



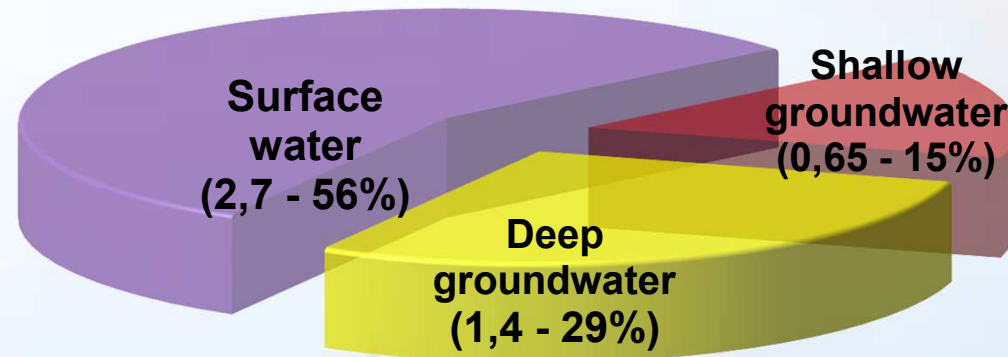
Water resources of Tunisia





Tunisia ranks in the category of countries with the least resources water in the Mediterranean . For a population of 11 million, the total renewable water resources per capita is estimated to **415 m³ (2014)** and is largely under the **penury threshold of 1000 m³**. This values is set to gradually decrease to **350 m³ in 2030**.

➔ **Total water resources availability (Billion of cubic meters)**



Global water resources : 4.825 billion of m³

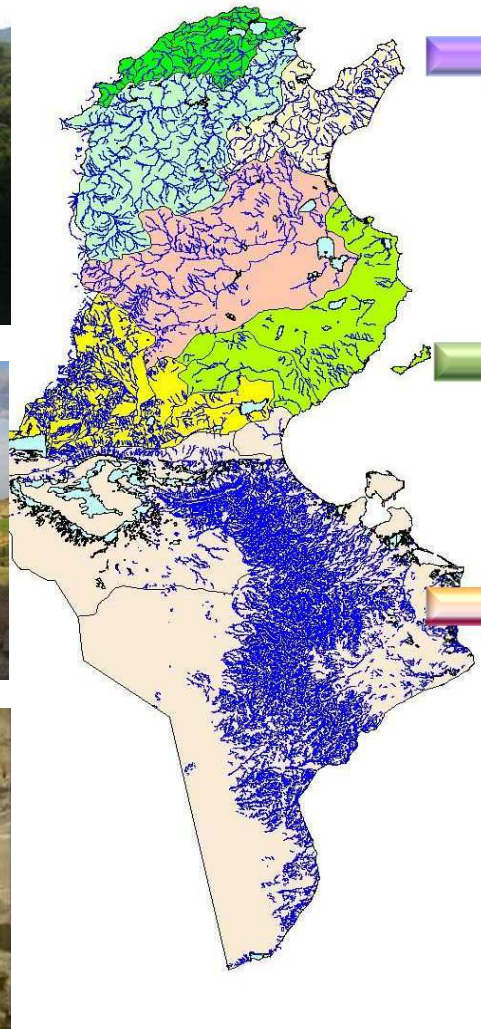
➔ **Water resources in Tunisia are limited and characterised by high spatial disparities.**



Surface water resources : **2.17 billion of m^3**



Cap Bon et Miliane



The main permanent surface rivers which drain to the sea are in the north, mostly rising in the northwest and flowing eastwards: **2190 Mm^3/y . (46% of surface flow)**

In the arid central area, surface rivers are ephemeral, flowing only for a few days or weeks a year: **230 Mm^3/y . (12% of surface flow)**

In the south, surface flows are rare and low: **190 m^3/y (6% of surface flow).**



None of these central and southern ephemeral flows reach the sea; instead, surface water infiltrates over plains or in inland depressions (sabhkas)



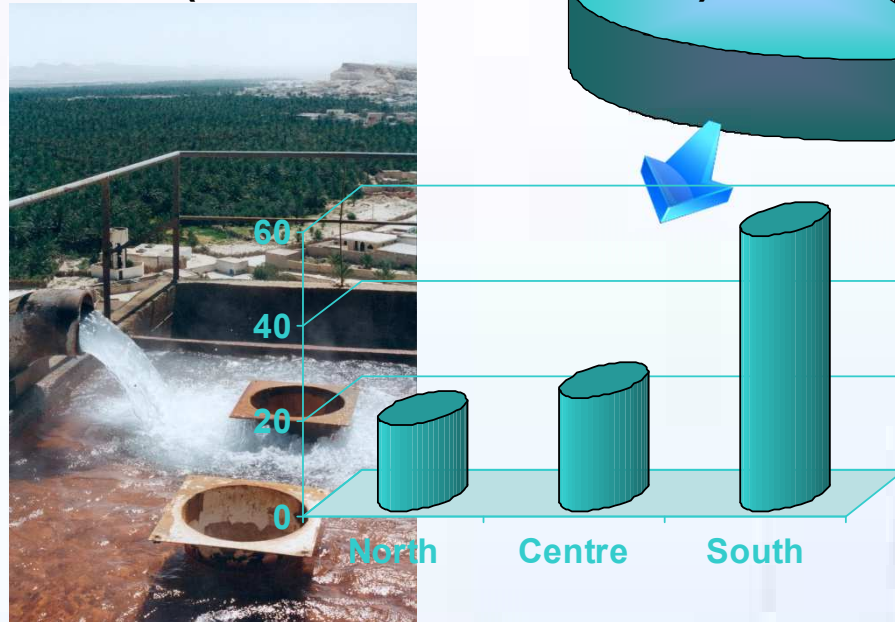
Global Groundwater resources



2.125 billion of m³

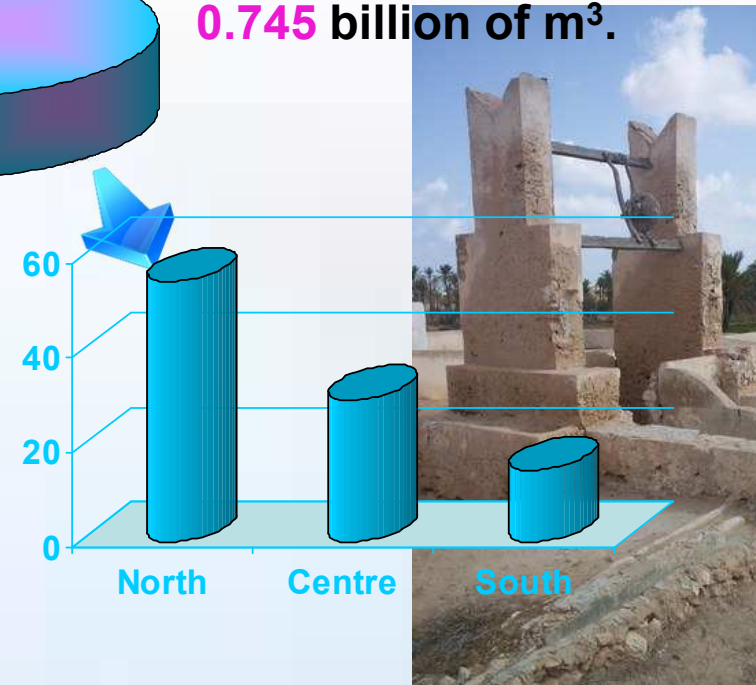
Deep aquifers

267 entities lodging 1.38 billion of m³ (0.65 are non renewable).



Shallow aquifers

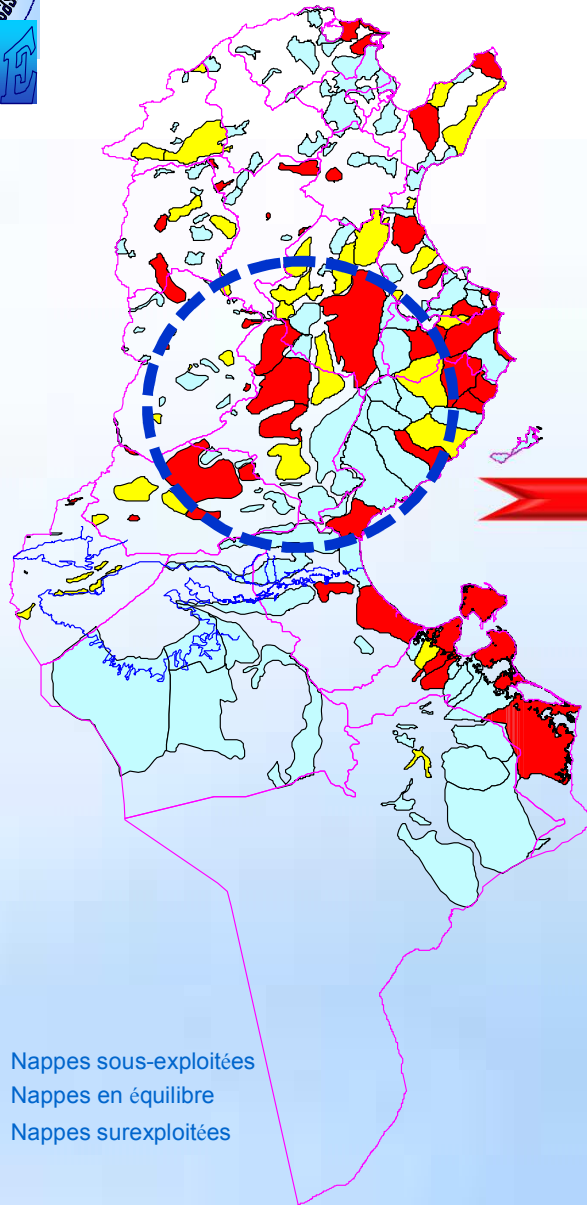
212 entities lodging 0.745 billion of m³.



- ➡ 50% of deep groundwater are non renewable.
- ➡ Most important reservoirs are located in southern Tunisia and are transboundaries aquifers shared with Algeria and Libya.



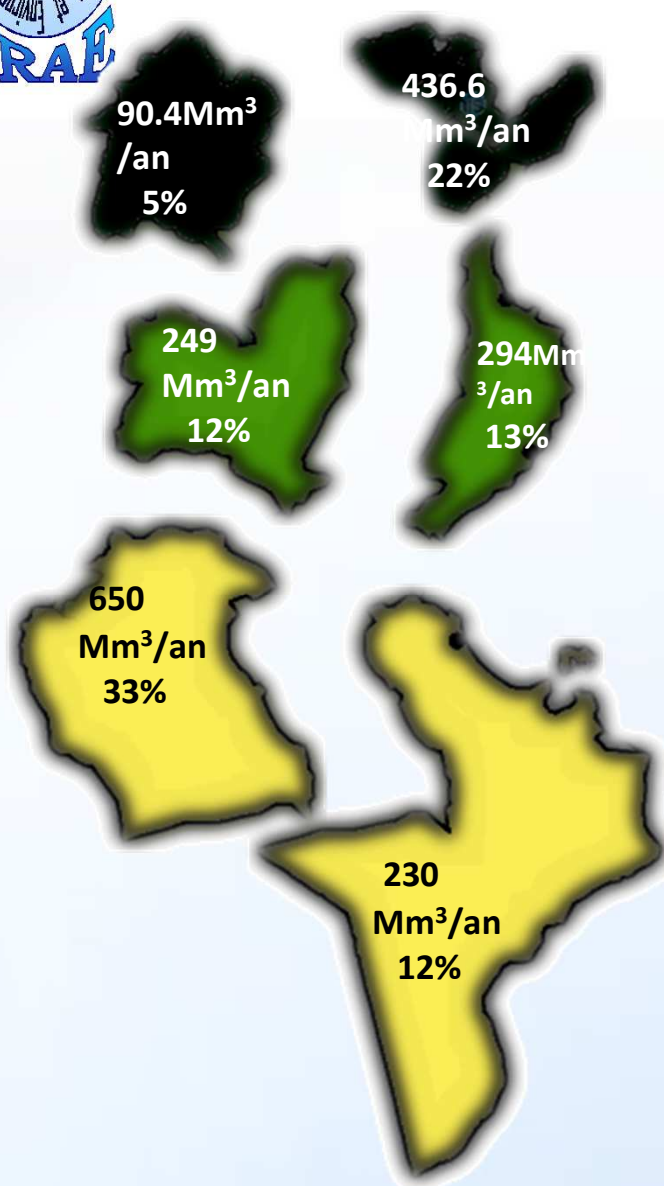
Groundwater Exploitation



- Shallow aquifers are highly exploited by local farmers.
- Overexploited aquifers are mainly located along coastal and in central areas of Tunisia.
- Deep groundwater located in the south are more exploited than those in the north and the center: 755 Mm³/y (77.5 %).

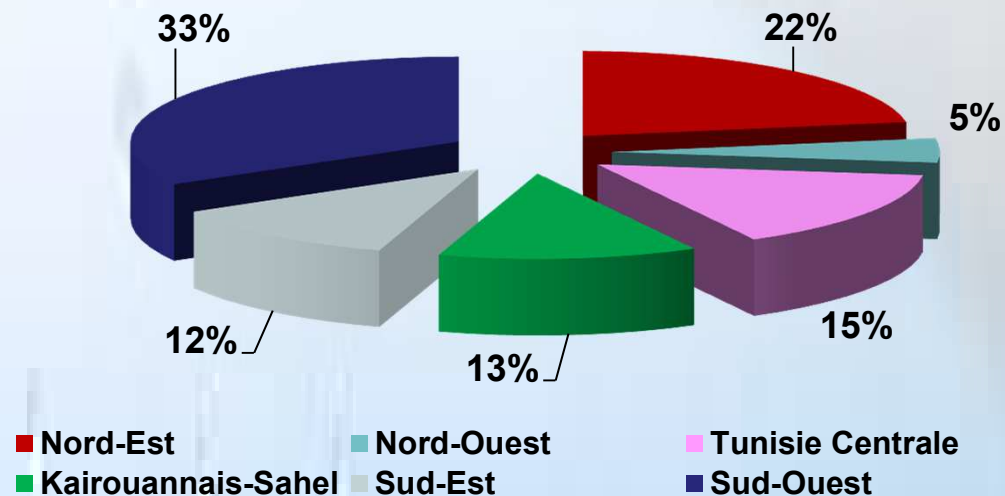


Groundwater Exploitation



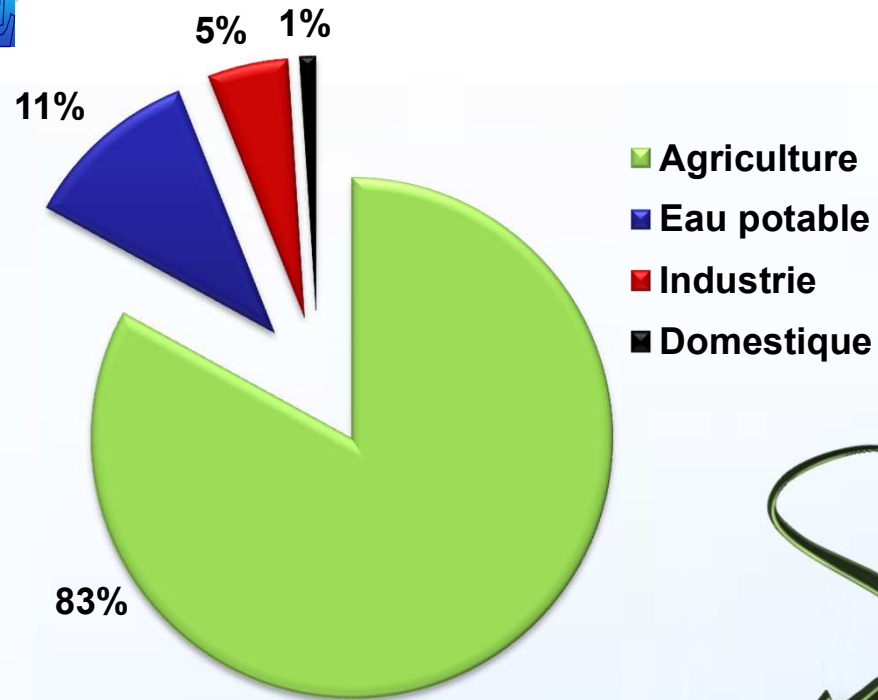
- Groundwater resources of Tunisia reached **2,16 Mm³/y** in **2008**.
- The exploitation of aquifers is about **1,950 Mm³/y** in 2008. This value represents **90%** of available resources.
- The shallow aquifers of **central Tunisia** are the most exploited, the exploitation rate is about **148%**.

Geographical distribution of exploitation rate



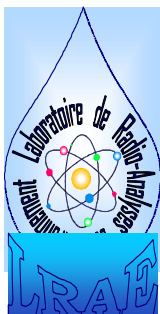


Groundwater Exploitation

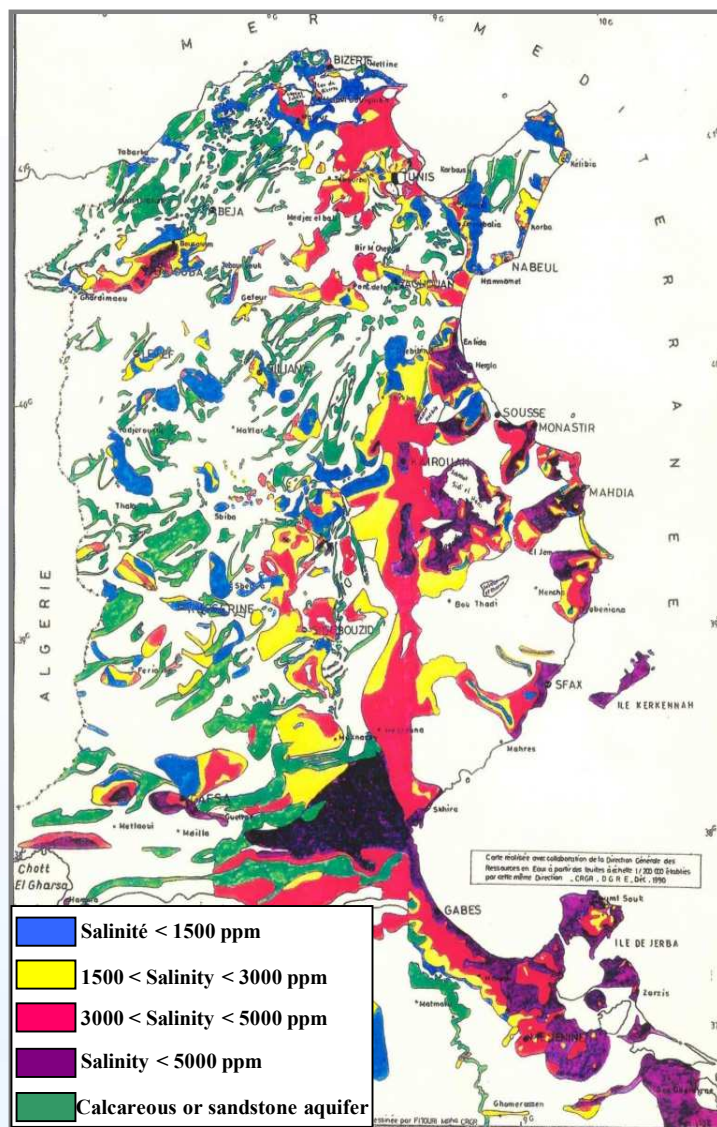


Agriculture still remains the largest consumer of water resources in Tunisia.

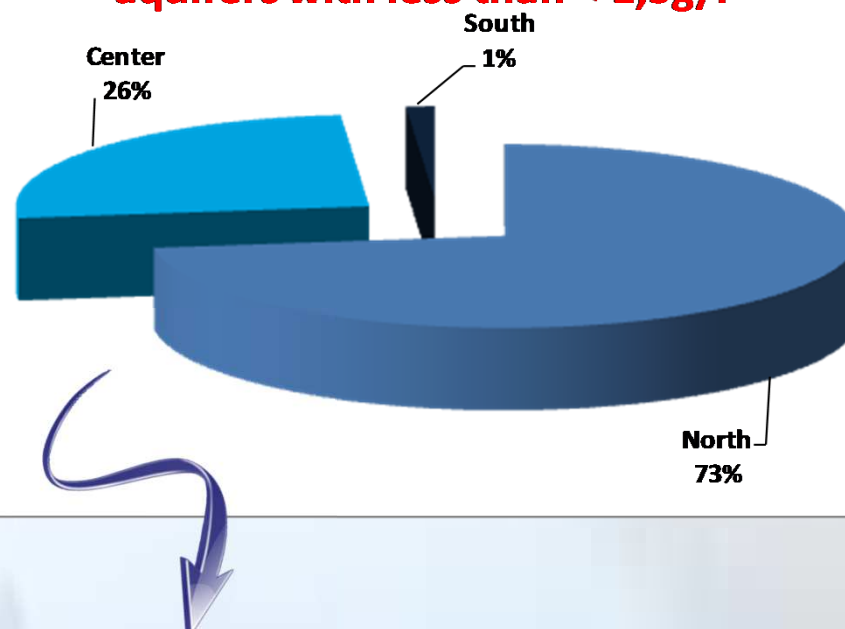




Groundwater Quality



Spatial distribution of shallow aquifers with less than < 1,5g/l



- ▶ 20% of total shallow reserves have a salinity less than 1.5 g/l.
- ▶ 98% of southern shallow aquifers have salinity higher than >1.5 g/l.



Water management authority

The Ministry of Agriculture, water resources and fishing (MAWRF) is the main government authority in charge of water resources. It is mainly responsible of water resources, agricultural withdrawals, supply for domestic and other uses. The DGRE is one of the main departments that play key roles in integrated water resources management. It is mandated to:



All following data concerning water resources are referred to the DGRE



Water management Policies



1. First : an intensive mobilization of available water (1990 – 2000)

- **Guideline plan for the water use in**

- ▶ The north
- ▶ The center
- ▶ The south

- **Hydraulic infrastructure:**

- ▶ dams
- ▶ hill dams
- ▶ Lakes
- ▶ Ground water withdrawn
- ▶ Dense well network
- ▶



MOBILISATION



➡ Surface Water :

- Big dams (31) : **1985 Mm³/an**
- Hill dams (226) : **272 Mm³/an**
- Hill lakes (856) : **86 Mm³/an**

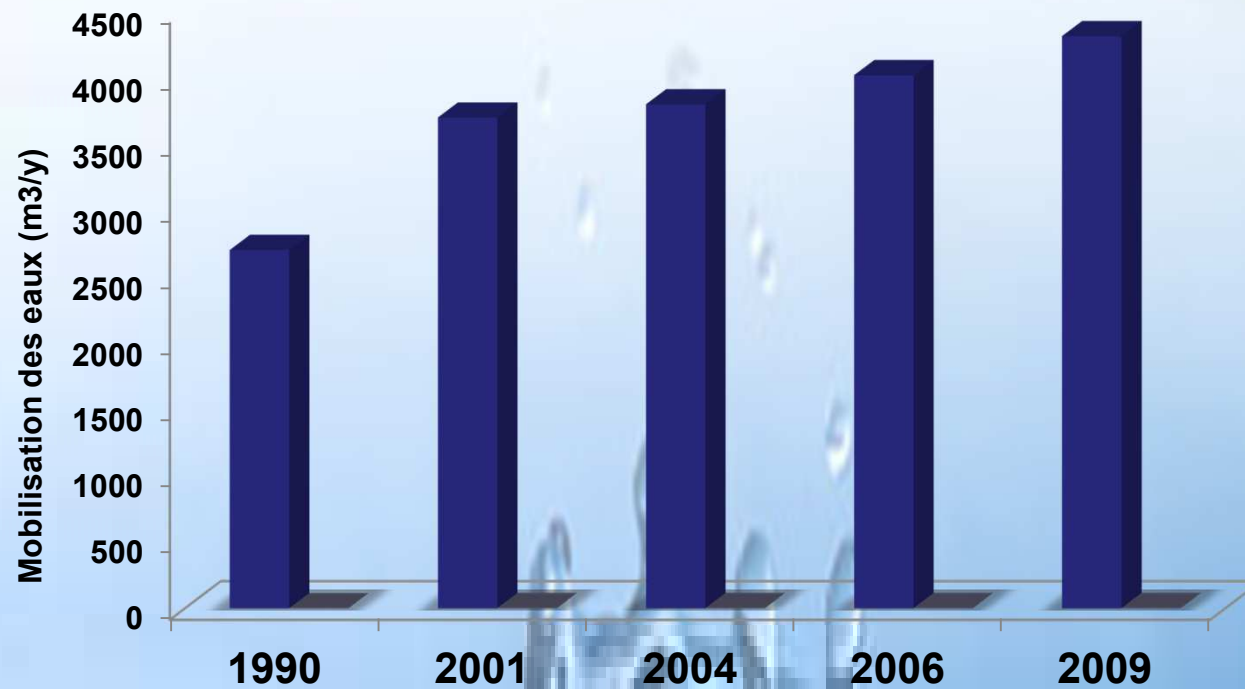
➡ Groundwater :

- • 215 Shallow aquifers
- • 314 Deep aquifers
- • 91 Over exploited aquifers
- • 6255 Extraction deep wells and springs
- • 308 Artesian aquifers
- • 94 Springs
- • 100 000 boreholes





➡ Mobilized water resources increased from **60% to 93%** during the **1990-2009** period.





Water management Policies

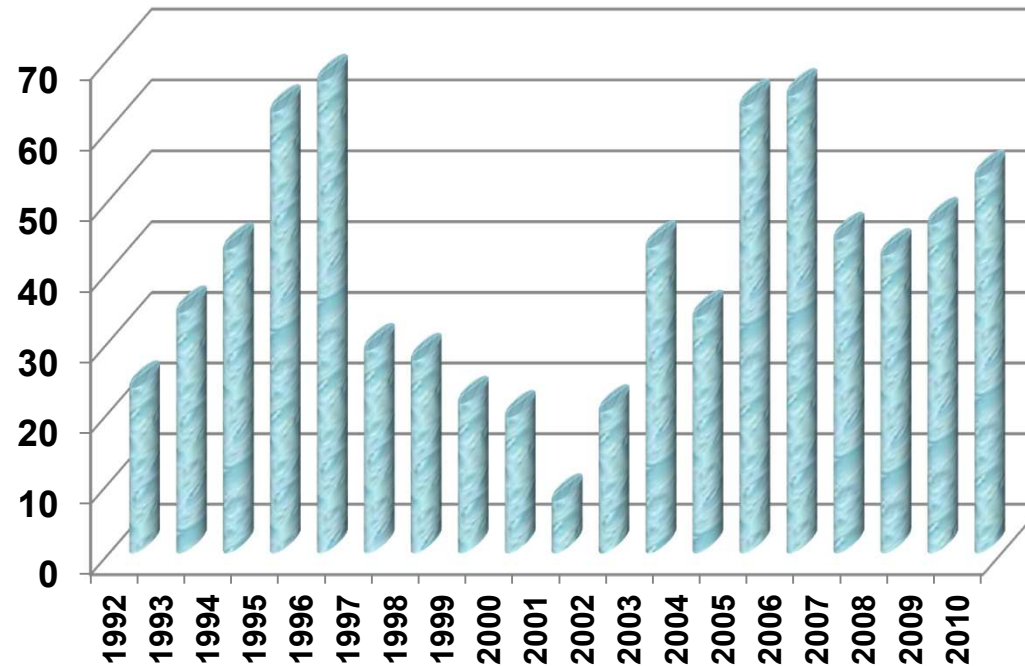


2. Then : controlling the needs (2001 – 2011)

- **Technical measurements : Enhancing natural processes**
 - ▶ **Artificial recharge of groundwater reservoir** : Releasing water and basin recharge, Infiltration Basins and Quarries, Recharge through river bed, spreading flow water by wadi derivation 'Mgoud', Water and soil conservation devices, Injection well recharge.
 - ▶ **Transfert between regions**
- **Unconventional water resources**
 - ▶ **Reuse of treated wastewater**
 - ▶ **Desalinisation of brackish water.**

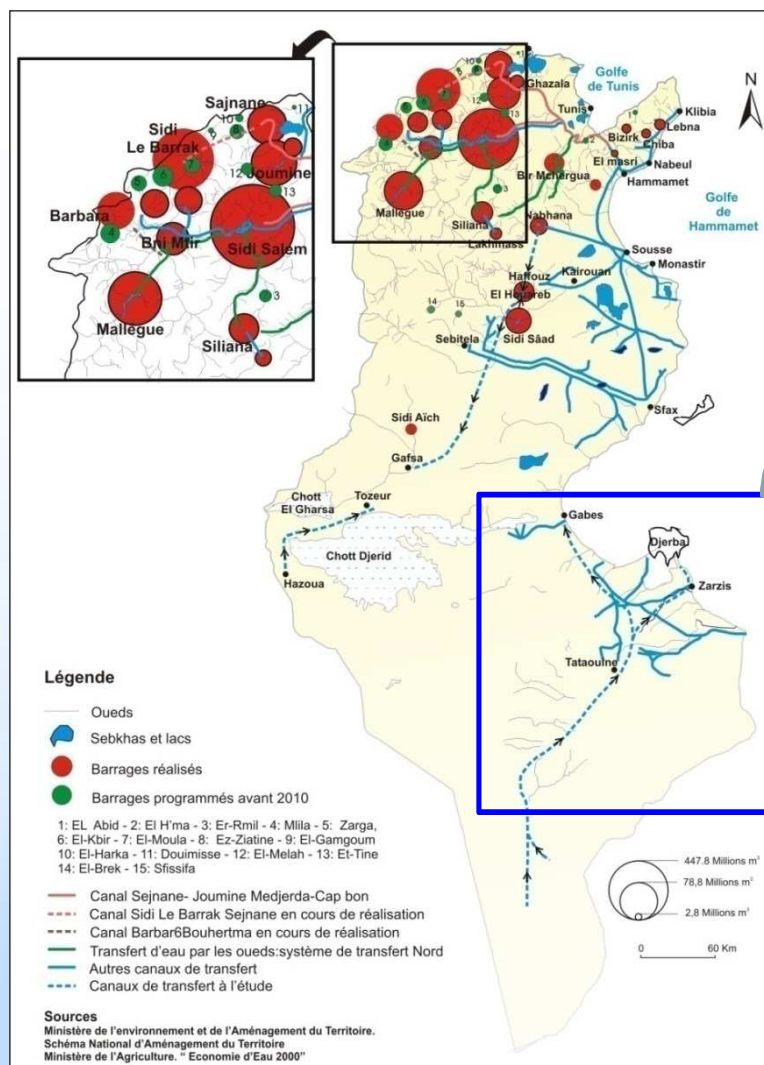
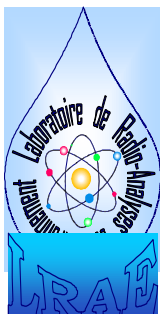


Total Recharge volume (1992-2010): 750 000 m³ (35 000 m³/year)

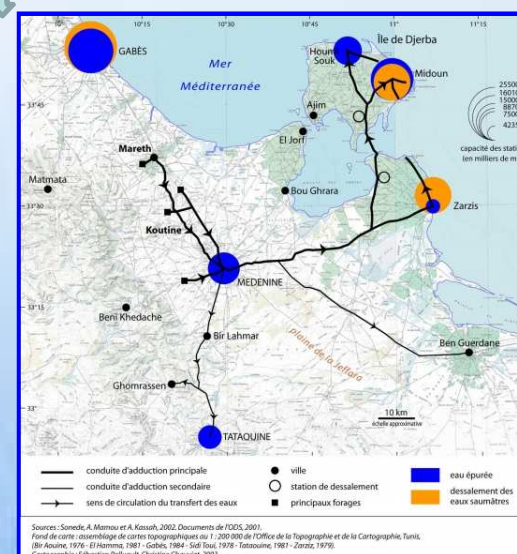


Source of water

- **Surface water (Dams) : 99 % (34,8 millions m³)**
- **Treated waste water : 1 % (0,2 millions m³)**



**Water tranfer is largely used to
reduce regional disparities and
ensure drinking water for
greatest cities in the North and
the South
.....but sometimes enhances
regional water conflicts.**



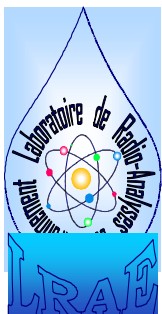


Water management Policies

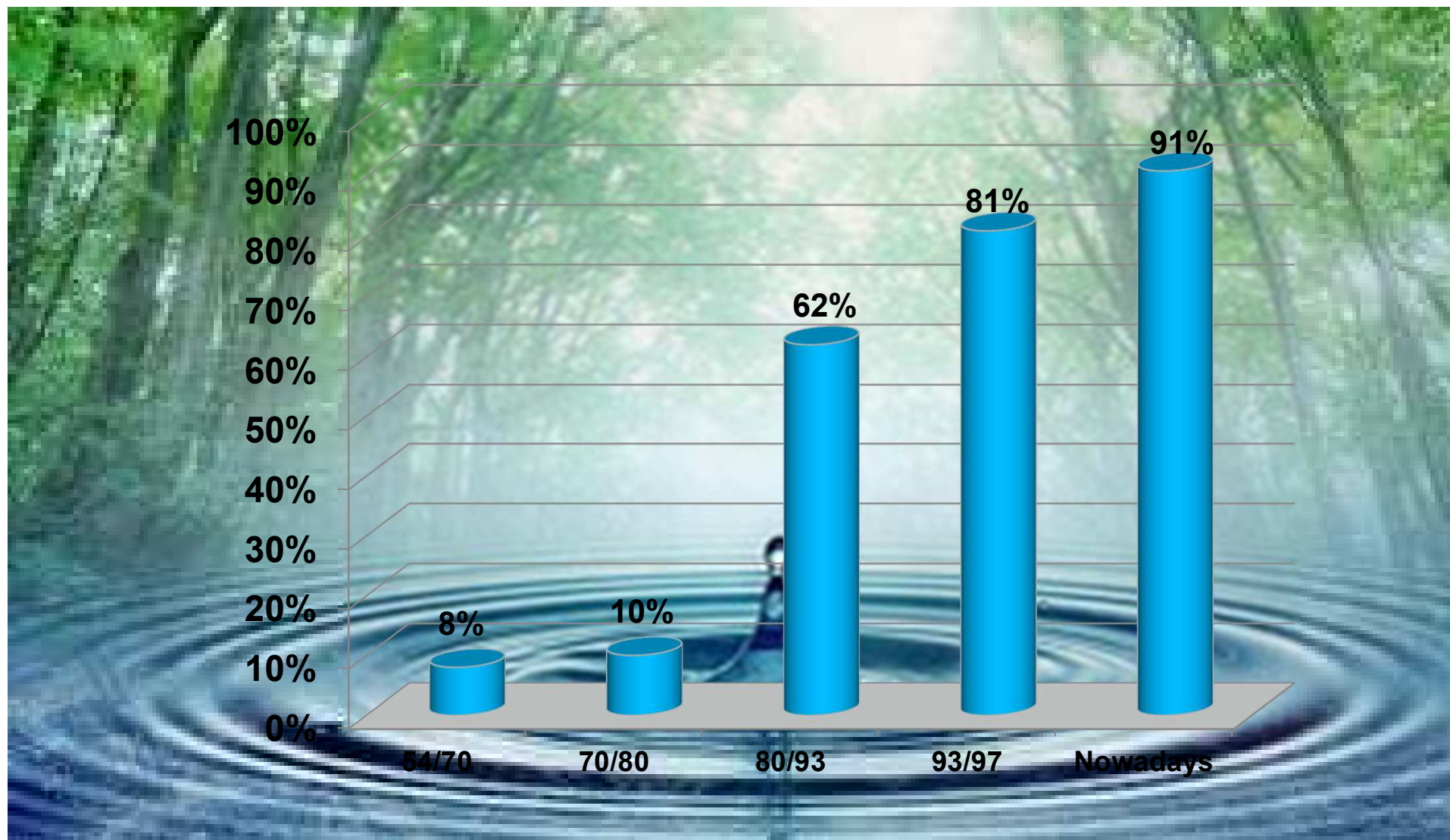


3. Actually: Long term strategy (2030)

- **Pollution remediation/prevention**
- **Legislative and institutional measurements**
 - ▶ **Incitative action for water saving techniques in agriculture;**
 - ▶ **Implication of different stakeholders (end-users);**
 - ▶ **Regulation of fertilizers and pesticides uses;**
 - ▶ **Protection and interdiction areas.**



➡ Water use rate evolution since 50's





Strategic trends of the tunisian policy

Some of the problems that have to be resolved:

- Mediterranean climate variability
- Poor water quality (salinity)
- Hydrogeological system disturbance
- Overexploitation of groundwater and water waste
- Salt water intrusion in the coastal zones
- Reduction of the refillment area of aquifers
- Dam efficiency for water regulation management
- Pollution from industrial, urban and agricultural water waste.
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Strategic trends of the tunisian policy



Supply of water to different uses has become more difficult. The saturation of the use of water resource is expected to happen soon.

As a consequence, Tunisia will face a major **challenge**: the rational exploitation of an increasingly **scarce** and **expensive** natural resource.

This challenge is linked to other constraints and problems such as food security, unemployment and regional imbalance.