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MANAGING GROUNDWATER QUANTITY ISSUES IN EUROPE

THE CASE OF FRANCE

OLIVIER PETIT (CLERSE, UNIVERSITÉ D'ARTOIS, ARRAS, FRANCE)

OUTLINE OF THE PRESENTATION

1. An overview of groundwater quantity issues in Europe
2. The importance of groundwater resources in France and its quantitative use
3. Managing groundwater quantity issues in France – legal and regulatory framework
4. The groundwater management toolkit – regulatory, economic and participatory instruments
5. An example of quantitative groundwater management: the Beauce aquifer
6. Conclusion What lessons for California?

1. AN OVERVIEW OF GROUNDWATER QUANTITY ISSUES IN EUROPE

- Importance of climate variability on water use in Europe.
- In southern Europe, agriculture represents around 80% of all water consumption, whereas it represents only 24% of all water consumption in Europe.
- Groundwater represents an important source of water supply in several countries of southern Europe (i.e. 54% of total water use in Portugal, for example).

1. AN OVERVIEW OF GROUNDWATER QUANTITY IN EUROPE

- The European Water Framework Directive requires achieving good qualitative (chemical and biological) and quantitative status for all groundwater bodies
- According to the most recent available data, 89 % of the area of groundwater bodies in Europe is in good quantitative status.
- “Good quantitative status can be achieved by ensuring that the available groundwater resource is not reduced by the long-term annual average rate of abstraction” (EC, 2018).

% of groundwater bodies in good quantitative status, by area	Member States
100 %	Austria, Latvia, Luxembourg, Netherlands, Romania, Slovenia
75-100 %	Croatia, Denmark, Estonia, Bulgaria, Portugal, Germany, Poland, Finland, Sweden, Czech Republic, France, United Kingdom, Spain, Italy
50-75 %	Hungary, Slovakia, Belgium
< 50 %	Cyprus, Malta

Source: WISE-SoW database data from 25 Member States (EU-28 except Greece, Ireland and Lithuania).

Water bodies (excluding unknown status) failing to achieve Good Groundwater status, by RBD

Show:

Failing to achieve Good
Groundwater status

Management plan (RBMP)
2nd

Measure
Area (km²)

Water bodies
(All)

Denominator
Water bodies (excluding ...

Filter by:

Aquifer type
(Tout)

Productivity
(Tout)

Filter by spatial unit

Country
(Valeurs multiples)

River basin district (RBD)
(Tout)

Legend:
0% 100%

Açores (PT)

Madeira (PT)

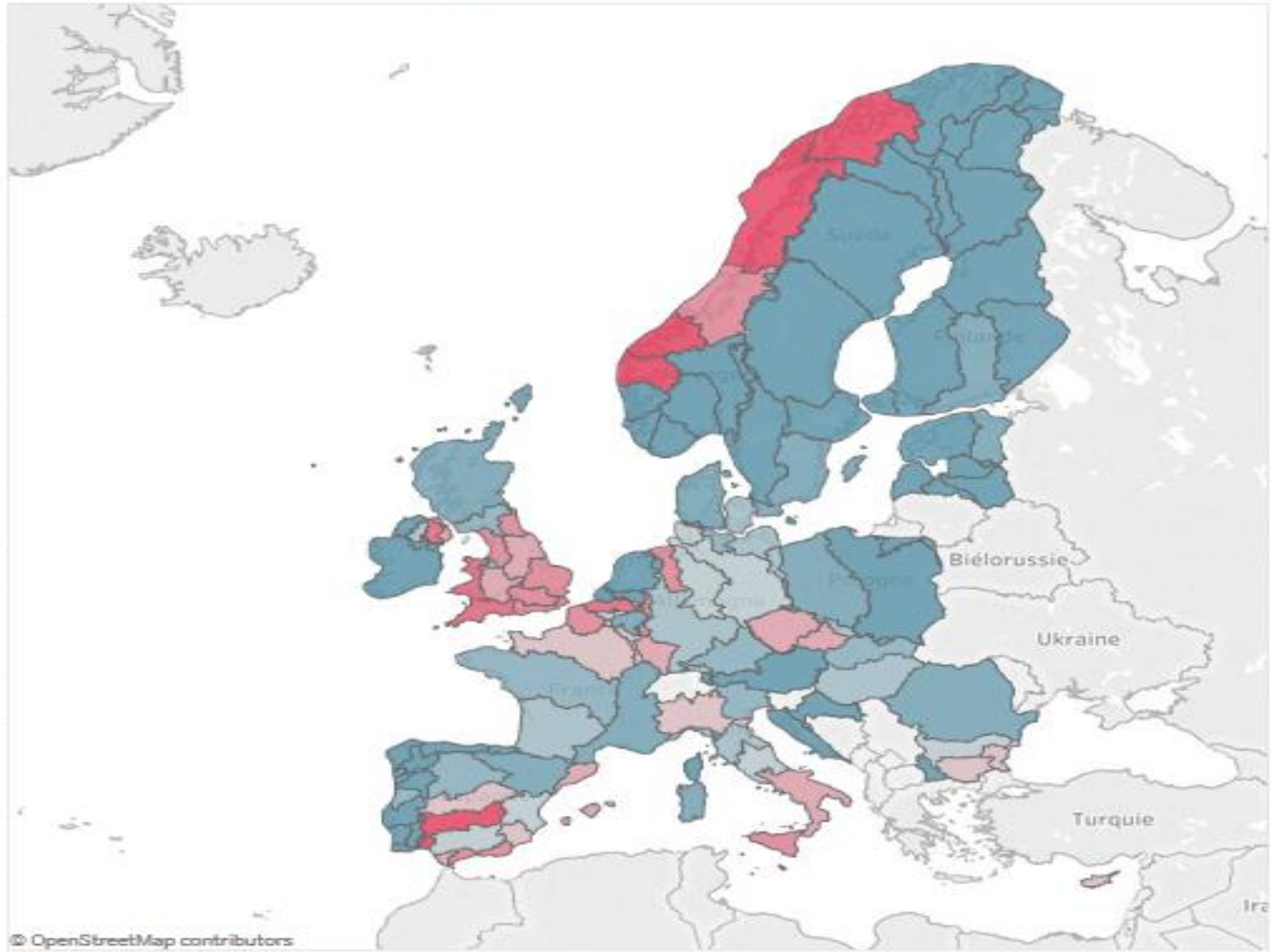
Canarias (ES)

Guadeloupe and Martinique (FR)

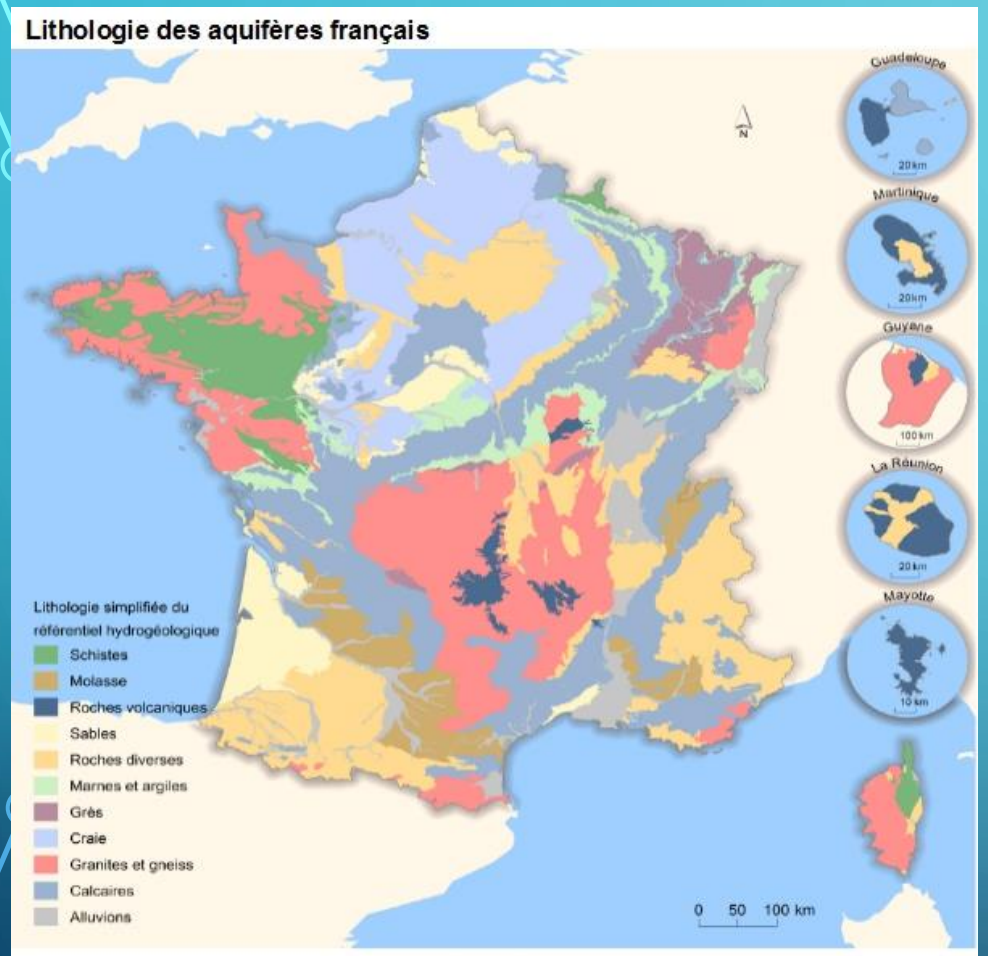
Guyane (FR)

Mayotte (FR)

Réunion (FR)



2. THE IMPORTANCE OF GROUNDWATER RESOURCES IN FRANCE AND ITS QUANTITATIVE USE



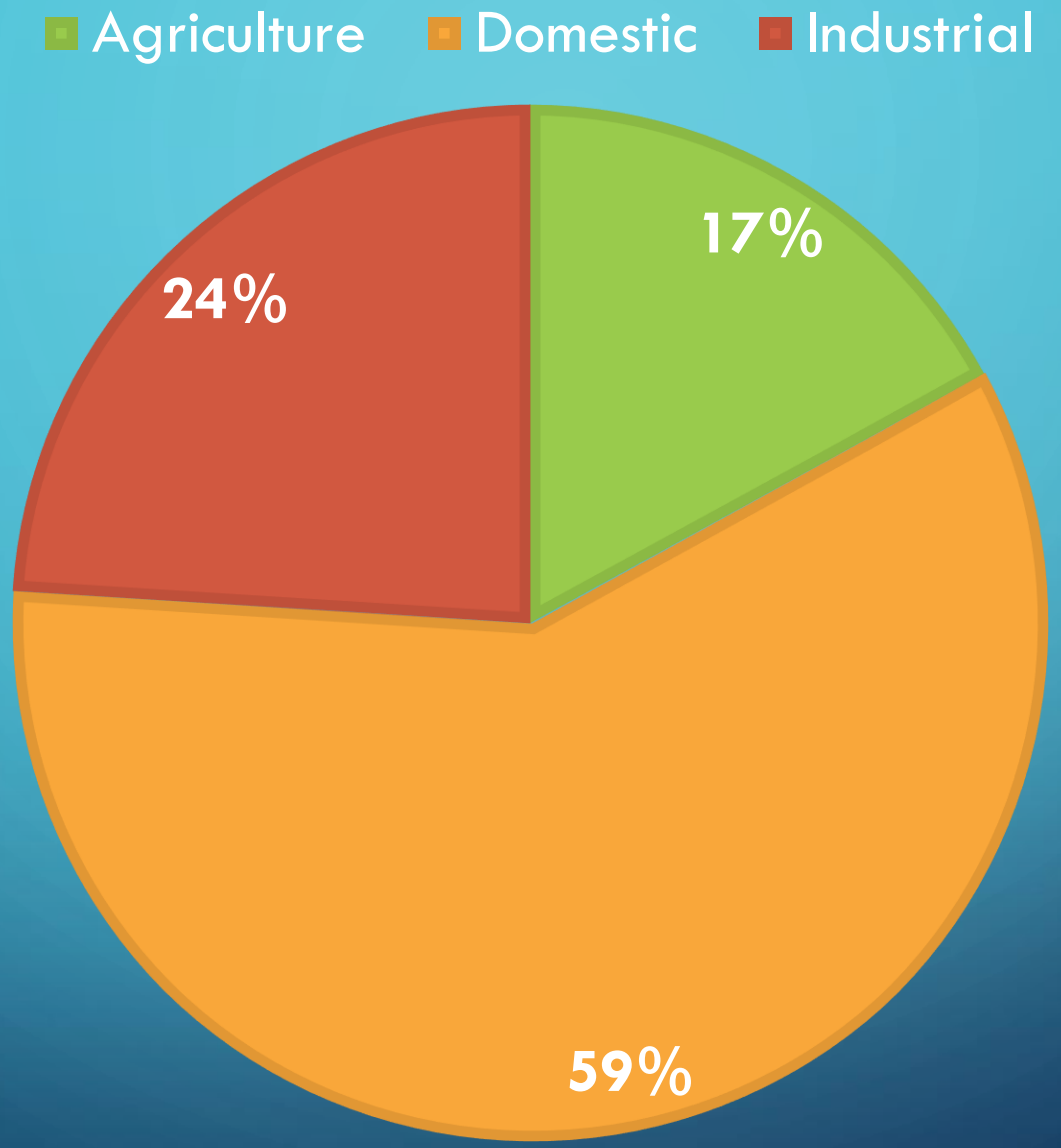
- Reminder : Area of metropolitan France: 551,500 km^2 (212,900 sq mi) + overseas regions, whose areas sum to 89,179 km^2 (34,432 sq mi)
- Available groundwater in France : 321 km^3 (260,239,323 acre-feet)

2. THE IMPORTANCE OF GROUNDWATER RESOURCES IN FRANCE AND ITS QUANTITATIVE USE

Piezometers followed by ADES

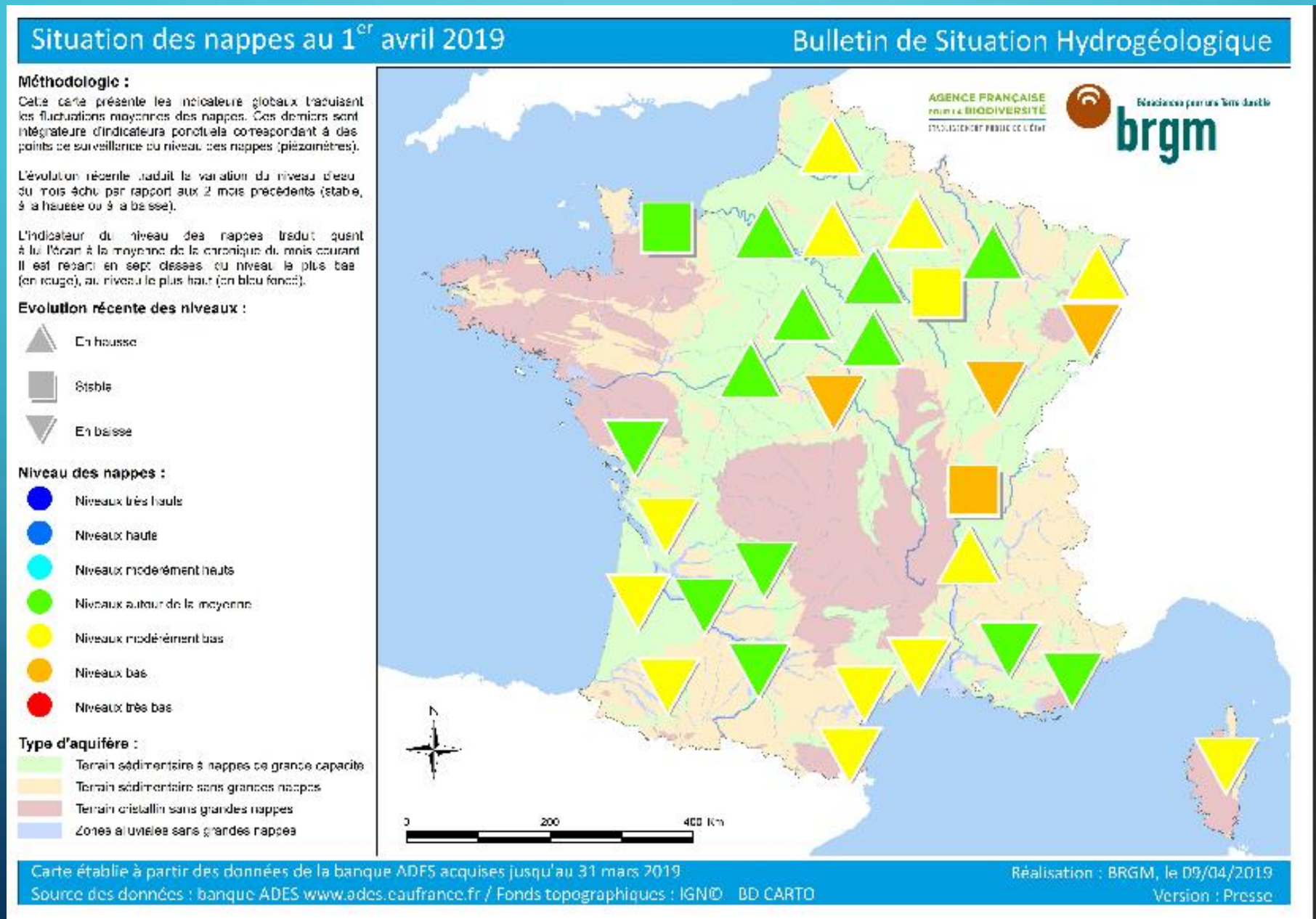
- Annual recharge (in 2013) : 180 km^3 (145,928,592 acre feet)
- 1,600 aquifers accounting for 646 groundwater bodies (599 in metropolitan France and 47 in overseas regions)

GROUNDWATER SECTORAL USE IN FRANCE



Source : Closas and Molle (2017) based on EASAC (2010)

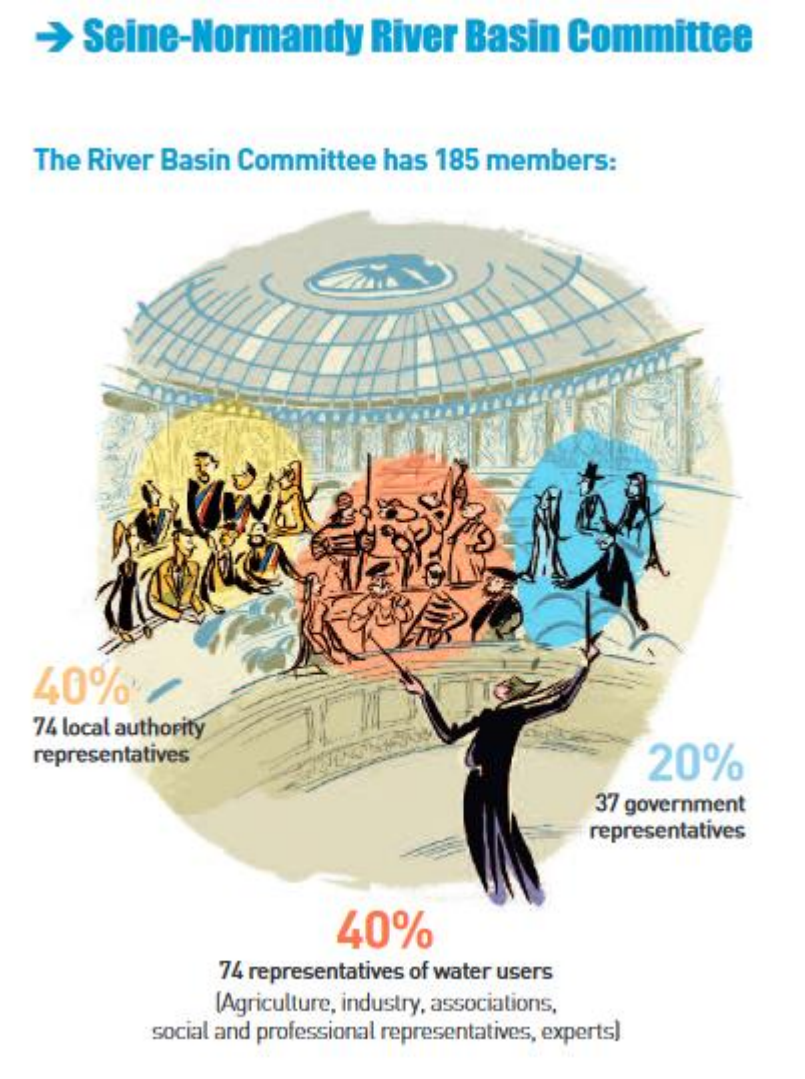
Groundwater monitoring levels by the French geological survey (BRGM)



3. MANAGING GROUNDWATER QUANTITY ISSUES IN FRANCE – LEGAL AND REGULATORY FRAMEWORK

- The legal and regulatory framework of water management is based on 3 main laws adopted in 1964, 1992 and 2006.
- The 1964 French water law, established the existence of 6 hydrological basins, managed thanks to basin committees. These principles were mostly driven by qualitative issues and surface water.
- The 1992 French water law implemented the principles planning at the hydrological basin level (SDAGE) and opened the possibility of water planning on sub-basins or aquifers (SAGE)

3. MANAGING GROUNDWATER QUANTITY ISSUES IN FRANCE – LEGAL AND REGULATORY FRAMEWORK

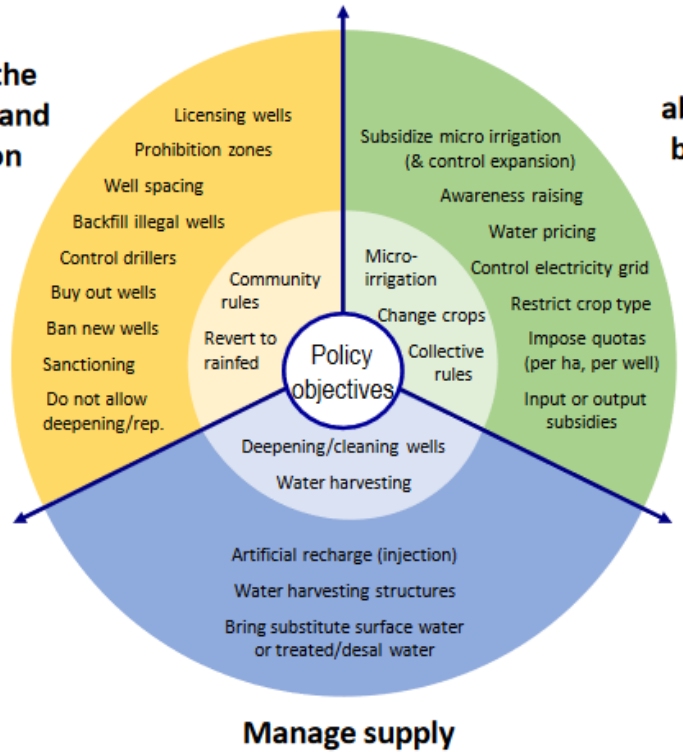


Source : Seine Normandy water agency

- The 2006 water and aquatic ecosystems law (LEMA) is France's implementing act under the European Union Water Framework Directive.
- LEMA reinforced the links between water and biodiversity issues.
- "LEMA focuses on structural, chronic water deficits. It requires setting annual maximum extractable volumes, which become the basis for groundwater allocations." (Rouillard, 2019)

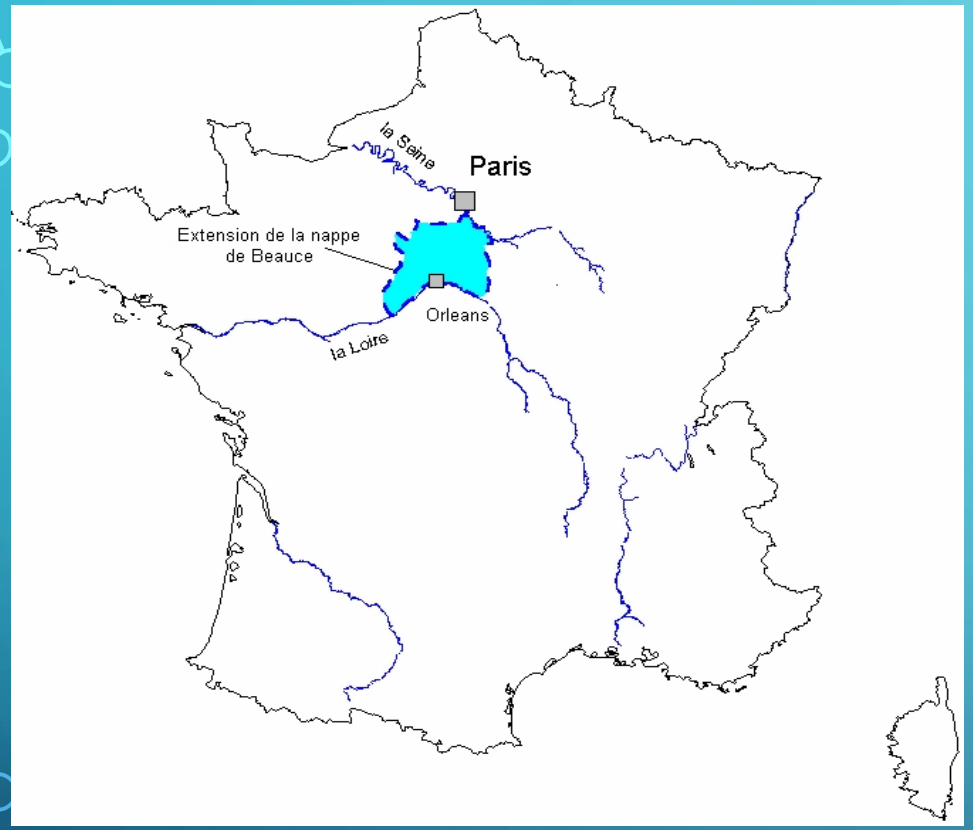
4. THE GROUNDWATER MANAGEMENT TOOLKIT – REGULATORY, ECONOMIC AND PARTICIPATORY INSTRUMENTS

Main groundwater policy objectives and tools (Molle and Closas, 2017).



- Regulatory instruments : licensing wells, impose quotas
- Economic instruments : abstraction fees collected by water agencies, depending on the type of use (irrigation, domestic, industrial), subsidies
- Participatory instruments : collective groundwater management through water planning instruments (SAGE)

5. AN EXAMPLE OF QUANTITATIVE GROUNDWATER MANAGEMENT: THE BEAUCE AQUIFER



- The Beauce limestone aquifer is located in the West of Paris and has an important surface area (9,700 km^2 – 3,745 sq mi)
- This aquifer is one of the most important of France in terms of volume (the volume of water stored in this aquifer is around 20 billion m^3 – 16,2 million acre feet) and needs (agriculture, industry, drinking water)
- Annual recharge : +/- 250 million m^3 (202,678 acre feet)
- 1,4 million inhabitants, 3700 farms
- The aquifer is located in one of the most productive agricultural region of Europe (field crops, mostly)

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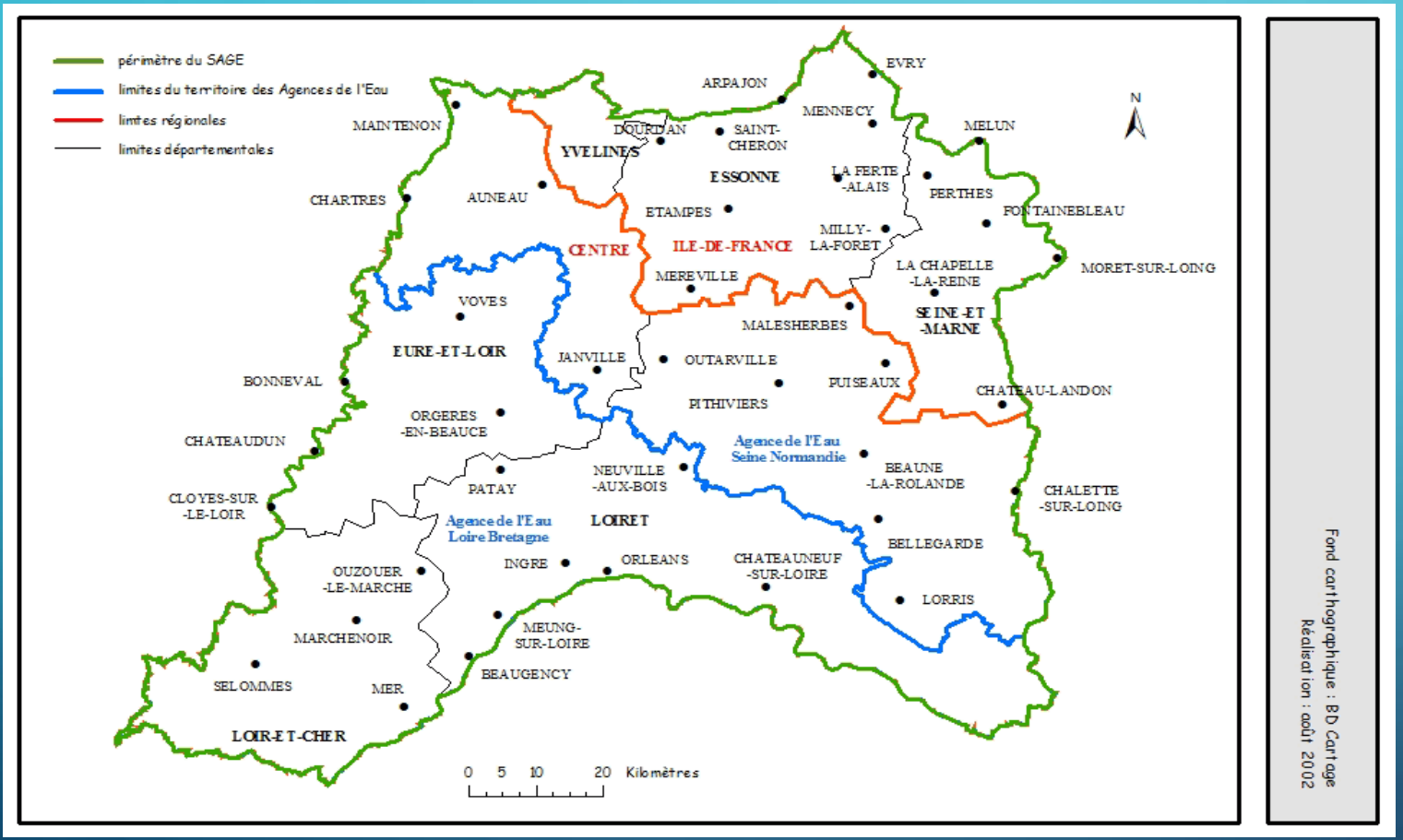

- It has a quite peculiar administrative position because the aquifer occupies (part) of the territory of six local departments, two regions and two hydrological basins

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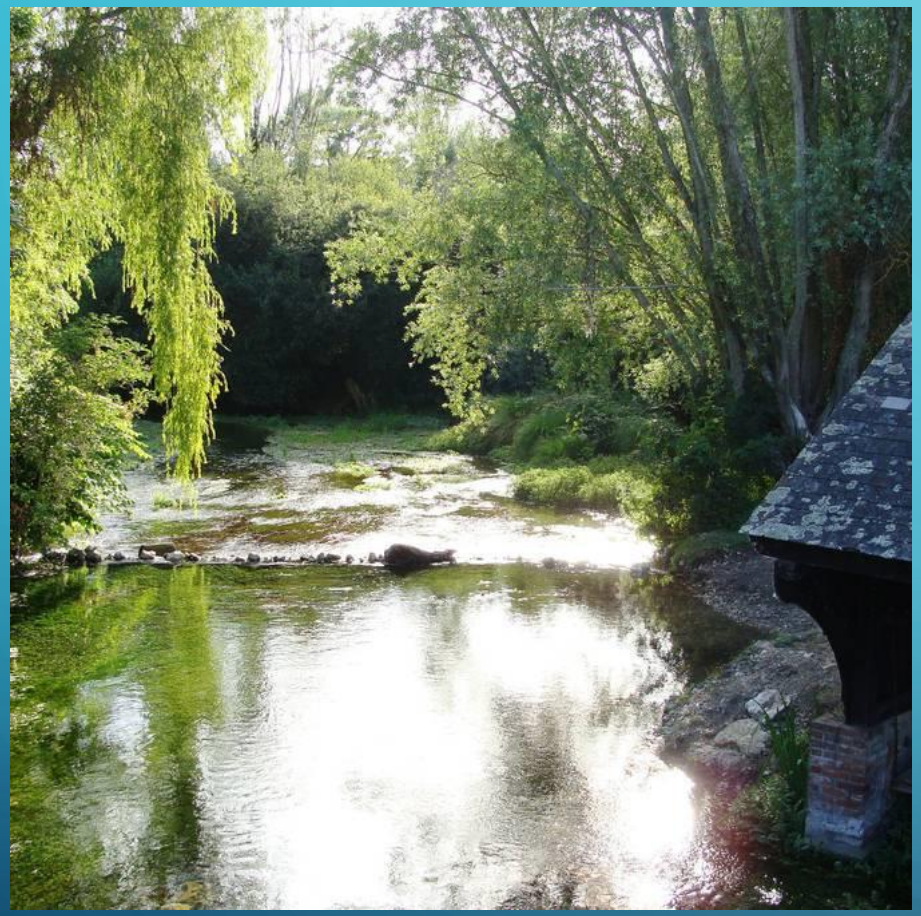
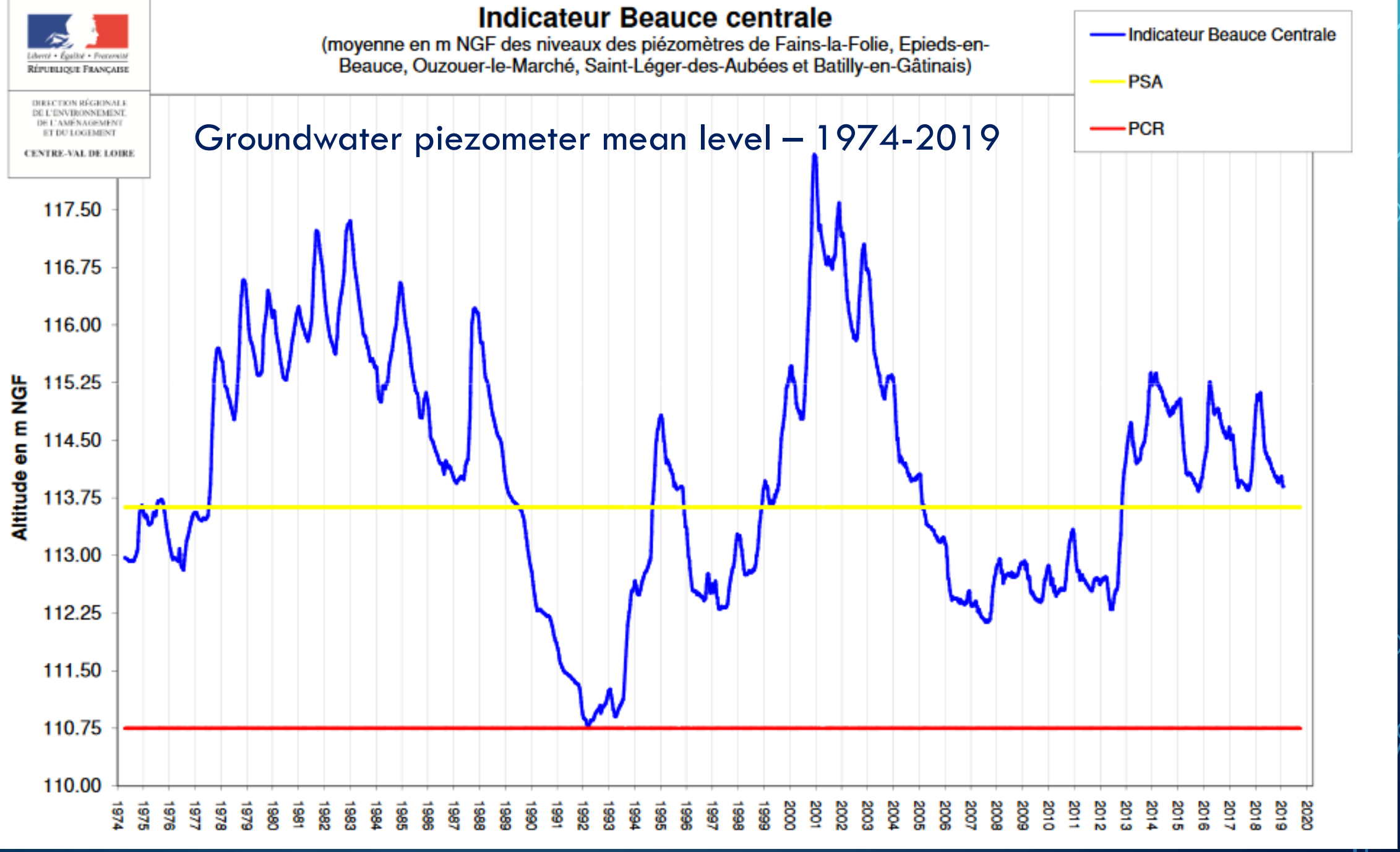


Conie river, near Chateaudun

Outline of the Beauce aquifer quantitative management history

- 1993 : use conflict erupted (Conie river was disappearing)
- 1994-1995 : pumping limits were established for irrigation purposes, but without any coordination between the local authorities (départements)
- 1995 : A Beauce aquifer charter was adopted between farmers and the French administration and a maximum volume to be abstracted for irrigation purposes established (450 million m3 – 364,821 acre feet)
- Moreover, alert thresholds were established, based on the piezometer mean level


Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
DIRECTION RÉGIONALE DE L'ENVIRONNEMENT DE L'AMÉNAGEMENT ET DU LOGEMENT
CENTRE-VAL DE LOIRE
Indicateur Beauce centrale
(moyenne en m NGF des niveaux des piézomètres de Fains-la-Folie, Epieds-en-Beauce, Ouzouer-le-Marché, Saint-Léger-des-Aubées et Batilly-en-Gâtinais)
Indicateur Beauce Centrale
PSA
PCR
Groundwater piezometer mean level – 1974-2019
Altitude en m NGF
117.50
116.75
116.00
115.25
114.50
113.75
113.00
112.25
111.50
110.75
110.00
1974
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5. AN EXAMPLE OF QUANTITATIVE GROUNDWATER MANAGEMENT: THE BEAUCE AQUIFER

A meeting of the Beauce « local water commission » held in Pithiviers

Outline of the Beauce aquifer quantitative management history

- 1998 : Beginning of the SAGE process
- 1999 : starting of the individual/collective quotas management (420 Mm^3 maximum allowed abstraction level for irrigation for a very favorable year)
- 2000 : The first local water commission was established
- 2000 : The WFD was adopted

5. AN EXAMPLE OF QUANTITATIVE GROUNDWATER MANAGEMENT: THE BEAUCE AQUIFER

Outline of the Beauce aquifer quantitative management history

- 2005-2007 : tendencies, scenarios, within the SAGE process
- 2007 : The flexibility of the quota management was abandoned
- 2013 : Formal agreement of the SAGE
- Since 2013 : Implementation of the SAGE agreement

5. AN EXAMPLE OF QUANTITATIVE GROUNDWATER MANAGEMENT: THE BEAUCE AQUIFER

The other side of the coin

- Important lobbying of farmers, all along the SAGE process
- An instrumentalization of hydrogeological modelling (we don't know exactly all the hydrogeological processes – how can we share the pie?)
- A very (very) long process, due to the aquifer size, its administrative complexity, etc.

CONCLUSION: WHAT LESSONS FOR CALIFORNIA?

Key physical characteristics (annual)	France	California
Average annual rainfall	900 mm (35,5 inches)	530 mm (21 inches)
Number of inhabitants	40 million	66 million
Total agricultural area	29 million ha (71,6 million acre)	17 million ha (42 million acre)
Total irrigated land	2 million ha (5 million acre)	4 million ha (10 million acre)
Average water extraction for irrigation	3 km^3 (2,4 million acre feet)	35 km^3 (28,4 million acre feet)
Average groundwater extraction for irrigation	1 km^3 (811 000 acre feet)	10 km^3 (8 million acre feet)
Number of farm businesses	515 000	80 000

Source : Adapted from Rouillard (2019)

CONCLUSIONS

- The property rights system is completely different in France (inheritance of the Roman law system) and in California (Common law);
- The instruments which can be mobilised are different (water banking or water transfers are not realistic instruments in the French case);
- Institutions to manage groundwater issues at the local level can be an effective means to regulate groundwater abstractions, but, it is necessary to connect these local institutions with higher level institutions (multi-level governance);

CONCLUSIONS

- For groundwater management to be effective, groundwater planning is necessary. This is the case in France (SAGE plans), as well as California (Groundwater Sustainability Agencies develop end monitor Groundwater Sustainability Plans). But the law is far from being sufficient in both cases.
- The coordination of multiples agencies, in charge of agriculture, industry, domestic water use, environmental issues is a necessary step.
- Flexibility in the institutional design of groundwater management agencies is also important. Each groundwater community can shape its own rules, if the general principles established by the WFD are matched.

FURTHER READINGS

- Rouillard J., 2019, *Groundwater and agriculture: a comparison of managing scarcity and droughts in France and California*, California Water Blog, March 24th, 2019.
- EASAC, 2010, *Groundwater in the Southern Member States of the European Union: an assessment of current knowledge and future prospects. Country report for France.*
- Closas A., F. Molle, 2016, *Groundwater Governance in Europe*, IWMI Project report, n°3.