



Israel's Water Sector: Growth and Development

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Water for Growth and Development Roundtable Discussion
Gauteng, Pretoria
Department of Water Affairs and Forestry
07-09 November 2008

TAHAL'S Fields of Activity



Water and Wastewater



- Water Resources Development and Management
- Hydrology
- Design of National and Regional Water Supply Systems
- Water and Wastewater Treatment Plants
- Desalination
- Drainage and Irrigation
- Prevention of Water Resources Pollution
- Wastewater Collection, Conveyance and Storage Systems
- Reservoirs, Dams and Hydraulic Structures
- Water Supply and Sewerage
- Reclamation of Effluents for Reuse in Industry and Agriculture

Agricultural Projects



- **Soil Conservation and Land Use**
- **Rural Development and Settlement**
- **Agricultural Extension Systems**
- **Agricultural Support Services**
- **Design of Irrigation Systems**
- **Design of Agro-industrial Enterprises**

TAHAL'S OPERATION IN AFRICA – SAMPLE PROJECTS



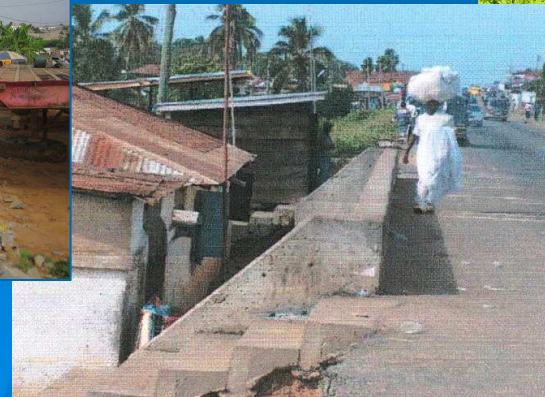
Morocco
Ghana
Nigeria
Congo
Angola
Namibia
Botswana



Egypt
Ethiopia
Kenya
Uganda
Tanzania
Zambia
Lesotho

Major Turnkey Projects in Africa

- Ghana** - *ATMA Rural Water Supply*
(Turnkey Project – US\$ 80 million)
- Angola** - *EPAL Water Supply Project in Luanda*
(Turnkey Project – US\$ 50 million)
- Angola** - *Quiminha Integrated Agricultural Development Project*
(Turnkey Project – US\$ 178 million)
- Botswana** - *Zambezi Integrated Agro-Commercial Development Project*
(Turnkey Project – US\$ 750 million)



Israel's Water Sector: Growth and Development



Water for Economic Growth & Development

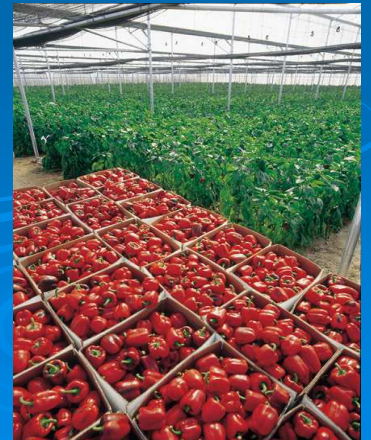
Key Success Factors



Addressing Israel's national priorities
using appropriate technologies

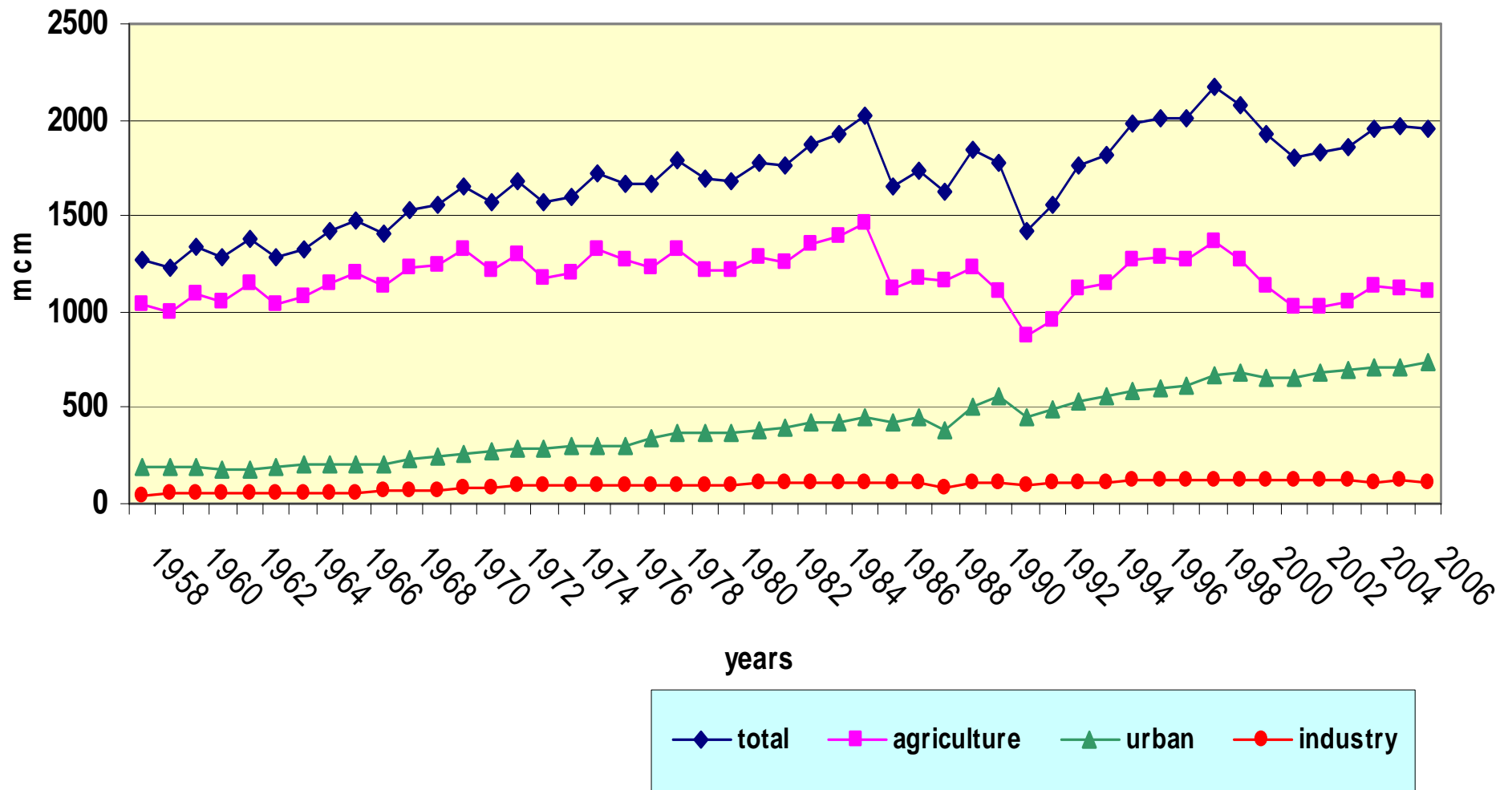


and methodologies; advanced demand
and supply management mechanisms

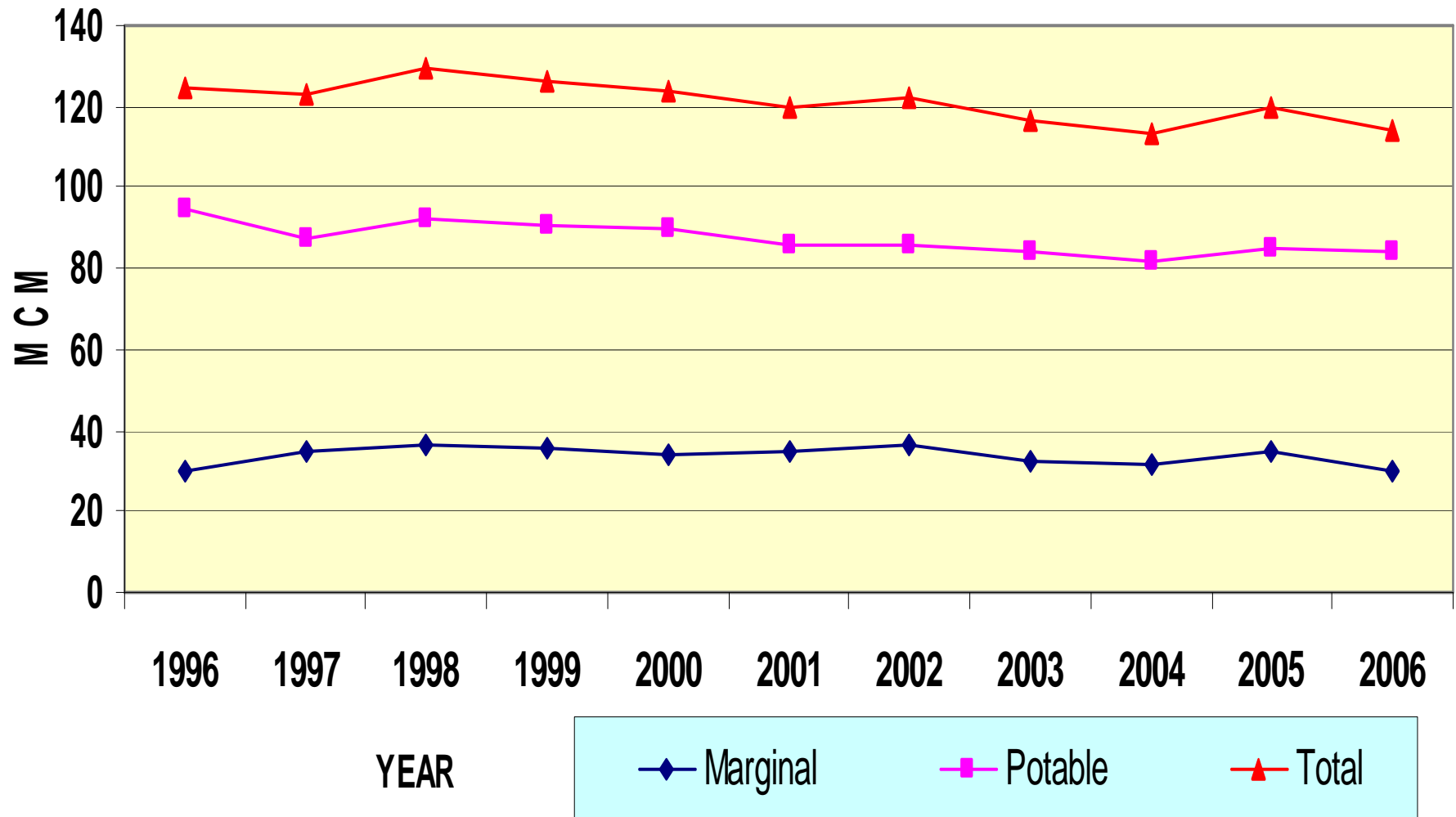


Water planning for Israel reflects the
evolution of Israel's
**economic, social & environmental
national priorities aimed toward
growth and development**

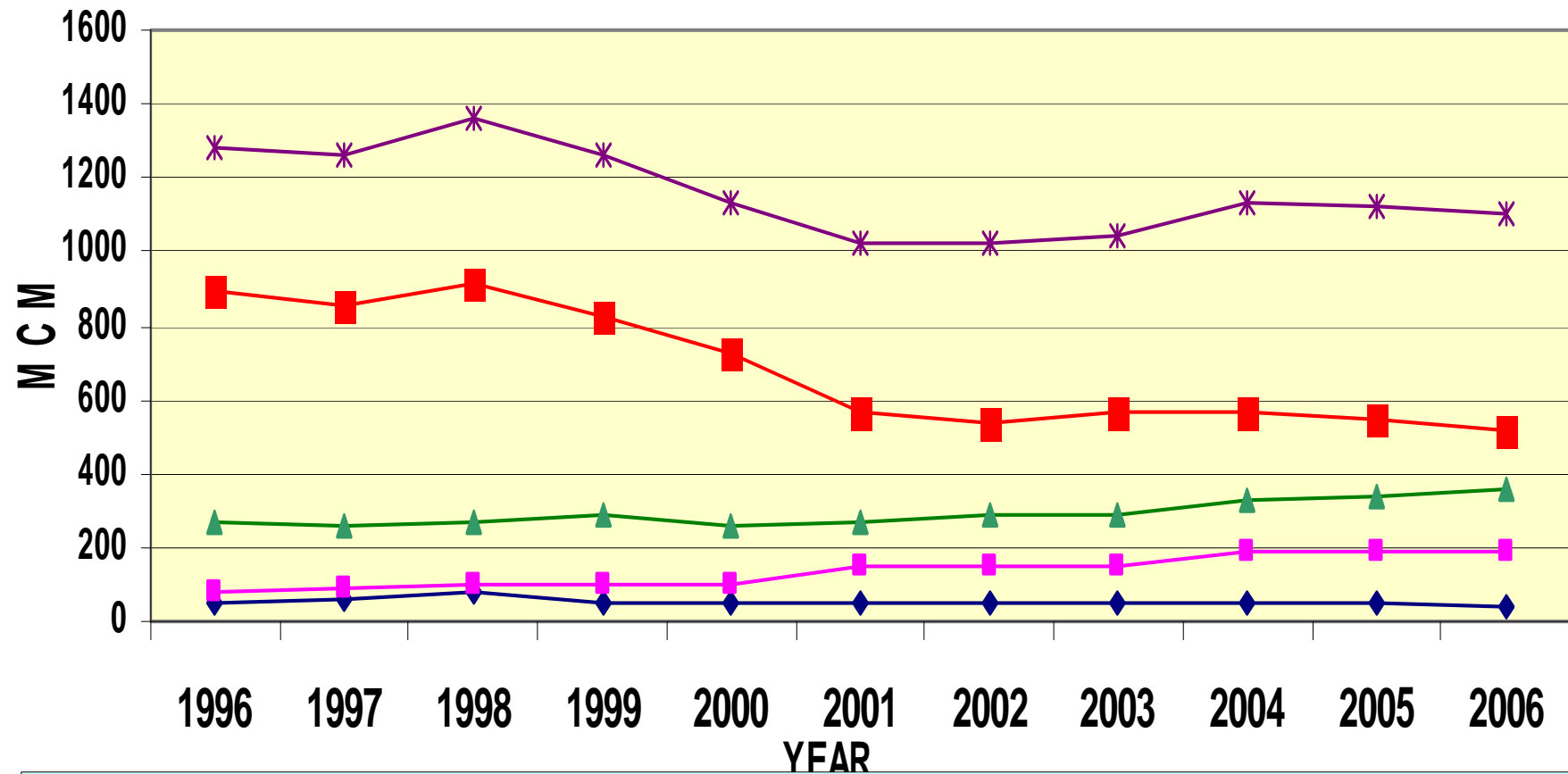
Water Consumption by Sectors



Industrial Water Use by Quality: 1996 - 2006



Agricultural Water Use by Quality: 1996 - 2006



◆ Floods

■ Saline

▲ Treated Sewage

■ Potable

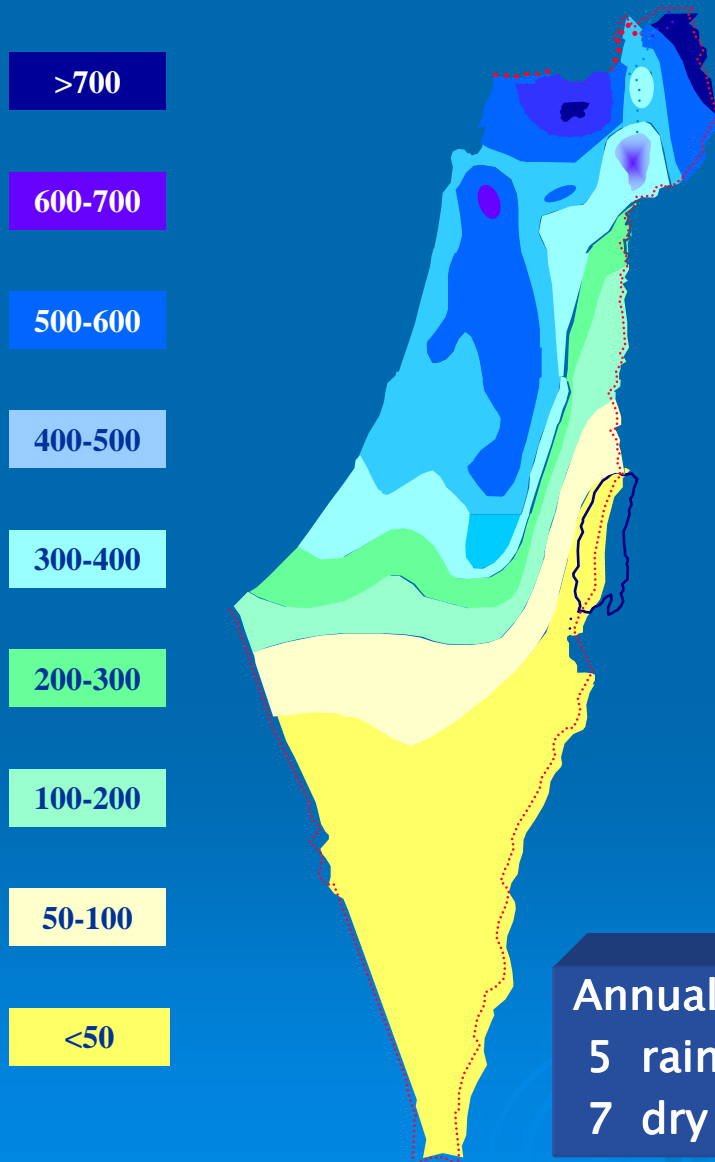
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Major changes within the water sector

- **Regulatory framework and institutions:** Water Law, Ordinances for Public Health (Water standards), Water & Sewage Corporations Law
- **Overexploitation and deterioration** of natural resources
- Increase in **sewage treatment**
- Use of **effluents for irrigation**
- **Desalination** technology
- **Filtration of surface water**
- Increase **water-use efficiency** in agriculture
- **Public awareness:** education & campaigns for domestic water saving
- **Economic tools:** Block tariff & administrative (quotas), pricing policy, levies
- **Increasing demand:** population growth, standard of living, peace agreement

Dry south and rainy north

Annual precipitation (mm)



Annual distribution:
5 rainy months
7 dry months



Key Success Factors in Water Resources Management in Israel in the 1950s

Challenges

State economy and production at low ebb

Dry south and rainy north of the country

Overexploited groundwater in the center

National Priorities

Increased agricultural production and food security

Rural and urban development in center and south

Agricultural and irrigation development in the south

Technologies

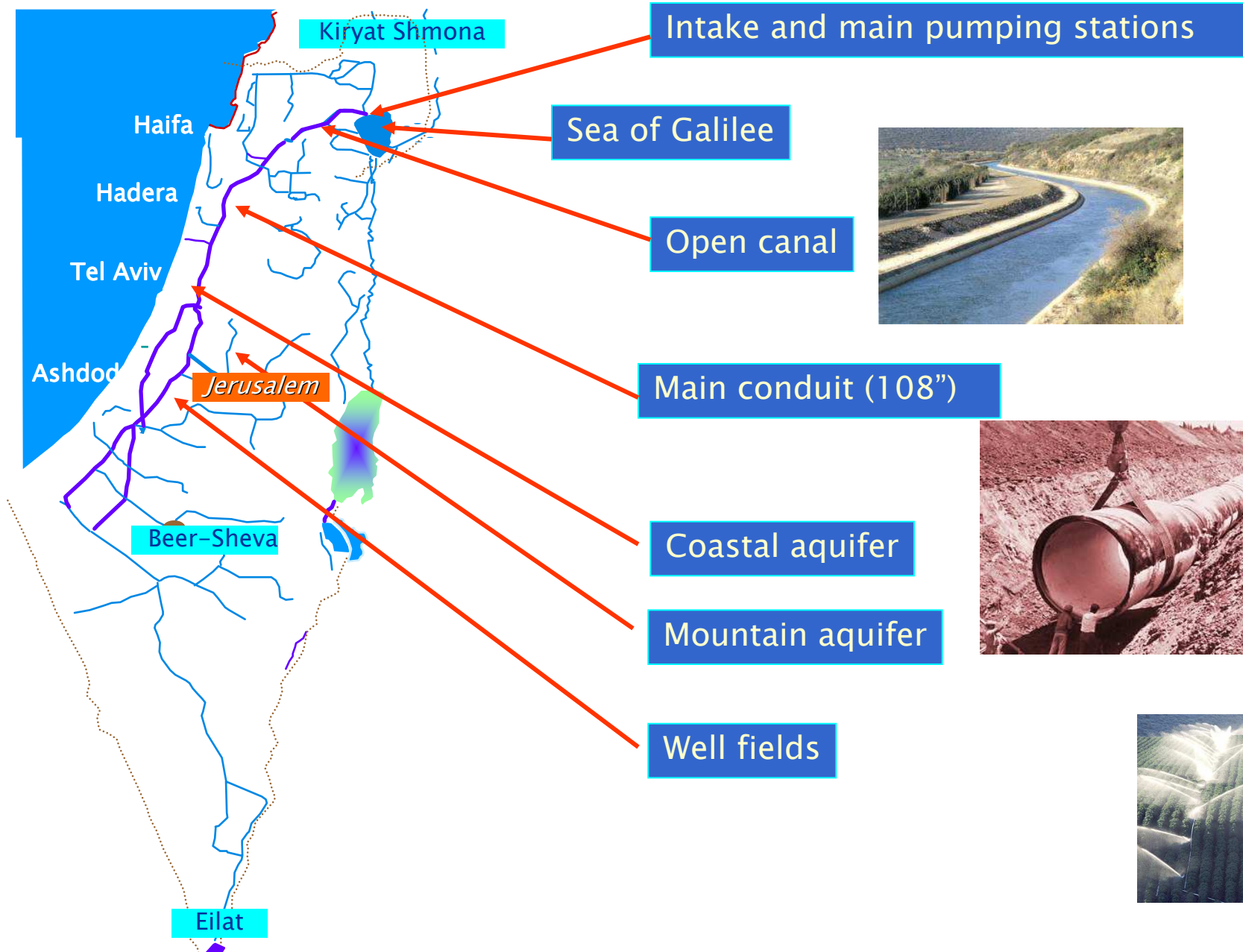
(Planning, design and supervision by TAHAL)

National Water Carrier

Conjunctive use of surface water and groundwater

Artificial recharge of groundwater

National Water Carrier - 1965



Key Success Factors in Water Resources Management in Israel in the 1970s

Challenges

Population growth and increasing water demand

Sewage and other wastes endangering public health and the environment

Continued groundwater overexploitation

National Priorities

Increased utilization of non-conventional water resources

Transfer of fresh water from irrigation to domestic use

Safe disposal of sewage effluent

Reduced groundwater exploitation

Technologies

(Planning, design and supervision by TAHAL)

Wastewater treatment (WWT) and reclamation for irrigation

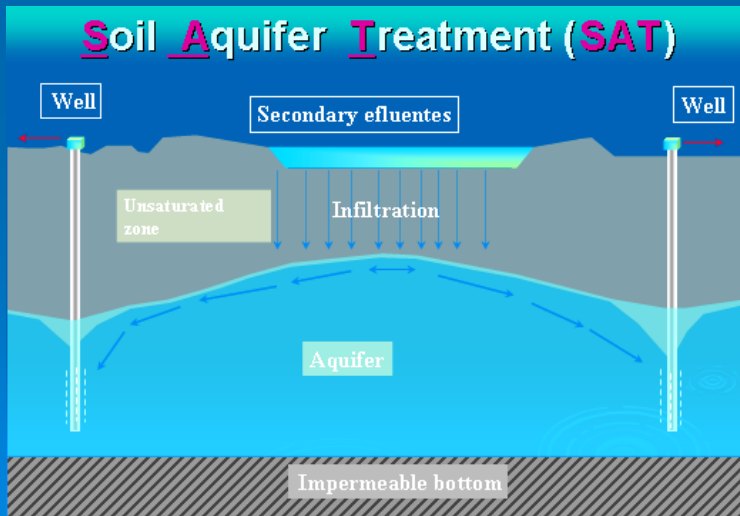
Shafdan Soil-Aquifer treatment

Small-scale brackish water desalination

Seawater desalination still not viable (cost of water > US\$ 3/m³)



- COLLECTION OF MUNICIPAL SEWAGE
- CONVEYANCE TO TREATMENT CENTERS
- CONVENTIONAL TREATMENT
- SOIL-AQUIFER TREATMENT



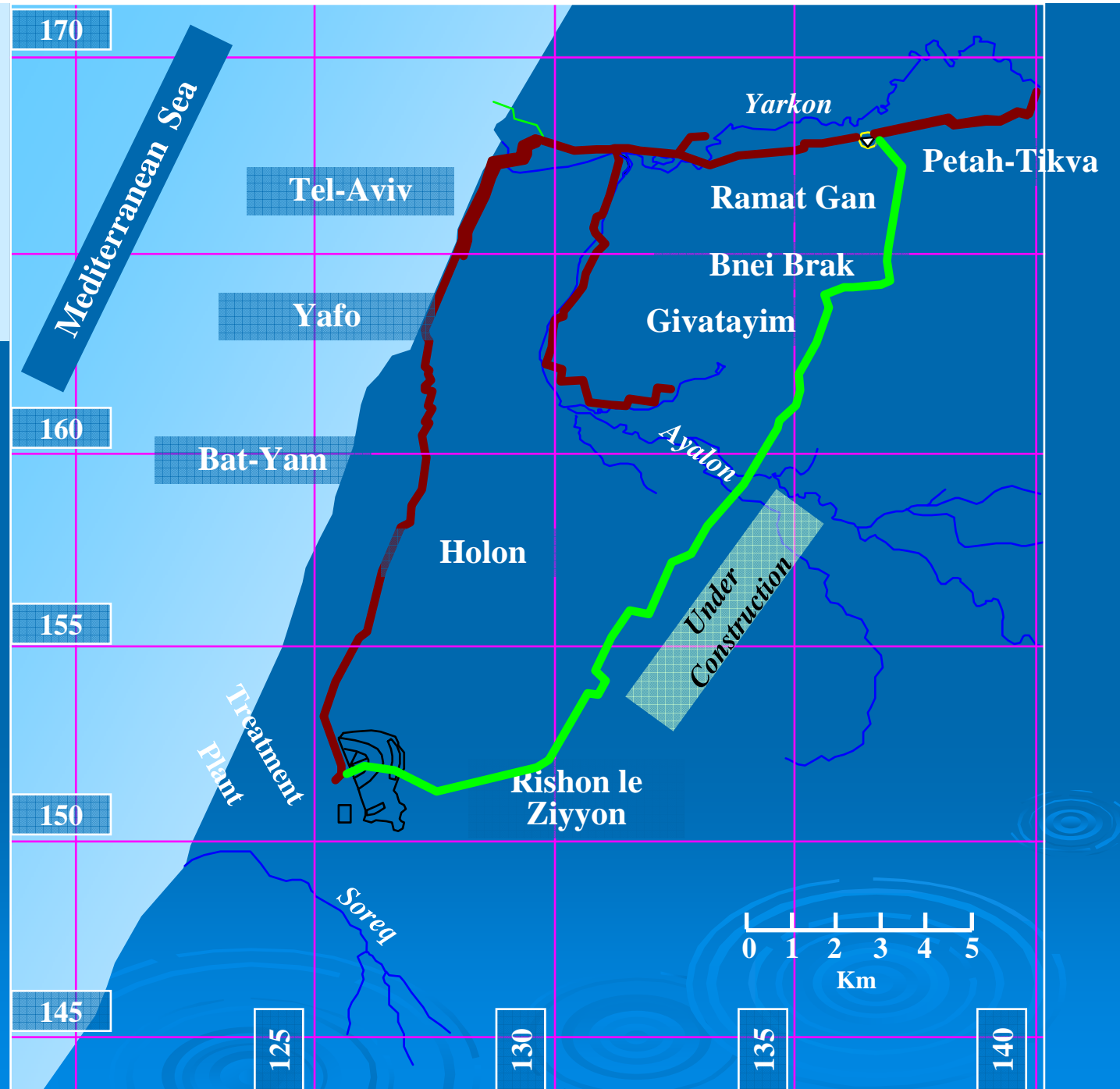
- SEASONAL STORAGE
- CONVEYANCE TO USERS
- REUSE



Sewage Production, Treatment and Reuse (km³/yr)

Year	1980	1989	1994	2004
Total sewage	225	293	389	470
Collected	205	273	364	451
Treated	133	232	309	428
Reused	52	195	254	312
Percentage treated	59%	79%	80%	91%
Percentage reused	23%	66%	65%	66%
Water demand				
Urban	368	501	556	705
Industry	100	114	114	113
Total	467	614	669	818
Percentage of sewage out of water demand				
Sewage	48%	48%	58%	57%
Reused	11%	32%	38%	38%

Conveyance, Treatment and Reuse of Wastewater from the Dan Region



Combined Reuse and SAT Scheme Dan Region Project in Israel



Soil Aquifer Treatment (SAT)

Well

Secondary effluent

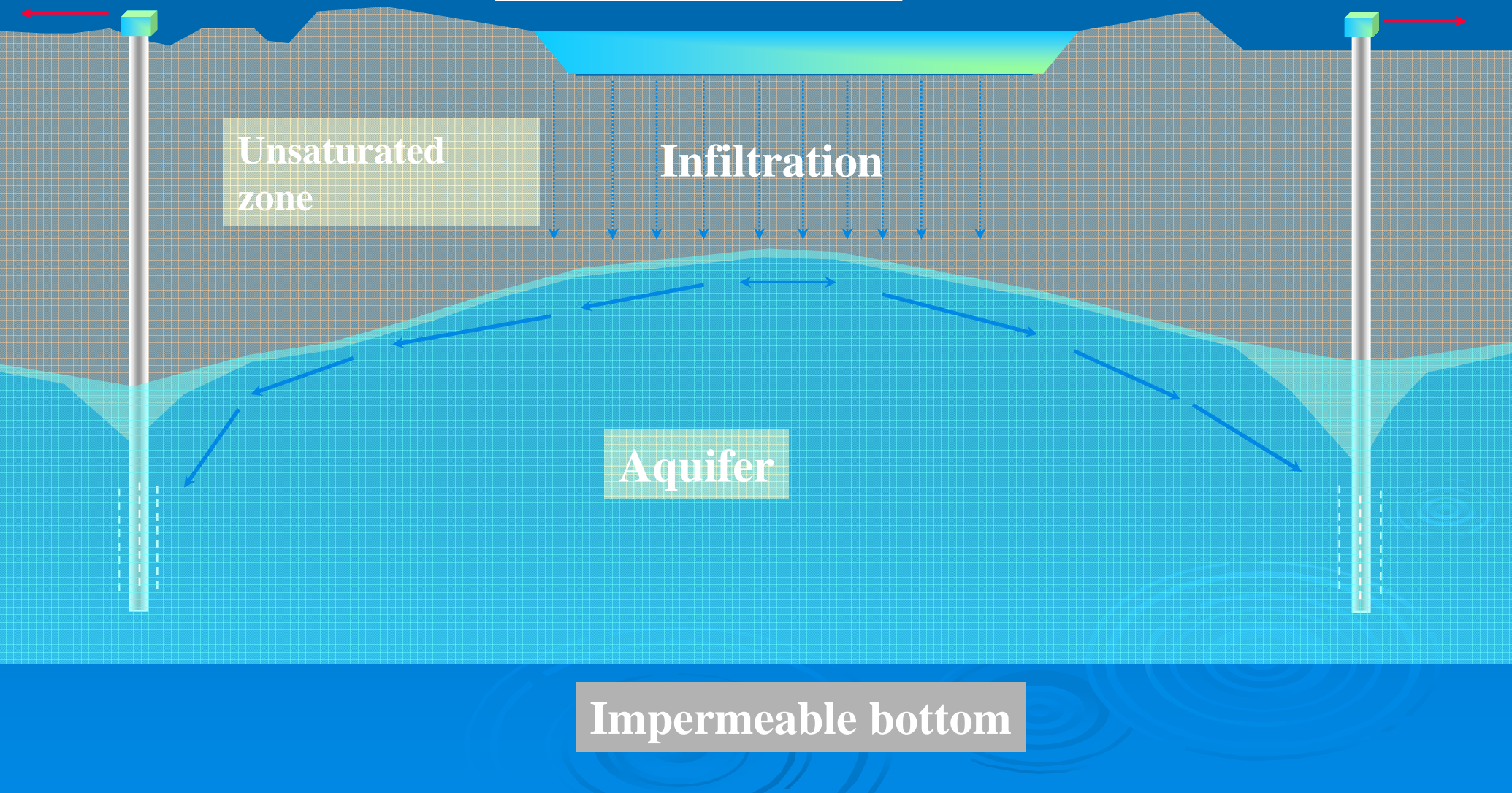
Well

Unsaturated zone

Infiltration


Aquifer

Impermeable bottom



Towards Sustainable Development - Adopted measures

(Transitional Master-Plan 2002-2010)

- **Promoting urban water saving**
 - **Ensuring water supply and sewage treatment in all sectors**
 - **Determining water supply criteria for maintaining nature and scenery values**
 - **Initiating quality improvement activities of treated sewage and preventing sewage dumping to the environment**
 - **Ensuring Israel's water supply ability for development purposes in suitable quantity, quality and reliability**
 - **Applying natural water resources conservation measures at drinking water quality**
- 
- The background of the slide features a blue gradient with several concentric white circles at the bottom, resembling ripples on water. These circles are of varying sizes and are positioned towards the right and bottom edges of the slide.

Key Success Factors in Water Resources Management in Israel, 2000-2010

Challenges

Increasing water demand in Israel and Palestinian Authority

Increasing salinity and contamination of groundwater

Continued groundwater overexploitation

National Priorities

Increase in available non-conventional fresh water resources

**Reduced water salinity
Supply of safe drinking water to protect public health**

Technologies

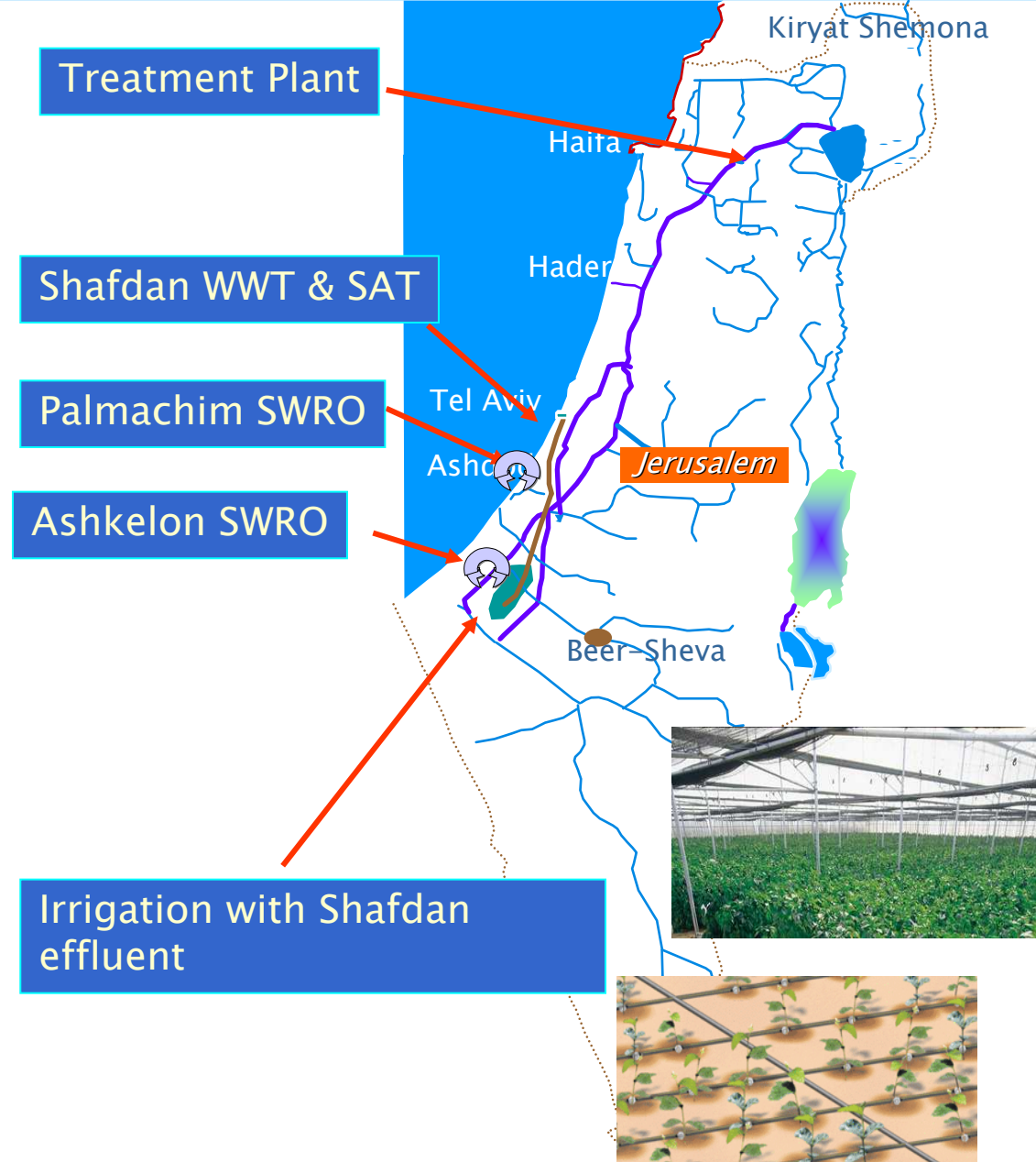
(Planning, design and supervision by TAHAL)

Seawater desalination
(Palmachim by TAHAL& Partners)

Upgrading and expansion of WWT plants

Filtration of surface water (Sea of Galilee)

National Water Carrier - 2008



Treatment Technologies Applied in the National System in 2007

Reverse Osmosis Sea Water Desalination Plant
Palmachim



Palmachim SWRO plant is modular and easily expanded from 30 to 60 Mm³/Year



- Seawater reverse osmosis (500,000 m³/day)
- Advanced filtration (1,700,000 m³/day)
- Advanced sewage treatment (500,000 m³/day)
- Continuous disinfection in the national system
- Disinfection of abstracted groundwater

Advanced Filtration





Settling pond

Operational reservoir

Backwash water treatment plant

Water Carrier canal

Sludge treatment facilities

Start of 108" line

Filtration plant

120,000 m3 reservoir with floating cover

Future UV Treatment Plant

Connection to 108" line

Diversion of Yiftael Stream

Seawater Desalination



Development Projections for Desalination Plants

P r o d u c t i o n	
YEAR	mm ³ /Year
2005	100
2010	365
2015	500
2020	750

Price of water: US\$ 0.6 – 0.7/ m³



Reverse Osmosis Seawater Desalination Plant - Palmachim



Palmachim SWRO plant is modular and can be easily expanded from 30 to 60 mm³/year

Key Success Factors in Water Resources Management in Israel, 2010-2020

Expected Challenges

Growing water demand in Israel and Palestinian Authority

Depletion of resources due to global climate changes

Increasing salinity of groundwater and sewage effluent

Pollution of resources vs. more stringent water quality requirements

National Priorities

Increase in available water resources

Protection and rehabilitation of groundwater

Reduced salinity of effluent to enable widespread reuse in irrigation

Technologies

Seawater desalination - expansion and improvements

Upgrading of WWT plants to enable unrestricted use of effluent

Interception of saline water intruding aquifers

Water Resources Development by Type of Water

(mm³/year)

<i>Year</i>	<i>2005</i>	<i>2010</i>	<i>2015</i>	<i>2020</i>
Drinking water				
Natural Resources	1,470	1,470	1,470	1,470
Desalinated brackish water	30	50	80	80
Desalinated seawater	100	365	500	650
SUBTOTAL	1,600	1,885	2,050	2,200
Brackish water	160	140	140	140
Recycled effluents	300	480	520	600
TOTAL	2,060	2,505	2,710	2,940

Summing up - Achievements

Seawater desalination enables:

- Demands of economy and well-being of population to be met
- Alleviation of political pressures
- Rehabilitation of depleted water resources
- Reduction of water resources salinity
- Improvement in water quality

Wastewater treatment enables:

- Supply of treated wastewater to agriculture to replace fresh water
- Reduction of pressure on fresh water resources
- Protection of the environment and public health
- Provision of water for natural conservation and recreation

What ahead...

- **Preventing contamination** of water resources locally and from across boundaries
- **Treating already-contaminated water** resources
- Creating effective **monitoring systems from catchments to tap**
- Ensuring **secure and safe drinking water**
- **Upgrading sewage treatment** in all facilities and building new facilities where needed
- Defining R&D goals for the water sectors and allocating funding for basic and applied research
- **Enlarging water supply** (by desalination and use of other marginal sources) and **lowering its production cost**
- **Adjusting water prices in all sectors** in order to reflect scarcity and managing the newly extraction levy effectively

Continue...

- > Executing and implementing the government's decision regarding the establishment of the **"National Authority of water and sewage"**
- > Increasing **clarity regarding the authority** of each governmental stakeholder
- > **Upgrading infrastructure in peripheral areas**
- > Improving **communication between stakeholders** in the areas of **data exchange** and in **routine and emergency notification, processes and actions regarding regular scheduled activities** and regarding **threats and other security issues** wrt the water supply
- > Creating useful **indicators for policy makers** for evaluating progress
- > Improving upon **residential water saving**
- > Complying with **water peace agreements** with neighbouring entities
- > **Stormwater Collection** and management



THANK YOU

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