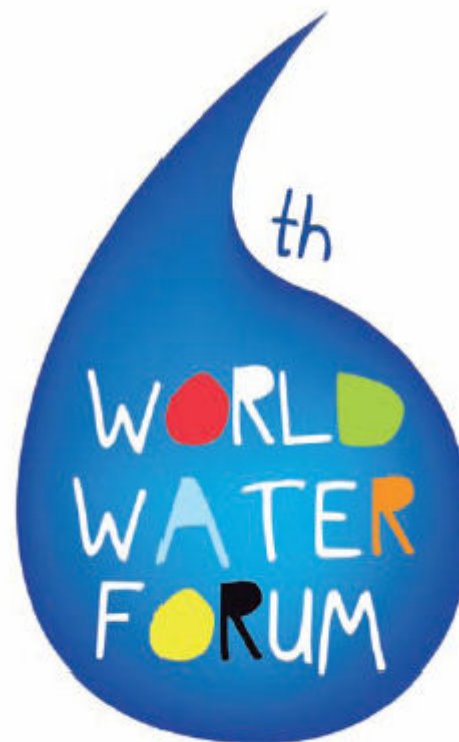




Challenges and Solutions for the Water Sector in Israel and the Region

Oded Fixler – Deputy Director General (Engineering)
Israel Water Authority

September 2011



MARSEILLE, FRANCE '12

TIME FOR **SOLUTIONS**

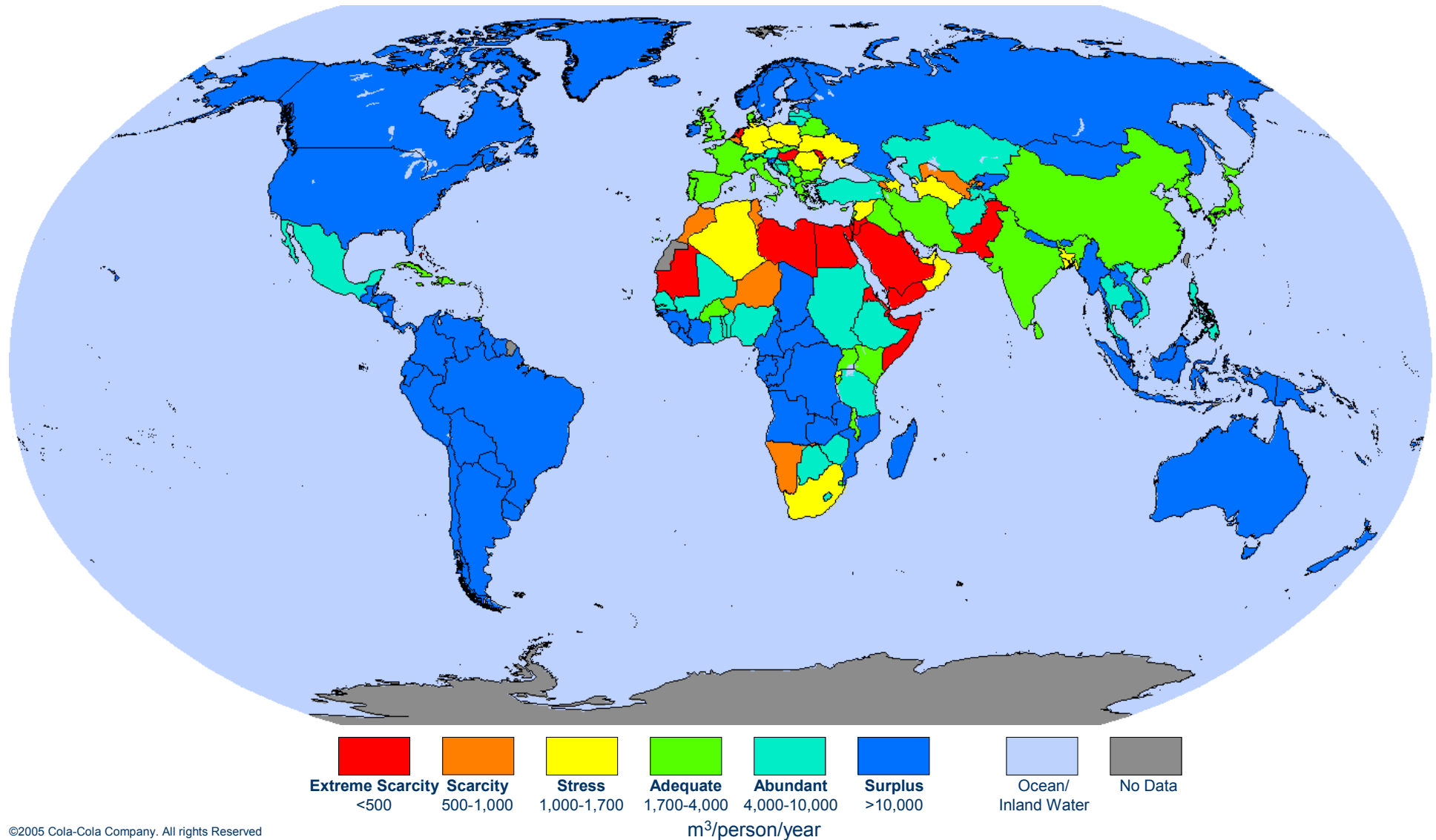


45%
of the world
population will be
living in countries
chronically short of
water by 2050

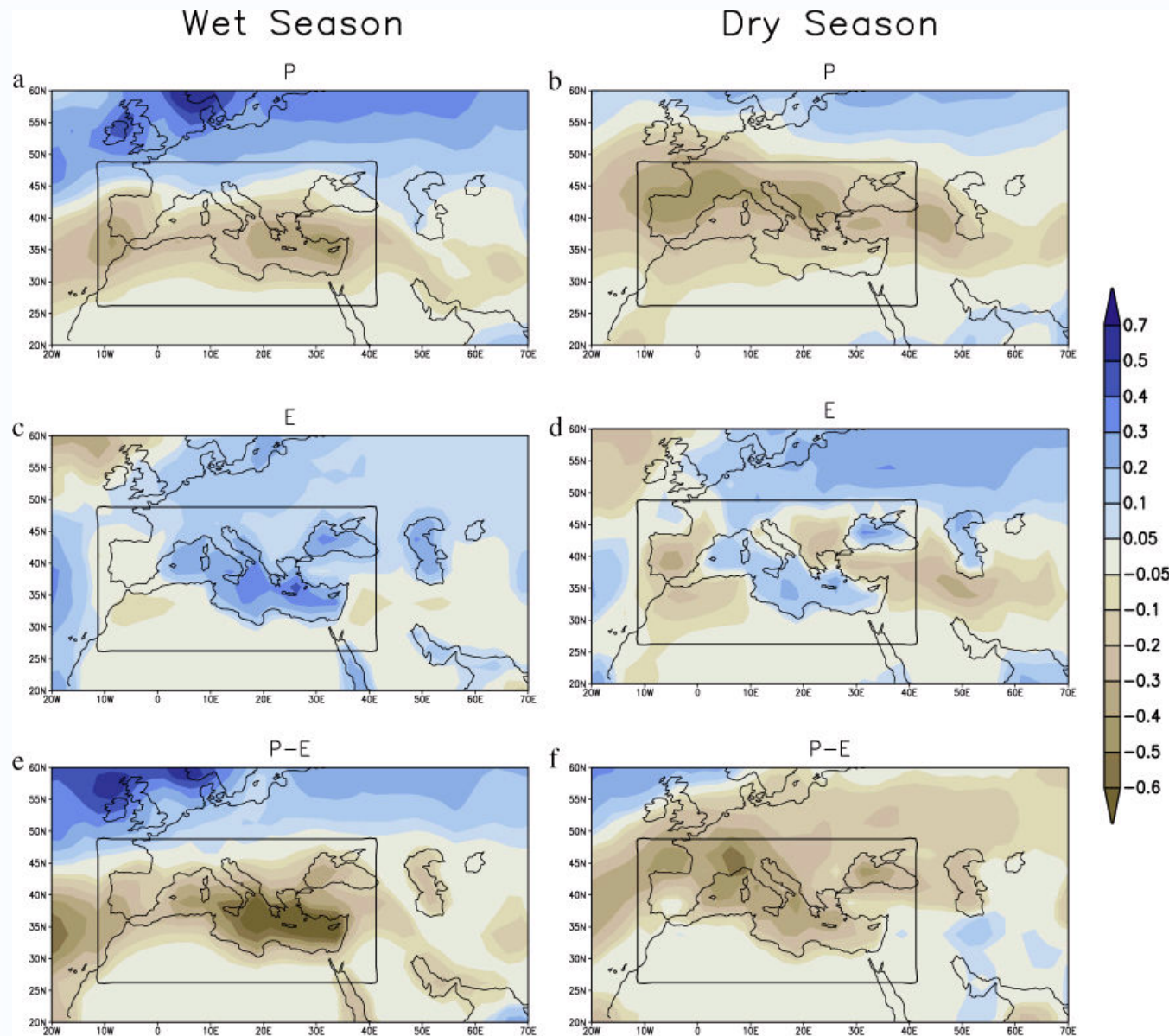
**In the Middle East it is a
well known reality!**

CHALLENGES

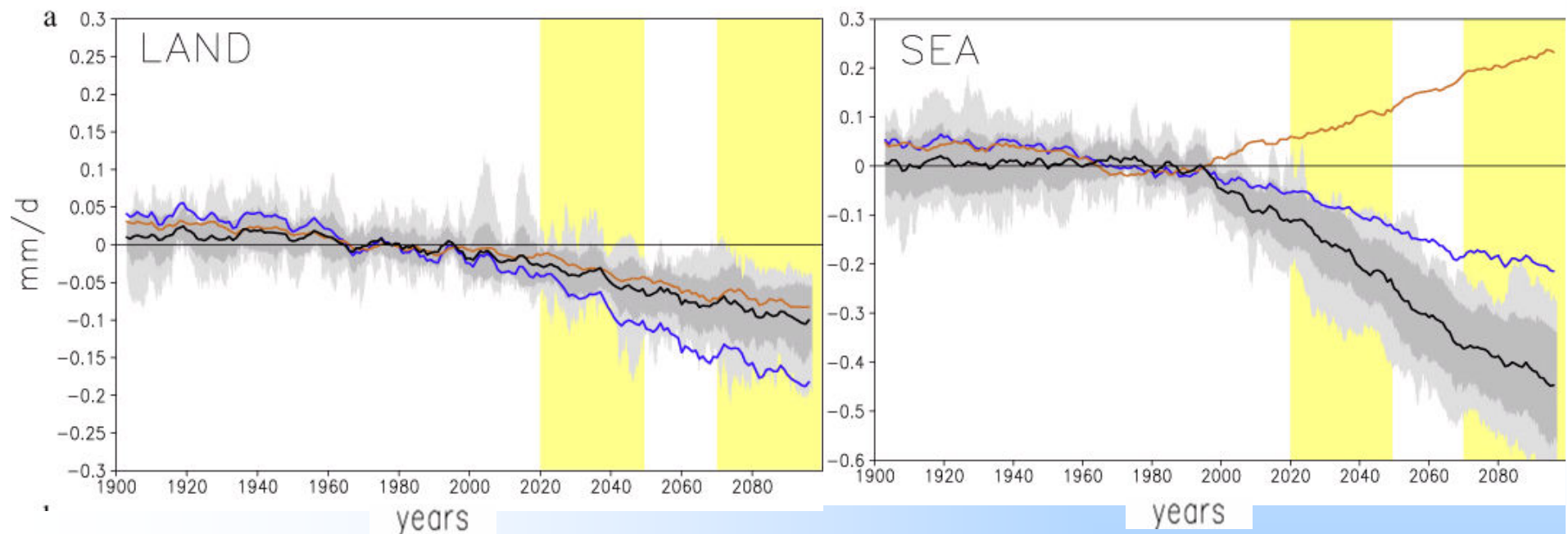
Water Availability: 2025



The Water Crisis



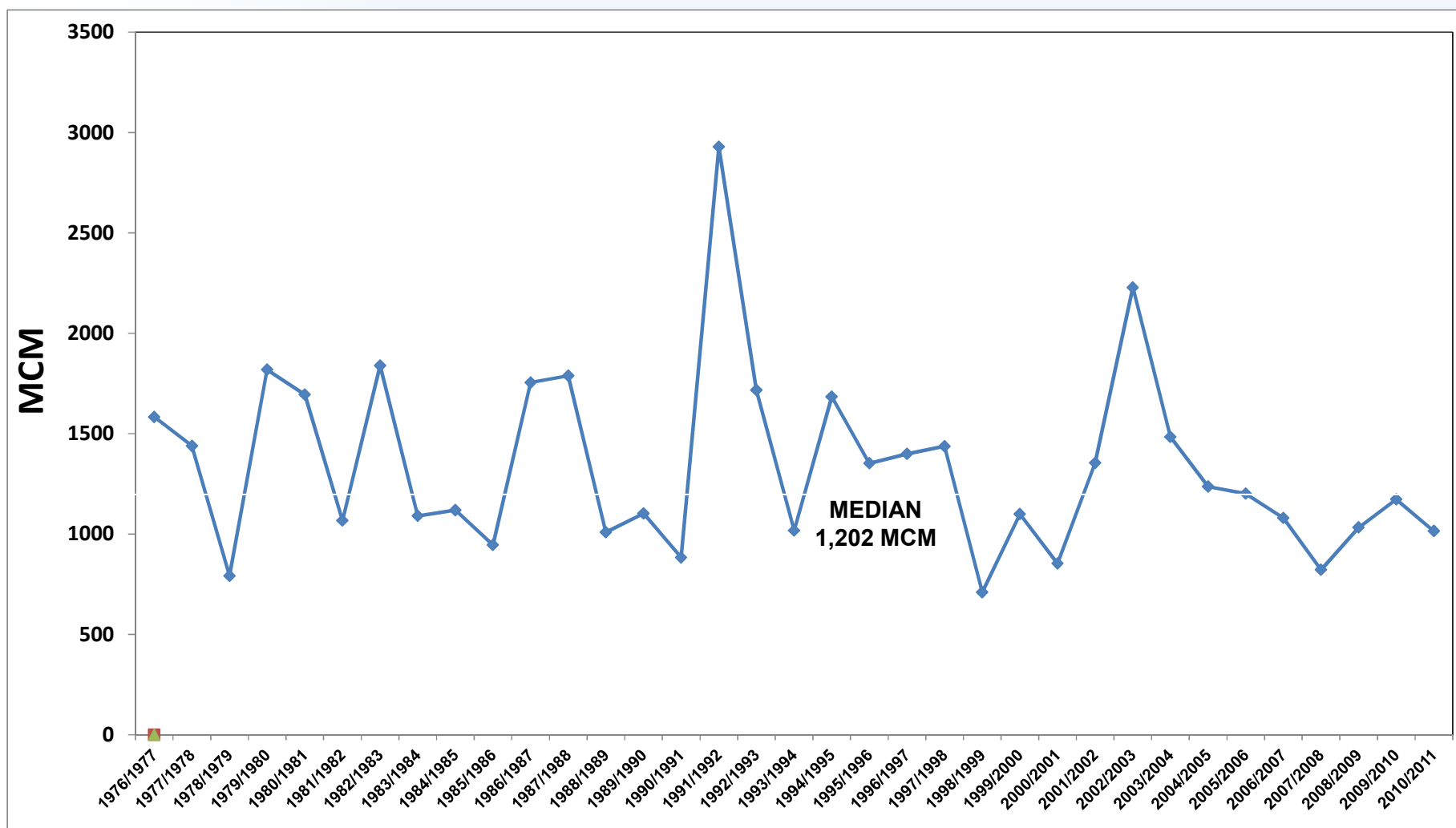
The Water Crisis



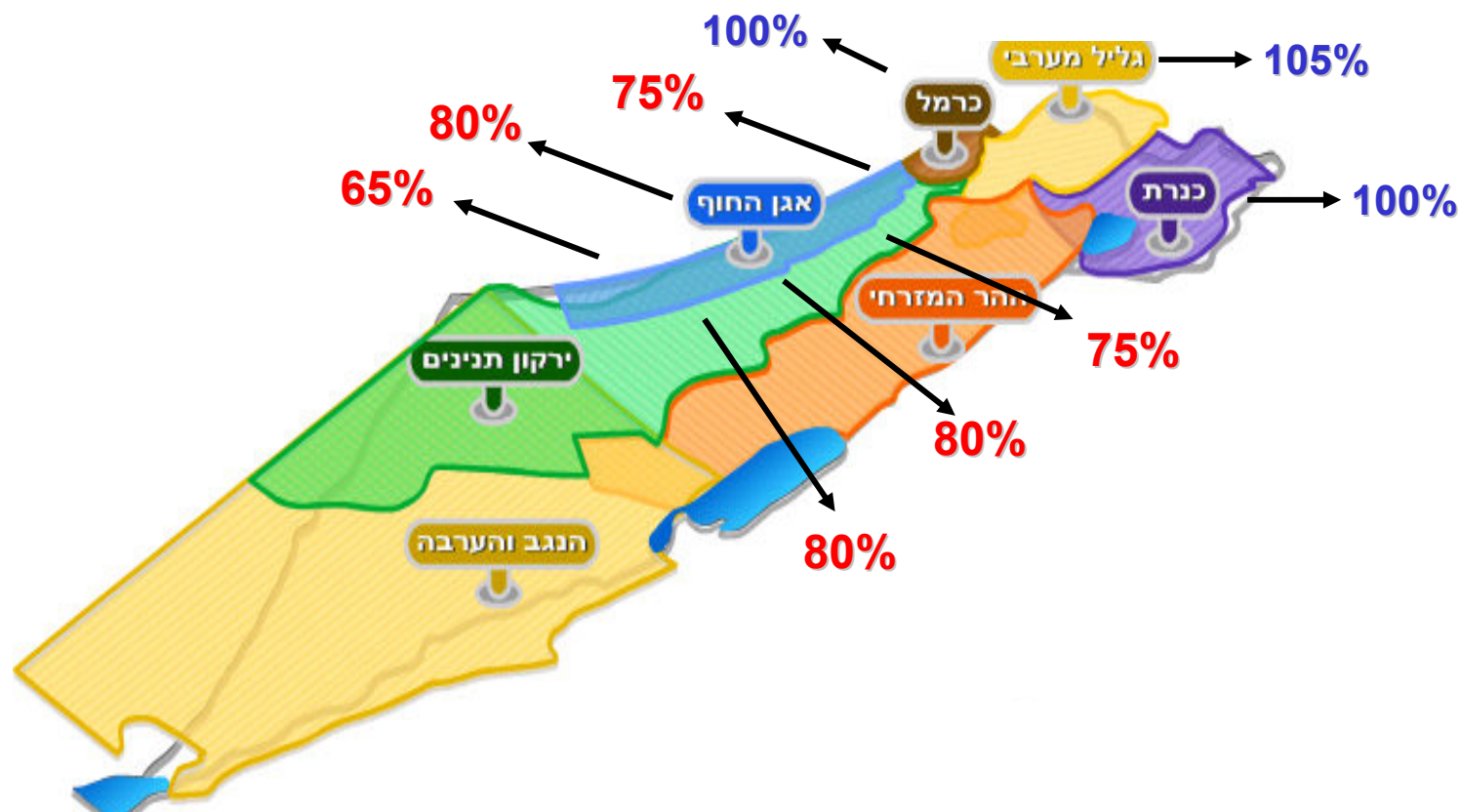
— P-E
— P
— E

Recharge from Rainfall along years: 1975-2011

AVERAGE: 1,336 MCM , MEDIAN: 1202, STD: 456 MCM
Min. : 710 MCM Max. : 2,929 MCM

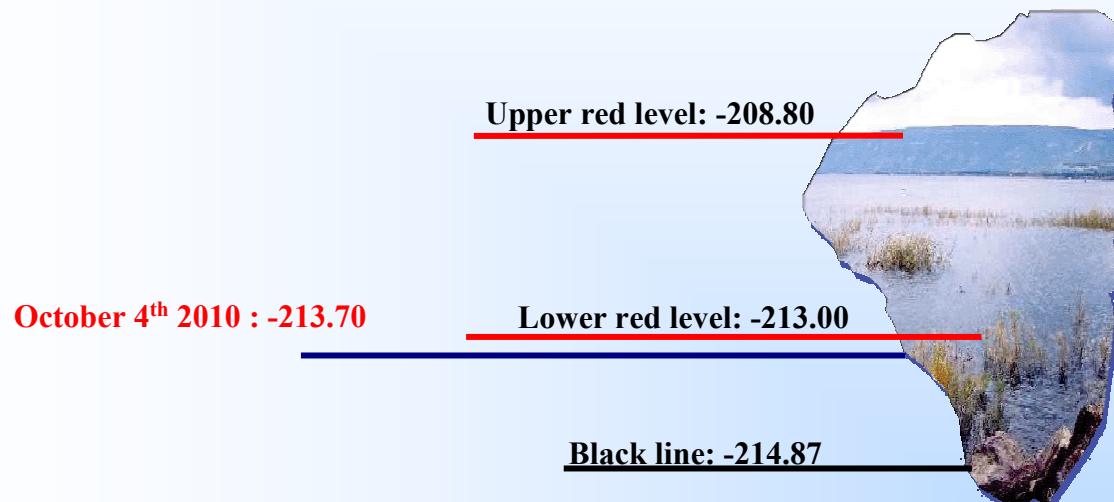


Amounts of precipitation relative to average (from 09/2010 to 05/2011)



Amount above average
Amount lower than average

Israel goes "from Red to Black"

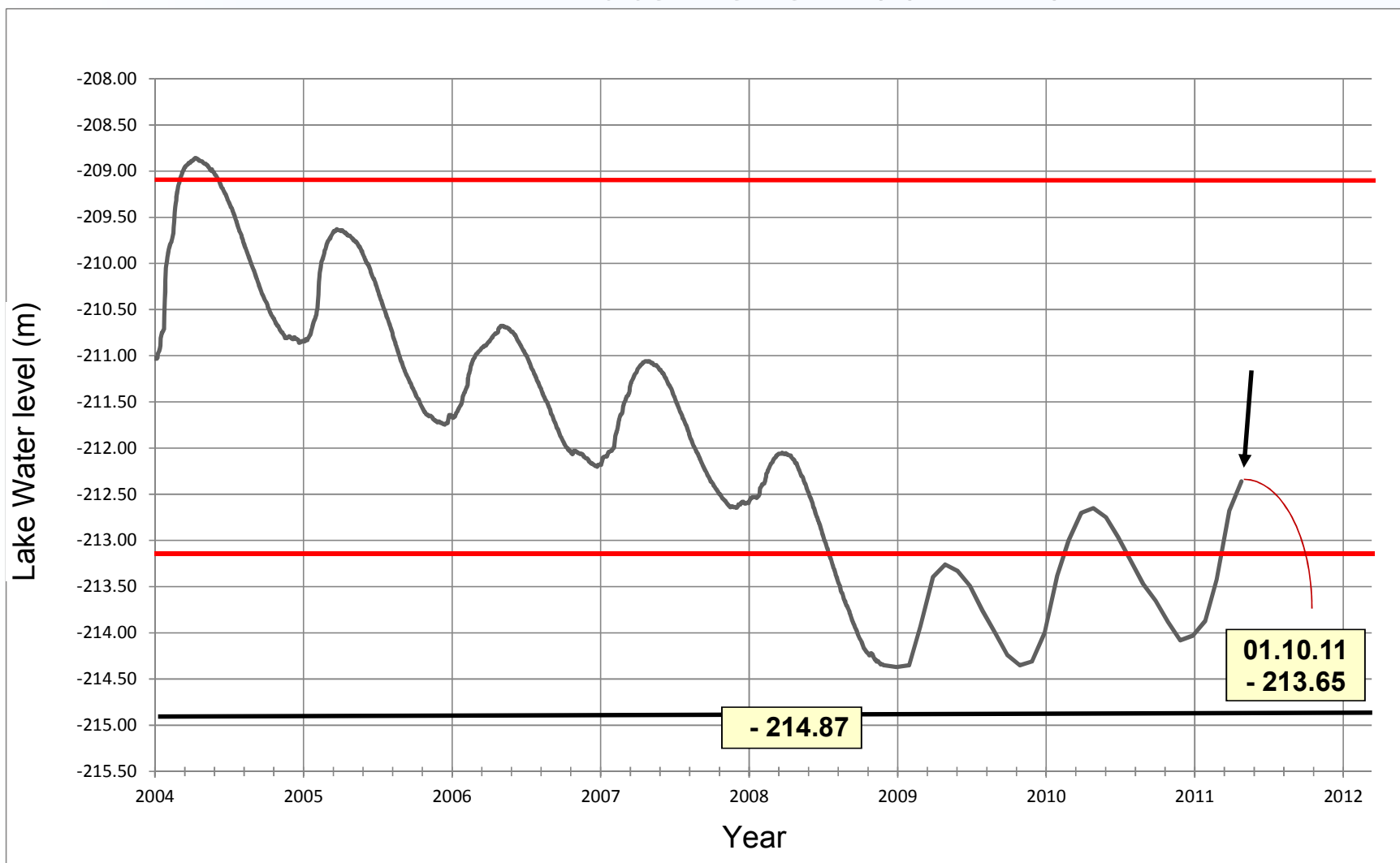


The rate of water depletion from the Kinneret and underground water reservoirs is alarming :

Red line = below this water level → damage to the water source

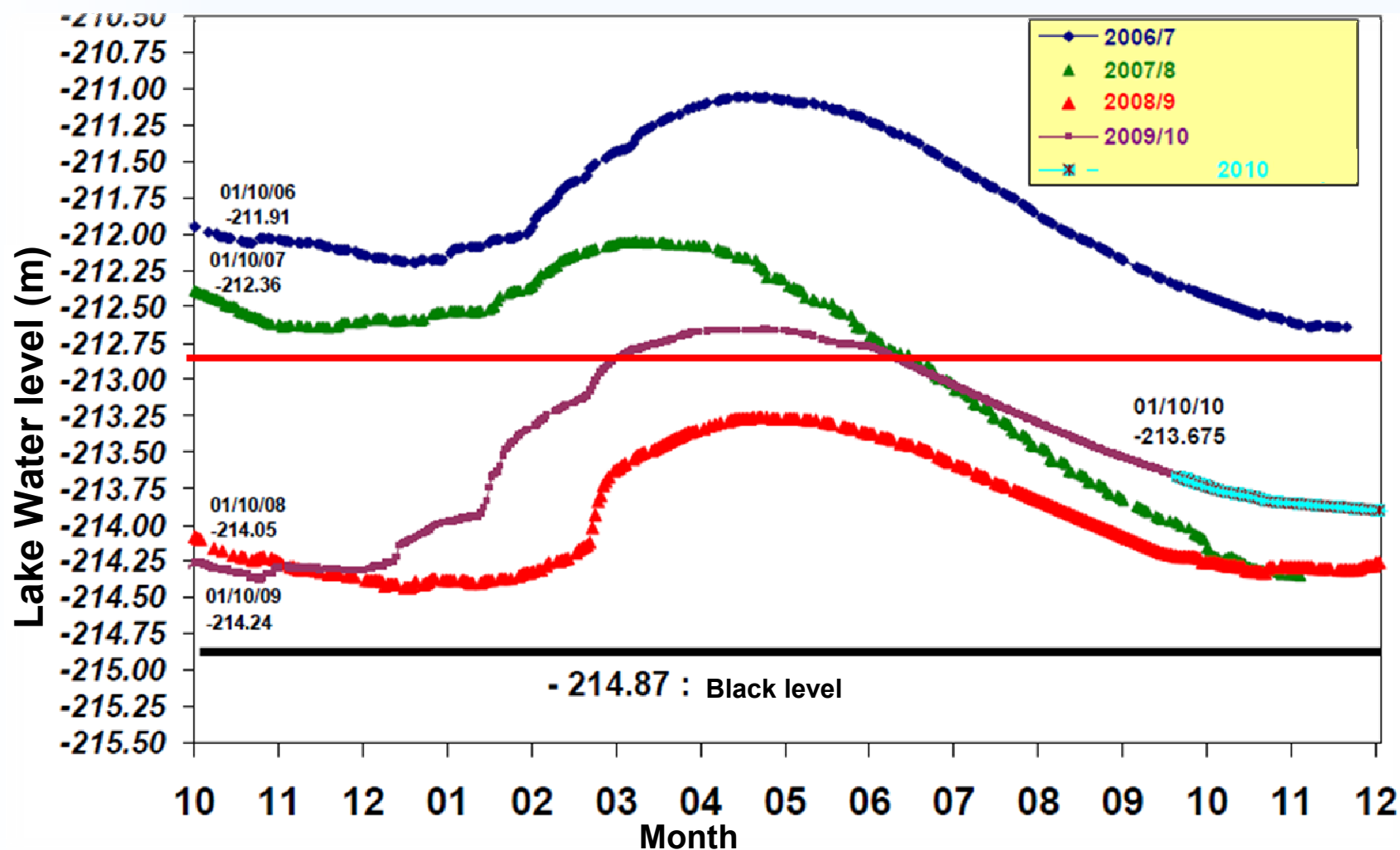
Black line = below this water level → irreparable damage

Water level 2004 – 2011



Lake Kinneret (See of Galilee)

Monthly Water level in the last four years





- Average total natural enrichment – 1.170 billion m³/annum
- Water demand – more than 2 billion m³/annum
- Current potable water demand < 1.2 billion m³/annum
- Forecast for water demand 2020 ~ 1.7 billion m³/annum

Water balance – 2010-2014

(MCM)

| | | 2010 | 2011 | 2012 | 2013 | 2014 |
|--------|--|-------------|-------------|-------------|-------------|-------------|
| SUPPLY | Effective storage opening balance | 135 | 243 | 253 | 59 | 95 |
| | Natural replenishment | 1175 | 1070 | 793 | 931 | 931 |
| | Seawater desalination | 255 | 291 | 291 | 350 | 541 |
| | Seawater desalination – temporary enlargement | | 3 | 25 | 0 | 0 |
| | Seawater desalination – permanent enlargement | | | 20 | 59 | 59 |
| | Brackish water desalination | 22 | 26 | 37 | 62 | 62 |
| | Emergency actions | 12 | 40 | 50 | 60 | 60 |
| | Total supply | 1464 | 1430 | 1216 | 1462 | 1653 |
| DEMAND | Domestic | 660 | 670 | 683 | 697 | 711 |
| | Industry | 86 | 87 | 87 | 87 | 87 |
| | Agriculture | 430 | 475 | 455 | 455 | 455 |
| | Nature | 9 | 15 | 10 | 10 | 10 |
| | Jordan and PA* – including self recharge from the Mountain Aquifer | 139 | 141 | 143 | 145 | 145 |
| | Non utilization – flows to the sea | 32 | 32 | 32 | 32 | 32 |
| | Total demand | 1356 | 1420 | 1410 | 1426 | 1440 |
| | Final storage | 243 | 253 | 59 | 95 | 308 |

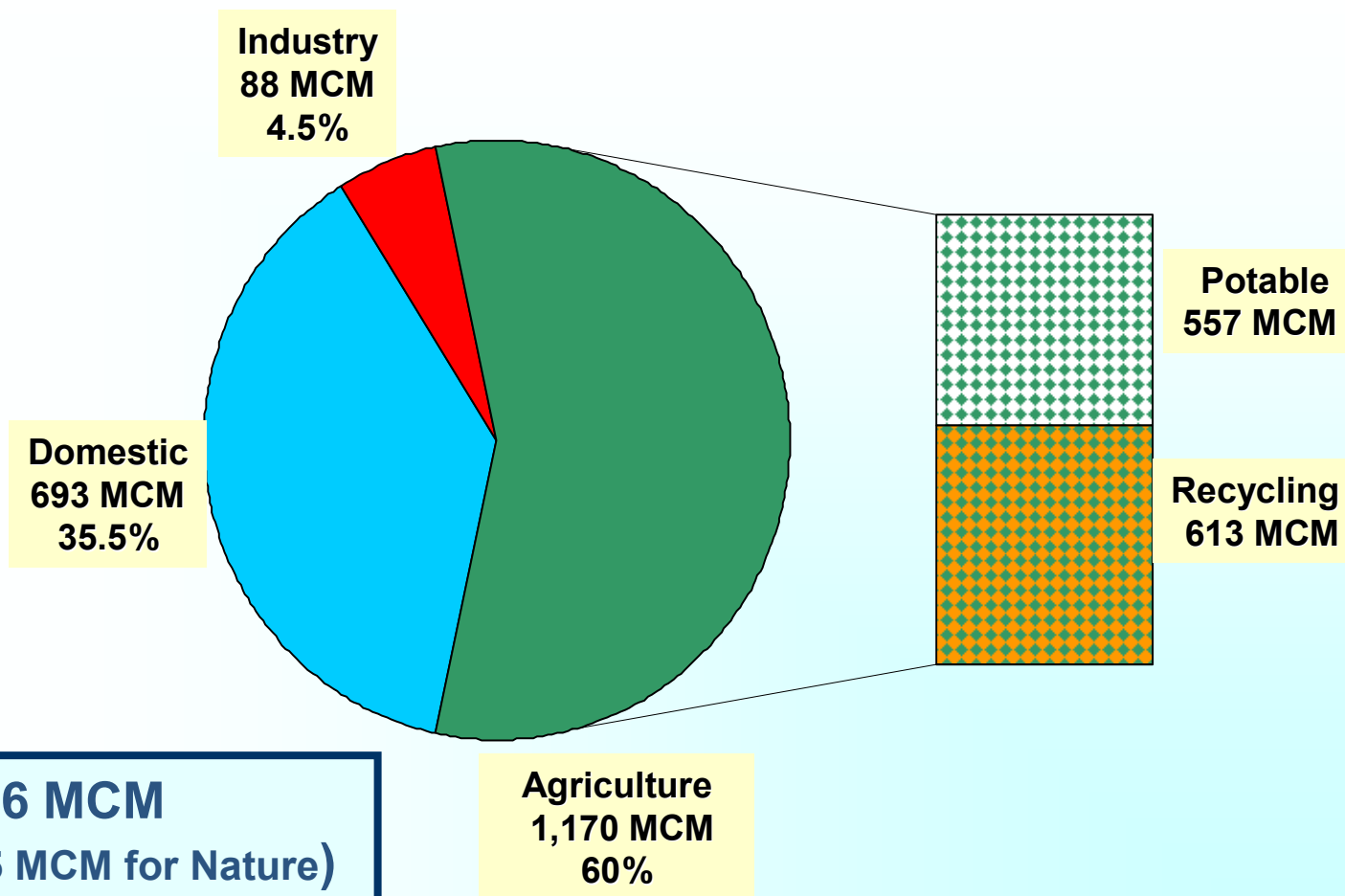
Additions to the total supply from the non-effective storage:

| | 2010 | 2011 | 2012 | 2013 | 2014 |
|---|------|------|------|------|------|
| Additional emergency actions | | 10 | 25 | 35 | 35 |
| Production from contaminated wells for irrigation | 8 | 30 | 40 | 40 | 40 |
| Release of potable water quotas in exchange of effluents for irrigation | | 16.5 | 30 | 30 | 30 |

Water Consumption in Israel

According to sectors

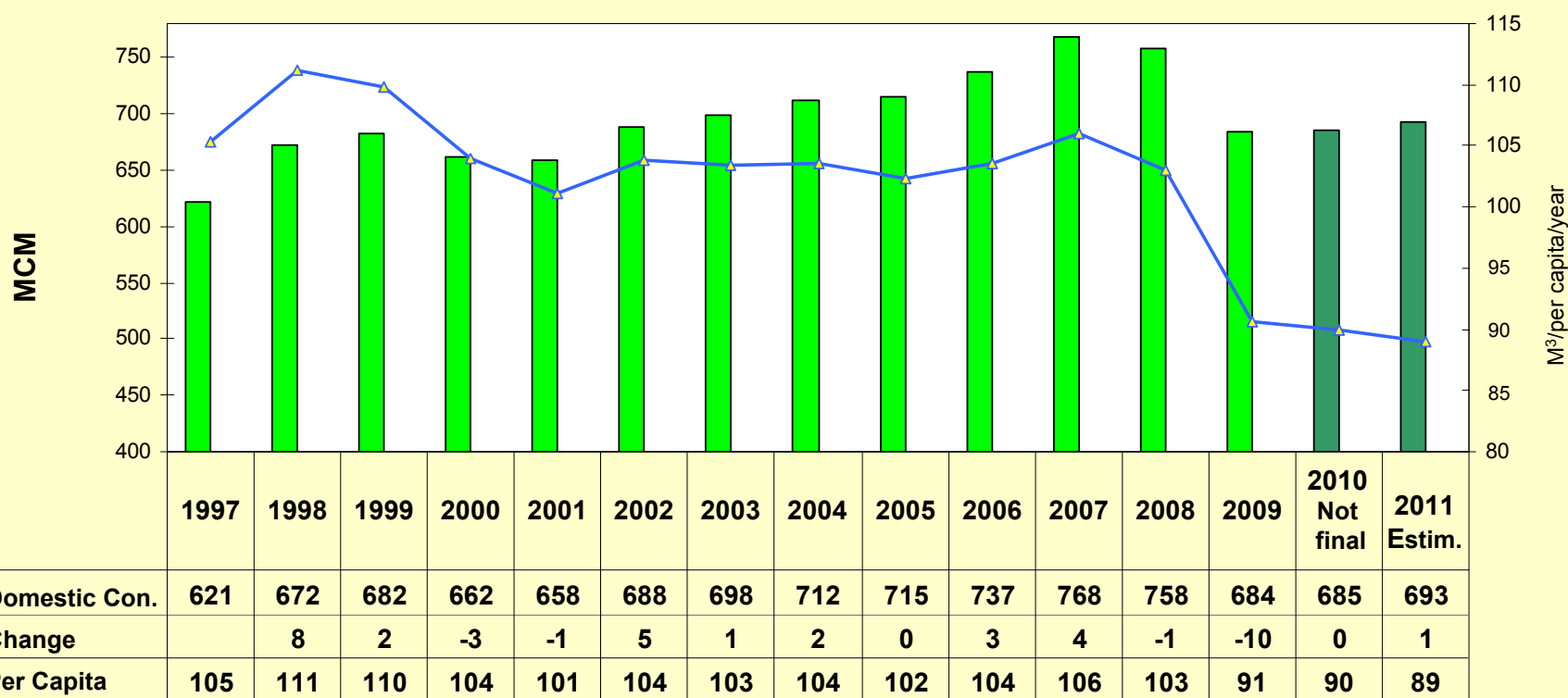
Estimated data for 2011



Supply to PA – 52 MCM; Supply to Jordan – 48 MCM

Domestic Water Consumption

Per capita / annum



SOLUTIONS

Decisions

In order to prevent irreversible damage to the water Sources, the Government of Israel made several decisions for the short and long term :

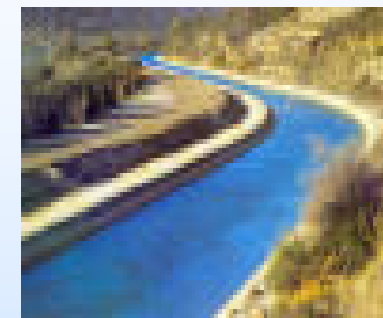
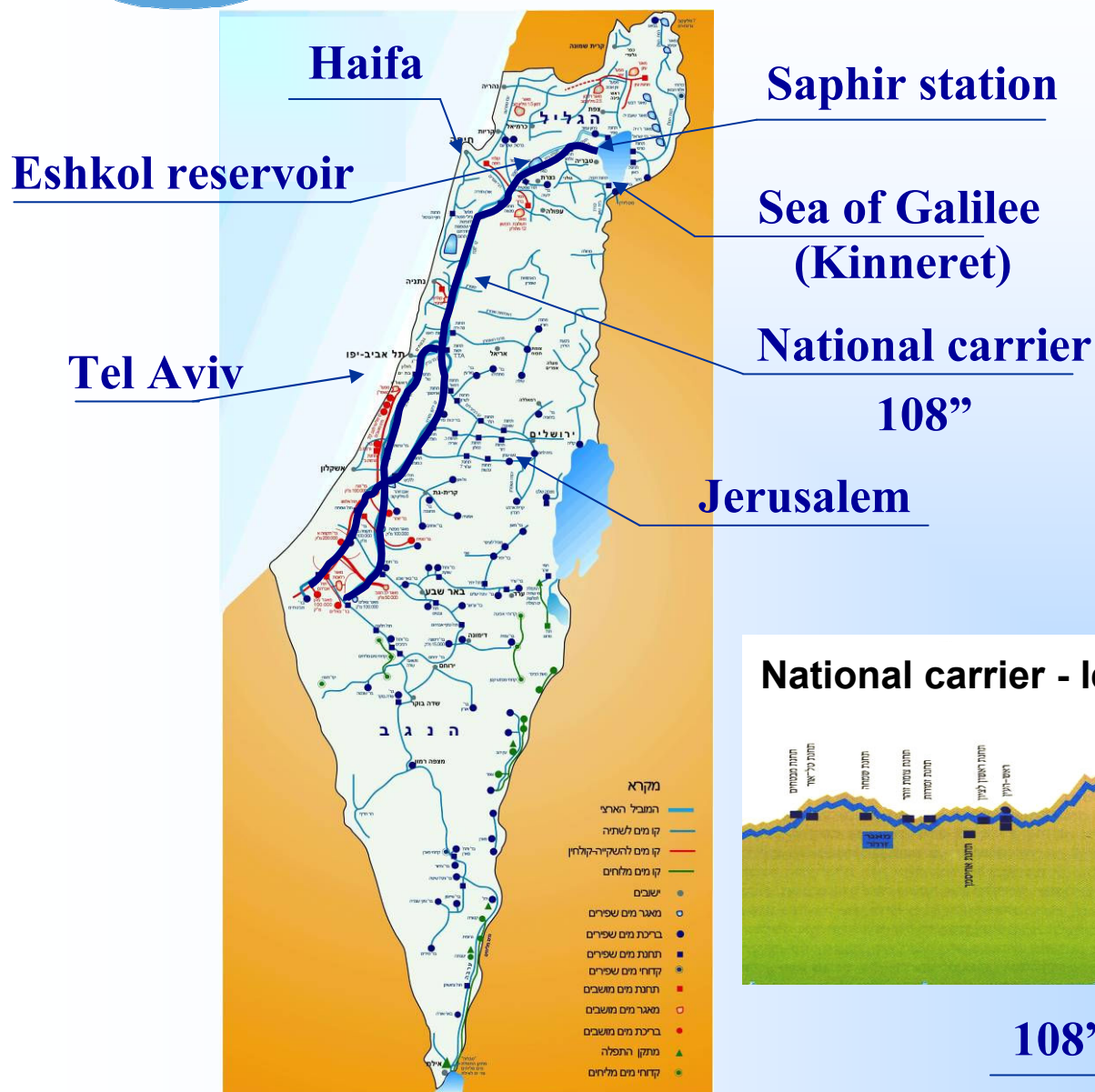
Water demand restraint :

- ⇒ **Comprehensive nation-wide media campaign calling citizens to save water, entitled “From Red to Black” and “Israel is drying”.**
- ⇒ **Supervision & enforcement**
- ⇒ **Graded water tariffs**
- ⇒ **Water allocation and cutbacks for agricultural sector and public gardening**

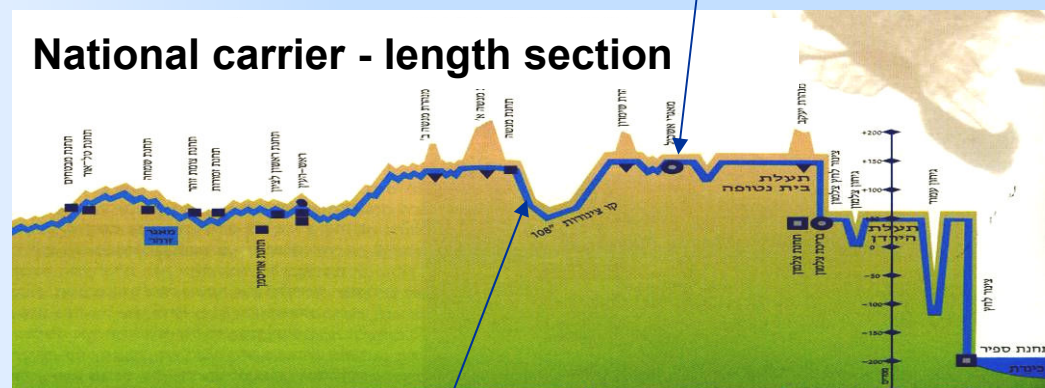
Water supply increase :

- ⇒ Drilling (including water sources monitoring);
- ⇒ Treatment of underground polluted water sources;
- ⇒ Development of new water sources :
desalinated seawater, desalinated brackish water,
treatment of wastewater.

Main Water Supply System



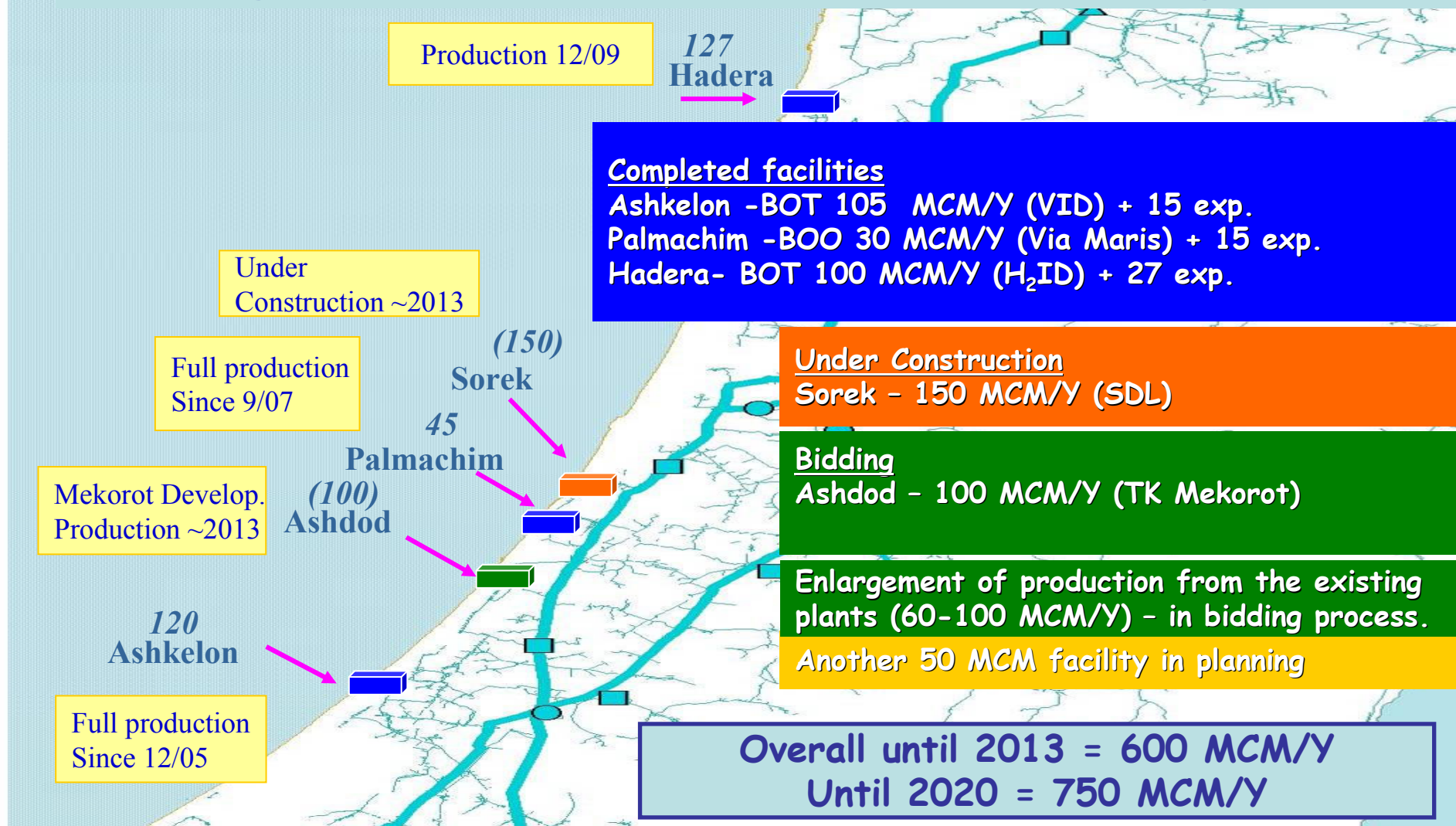
National carrier - length section



108''

Sea of Galilee

In accordance with the Government decisions since 2001 large scale seawater desalination facilities are being built:



Ashkelon SWRO



Palmachim SWRO



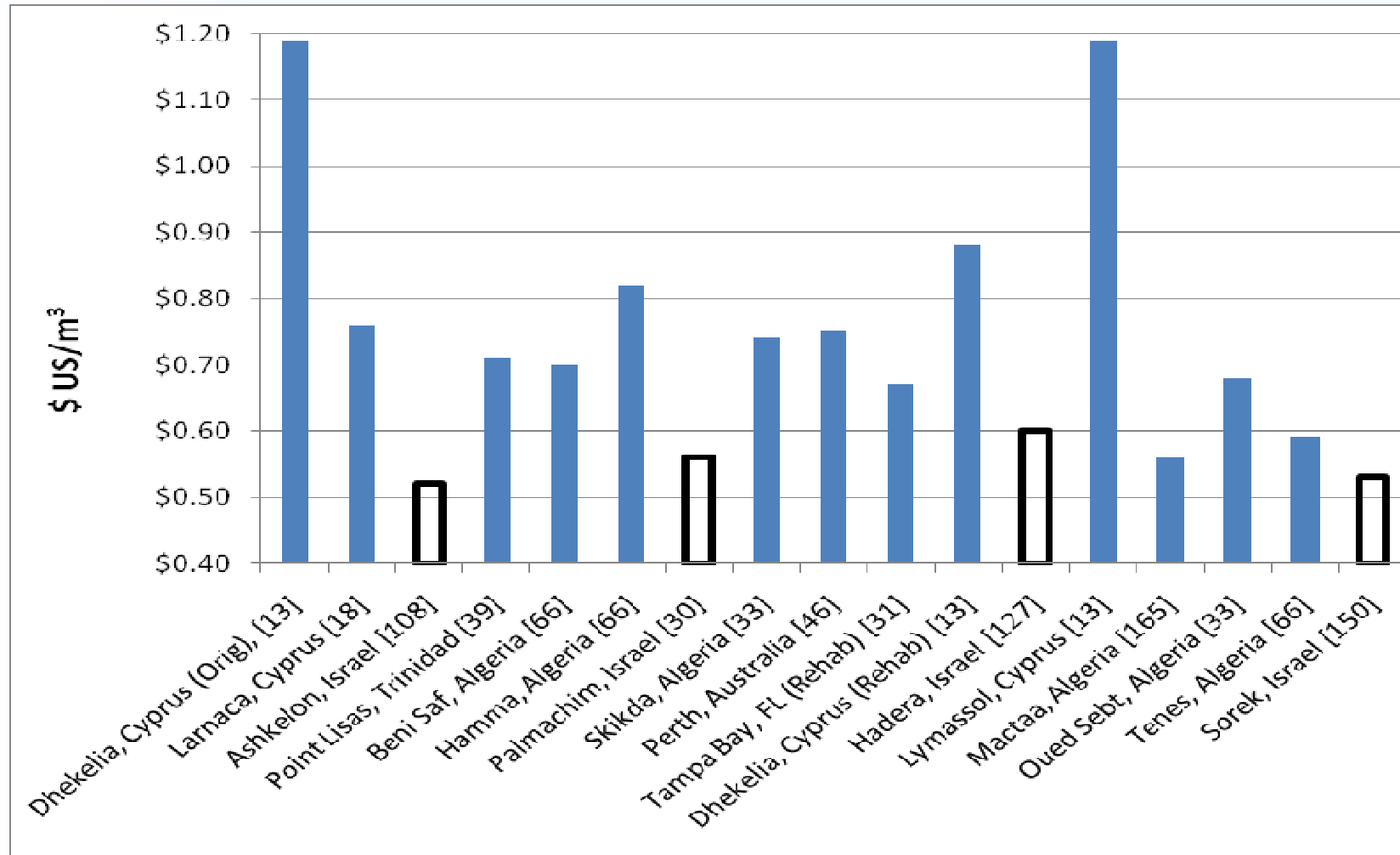
Hadera SWRO



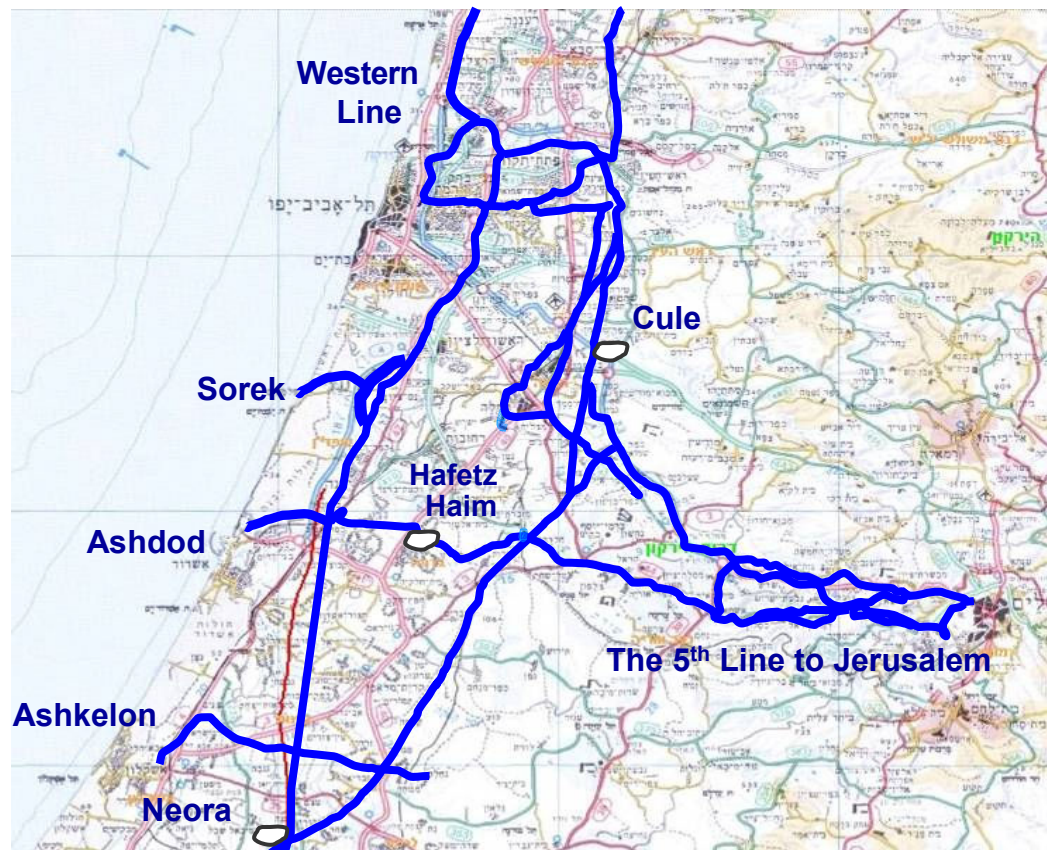
SWRO Costs

| | Ashkelon | Palmachim | Hadera | Sorek |
|--|----------|-----------|--------|-------|
| MCM/Year | 120 | 45 | 127 | 150 |
| Salinity – PPM | 20 | 30–40 | 20 | 20 |
| Total cost – \$ (1 \$ = 3.7 Shekel) | 0.81 | 0.878 | 0.735 | 0.54 |

Exceptional Cost Efficiency of Israel's Desalination Facilities



SWRO facilities connection - Revolution in the National System operation



Drillings



- Private sector
- Mekorot Co.



Brackish water desalination facilities – 50 MCM/Y



BWRO - Mekorot Co.



Granot



2674A003



Ktziot



Neve Zohar

Reuse of All Sewage Effluents

- ⇒ Reuse of 500 MCM/Y in 2014 (370 today).
- ⇒ Sewage effluents for Agriculture – 50% of allocations in 2014.
- ⇒ Tertiary treatment – unrestricted irrigation. New stringent standards for effluents quality (37 parameters).
- ⇒ Nutrients and Salt Removal.
- ⇒ Methods of agricultural cultivation in Israel are constantly modernized and innovated.
- ⇒ Israel became an international leader in developing water saving technology in agriculture.

Reuse of all sewage effluents in Dan Region (Greater Tel Aviv) Wastewater Treatment plant (Shafdan) and the pipeline to Negev

Sewage from the Greater Tel Aviv area – 125 MCM/Y (2010)

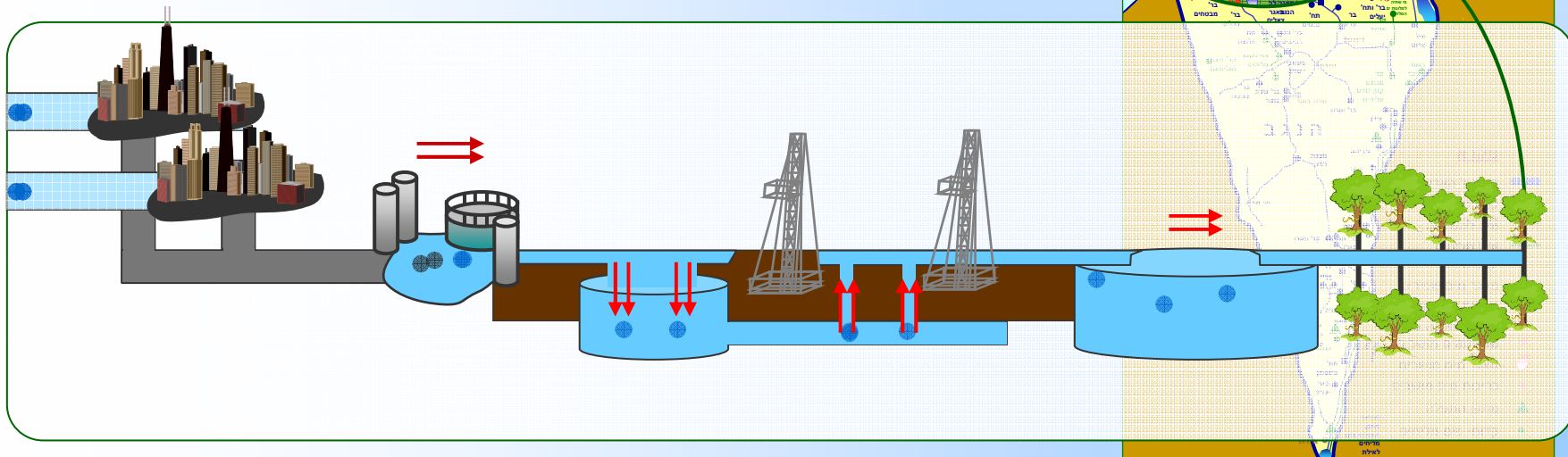
Large-scale WWTP – secondary treatment quality

Six infiltration fields

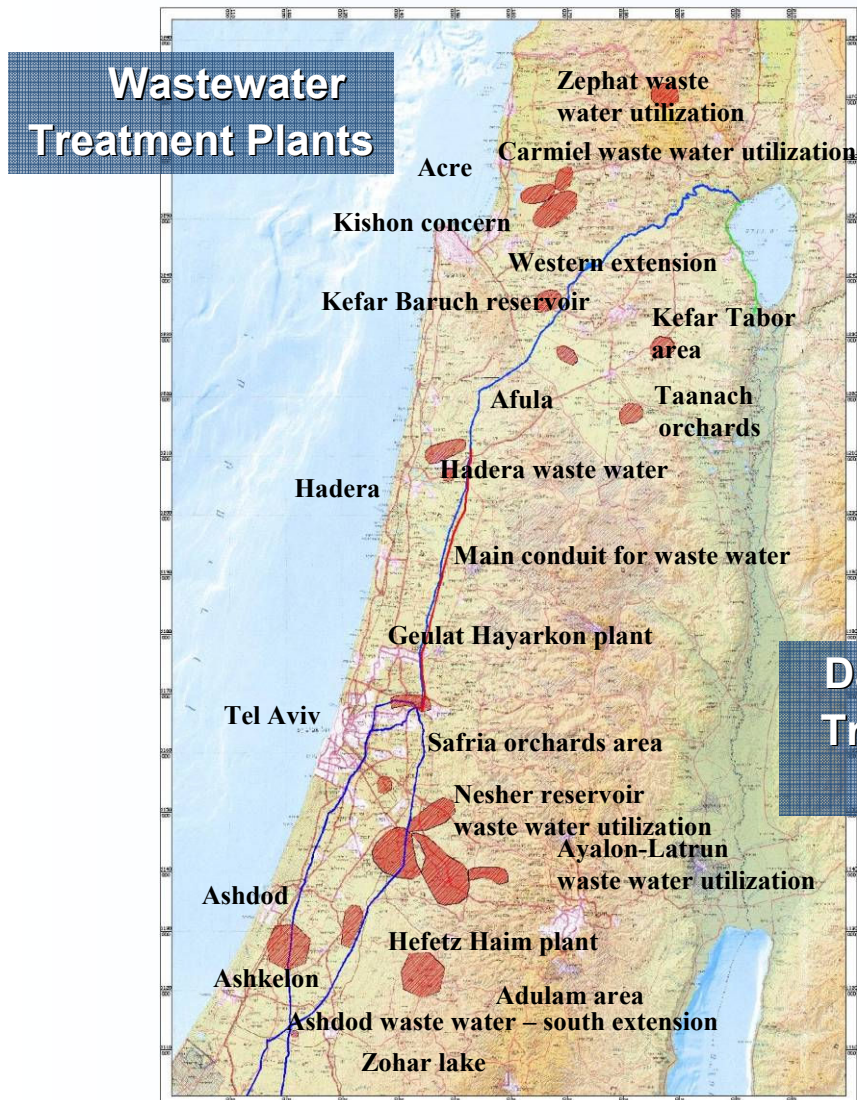
Over 150 production and monitoring wells (quality permitted for “occasional drinking)

90km pipeline to Negev

32 pumping stations, operational storages (0.51MCM) and seasonal storages (17.2 MCM)



Reuse of All Sewage Effluents



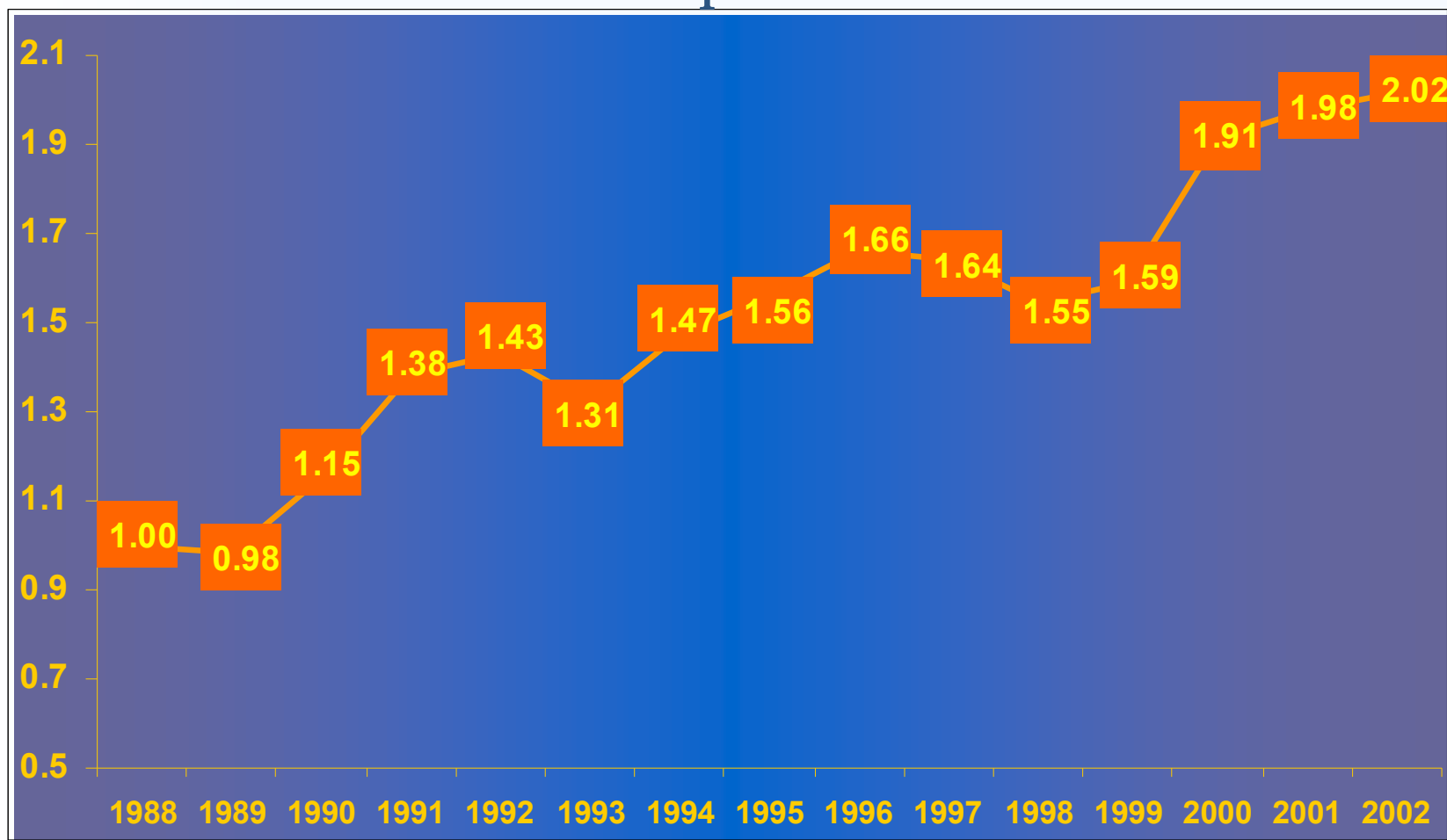
Water for agriculture – 1,150 MCM/Y

450-530 MCM/Y – constant quota (potable water)

Water Authority development plans:

- Irrigation with recycled effluents in exchange of potable water quota release;
- Building of irrigation water recycling facilities as a stable water supply source (replacing potable water quotas which are exposed to frequent cutbacks);
- Reform in water tariffs for agriculture and graduate replacement of subsidy through water tariff towards direct subsidy to farmers;
- “Network separation”: high quality potable water at appropriate tariff;
- Brackish water suitable for irrigation at low tariff.

Production per Water Unit



Source: Israel Farmer's Federation



Water Sector development

Development programs based on long term Master plan taking into consideration the population growth rate and its distribution and the rate of growth in consumption:

- **Increased living standards**
- **Water for nature utilization**
- **Agricultural distribution and water consumption**
- **Political arrangements**

Paving the path to regional solutions

Resolving problems in the spirit of cooperation and good neighboring, and not hiding failures in pointless accusations.

Honoring bilateral agreements and donors efforts and finance for stabilizing the water sector.

Implementing the vital water and wastewater treatment projects and enforce uncompromisingly illegal acts.

Strengthening technical cooperation.

Acting towards clean environment: sewage treatment and effluents reuse.

Taking actions for building administrative and economic structures to prevent funds lose and water spend.

**Water is a matter of
deeds,
not words!**