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For a healthier life

Advanced Wastewater treatment in Israel

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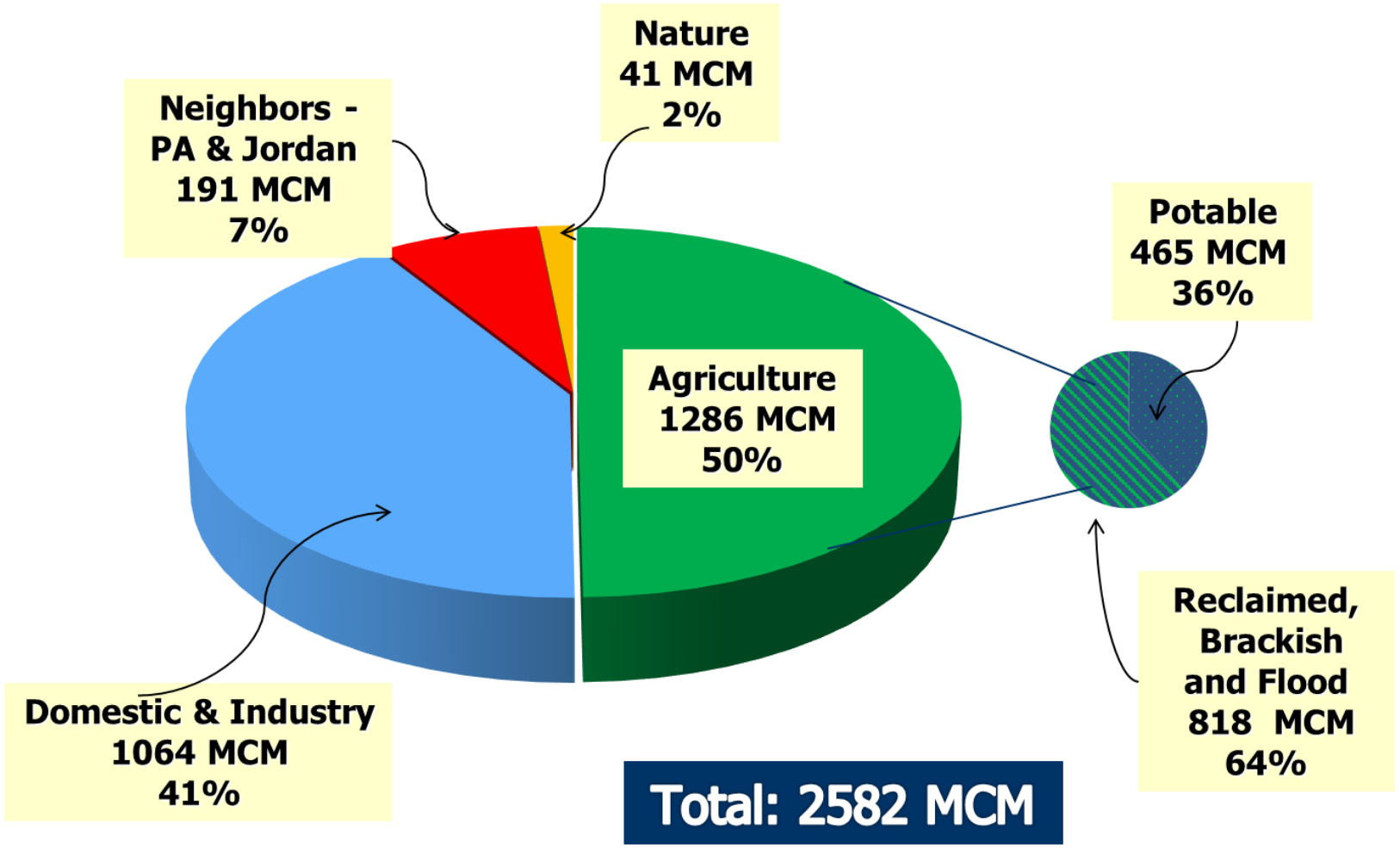
Water consumption in Israel 2021



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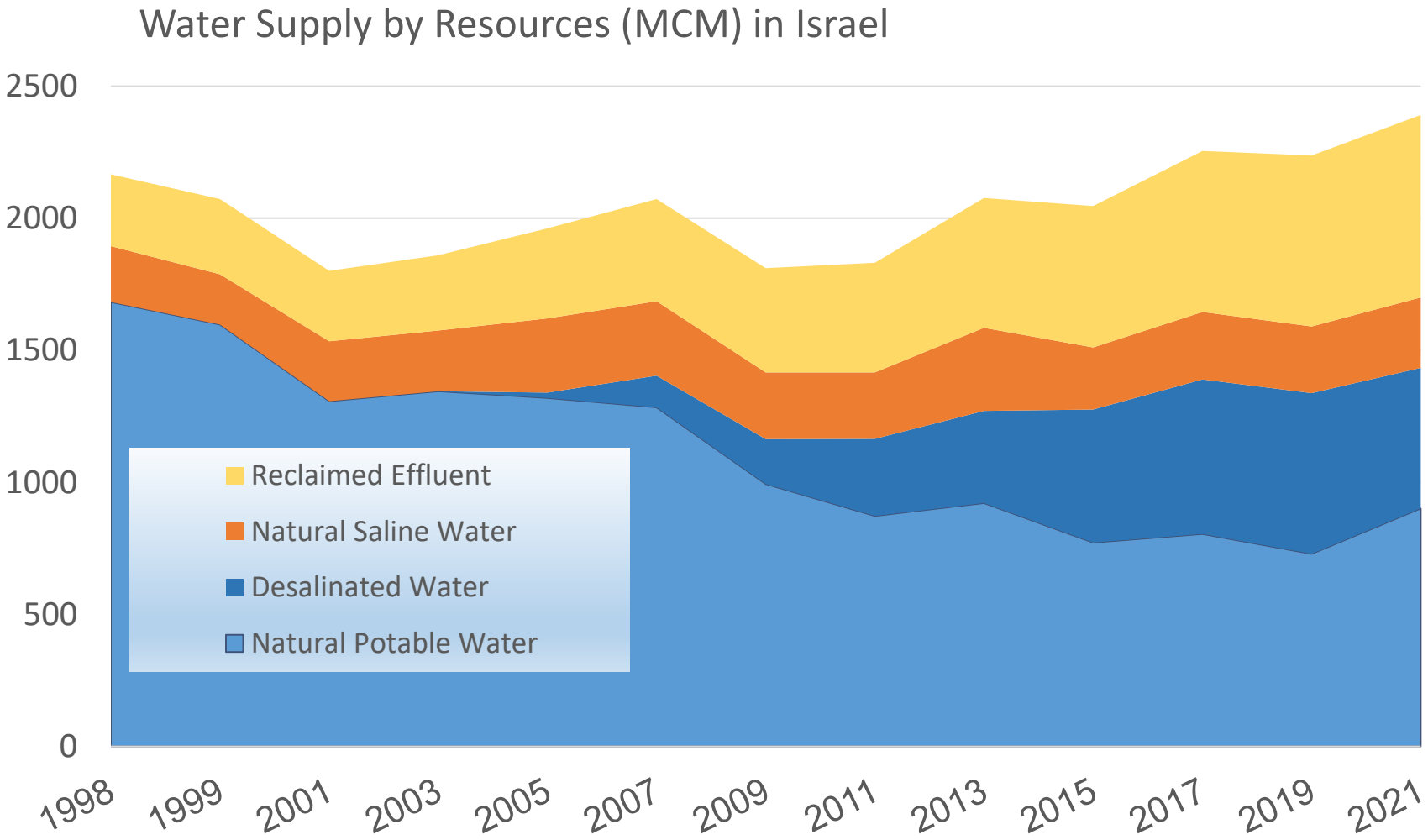
Water supply by Resources in Israel

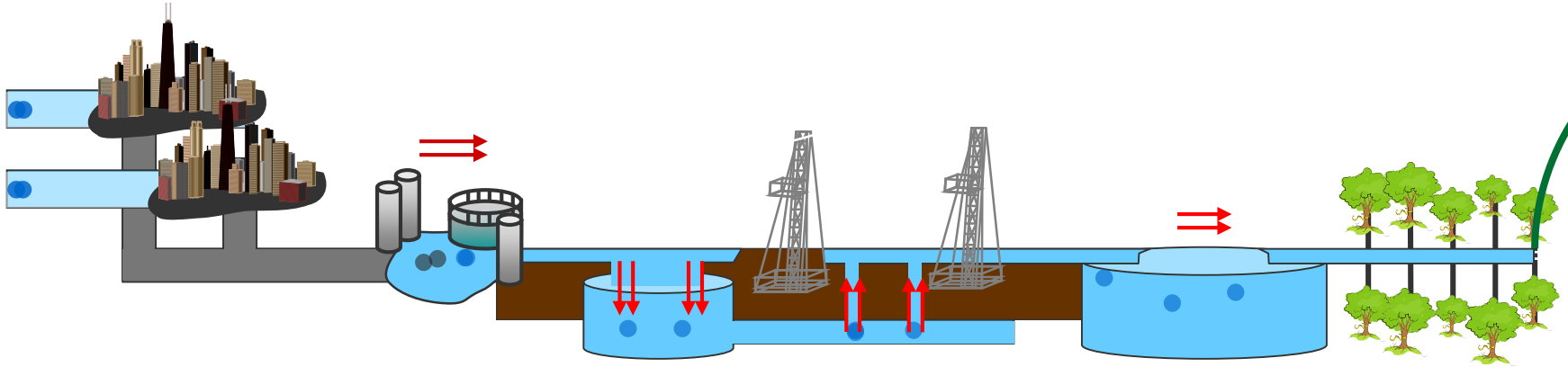


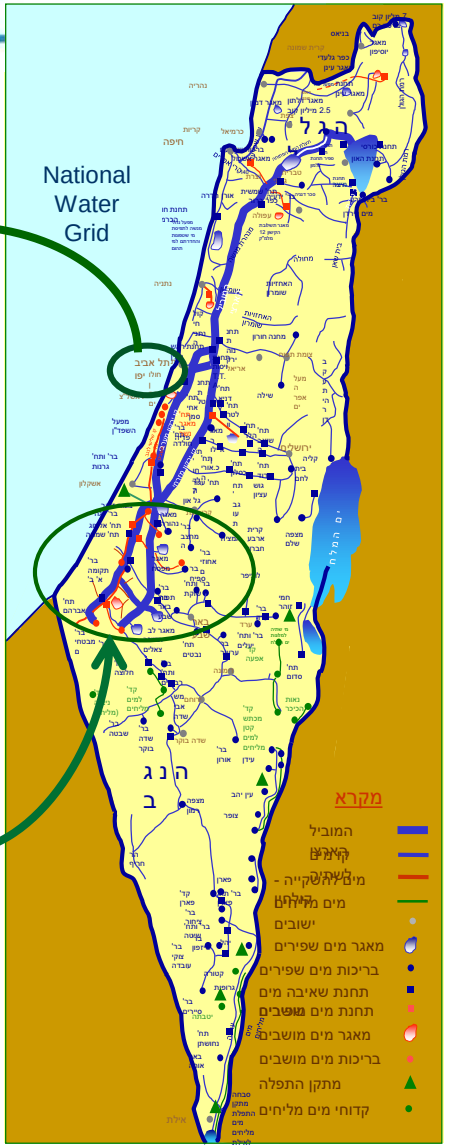
Use of Reclaimed Wastewater

- 90 “BIG” (1000-350,000 m^3 / day) and 300 “small” WWTP.
- About 82% of the sewage is reused mainly for agriculture
- About 45% of the water for agriculture is treated effluent
- 63% of wastewater is tertiary treated

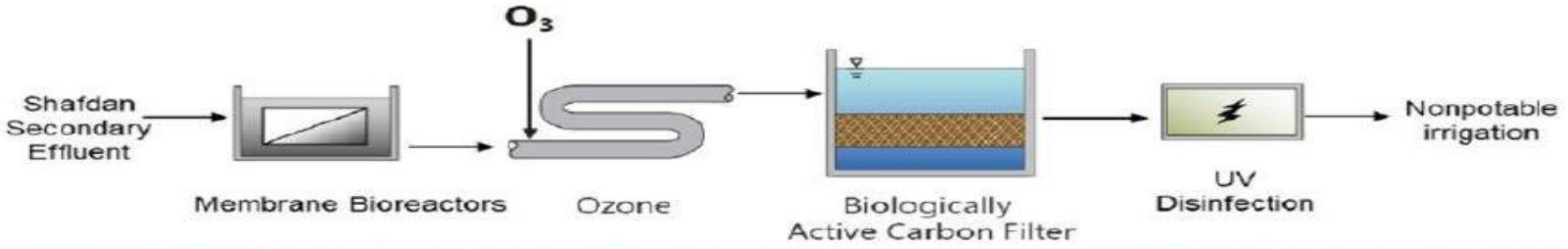
Shafdan SAT - and the Pipeline to the Negev (southern Israel)

- Sewage from the Greater Tel Aviv area (2.5 million ppl.– 140 MCM/Y)
- Large-scale WWTP – secondary treatment quality
- Six infiltration fields
- Over 150 production and monitoring wells (quality permitted for "occasional drinking")
- 90km pipeline to Negev
- 32 pumping stations, operational storages (0.51MCM) and seasonal storages (17.2 MCM)

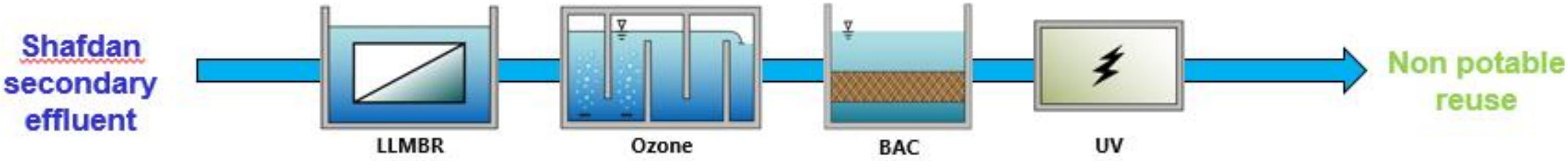




Expanding the "Shafdan" : Manufactured Water as SAT equivalent



Treatment Train: Pathogen and CEC's removal requirements



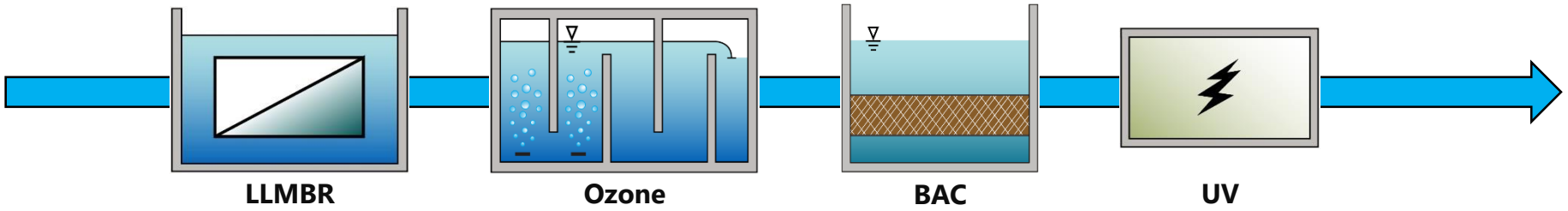
Pathogen	Total Required Log Removal
Virus	10
Cryptosporidium	8
Giardia	8

- **At least 3 treatment stages :1-6 virus log removal each**
- **80% CEC removal :**

Iopromid, Iohexol, Iopamidol, Metformin, TRIS-(2-chlorpropyl)-phosphate, Acesulfame, Bezafibrat, Caffeine, Carbamazepine, Diclofenac, Ofloxacin, Sucralose, NDMA

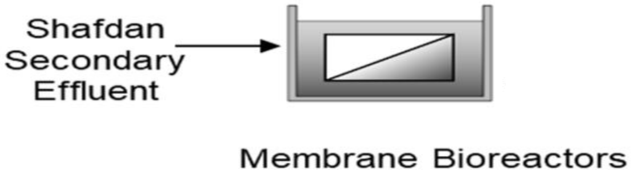
Log Removal Credit by technology

Shafdan secondary effluent



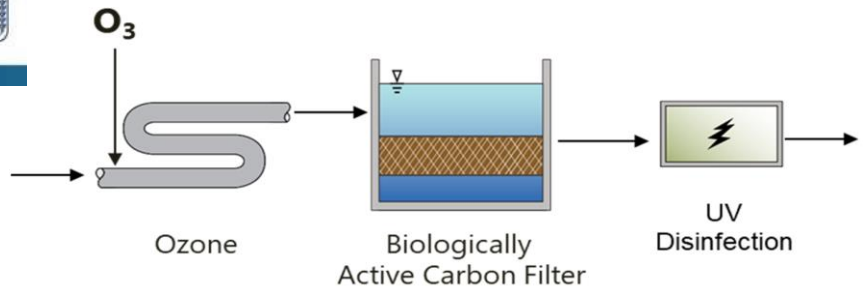
Non potable reuse

Technology	Israeli log removal credit Virus	Israeli log removal credit Protozoa	Chemical Reduction
LLMBR	**1.5**	**2**	Good reduction of TOC and various chemicals
Ozone (NTU<0.15)	**4**	**0 log cryptosporidium 3 log Giardia**	Robust destruction of a broad range of constituents, depending upon control set points
BAC	**--**	**--**	Robust biodegradation for a broad range of constituents, depending upon control set points
UV (UVT>85%)	**6**	**6**	Photolysis of some constituents depending upon control set points



The role of MBR

- ☑ **Completing the nitrification process: removing nitrite (reducing ozone consumption) and ammonia**
- ☑ **Reduces turbidity below 0.15 NTU (Ozonation entry conditions to obtain log removal credit)**
- ☑ **Reduces TOC**
- ☑ **Removes Pathogens(1.5 log virus credit removal)**



Role of OZONE-BAC-UV

- ☑ **Ozone: micropollutant oxidation (residues of pharmaceuticals and PPCP's) and virus removal**
- ☑ **BAC: Removal of ozone residues and byproducts**
- ☑ **UV: disinfection (UV dose is 235 mj/cm2)**

What's Next?

At the end of the pilot stage, a quaternary treatment plant with a capacity of 7,500 m^3/hr will be constructed in the Shafdan.

Israel intends to examine the upgrading of additional WWTP for quaternary treatment.

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