

# France

**Capital city:** France  
**Inhabitants:** 65 Million



## INSTITUTIONAL SETTING AND PURPOSE

The Ministry of the Ecological and Inclusive Transition (MTES) is in charge of water management and implements the EU Water Framework Directive in France. Surveillance for groundwater quality is mentioned as one of the water policy actions on the ministerial website. There are various groundwater monitoring networks in France, and it is not always clear which governmental institution manages them.

## CHARACTERISTICS OF THE NETWORK

At a national level, the National Quantitative Monitoring Network for Groundwater (RNESP) monitors the quantity of aquifers of national interest. Minimum monitoring point density has been specified for this network, according to the CIS/EU guidelines type and size of the aquifer: 1 point every 500 km<sup>2</sup> in unconfined aquifers (including wetlands), 1 point every 1000 km<sup>2</sup> for small confined aquifers of less than 1000 km<sup>2</sup>, 1 point every 3000 km<sup>2</sup> for large confined aquifers of more than 1000 km<sup>2</sup>, and 1 point every 7000 km<sup>2</sup> in deep aquifers (higher densities have sometimes being selected). The network has 1,843 sta-

tions, among them 1,775 are active at the moment. According to the CIS/EU guidelines, the minimum frequency of monitoring is weekly, and monthly for confined aquifers.

Other groundwater monitoring networks are the parts of the surveillance network reporting results to Eaufrance in 12 regions. These networks provide an overview of the status of water in each catchment and sub-catchment, including groundwater.

## PROCESSING AND DISSEMINATION

The National Portal for Access to Groundwater Data (ADES), maintained by the French Geological Survey (BRGM) and the product of the Water Information System (SIE), is the national database of public quantitative and qualitative groundwater data for metropolitan France and overseas departments. Main partners in data provision are BRGM, French Office for the Biodiversity, Water Agencies; Regional Directions for the Environment, Planning and Housing (DREAL); Regional Health Agencies (ARS), local authorities and other public bodies. Regularly updated information is available by point, river basin, region and aquifer. Currently, 15,992,803 water levels and 82,956,553 water analyzes are available online.

Groundwater level monitoring stations can be accessed online, and their metadata and data can be visualized and exported (including coordinates), Figure 1.

For 1,450 monitoring points of the 1,600 managed by the BRGM, observation data are available in real time. They can be viewed on ADES every day.



**Figure 1 - Well BSS001MXUY from Loire-Bretagne Basin. Source: ADES Portal**

Since 1988, the BRGM is preparing the National Hydrological Situation Bulletin (BSH) for groundwater. BSH describes the quantitative status of aquatic environment (streamflows, groundwater, reservoirs) through indicators.

# STANDARDISED PIEZOMETRIC INDICATOR (IPS)

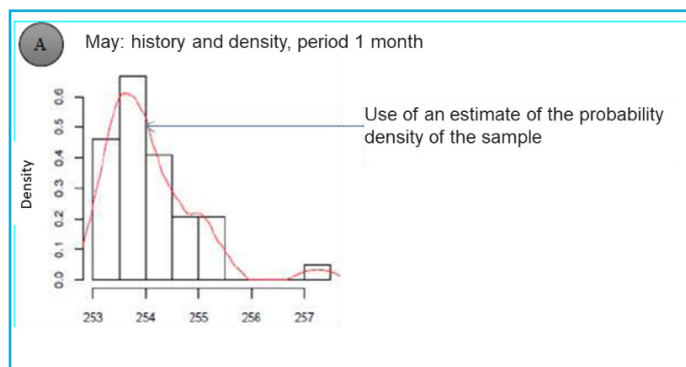
The Standardised Piezometric Indicator (IPS), in use since 2017, is set up to provide a homogeneous info about the status of aquifers. It is based on other indicators such as the Standard Precipitation Index (SPI) and the Standardised Groundwater level Index (SGI).

To calculate the IPS the following steps are applied:

- The construction of piezometric levels series over the period of N years.
- Calculation of the average piezometric level over n months (the current month and the n-1 previous months) with n=3, 6, 9, 12 months or more. These months represent different time scales that may correspond to periods of precipitation deficit.
- A continuous curve of IPS n-month is obtained over the entire period of N years.

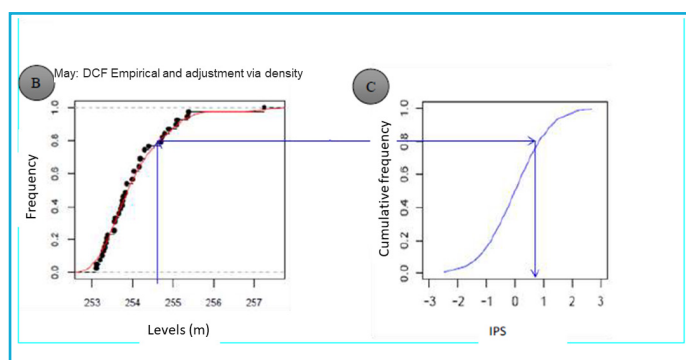
The IPS\_1 month allows to compare the average level of the current month with the values of the same month of the N years. IPS\_6 month compare the average level over the last 6 months (including the current month), etc.

“Current month” means the month preceding the edition of the bulletin, for example for the bulletin on June 1st, the current month corresponds to the data of May. The rolling average of groundwater levels and the IPS value is calculated every month (12 values of IPS per year). Example: Figure 2 shows the density histogram of the average levels of the months of May and the fit of a probability density estimator.



**Figure 2 - The density histogram of the average levels of May months.** Source: Gourcy et al, 2018

Figure 3 (B) shows the cumulative distribution of adjusted frequency of the average levels of the month of May, projected over cumulative frequency in Figure 3 (C).



**Figure 3 - The cumulative distribution of adjusted frequency of the average levels of the month of May (B) and cumulative frequency (C).** Source: Gourcy et al, 2018

The value of IPS ranges from -3 to +3, Table 1. Seven classes are defined based on the IPS values, from “very low” to “very high”.

IPS Classes		Level qualification	Return period
Min.	Max.		
≥ 1.282	≤ 3.000	Very high level	> 10 years wet
≥ 0.842	< 1.282	High level	From 5 to 10 years wet
≥ 0.253	< 0.842	Moderately high levels	From 2.5 to 5 years wet
≥ -0.253	< 0.253	Levels close to the average	From 2.5 years wet to 2.5 years dry
≥ -0.842	< -0.253	Moderately low levels	From 2.5 to 5 years dry
≥ -1.282	< -0.842	Low levels	From 5 to 10 years dry
≥ -3.000	< -1.282	Very low levels	> 10 years dry

**Figure 4 - IPS classification.** Source: Gourcy et al, 2018

The IPS is calculated for all indicators points when data of 15 years or more are available. For stations with a short series of historical data (10 to 15 years), a Position Indicator (IP) is calculated monthly:

$$IP = \frac{(moy_{mois} - mini_{serie})}{(max_{serie} - min_{serie})} \cdot 100$$

Where:

- **moymois**: groundwater level monthly average of the current month
- **miniserie**: monthly minimum groundwater level of the series
- **maxiserie**: monthly maximum of groundwater levels of the series
- **maxserie** and **minserie** include the current month. Therefore, the indicator position is between 0% (low water never encountered before) and 100% (high water situation never encountered before).

The classes of position indicators will be distributed similarly to the IPS from -3 to +3, between 0 and 100%, Table 2.

IP Class	Classification
≥ 90%	very high levels
≥75% and <90%	high levels
≥55% and <75%	moderately high levels
≥45% and <55%	around the average
≥25% and <45%	moderately low levels
≥10% and <25%	low levels
<10%	very low levels

**Figure 5 - IPS classification**

BRGM produces press publications of the groundwater level status in France every month including a groundwater trend map, Figure 4. The publications describe the evolution of groundwater levels and expected trends.

**Méthodologie :**

Cette carte présente les indicateurs globaux traduisant les fluctuations moyennes des nappes. Ces derniers sont intégrateurs d'indicateurs ponctuels correspondant à des points de surveillance du niveau des nappes (piézomètres).

L'évolution récente traduit la variation du niveau d'eau du mois échu par rapport aux 2 mois précédents (stable, à la hausse ou à la baisse).

L'indicateur du niveau des nappes traduit quant à lui l'écart à la moyenne de la chronique du mois courant. Il est réparti en sept classes, du niveau le plus bas (en rouge), au niveau le plus haut (en bleu foncé).





**Evolution récente des niveaux :**

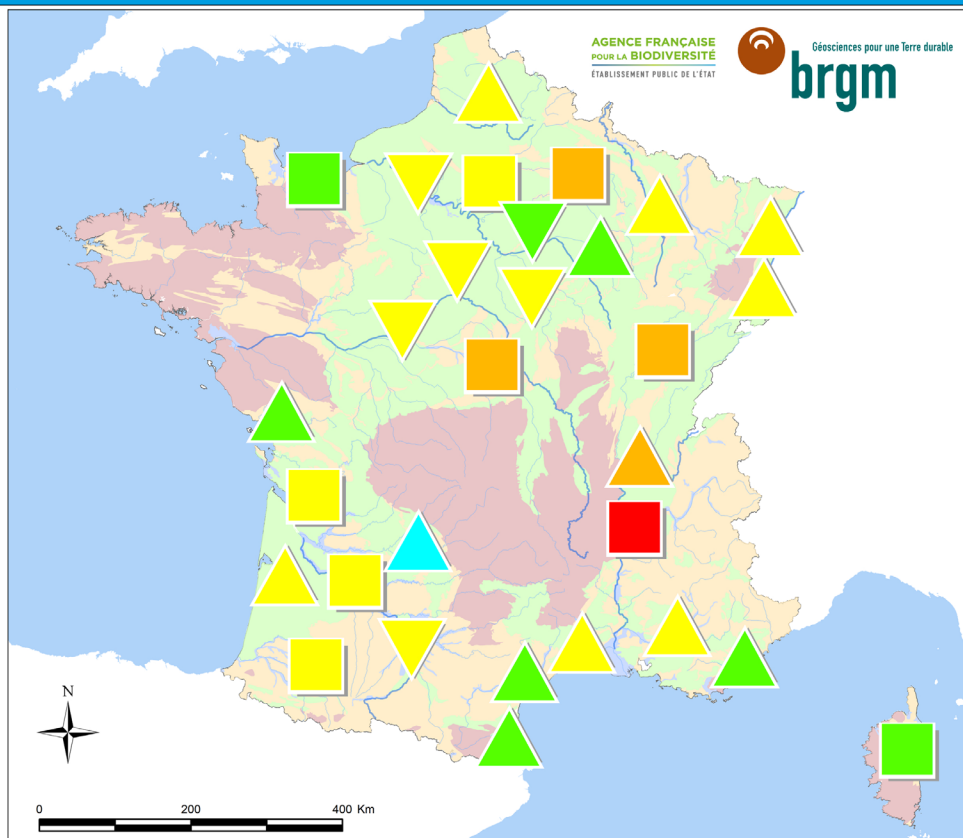
-  En hausse
-  Stable
-  En baisse

**Niveau des nappes :**

-  Niveaux très hauts
-  Niveaux hauts
-  Niveaux modérément hauts
-  Niveaux autour de la moyenne
-  Niveaux modérément bas
-  Niveaux bas
-  Niveaux très bas

**Type d'aquifère :**

-  Terrain sédimentaire à nappes de grande capacité
-  Terrain sédimentaire sans grandes nappes
-  Terrain cristallin sans grandes nappes
-  Zones alluviales sans grandes nappes



Carte établie à partir des données de la banque ADES acquises jusqu'au 31 octobre 2019

Source des données : banque ADES [www.ad.es.eaufrance.fr](http://www.ad.es.eaufrance.fr) / Fonds topographiques : IGN© - BD CARTO

Réalisation : BRGM, le 12/11/2019

Version : Presse

Figure 6 - State of groundwater in France in November 2019. Source: BRGM

The map shows indicators that reflect the average fluctuations of the water levels with respect to the previous 2 months (Recent evolution: stable – square, levels go up – triangle or levels go down - inverted triangle).

The colours show how much the current values move far away from the historical average. The range is divided into seven classes, from the lowest level (in red) to the highest (in dark blue).

## Sources

- ADES. National heritage network for quantitative monitoring of groundwater - <http://www.ad.es.eaufrance.fr/Fiche/Re-seau?Code=0000000029>;
- ADES, National portal for access to groundwater data - <https://ades.eaufrance.fr>;
- Feedback from BRGM - received on 25-03-2020;
- Gourcy L., Seguin J.-J., Hélène B., Mougin B., Vigier Y., Nicolas J., Loigerot S., Allier D, 2018. Herramientas para la Gestión de las Aguas Subterráneas durante Eventos Extremos. El Agua Subterránea: Recursos sin Fronteras: Acuíferos Transfronterizos, El Agua Subterránea y las Ciudades. Planificación y Gestión. Rodolfo Fernando García [et al.]. Primera Edición. 2018. p 165-170 - ISBN 978-987-633-535-5;
- Groundwater levels on 1st November 2019 - <https://www.brgm.fr/actualite/nappes-eau-souterraine-1er-novembre-2019>;
- Ministry of the Ecological and Inclusive Transition. Water management in France - <https://www.ecologique-solidaire.gouv.fr/gestion-leau-en-france>; and
- Monitoring programs - <http://surveillance.eaufrance.fr>.