MINISTRY OF AGRICULTURE, HYDRAULIC RESOURCES AND FISHING

NATIONAL WATER SUPPLY COMPANY (SONEDE)

ARAB - JAPAN ECONOMIC FORUM

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DRINKING WATER IN TUNISIA :

PRESENT, PROSPECTS AND CHALLENGES

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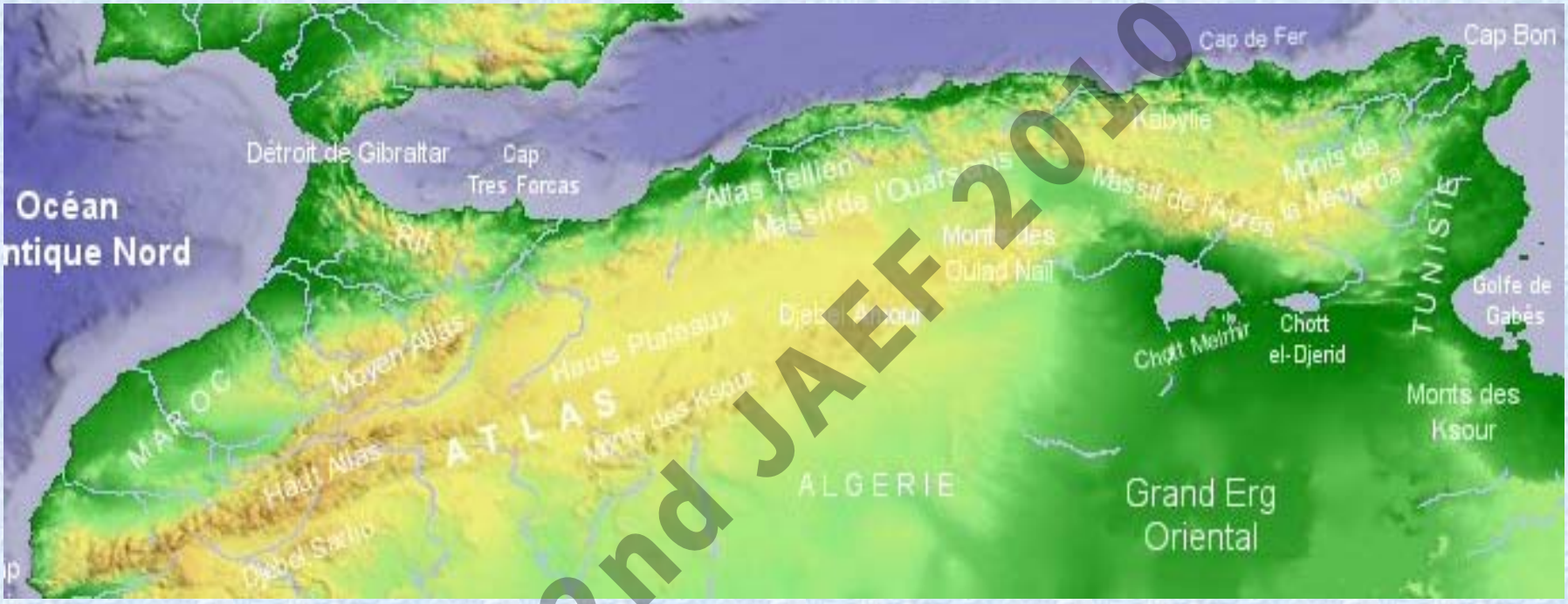
PLAN

1. Introduction,
2. Water sector in Tunisia,
3. General Indicators,
4. Main water consumption regions,
5. Water supply in rural regions,
6. Water saving,
7. Water quality improvement,
8. National strategy,
9. Conclusion.

1 - INTRODUCTION

1- INTRODUCTION

1.1- Potential water resources



- The water resources in Tuinisia are unequally distributed in time and space.
- The annual average of pluviometry varies less than 100 mm in the south and 1500 mm in the north.

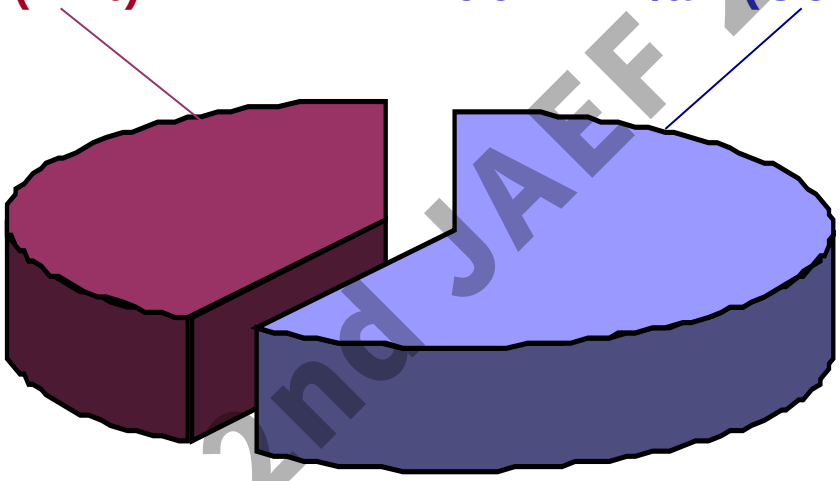
1.2-The potantial resources (Underground and Surface water)

Underground water

2140 Mm³/an (44%)

Surface water

2700 Mm³/an (56%)



Water allowance : **460 m³/capita/year**, in 2009

315 m³/capita/year, in 2030.

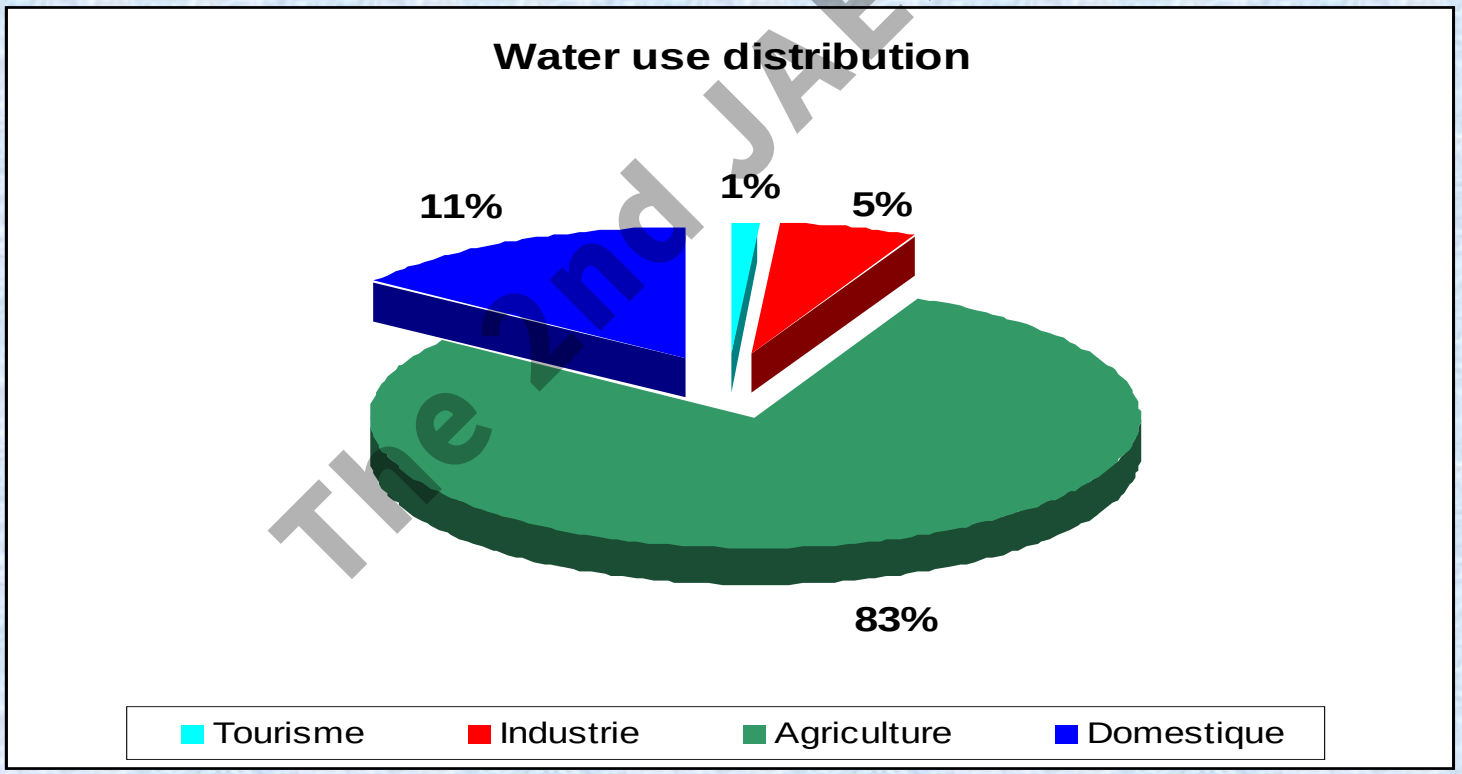
Hydraulic stress limit : 1000 m3/capita/year.

Tunisia is under hydraulic stress.

2.1- The use of water :

The use of water in Tunisia is distributed as follows :

- 83% of mobilized resources are intended for Agriculture
- 17% of mobilized resources are intended for drinking water.



2.2 Water quality :

- The quality of water is variable through the country,

- In Tunisia recommanded maximum salinity for drinking water is around 1,5 g/l.

✓ 70 % of Surface water (Salinity≤1,5 g/l).

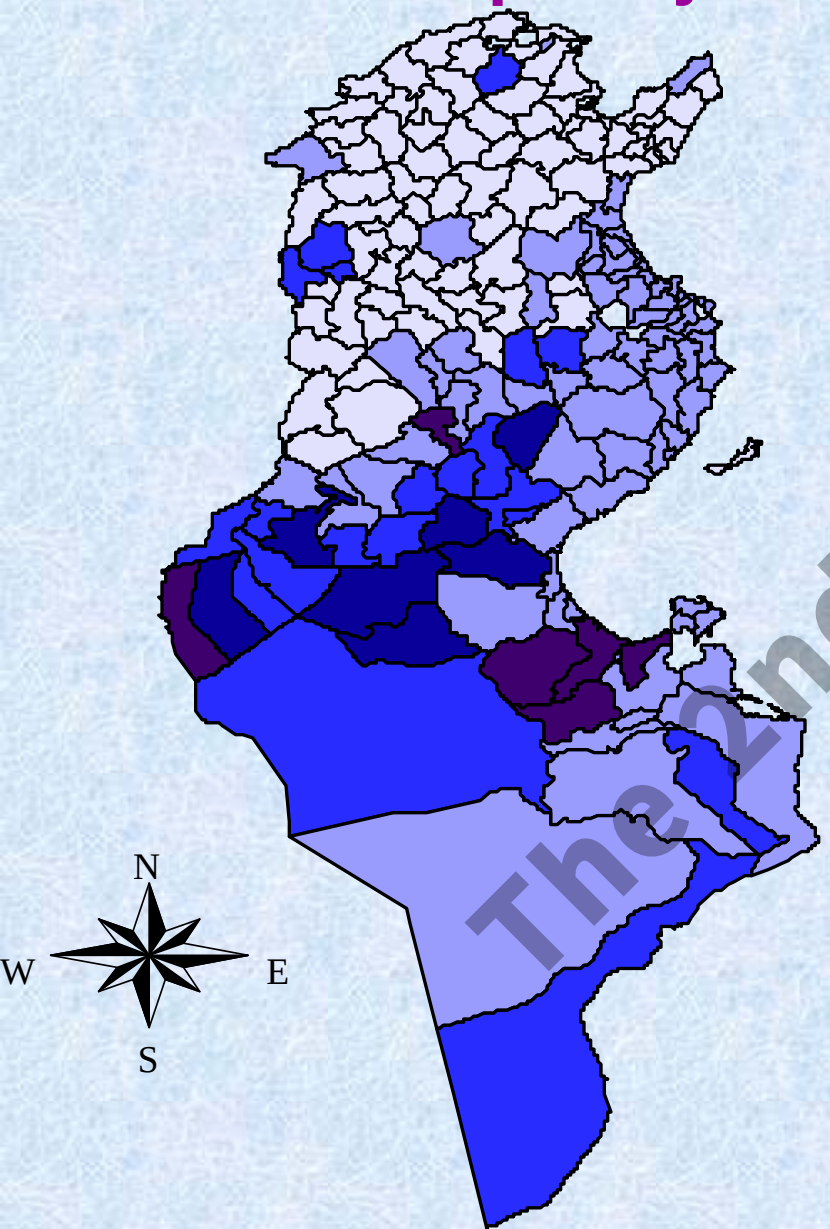
✓ 25 % of underground (Salinity ≤ 1,5 g/l).

✓ 50 % of underground (1,5<Salinity <5,0 g/l).

✓ 25 % of underground (Salinity ≥ 5,0 g/l).

2- The water sector in Tunisia

2.3- Water quality



Salinity (mg/l)

- 0 - 1000
- 1000 - 1500
- 1500 - 2000
- 2000 -2500
- > 2500

The highest salinity is concentrated in the center and the south of the country whereas the lowest salinity is concentrated in northern regions.

3 – GENERAL INDICATORS

3 - GENERAL INDICATORS

PRESENTATION OF SONEDE

- The National Company of Exploitation and Distribution of Water (SONEDE) operates on all the Tunisian territory. SONEDE is the single company in charge of water supply in the whole country.

- It serves drinking water for all the urban population and approximately half of the rural population.

- SONEDE has 2,2 millions subscribers, its network extends on approximately 45682 km.

3 - GENERAL INDICATORS

EVOLUTION OF MAIN INDICATORS

INDICATORS	1968	1987	2009
Global servecing rate	31,0 %	71,6 %	98,0 %
Urban servecing rate	55,0 %	100,0 %	100,0 %
Rural servecing rate	9,2 %	31,1 %	94,1 %
Rural servecing rate (SONEDE)	9,2 %	19,6 %	48,3 %
Rural servecing rate (GR)	-	11,5 %	45,8 %
Number of Customers (Thousands)	103,0	775,6	2 225,8
Consumed Volume (Mm^3)	63,0	184,9	371,2
Distributed Volume (Mm^3)	82,0	238,4	448,6
Pipes Network (Km)	8940	18780	45 682
Feeders	2 531	4 760	8 480
Distribution	6 409	14 020	37 202

3 - GENERAL INDICATORS

EVOLUTION OF MAIN INDICATORS

Désignation	1968	1987	2009
Nomber of staff	1 555	6 972	6 875
Number of customers per agent	66	111	324
Network efficiency (yield)	70,0%	72,1%	76,1%
Feeders	-	93,0%	91,6%
Distribution	-	77,6%	82,7%
Number of pipe breakages (U)	-	8 854	12 313
Index of breakage (U/100 km)	-	47	27
Number of water leakage (U)	-	58 119	135 859
Lineair index of losses (m3/km/d)	-	10,5	5,7

3 - GENERAL INDICATORS

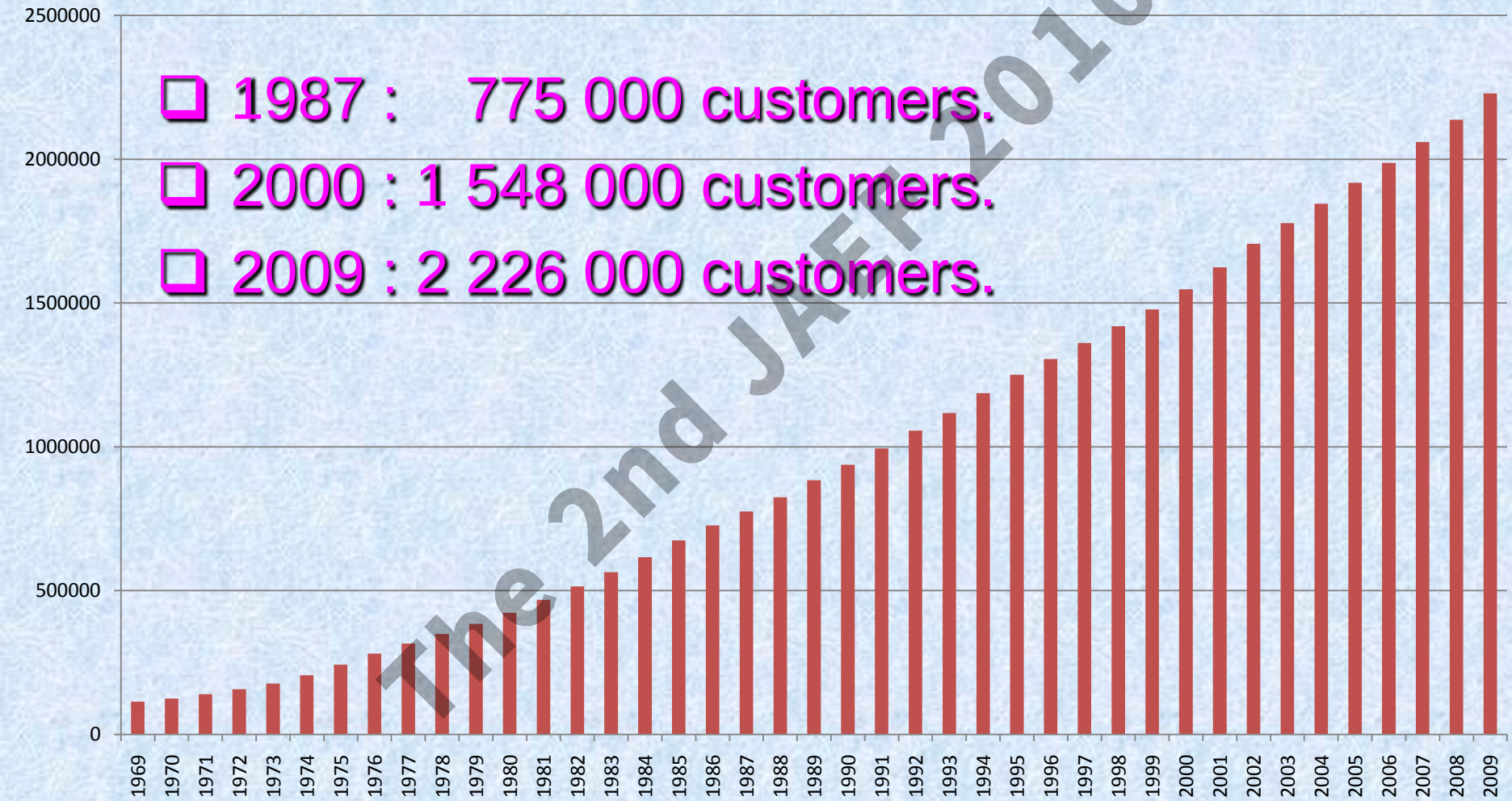
CONSUMED VOLUME & CUSTOMERS NUMBER (2009)

Use	Consumption		Customers number	
	Mm^3	%	Number	%
Domestic connected	264,3	72,2%	2 115 000	95,00%
Collective	43,7	12,0%	93 850	4,20%
Industry	30,0	8,2%	13 527	0,60%
Tourism	17,5	4,8%	1 458	0,07%
Domestic not connected	8,2	2,3%	916	0,04%
Others	7,5	0,6%	1 263	0,06%
Total	371,2	100%	2 225 801	100%

3 - GENERAL INDICATORS

Evolution of customers number

- 1987 : 775 000 customers.
- 2000 : 1 548 000 customers.
- 2009 : 2 226 000 customers.



4 – MAIN WATER CONSUMPTION REGIONS IN TUNISIA

DRINKING WATER DEMAND

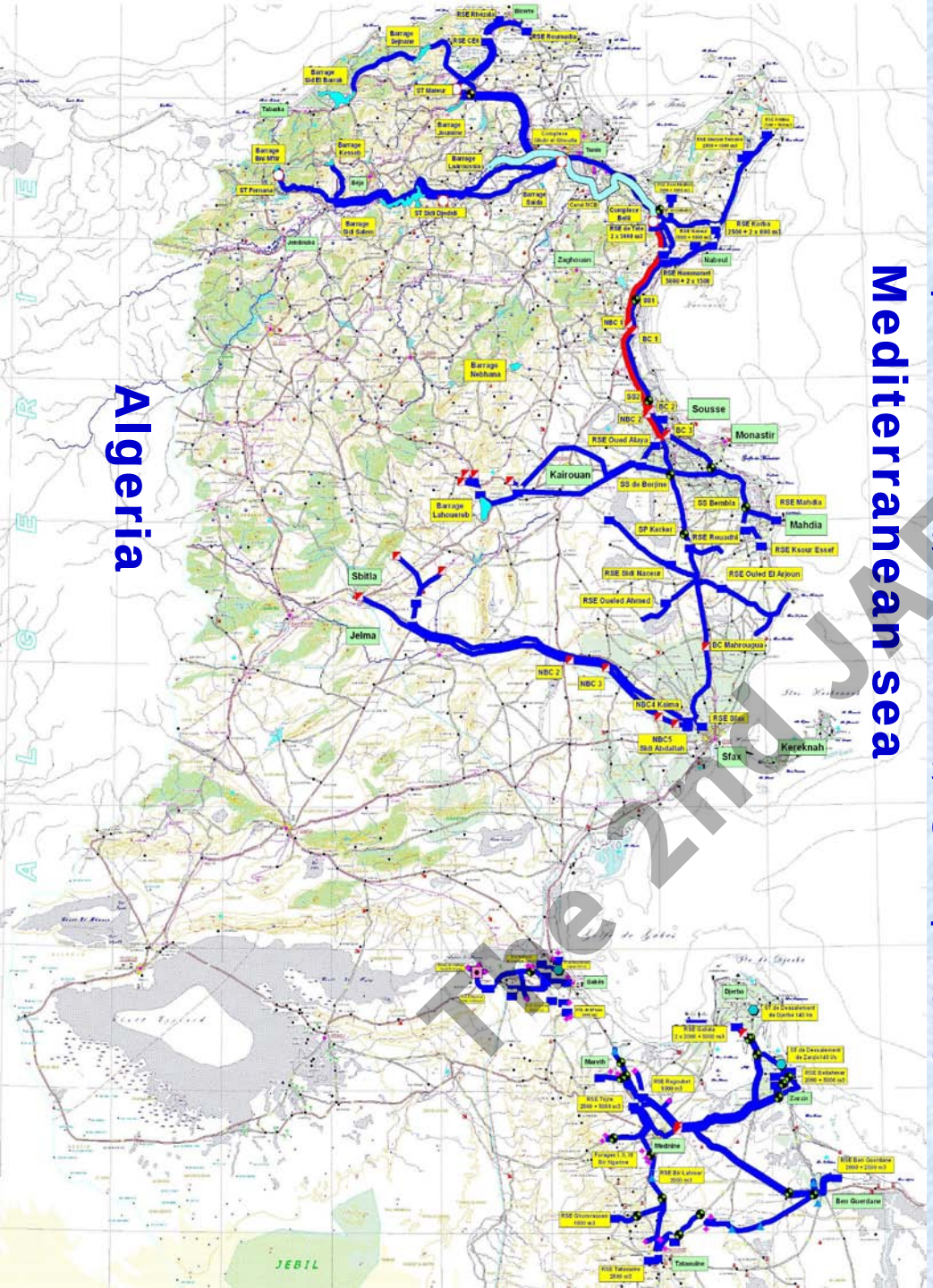
- The forecast water demand of the whole country are estimated at approximately 900 Mm3 at 2030 and 1267 Mm3 at 2050.

- The consumption of the seven (7) most significant regions represent 84 % of national consumption. These regions are presented as following :

DRINKING WATER DEMAND

- Great Tunis,
- Bizerte,
- Cap-Bon,
- Sahel,
- Grand Sfax,
- Grand Gabes,
- Sud-Est,

GREAT SYSTEMS OF WATER TRANSFER IN TUNISIA

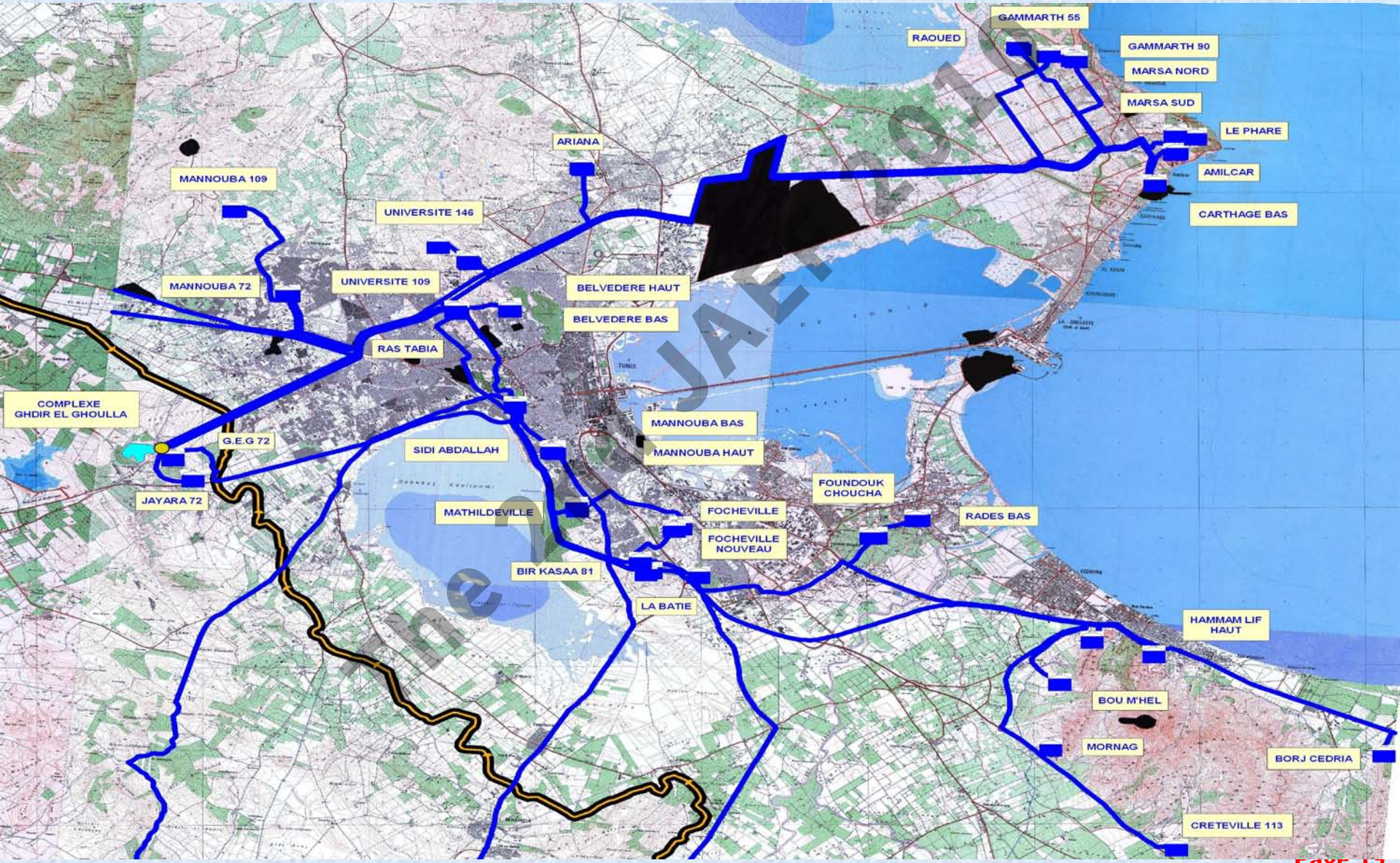


The Tunisian strategy in term of water resources management, particularly the drinking water, is based on a system of transfer of water between the areas having the most abundant water resources towards the areas sheltering most significant centers of consumption.

This system of transfer ensures, on the one hand, an equitable allocation of mobilized resources and a balancing water quality.

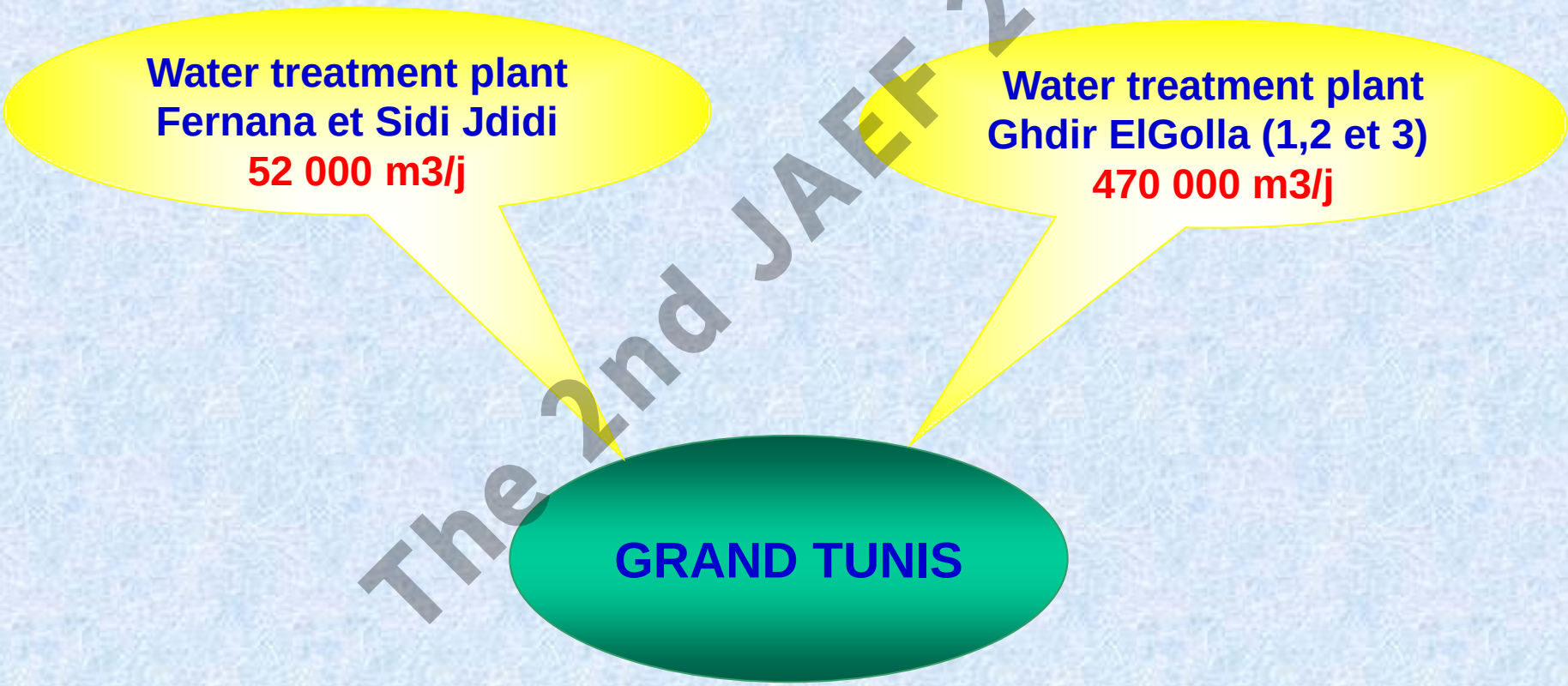
GREAT TUNIS

Main Network



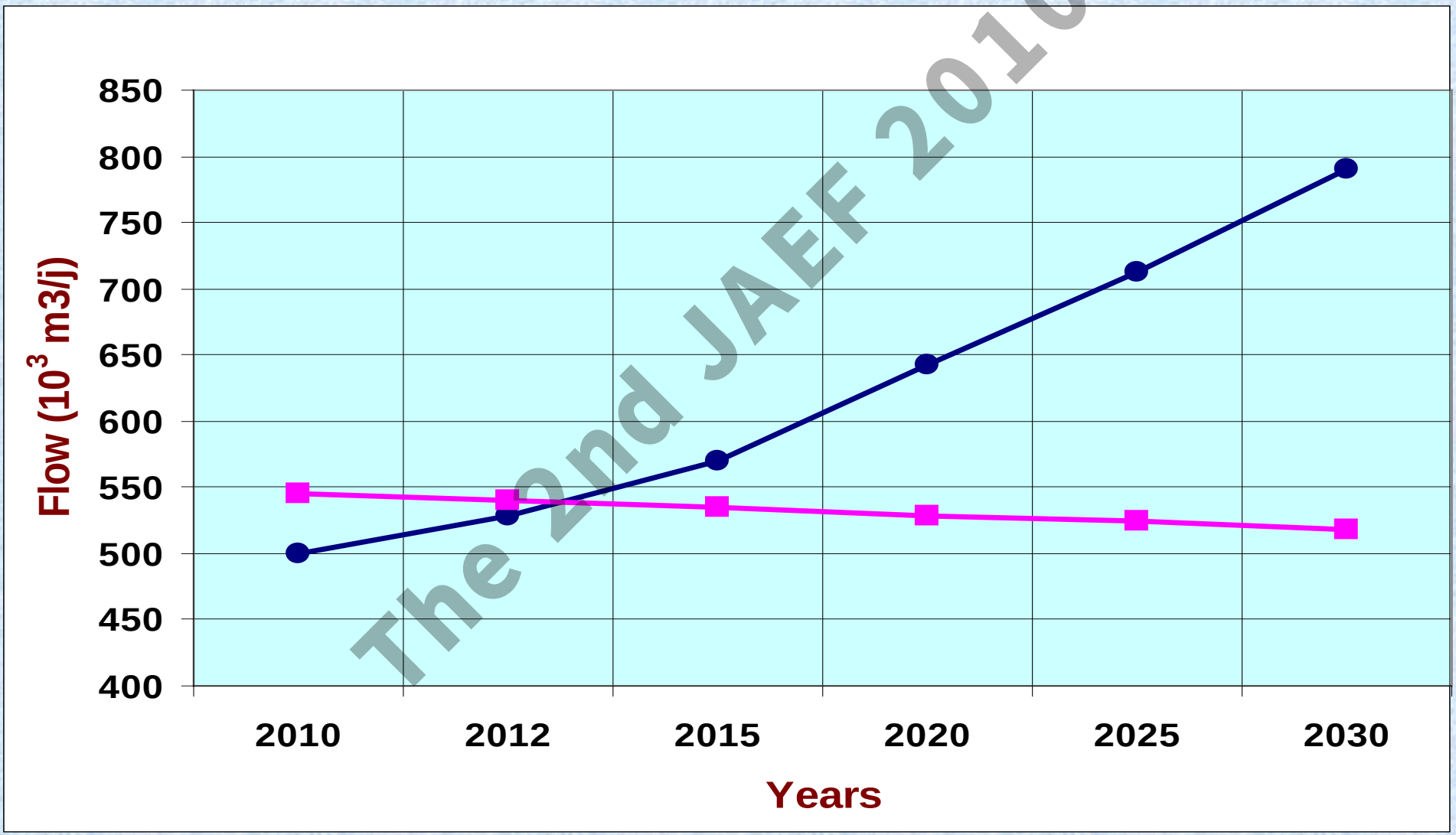
GREAT TUNIS

Water Resources



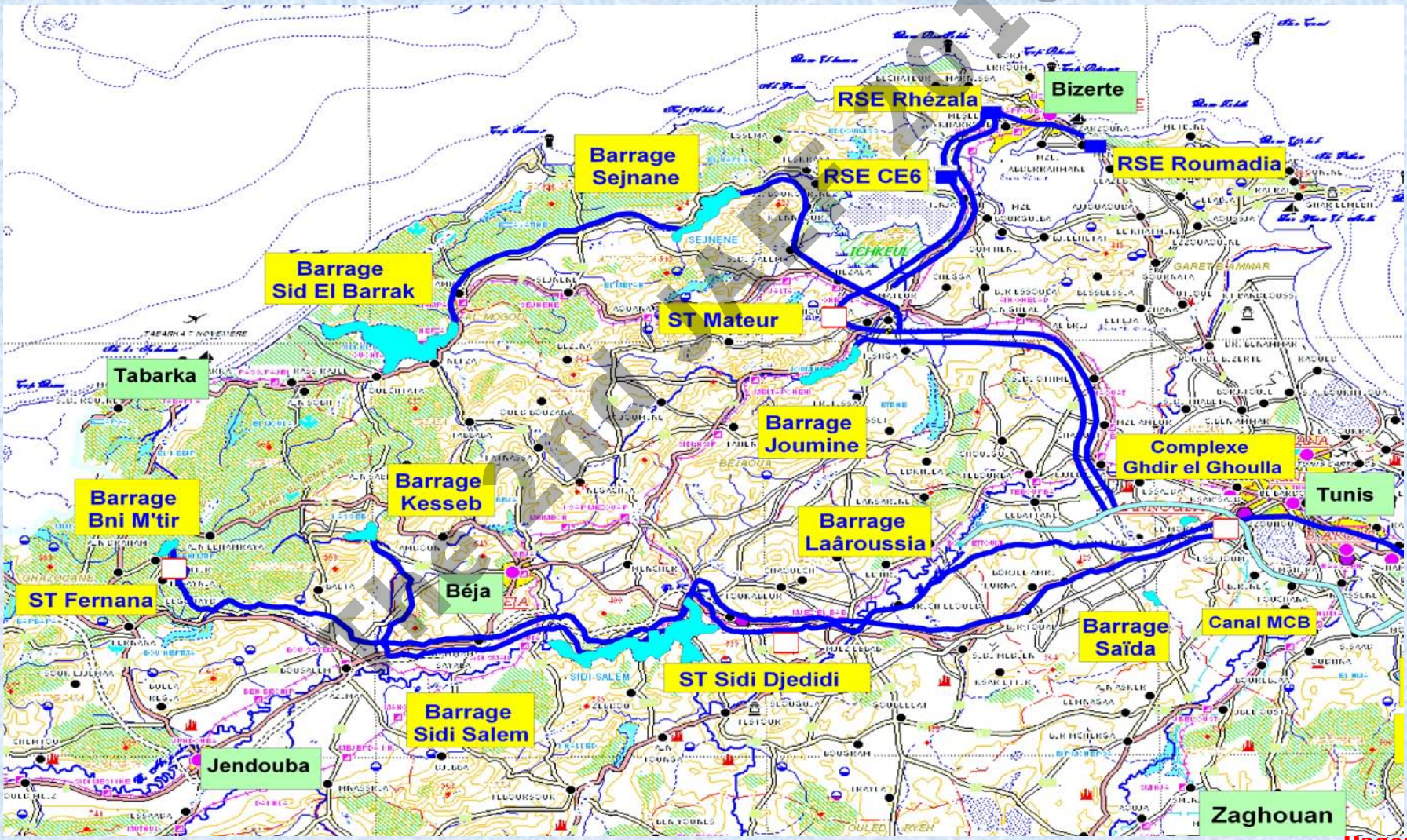
GREAT TUNIS

Water Resources / Water Demand



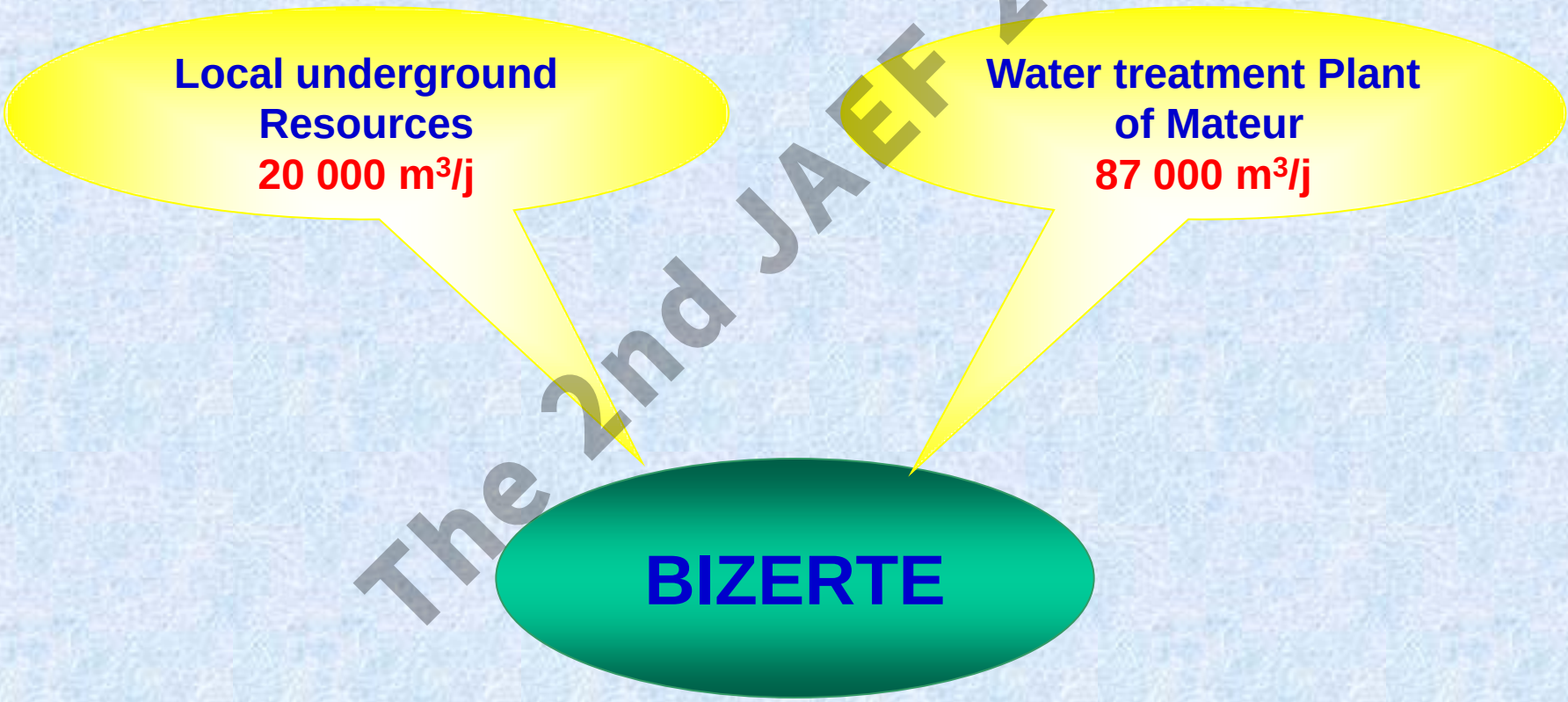
BIZERTE

Main Network



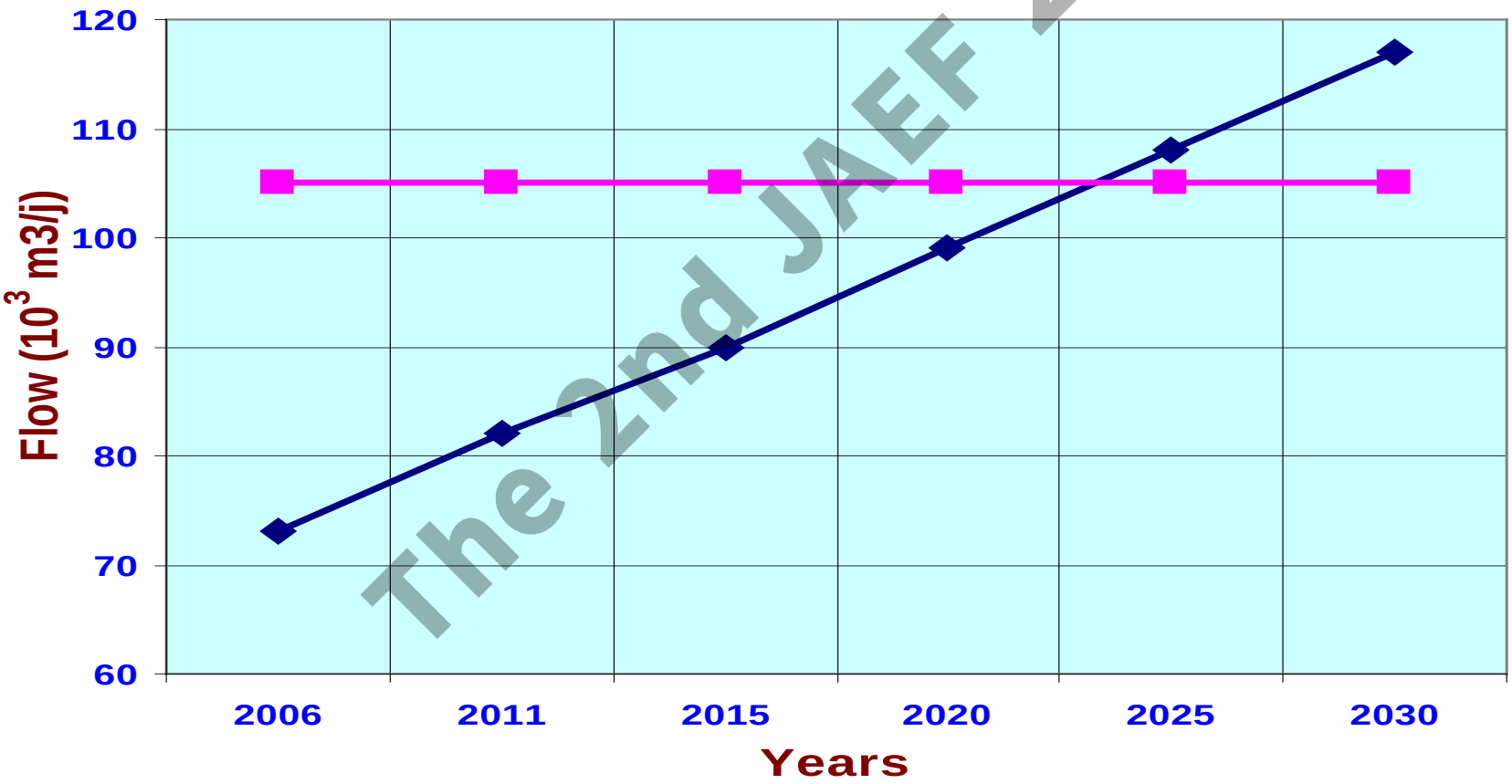
BIZERTE

Water Resources



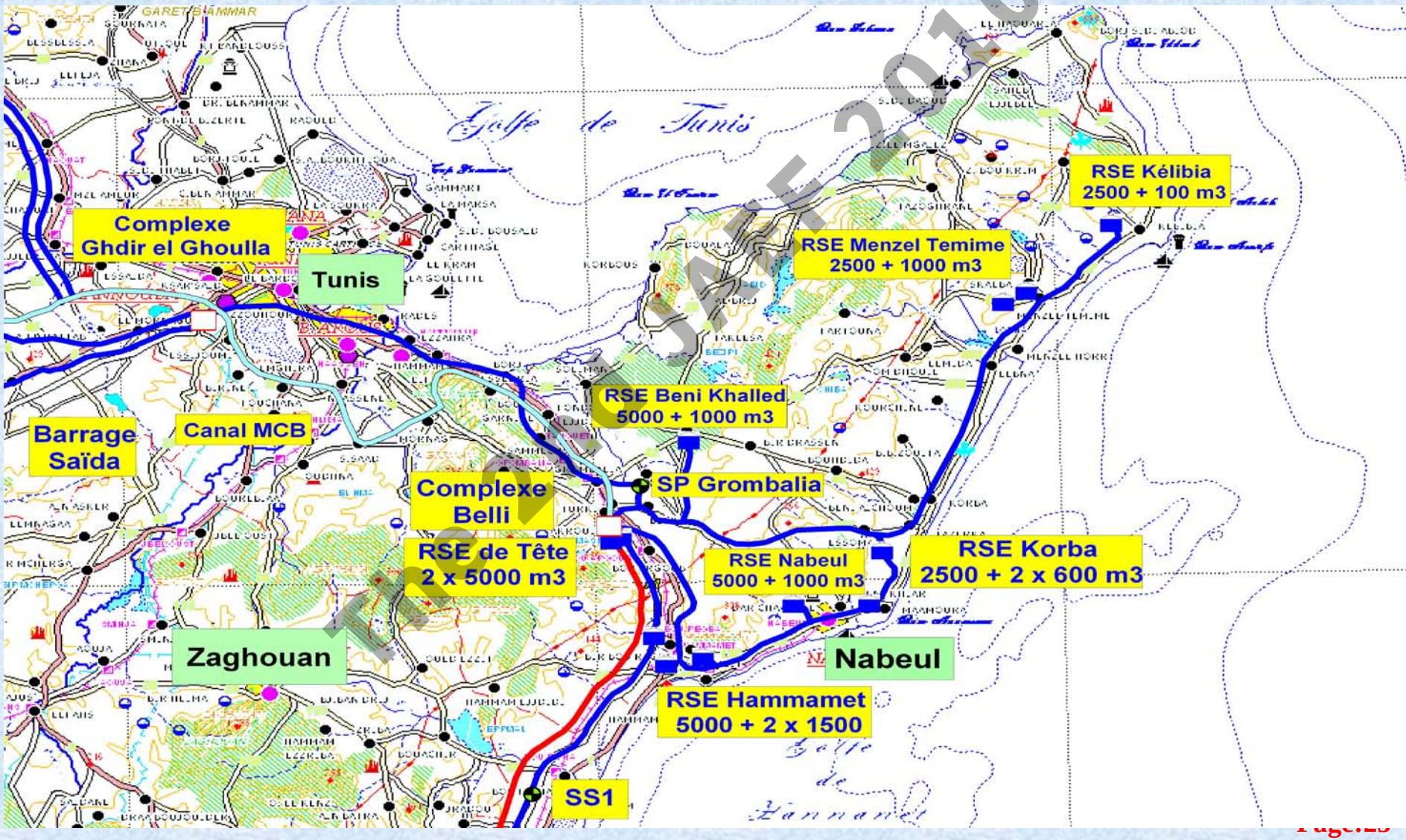
BIZERTE

Ressources / Besoins en eau



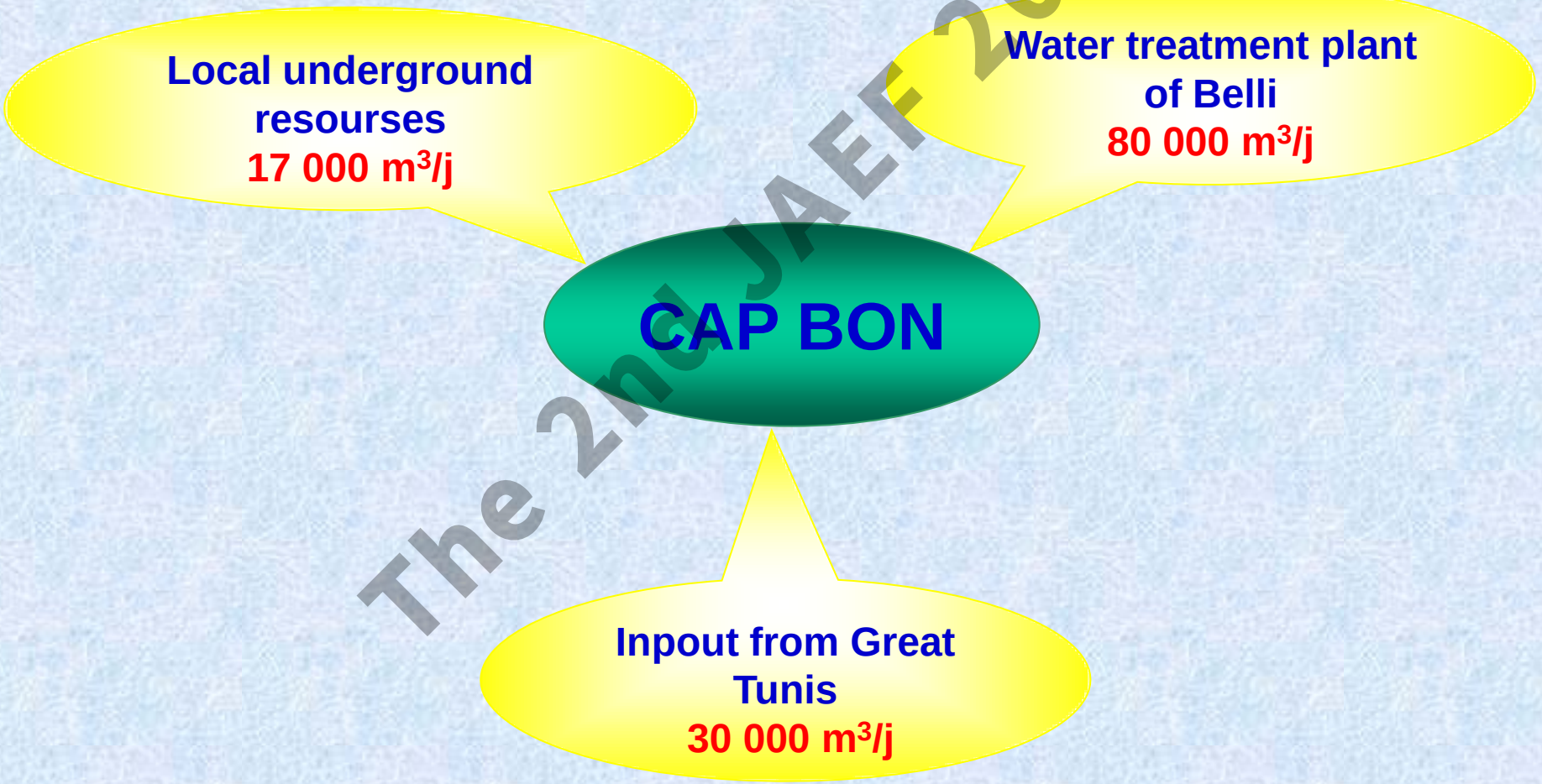
CAP BON

Main Network



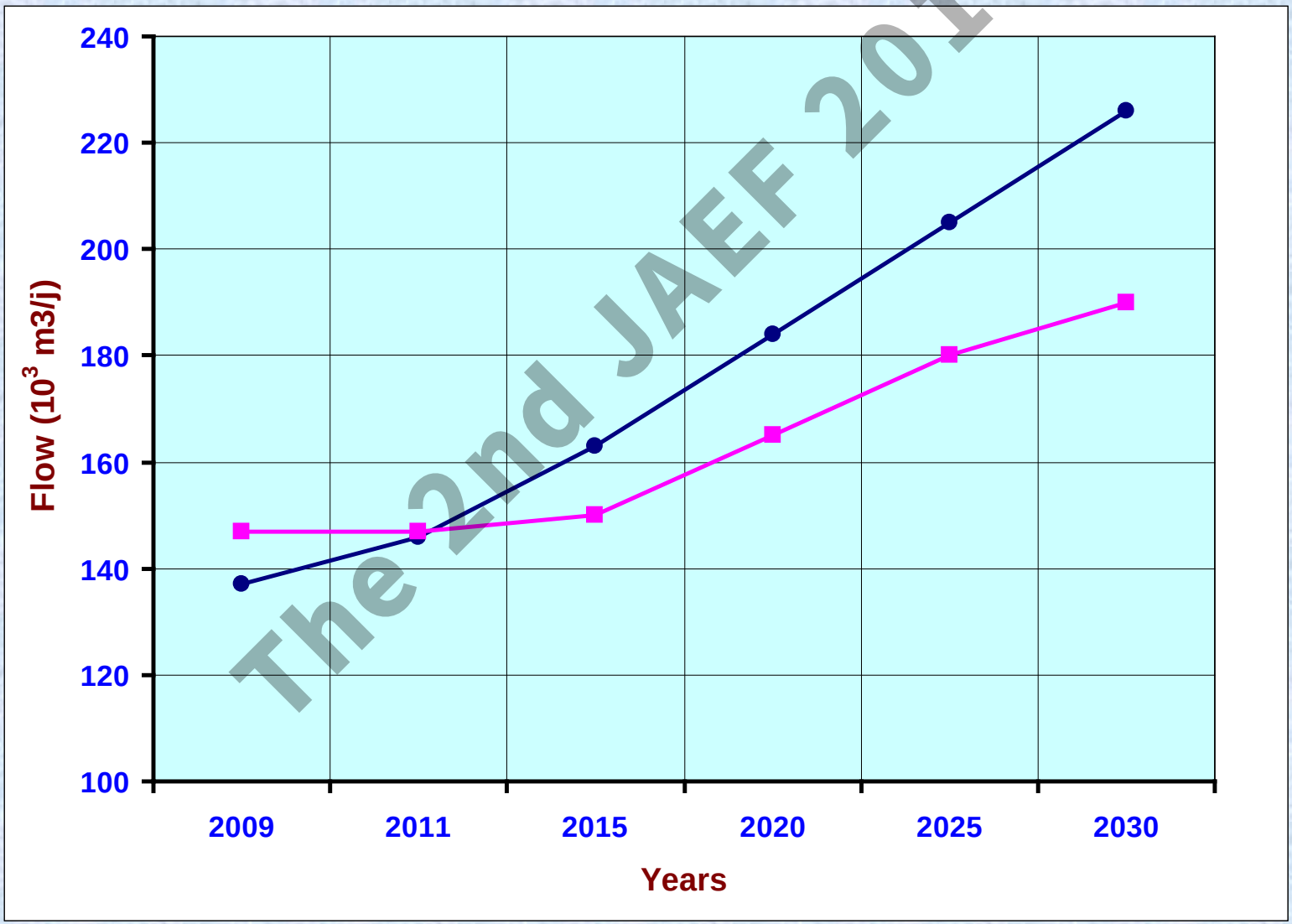
CAP BON

Water Resources



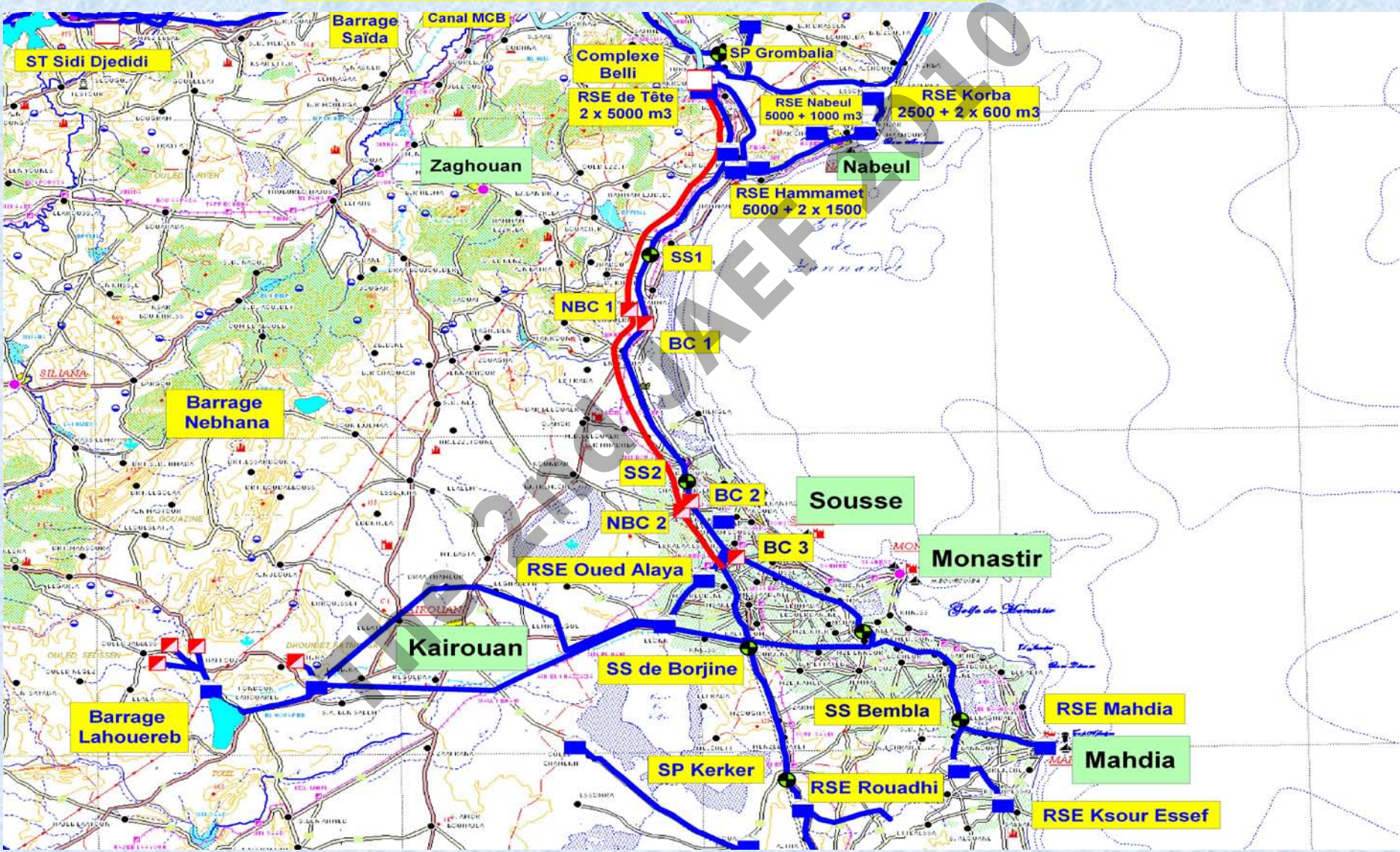
CAP BON

Water Resources / Water Demand



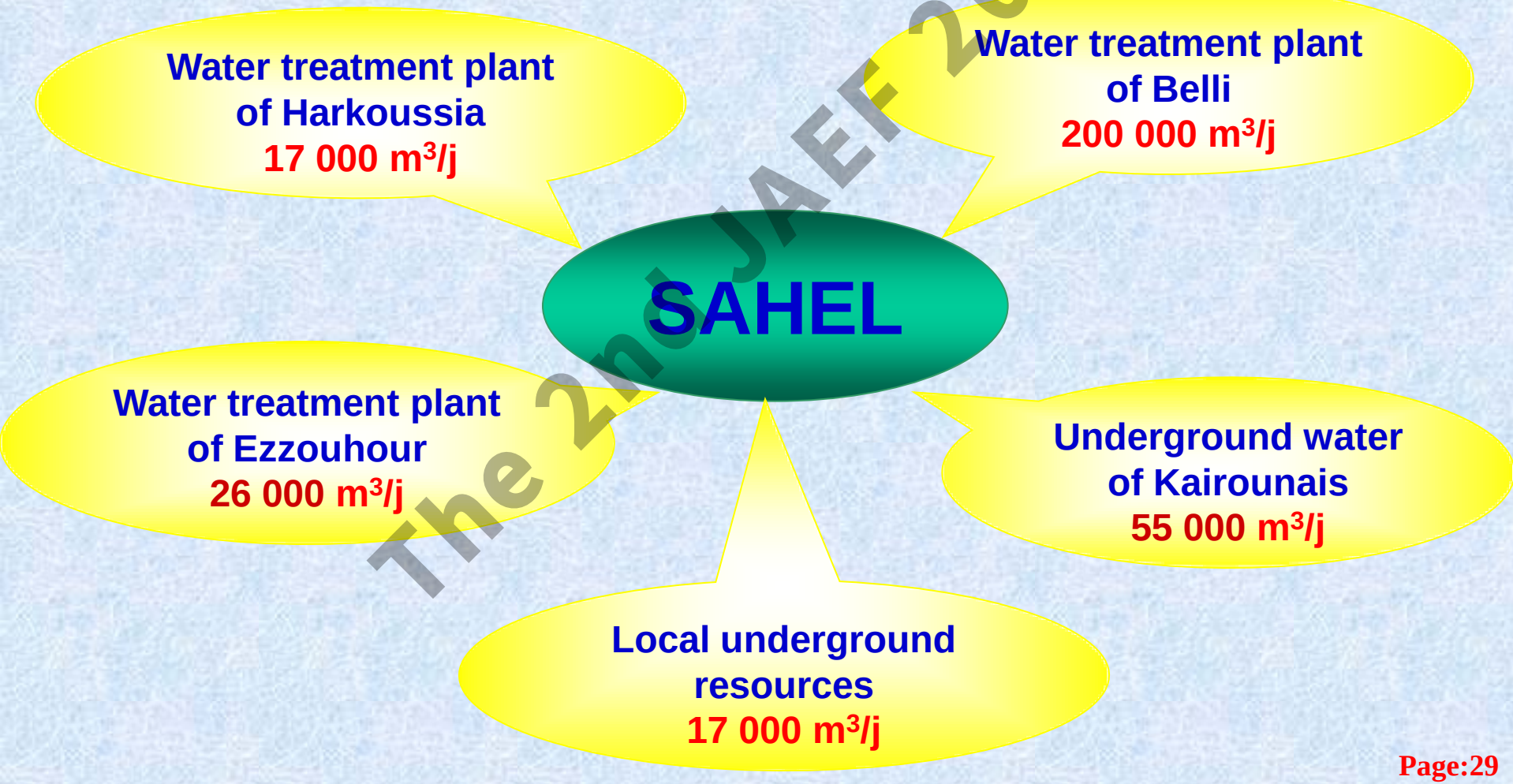
SAHEL

Main network



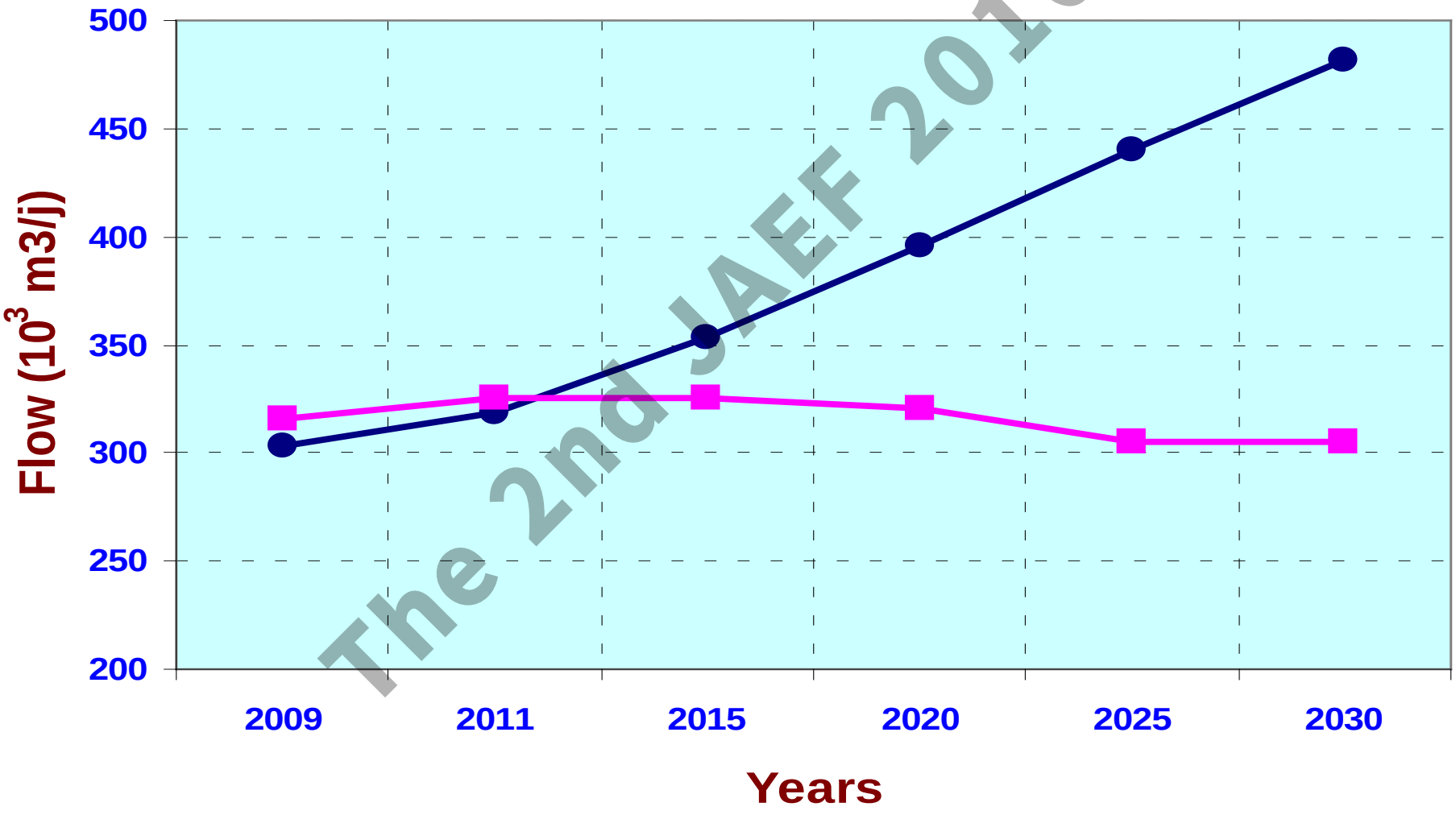
SAHEL

Water resources



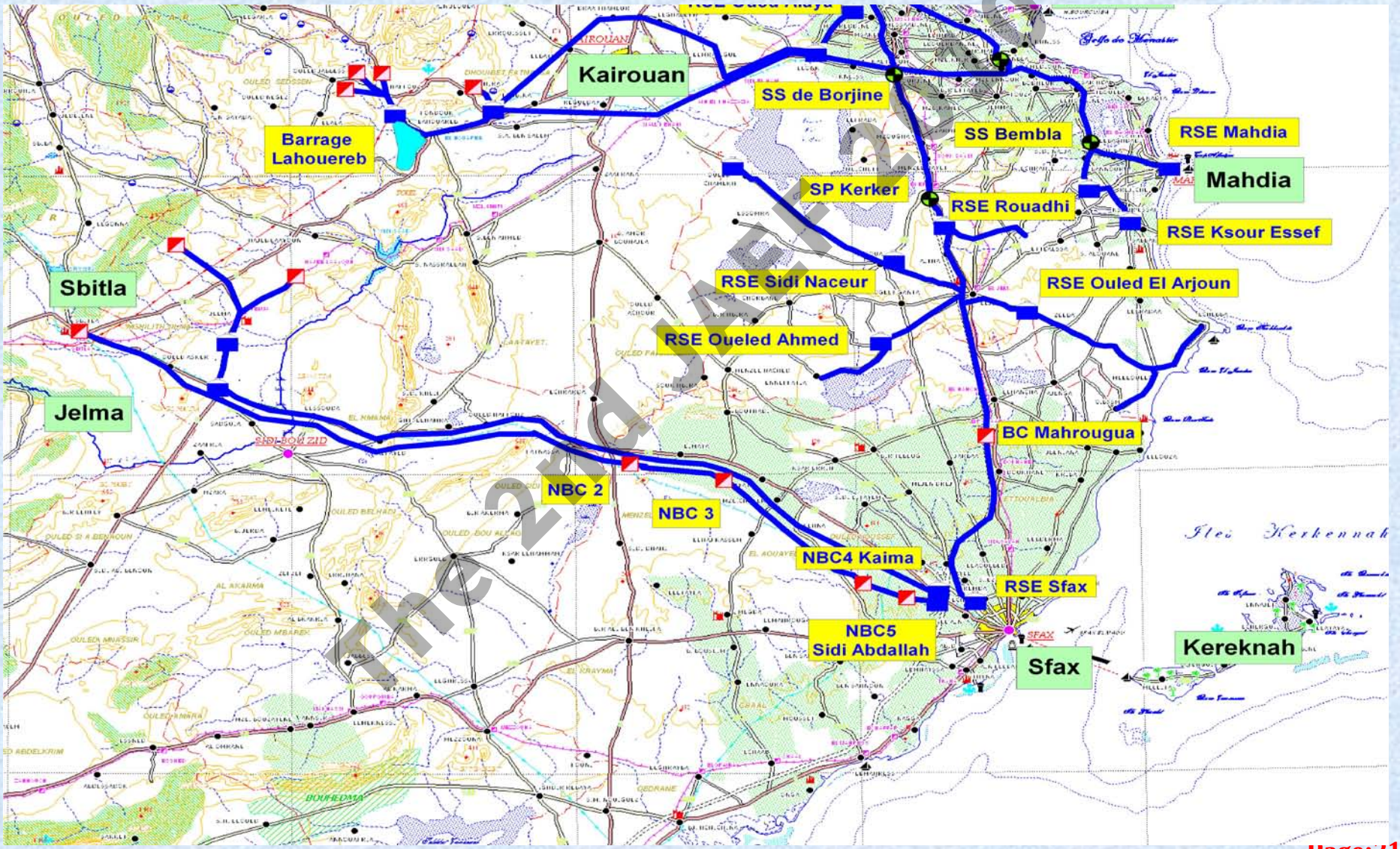
SAHEL

Water Resources / Water demand



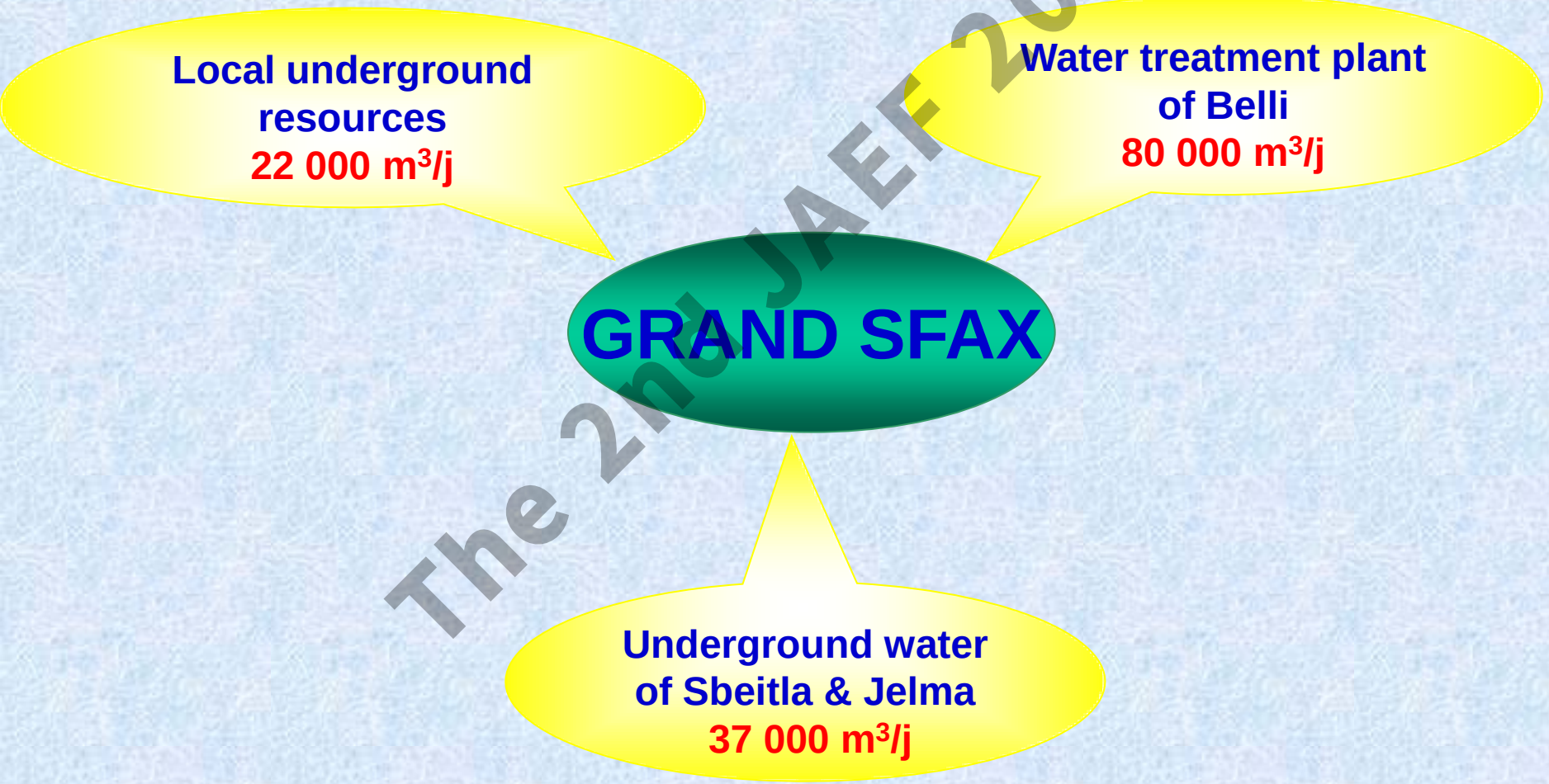
SFAX

Main network



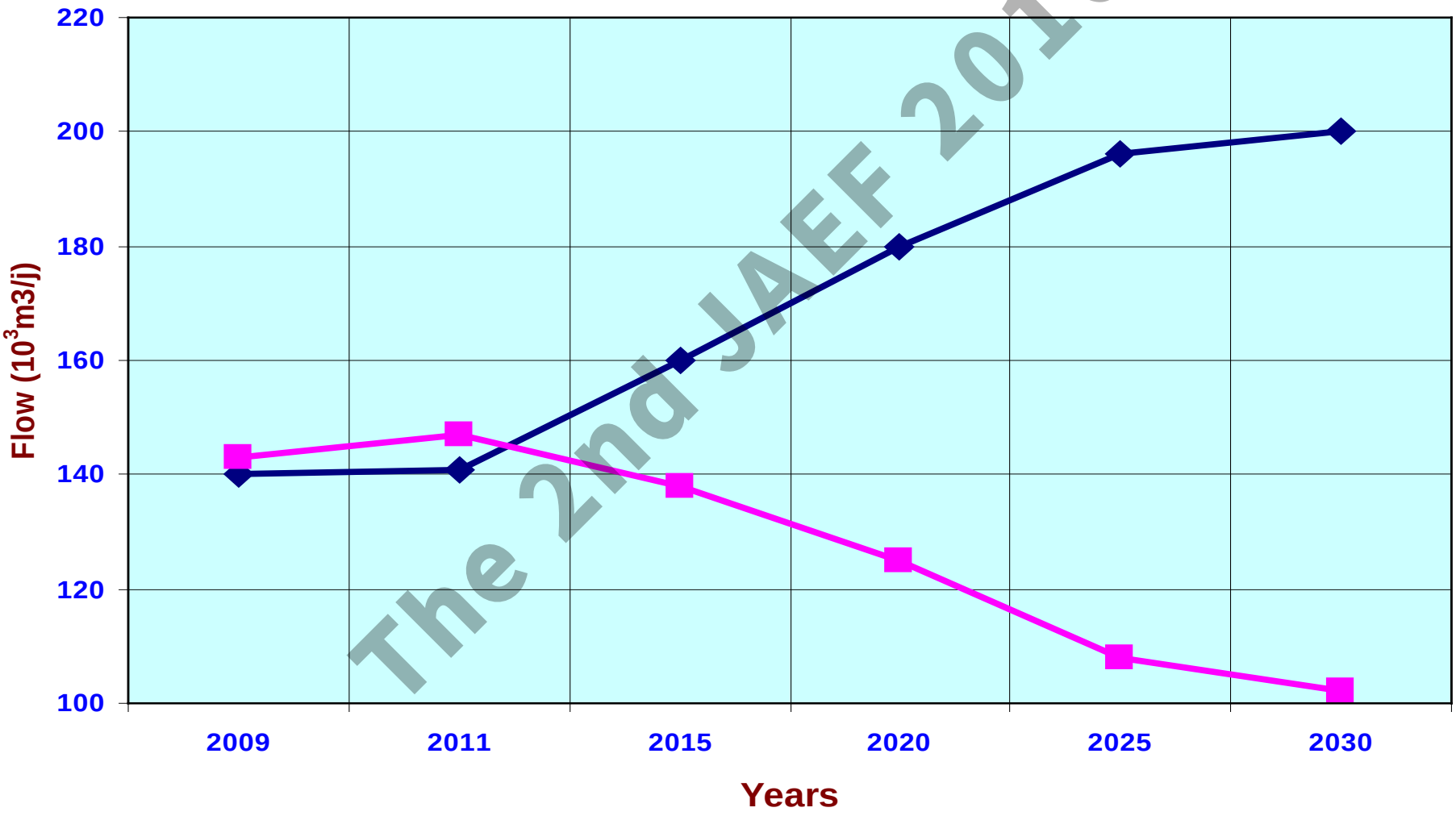
GRAND SFAX

Water resources



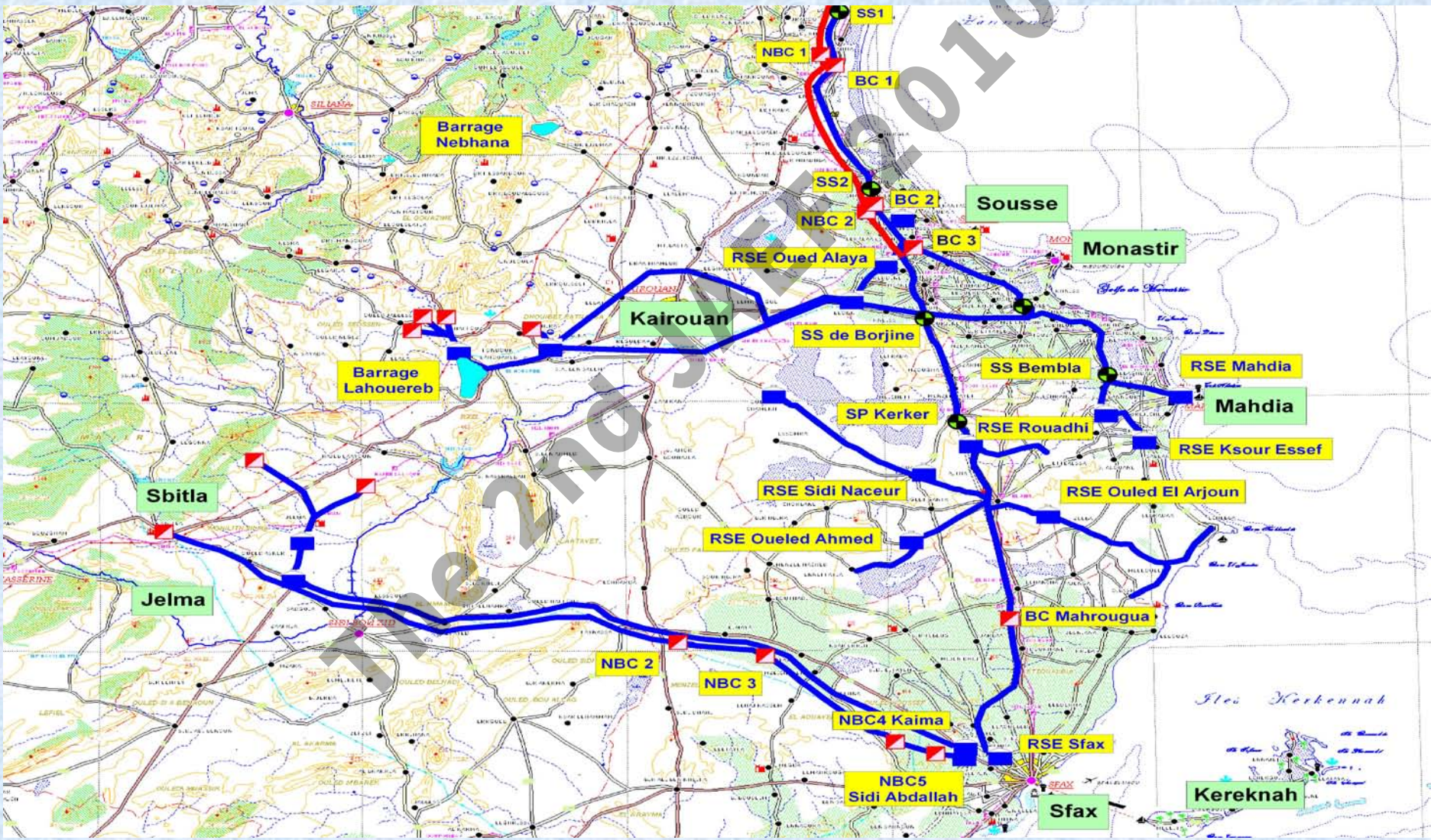
GRAND SFAX

Water Resources / water demand



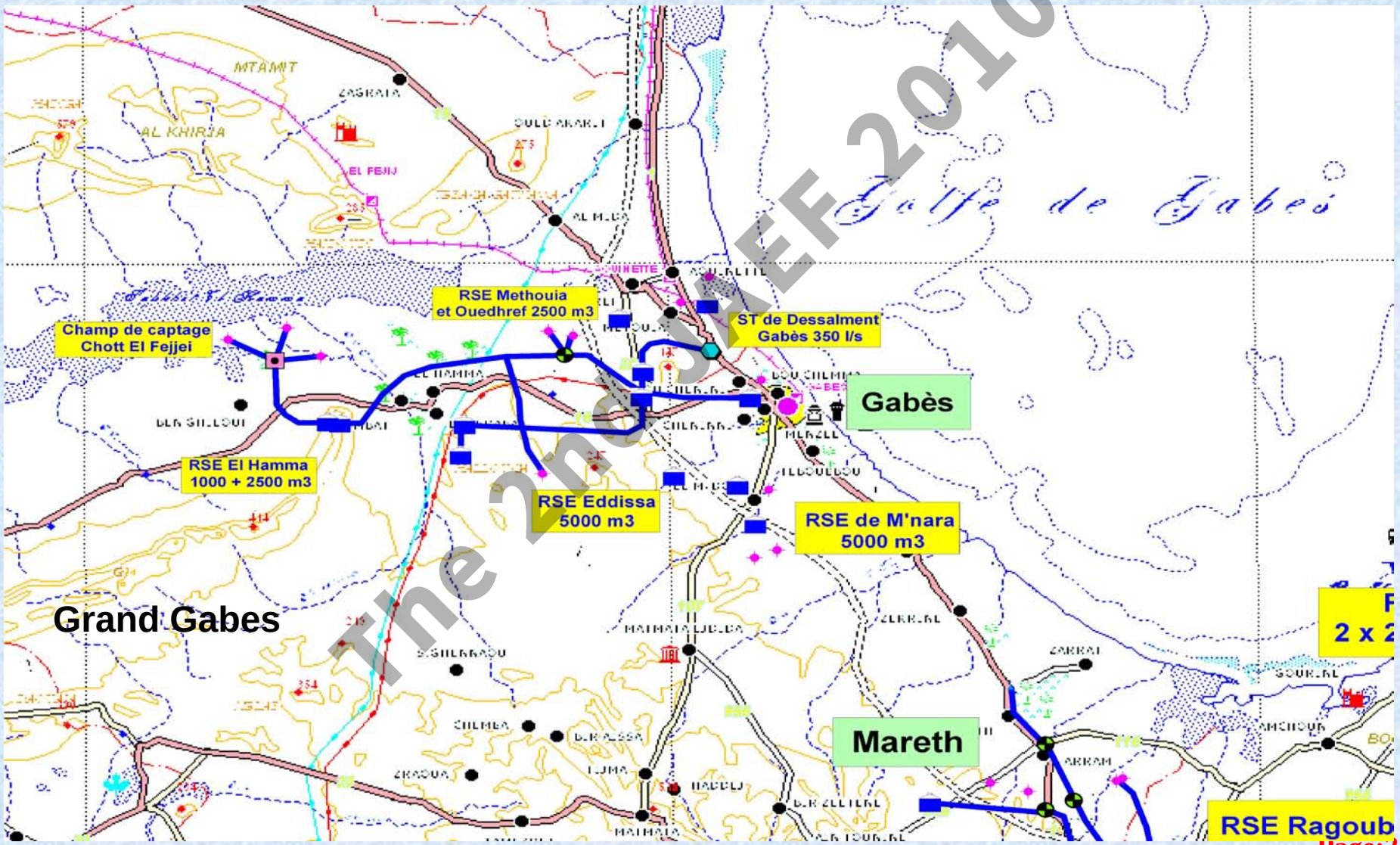
SAHEL & SFAX

Prospects



Great Gabes

Network



Great Gabes

Water resources

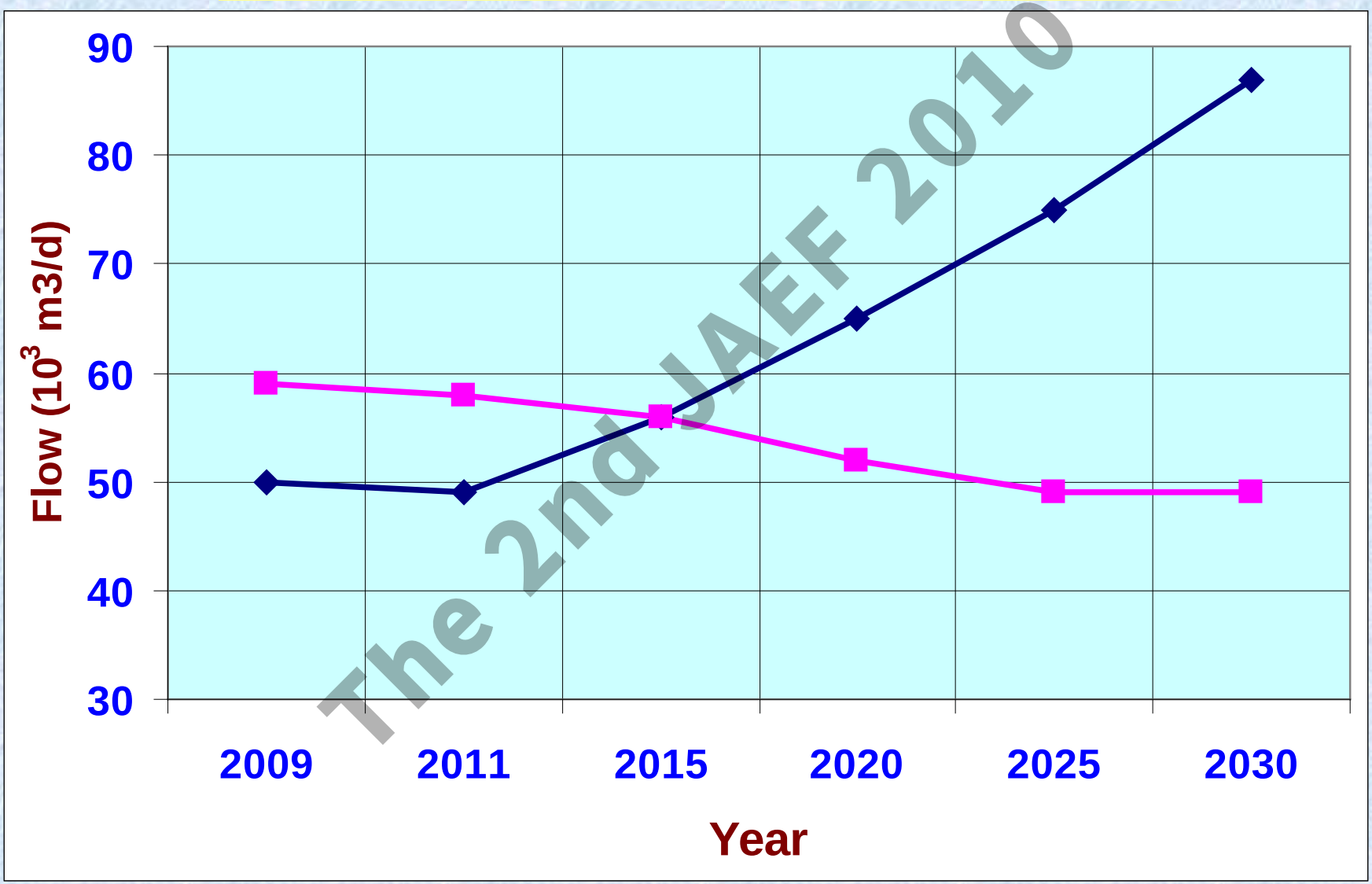
Local underground water resources
25 000 m^3/d

Water desalination plant of Gabes
34 000 m^3/d

GABES

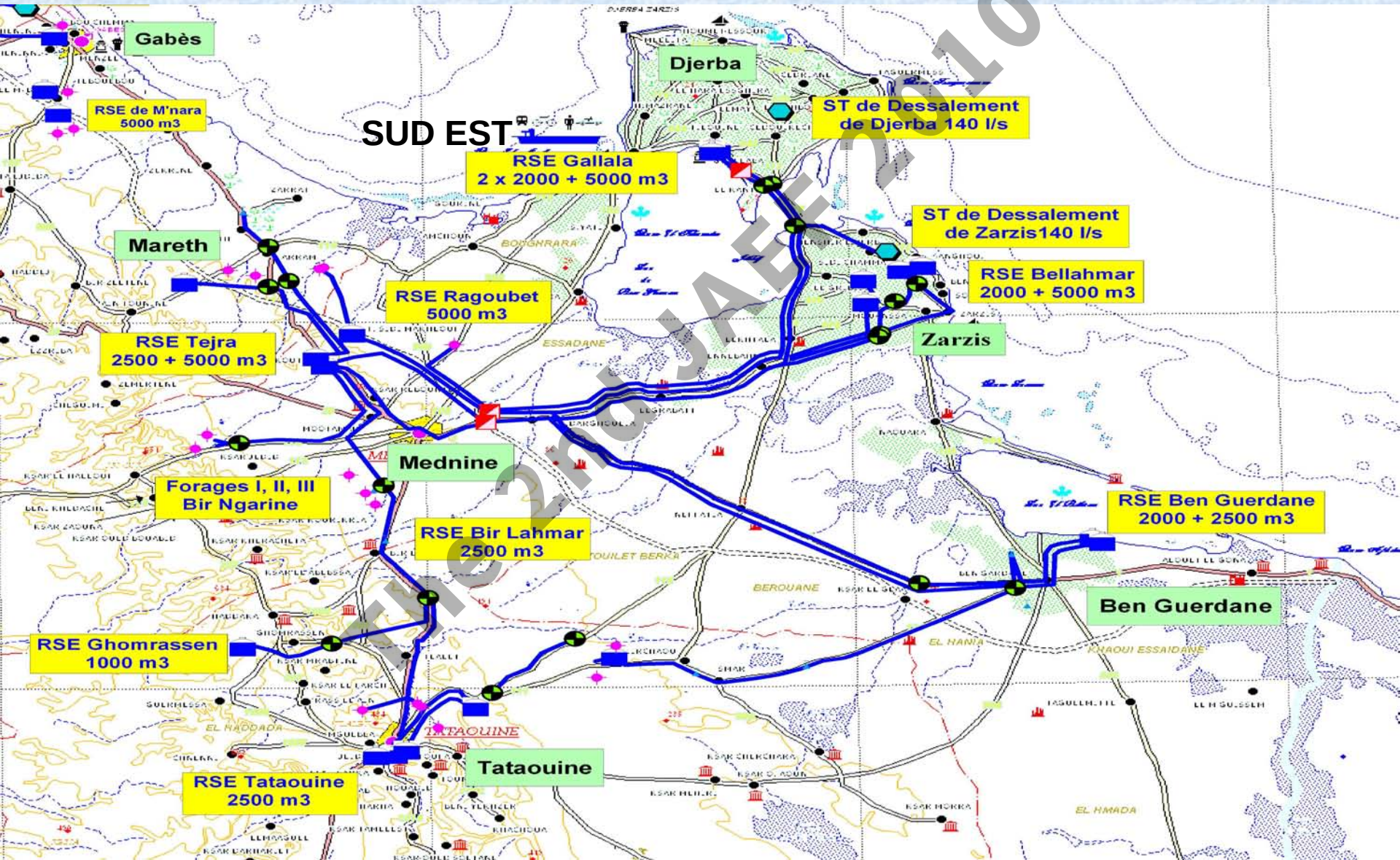
Great Gabes

Water resources / Water demand



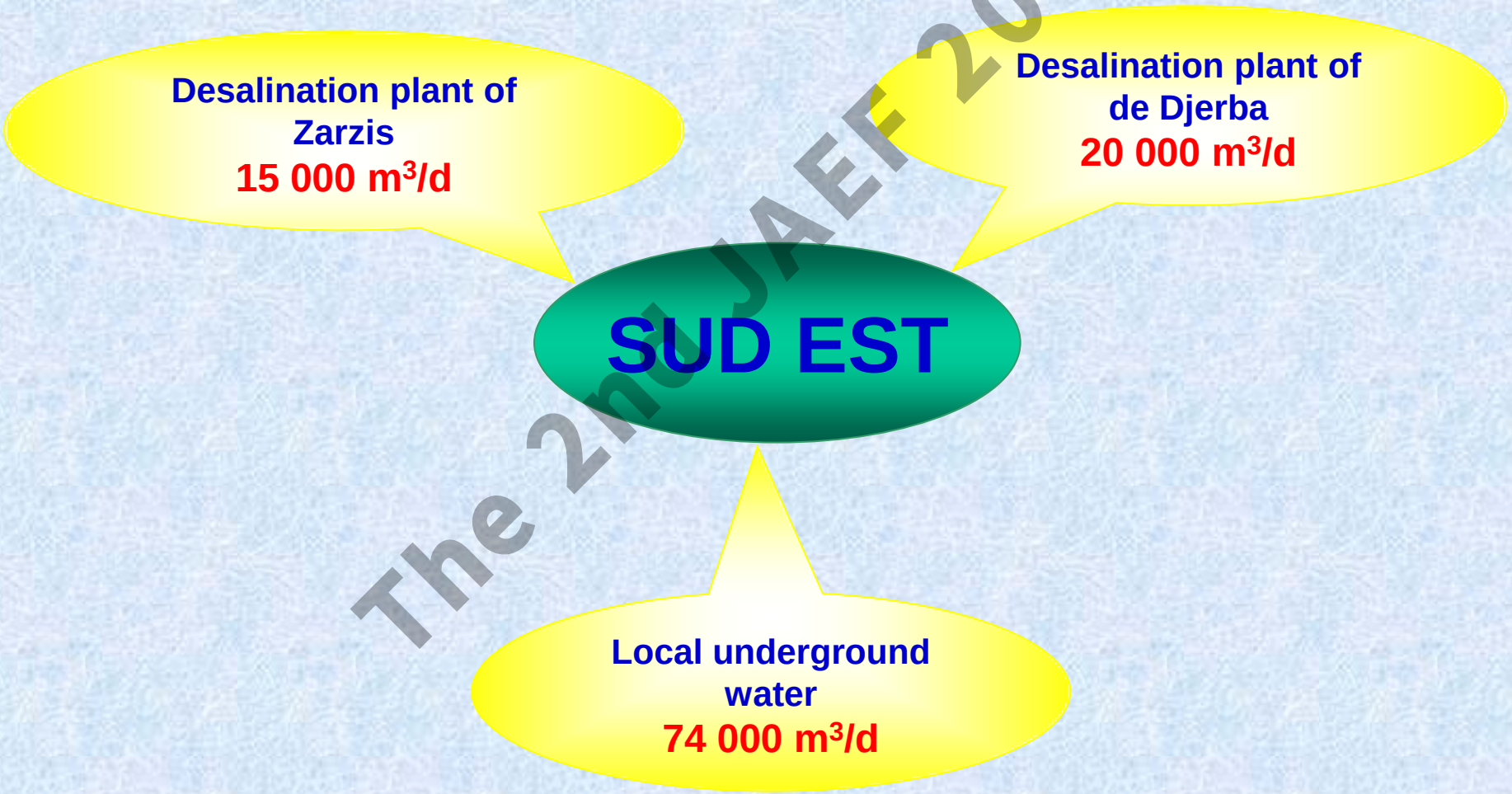
SOUTH EASTERN REGION

NETWORK



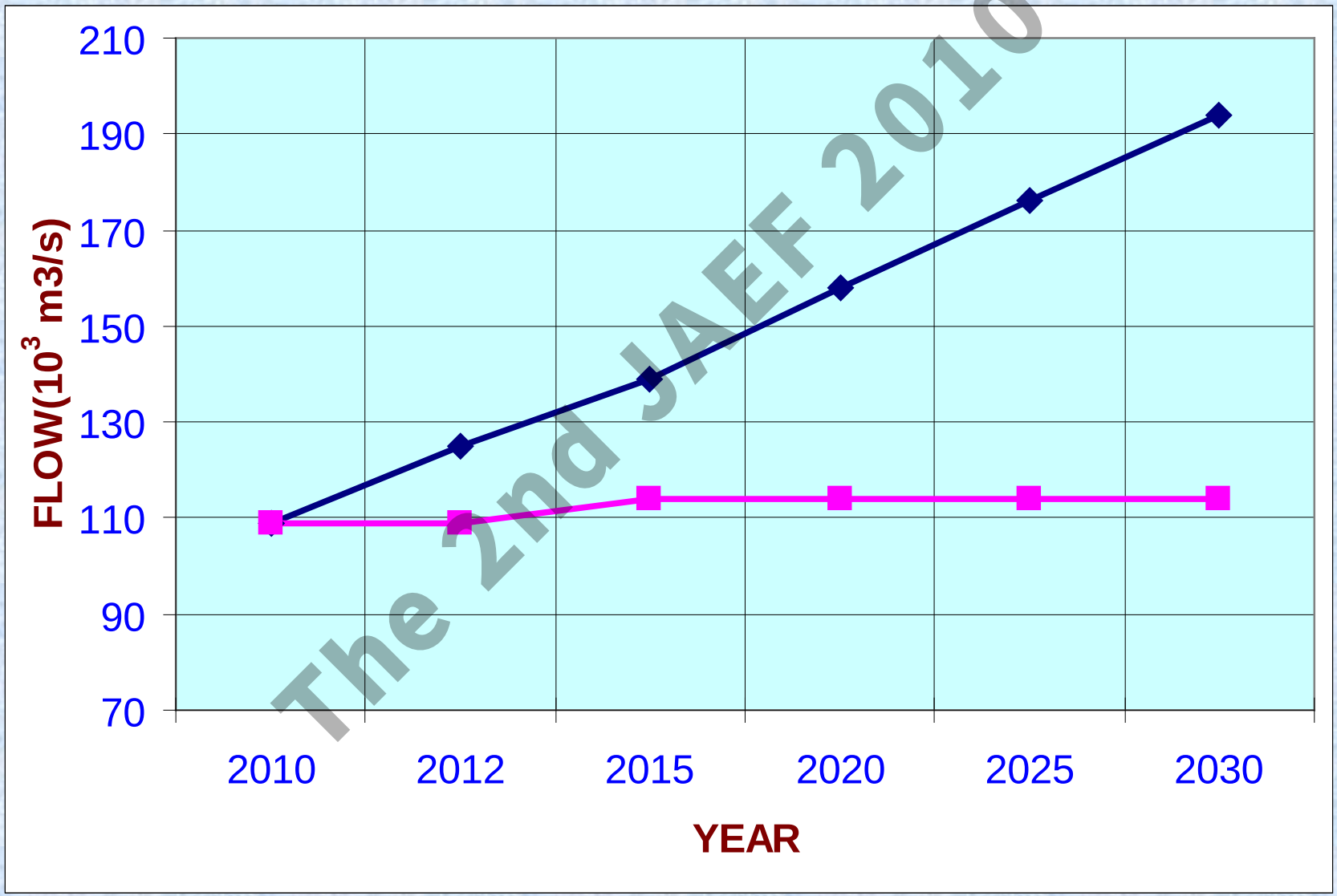
SOUTH EASTERN REGION

Water resources



SOUTH EASTERN REGION

Water resources / Water demand



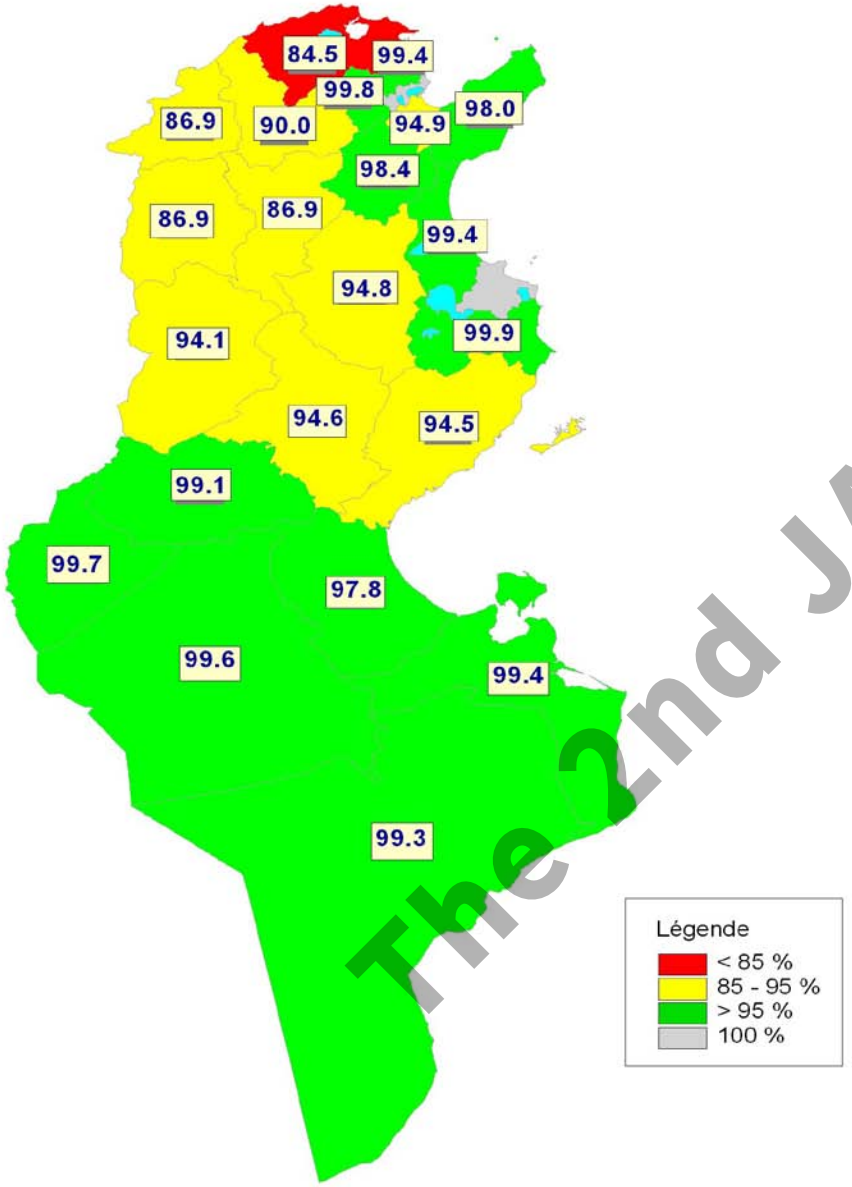
DRINKING WATER DEMAND

Water resources / Water demand

The examination of these assessments of resources and demand, shows that the horizon of saturation for all the regions varies between 2010 and 2022. Thus, several specific projects for each region are already programmed to cope with the forecast water demand and to preserve the quality of service guaranteed by SONEDE, which consists in distributing water to all citizens through the whole territory at any moment during the day and along the year with a quality of water in conformity with national and international standards and a quantity and pressure needed by the customer.

5 – Water supply in rural regions

5. Water supply in rural regions



Current situation

The national average rate of water supply in rural regions recorded in 2009 is 94,1 %.

The highest rates are recorded in south gouvernorats.

The lowest rates are recorded in the north gouvernorats.

- Jendouba : 86,9 %,
- Bizerte : 84,5 %
- Béja : 90,0 %

5. Water supply in rural regions

- The future national objective is to reach an average servecing rate of 95 % with a minimum of 85 % in each gouvernorat.

- To achieve this goal, the approach is to focus on the gouvernorats having the lowest rates such as : Jendouba, Bizerte and Béjà.

- Although these areas contain the major part of water resources of the country, the rates are the lowest.

5. Water supply in rural regions

- This could be explained by the topography of the region and the absence of sufficient and perennial hydrogeologic structures.

- In order to bring the water resource closer to the most withdrawn rural zones, the state programmed, in first phase the realization of axes of transfer of water between the closest dams and these zones. In second phase, the construction of distribution networks of all rural localities concerned.

- The project will touch 491000 inhabitants distributed in 2086 rural localities.

4. Water supply in rural regions

Jendouba Project :

- Estimate cost : 84,0 Millions DT.
- Profit Population : 203 000 inhabitants.
- Localities concerned : 1016 localities.
- Target servecing rate : 97,6 %.

Bizerte Project :

- Estimate cost : 71,0 Millions DT.
- Profit Population : 165 000 inhabitants.
- Localities concerned : 539 localities.
- Target servecing rate : 97,2 %.

Beja Project :

- Estimate cost : 48,0 Millions DT.
- Profit Population : 90 000 inhabitants.
- Localities concerned : 399 localities.
- Target servecing rate : 96,9 %.

6 – WATER SAVING

6. WATER SAVING

PROSPECTS

For a few years the SONEDE has not ceased making efforts to inculcate a culture of water saving.

The strategy of the company in this field consists in the following axes :

- Control of water demand by the rationalization of consumption.
- Reduction of water losses in the network.

6. WATER SAVING

PROSPECTS

SONEDE Network : It aims to improve the network efficiency by :

- **Systematic research program of water escapes,**
- **Metering improvment,**
- **House connections renewal,**
- **Decayed pipes replacement,**
- **Reduction of network operating pressure,**
- **Systematic renewal of equipment,**
- **Preventive maintenance.**

6. WATER SAVING

PROSPECTS

Customers :

- To intensify the public sensitizing campaigns which target the whole subscribers (audio-visual Spots, caravans of water saving, cultural events in the educational establishments, public sites...).

- To incite customers having high consumption to carry out technical audit of their intern networks at least once every five years (1000 subscribers per year).

7- WATER QUALITY IMPROVEMENT

7. WATER QUALITY IMPROVEMENT

Current situation

- The improvement of water quality is a serious challenge in a country where 50 % of the water resources have a salinity higher than 1,5 g/l.
- An integrated management of surface water and underground water on the one hand and fresh and brackish water on the other hand made it possible to ensure an acceptable water quality and in conformity with the standards for the major part of the Tunisian population.
- 93 % of the population served by SONEDE is supplyed by water in conformity with the current national standard.

7 . WATER QUALITY IMPROVEMENT

Current situation

- SONEDE is setting up a national strategy having for goal to attenuate imbalance in the allocation of resources by the reinforcement of the current resources while guaranteeing a good quality of water.
- To carry out this strategy, SONEDE had recourse to several means among which the use of nonconventional resources :

Desalination

- Currently, SONEDE is operationg four water desalination plants :
  - Kerkennah island plant (3300 m3/d),
  - Gabès plant (34 000 m3/d),
  - Jerba plant (20 000 m3/d),
  - Zarzis plant (15 000 m3/d).

7. WATER QUALITY IMPROVEMENT

Prospects

WATER QUALITY IMPROVEMENT PROGRAM IN SOUTHERN REGIONS

This program consists in the implementation of brakish water desalination plant and transfer of fresh water for *localities having population higher than 4000 inhabitants and water salinity exceeds 1.5 g/l*.

This program will be carried out in two phases:

- **the first phase : 13 projects.**
- **the second phase : 8 projects.**

Prospects

WATER QUALITY IMPROVEMENT PROGRAM IN SOUTHERN REGIONS

PHASE 1 :

The first phase relates to the *localities having a population higher than 4 000 inhabitants and whose salinity of distributed water is higher than 2,0 g/l*.

The population concerned is approximately 340 000 inhabitants.

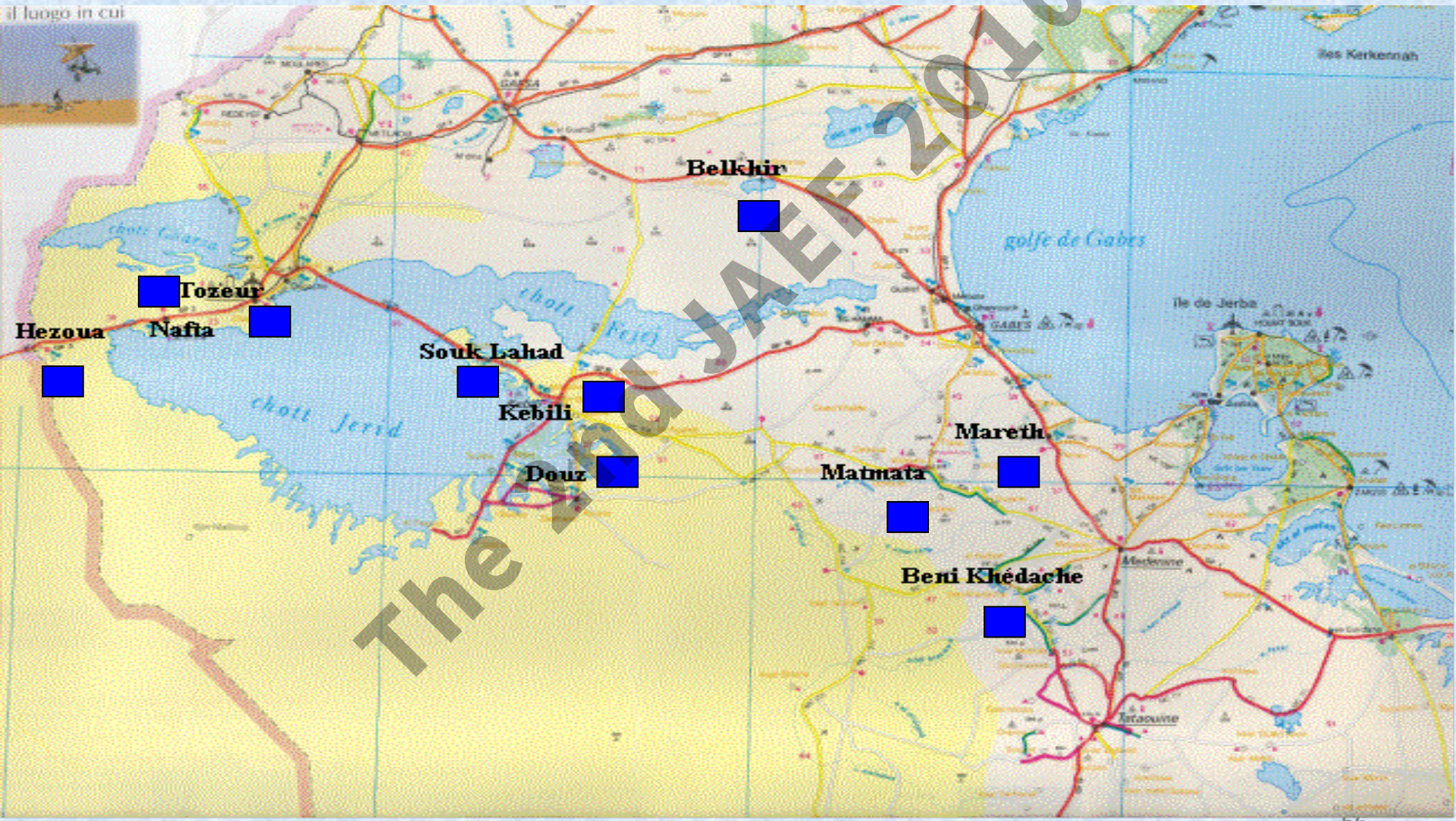
The estimated cost is 62 millions DT.

Status progress : Under-Construction.

7. WATER QUALITY IMPROVEMENT

WATER QUALITY IMPROVEMENT PROGRAM IN SOUTHERN REGIONS

PHASE 1



7. WATER QUALITY IMPROVEMENT

Prospects

WATER QUALITY IMPROVEMENT PROGRAM IN SOUTHERN REGIONS

PHASE 1

Gouvernorat	Plant Site	Capacity (m^3/d)	Technology	Lines Number
Tozeur	Tozeur	6000	RO	3/2000
	Nafta	4000	RO	2/2000
	Hezoua	800	RO	1/800
Kébili	Kébili	6000	RO	3/2000
	Souk Lahad	4000	RO	2/2000
	Douz	4000	RO	2/2000
Gabès	Matmata	4000	RO	2/2000
	Mareth	5000	RO	2/2500
Médenine	Béni Khédache	800	RO	1/800
Gafsa	Belkhir	1600	ED	2/800
Total		36200		

7. WATER QUALITY IMPROVEMENT

Prospects

WATER QUALITY IMPROVEMENT PROGRAM IN SOUTHERN REGIONS

PHASE 2

- **The second phase relates to the *localities having a population higher than 4000 inhabitants and water salinity varies between 1.5 g/l and 2 g/l*.**
- **It will be set up 8 projects of desalination plants with a total capacity of 32 500 m3/j.**
- **The *population* concerned by the second phase is approximately *400 000 inhabitants*.**
- **The estimated cost is 60 MDT.**
- **Progress status : Consulting service.**

7. WATER QUALITY IMPROVEMENT

Prospects

WATER QUALITY IMPROVEMENT PROGRAM IN SOUTHERN REGIONS

DEUXIEME PHASE

Gouvernorat	Plant Site	Capacity (m^3/d)	Technology	Lines number
Tozeur	Deguèche	2500	RO/EDR	1
Kébili	Kébili-extension	2000	RO/EDR	1
Sidi Bouzid	Meknassi-Mazouna-Bouzian	2000	RO/EDR	1
Médenine	Ben Guerdane	7500	RO/EDR	2
Gafsa	Gafsa nord-Gafsa sud-Ksar	9000	RO/EDR	3
	Mdhila-Gtar- Ayeycha Metlaoui	2500	RO/EDR	1
	Redayef-Moulares	3000	RO/EDR	1
		4000	RO/EDR	2
Total		32 500		

Prospects

Sea water Desalination plant

Being given the massive exploitation of brackish water resources in the Tunisian south, the passage to the desalination of sea water seems inevitable. Thus, Tunisian Government engaged an ambitious program of sea water desalination which is integrated in the national strategy of water resources mobilization.

In this context, four projects of sea water desalination plant were programmed:

-Three (03) stations (BOT),

- One (01) station (Turn-key).

Prospects

Djerba sea water desalination plant

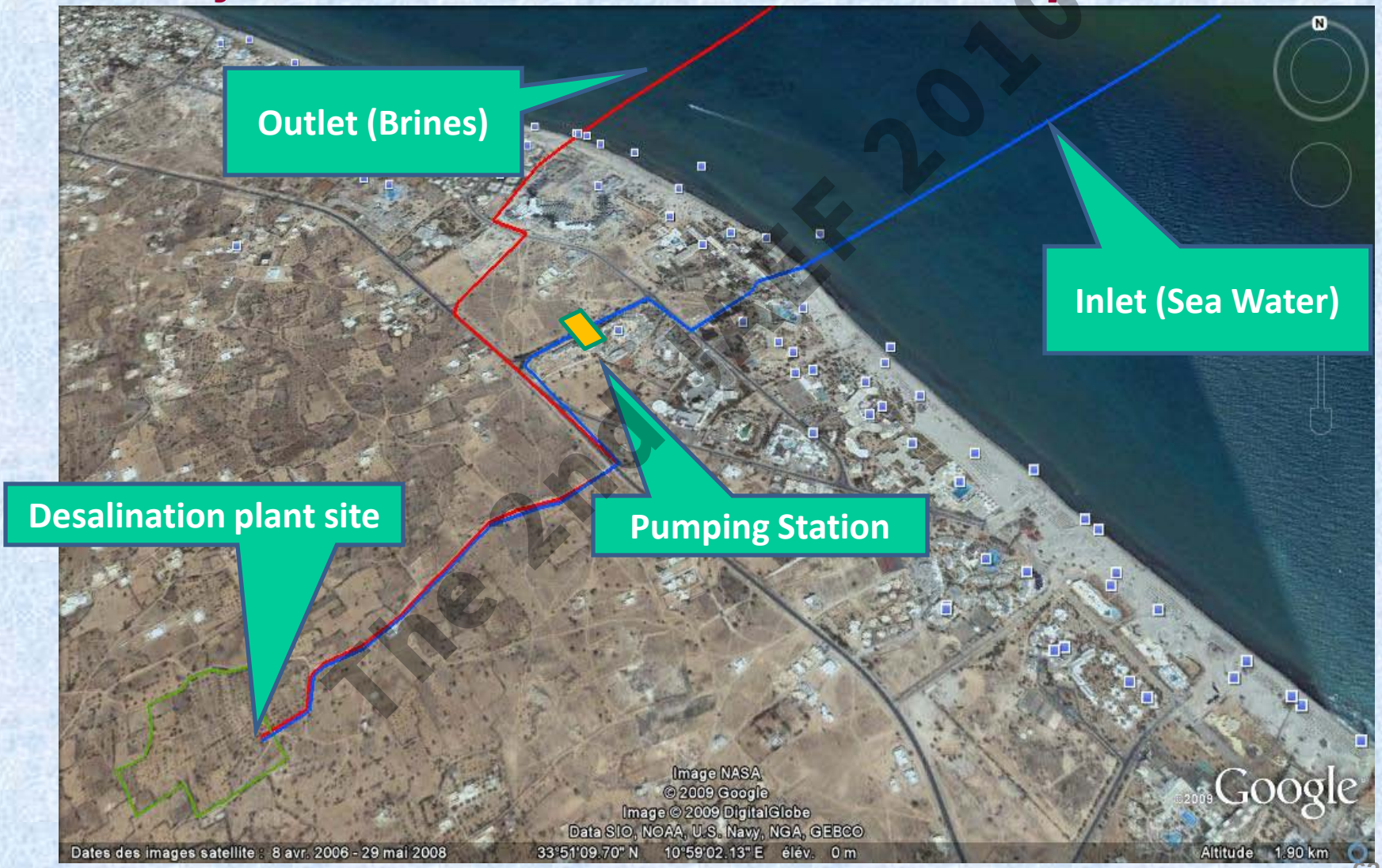
Objective : Water quality improvement and reinforcement of resources for Djerba island and Zarzis (2030).

- **Capacity : 50 000 m3/d,**
- **Technology : Reverse Osmosis**
- **Mode of realization : Concession (BOT).**
- **Cost : 85 MTD.**
- **Progress status : Contract negociation,**
- **Startup date : 2012.**

7. WATER QUALITY IMPROVEMENT

Prospects

Djerba sea water desalination plant



7. WATER QUALITY IMPROVEMENT

Prospects

Zarat sea water desalination plant

Objective : Water quality improvement and resources reinforcement for the gouvernorats of *Gabes* and *Medenine* (2030).

- **Capacity : 50 000 m3/j,**
- **Technology : Reverse Osmosis,**
- **Mode of realization : Concession (BOT),**
- **Estimated Cost : 90 MDT,**
- **Progress status : Consulting service.**
- **Startup : 2015.**

Prospects

Sfax sea water desalination plant

Objective : Water quality improvement and reinforcement of resources for *Great Sfax*.

- **Capacity : 150 000 m3/d (3 Phases),**
- **Technology : Reverse Osmosis,**
- **Mode of realization : Concession (BOT),**
- **Estimated Cost : 250 MDT,**
- **Progress status : Terms of references.**
- **Startup date : 2016 (Phase 1),**
  2020 (Phase 2),
  2025 (Phase 3).

7. WATER QUALITY IMPROVEMENT

Prospects

Kerkennah sea water desalination plant

Objective : Improvement of the quality of distributed water and reinforcement of water resources in the island of Kerkennah.

- **Capacity : 6 000 m 3/d,**
- **Technology : Reverse Osmosis,**
- **Mode of realization : Turn-key,**
- **Estimated Cost : 20,4 MDT,**
- **Progress status : Tender documents,**
- **Startup date : 2015.**

Prospects

Water Desalination using solar energy

Objective : Water quality improvement and reinforcement of resources of Benguerdane.

- **Capacity :** 2 000 m 3/d,
- **Technology :** Reverse osmosis,
- **Mode of realization :** Turn-key,
- **Estimated Cost :** 15 MDT,
- **Progress status :** Tender documents,
- **Startup date :** 2015.

7. WATER QUALITY IMPROVEMENT

Prospects

Water Desalination using solar energy

8. NATIONAL STRATEGY

8. NATIONAL STRATEGY

The national strategy in term of drinking water supply is founded on three bases :

1) Water supply securisation,

2) Water saving,

3) Tariffing and covering of the costs.

8. NATIONAL STRATEGY

Water supply securisation

SONEDE continues to take necessary provisions for the securisation of drinking water supply of all the regions of Tunisia through:

- The diversification of water resources for each area.
- Reinforcement of storage capacities of row and treated water.
- Reinforcement of adduction networks and their interconnection between the regions.
- Reinforcement of the capacities of water treatment and desalination plants.

8. NATIONAL STRATEGY

Water supply securisation

- In addition, SONEDE programmed the implementation of mega projects to cope with the future needs to horizon 2030 for the large poles of consumption.

- The future orientations aim at making safe the supply of these poles of consumption to horizon 2050.

- Taking into account the localization of the large poles of consumption along the coast, the securisation relates to the construction of sea water desalination plant.

- These plants will ensure the vital needs for the population without probably exceeding 20 % of the total demand.

8. NATIONAL STRATEGY

Water saving

- Because of the scarcity of water resources, and in order to satisfy the increasing demand, SONEDE established since the Nineties a programme of water saving centered on the improvement of the performances of its infrastructures and the rationalization of the consumption of water among subscribers.

- This programme of water saving was reinforced since 2002 following the National Strategy of water saving (Ministerial Council 2001).

8. NATIONAL STRATEGY

Water saving

This strategy which targuet at year 2030 aims at :

- Saving water in the various sectors users in a proportion of 30 %.
- Increasing to 7 %, the contribution of water resources coming from the nonconventional resources (Desalination and exploitation of treated worn water).

8. NATIONAL STRATEGY

Water saving

In order to face an unceasingly increasing demand, SONEDE proposes the implementation of several actions, with the horizon 2050 of which mainly the following ones:

- Obligation to install equipment saver of water in all users sectors.
- The recovery of rain water by the construction of the cisterns of collection of rainwater in new constructions.
- The use of saving water techniques in industrial sector using processes of production based on the re-use of process water.

8. NATIONAL STRATEGY

Water saving

- The recourse to the nonconventional water resources in tourist establishments (located on the coastal zones), construction of sea water desalination plant.

- Marketing equipement allowing the reduction of water consumption (washing machine, car washing station...).

- The recourse to the separation of the intern networks of new buildings and buildings to be rehabilitated (worn water and gray water) .

8. NATIONAL STRATEGY

Water saving

It should be noted that the success of the strategy of water saving requires the assent of the various partners and the implementation of mechanisms and financial encouragements.

8. NATIONAL STRATEGY

Tariffing and covering of the costs

The tariffing system applied by SONEDE answers triple function :

- Social, by providing water to the modest population with a low cost.
- Economic, by safeguarding of competitiveness of the company.
- Ecological, by inciting to water saving.

8. NATIONAL STRATEGY

Tariffing and covering of the costs

- Currently, the tariff applied is binomial (an indebted fixed part whatever the consumption, and a variable part according to consumption). This is to take account of the investment and operation cost to produce and distribute water.

- In Tunisia, tariff adjustments were applied with an aim of bringing closer the average sale price of water at the real cost.

It should be noted that tariffing is powerful when the subscribers are brought to pay water at its real cost.

9. CONCLUSION

In order to cope with the increase in water demand, in the future, Tunisia is called to continue the policy of integrated management of water resources by :

- The reinforcement and the extension of water transfer system from the north towards the center and the south.

- The mobilization of water resources to reach the level of 95 %

9. CONCLUSION

- The development of the use of nonconventional water resources such as the brackish water desalination and sea water desalination.
- The reinforcement and extension of the infrastructures of water production, transfer and distribution.
- The water saving by demand control and improvement of network efficiency.