WATER AUTHORITY

State of Israel

Israel Water Authority

STATE OF ISRAEL

Quality of Israel water sources

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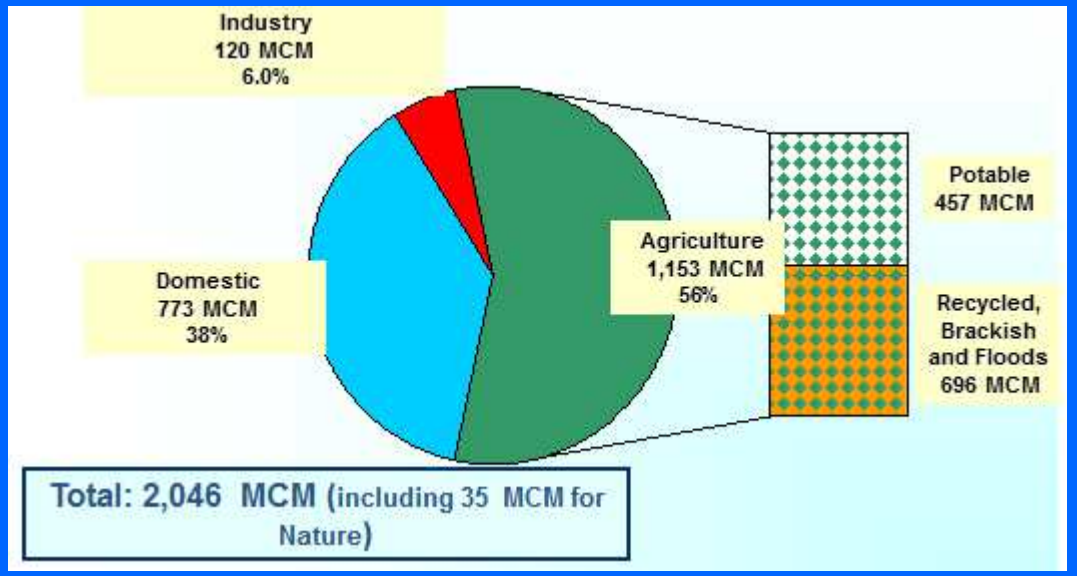
Water in ISRAEL – Fast Facts

- **Natural water refill: 1170 MCM (per year)**
- **Water consumption: 2150 MCM (per year)**

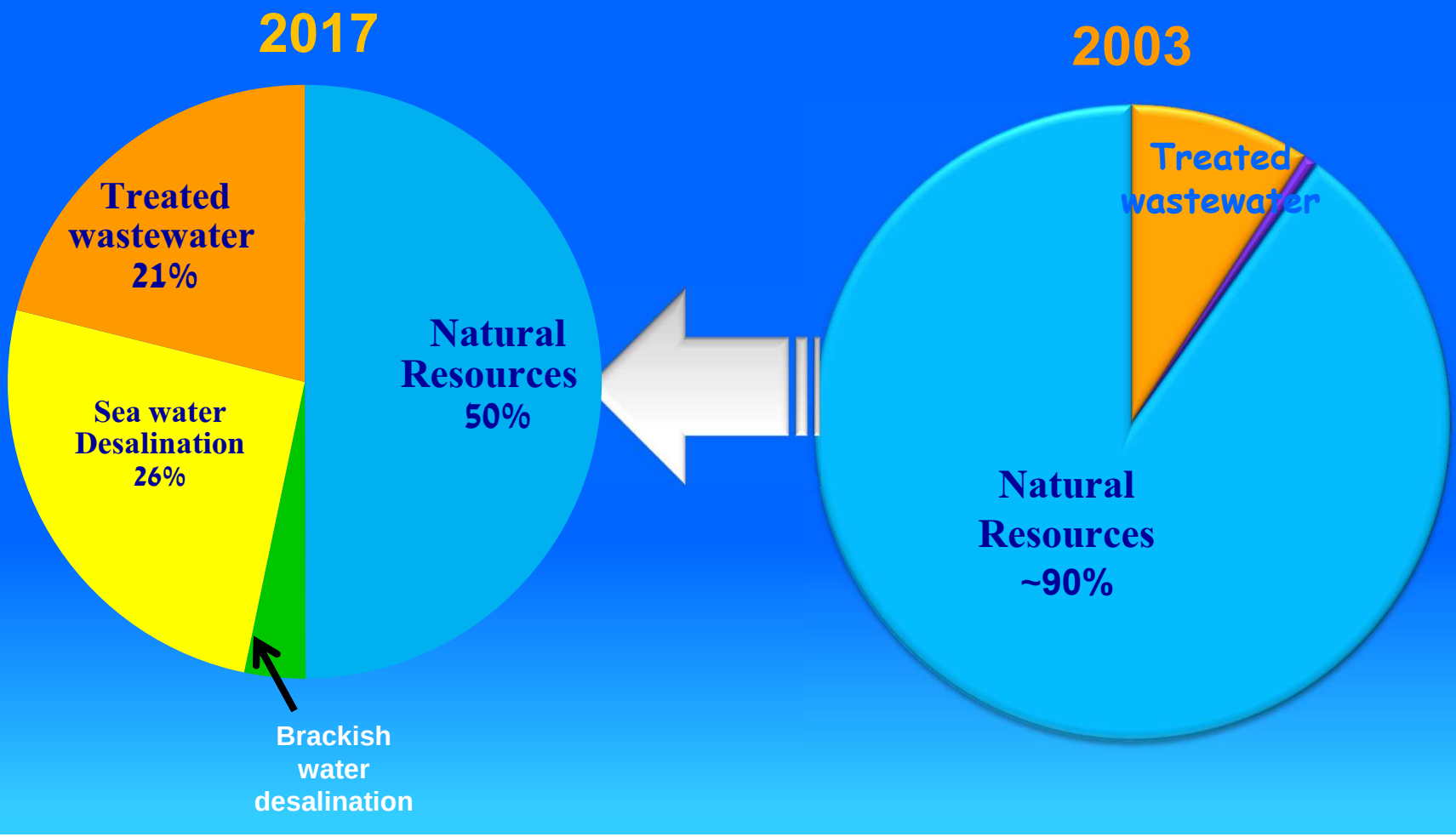


- **Annual Shortage of over ~45%**
- **Forecast for potable water demand: 2050 ~ 2.45 billion m3/annum**

Supply to PA – 66.1 MCM
Supply to Jordan – 54.9 MCM

Closing the gap- the water revolution

50% of the total consumption are manufactured water



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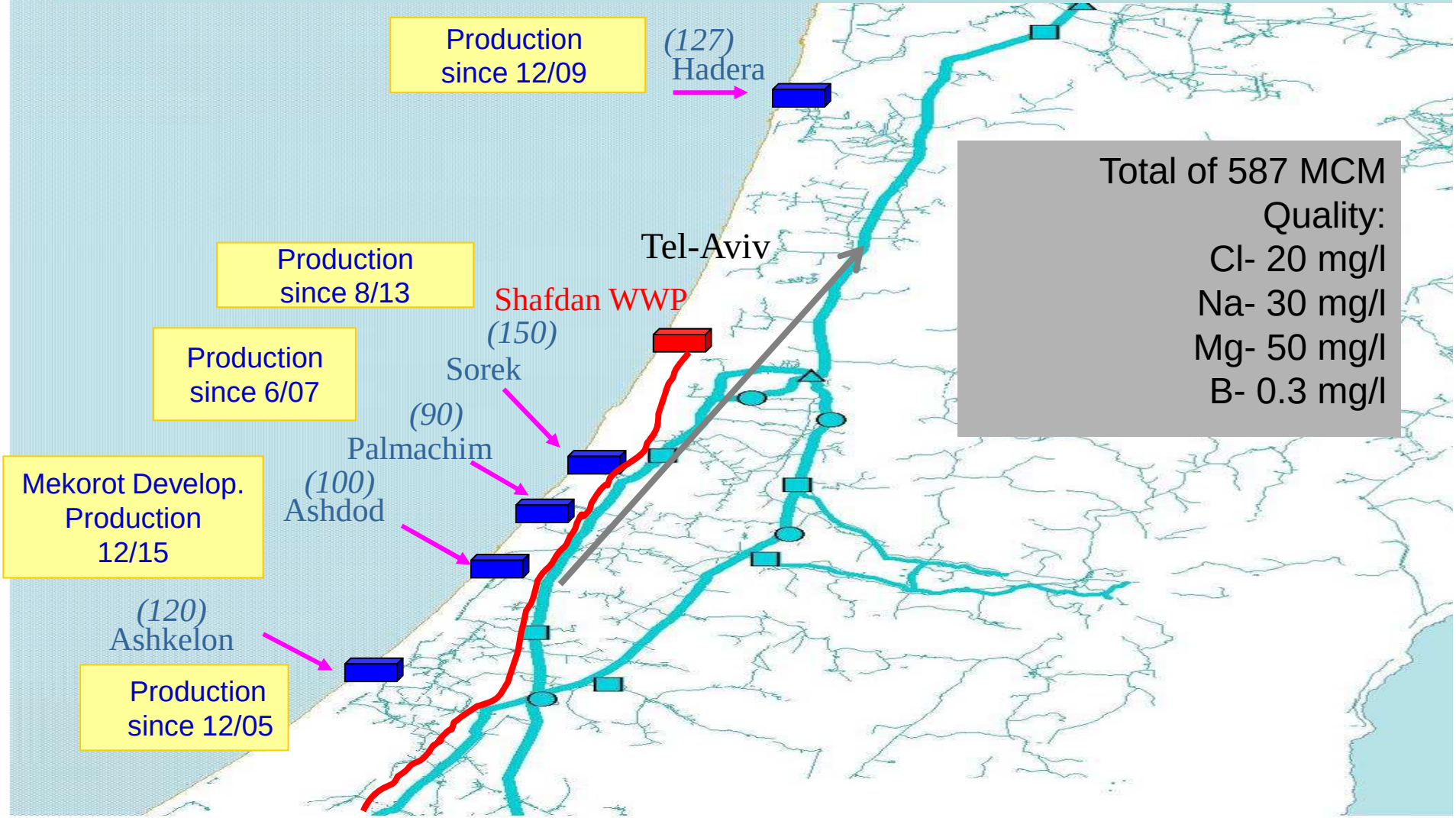
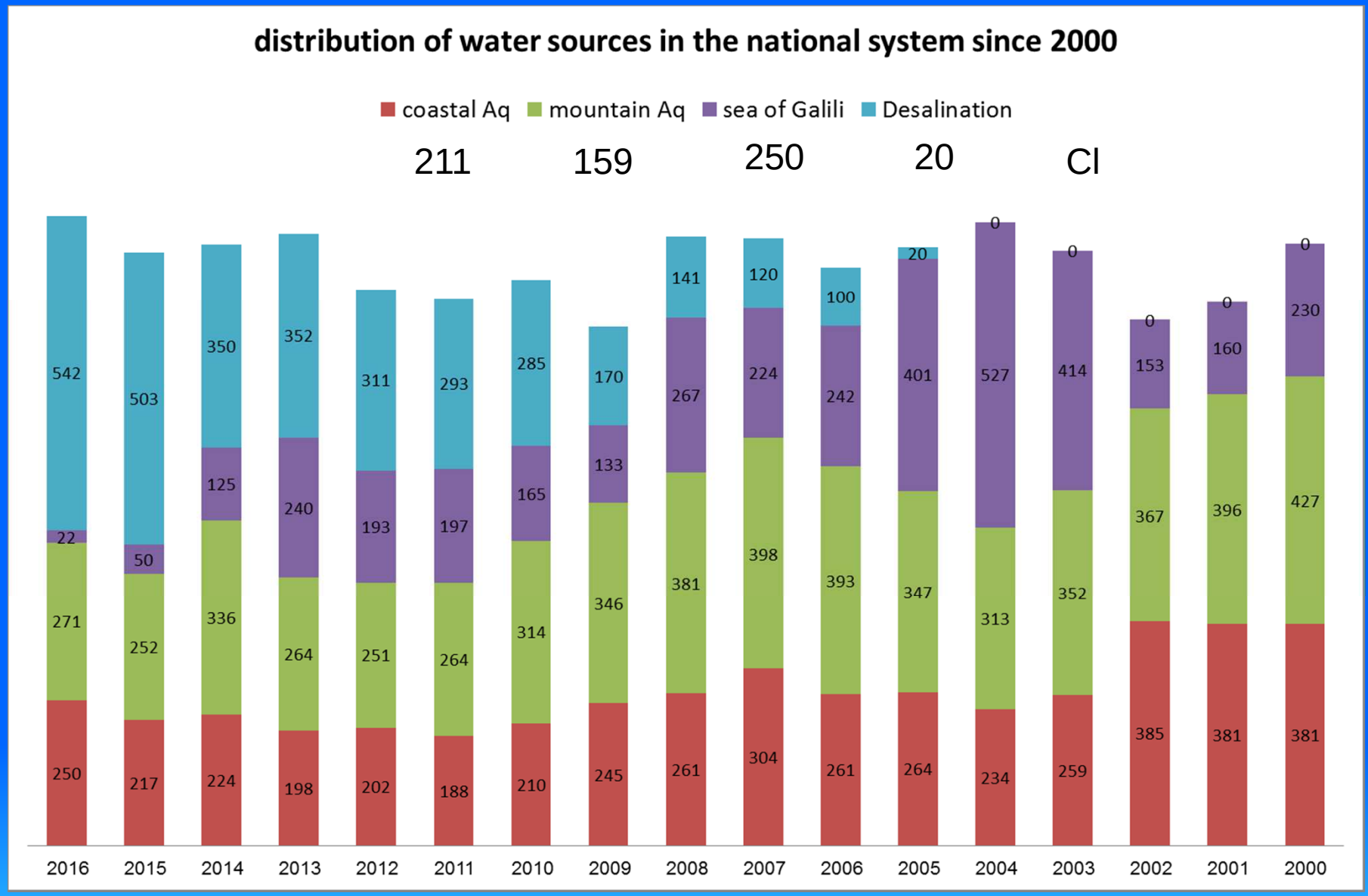
Sea Water Desalination

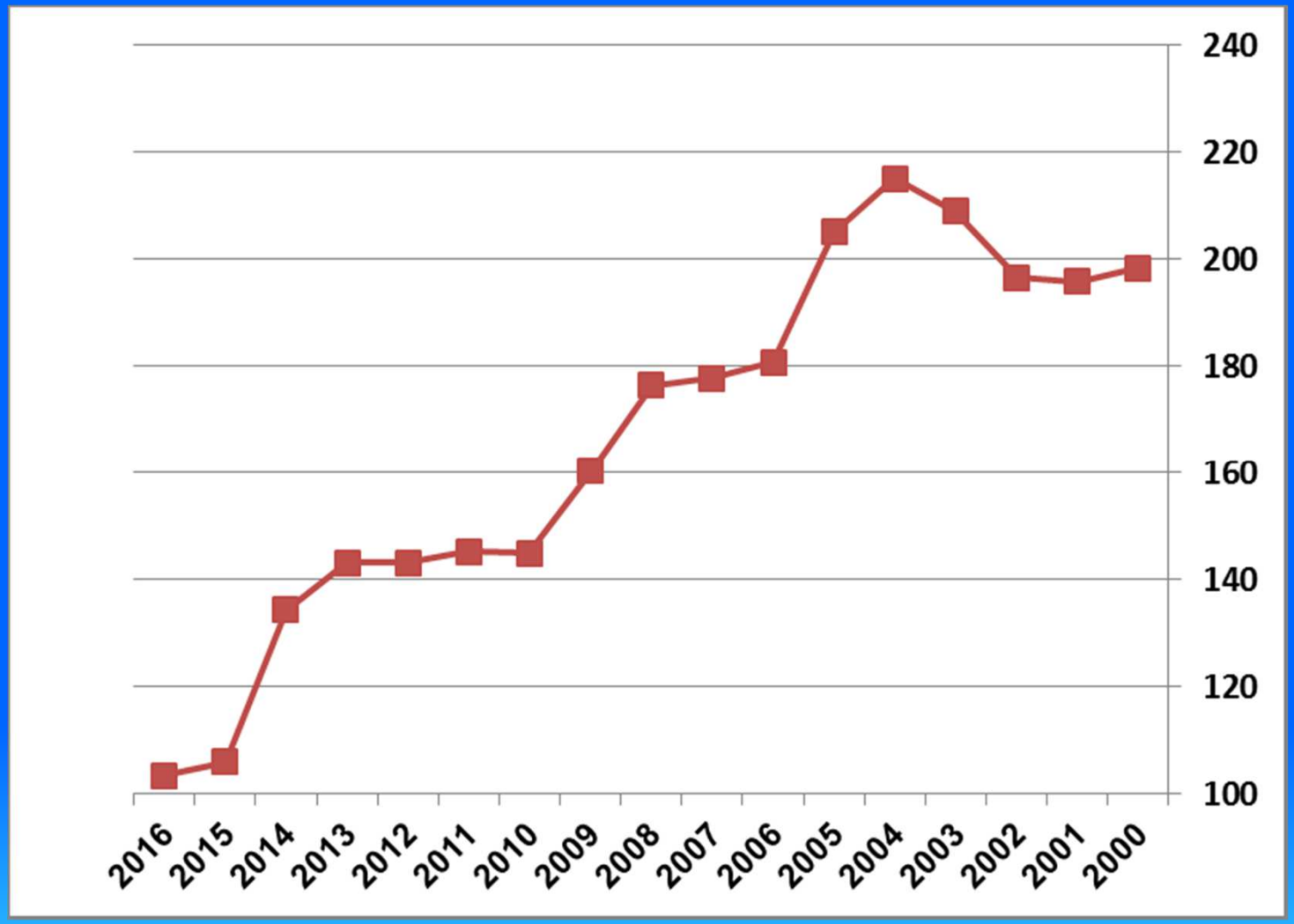
STATE OF ISRAEL

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

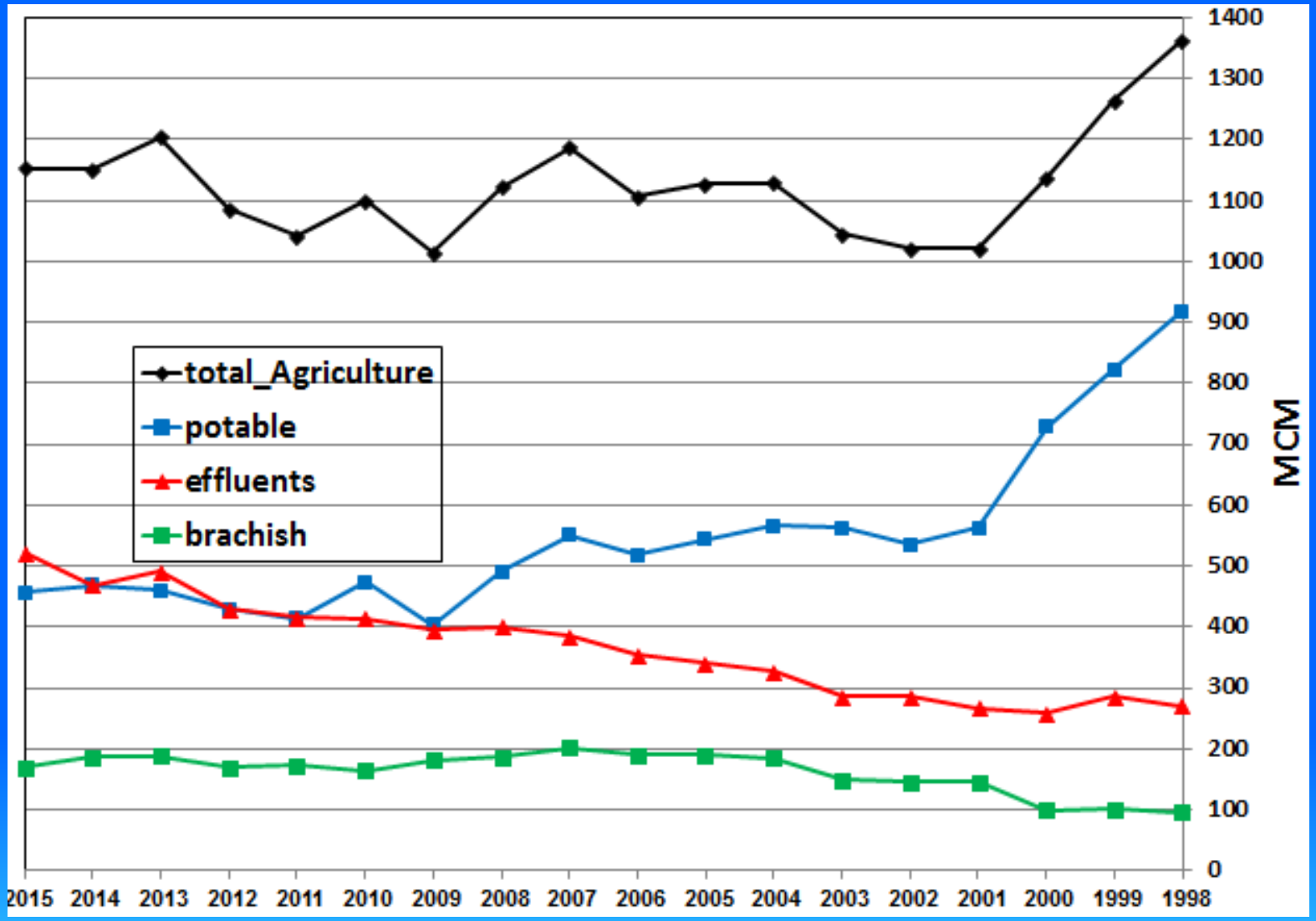



distribution of water sources in the national system since 2000
coastal Aq
mountain Aq
sea of Galili
Desalination
211
159
250
20
Cl
2016 2015 2014 2013 2012 2011 2010 2009 2008 2007 2006 2005 2004 2003 2002 2001 2000
250 217 224 198 202 188 210 245 261 304 261 264 234 259 385 381 381
271 252 336 264 251 264 314 346 381 398 393 347 313 352 367 396 427
22 50 125 240 193 197 165 133 267 224 242 401 527 414 153 160 230
542 503 350 352 311 293 285 170 141 120 100 20 0 0 0 0 0

Changes in chloride concentration with time in the national system



Water Sources in the Agriculture Sector



Impact of desalinated water on agriculture

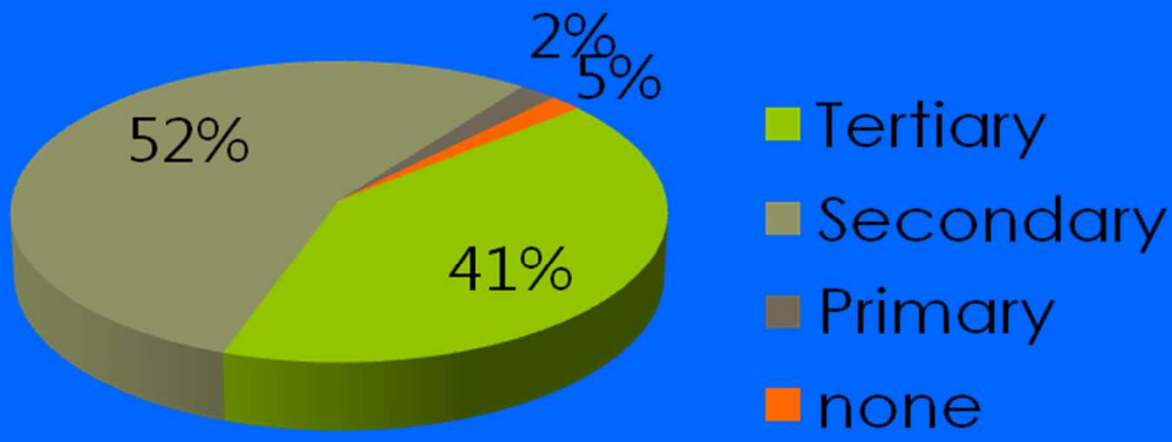
- Ensuring water quantity demand on long term (+)
- Reducing salt loads and concentration (+)
- Possibility of high SAR ratio (-)
- Limits in nutrients such as Mg, Ca & K (-)
- Frequent changes in water quality (-)

From nuisance to asset- Wastewater treatment and effluent reuse

Wastewater treatment and effluent reuse

- Israel is the leading country in the world utilizing treated wastewater for irrigation (85% from produced wastewater).
- The treated wastewater quality demand is very high, and significant portion (140mcm/year SHFDAN effluent) is define as safe for occasional drinking.
- The reuse of treated wastewater for irrigation serves two main goals, valid water source for agriculture also in drought years, and end solution to wastewater stream along with protecting the environment.
- The high reuse portion of the wastewater in Israel led to new innovative methods for the treatment.

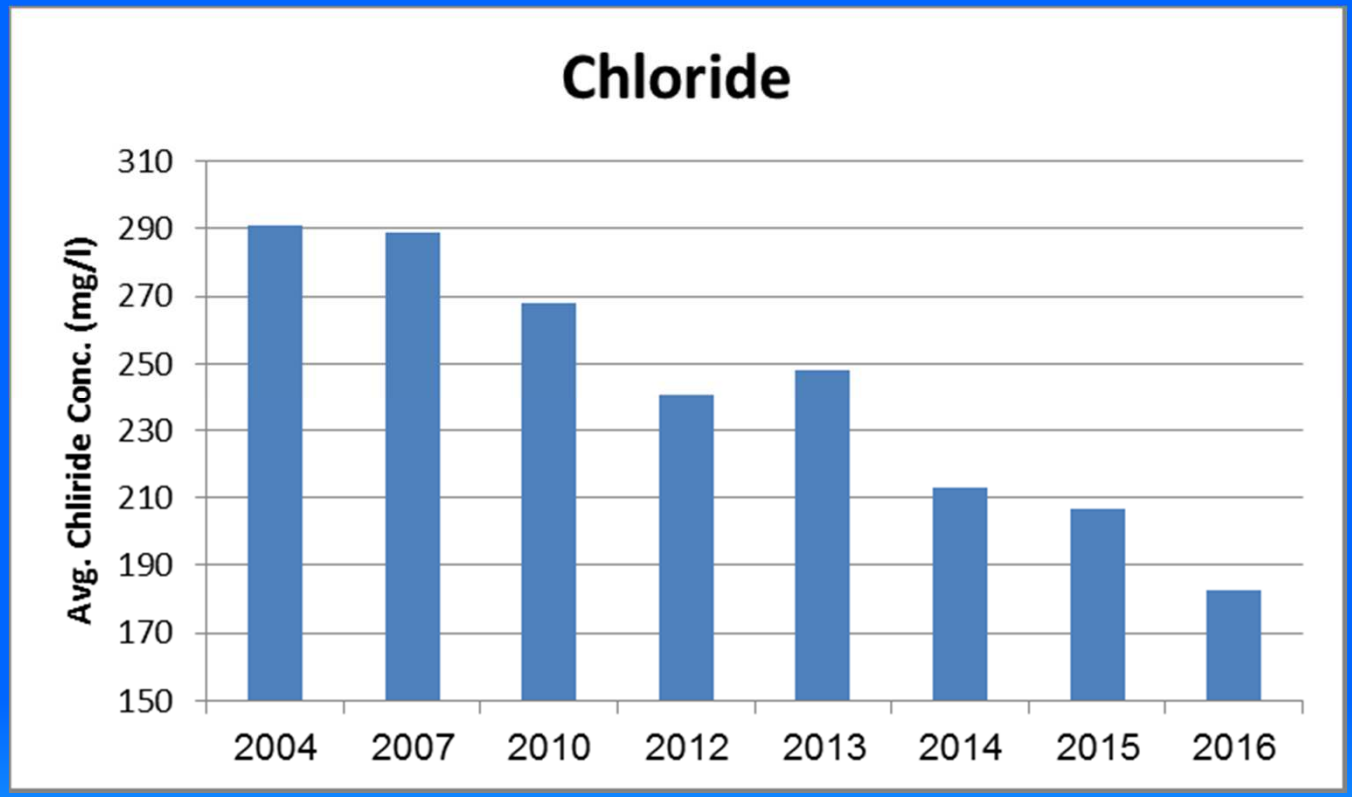
Wastewater and Effluent Sector Qualities and Quantities



from 2020 all STP's will treat sewage to a tertiary level

540 million m3 → 94% is treated → 88% reuse

Chloride concentration in the Shafdan WWP- effect of desalinated water

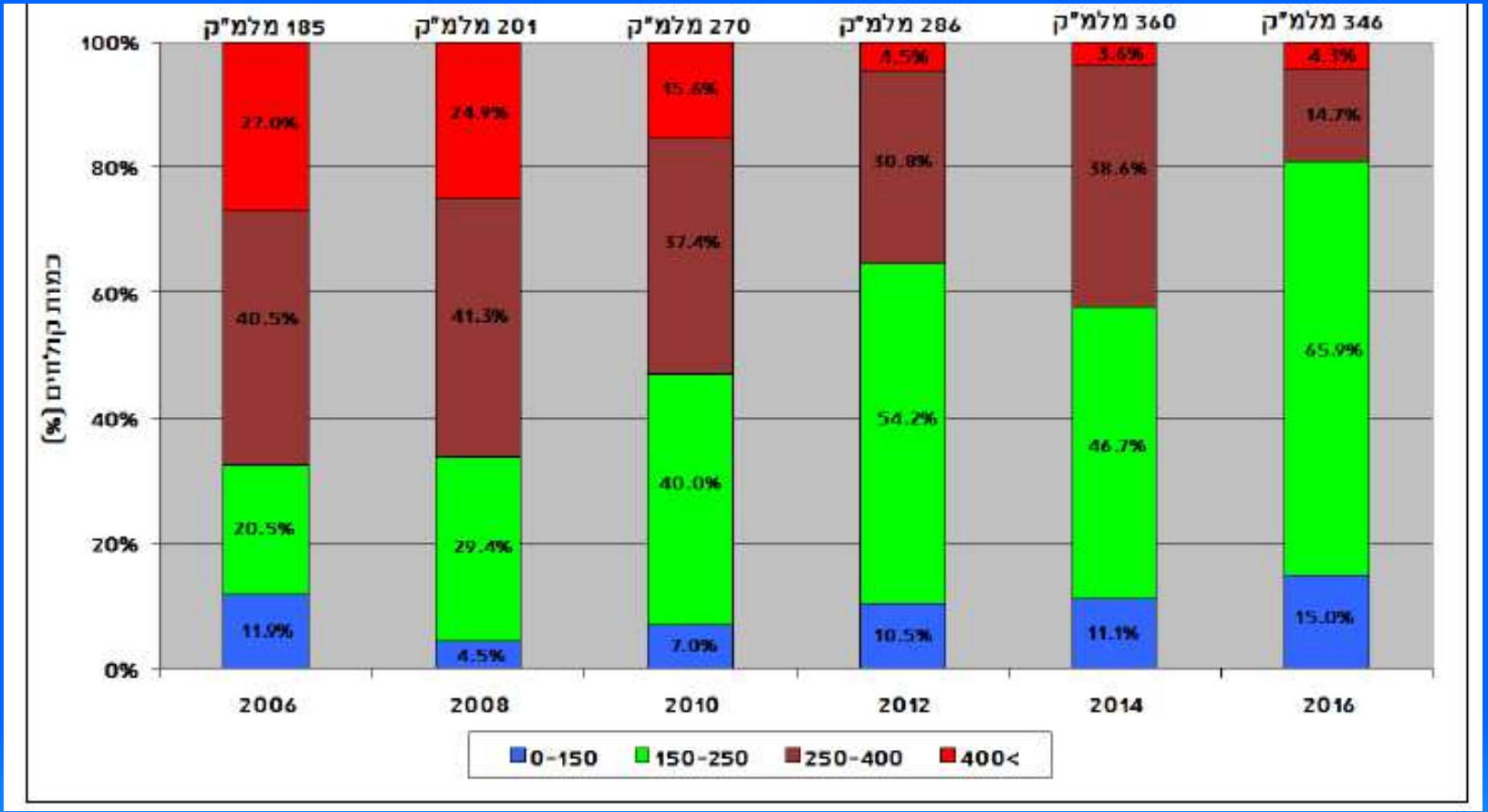


EFFLUENT STANDARTS

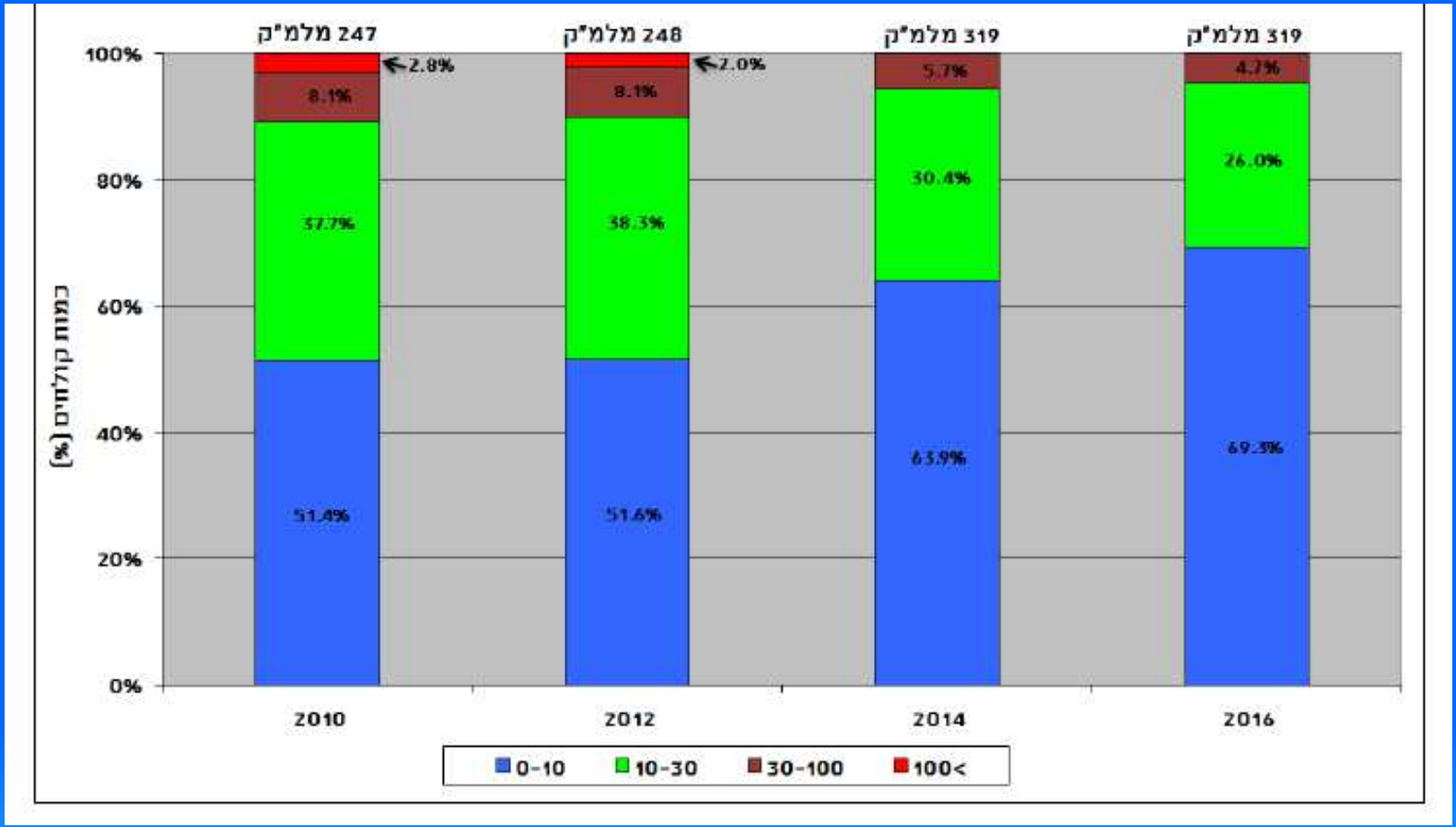
STANDART	PARAMETER
250 mg/l	CHLORIDE
25 mg/l	TOTAL_N
10 mg/l	N-NH3
0.4 mg/l	BORON
150 mg/l	SODIUM
5.0	SAR
1.4 dS/M	EC
10 mg/l	BOD5

Effluent Quality Standards and Rules for Sewage Treatment, Regulations, 2010

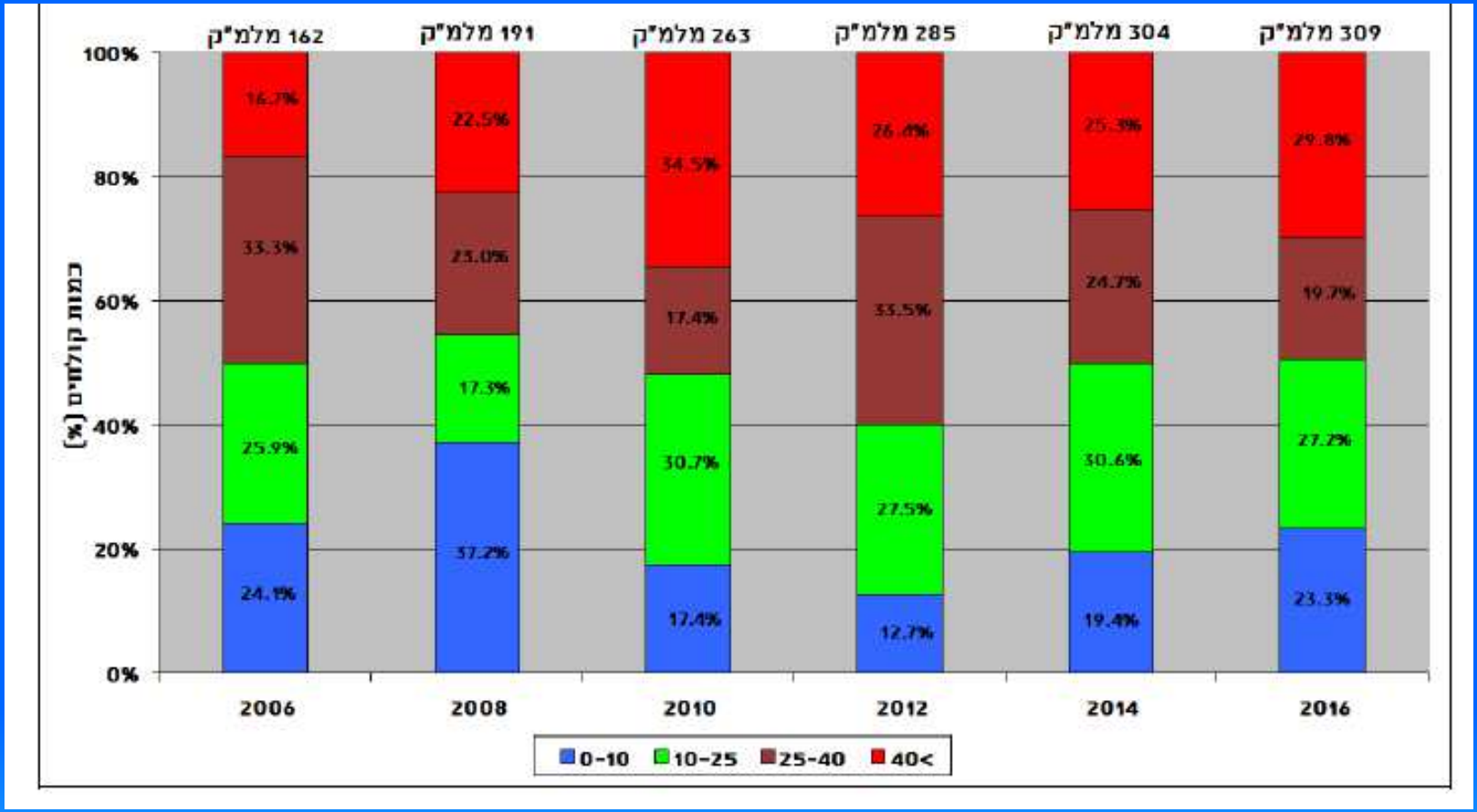
Chloride concentrations in effluent reservoirs- National survey



BOD concentrations in effluent reservoirs- National survey



Nitrogen concentrations in effluent reservoirs- National survey



Prevention:
Industrial Wastewater

Rules define industrial wastewater quality allowed discharging to the sewage system:

- Protect the sewage system from damage and clogging
- Protect the biological process in the WWTPs
- Reduce contaminants from sewage and effluent

Natural Resources Water quality

- Main groundwater quality problems in Israel are caused by leakage from fuel instillations, historical spills at industrial sites (military, metal finishing factories) and non point contamination from agriculture.

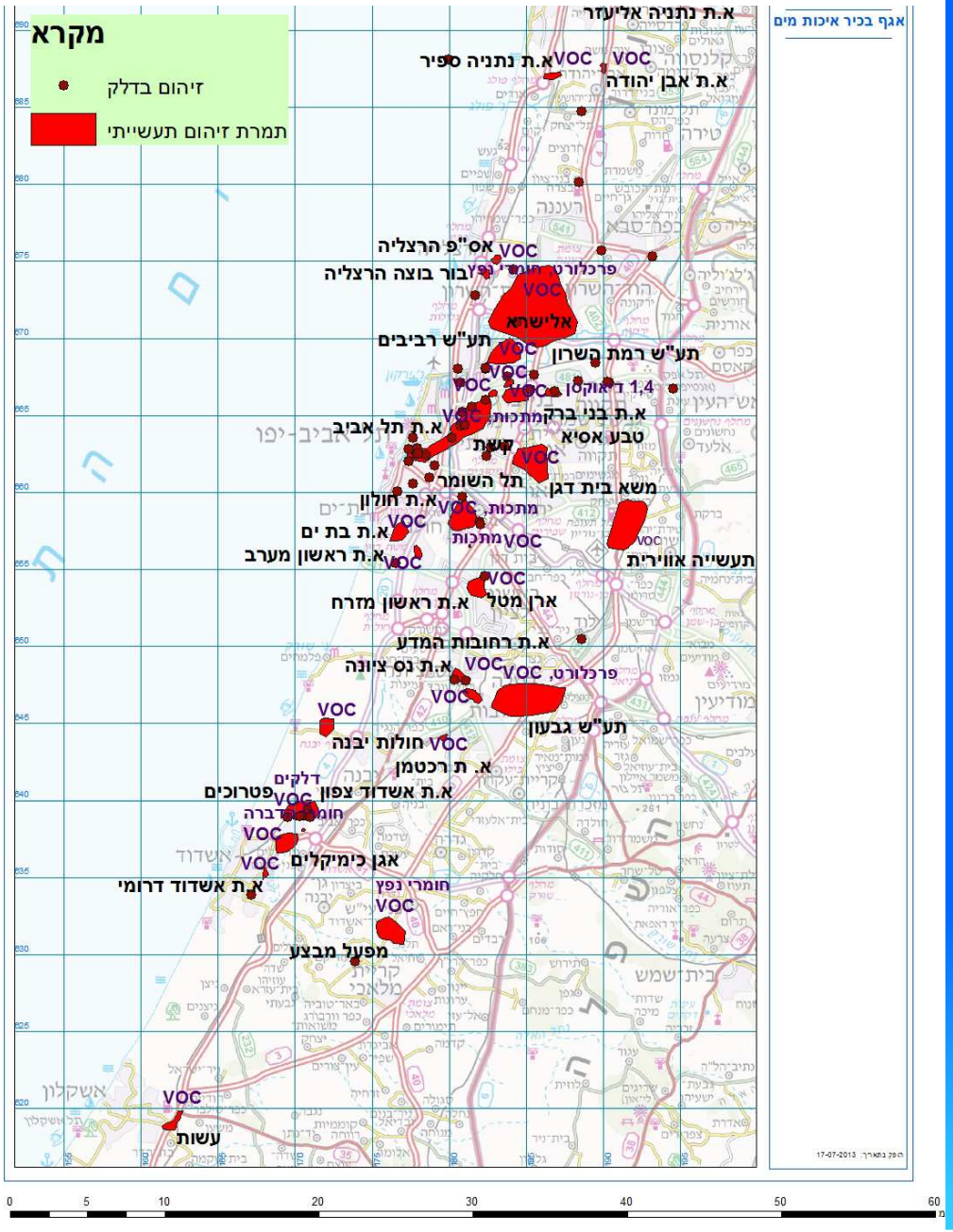
- Contamination plumes effects:
  - Existing Pumping wells
  - Environmental health by vapor intrusion from volatile compounds
  - Land development

Number of closed drinking wells in Israel according to Couse of disqualification

Pollutant	Number of closed well 1998-2013
nitrate	109
chloride	24
microbial	5
detergents	**3**
Heavy metal	**4**
Organic pollutants (VOC)	**28**
EDB	**18**
MTBE	**4**
perchlorate	**14**
total	**209**

23% of the wells closed due to industrial pollution
over 50% due to agriculture practices

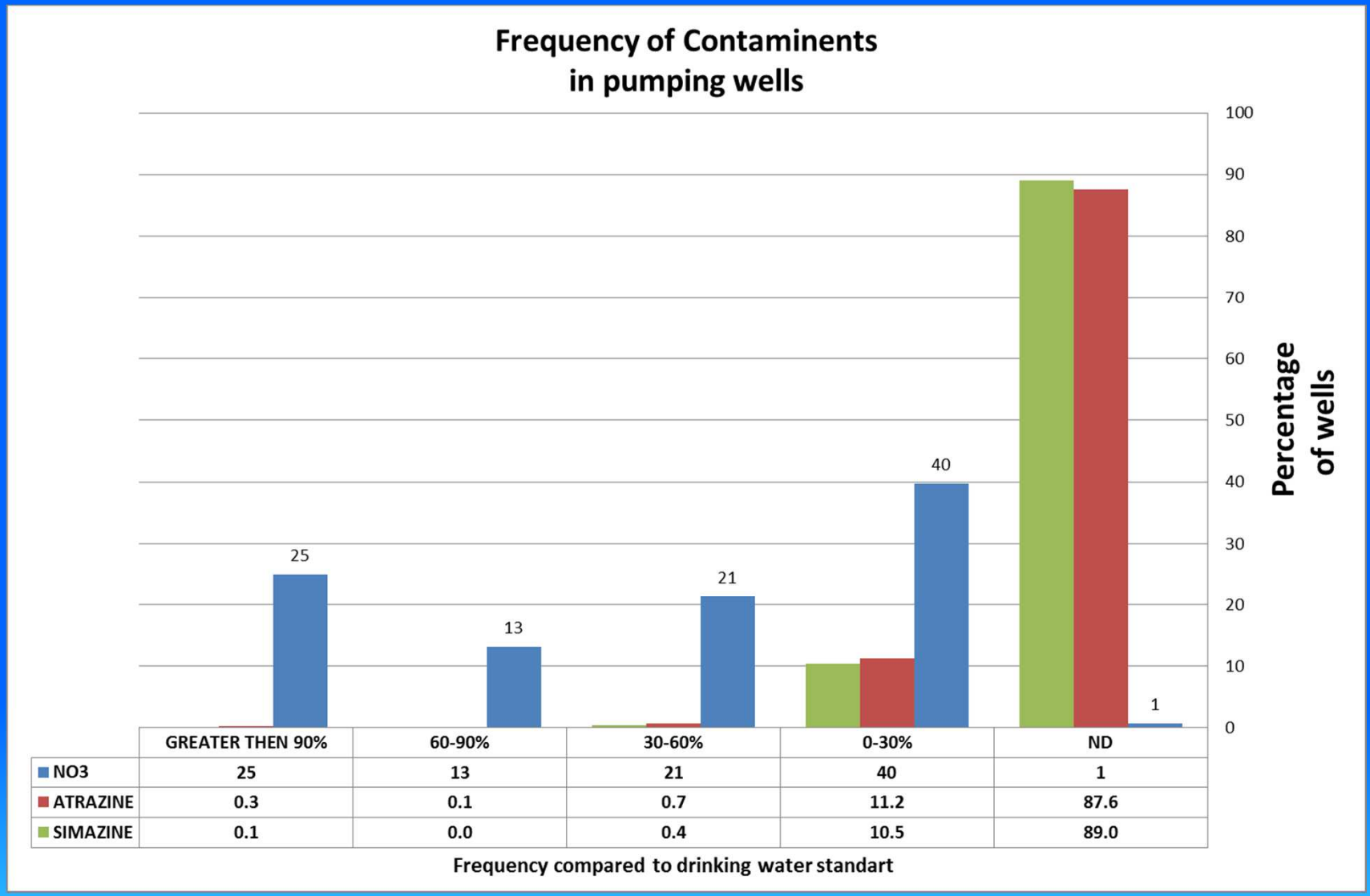
Industrial contaminated groundwater plumes in the coastal aquifer



Main contaminants:

- 140 sites with severe contamination
- VOC (TCE,PCE, DCE), Perchlorate
- MTBE-fuel additive
- 82 square kilometer of contaminated area , that is equivalent to 1.9 billion M3 of water.

Water quality in Israel Aquifers



	GREATER THEN 90%	60-90%	30-60%	0-30%	ND
NO3	25	13	21	40	1
ATRAZINE	0.3	0.1	0.7	11.2	87.6
SIMAZINE	0.1	0.0	0.4	10.5	89.0

Reduce risks- Management of contamination

- Installing monitoring systems to asses plumes behavior over time and space.
- Source removal at point sources- installing active systems for groundwater remediation (in-site and ex-site) to reduce concentrations
- Plume control – in large contaminated area installing pump and treat systems for hydraulic control of the plumes
- Well head treatment – supplying water after treatment (activated carbon, electro dialyses, dilution)

Polluted sites- Remediation technology used in Israel

Number of sites	***type***
1	MPE - Multi-Phase Extraction
3	Circulation Wells
6	Enhanced Natural Attenuation
28	Oil Recovery
5	Chemical Oxidation
3	Pump and treat
1	reductive dechlorination
5	SVE & AS

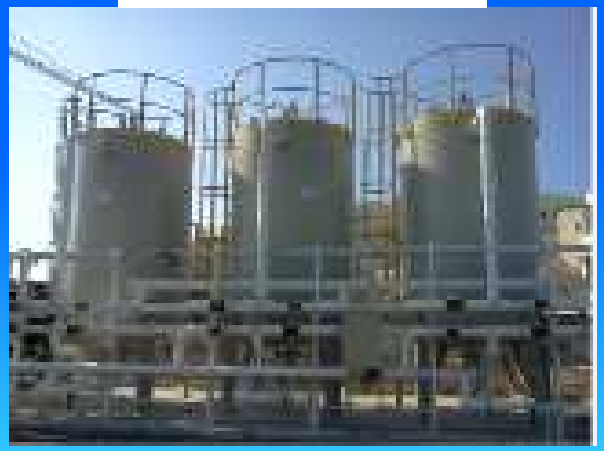
Well Head Treatment

Drinking water treatment is supported by the government

Most of the polluted wells are been treated for DW supply

EDB Removing - GAC

Detergents -GAC



RO – nitrate removal

Elecrtodialysis - selective Membrane

AOP-UV technology

Contaminated well treatment

Production m3	Number of wells	Treatment type	Contamination type
4,910,379	16	Activated carbon	VOC
3,639,502	13	Electro dialyss	Nitrate
6,237,436	22	dilution	Nitrate
14,787,317	51		total

summery

- Israel water sector relies long term on a combination of several water sources : natural, sea desalination and treated sewage
- Israel regulation goals are to protect the water sources and the environment
- Israel has set up national monitoring plans to asses the quality and quantity status of its water sources and to initiate corrective action plans when deterioration is observed.