

# TEL AVIV: ALTERNATIVE HYBRID UF-SAT OR SAT-NF TREATMENTS TO UPGRADE EFFLUENT QUALITY



## DESCRIPTION OF THE PROJECT

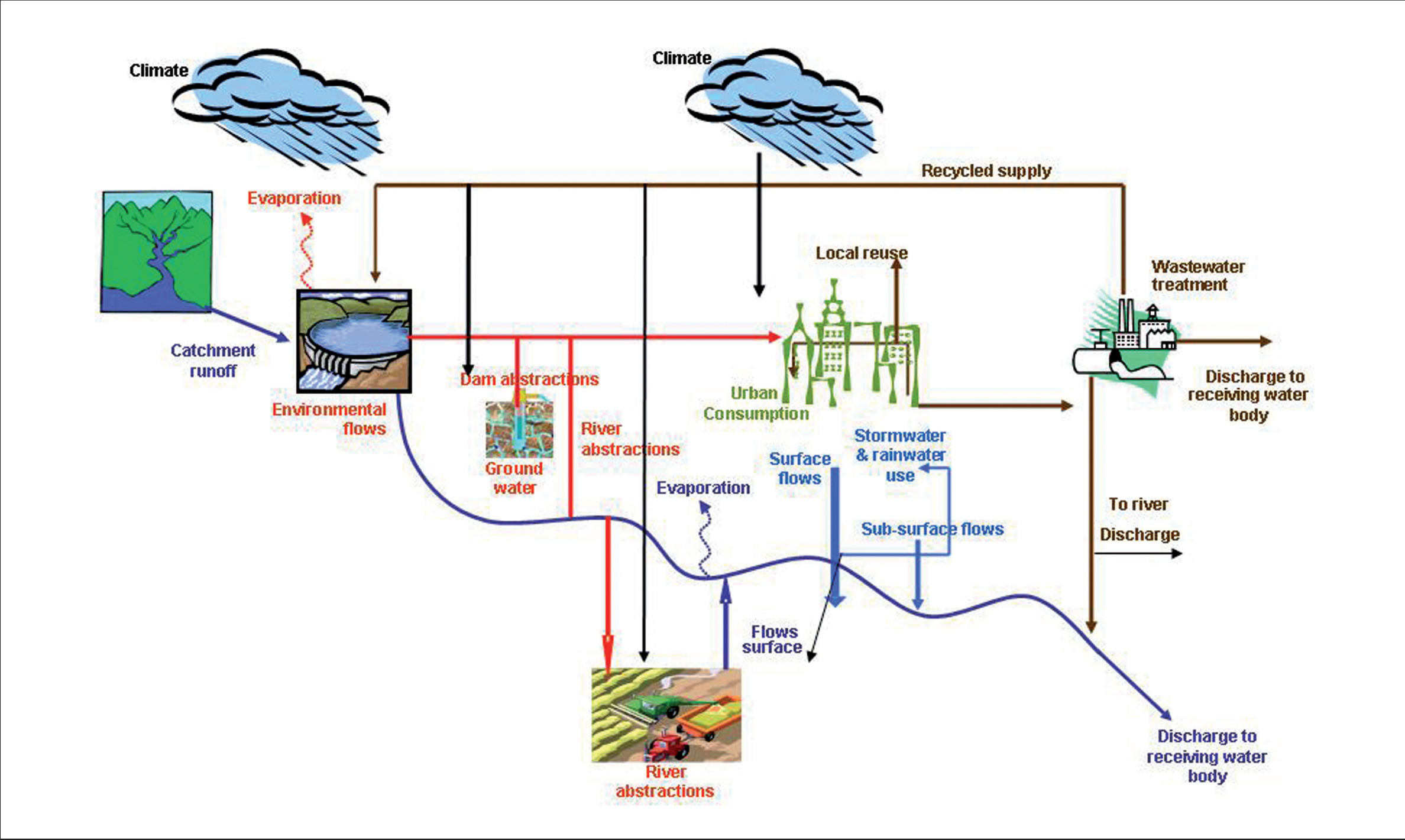
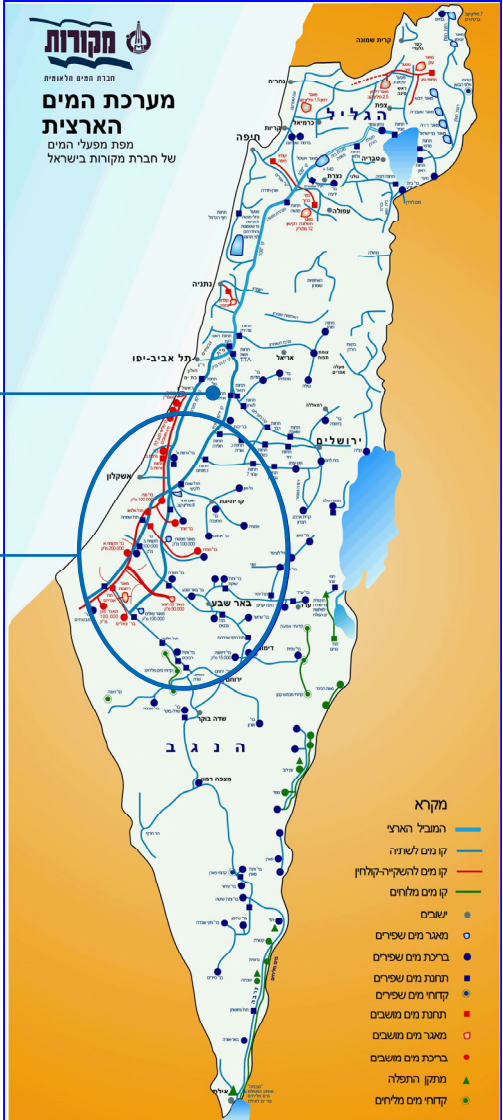
### The main water problems in Israel are:

- Pollution and salinisation of part of the coastal aquifer due to the intensive urbanization Industrial pollution and agriculture activities.
- Change from extensive to intensive wastewater treatments methods.
- Scarcity of natural water sources that requests very high effluent reuse The SAT project is part of the Shafdan Reclamation project together with the WWTP (see Figure 1).

Figure 1. Geographic location of the Shafdan project and SAT-NF project

Shafdan WWTP and Reclamation Project

Third Line supply area



## POTENTIAL IMPACT

The SAT system reclaims 140 MCMY enabling the use of an equivalent amount of fresh water for drinking water purposes only. The SAT treated very high quality water is used for unrestricted irrigation. The alternative SAT treatment will help to overcome the lack of land for infiltration at increasing amount of effluents for reuse

## PROBLEMS IN THE SAT SYSTEM:

### During the 30 years of operation:

1. Deterioration in Recharge Capacity (OM, Temp, Rain)
2. Bio-fouling of Effluent Pipelines( Before and after SAT)
3. Mn and Fe oxides due to anaerobic conditions in part of the SAT system cause clogging problems in irrigation systems
4. No more new lands are available for infiltration !!

## SUGGESTED SOLUTIONS

### Hybrid UF-SAT or SAT-NF treatments

In order to improve the current extensive method (conventional SAT) and be able to infiltrate more effluents in a given infiltration area two EU Research projects were started in 2005-2006:

- The RECLAIM project: UF- short SAT
- The SWITCH project: short SAT-NF

### Partners and LA members

Partners: Gary Amy (IHE), Mathias Ernst (TUB) and Avner Adin (HUJI)

LA members: The Water Authority, The Dan Region Association of Towns, T.A. Municipality, Health Ministry, Interior Ministry, Farmers Association, NGO, HUJI. Mekorot.

## SWITCH SHORT SAT-NF PILOT PLANT IN SHAFDAN



Figure 2. Location of the SWITCH pilot plant

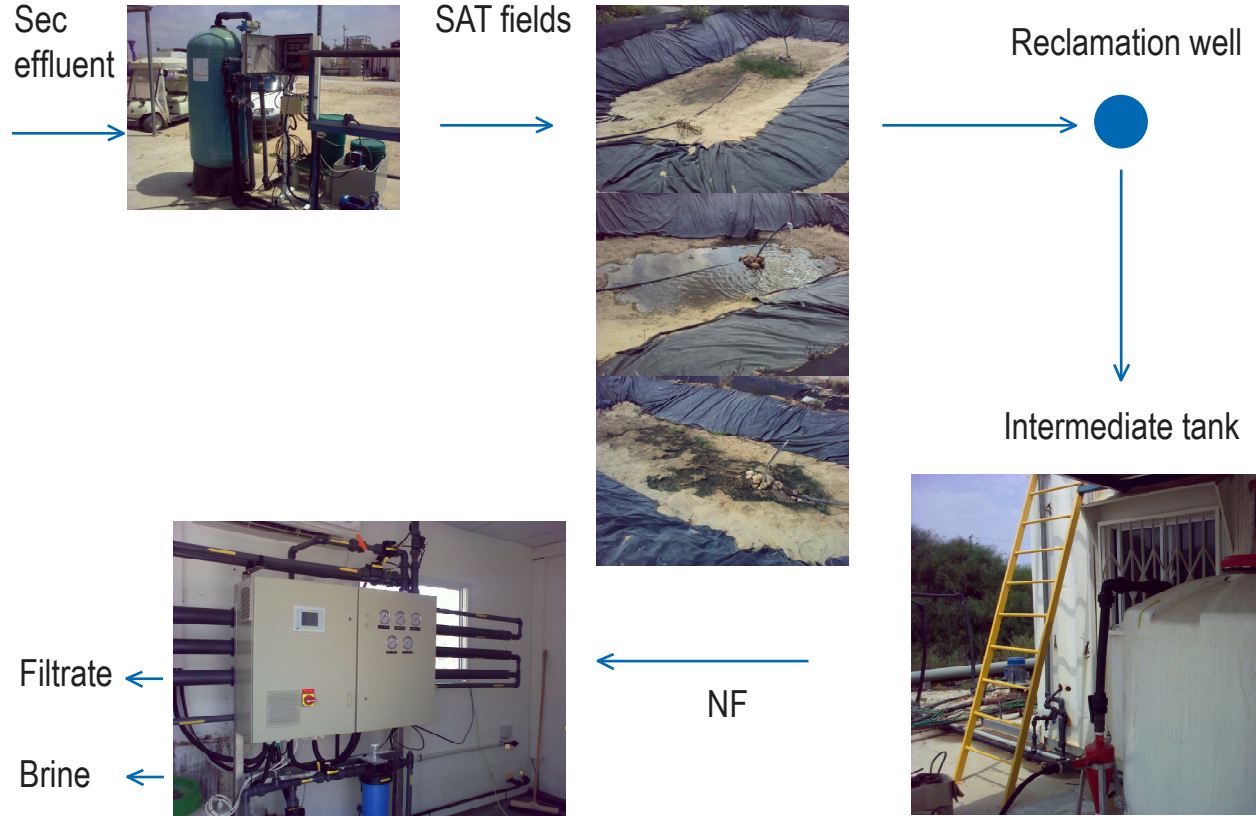


Figure 3. SWITCH pilot plant

## SWITCH pilot – Status and intermediate results:

- Completion of 2 bromide tracer tests (see fig. 4) showing for the OW (5 m. from SAT) a retention time in the aquifer of 20 days and for the reclamation well (15 m. from SAT) a retention time of 35 days.
- September 2008: The first infiltration tests with sand filtered secondary effluents
- Effluents after sand filtration around 1 NTU and 1 mg/l TSS (see Table 1) as a result no clogging of the fields is seen even at 3-4 m/d infiltration velocity.
- Beginning November 2008:
  - Analyses of the first samples after SAT to check if the polysaccharides and other clogging material had been retained by the sand filter and the short SAT
  - Conventional analysis of the sample after short SAT (35 days retention time) show very good removal of P,N and C (Table 1).
- Mid- November 2008: Operation of the NF membrane

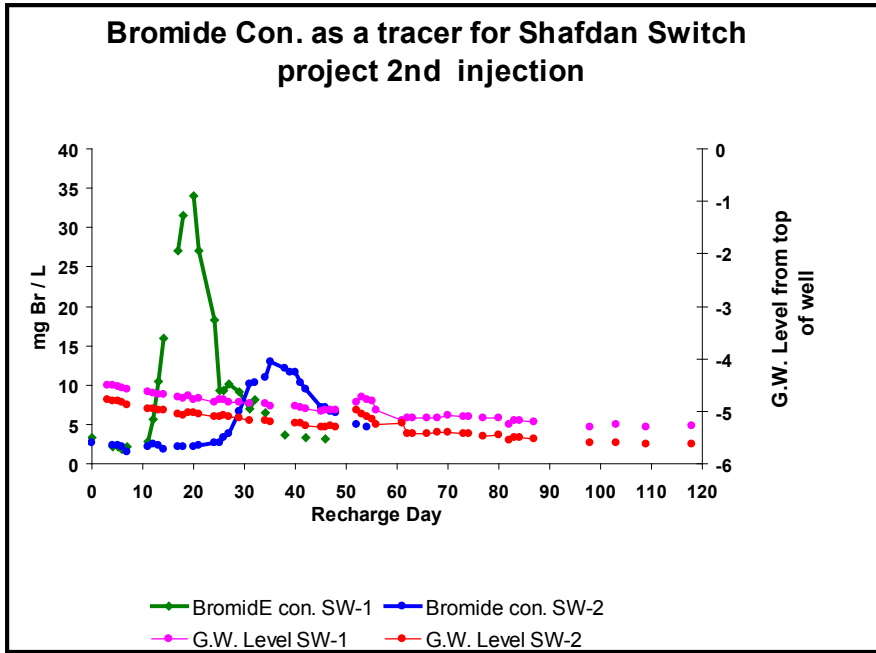


Figure 4. Tracer tests

Date	Sample point	COD (mg/l)	COD <sub>Cr</sub> (mg/l)	P-PO <sub>4</sub> (mg/l)	P <sub>i</sub> (mg/l)	N-NO <sub>2</sub> (mg/l)	N-NH <sub>4</sub> (mg/l)	Cond. (µS/cm)	TSS (mg/l)	VSS (mg/l)	Turb. (NTU)	UV abs (cm <sup>-1</sup> × 10 <sup>3</sup> )	pH	O <sub>2</sub> (mg/l)
9-10/11/08	Before sand filter	34	32						2.6	0.5	2.3	214	8	3.5
	After sand filter	33	31	0.7	0.6	1.22	2.9	1492			1.1	208		2
	After short SAT		7	<0.5	<0.5	0.05	<0.5	1398	0.4*		1.2*	48	7.8	0.4

\* There is a hydrocyclone and 5 micron filter to remove the sand and turbidity before the entrance to the NF

There is still around 7-10% dilution of background water. The COD and P, N results similar to the ones obtained in Reclaim for the same (35 days) retention in the ground

Table 1. Switch pilot – Secondary effluent sand filtration and short SAT (35 days retention time) before NF

The process	The method	Infiltration rate	Retention time in aquifer before pumping	Expected final effluent quality
Conventional SAT	1 day infiltration 2 days relaxation	1 m/d	6-12 months	DOC 0.5-1 mg/l, no bacteria and viruses, most micropollutants removed
UF-SAT	UF prefiltration and short SAT	10 m/d	1-2 month	COD 6 mg/l, no NP, no bacteria and viruses, some hardly biodeg. micropollutants not removed
SAT-NF	Sand filter prefiltration, short SAT, NF	3-4 m/d	1-2 month	After short SAT: COD 7 mg/l, N and P removed, micropollutants results after SAT pending, NF not operated yet

Table 2. The SWITCH PROJECT results till now compared to the conventional SAT and RECLAIM

## Evidence of demand and plans for up-scaling

- If the project results will be positive it will enable to produce more very high quality reclaimed water at the same SAT footprint.
- A scale-up will be possible after a techno-economical study



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3rd SCIENTIFIC MEETING  
BELO HORIZONTE BRAZIL  
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