Biofilter met drinking water guidelines for chemical and toxins parameters (not pathogens).

4. Biofiltration costs >14% LESS compared to the current desalination costs in Israel.

PROOF OF CONCEPT

Urban Runoff Potential in Tel-Aviv

City Total Water Demand
44 GL/year

Annual rainfall
~ 31.2 GL/year

Tel-Aviv

Water recycled
27.5 GL/year

Urban Runoff
~ 23 GL/year

1 Giga L/year = 1 Million m^3/year

SWIM and Horizon 2020

Working for a Sustainable Mediterranean, Caring for our Future

Thank U for Having me
Qustion pls

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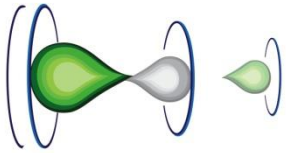
The Center for Water Sensitive Cities in Israel

המרכז לערים רגישות מים בישראל



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