

# Closing the water gap: Israel's experience

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**Water Pricing for a Dry Future: Policy Ideas from Abroad and their Relevance to California**

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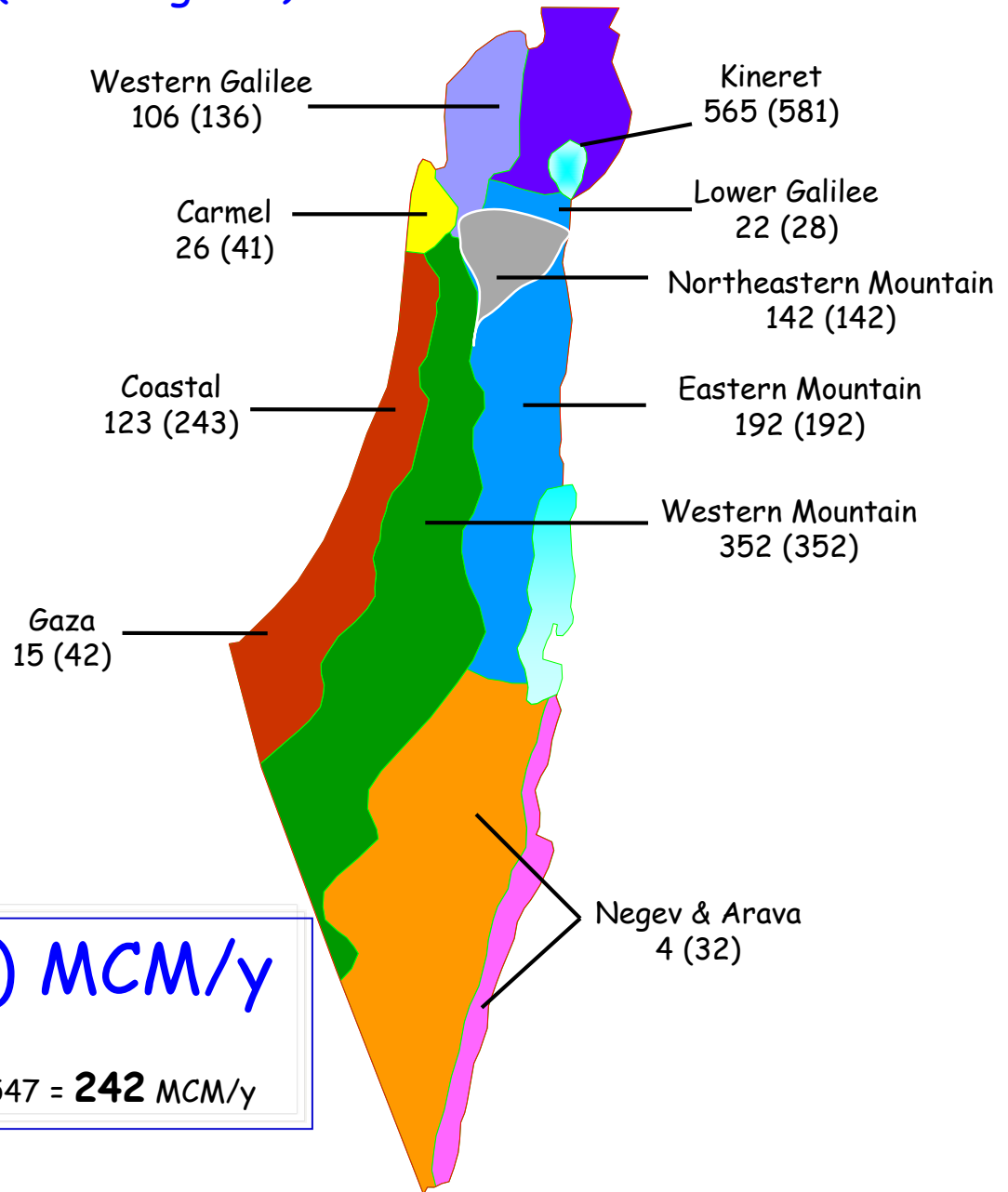
# ISRAEL and...



*Maps drawn to same scale.  
Israel shown in blue.*

Information Regarding Israel's Security  
<http://www.iris.org.il>

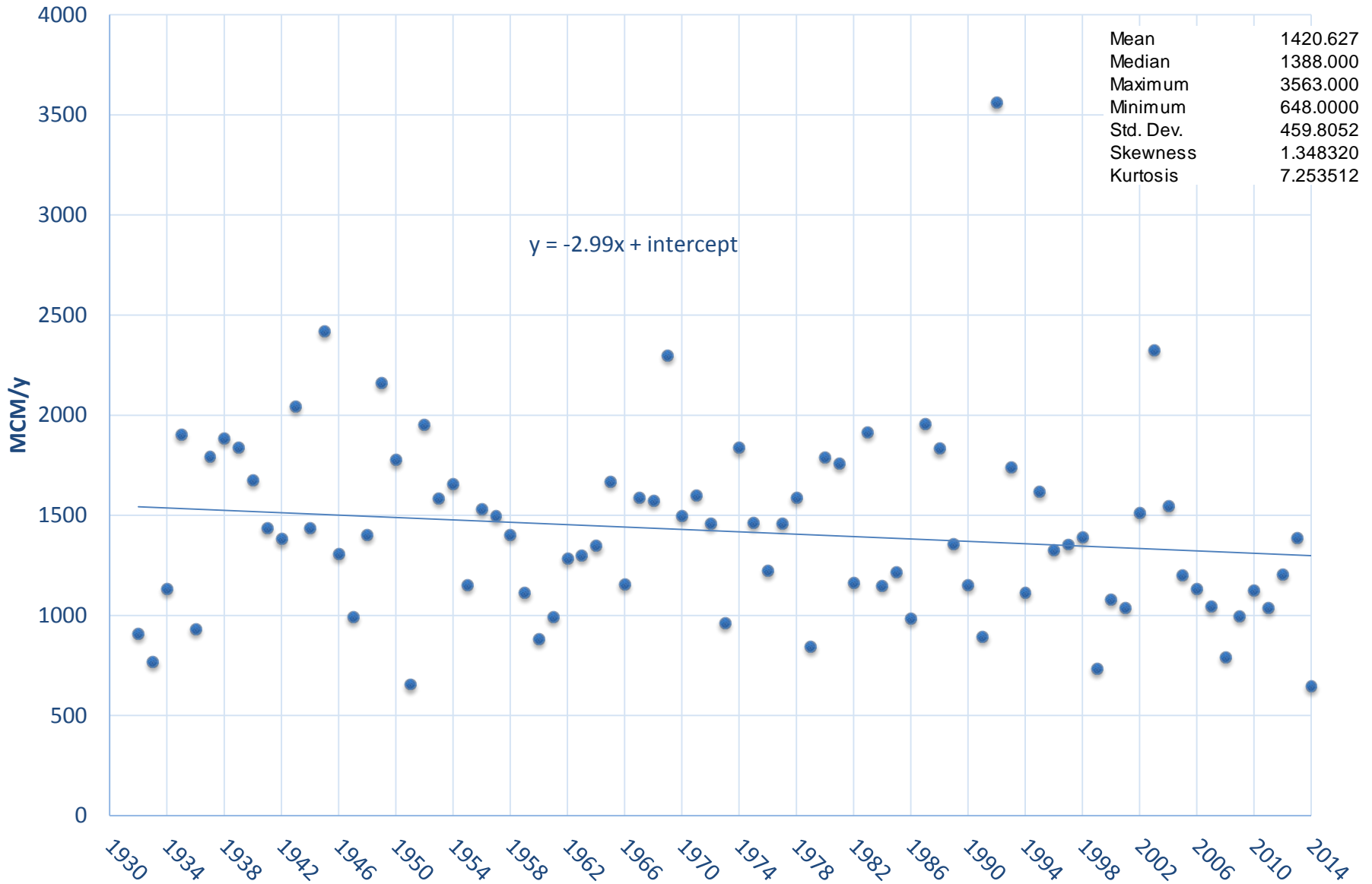
# Average annual Natural Recharge 1973 - 2009 (MCM/y) without (with) brackish (> 400 mg/l Cl) water



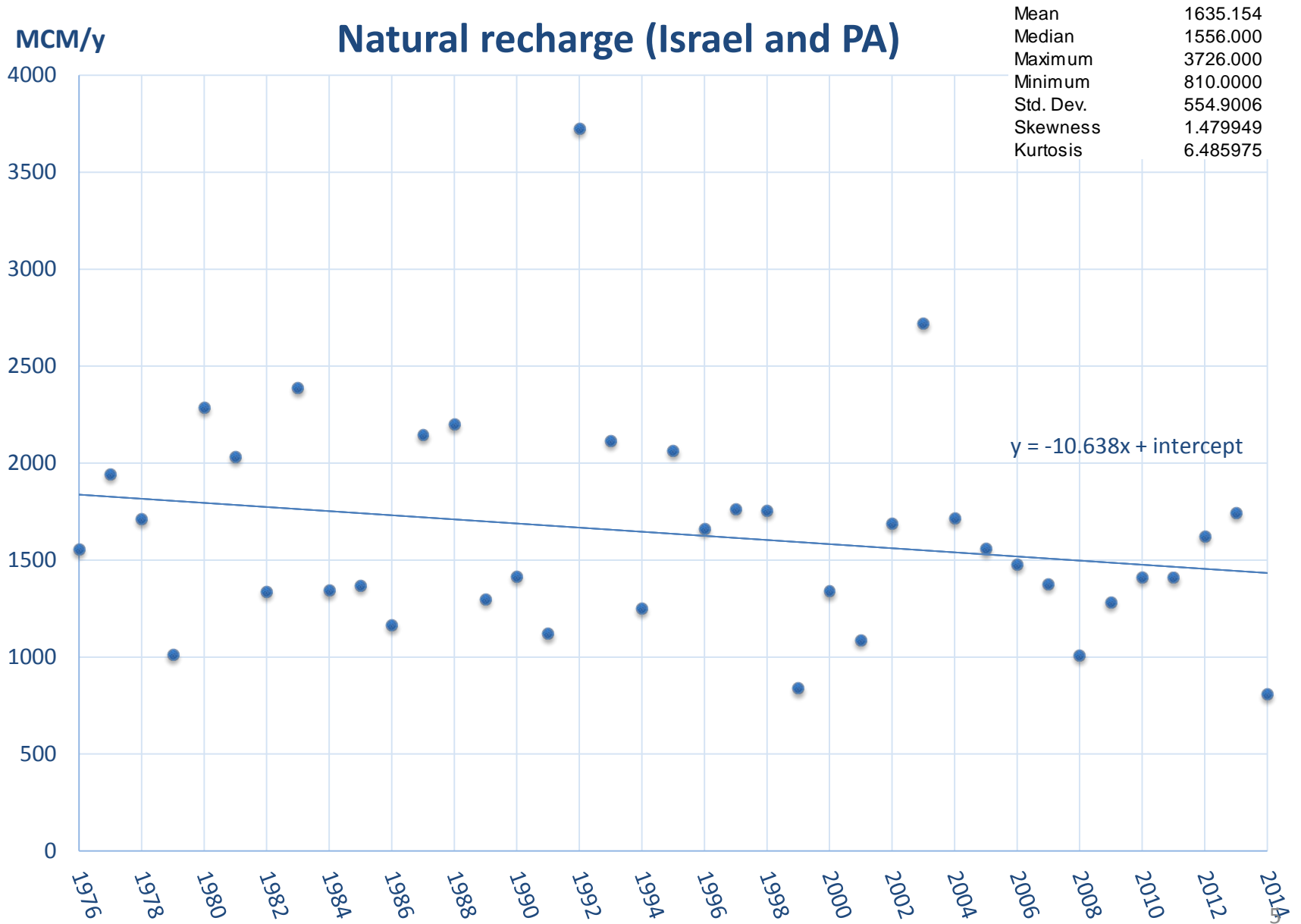
**Total: 1547 (1789) MCM/y**

Brackish (> 400 mg/l Cl): 1789 - 1547 = **242** MCM/y

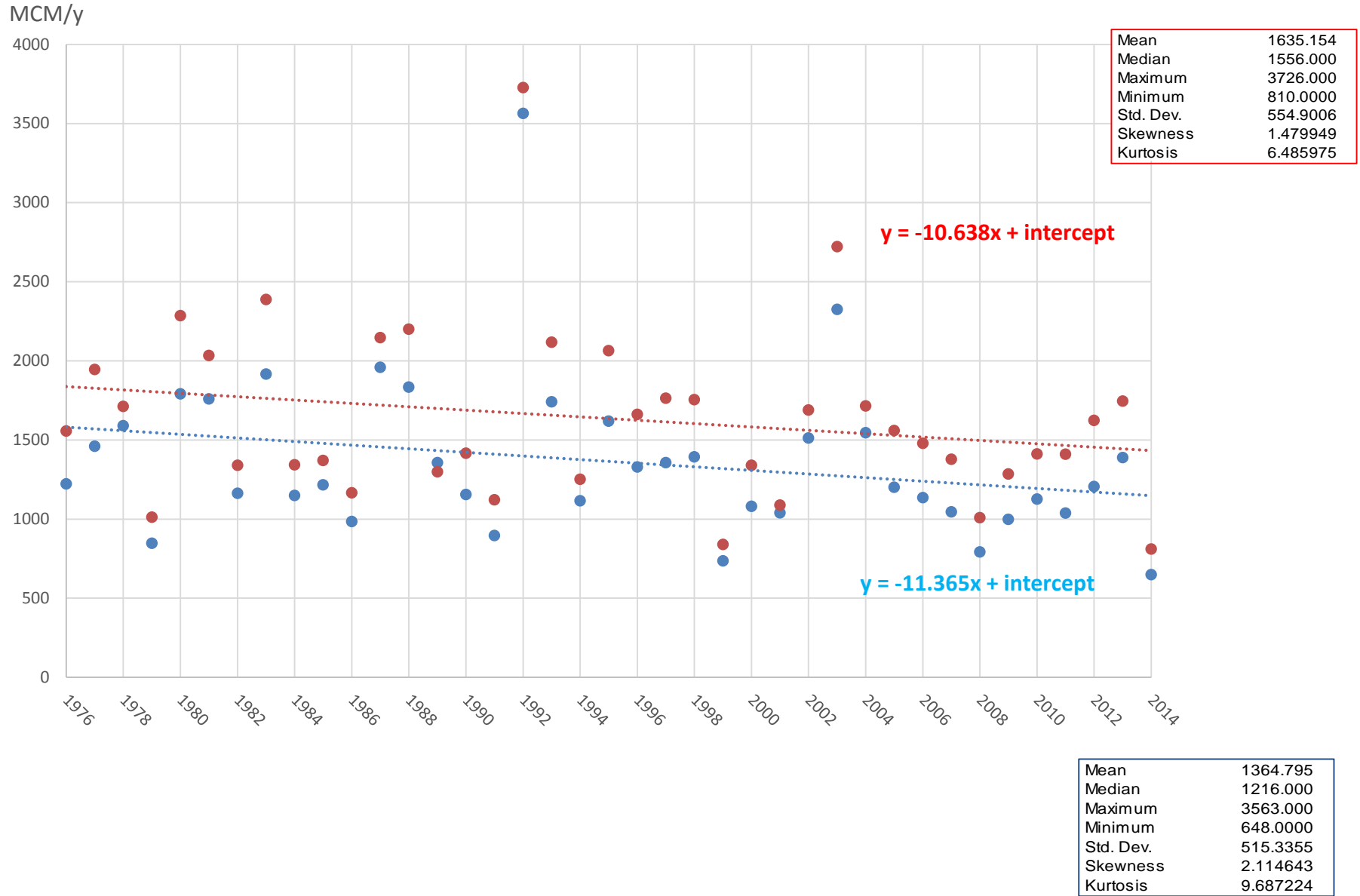
# Natural recharge (without eastern mountain): 1932 - 2014



# Natural recharge west of the Jordan River: 1976 - 2014



# Natural recharge 1976 - 2014 (Israel; Israel + PA)

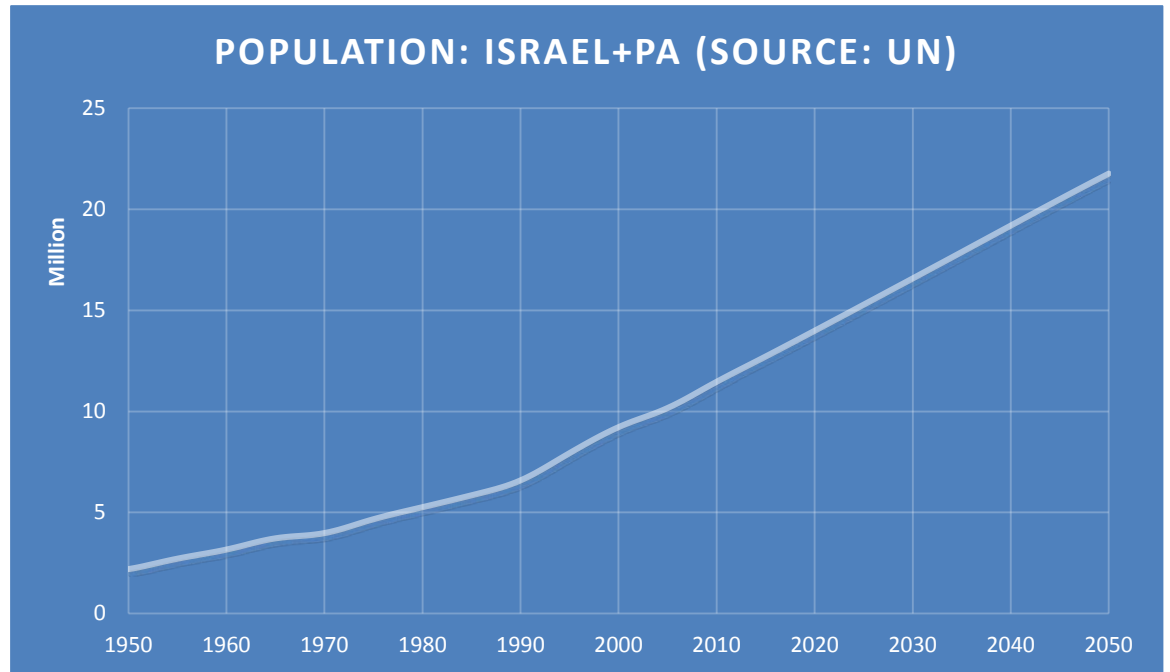


# Natural renewable water resources (MCM/y)

Israel and PA:  $1789 - 242 = 1547$  MCM/y

**High fluctuations; Declining trends**

# Water scarcity: m<sup>3</sup>/person/year



1547 MCM/y

	Pop (million)	m <sup>3</sup> /person/year
2010	11.5	135
2030	16.6	93
2050	21.8	71

(m<sup>3</sup>/person/y)

1700 → Water stress

1000 → water scarcity

500 → absolute scarcity

100 → subsistence



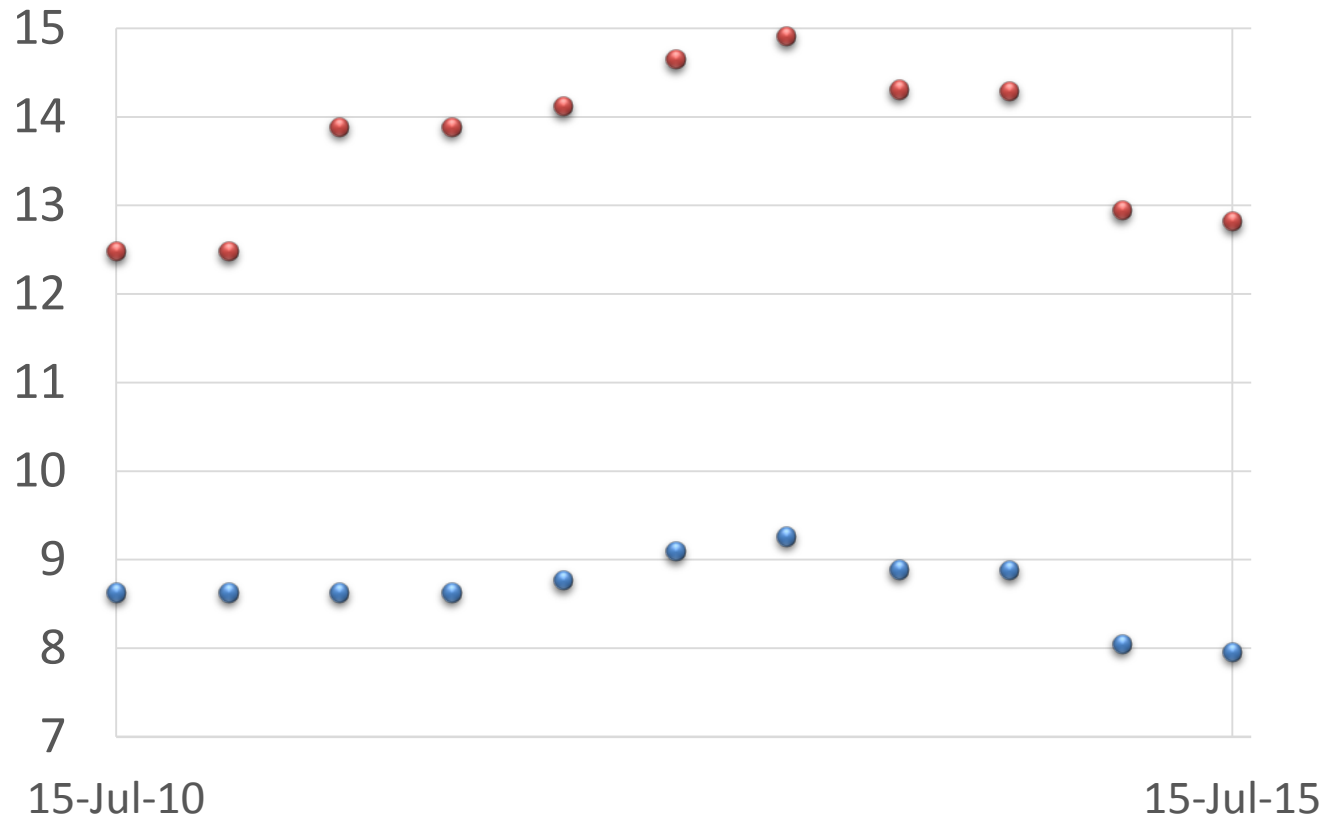


# Water policy

## Combination of

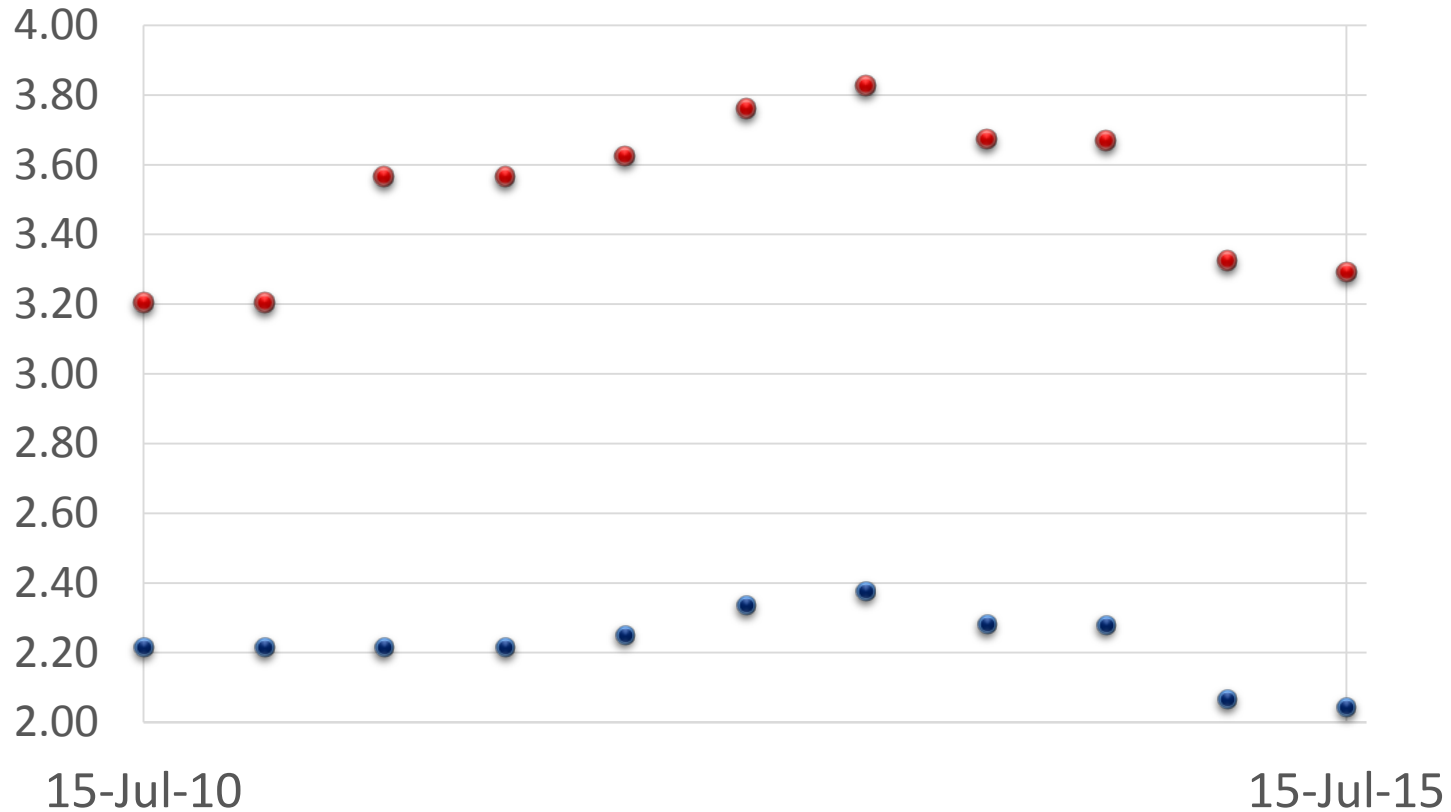
- **Demand management:**
  - **Pricing**
  - **conservation**
- **Supply management:**
  - **Recycling**
  - **Desalination**

## Pricing: Domestic water rates (€/m<sup>3</sup>)

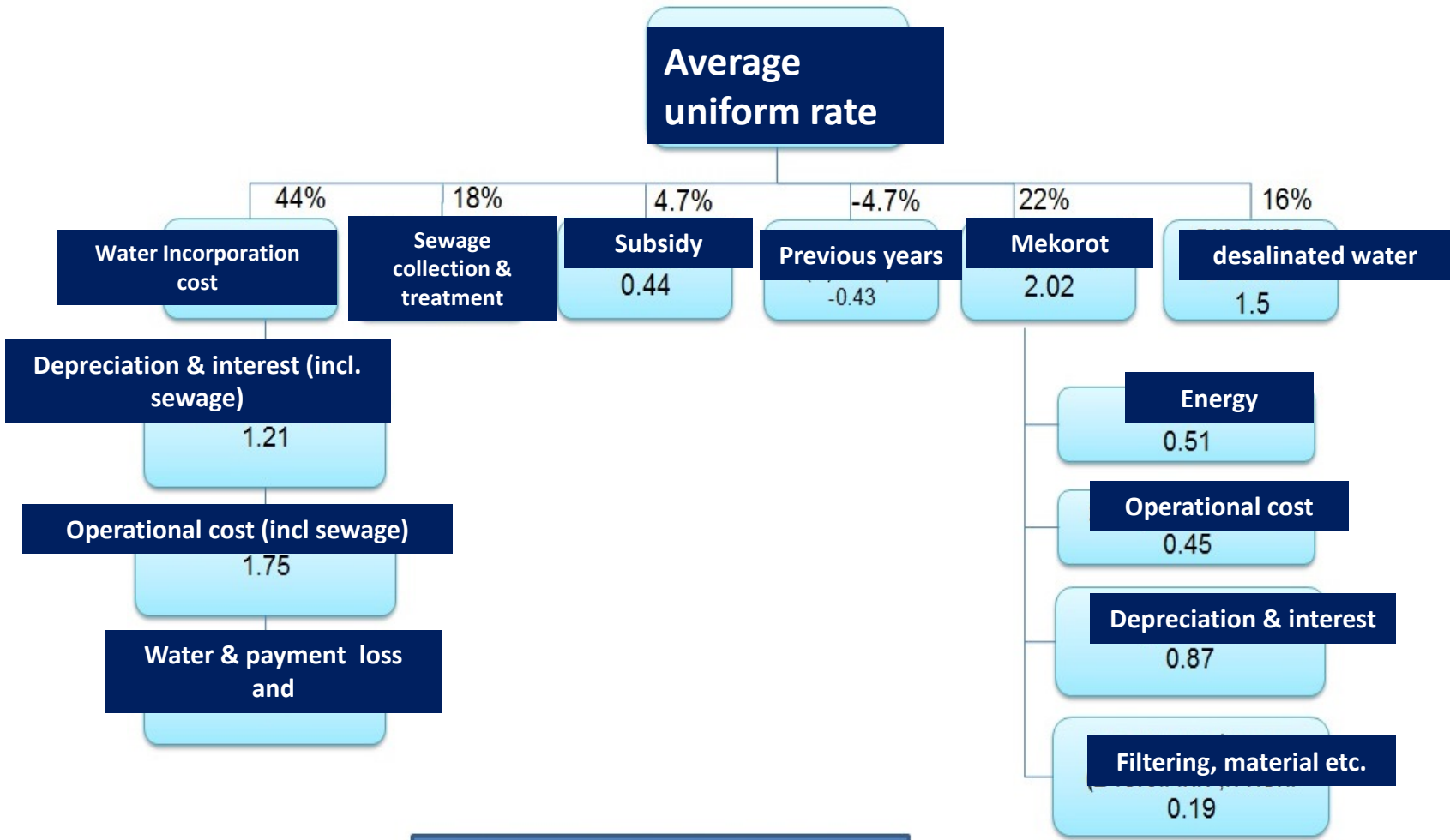


- Lower rates apply to first 8 m<sup>3</sup> per month per household, corrected for number of members.
- Industry pays higher rates

## Domestic water rates (\$/m<sup>3</sup> at Xrate \$1 = 3.89 NIS)

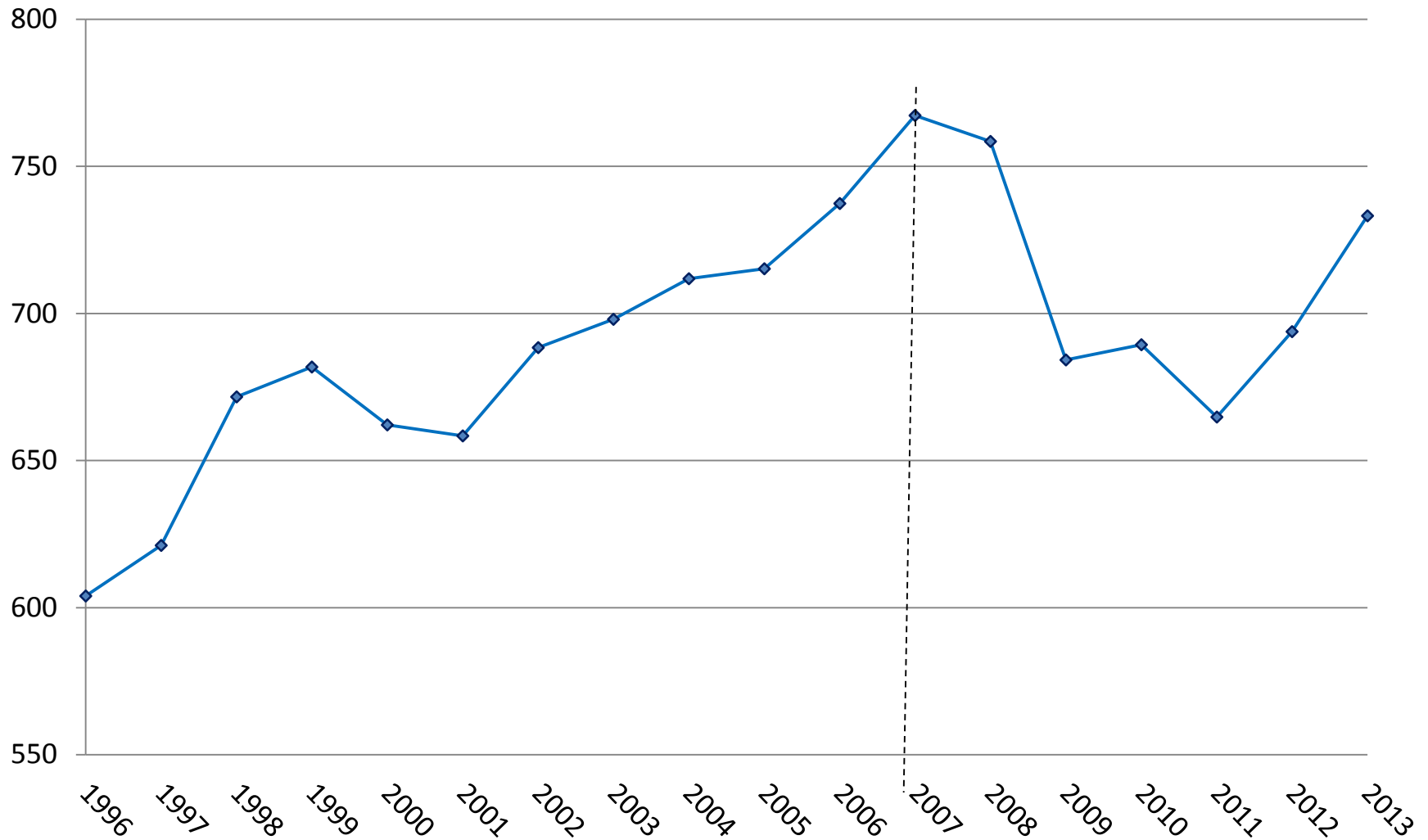


- Lower rates apply to first 8 m<sup>3</sup> per month per household, corrected for number of members.
- Industry pays higher rates



\* עקב מעבר תעריף תעשייה לתעריף הגבוה-שזנו היחסים בהתאם.  
 \*\* שינוי חד פעמי עקב הפרשי הכנסה משנים קודמות

# Domestic water consumption (MCM/y): 1996 - 2013



Source: Israel's Water Authority:

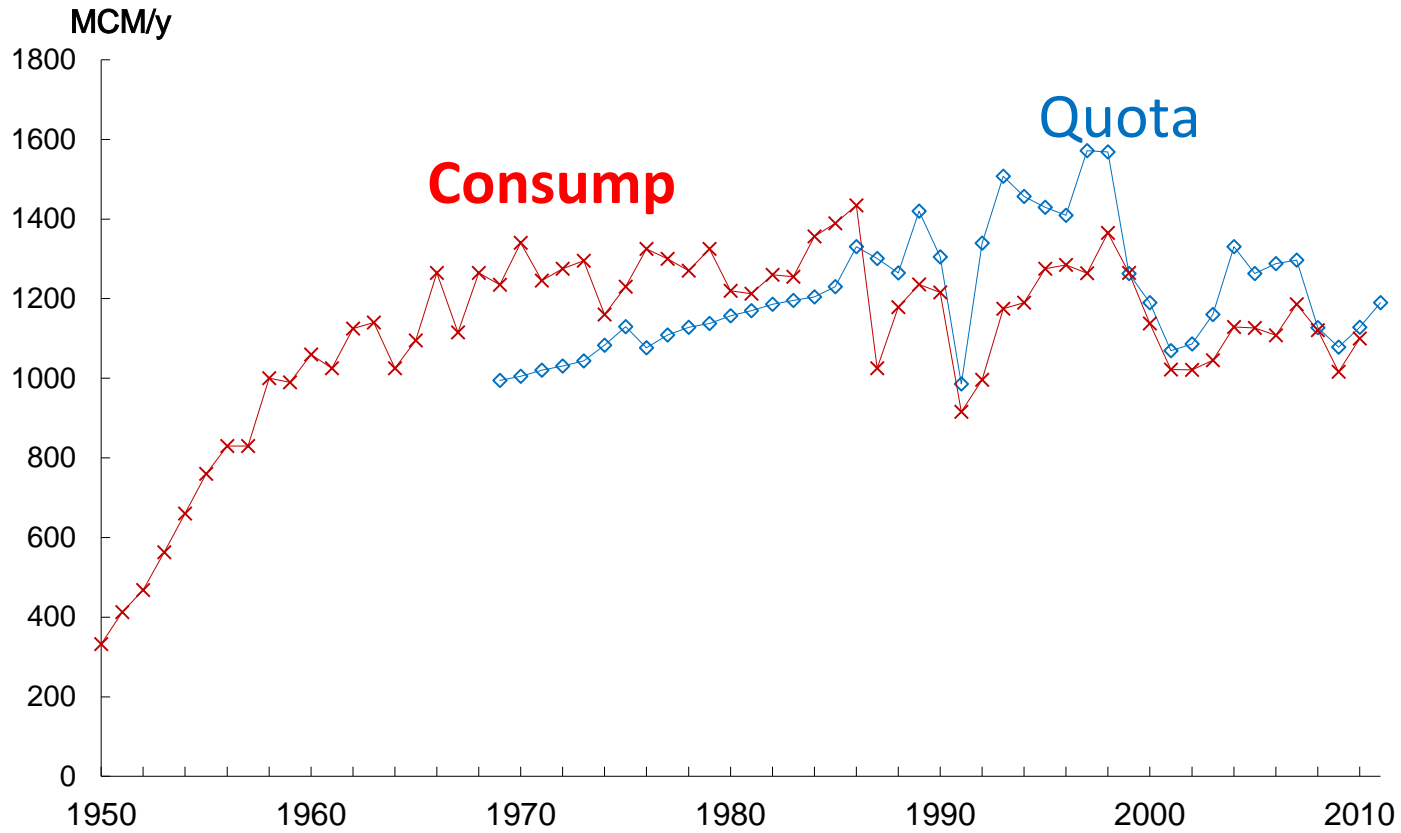
<http://www.water.gov.il/Hebrew/ProfessionalInfoAndData/Allocation-Consumption-and-production/20133/1996-2013.pdf>

## Irrigation water rates in 2015: Natural

	<b>₪/m<sup>3</sup></b>	<b>\$/m<sup>3</sup></b> <b>(\$1 = 3.89 NIS)</b>
<b>Up to 50 % of quota</b>	<b>2.533</b>	<b>0.65</b>
<b>50 % to 80 % of quota</b>	<b>3.167</b>	<b>0.81</b>
<b>Above 80 % of quota</b>	<b>7.95</b>	<b>2.04</b>

# Consumption and quota of natural water in agriculture

(Source: Kislev and Tsaban )



## Irrigation water rates: Shafdan

	<b>₪/m<sup>3</sup></b>	<b>\$/m<sup>3</sup></b> <b>(\$1 = 3.89 NIS)</b>
<b>Quota</b>	<b>1.27</b>	<b>0.33</b>
<b>10 % above quota</b>	<b>1.69</b>	<b>0.43</b>
<b>Above 110 % of quota</b>	<b>2.40</b>	<b>0.62</b>



## Irrigation water rates: recycled

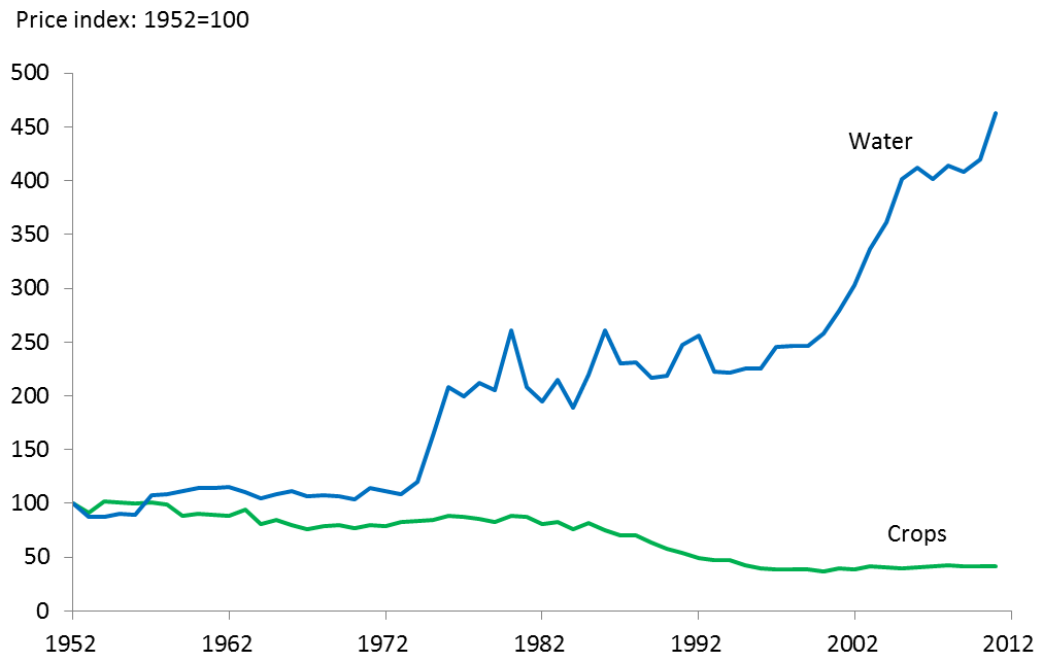
Recycled	₪/m <sup>3</sup>	\$/m <sup>3</sup> (\$1 = 3.89 NIS)
Quota	1.21	0.31
8 % above quota	1.52	0.39
Above 108 % of quota	1.82	0.47

Low quality recycled	₪/m <sup>3</sup>	\$/m <sup>3</sup> (\$1 = 3.89 NIS)
Quota	1.04	0.27
8 % above quota	1.30	0.33
Above 108 % of quota	1.57	0.40

## Irrigation water rates: saline

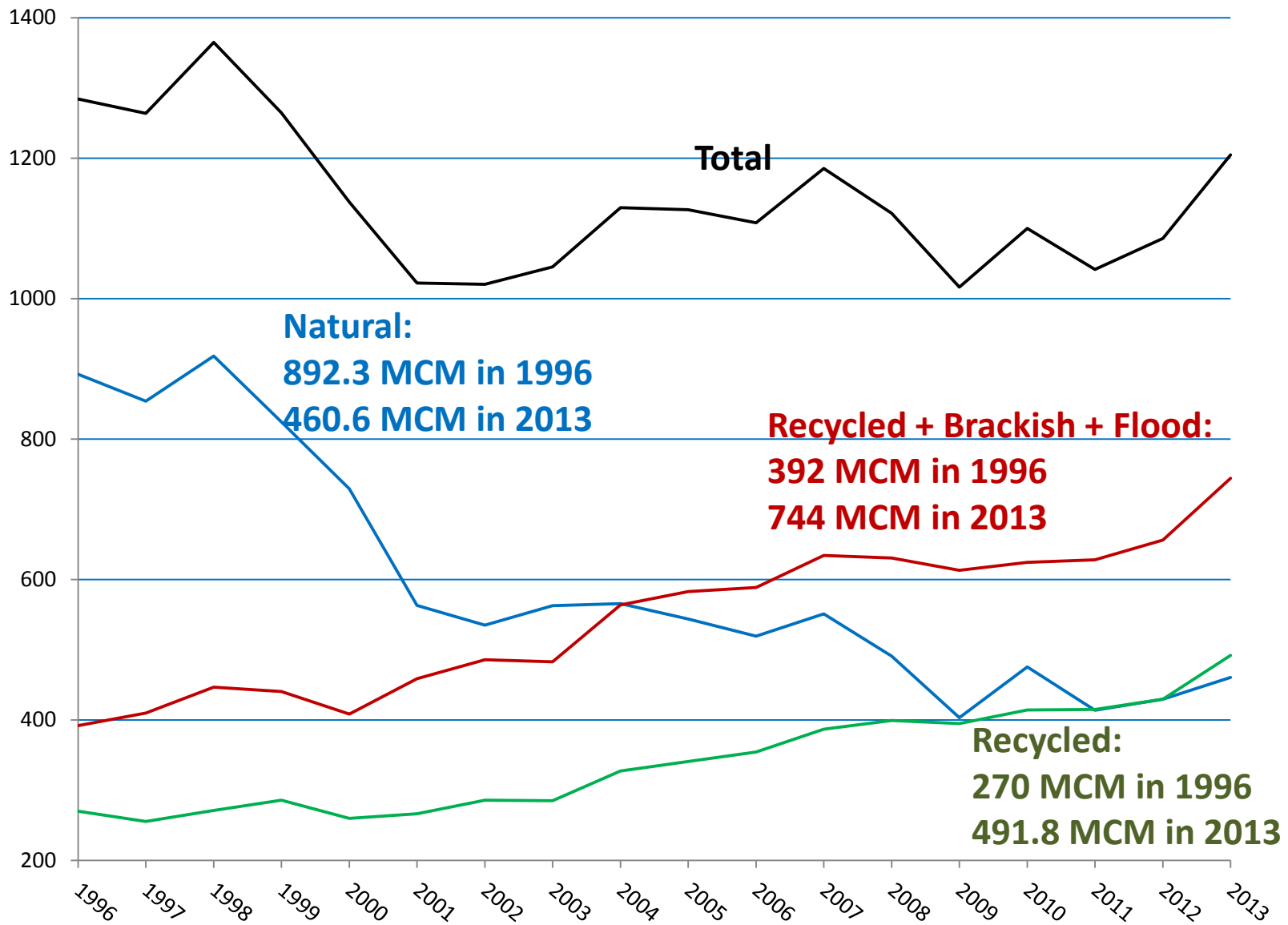
Saline	$\text{m}^3/\text{m}^3$	$\text{\$/m}^3$ (\$1 = 3.89 NIS)
Average	<b>1.56</b>	<b>0.40</b>
EC: 1.9 – 2.65	<b>1.41</b>	<b>0.36</b>
EC: 2.65 – 3.4	<b>1.19</b>	<b>0.31</b>
EC: 3.4 – 4.1	<b>1.00</b>	<b>0.26</b>
EC: 4.1 – 4.8	<b>0.93</b>	<b>0.24</b>
EC: > 5.2	<b>0.79</b>	<b>0.20</b>

# Demand management: irrigation water pricing



Trajectories of the price indices of natural (non-brackish) water in agriculture and of crops' prices during 1952 – 2011 (1952=100, adjusted for consumer price index). Source: Kislev and Tzaban (2013), based on publications of Israel's Central Bureau of Statistics.

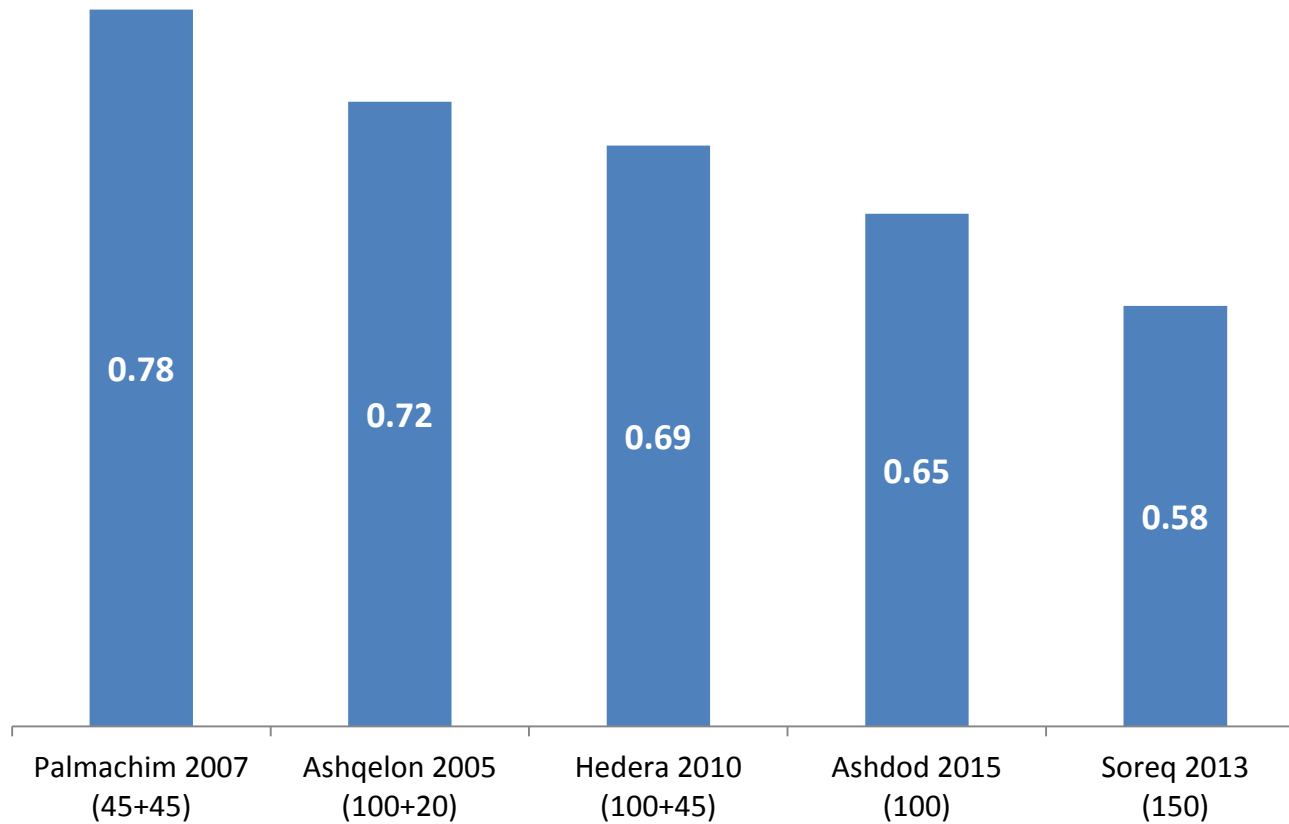
# Irrigation water (MCM/y) : 1996 - 2013



Source: Israel's Water Authority: <http://www.water.gov.il/Hebrew/ProfessionalInfoAndData/Allocation-Consumption-and-production/20133/1996-2013.pdf>

# Supply management: Desalination cost (\$/m<sup>3</sup> at plant's gate)

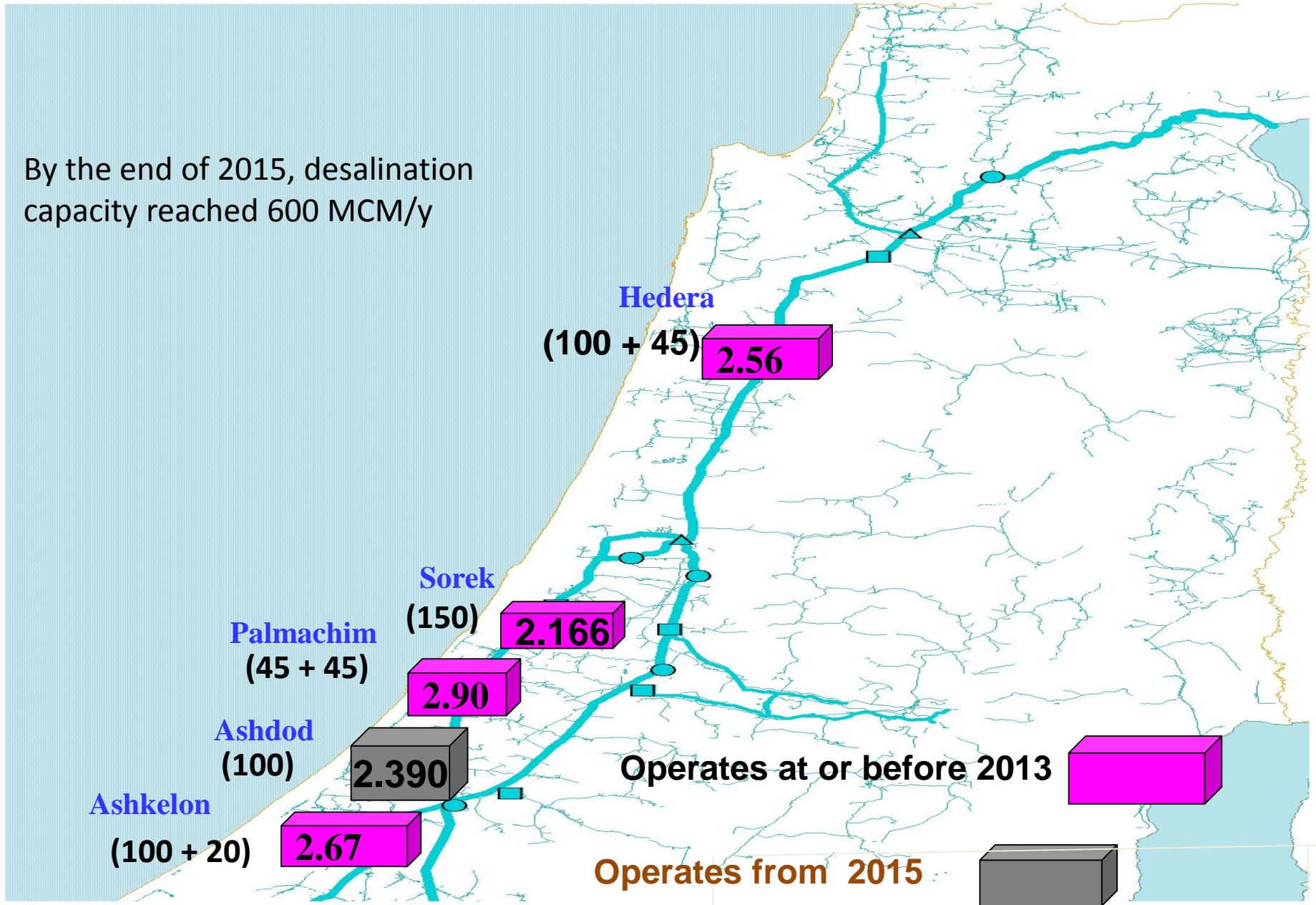
(x-rate: \$US 1 = 3.7 NIS)



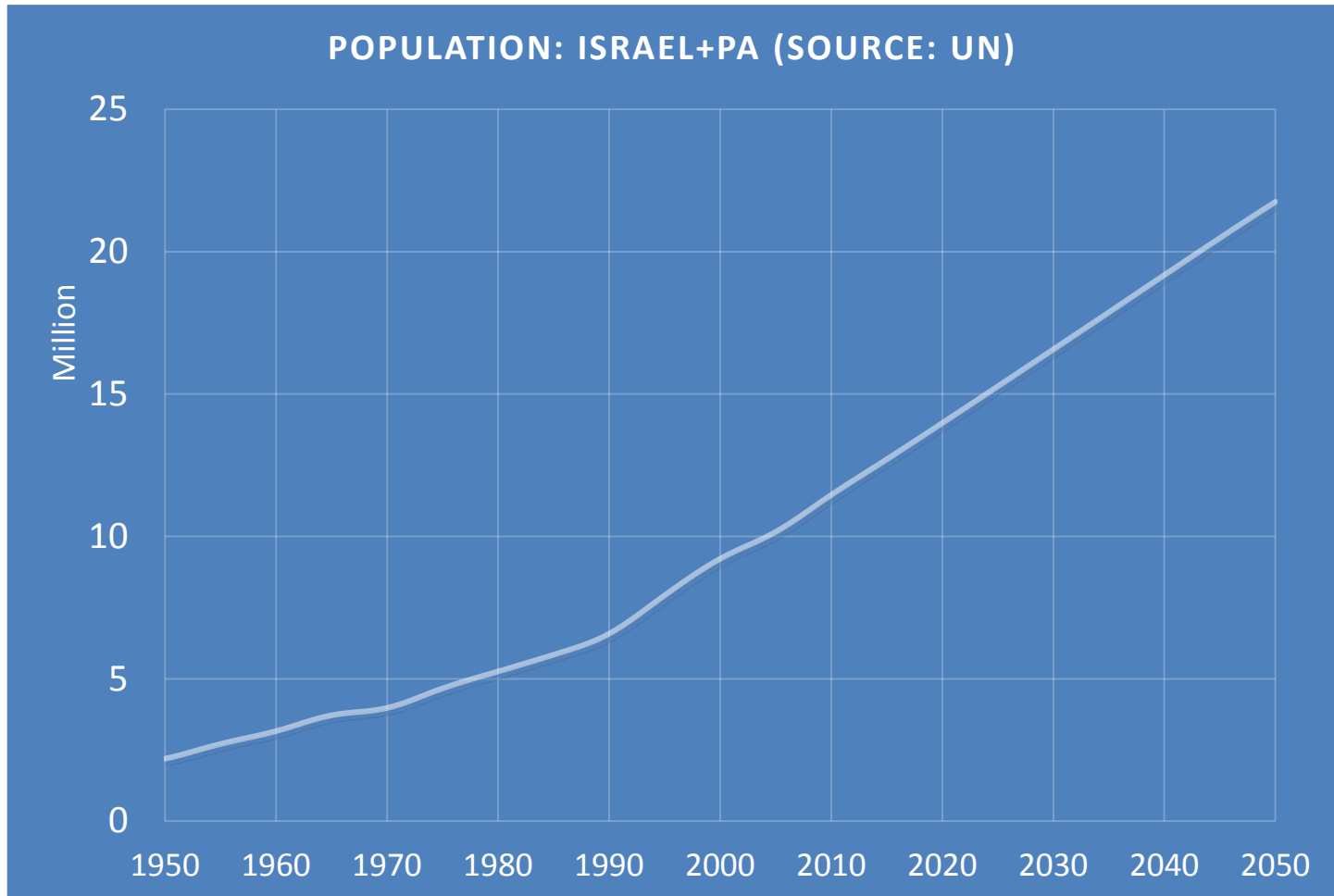
# Israel's desalination (MCM/y)

NIS/m<sup>3</sup>

By the end of 2015, desalination capacity reached 600 MCM/y



# Population (again)



# Israel's Water Authority Master Plan

## Water Sources (MCM/y)

סך הכל היצע*	השלמה דרושה (3)	(2) Desalination	Brackish desalination	Recycled	Brackish	(1) Natural	Year
2,131	4	280	23	450	174	1,200	2010
2,672	9	750	50	573	150	1,140	2020
2,765	50	750	60	685	140	1,080	2030
<b>3,571</b>	<b>671</b>	<b>750</b>	<b>70</b>	<b>930</b>	<b>130</b>	<b>1,020</b>	<b>2050</b>

(1) סה"כ העשרה ממוצעת של מים שפירים טבעיים בניכוי איבודים עבור מים שהינם מתחת ל-400 מג"ל.

(2) "התפלת מים" – על פי החלטות ממשלה שאושרו.

(3) "השלמה דרושה" = הפרש בין סה"כ צריכת שפירים (טבלה התחתונה) לבין סה"כ מקורות המים השפירים.

## Agriculture Water consumption (MCM/y)

Total	Recycled	Brackish	Natural	Year
1,044	400	144	500	2010
1,138	528	120	490	2020
1,225	645	110	470	2030
<b>1,450</b>	900	100	450	<b>2050</b>

**300 - 400 MCM/y**  
for environmental  
purposes (recycled,  
tertiary)



# Summary

- Integrated approach:
  - demand management (pricing, conservation)
  - supply management (recycling, desalination)
- Water rates reflect true cost of water supply (incl. scarcity), sending a clear signal to water users
- Desalination capacity is currently about 80% of total households consumption (Israel only)
  - In addition, mitigates quality deterioration processes
- About 90% of domestic water is collected, treated (to tertiary level) and reused in irrigation and environmental restoration
- Over time (2 – 3 decades) supply of recycled water will suffice for irrigation and environmental (incl. partial restoration of the lower Jordan River)