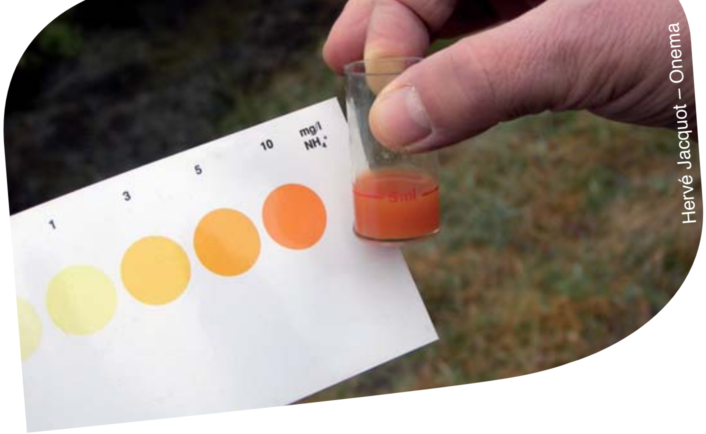
the Briefs
N°2 - June 2010






# Progress in monitoring river quality

Almost 40 years after the first Water law in France established a comprehensive and decentralised water-management system, the European water framework directive voted on 23 October 2000[1] initiated a new phase in the strategy to monitor and evaluate water quality. The changing regulatory context was a chance to study the evolutions in river-quality systems and to measure the progress in monitoring over several decades and in the various methods to evaluate the chemical and ecological quality of water.

## 1971, the first national status report on river quality

The first Water law, voted in 1964[2] to meet the challenges of strong population growth, industrial development and the resulting pollution, laid the institutional, financial and technical groundwork for comprehensive and decentralised management of water resources. It initiated:

> a management system based on the major river basins, i.e. not administrative borders;

> creation, in each basin, of a basin committee, in charge of formulating management policy, and of a Water agency (or basin financial agency), in charge of executing the policy;

> creation of a National water committee, a committee advising the Prime Minister.

In view of fighting pollution, the law required the creation of a national inventory to determine the level of pollution (INP) in surface waters and define objectives to improve quality. In 1971, the first status report on the quality and uses of rivers was carried out by the Water agencies, with coordination provided by the Ecology ministry.

Measurements were run in **957 measurement stations**, located mainly on large rivers and in areas subjected to major human and industrial pressures, which explains the high density in the Artois-Picardie and Rhine-Meuse basins. Two-thirds of the stations still operate today and offer almost 40 years of data on river quality and the changes over time.

The **132 000 analyses** on water run in 1971 covered **66 parameters**. Almost half concerned **physico-chemical** aspects (temperature, hydrogen potential, oxygen, potassium, chlorides, nitrates, suspended matter, etc.). The other half dealt with mineral and metal micropollutants (e.g. iron, manganese, zinc), environmental parameters (presence of mud, detergent foam or iridescent sheen), organic micropollutants and other parameters (microbiology, radioactivity, etc.). A few hydrobiological analyses filled out

eaufrance
Public water-information system

[1] Directive 2000/60/CE (23 October 2000), transposed to France especially by Law 2004-338 (21 April 2004).
[2] Law 61-1245 (16 December 1964).

the total, notably an inventory of benthic invertebrates in view of calculating a biotic index.
Two other national campaigns were launched in 1976 and 1981, with further analyses carried out each year by the networks in each river basin. Finally, because two of the three national campaigns occurred during very dry years (1976 and 1981), they were subsequently pursued annually to obtain more complete and regular information on river quality.

To interpret the results, the first water-quality evaluation system was established, the « multi-use » **Grid 71**. The goal was to determine the aptitude of water at a given point (the measurement station) to serve for various uses (bathing, industry, irrigation, navigation, drinking water). The studied parameters dealt essentially with organic matter as well as nitrogenous and phosphate compounds, the items responsible for the pollution observed at that time.

## Principles behind water-quality evaluations using the Grid 71

Threshold values are set for each parameter, determining the necessary water quality for a given use. Analysis results are compared to the threshold values and assigned to one of five quality classes (high quality, good quality, moderate quality, poor quality, excessive pollution). For each parameter, the 90th percentile (that not exceeded by 90% of results over the year) serves as the reference point. The quality class assigned to water is determined by the most unfavourable parameter.

In addition to mandatory monitoring of rivers, the 1964 law required the setting of goals to improve quality. The Grid 71 classification was used to assign a quality goal to each consistent reach of river. The quality goals are presented graphically on maps that were among the first reference documents for river-quality management and were often used by the water police prior to the approval of the latest river basin management plans (RBMP) in 2009.

### Step 1. Determine the quality class of a parameter

All analysis results of a **parameter**

Calculation of the 90th percentile

Comparison with threshold value = determine the quality class of the **parameter**

<5 | 5-25 | 25-50 | 50-100 | >100

### Step 2. Determine the quality class of the measurement station

Parameter 1
Parameter 2
Parameter 3

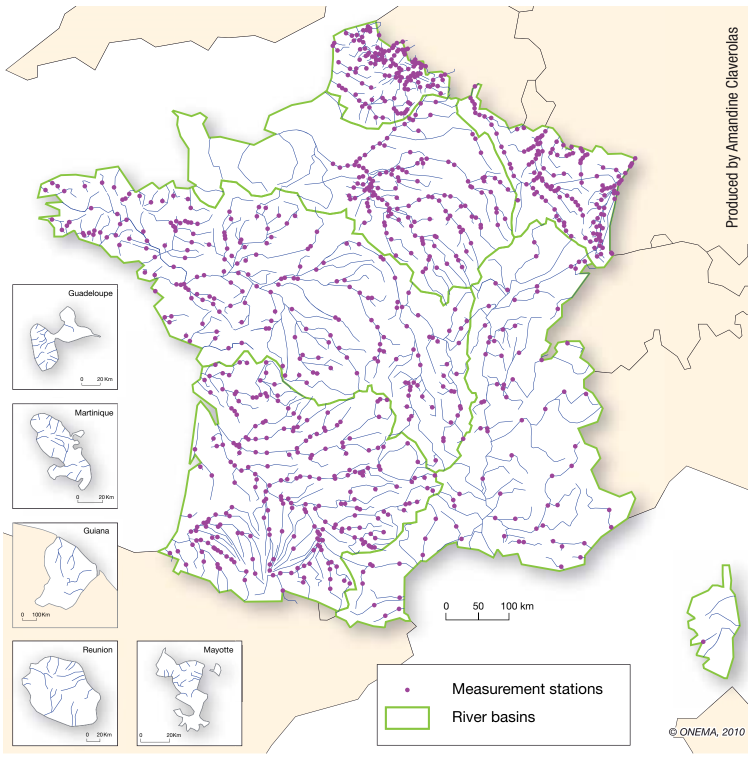
Quality class of **each parameter**

High
Good
Moderate
Poor
Excessive pollution

Measurement station quality class = that of the **most unfavourable parameter**

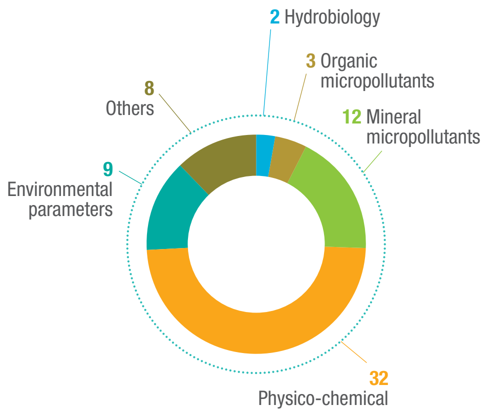
## Distribution of measurement stations in 1971

Source: NWDB (IO Water) - Water agencies - February 2009




## Groups/numbers of parameters monitored in 1971

Source: NWDB (IO Water) - Water agencies - February 2009





## 1987, the start of more uniform monitoring

Over the years, the river basins fleshed out their measurement networks according to their different strategies (enhanced monitoring of certain zones or parameters) and financial means. This diversity induced the State to launch a study on a single, consistent system. In 1987, the reorganisation of the networks resulted in the national basin network (NBN), which replaced the national inventory.

The goal of the new network was to amass long-term knowledge on river quality and constitute a source database for water managers. It is based on a national protocol, drafted by the Ecology ministry and the Water agencies, which establishes minimum rules for all six river basins (station density, mandatory parameters, measurement protocols) to ensure the consistency of data.

In 1987, NBN comprised **1 508 measurement stations** (proportionally half again as large as the national inventory), installed on the largest rivers to evaluate the level of pollution in aquatic environments and monitor the impact of pollution..

In parallel with NBN, most of the Water agencies set up additional basin networks (ABN) and encouraged local governments to create local monitoring networks to improve territorial coverage and create synergies for the human and technical resources employed.

In the French overseas departments, the first measurement networks were set up in the middle of the 1990s.

In 1987, **216 000 analyses** were carried out each year, almost double that of the previous period, including 80% on water. Starting in the beginning of the 1980s, the new aspect was analyses on suspended matter and sediment (20% of analyses), which served to better measure concentrations of micropollutants, both organic and mineral. These substances, often absorbable, link to and concentrate in these environmental compartments (sediment, biota, water, etc.) whose analysis provides a cumulative indication on contamination over a certain time interval.

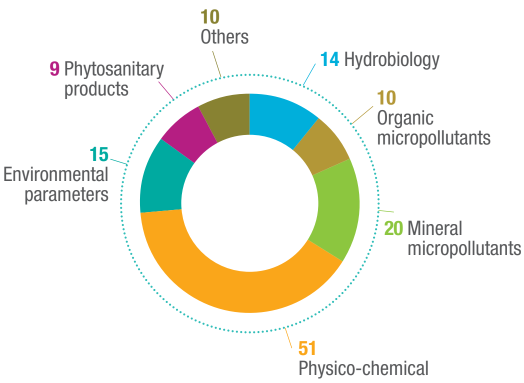
New types of pollutant appeared, notably **phytosanitary** and pharmaceutical products (including DDT, lindane, dieldrin and aldrin) and **organic micropollutants** (PCB-polychlorinated biphenyls), as well as new **hydrobiological parameters** (IBGN-biotic index). NBN and the ABNs adapted over time to new needs for knowledge on the biological quality of rivers, notably to respond to new problems, such as pollutants caused by industrial and agricultural development.

Monitoring has also been increased in the middle and upper reaches of river basins to improve overall knowledge of the territory, i.e. not only the lower reaches that have been monitored for decades, by increasing analysis frequency and the number of parameters measured.

Until 1992, the Grid 71 was used for data interpretation, where the objectives of evaluations was essentially to determine the aptitude of water to fulfil certain uses.

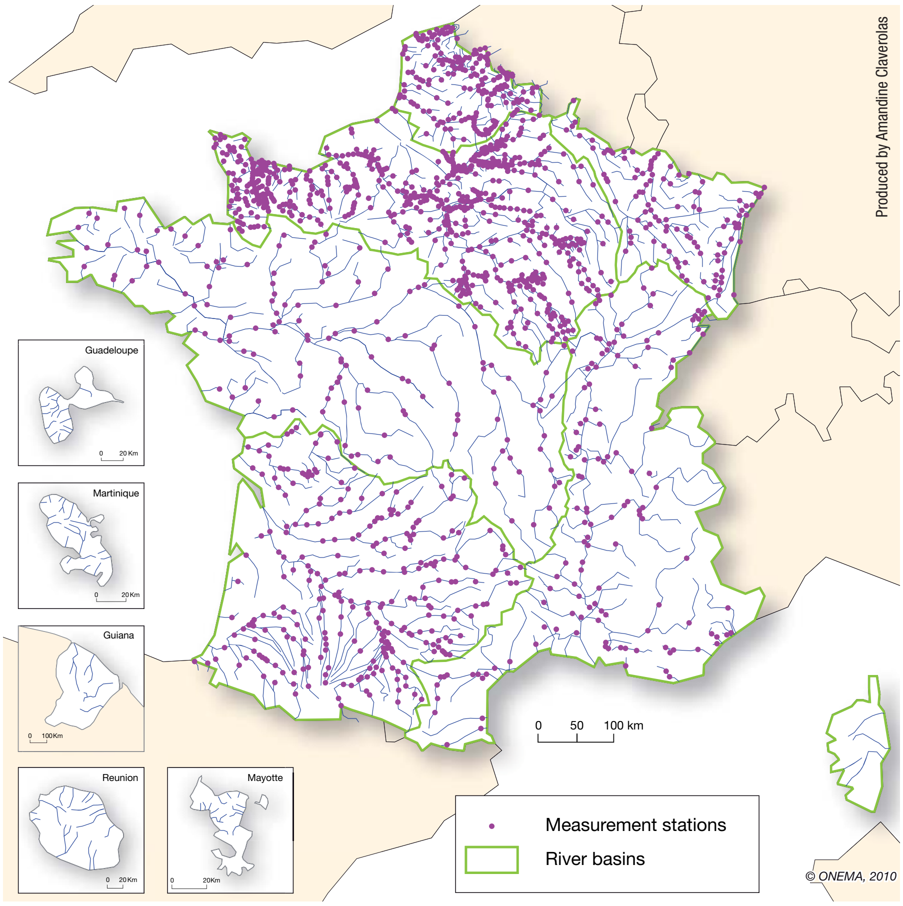
**Groups/numbers of parameters monitored in 1987**

Source: NWDB (IO Water) - Water agencies - February 2009




**Distribution of measurement stations in 1987 (NBN)**

Source: NWDB (IO Water) - Water agencies - February 2009



## 1992, a new law and launch of the river-quality evaluation system

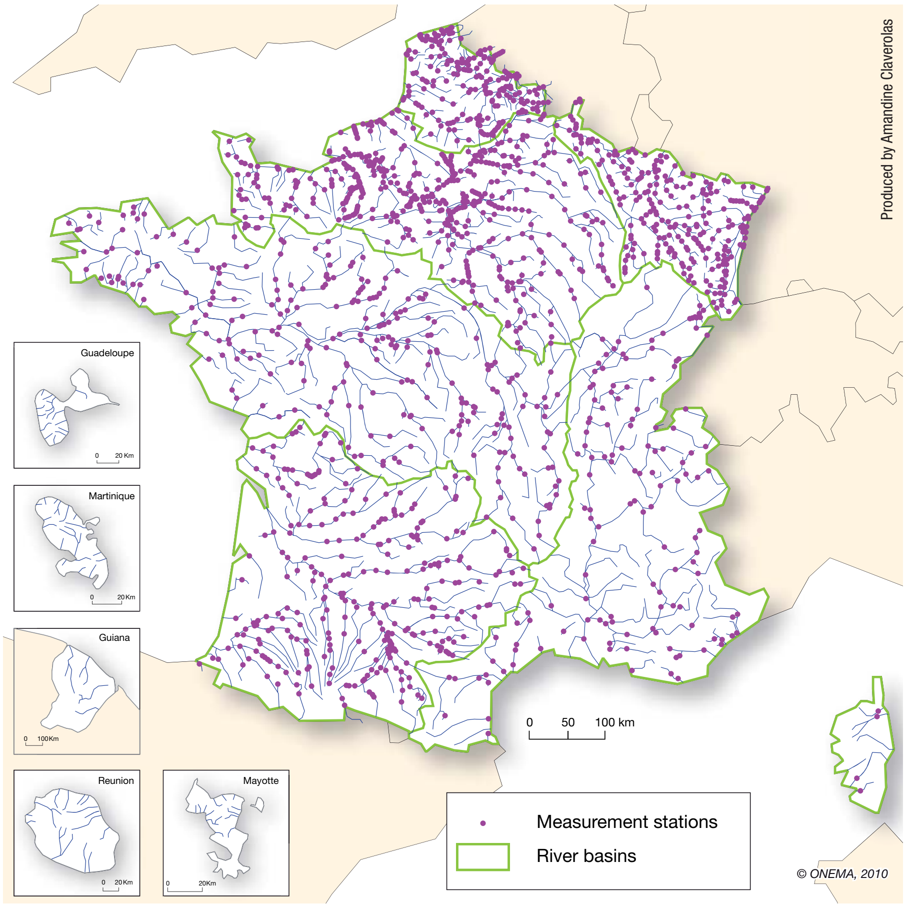
During the 1970s and 1980s, many European directives set up quality standards for water intended for certain uses (drinking water[3], bathing waters[4], fisheries[5], shellfish[6]). The second Water law[7] (3 January 1992) created the necessary legal conditions to apply the directives. One of the major advances in the law is the creation of two new planning systems for water resources, namely the river-basin management plans (RBMP) for each of the major French river basins and sub-basin management plans (SBMP) for smaller basins.

Contrary to the 1964 law, the 1992 law did not impose mandatory monitoring, but it reinforced the principles governing protection of aquatic ecosystems and organised discussions between water users and stakeholders. The quality objectives defined in the 1970s were revised in each of the six river basins to take into account the new regulations.

The knowledge acquired resulted in awareness that an evaluation of river quality must address the different compartments making up the environment, i.e. the water and the substrate, but also the living organisms. That led to the project to create **a quality-evaluation system (QES)** for rivers, comprising three main components of hydrosystem quality, i.e. water (QES-Water evaluates the physico-chemical quality of water and its capacity to fulfil the natural functions of aquatic environments and human needs), biology (QES-Bio uses biological indicators to evaluate the status of aquatic living communities) and physical environment (QES-Physical evaluates the artificialisation of river channels, banks and high-water channels). The different QESs came into being at the end of the 1990s, but only QES-Water was implemented on a wide scale.

### Distribution of measurement stations in 1992 (NBN)

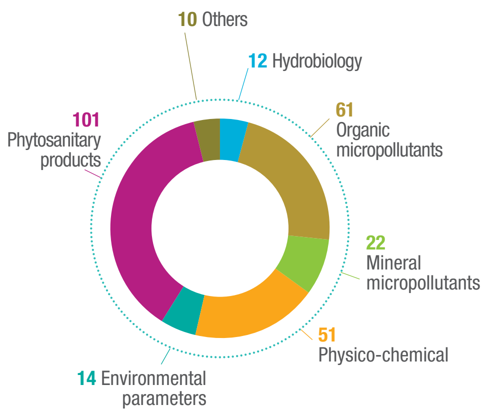
Source: NWDB (IO Water)- Water agencies - February 2009




In 1992, **362 000 analyses** were run in **1 573** stations and covered **271 parameters**. Though the number of stations stagnated, the number of parameters increased, particularly for **pesticides** and **organic micropollutants**.


### Groups/numbers of parameters monitored in 1992

Source: NWDB (IO Water) - Water agencies - February 2009




[3] Directive 75/440/CEE (16 June 1975) [4] Directive 76/160/CEE (8 December 1975) [5] Directive 78/659/CEE (18 July 1978) [6] Directive 79/923/CEE (30 October 1979) [7] Law 92-3 (3 January 1992)



## Principles behind water-quality evaluations for QES-Water

The QES-Water evaluation system takes into account different types of pollution characterised by groups of parameters that are similar or produce similar effects (called alterations) on aquatic environments. For example, the « organic and oxidisable matter » alteration groups parameters such as the concentration of dissolved oxygen, biochemical oxygen demand, ammonium concentration, etc. The effect of water quality on natural functions and human uses is evaluated via aptitude classes (high aptitude, good aptitude, moderate aptitude, poor aptitude and bad aptitude) and potential uses (maintaining balances, biology, drinking water, recreation and aquatic sports, aquaculture, watering of animals, irrigation). The five quality classes are defined by threshold values set for each parameter in each alteration. Water quality over the given time period for each alteration is determined by the worst parameter for the alteration, i.e. that resulting in the lowest quality class.

To evaluate the annual or interannual quality of rivers, a minimum number of samples spread correctly over the year is required to characterise each alteration. The annual quality class is determined using the 90th percentile rule, i.e. after eliminating the worst samples (10% of the total). This rule results in an evaluation of water quality that takes into account critical conditions, but eliminates exceptional situations not representative of the whole. Approximately 130 parameters are measured (compared to 20 for the Grid 71), including organic and mineral micropollutants, and grouped into 15 alterations.

**Step 1.** Determine the quality class of a parameter for an alteration

All analysis results of a **parameter**

Calculation of the 90th percentile

Comparison with threshold value = determine the quality class of the **parameter**

<2 | 1-10 | 10-25 | 25-50 | >50

**Step 2.** Determine the quality class of an alteration

Parameter 1
Parameter 2
Parameter 3

Quality class of **each parameter**

High
Good
Moderate
Poor
Bad

Alteration quality class = that of the **most unfavourable parameter**

**Step 3.** Determine the quality class of the measurement station

Overall quality class

Aptitude class for uses

In parallel with the new quality objectives, the amounts of data on the quality of aquatic environments progressively increased and the Ecology ministry decided in 1992 to create a network of water-data producers, the national water-data network (NWDN). The main goal was to coordinate data producers and how data is collected, stored and disseminated. The main producers and users of public water data (Ecology ministry, Water agencies, BRGM - French geological survey, CSP - Superior Council of Fishing, EDF, Ifremer - Research institute for exploration of the sea, French environmental institute, Météo France, International office for water, etc.) signed an agreement setting goals for NWDN and defining its structure and organisation.

In addition, data exchanges between participants imply certain rules defining both data content and format. Sandre, the national center for water data, was created in 1993 to that end. Its mission is to encourage standardisation of data and to promote a common language for automated data exchanges between the various data producers. To meet growing needs in terms of data processing and dissemination on both the national and EU levels, in 1994 the Ecology ministry assigned to IOWater the task of administering BNDE, the national water database. The database collects information on the chemical quality of rivers from the Water agencies.

## 2000, the new situation created by the Water Framework directive

Until 1995, all directives and decisions in the water field were sectoral in nature, addressing the type of environment (surface waters, groundwater), use (drinking water, bathing waters, fisheries, etc.) or disturbance (hazardous substances[8], nitrates[9]). To implement protection policies for water resources and aquatic environments in a more comprehensive manner, the EU adopted the Water framework directive[10] (WFD) on 23 October 2000. The directive implements a number of French ideas contained in the 1964 and 1992 laws, such as decentralised management of large hydrographic basins and management plans, but also includes new notions that modify the French approach to water management and to river quality evaluation:

> the directive sets environmental objectives for rivers: protect, improve and restore all rivers; not degrade water resources; achieve water good status by 2015 (later if exemptions apply); reduce pollution caused by certain chemical substances termed « priority substances » and eliminate emissions, discharges and losses of hazardous priority substances. The innovative aspect compared to previous objectives is that all compartments (water, environment, fauna and flora) are taken into account, notably biological factors (i.e. not only physico-chemical aspects);

> it requires results by mandatory deadlines, e.g. 2015 to achieve river good status. It stipulates plans to protect, upgrade and restore aquatic environments, and requires proof that the selected measures are the most effective for the least cost;

> the new territorial framework for planning and programming is the river basin district (also called a « WFD district »), defined as the terrestrial and maritime area comprising one or more river basins with the corresponding groundwater and coastal waters. The district is the primary unit for water management;

> the unit for quality evaluation is the water body, defined as a volume of water with consistent physical characteristics and subjected to identical urban, agricultural and industrial pressures. Each water body was assigned a status objective in the RBMPs adopted in 2009.

Christian Jourdan – Onema

To meet the above objectives and enhance the effectiveness of French water policy, a new law was voted on 30 December 2006[12], the law on water and aquatic environments. In compliance with WFD stipulations, it requires for each district:

> a status report to detect water bodies that risk not reaching good status;

> a water-status monitoring programme (rivers, lakes, transitional and coastal waters, groundwater);

> a six-year management plan with precise objectives and programmes of measures listing the necessary action to achieve the set objectives.

### Good status of «river» water bodies for the WFD

The concept of « good status » of « river » water bodies is a completely new approach compared to the older one of evaluating water aptitude for certain uses. It targets the status of the environment itself and not only human uses of water.

Good status of a « river » water body is reached when its ecological and chemical status are at least «good».

Chemical status takes into account the individual concentrations of 41 « priority » and « hazardous priority » substances. Chemical status can be either good or bad. Good status of a measurement station is achieved when the maximum and average concentrations do not exceed the environmental quality standards (EQS) set by the 2008[11] directive. When one or more parameters exceed the EQS thresholds, station status is bad even if all other parameters are satisfactory.

Ecological status takes into account the structure and functioning of aquatic ecosystems associated with surface waters. It is based on « quality elements », i.e. criteria that may be biological (animal or plant), hydromorphological or physico-chemical. Ecological status comprises five classes (high status, good status, moderate status, poor status, bad status) and is characterised by its divergence from a reference status, i.e. that representative of a river not or barely impacted by human activities. Good ecological status corresponds to minor divergence from the reference status for a given type of water body.

[8] Directive 76/464/CEE (4 May 1976) [9] Directive 91/676/CEE (12 December 1991) [10] Directive 2000/60/CE (23 Oct. 2000), transposed to France especially by Law 2004-338 (21 April 2004)
[11] Directive 2008/105/CE (16 December 2008) [12] Law 2006-1772 (30 December 2006)



**Step 1.**
**Determine the status class of a parameter**

All analysis results of **a parameter**

Average or 90th percentile or Annual average or Maximum value

Comparison with threshold value or quality standards = determine the status class of **the parameter**

<5 | 5-25 | 25-50 | 50-100 | >100

**Step 2.**
**Determine the ecological status and the chemical status of a water body**

Parameter 1
Parameter 2
Parameter 3

Status class of **each parameter**

**Ecological status** = combination of biological, physico-chemical and hydromorphological quality elements

**Chemical status** = compliance/non compliance with all environmental quality standards

High, Good → ☺ and ☺ ← Good

Moderate, Poor, Bad → ☹ ☹ ← Bad

The formulation of the monitoring programmes was coordinated by the Ecology ministry and the basin committees. The programmes resulted in the creation of the following:

> a surveillance monitoring network (SMN), intended to inform on the overall status of water in the basin, over the long term. The river SMN was set up according to selection criteria stipulated in ministerial instructions[13] (number of sites determined according to basin size and the length of rivers). It comprises new measurement stations and, where applicable, stations from the old NBN and ABN networks, as well as from local networks. Initial measurements started in 2007 in a network with a total of 1 584 stations;

> an operational monitoring system (OMS) intended for water bodies that may fail to achieve environmental objectives. Monitoring is carried out in measurement stations that may belong to the SMN or other networks (departmental networks or those set up specifically for the Nitrates directive, etc.), as well as other measurement stations. Operations started progressively in 2008, in approximately 2 000 stations (number mentioned in the 2008 report on the main water bodies).

In parallel, the river basins (water agencies, regional Ecology ministry services, Onema - French national agency for water and aquatic environments) reorganised the additional basin networks to enhance territorial coverage and/or address local problems not handled by the national networks. The additional networks often included long-standing stations that were not included in the SMN and OMS.


[13] Circular WFD2006/16 (13 July 2006)

In 2007, **4.6 million analyses** were run in **2 734 stations** and covered **895 parameters**. Analysis distribution according to the type of parameter underwent a profound change. **Phytosanitary parameters** were the most frequently analysed (over 50%), followed by **organic micropollutants** (over one-third). This change in parameters was due to the need to monitor priority substances in order to meet WFD goals, but also to technical progress in analysis methods and the emergence of increasing numbers of new substances.

However, the number of parameters monitored differed depending on the river basin and the measurement stations. In 2007, the average number for all measurement stations was 290 parameters, but over 300 were measured in one-third of the stations, essentially in the Loire-Brittany and Rhine-Meuse basins, the southern part of the Seine-Normandy basin and the major rivers in the Rhone-Mediterranean basin. This was in part due to the choice of the lab running the analyses and whether it offered multi-residue methods that can detect numerous substances in a single analysis.

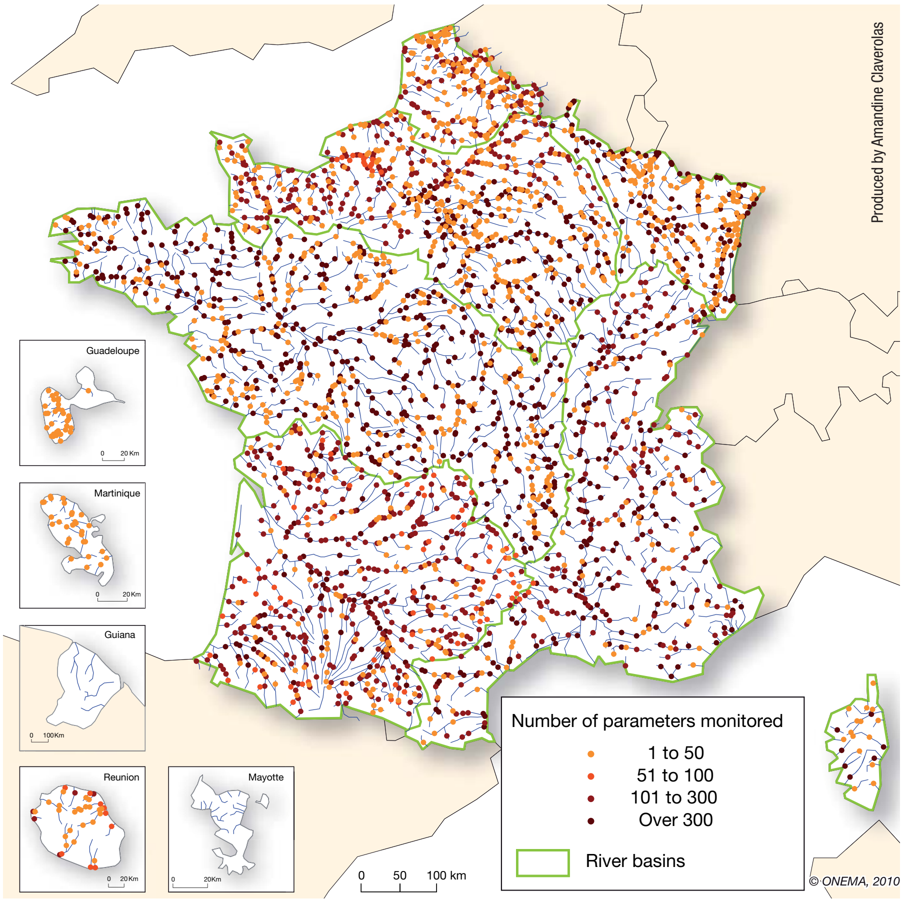
The WFD also required the creation of an information system capable of informing on the quality of aquatic environments and identifying the causes of deterioration. In 2002, a ministerial instruction[14] stipulated the necessary measures, i.e. simplify funding processes, establish organisational rules for networks and run an evaluation on all water-data networks in France. These measures resulted in a framework for water data (BFWD) for each basin. The BFWD describes the future information system and the necessary work, and the partnerships to be set up with the various public entities in the river basin. The project must respect WFD principles concerning organisation and cost effectiveness. In addition, the Aarhus convention[15] entered into force in France on 6 October 2002. It obliges public authorities to make environmental information available to the public.

To meet the above requirements, the water-information system for France (WIS-FR) was created in 2003 to replace NWDN. This water-policy tool, for which Onema assumed technical management under the authority of the Ecology ministry, organises the production, storage, use and dissemination of the vast quantities of water data. The national framework for water data[16] (NFWD) stipulates the role and responsibilities of each data producer as well as the components making up WIS-FR. A multi-year action plan sets guidelines for NFWD work.

WIS-FR is based on the common language set up by Sandre, now the French national service for water data and common repositories management. The NAIADES database in particular, now being developed, will contain data on river quality (chemical, biological and hydromorphological) and will replace the existing databases on the subject, including NWDB. The data will be available via the Eaufrance web portal.

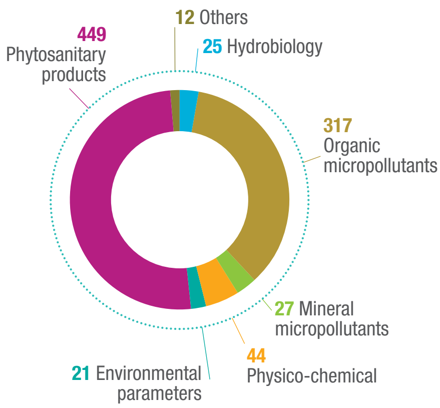
### Numbers of parameters monitored in 2007 (SMN and additional networks)

Source: NWDB (IO Water) - Water agencies - February 2009

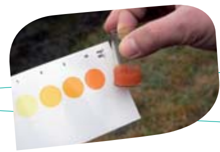



### Groups/numbers of parameters monitored in 2007

Source: NWDB (IO Water) - Water agencies - February 2009




[14] Circular WFD2004/9 (26 March 2002) [15] Convention signed 25 June 1998 [16] Decree 2009-1543 (11 December 2009)





## Three distinct periods in step with legislation

The major stakeholders in the water sector have clearly made increasing efforts to monitor river quality since the 1970s. Also evident are the major changes made in monitoring strategy (the measurement networks) and in the technical means employed to meet quality-evaluation objectives. Three distinct periods emerge.

> 1964 to 1986: the start of efforts against pollution and of decentralised institutional organisation; initial river-monitoring projects were launched and progressively developed;

> 1987 to 2006: increased monitoring of river quality to meet regulatory requirements and growing problems with pollution;

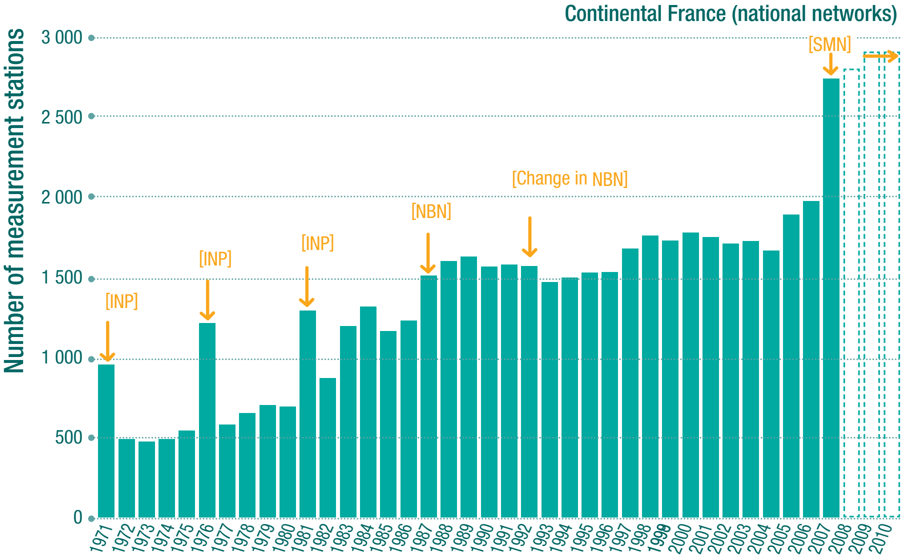
> since 2007: WFD implementation, resulting in reorganisation of the measurement networks and of the technical evaluation systems.

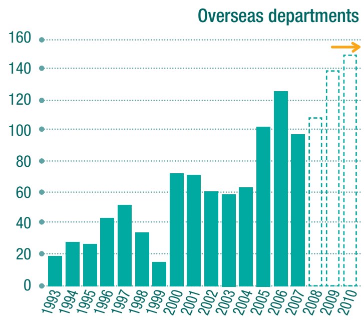
These periods were largely shaped by legislation that first imposed monitoring of aquatic environments, then the setting and attainment of quality objectives. Since 1971, monitoring of French rivers has steadily increased and monitoring conditions have steadily improved.

> **More measurement stations.** They were initially located on major rivers and downstream of significant discharges in continental France, today they cover all rivers, including in the French overseas departments.

### Change in the number of measurement stations

Source: NWDB (IO Water) - Water agencies - February 2009



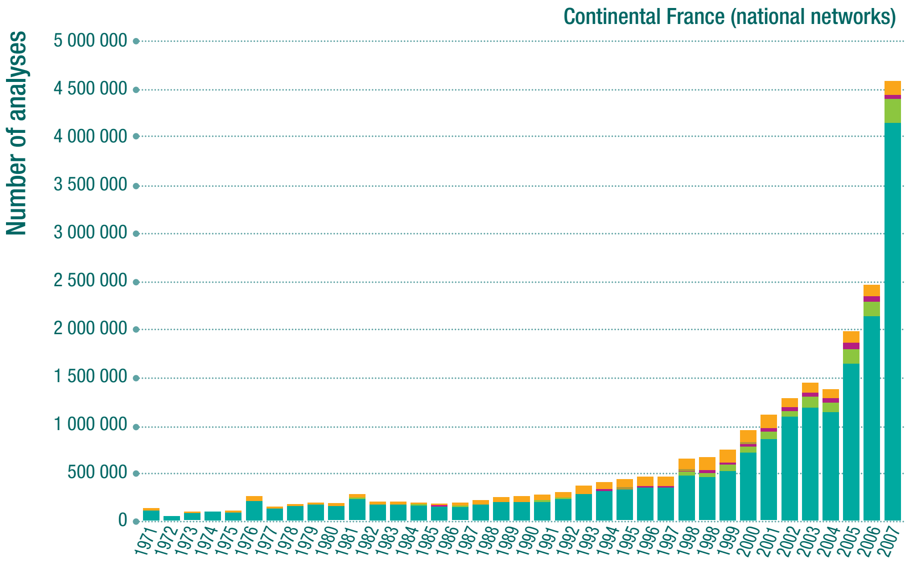





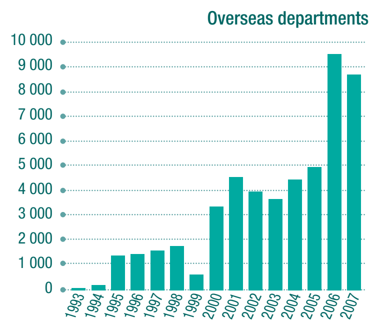
**> More analyses on different environmental compartments.** Samples initially targeted exclusively water, but have been progressively expanded to sediment, suspended matter and bryophytes. These compartments concentrate numerous micropollutants and measurements provide information on cumulative contamination over a given time interval. The increase in the number of analyses is also due to greater sampling frequencies, which, for example for water, shifted from 6 on average per year and per station in 1971 to 13 in 2007, given the greater diversity of parameters monitored.

## Change in the number of analyses on each type of compartment

Source: NWDB (IO Water) - Water agencies - February 2009

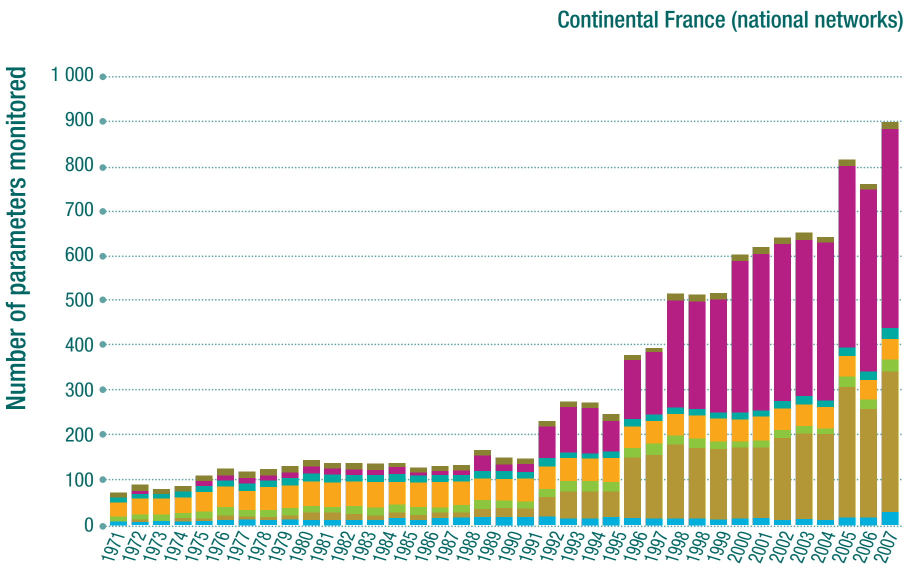


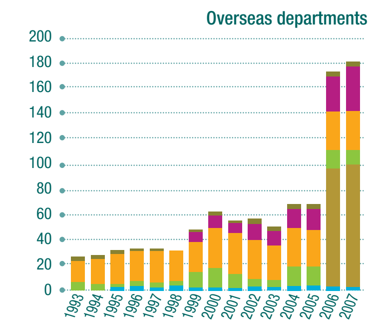

Note. In the overseas departments, analyses concern exclusively the water compartment because there are very few zones where fine sediment is deposited due to the slopes and force of flows.




## Change in the number of parameters monitored in each group

Source: NWDB (IO Water) - Water agencies - February 2009




**> More parameters monitored.** Analyses initially focussed on physico-chemical parameters, then shifted to micropollutants in the 1990s, then to biology and hydromorphology after 2000.

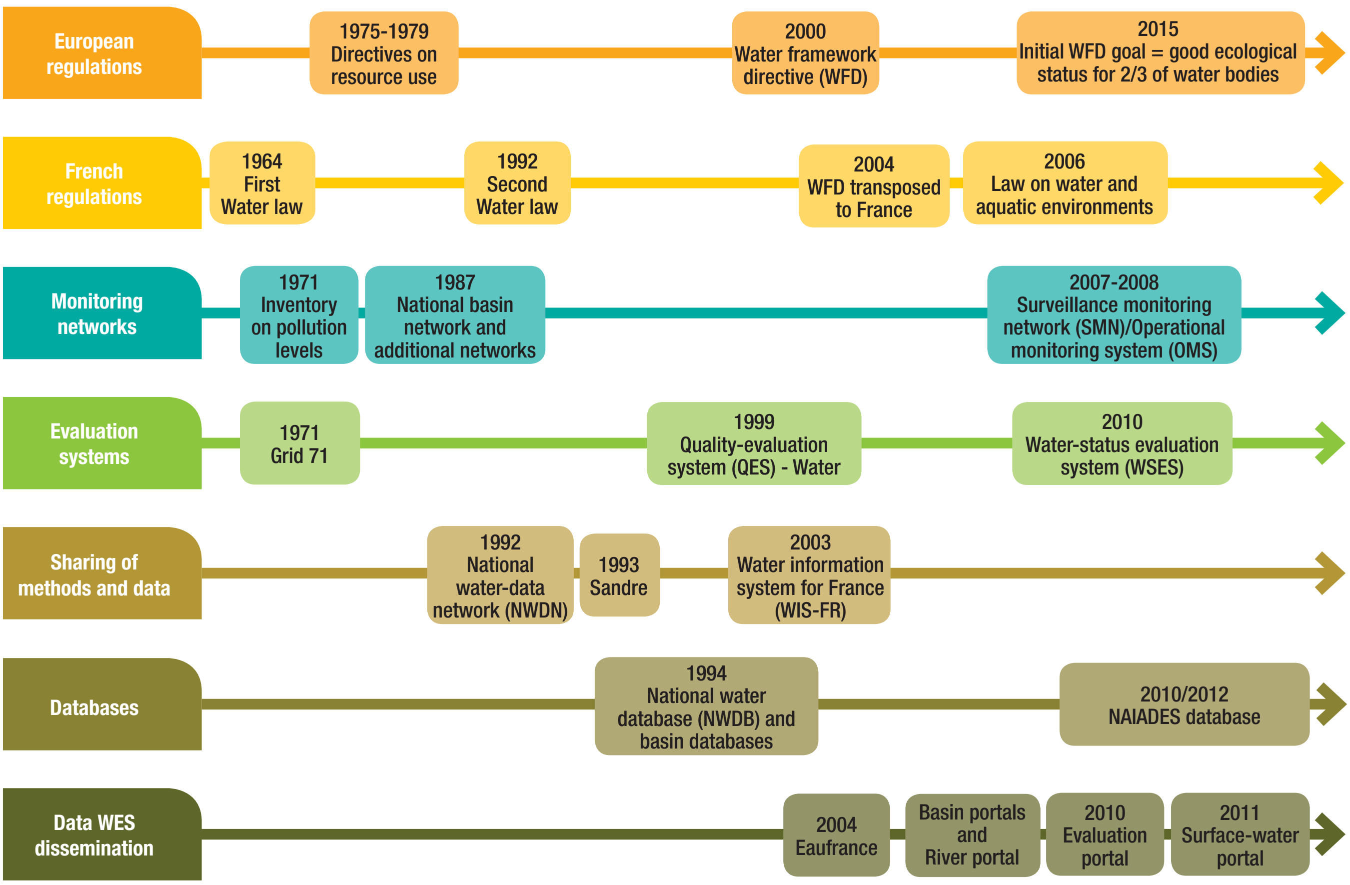
## Progress in monitoring river quality

Currently, 70% of the 4 215 stations monitored since 1991 have data series spanning 1 to 10 years, 20% spanning 10 to 30 years, almost 10% spanning over 30 years. The latter are, quite logically, on the largest rivers.

These increases are closely tied to technical progress (analysis methods), but above all to changes in regulations and in the corresponding evaluation objectives. It is the objectives for quality water that determine the monitoring strategies. The basic concept of comparing parameter values to set threshold values remains, but the targeted parameters have changed significantly. The difference lies in the number and variety of parameters.

| 1971 | 1992 | 2007 |
|---|---|---|
| 957 stations | 1 573 stations | 2 734 stations |
| 66 parameters | 271 parameters | 895 parameters |
| 132 000 analyses | 662 000 analyses | 4 589 000 analyses |

Michel Monsay



Starting with the 1964 Water law and for many years thereafter, the goal was to evaluate the aptitude of water to meet different human needs and the general rule for the evaluation of river status was to detect the worst situation or the situation observed 90% of time (the 90th percentile).

The second Water law (1992) generally pursued the same goals (aptitude of water for uses), but improved the existing monitoring system in two ways.

> First, it increased the number of parameters in quality evaluations (from some 20 for the Grid 71, essentially organic matter as well as nitrogenous and phosphate compounds, to approximately 130 parameters for QES-Water, including the new organic and mineral micropollutants).

> Secondly, it adapted threshold values and took into account the specificity of certain rivers by implementing typologies (rivers with naturally low oxygen levels, rivers with high organic-matter content, rivers with acid water, rivers with high concentrations of suspended matter, areas with peat bogs, rivers with naturally high water temperatures).

The WFD evaluation objectives (2000), included in the third Water law (2006), are very different. They no longer address how water can be used, but the ecological status of the rivers themselves. To achieve those objectives, monitoring and evaluation cover new and more numerous parameters, notably biological parameters which, similar to chemical parameters, are part of the quality elements required to assess the overall status of a river.

Olivier Leroyer – Onema

### Note on methods

The information presented briefly here is drawn from a study that may be consulted on the Eaufrance web portal. The study was based on methods shared by Onema (funding entity), IOWater (study producer) and BRGM (producer of a similar study on groundwater).

In this document, the numerical data is drawn exclusively from the national water database (NWDB), administered by IOWater, which contains the data from measurements carried out up to 2008 and collected from the Water agencies. The data was extracted from the database in February 2009.

### For more information…

See the information on WFD river-monitoring programmes at: http://www.surveillance.eaufrance.fr

See the river-quality data on the sites of the water agencies and offices, and soon at www.evaluation.eaufrance.fr

Find this document on the internet at: http://www.eaufrance.fr/IMG/PDF/surveillancecoursdeau_201006_EN.pdf or www.documentation.eaufrance.fr

Find this document, in french language, on the internet at: http://www.eaufrance.fr/IMG/PDF/surveillancecoursdeau_201006.pdf or www.documentation.eaufrance.fr

Find the complete study, in french language, on progress in monitoring river quality at: http://www.eaufrance.fr/IMG/PDF/surveillancecoursdeau_201006_rapport.pdf or www.documentation.eaufrance.fr

eaufrance The french water-information portal: www.eaufrance.fr

**Publisher:** Patrick Lavarde (Onema)
**Editor:** Christian Jourdan, WIS-FR coordinator (Onema)
**Coordination:** Janik Michon and Isabelle Vial (Onema), Vassilis Spyratos (Ecology ministry), Stéphanie Laronde (IOWater)
**Author:** Katell Petit (IOWater)
**Contributors:** Water agencies and regional Ecology ministry services

This document was drafted in accordance with the national framework for water data and was submitted to the concerned WIS-FR partners.

the Briefs

Communication department, Onema, 5 square Félix-Nadar, 94300 Vincennes. Layout design: Éclats Graphiques. Production: Bluelife. Printed on paper from sustainably managed forests by IME.