

National Capacity Development Training of Trainers (TOTs) Workshop on Developing and Implementing Mitigation and Preparedness Water Scarcity and Drought (WS&D) Management Plans

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Drought Management in Tunisia

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Outline

- Objective and methodology,
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- Climate,
- Water resources,
- Drought Management :
 - Tools,
 - Institutional aspect,
 - Legal aspect,
 - Drought Management.
- Examples.

OBJECTIVE AND METHODOLOGY

Tunisia

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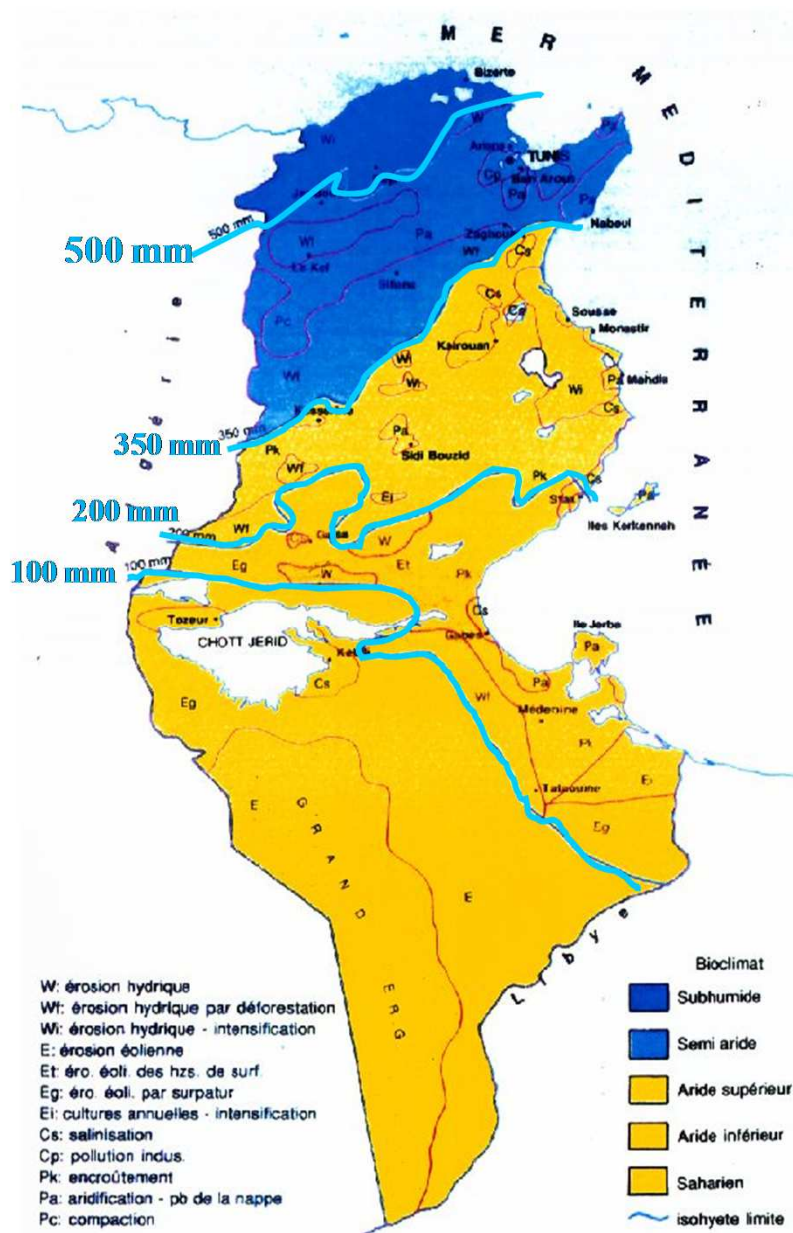
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SUMMARY – This chapter summarizes the analysis of the Tunisian organizations and institutions related to drought. First, the chapter provides an overview of the rainfall and water resources in Tunisia. Second, mapping of the different national organizations and institutions involved in water management and drought mitigation, and also those that are not working on water management but, due to the emergency of drought circumstances and regarding the importance of their contribution, they are associated when the drought is upon them. The international organizations working on water resource management in Tunisia and eventually on drought mitigation are also described. The chapter analyses the interaction between the different organizations and institutions involved in the process of water management and drought mitigation as well as in the linked data and information collection and processing system. The chapter includes a description of the water resource data and information systems, which play an important role in water management and drought mitigation. The Tunisian water resources and drought policy and the related legislation are described. Finally, the drought preparedness and management system in Tunisia and its drought-coping proficiency is outlined.

Key words: Water resources, drought, management.

CLIMATE

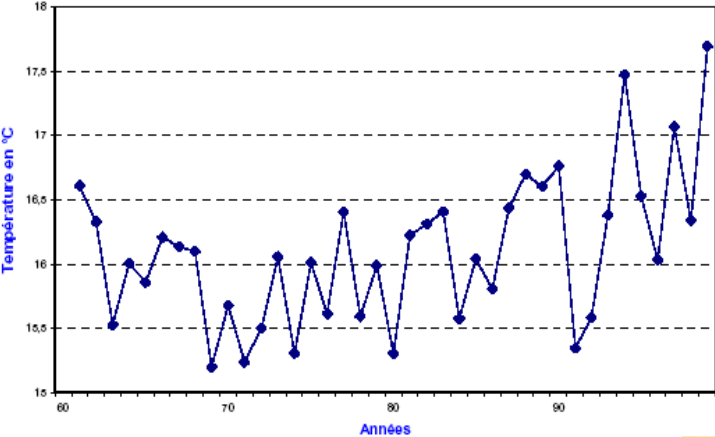
Climate of Tunisia



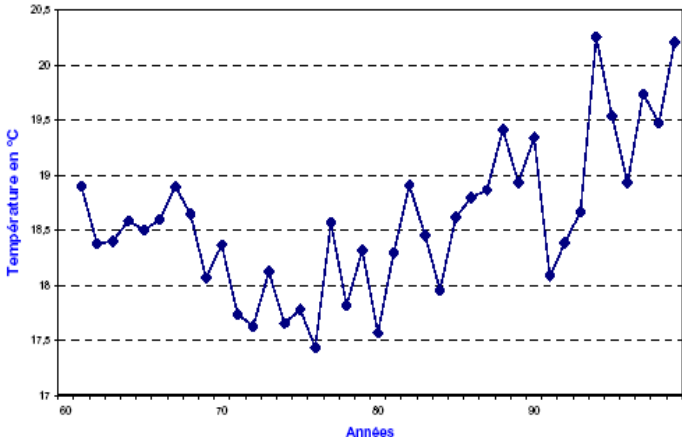
- Annual rainfall: 250 mm (100 -1500 mm)
- Runoff is only **12 %** of the rainfall (0 -700 mm)
- Potential Evapotranspiration (1000-3000 mm)
- The North of Tunisian Dorsal: a Mediterranean climate
- The Centre and the Golf of Gabes: a semi-arid climate
- The rest of the country: a dry desert climate.

Temperature (1961/2000)

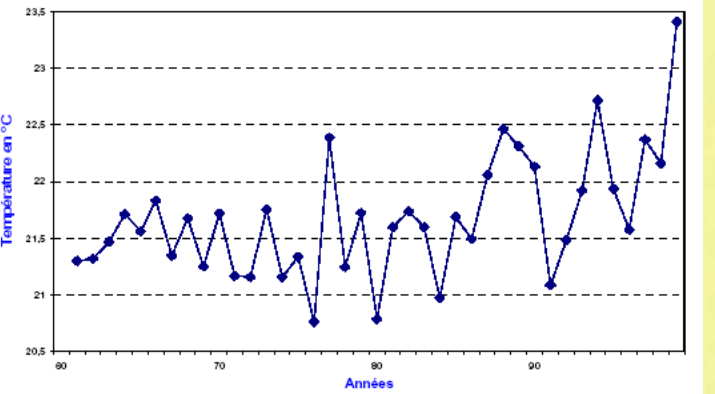
Le Kef



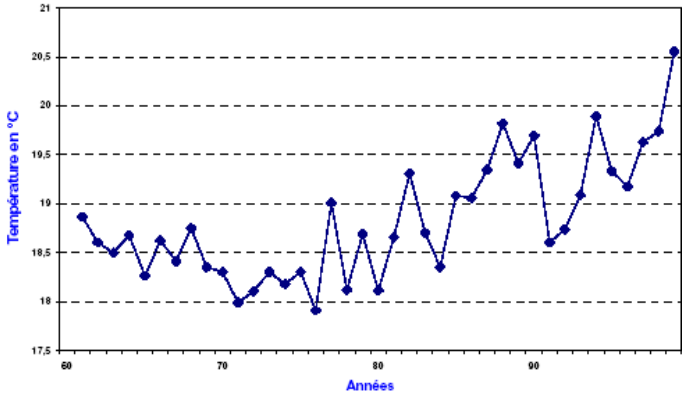
Tunis-Carthage



Tozeur

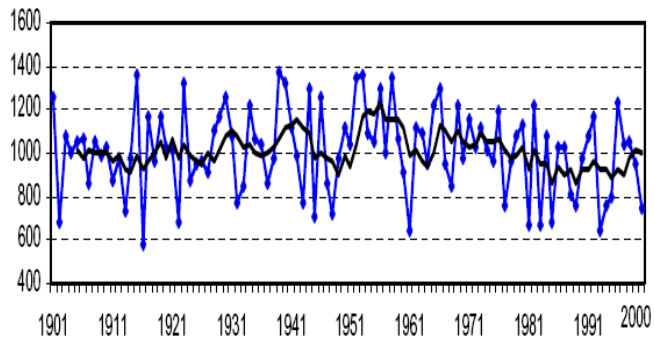


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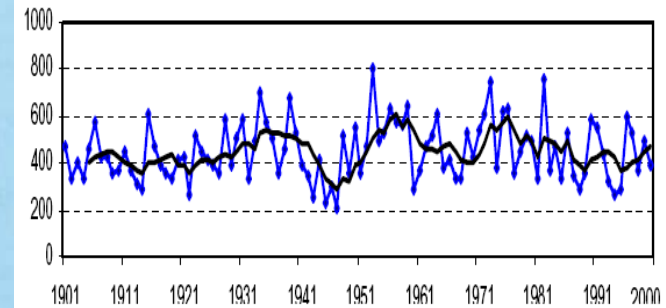


Rainfall (1901/2000)

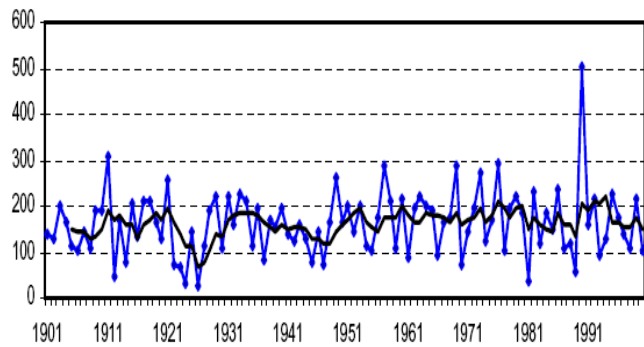
Tabarka



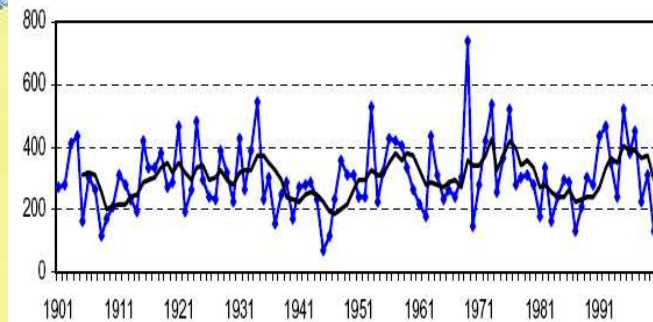
Tunis-Carthage



Gafsa

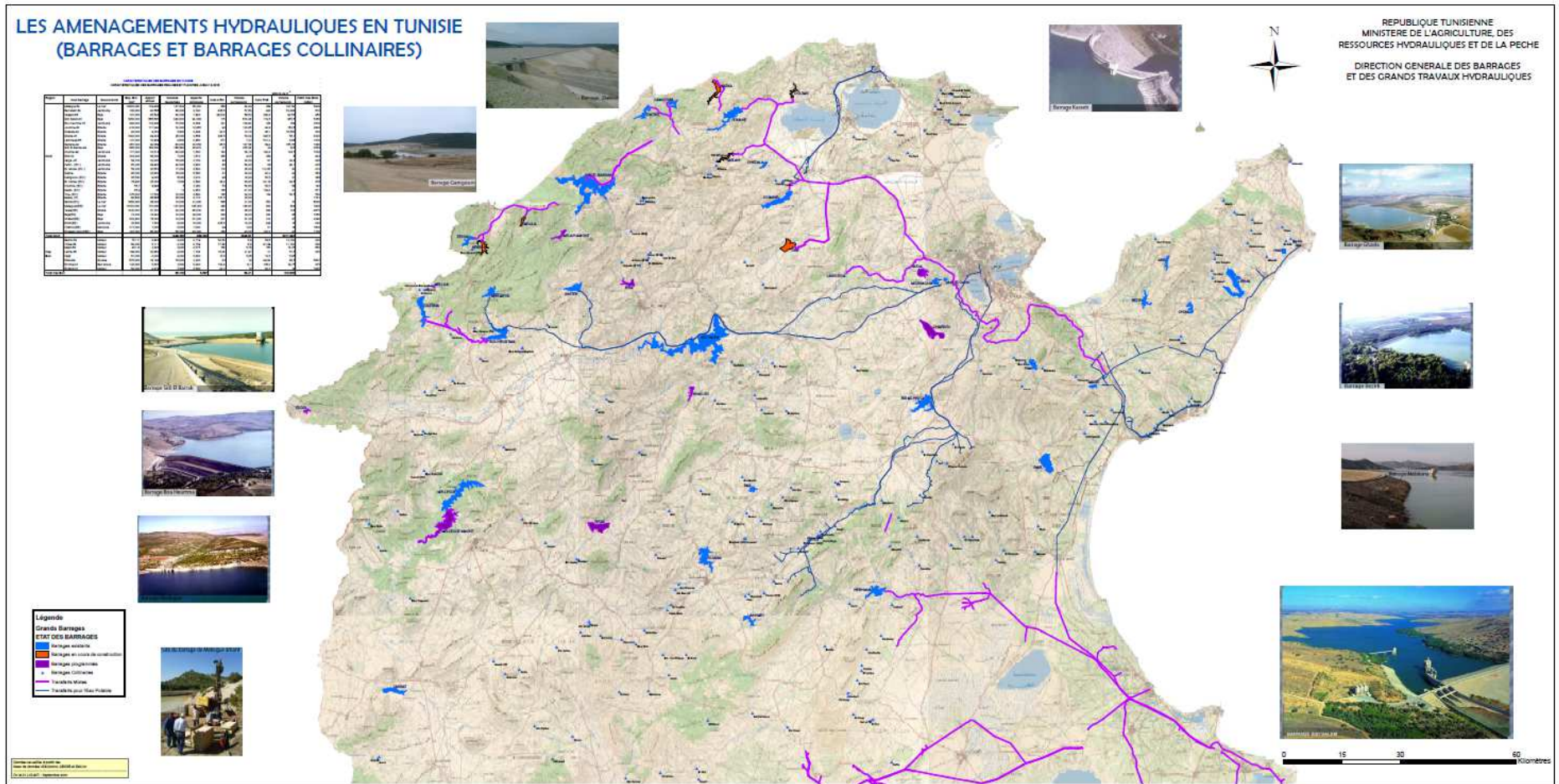


Kairouan



WATER RESOURCES

Surface water



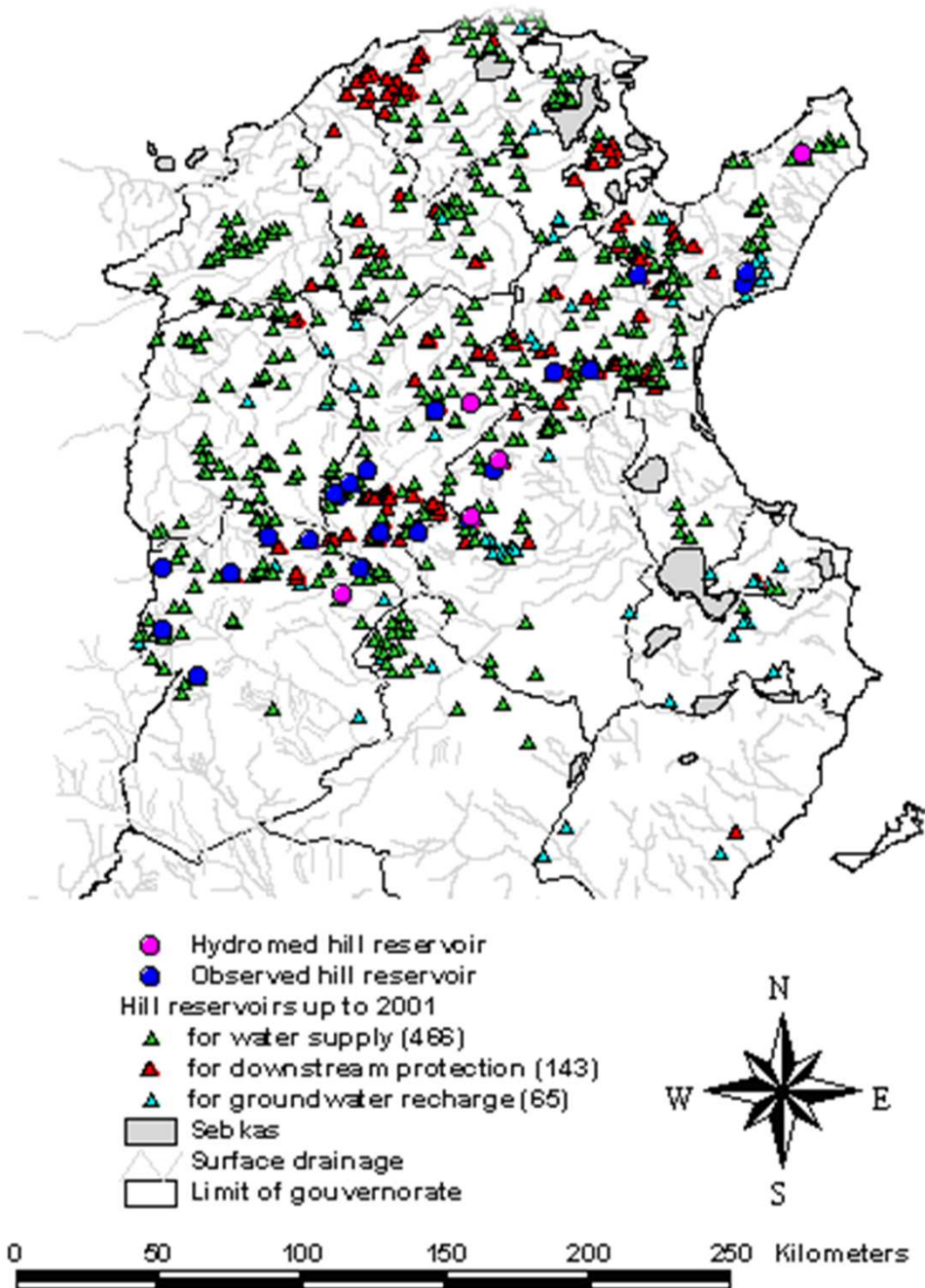
37 Dams

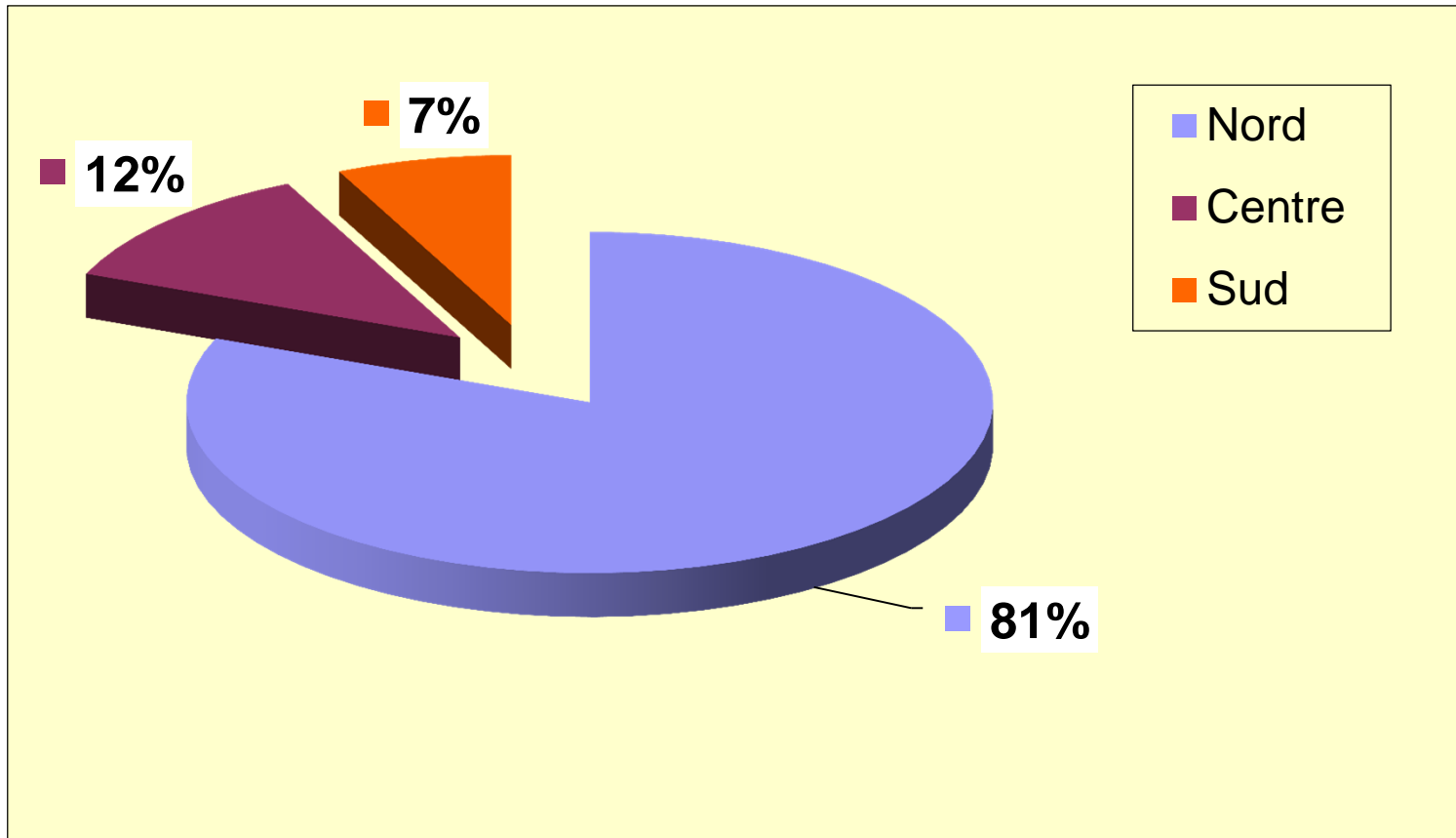
Hill-Reservoirs : Water Harvesting System (850)

1- Irrigation and domestic uses

2- Groundwater Recharge

3- Infrastructure protection



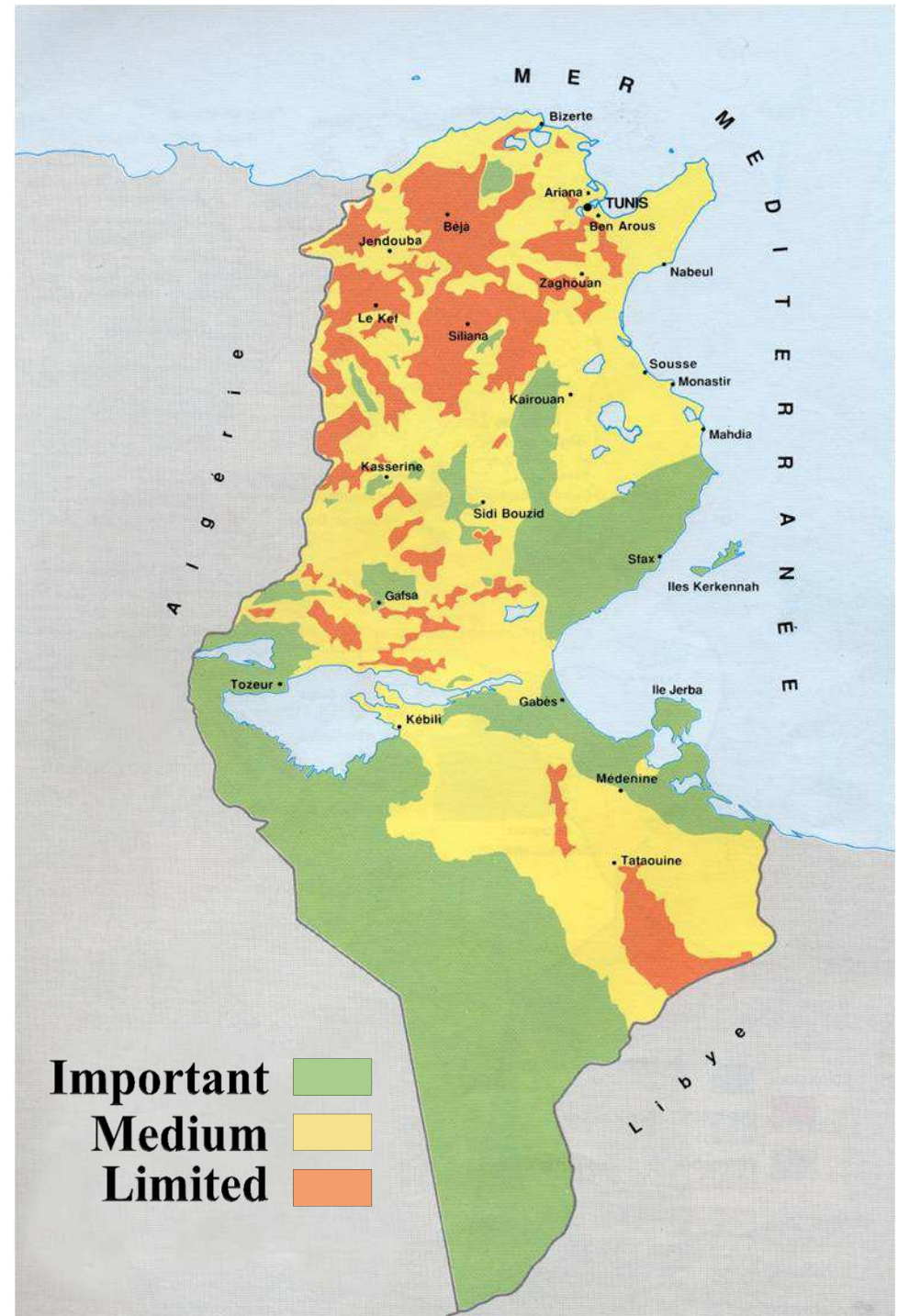


• North :	2190 M m ³ /year	81%
• Center :	320 M m ³ /year	12%
• South :	190 M m ³ /year	7%

2.7 Milliard m³/year

Groundwater resources

2.14 Milliard m³/year

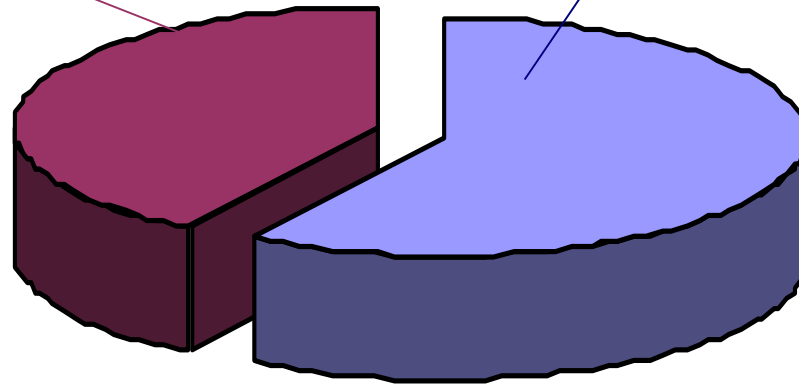


Water resources in Tunisia

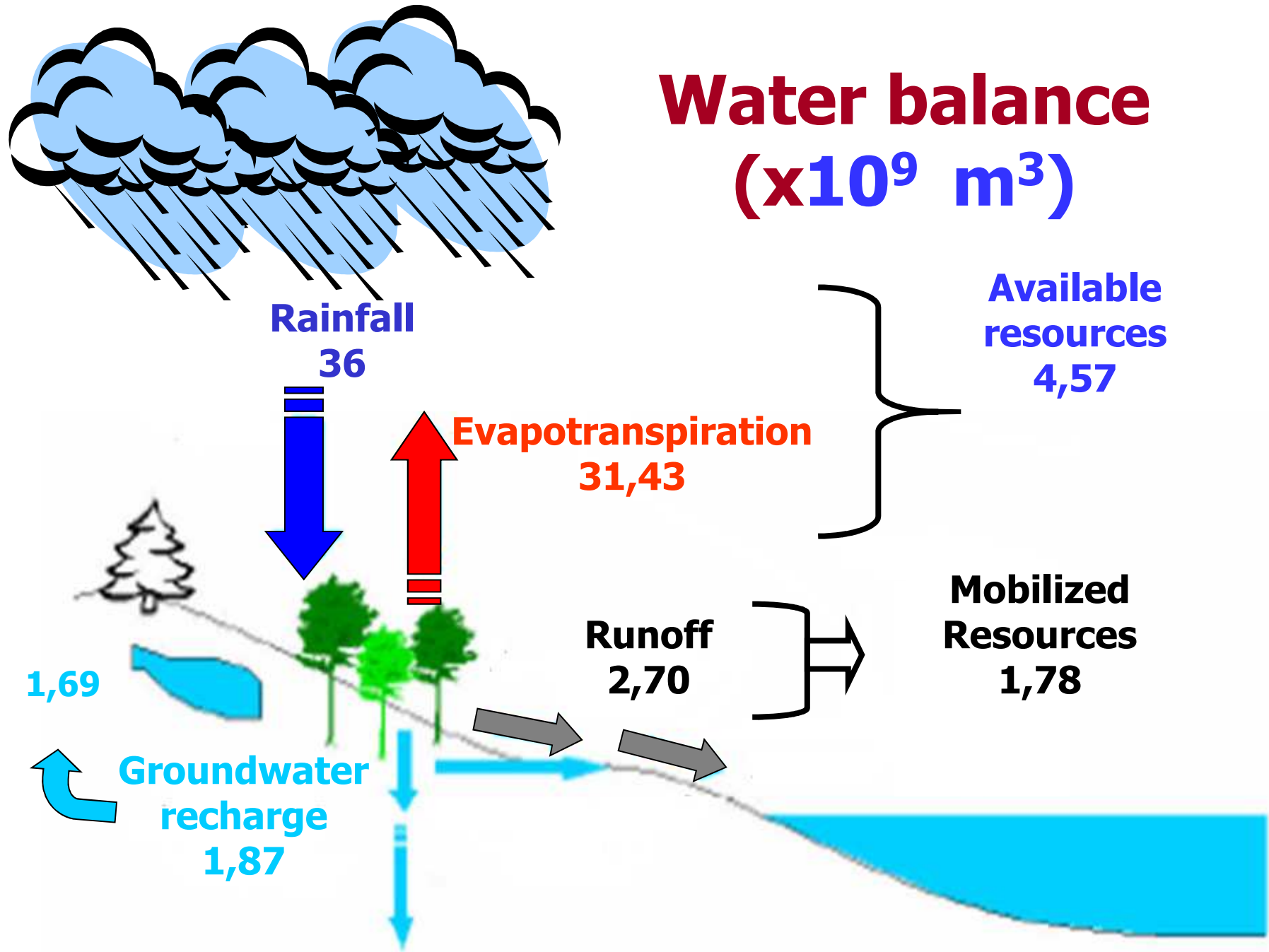
Groundwater
2140 Mm³/year (44%)



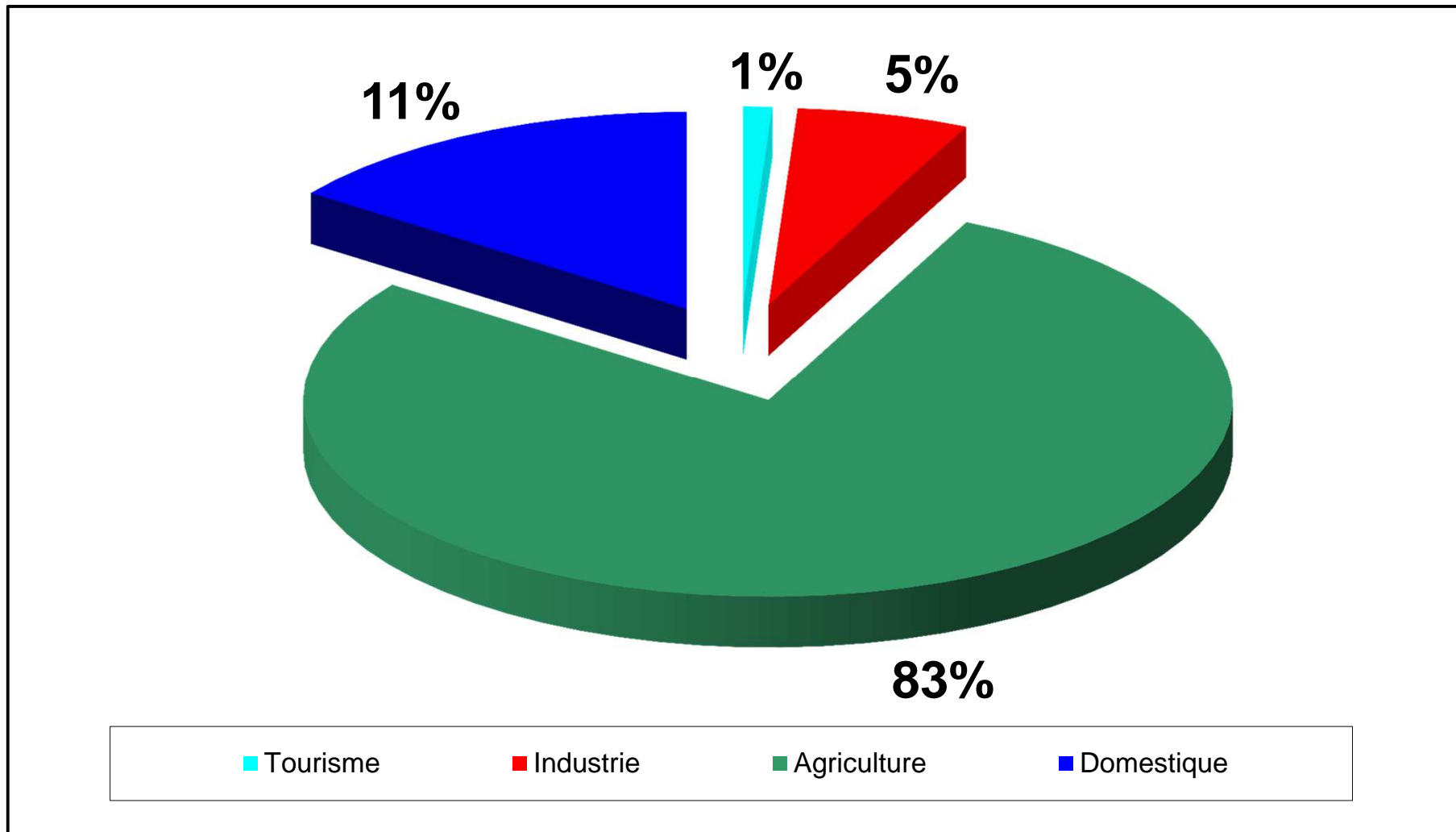
Surface water
2700 Mm³/year (56%)



Water balance ($\times 10^9 \text{ m}^3$)

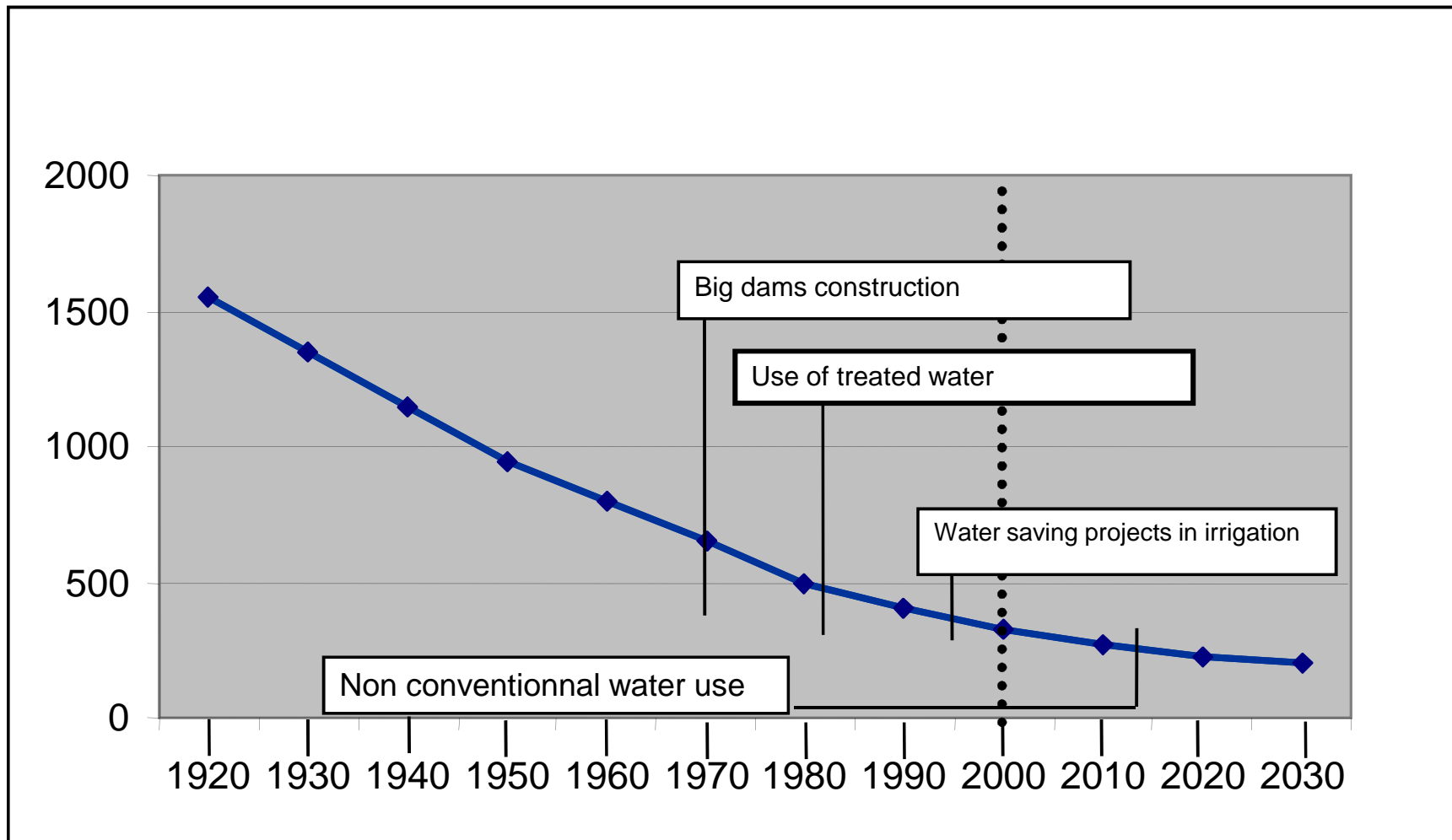


Water uses



Water dotation : 461 m³/cap/year (2009)
315 m³/cap/year (2030)

Water resources per capita (m³/cap.)



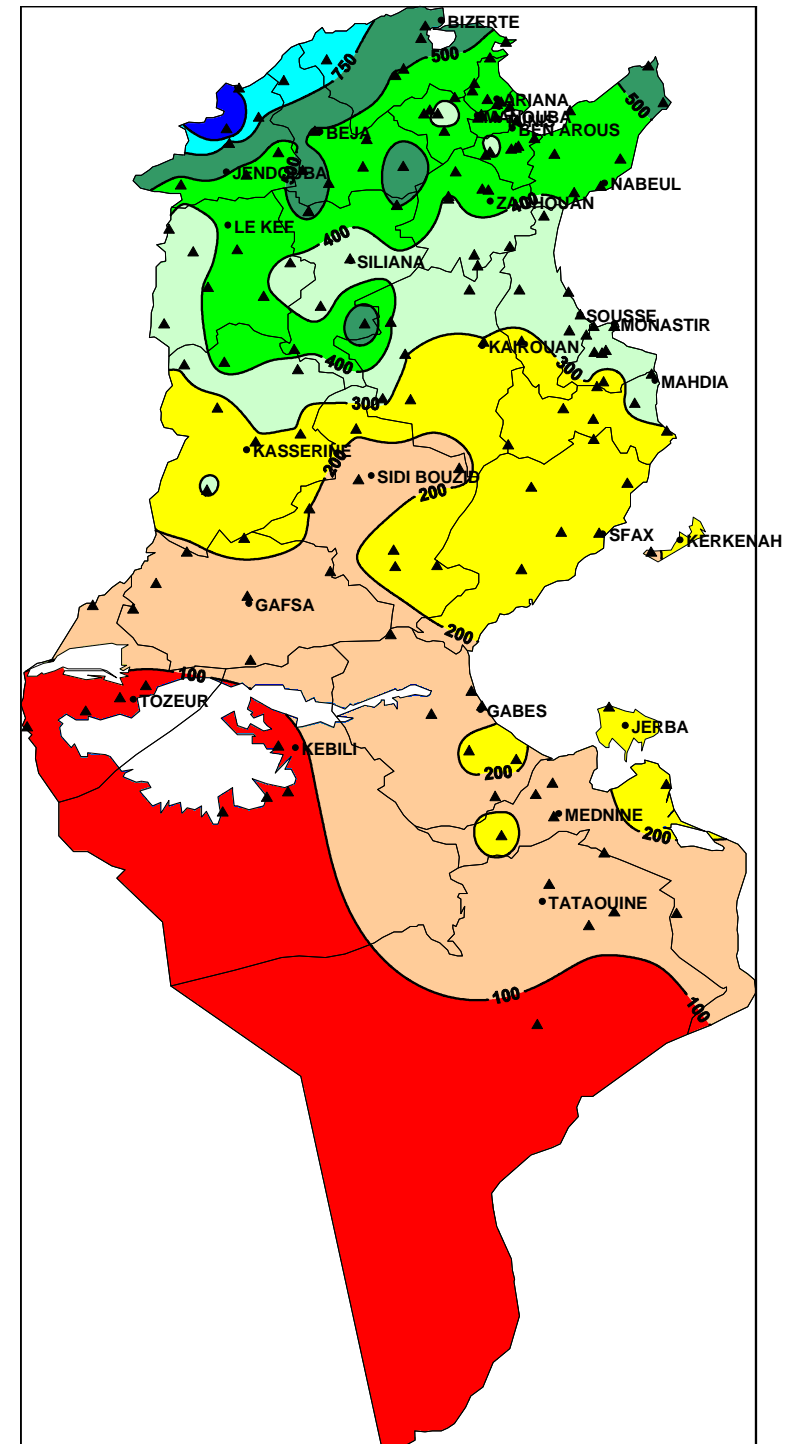
« Usage rétrospectif et prospectif de l'indice de pression démographique sur les ressources en Eau – Tunisie – Zahar, 2001 »

DROUGHT MANAGEMENT

Tools

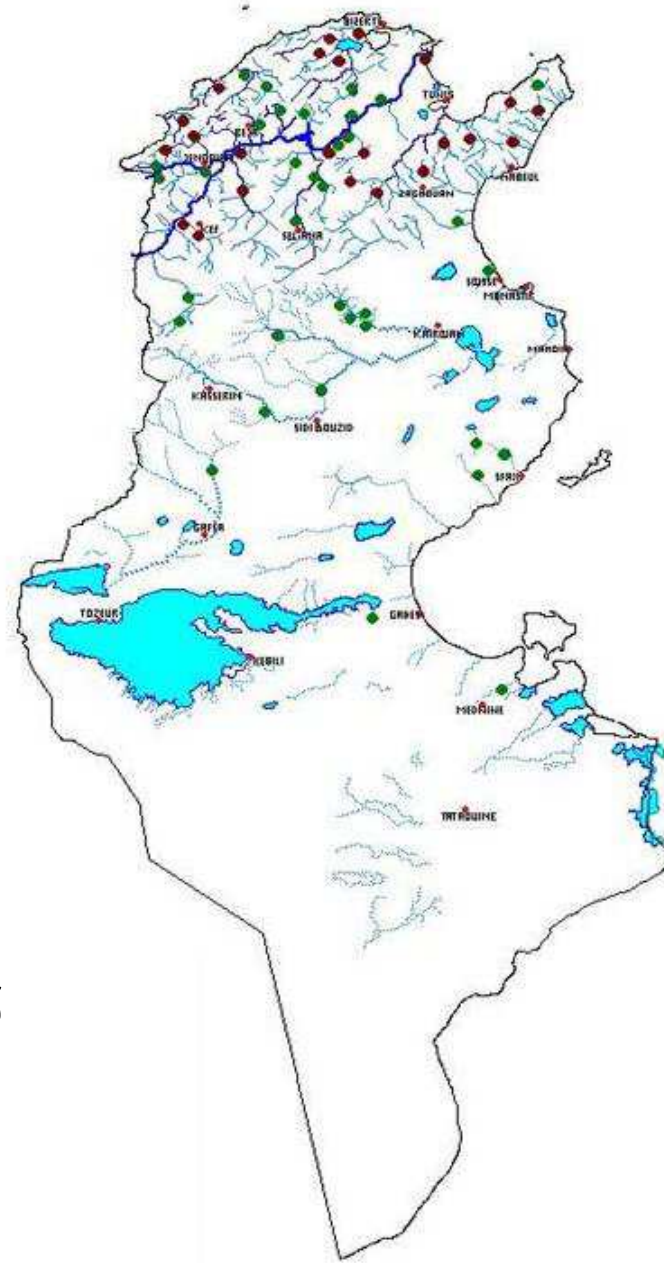
Rainfall measurement network

- 100 years.
- 850 measurement stations.
- 100 pluviographs (IDF).
- Statistics documents from 1969.
- Daily and monthly bulletins.
- Databases: Pluviom, Hydrom, Access, “système de gestion des ressources en eau : Sygreau” .

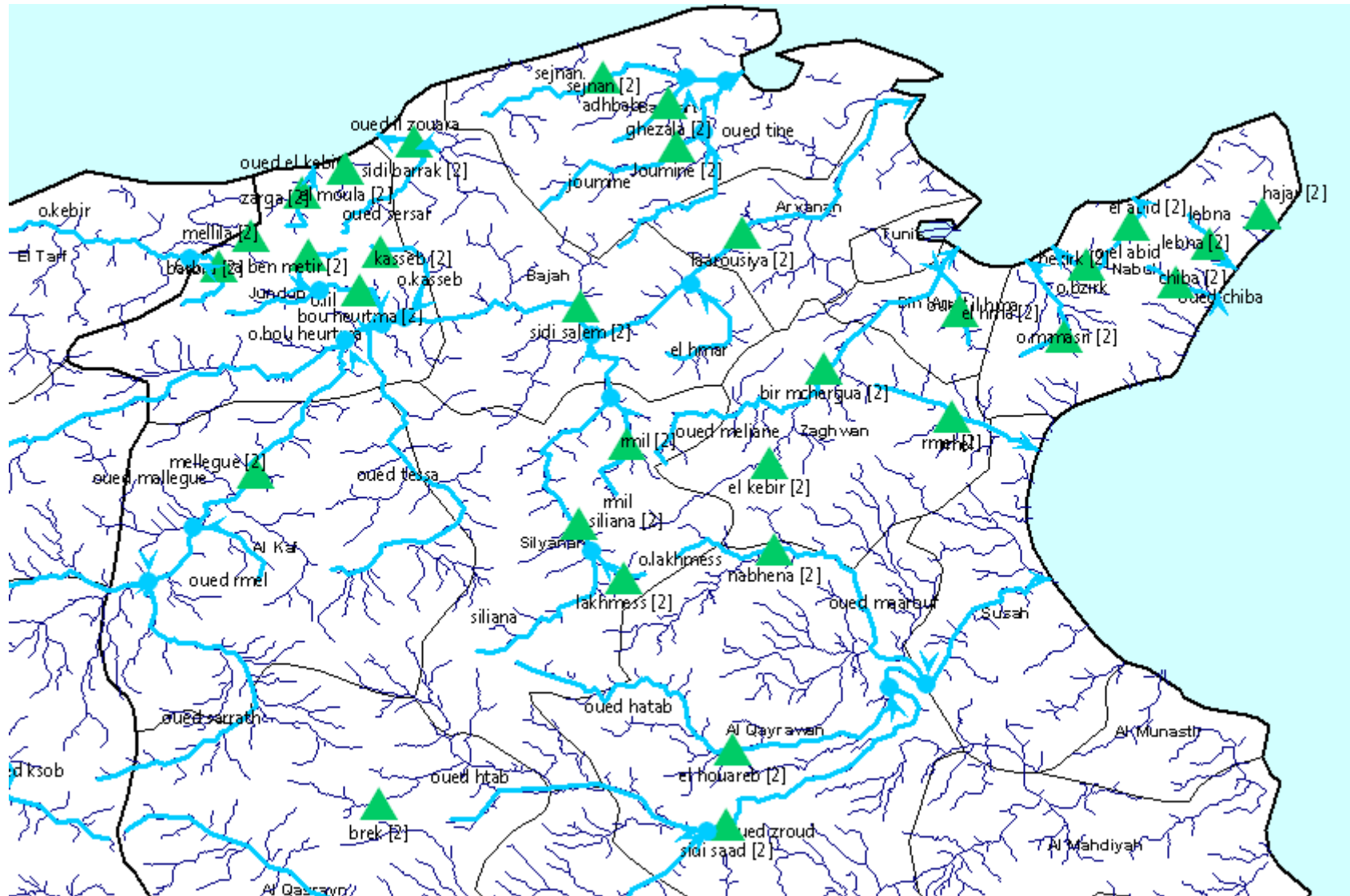


Flow measurement network

- 60 stations
- 74 measurement points
- Statistics documents from 1974-75
- Transmission mode:
 - In 2005 : Cell phone network for the Medjerda river basin.



Linked dams (natural and artificial channels and pipes)



Drought indice

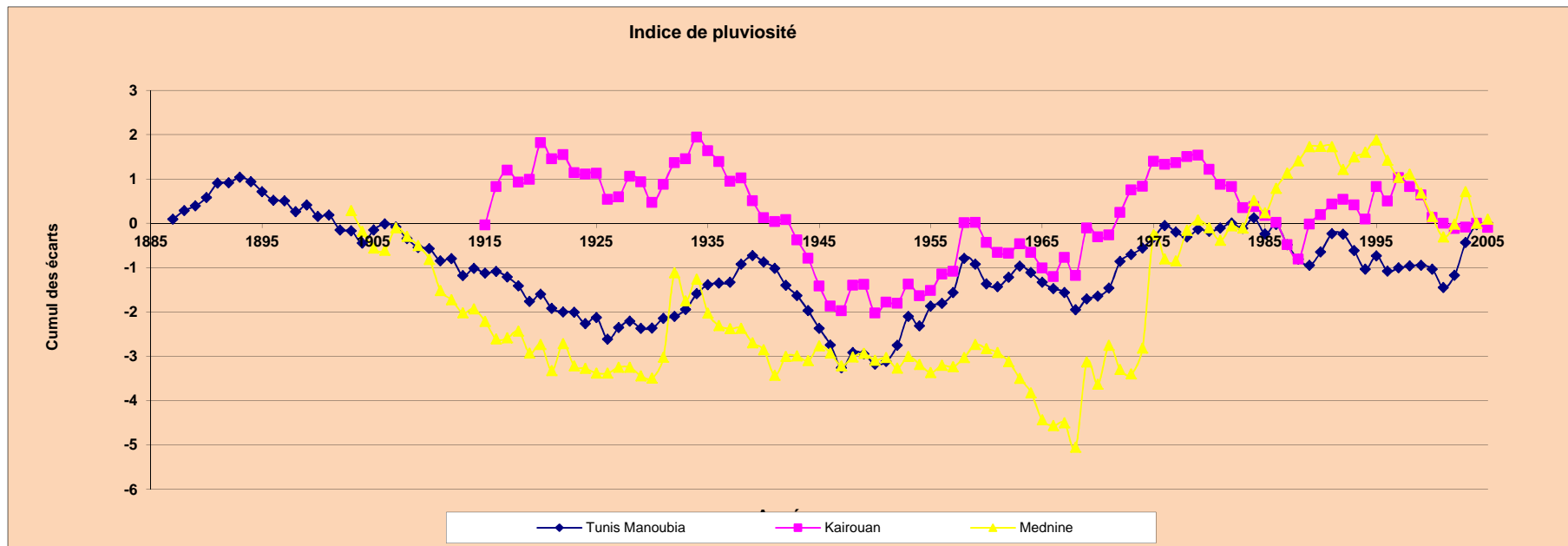
The percentage of precipitation deviation from the mean historically established values.

Precipitation quantities are ranged between 70 to 50% :

Drought

less than 50%:

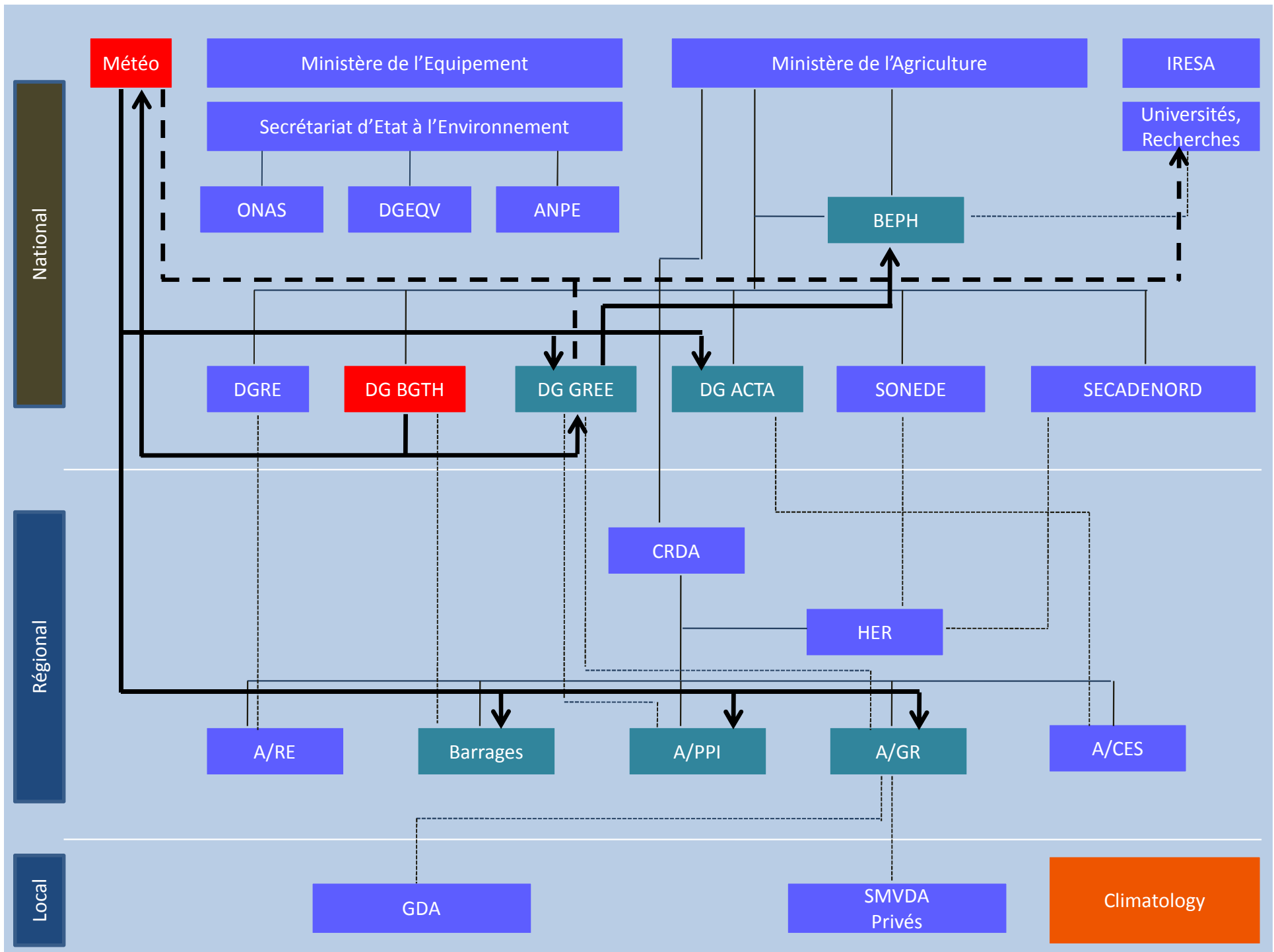
Severe drought

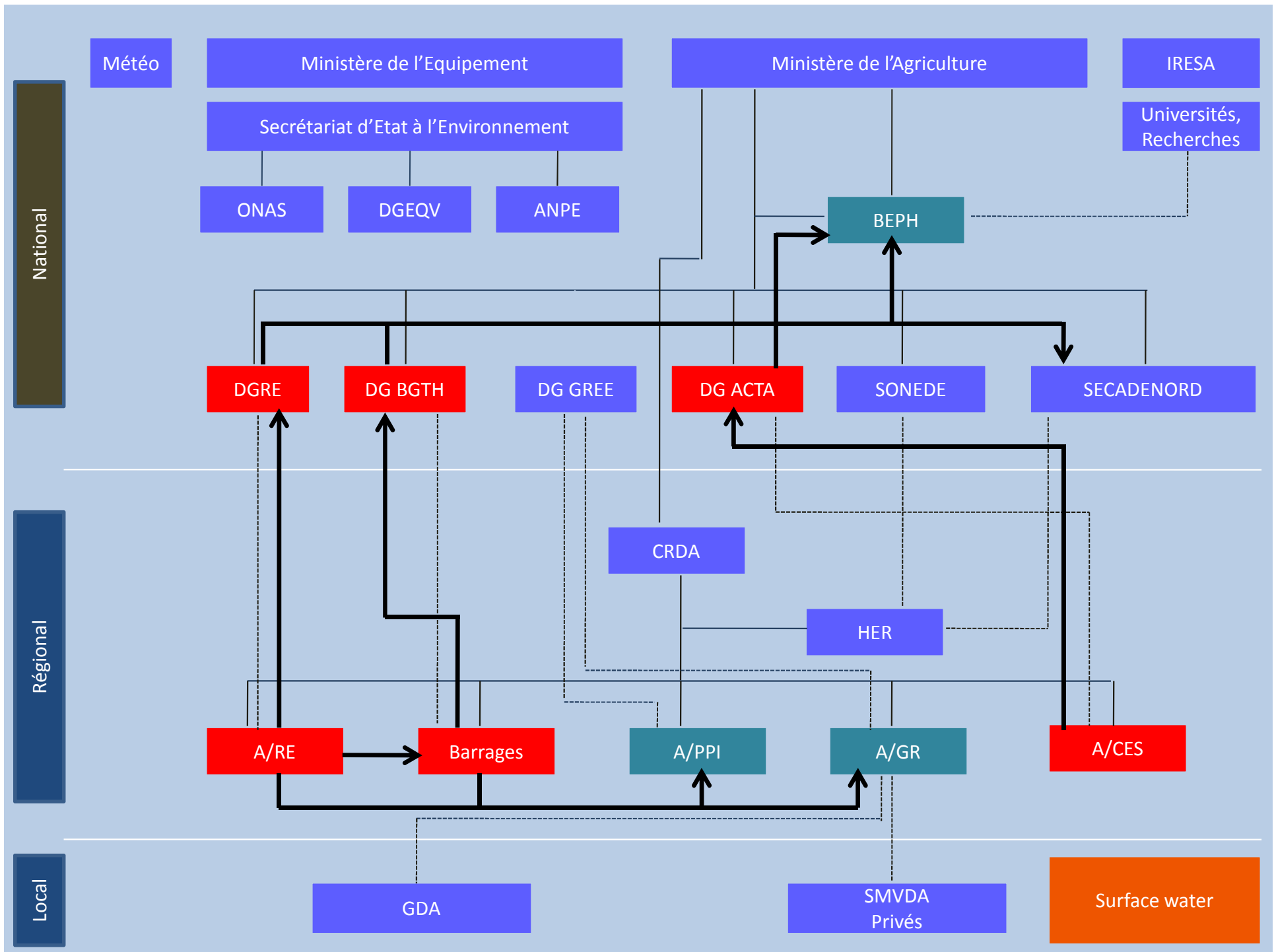


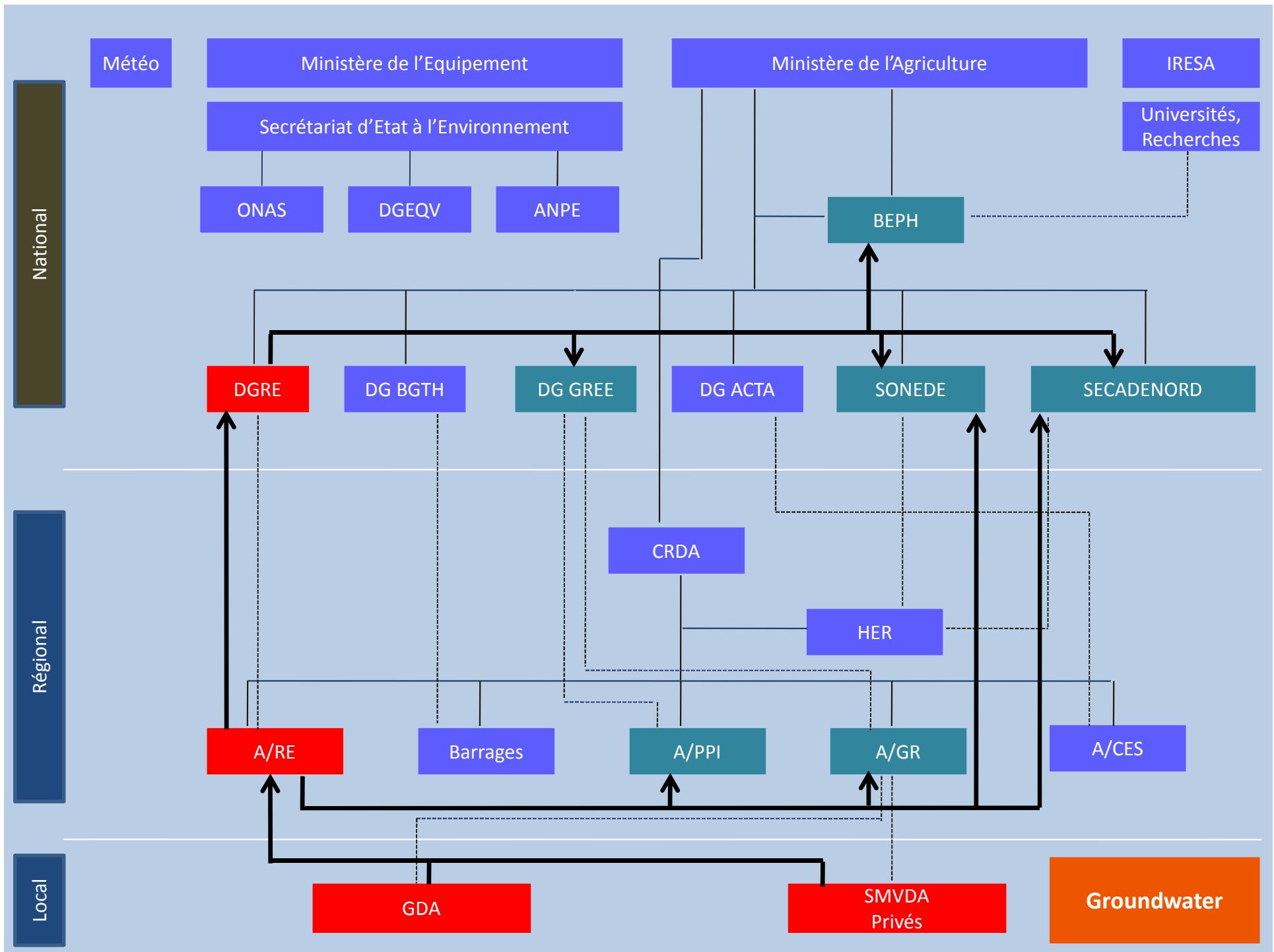
1758 to 1900 : 4 droughts

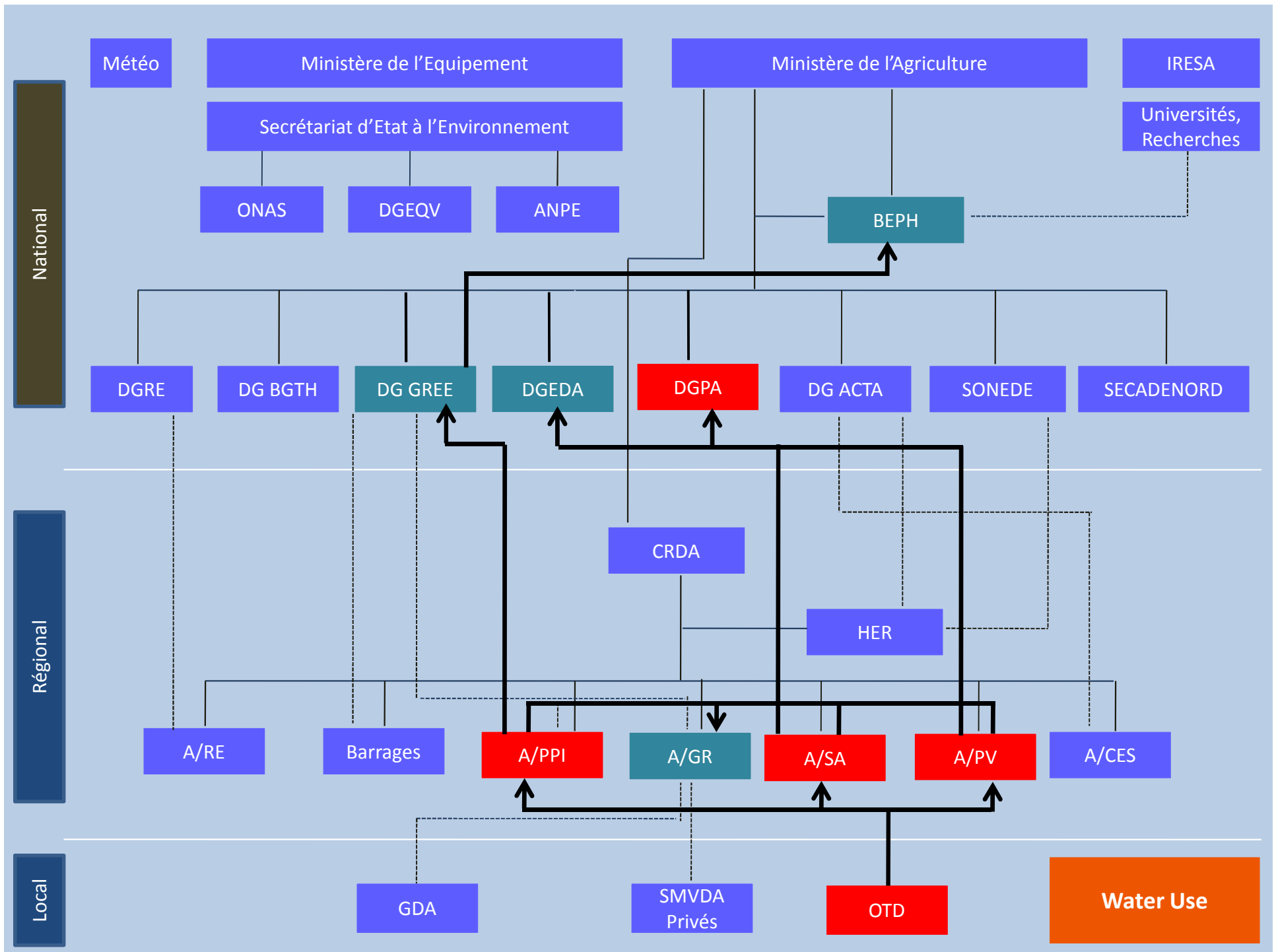
After 1900 : 20 droughts

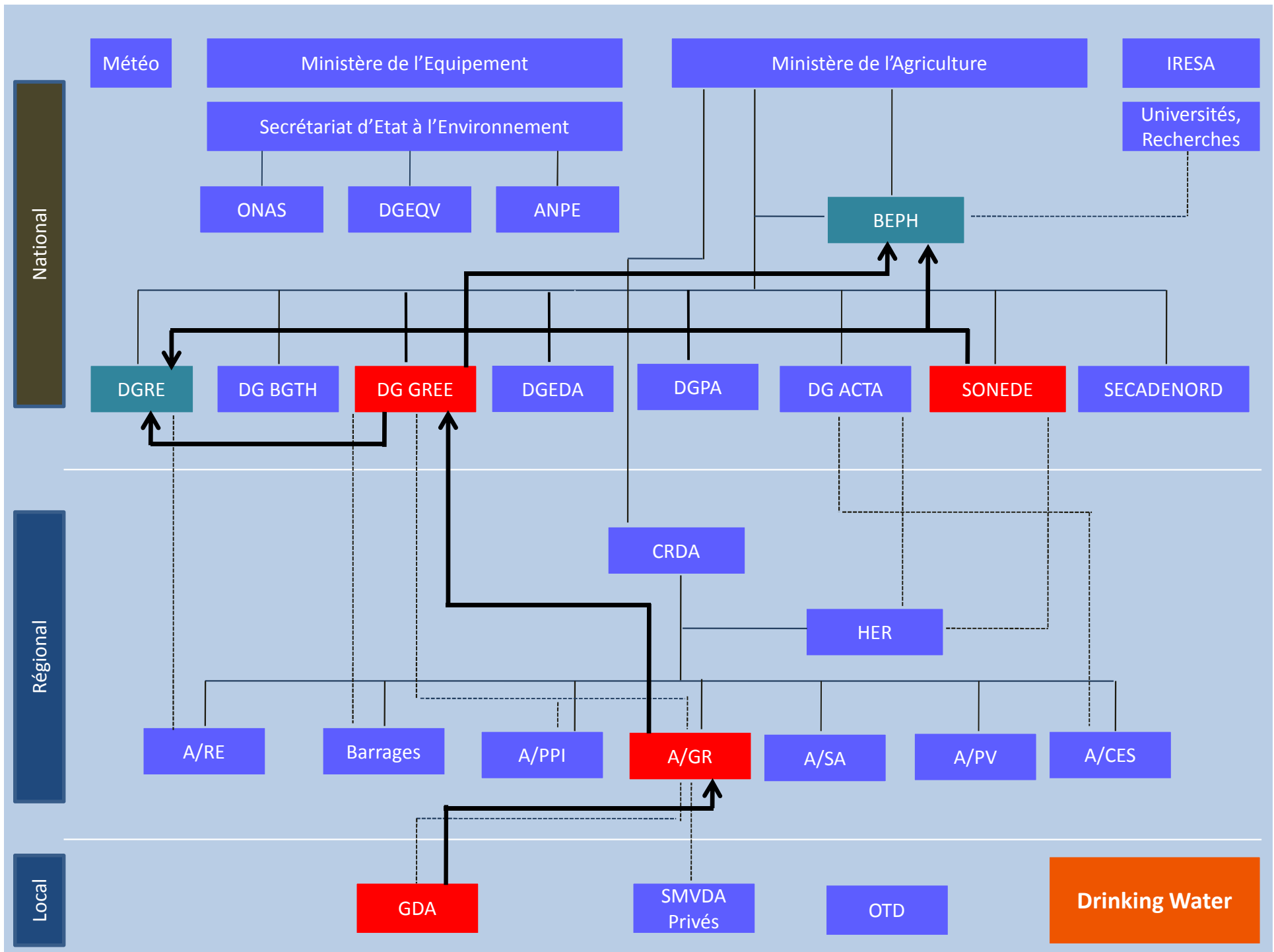
Institutional aspect

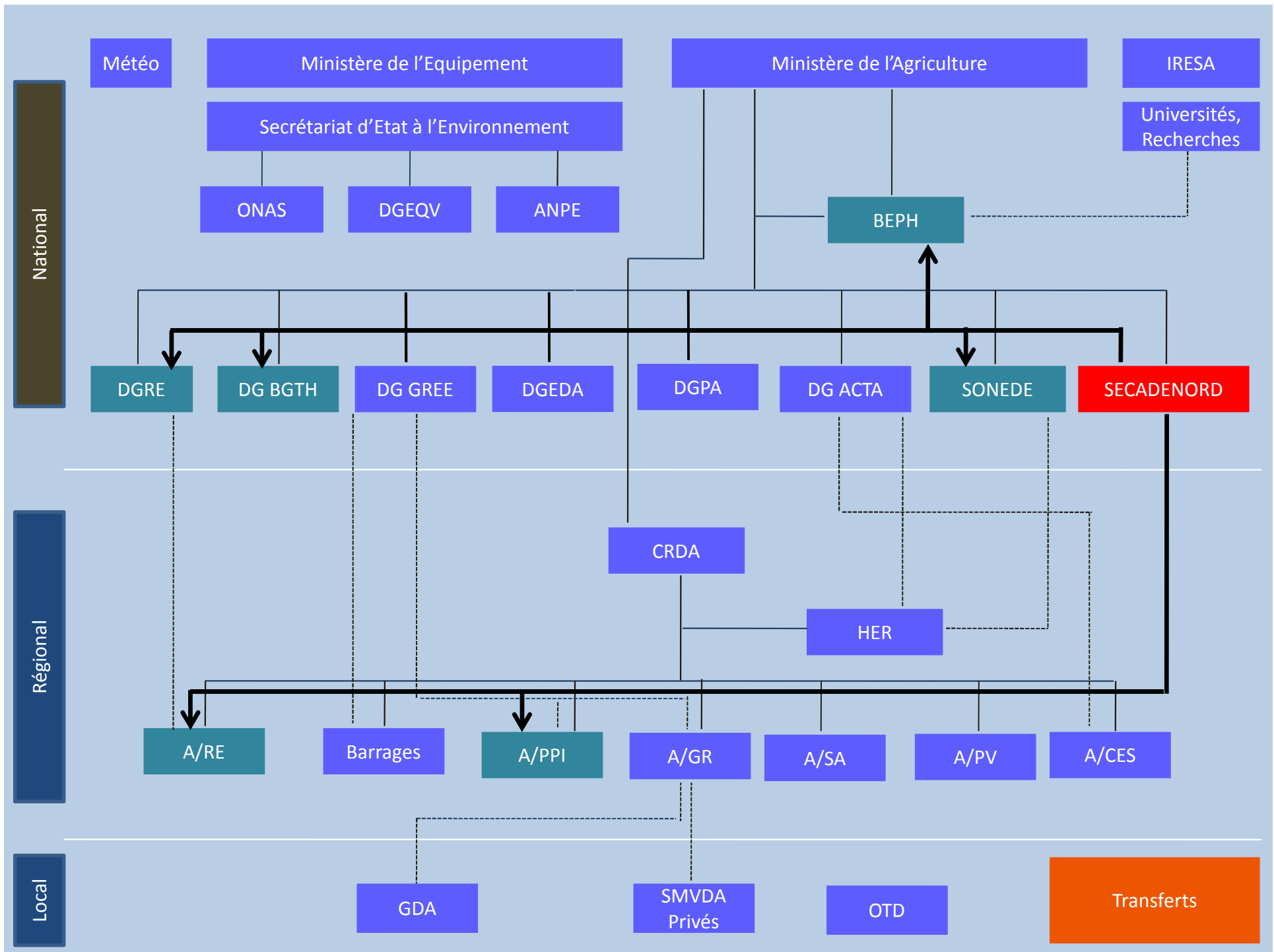


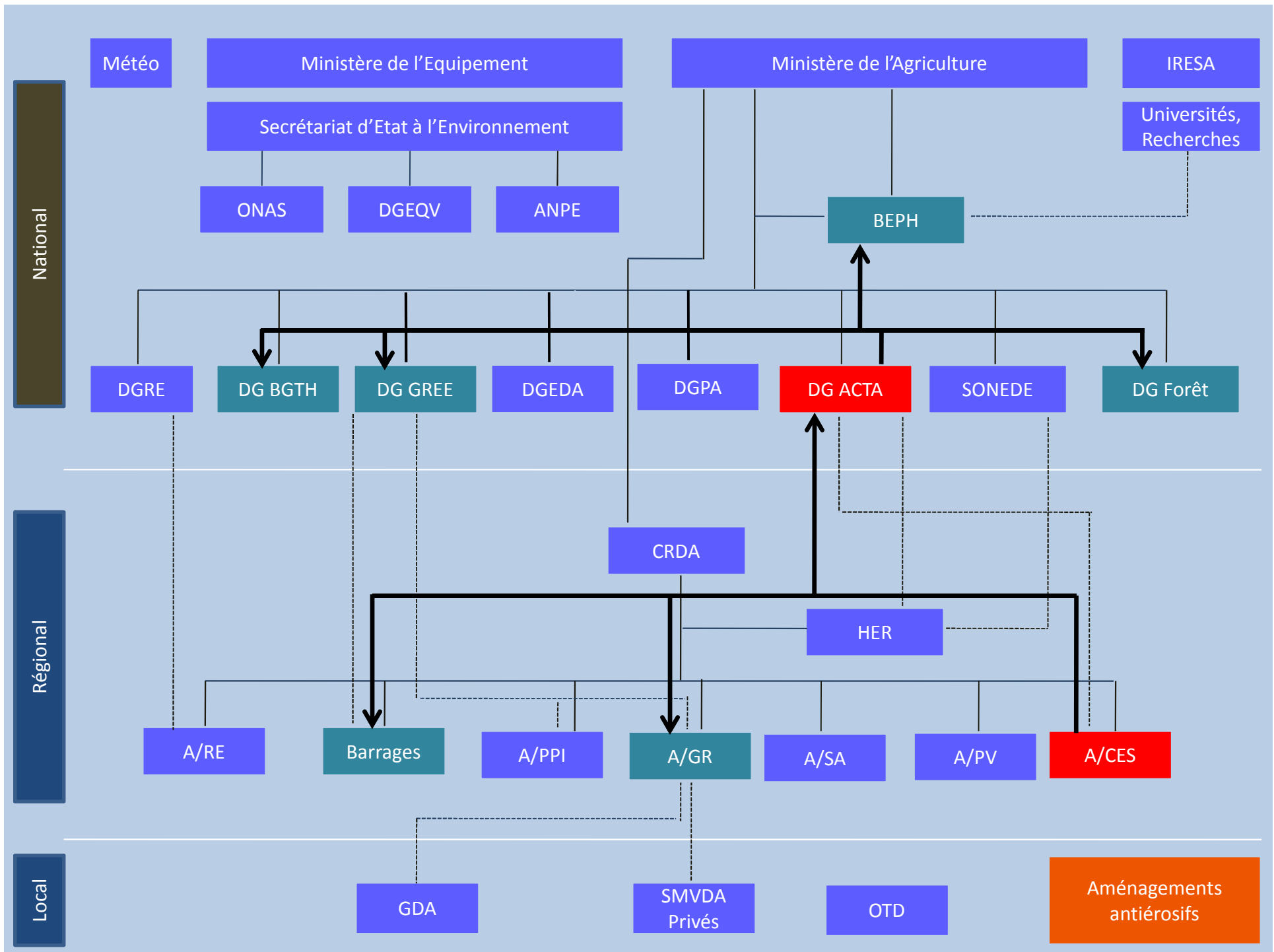


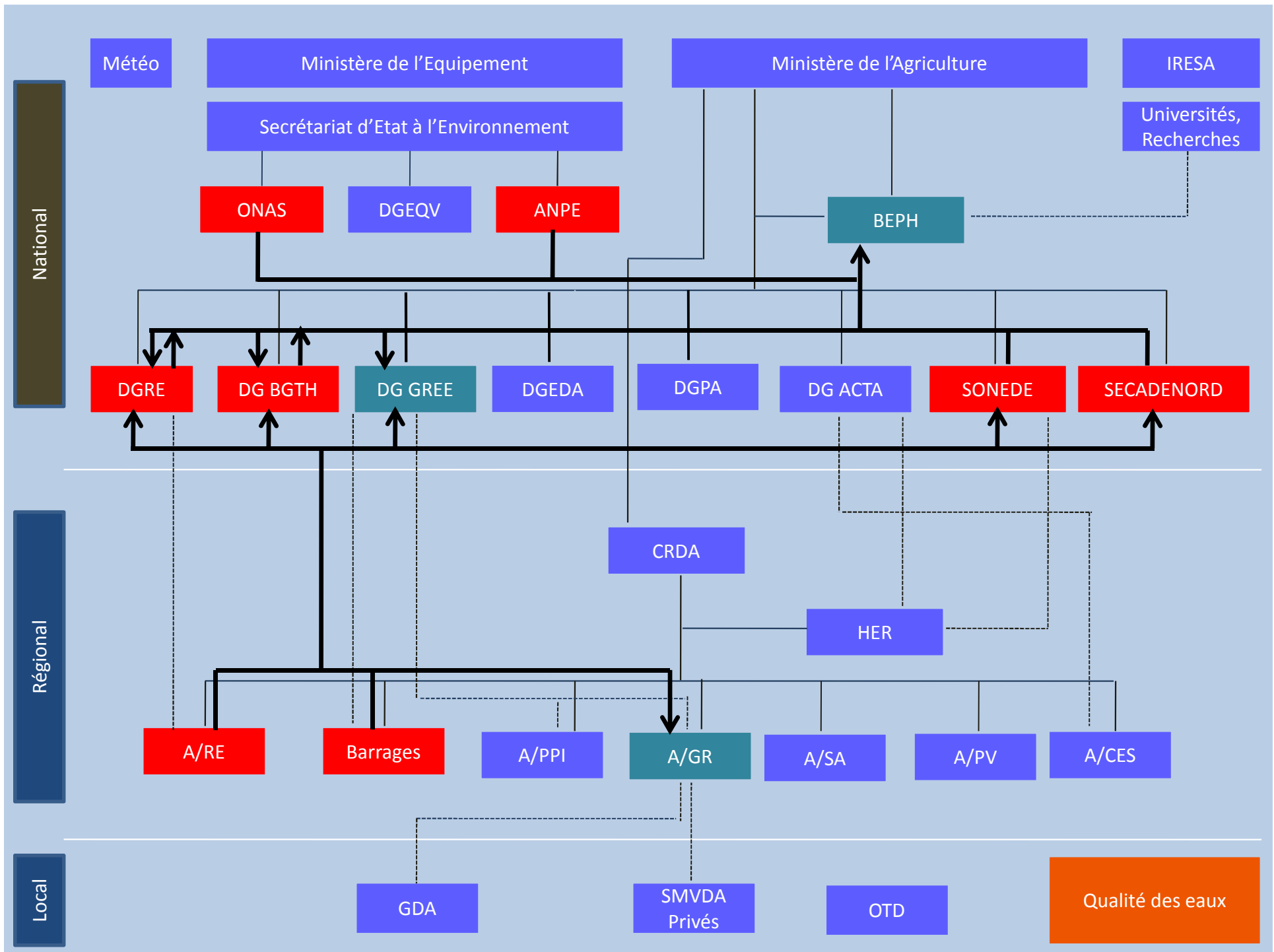












Legal aspect

Water code,

Chapter 6 is devoted to water management, especially the water **saving sensitive measures**. The water use should be justified by socio-economic profitability and environmental sustainability.

The **Minister of Agriculture** promulgates several **decisions** related to the different **drought committees**,

The **Tunisian Central Bank** delivers a circumstance circular establishing easiness in the credits delivery for farmers,

Special decisions are taken in order to **exempt the importation from the custom duties**.

Drought management

(i) Drought announcement:

Referring to rainfall, hydrologic and agricultural indicators as observed in the different regions affected by drought and transmitted by the agricultural, economic, and hydrologic districts of MAERH, a **drought announcement is established.**

The MAERH Minister proposes a **scheduled operations** plan to the National Commission, which is composed by decision makers and beneficiaries.

The National Commission: supervises the execution of all the operation actions, with the regional and specialized committees.

The drought commissions:

- ✓ *The Drought National Commission:* supervision of the execution of all the operation actions:
 - (i) **before** – drought preparedness;
 - (ii) **during** – drought management;
 - (iii) **after** – subsequent drought management.

- ✓ *The Drought Regional Commissions (24)*

- ✓ *The Drought Specialized Commissions (4):*
 - (i) Water Resources Management Committee
 - (ii) Livestock Safeguard Committee.
 - (iii) Cereal Sector Management Committee.
 - (iv) Arboriculture Sector Committee.

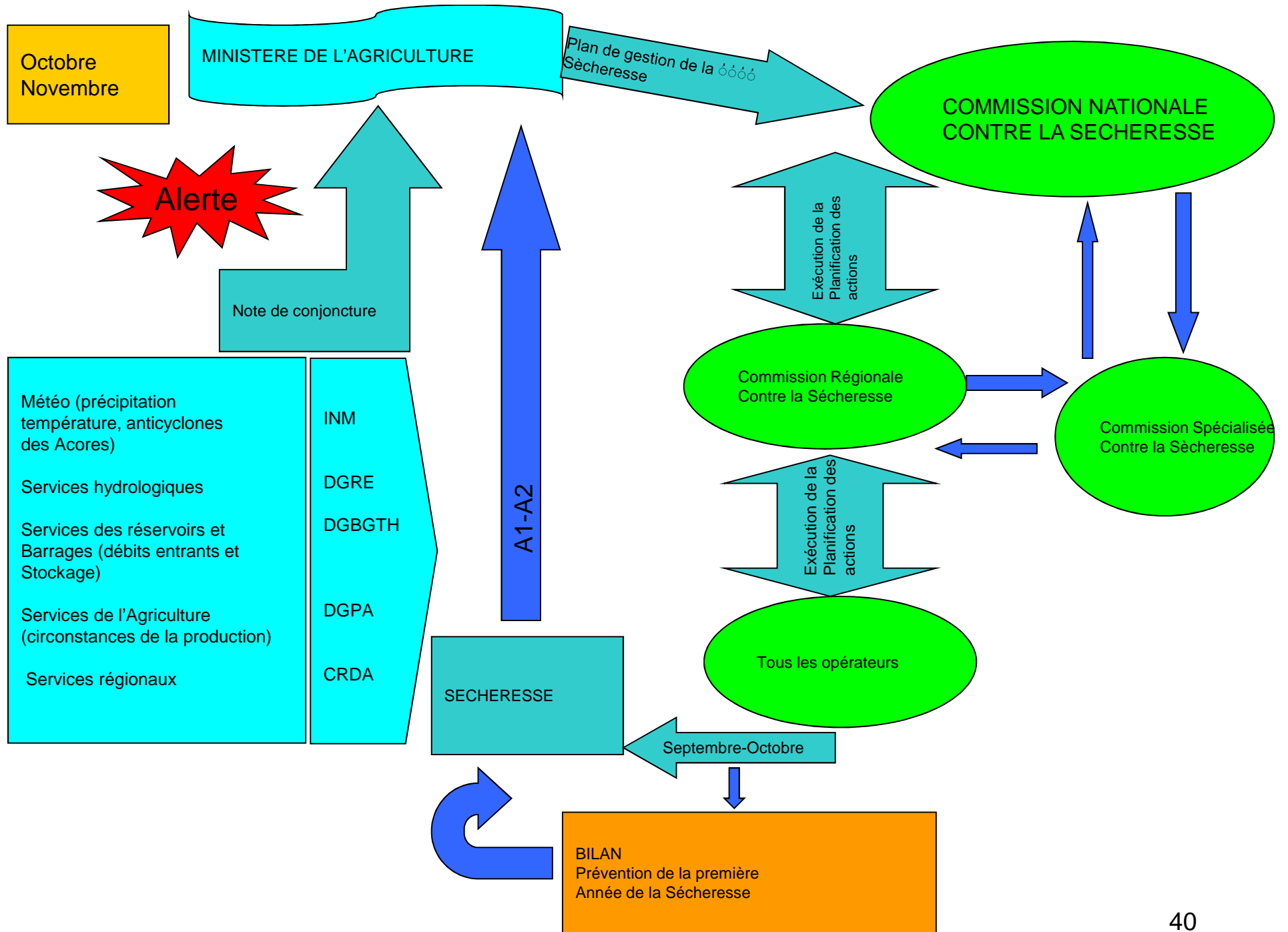
Drought management steps

A/ Drought preparedness

- (i) The climatic and hydrologic data are analyzed in order to predict the hydro climatic situation.
- (ii) A water management program is established..
- (iii) Equipment of water points for domestic use when the drought has set in.
- (iv) Contributing within the National Program of Water Saving by a growing public awareness on the drought event.

B/ Drought management

- (i) Identification of **affected regions**.
- (ii) Evaluation of **dams**, water reserves and fitting a management plan regarding the available water.
- (iii) Enhancing of the **irrigated cereal program**.
- (iv) Encouragement of the **cereal complementary irrigation**, especially in the seed production areas.
- (v) Evaluation of **animal nutrition stocks** and prevision of the eventual importation.
- (vi) Supply the drought damaged regions by **barley and other forage** products.
- (vii) Prevision of **priority products importation**.



C/ Subsequent drought

- (i) Intensification of the extension program related to the soil tillage and farming practices.
- (ii) Establishing a scheme of delaying the credit payment,
- (iii) Programming the distribution of cereal and forage seeds.
- (iv) Evaluation of the available water resources (dams and aquifers).
- (v) Reconstitution of the aquifers water reserves.
- (vi) Evaluation of the mitigation program efficiency and estimation of their cost.
- (vii) Updating the drought mitigation program with reference to the identified deficiency.
- (viii) Associate the research institutes and universities in the development of research program related to drought mitigation.

Examples

1993-1994

Table 6. Minimal water input recorded during 1993-1994 year in the 18 dams under exploitation in Tunisia. Source: DGBGTH, 1996

Dams	Use starting date	Minimal water input (M m ³)
Mellègue	1954-1955	36.6
Joumine	1983-1984	17.9
Ghezala	1984-1985	0.5
Siliana	1987-1988	3.5
Bir M'cherga	1971-1972	3.4
Nebhana	1967-1968	3.1
El Houareb	1989-1990	7.5
Bezirk	1961-1962	0.2

Table 7. Water catchments (input) in dams in Tunisia between 1st September and end of August (M m³)

Dams	Mean	1992-1993†	1993-1994	1994-1995
North West (10 dams)	1108.1	566.1	318.3	466.2
Centre (4 dams)	210.8	119.4	36.7	132.5
North East (4 dams)	23.1	19.2	23.3	7.0
Total (volume)	1342.0	704.6	378.3	605.7
Total (%)	100.0	56.7	30.4	45.1

†1992-1993 could be supposed with satisfactory water resources availability since water storages since the precedent year had not been affected by drought.

Table 8. Water volumes stored in the dams during 1992-1993, 1993-1994 and 1994-1995 in Tunisia. Source: DGBGTH, 1996

Dams	1992-1993		1993-1994		1994-1995	
	Volume (M m ³)	Filling rate (%)	Volume (M m ³)	Filling rate (%)	Volume (M m ³)	Filling rate (%)
North West	864.8	81.7	698.7	66.0	403.3	38.1
Centre	307.3	84.0	287.2	78.5	194.8	53.3
North East	36.7	71.5	29.9	58.2	26.0	50.6
Total	1208.8	81.9	1015.8	68.8	624.1	42.2

The drinking water supply (for domestic, tourist and industrial use as well) has been ensured without any restriction during the successive years 1992-1993, 1993-1994 and 1994-1995.

The agricultural water demand was satisfied during 1992-1993 and 1993-1994. A restriction plan was prepared for 1994-1995 (19 – 27 %). This plan was applied in March 1995 and updated in July 1995 regarding the water resources situation which was improved by the exceptional rainfall of June 1995 (in Mellègue).

1999-2002

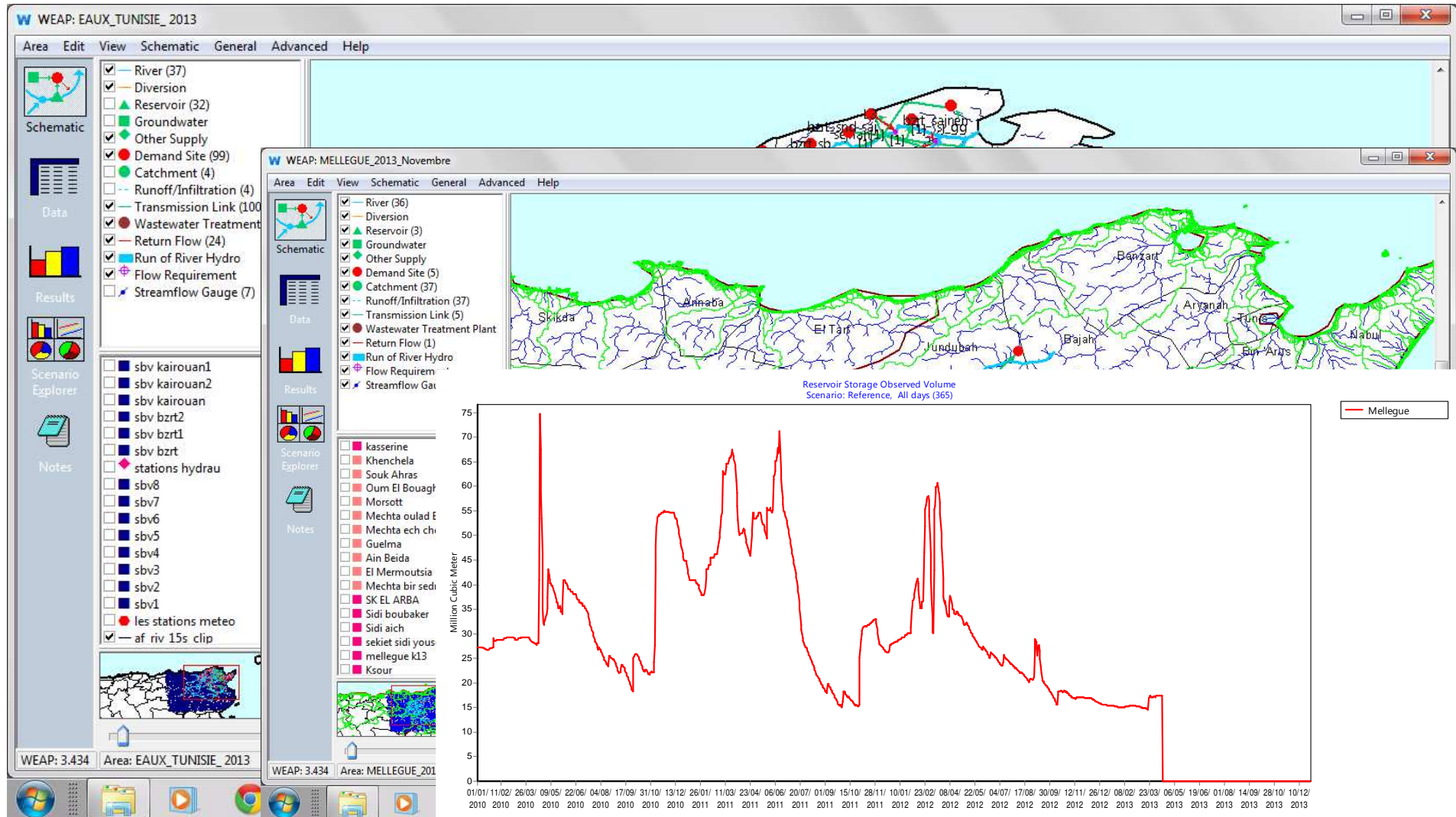
Table 10. Rainfall [Pm: historical mean (mm); P: measured (mm)] and drought index (DI = $P/Pm * 100$) during 1999-2002 (autumn, winter and spring) in Tunisia

Regions	Autumn-winter-spring			Year		
	Pm	P	DI (%)	Pm	P	DI (%)
1999-2000						
NW	587	436	74	619	504	81
NE	467	418	90	489	437	89
CW	283	235	83	320	252	79
CE	305	296	97	317	335	106
SW	116	82	71	124	116	94
SE	172	125	73	175	125	71
2000-2001						
NW	587	599	102	619	625	101
NE	467	436	93	489	455	93
CW	283	178	63	320	189	59
CE	305	156	51	317	158	50
SW	116	55	47	124	56	45
SE	172	53	31	175	54	31
2001-2002						
NW	587	371	63	619	468	76
NE	467	262	56	489	308	63
CW	283	176	62	320	229	72
CE	305	185	61	317	201	63
SW	116	82	71	124	87	70
SE	172	86	50	175	87	50

Summary

- Tunisia faces drought events, that will be more frequent as forecasted by climate change models,
- Strength :
 - Tools infrastructure (data monitoring and collection)
 - Institutional platform (involved institutions).
- Future improvements needed:
 - Definition of comment indicators and indices,
 - Elaboration of a legal manual to use when drought is declared.
 - Optimize the Information Sharing and processing,
 - Use of modelling and optimizing tools to take decision.

WEAP Models





شكرا

Merci

Thank You

Danke schön

Thank you