43rd International Workshop on Urban and Territorial Creativity
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The River Seine as a Great Garden: The Sources

Ecology & Habitability of the Seine and its Tributaries

Context document

les Ateliers
maîtrise d'œuvre urbaine

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Les Ateliers Internationaux de Maitrise d'Oeuvre Urbaine de Cergy-Pontoise

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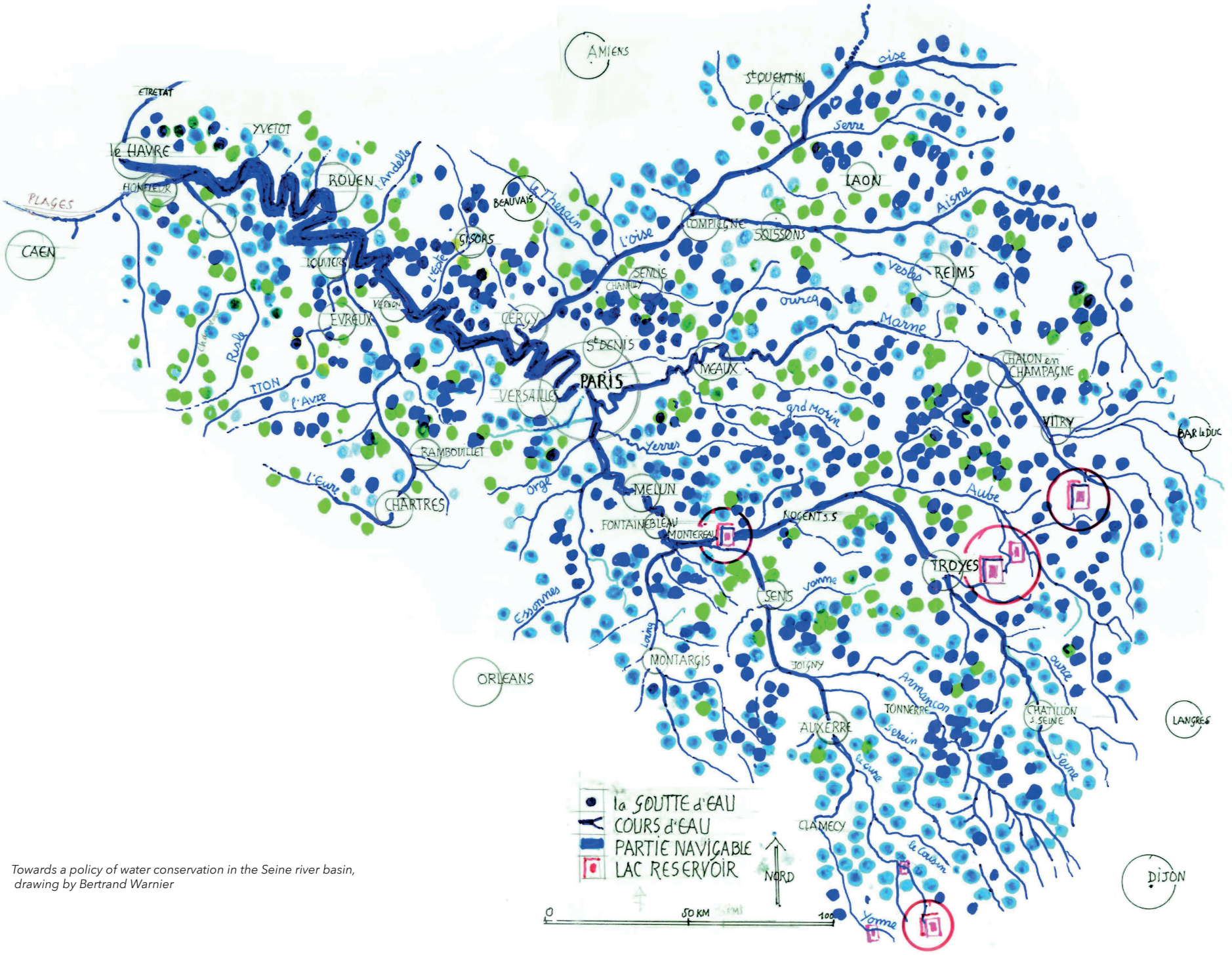


Towards a policy of water conservation in the Seine river basin, drawing by Bertrand Warnier

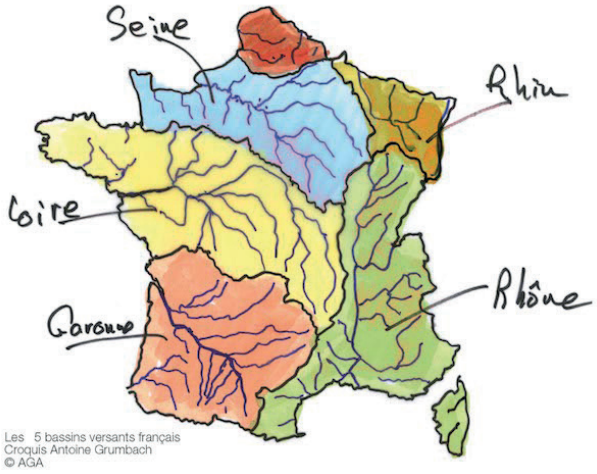
Part 1: The upstream Seine

The Seine basin

The Seine basin is the river's hydrographic catchment. It covers almost the whole Paris Basin. Its area is 78,650 km² and it has 18.3 million inhabitants, including 11.8 million in Île-de-France. It spans four regions: Bourgogne-Franche-Comté, Grand Est, Île-de-France and Normandie; and 28 départements (departments). Although 85% of people live in urban areas, engineered land represents only 7% of the basin. In reality the Seine basin is predominantly rural, with 66% agricultural land and 26% forests and semi-natural habitats.
As the river flows it has an upstream direction, towards the source, and a downstream direction, towards its outlet. The Seine basin can be read in three spatial sequences: the lower valley with the Metropolitan Seine, the heart of a global city with the Metropolitan Seine, and the upper valley with the Upper Seine.

1. **Upper valley, Upper Seine**: a territory of sources and tributaries, agricultural plateaux, vine-covered slopes, rural and peri-urban fringes; the water tower of the Paris metropolis.
2. **Metropolitan Seine**: the most urbanised valley, the heart of a global city integrated into its metropolitan and geographic context.
3. **Lower Seine, lower valley**: an archipelago of medium-sized towns, the transition from peri-urban fringes to the estuary and the sea.

Map of the main tributaries (more than 50 km long) of the Seine river - https://umap.openstreetmap.fr/fr/map/bassin-de-la-seine_402793#6/51.000/2.000

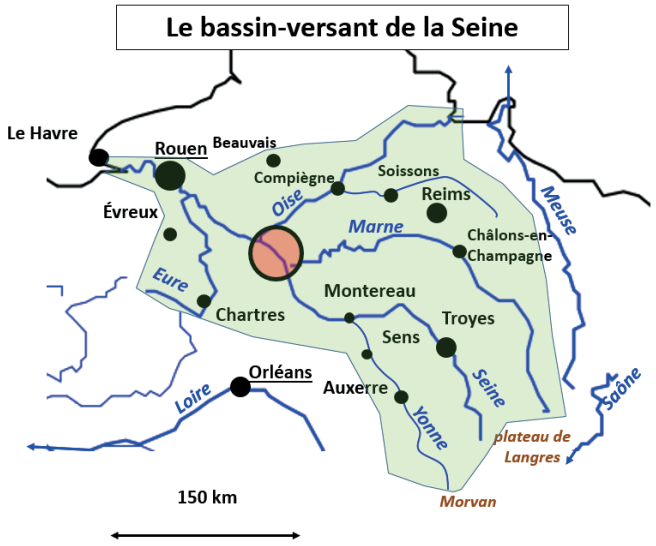


5 watersheds in mainland France - Antoine Grumbach

1. The Seine system

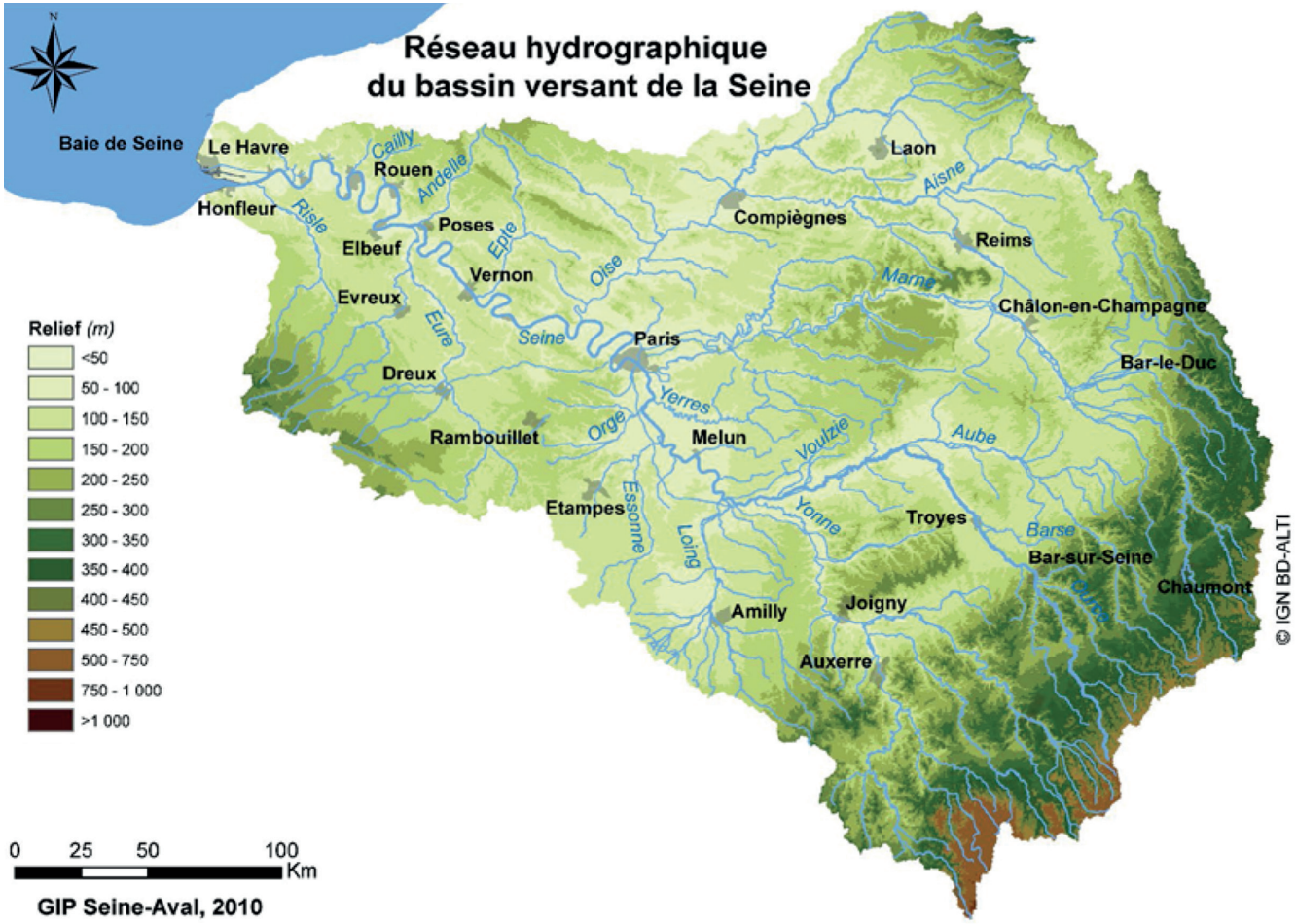
With 23,000 km of watercourses, the Seine catchment forms a genuine system. Any intervention on a watercourse, upstream or downstream, affects the whole catchment. These upstream and downstream relations create territorial interdependencies and therefore conflicts of use.

1.1 The Seine and its various tributaries: the sources of the Seine



Map of the Seine river basin - https://amnistiegenerale.wordpress.com/2021/05/12/le-bassin-versant-de-la-seine-reperage/

The Seine runs for 770 km before emptying into the English Channel between Le Havre and Honfleur. From its sources it is joined by many main tributaries, the Yonne, the Marne and the Oise, as well as about a hundred brooks and rivers. Together they make up the Seine system.



Topography of the Seine river watershed - GIP Seine aval, 2010

The Seine is a lowland river. Rainfall varies across the catchment, from areas with 550 mm per year in the Beauce to others with 1,200 mm per year in the east and west of the basin. Evaporation rates are high. The main tributaries share a similar hydrological regime because they have a temperate oceanic climate, little relief and comparable geology. The basin alternates between high winter flows and low summer flows, with seasonal variations that bring periods of low water and flood.

The Seine's four main tributaries

- Yonne (left-bank tributary) rises in the Morvan massif and meets the Seine at Montereau-Fault-Yonne after 293 km, of which 108 km are classed as navigable. Deified in Celtic times as Icauna, meaning she who gives water, it was long considered the Seine's twin. It is an unpredictable tributary and a major factor in the irregularity of the basin's hydrographic system because it crosses many impermeable terrains. At its confluence it has a greater discharge than the Seine, which leads some to say that it is the Yonne that flows through Paris rather than the Seine. It spans two distinct geological domains, gneissic and granitic massifs in the Morvan, then the sedimentary plains and plateaux of southern Burgundy and Champagne. It connects with the Loire by the Nivernais Canal and with the Saône by the Burgundy Canal.

The river Yonne crossing the city of Auxerre - Tourism office of Auxere

- Marne rises on the Langres Plateau and joins the Seine at Alfortville. At 514 km it is the longest river in France. Its Latin name Matrona, mother, suggests it was a source of wealth. It is a lowland river that draws typical meanders and has a gentle gradient of 45 cm per kilometre. Navigation has been made easier by many works, including diversions and channelisation. Near Paris its course is punctuated by hydraulic structures such as the weirs at Joinville, Créteil and Saint-Maurice, intended to keep a stable impounded level so that both draught and air draught are adequate for navigation. Regulating its discharge and that of its tributaries is complex, notably the Grand and

the Petit Morin. Because it meets the Seine at the entrance to Paris, its variations are closely monitored and feed into the continuous adjustment of regulation on the Seine in order to reduce flooding in the city centre.

The river Marne in Joinville - Joinville tourism office

- Aube also rises on the Langres Plateau. After 248 km through Côte-d'Or, Haute-Marne and Aube it flows into the Seine at Marcilly-sur-Seine. It crosses distinctive landscapes

The river Aube and the typical landscapes from "Champagne crayeuse" - https://www.aube-champagne.com/

in succession: the Barrois wine country, the humid Champagne and the chalky Champagne. Watercourses pass from deep valleys to broad, flat valleys before coming together in the Bassée and then at Marcilly-sur-Seine. Its mean discharge is higher than the Seine's.

- Oise rises in Belgium. After 341 km through the landscapes of Hauts-de-France and the Île-de-France département of Oise, it flows into the Seine at Conflans-sur-Seine, in Yvelines. It has the largest receiving area of all the Seine sub-basins, estimated at 20,000 km². Set on a Tertiary plateau of the Paris Basin, any flood can cause severe inundation, which makes the Oise a feared river. It is regarded as France's third fluvial axis for navigability, helped by numerous canals.

The river Oise in the Aisne area - "La rivière Oise se dévoile aussi dans l'Aisne", L'union, 2022

The Seine basin also includes an intermediate sub-basin formed by secondary tributaries of the Seine and the Marne, such as the Loing, Essonne, Yerres, Grand Morin and Petit Morin, representing 35% of the catchment.

1.2 Upstream as a territory serving the Paris conurbation

The upstream part of the hydrological basin serves Greater Paris by providing resources. This interdependence shows up in works, policies and mandates that shape the upstream and transform its natural landscapes.

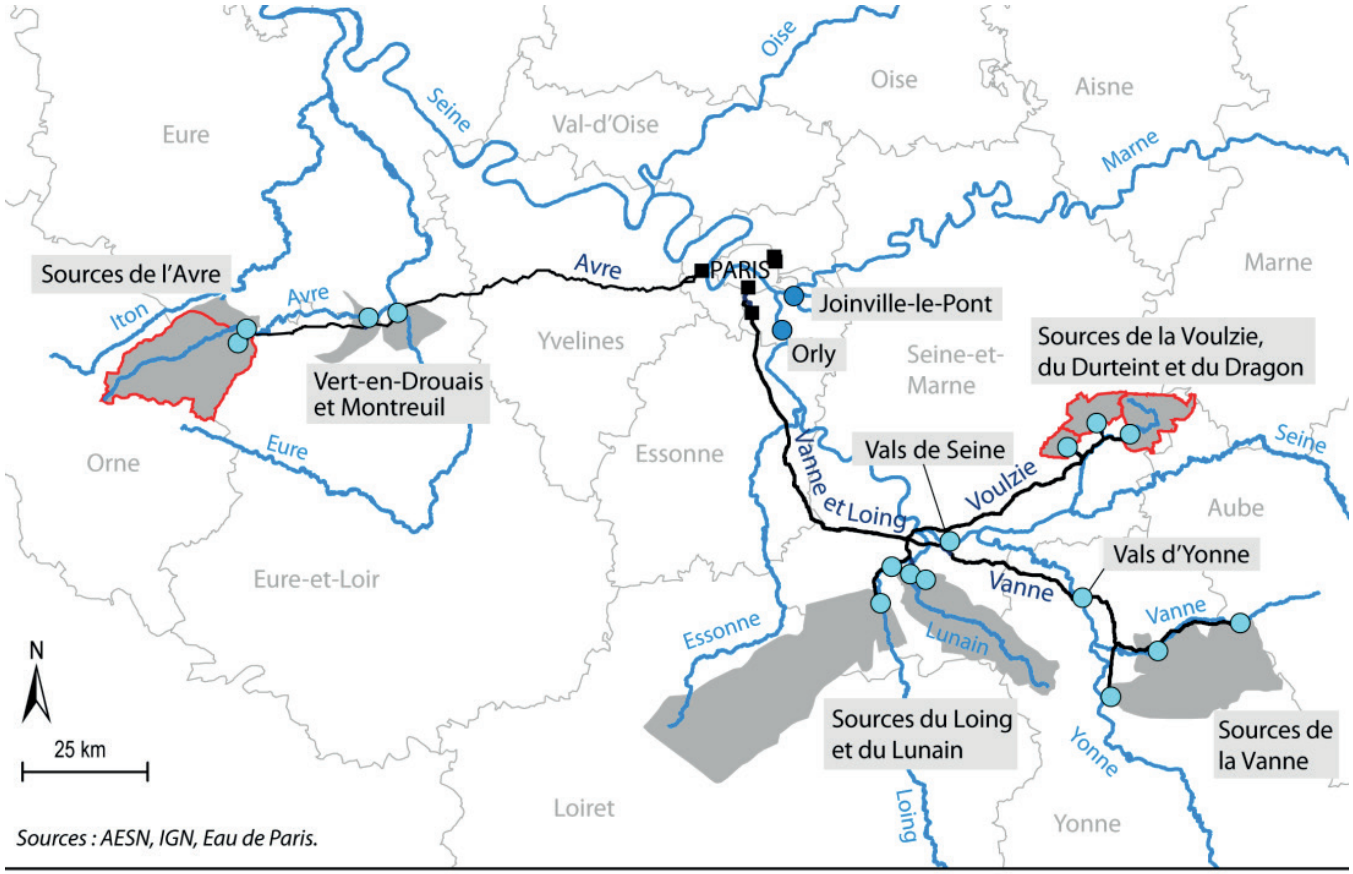
The Vanne aqueduct supplies Paris with water for 150 years - Bruno Mazodier

Drinking water supply

Under the Second Empire from 1851 to 1870, Napoleon III's administration, Baron Haussmann, Prefect of the Seine, and Eugène Belgrand of the Ponts et Chaussées, set out to create two independent pipe networks: one for wastewater and one for drinking water. To provide Parisians with better quality water in sufficient quantity, abstractions were created by diverting springs upstream of the city from alluvial aquifers as well as the chalk and the Champigny limestones. Abstractions supplying Paris have been made since 1865 in the Dhuis in Aisne and Marne, since 1874 on the Vanne in Aube and Yonne, in 1893 on the Avre in Eure-et-Loir, in 1900 on the Loing and the Lunain, and in 1925 on the Voulzie. Drinking water is taken within a radius of 80 to 150 km around Paris and is conveyed by 470 km of aqueducts and 2,000 km of gallery pipelines

These aqueducts are a heritage asset that still supplies the capital. The abstraction footprint covers nearly 1,300 hectares and has 102 abstraction points. Of the supply, 49% comes from groundwater and 51% from the Seine and its tributaries. Today, groundwater is treated at plants built from 2004 onwards at Sorques and Longueville in Seine-et-Marne, at Saint-Cloud in Hauts-de-Seine, at L'Haÿ-les-Roses in Val-de-Marne, and in Paris. About three million users, including 2.2 million in Paris, depend on the Seine for an annual production of 171 million m³ of drinking water.

View on the Vanne aqueduct, Paris City Hall



Mapping of Paris' water collection points in the Upper Seine - Mathilde Resch

Water resource mobilized by the city of Paris
Dark blue dots: Surface Water Intake Point (Seine, Marne)
Light blue dots: Groundwater Intake Point
Light gray zone: Recharge Areas for Groundwater Intake
Black lines: Aqueducts transporting water n or analysis related to water supply.
Black squares: Reservoirs

Towards preserving the resource

Since the intensification of agriculture after the Second World War, chemical inputs have been used on a large scale in the Seine basin. This has clear consequences for groundwater: water quality is gradually degrading because of high concentrations of pesticides and nitrates above the regulatory threshold of 50 mg per litre. Infiltration rates vary with soils and rock. Infiltration may be slow where water passes through successive rock layers, and rapid where it connects with karst systems. Evidence of slow infiltration is found in the persistence of herbicide molecules that have been banned for decades. Some abstraction points have been abandoned because of excessive nitrate and pesticide pollution. Drinking-water supply also depends on river discharge, which is being challenged by climate change. In the Seine basin, the discharges of the Seine and its tributaries could fall by 30%, temperatures could rise by 2°C and aquifer levels could drop by 2100.

To address these issues, Eau de Paris, the authority managing the capital's water supply, uses regulatory tools such as protection perimeters around abstractions, supported by land acquisition up to 150 km from the capital where water is drawn. The City of Paris owns about 850 hectares, kept as meadows or woodland where activities are regulated or prohibited. Some farmland is made available to farmers in exchange for practices that protect the water resource. Eau de Paris promotes ecological management in source areas by supporting the development of organic supply chains through financial aid and by encouraging tree planting on its abstraction sites for carbon sequestration. It works with farmers in the Voulzie catchment in Seine-et-Marne and around the Vigne sources in Eure, Eure-et-Loir and Orne, offering technical advice and coordination. Eau de Paris also partners with local water syndicates such as SIAAEP du Bocage, SIAEP de Nemours Saint-Pierre, SIE de Grez Montcourt and Syndicat Sens Nord Est.

Information panel on water collection in Villeron installed by Eau de Paris - Mathieu Génon

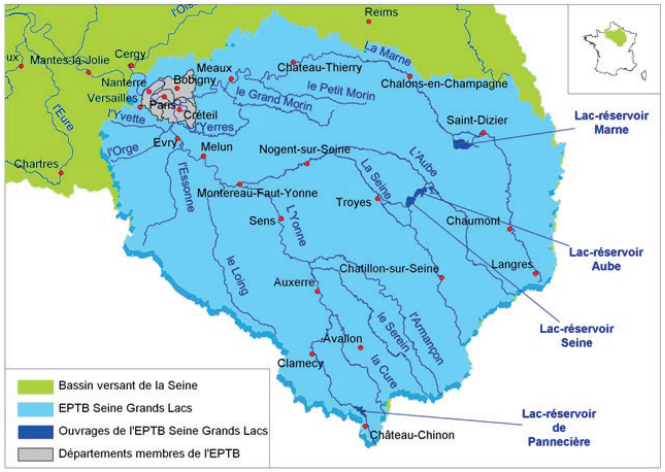
Flood prevention

In 1910 the Seine burst its banks, causing damage not seen since 1658. The flood resulted from intense rainfall across the basin and saturated soils. Successive flood waves on the Seine, the Marne, the Yonne and the Loing caused the Seine and its tributaries to overflow and reach record levels: 8.5 metres in Paris and a discharge of 2,400 m³ per second. Before this flood there had been local protection works, for example the Settons dam in the Morvan in 1858 to regulate the Yonne and the Cure, but these were insufficient at catchment scale. The idea of creating reservoirs emerged in the nineteenth century, including the law of 28 May 1858 that established servitudes to maintain floodable fields in the Seine and Marne valleys, but it did not come to fruition.

The Crescent dam creates the Crescent lake - Tourism office Morvan

The 1910 flood left a deep mark because of its disastrous economic impact. There were already reservoirs in the system, but they served navigation needs only. After studies, in 1920 the project to regulate the Seine's discharge by creating reservoir lakes across the basin was confirmed. In the short term, four dams were built in the Seine basin: the Crescent dam on the Cure in 1931; the Bois-de-Chaumeçon dam on the Chalaux, a tributary of the Cure, in 1934; the Champaubert-aux-Bois reservoir on the Blaise, a tributary of the Marne, in 1938; and the Pannecières-Chaumard dam on the Yonne. Most of these also met economic objectives by producing hydroelectricity thanks to the head created.

The four lakes were sited on impermeable ground, either on the granitic massifs of the Morvan or on the Gault Clay of the Humid Champagne. They are now managed by EPTB Seine Grands Lacs. The works are as follows.



Map of the lakes managed by the Seine Grands Lacs Public Company

- **Pannecière-Chaumard reservoir-dam** in the Upper Yonne valley, completed in 1949. It sits within what later became the Morvan Regional Natural Park.
- **Seine reservoir, Lac de la Forêt d'Orient**, defined by earth embankment dams, an off-take from the Seine upstream of Troyes, commissioned in 1966.
- **Marne reservoir, Lac du Der-Chantecoq**, defined by earth embankment dams, an off-take from the Marne and the Blaise, a tributary of the Marne. It lies in the Humid Champagne on a former marsh plain. It controls a 220 km² catchment and was commissioned in 1974, with construction in two phases, 450 ha in 1935 then an enlargement to 4,800 ha.
- **Aube reservoirs, Lacs Aube** consisting of two basins, Lac Amance and Lac Temple, supplied by a diversion from the Aube.

Together they regulate a 1,650 km² catchment. Initial filling was completed in 1991.

With a combined storage capacity of 830 million m³, the four reservoirs regulate low flows by storing water in winter and spring, and they attenuate flood peaks on the Seine and its main tributaries. Filling helps prevent flooding in high-water periods, and drawdown sustains low flows by adding discharge. In summer and autumn, when discharge is low, stored water is released to support different activities, including drinking-water supply, industry, agriculture and inland navigation. Maintaining discharge helps to prevent flooding, ensures better water quality for consumption, supports ecological balance in the river and allows year-round navigation. The reservoirs are emptied every ten years for desilting and maintenance.

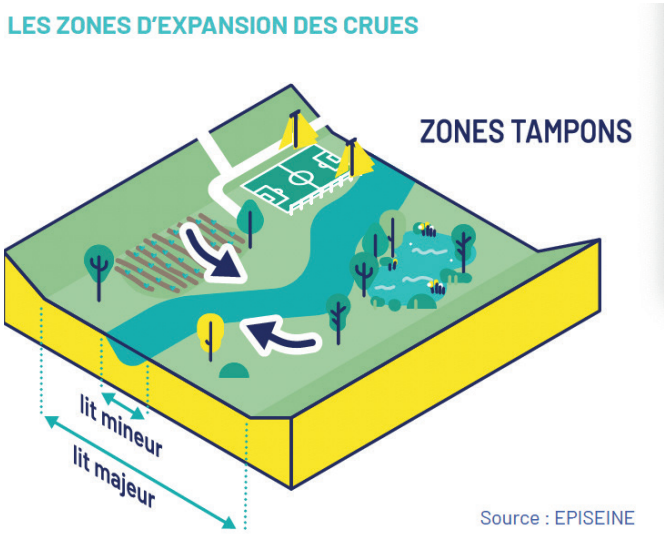
Built to serve and protect Paris, the first lakes were constructed upstream on the Seine under the impetus of the State and the départements between 1931 and 1950 in sparsely populated areas. However, because they cover hundreds of hectares and involve major civil-engineering works, they were contested locally. The Lac du Der-Chantecoq entailed clearing forests, farms and ponds and the destruction of three villages, Chantecoq, Champaubert-aux-Bois and Nuisement-aux-Bois; only the upper part of the village church remains. The Lac d'Orient required clearing a substantial part of the Aube forest, known as one of the largest oak forests in eastern France. These large lakes are major technical works. Their construction brought new road infrastructure that altered the landscapes. For the Lac d'Orient alone this meant 26 road bridges, two SNCF bridges and two footbridges. Heavy infrastructure such as feeder canals and diversion channels also cuts across and privatises the landscape. Where lakes are ringed by dykes the water is often not visible from nearby roads.

As a sign of re-appropriation, local actors have developed activities around the large lakes, combining environmental protection and tourism. These places have become areas for leisure and nature. Their landscape appeal supports tourism on the water, including bathing and sailing, in all seasons. In some areas they provide ecological reserves for fauna and flora. Parts of the new wetlands are managed extensively by introducing Highland cattle or Polish horses.

In a flood, what happens upstream of these dams and retention works? Upstream départements regularly experience floods that do not reach Paris and therefore receive less media coverage, which fuels a feeling of abandonment by the public authorities. During floods, navigation weirs are lowered so that floodwater can pass. This is not enough to contain sensitive rivers such as the Aube or the Yonne after torrential rain. With fields, meadows, roads and homes inundated, some upstream villages such as Arcis-sur-Aube live to the rhythm of the Aube, or of the Oise and its Grand Morin. Floods are seen as a natural and recurring phenomenon. In the Upper Marne basin, flooding caused by rainwater run-off is increasingly frequent. The causes include land take, the absence of vegetation and some farming practices. Upstream flooding affects urban and rural areas alike and damages farmland.

Upstream and downstream solidarity is well established. It takes shape, among other things, through cooperation between actors such as the Chamber of Agriculture, **EPAGE** and the

communes at sub-catchment scale. At the Seine basin scale, the **EPTB** coordinates the management of **ZEC** (Zones d'Expansion des Crues, flood expansion zones), which provide an additional tool for limiting flood impacts. Located in flood-prone zones that are little or not urbanised, where water can spread and accumulate temporarily, 260 such zones are being developed by EPTB Grands Lacs across the Seine basin.



Flood expansion zone - Episeine

There is now a clear need to reconcile uses that are in conflict. On the one hand, the safety of structures and the hydrological function of the basin must be ensured. On the other, there are tourism functions to provide. For example, dykes are not planted for stability monitoring reasons, such as the risk of collapse, breach or movement, even though current ecological priorities would favour more planting. Cyclists who use the service tracks forget that access for motor vehicles must be maintained. Reservoirs are drawn down in summer to support low flows, precisely when demand for bathing is highest, which creates late-season hygiene issues and leads to bathing bans.

Despite their size, these works are not sufficient to avert a 1 in 100 year flood, the scenario most feared in Paris. With land no longer available and the dams having shown their limits, new modes of regulation now favour more flexible and intermittent systems such as flood expansion zones.

The Loing canal near Moret-sur-Loing - Mélanie Rostagnat

Flood-prevention measures are complemented by the **Bassée scheme**, upstream of the Seine and Yonne confluence. This is a natural flood expansion area of the Seine that was heavily exploited for sand and gravel extraction. It is now the subject of further works to strengthen the defence system by building dykes to raise the margins of existing water-filled pits and to create future flood expansion zones. As with the reservoir lakes, the project is widely contested by local populations because of its consequences for biodiversity.

Navigability of the Seine: upstream and downstream trade

Downstream demand shapes upstream production. The river is the main supply axis for Paris. The Seine carries trade from upstream, notably from the Yonne and the Marne.

Historically, fuelwood and timber for construction came almost exclusively from the upstream part of the Seine basin. From the mid sixteenth century to the twentieth, the forests of the Morvan supplied Paris during a serious heating-wood shortage. Timber was transported by log floating. It was cut and sent down the streams of the upper Yonne, the Beuvron and the Cure. In the nineteenth century, navigation on the Yonne and the Upper Seine was very active upstream, with about 4,500 timber rafts descending the Seine each year. Villages near the Seine and Marne confluence served as depots. Ivry-sur-Seine on the left bank received timber from the Morvan, while the Port des Carrières on the right bank received Champagne wines and charcoal from Auvergne. Waterways also supplied coal from the Aube and the Loire, for example 46,000 tonnes in 1866.

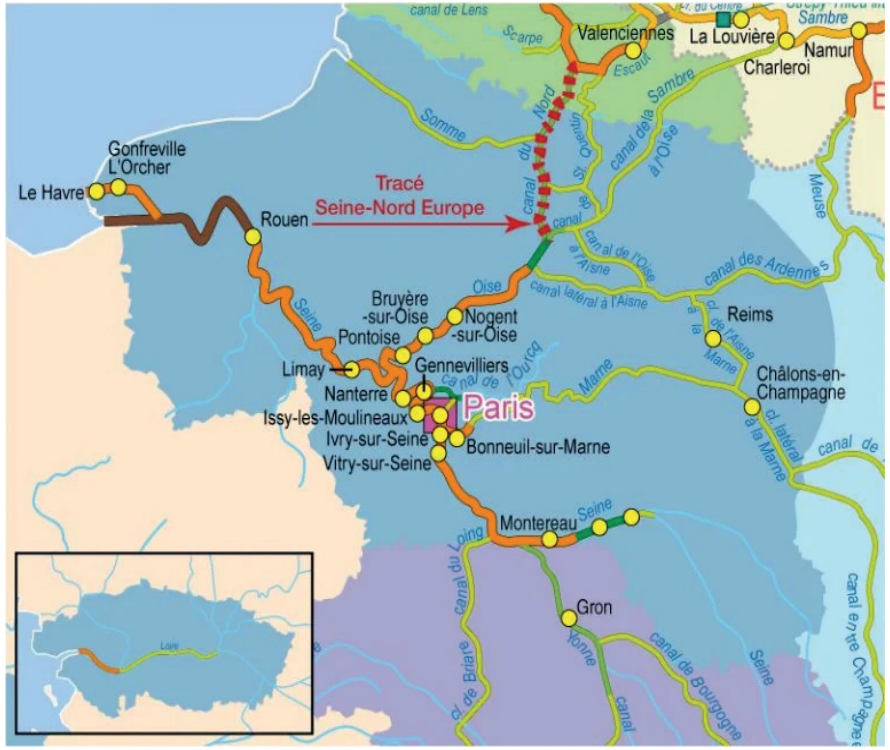
Between flood and low water, navigation is complex. Other factors also matter, including the strength of the current, silting of the riverbed and bank erosion. The wish to engineer the river is long-standing. As early as the Middle Ages, navigation difficulties caused conflicts of use, for example with mills or with *bateaux-lavoirs*(floating washhouses), and with fishing grounds. Works were under taken to improve navigation. Channelisation of the Seine in 1846 was seen as a response to major floods and aligned with hygienist ideas about the circulation

of fluids, but it was above all intended to facilitate navigation.

Inland navigation drives landscape modifications upstream, including changes to the low-flow channel of the Seine. There are cases where secondary channels were filled for hydraulic works or after natural processes such as the abandonment of a channel following a flood. There are also cases where islands were merged to increase current in the main channel. More rarely, artificial islands were created in areas with many meanders, as on the Upper Seine or the Yonne. At Marolles-sur-Seine, just downstream of Montereau-Fault-Yonne, there is an example of a meander cut-off. More recently, in the 1970s, the Seine Navigation Service cut through trains of meanders between the Aube and Yonne confluences to meet navigation needs.

The Loing canal near Moret-sur-Loing - Mélanie Rostagnat

Canals were built to support inland navigation and to enhance trade with the rest of France. In the Upper Seine basin these include the Loing Canal, opened in 1723, which links the Seine basin to the Loire; the Burgundy Canal, opened



Map of navigable waterways in the Seine basin - VNF.
The gauge wets wider as the Seine river comes closer to the sea. The map also show the large canal project linking northern Europe to the Paris region.

in 1832, which links the Seine to the Rhône basin; the Nivernais Canal, opened in 1842, which links the Loire and the Yonne basins; and the Upper Seine Canal, opened in 1846 and closed in 1898.

After a period of decline in favour of road haulage, bulk river transport has again become an economic and ecological priority for the State, which aims to open the French network to international trade with northern Europe. About 18 million tonnes are carried per year. From upstream come mainly agri-food products and aggregates from alluvial sand and gravel operations in the Bassée, which supply the metropolitan area with about 3 million tonnes per year. The waterways also provide, in the reverse direction, an outlet for waste, in particular at the ports of Saint-Maximin in the Oise and Marolles-sur-Seine between Paris and Nogent-sur-Seine. Some waste also transits on the Marne, including by a container line to Précy-sur-Marne. Waste sent upstream mainly comes from major urban and transport projects, such as fill material and inert waste that includes concrete, bricks and plaster.

With the merger of downstream river ports into **Haropa Port**[1], France's leading freight port and the fourth in Europe, the authority aims to continue improving navigability on the Seine

1 Port authority that brings together the ports of Paris, Rouen and Le Havre

for reasons of profitability. The return of river transport implies upgrading waterways upstream of Paris to large-gauge navigation, especially for the port of Nogent-sur-Seine, known for cereal exports. Vessels are longer, wider and carry more containers, which makes it necessary to widen waterways and to raise bridges. Upstream, industries along the axis from Bray-sur-Seine to Nogent-sur-Seine stand to gain a more direct and less costly transport route. One example is Soufflet, an agri-food group based in Nogent-sur-Seine that specialises in the collection, processing and international trade of cereals and derives 61% of its turnover from exports, mainly by waterway. The project to upgrade to large-gauge navigation between Bray-sur-Seine and Nogent-sur-Seine, led by **VNF** (Voies Navigables de France), focuses on the Bassée. The section is currently navigable for vessels of 650 to 950 tonnes. It would be dredged, widened and engineered, and the curves straightened, so that 2,500 tonne vessels can navigate. First imagined in 1890 and abandoned, then revived in 2008, it was declared of public utility in 2022. Over 28.5 km the project's local area of influence would affect 350,998 inhabitants, and 15 communes in the départements of Seine, Marne and Aube would be directly impacted.

Like a motorway that cuts through a landscape, these new river infrastructures become foreign to the territories they divide, to the detriment of the ecological balance of the waterway.

1.3 Hydrological hazards and climate change

The Seine catchment is notorious for its flood risks: 4.8 million people are vulnerable to flooding, representing 25% of the population of the catchment, and 3 million jobs. Flood markers, historical reminders of past floods, mandatory since the Bachelot Law of 2003 in municipalities exposed to risk, are a constant reminder of this vulnerability.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Front page of L'Yonne Républicaine on June 1, 2016, after the flood - L'Yonne Républicaine

Two types of floods are observed. Rapid floods affect mainly small sub-catchments and follow intense rainfall events. Slow floods propagate over several days and very large areas, linked to rivers overflowing when soils are saturated by winter Atlantic weather systems. The Seine's tributaries behave differently. Flood waves from the upper Yonne or the Loing take on average 3 to 4 days to reach the heart of the Paris conurbation, compared with 6 to 8 days from the upper Seine and the Marne. The basin is experiencing climate change through extreme phenomena: severe low-flow conditions due to declining summer rainfall, and cloudbursts that drive flooding. In rural areas, stormwater run-off carries nutrients mobilised by soil erosion. In addition to pluvial run-off and river flooding, there is a risk of groundwater flooding. Many areas in the Upper Seine are sensitive to this because of their geology: unconfined chalk aquifers (Champagne chalk), limestone aquifers (Tertiary limestones, Brie Limestone in Seine-et-Marne), and the alluvial aquifers of the Seine, the Marne and the Oise.

While the risks and economic impacts of flooding are well known at basin scale, drought is less well understood. Yet it is a major risk in a changing climate and is the focus of numerous adaptation strategies by water actors in the basin (AESN, EPTB Grands Lacs, SDDEA).

The flooding of the Loing River in 2016 left a lasting impact on the region. Seen here in Moret-Loing-et-Orvanne – Sipa Press

Drought is defined as a period of water shortage, cyclical or exceptional, affecting a geographic area of varying extent. During the low-flow period in summer, groundwater levels are particularly low because they depend on the cumulative rainfall of preceding months.

Rising air temperatures and declining summer rainfall increase water temperatures, which harms vegetation and some fish species because oxygen is less soluble in warmer water. Dried

soils lose their capacity to absorb rainfall, which leads to flooding and landslides. These conditions also increase irrigation needs for agriculture, over longer periods, even as the water resource is already under stress. They are also linked to higher evapotranspiration, which reduces river flows. Lower flows reduce the dilution capacity of watercourses, so pollutant concentrations rise. Higher temperatures combined with higher pollutant concentrations can increase the risk of eutrophication, which in turn degrades water quality.

Hydrological hazards and the effects of climate change on water quantity and quality have clear consequences for all water-related activities.

Flood markers in Eragny-sur-Oise - Ville d'Eragny-sur-Oise

Flood markers showing the highest level of water, the year and name of the river - Virages.com

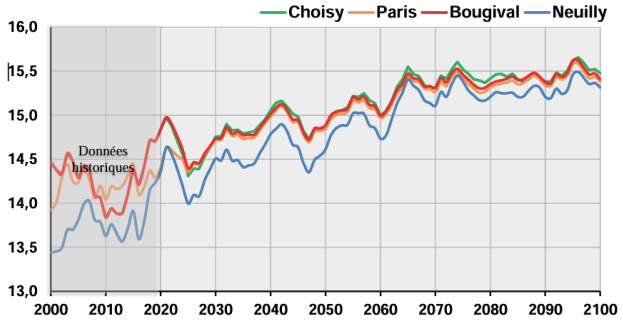


Figure 18 Comparaison des projections de la température de l'eau pour les quatre stations pour le scénario 4.5 : Choisy : la Seine à Choisy-le-roi, Paris : la Seine à Paris, Bougival : la Seine à Bougival et Neuilly : la Marne à Neuilly sur Marne.

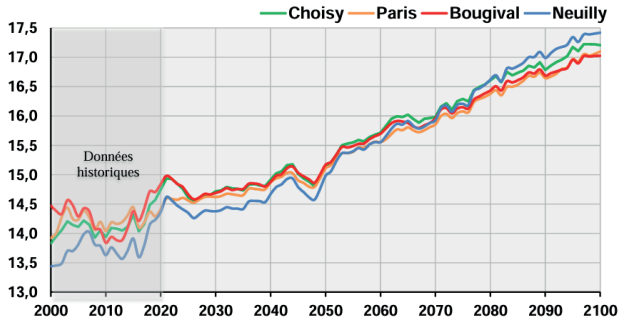
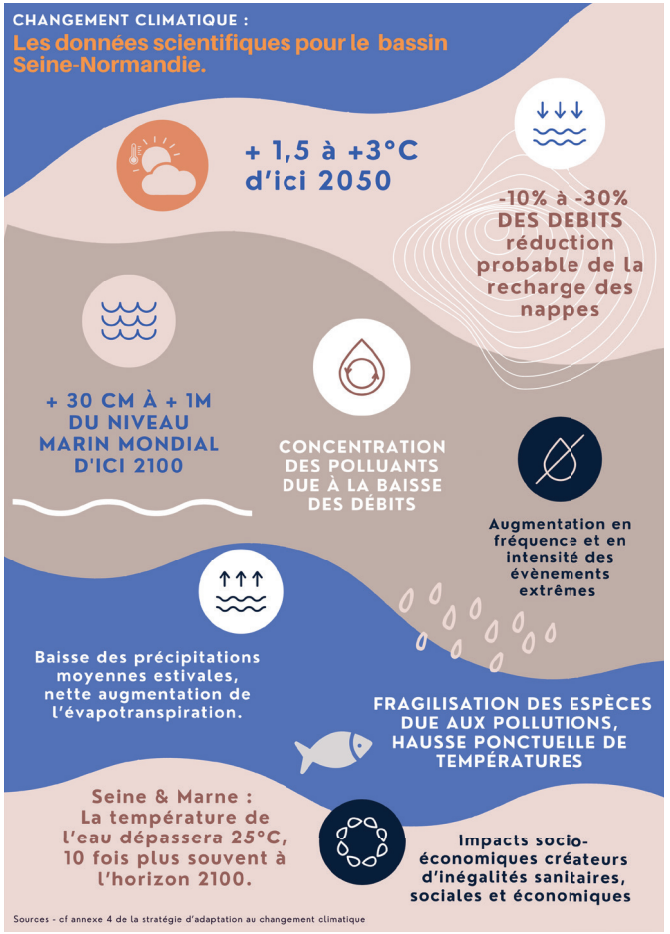


Figure 19. Comparaison des projections de la température de l'eau pour les quatre stations pour le scénario 8.5 : Choisy : la Seine à Choisy-le-roi, Paris : la Seine à Paris, Bougival : la Seine à Bougival et Neuilly : la Marne à Neuilly sur Marne.

Projections of water temperature of the river Seine in 2100 following two main scenarios - Agnès Rivière, Daphné Ladet, William Thomas, Guillaume Le Breton, Agnès Ducharne et Ludovic Oudin, PIREN-Seine 2010



Scientific data on the effects of climate change on the Seine watershed - Agence de l'eau Seine Normandie

- *+1.5°C to +3°C by 2050.*
- *−10% to −30% in river flows; likely reduction in aquifer recharge.*
- *+30 cm to +1 m in global sea level by 2100.*
- *Higher pollutant concentrations as flows decline.*
- *Extreme events more frequent and more intense.*
- *Lower average summer rainfall; marked increase in* evapotranspiration.
- *Aquatic species increasingly vulnerable due to pollution; episodic temperature spikes.*
- *Seine-et-Marne: river water temperatures expected to exceed 25°C ten times as often by 2100.*
- *Socio-economic impacts that worsen health, social and economic inequalities.*

2. Water in the Upper Seine: multiple uses

The catchment is under strong pressure for water. Some 3 billion m³ are abstracted each year, mainly from watercourses, to cover different categories of demand. Public drinking-water supply is the principal use with 73% of abstractions, followed by industry at 22%, and irrigation at 5%.

The multiplicity of uses creates challenges for managing both quantity and quality, and for managing water across time and space. Old and new uses together call for multi-actor governance (for example bathing, biodiversity zones) to meet diverse objectives. Understanding water scarcity and climate-related hazards now happens at every scale, from residents and farmers to industry and elected officials. It also brings conflicts of use that stem from diverging interests: economic, where water is used immediately, and ecological, where water must be conserved.

2.1 Upstream, France's breadbasket

Agriculture is the basin's primary land use. In 2017, the Surface agricole utile (SAU) covered 5.7 million hectares, or 58% of the basin. In Aube, the SAU accounts for 83%, and in Marne, 81%.

Cropping patterns shifted in the 1960s with new **CAP guidlines**[2]. These went hand in hand with land consolidation, which enlarged fields, favoured specialisation, and intensified production for export to Europe. The chalk soils of Champagne, long disparaged, gained value through fertiliser use, and larger farm sizes enabled mechanised harvesting. Champagne became one of the world's major beet-growing regions. Agriculture moved from small mixed farms to extensive specialised arable systems, and mixed arable–livestock farming gave way to specialisations aligned with the basin's varied climates. Agricultural landscapes changed profoundly. Meadows in major floodplains disappeared in favour of large arable fields.

There are three main types of farmland upstream:

- Limestone plateaux: cereals and oilseed–protein crops. These areas show significant run-off and infiltration of residual inputs
- Morvan: specialisation in beef cattle. Dense hydrography, exposure to livestock effluents, and a resulting risk of pollution of surface waters and habitats.
- Champagne: two main zones, the chalklands (Champagne crayeuse) and the Humid Champagne (Champagne humide).

2 The Common Agricultural Policy (CAP) was introduced in 1962 following the Treaty of Rome (1957). It was introduced at European Union level to modernise and develop agriculture.

Champagne crayeuse: continuation of industrial cropping, notably sugar beet, with some viticultural areas. Soils are calcareous and permeable.

Chalky Champagne landscape - PNR - Foret d'Orient

Champagne humide: formerly a livestock area, it evolved through mixed farming before shifting to cereal production. Soils are impermeable, and surface waters are exposed to erosion and run-off.

Ponds typical of the humid Champagne region - Terre Vivante

Regional produce is recognised by various protected designations (AOC, AOP, IGP) that signal terroir quality, including Volaille de Champagne, Chaource cheese, Champagne, Label Rouge products from Champagne, and the bries of Meaux and Melun

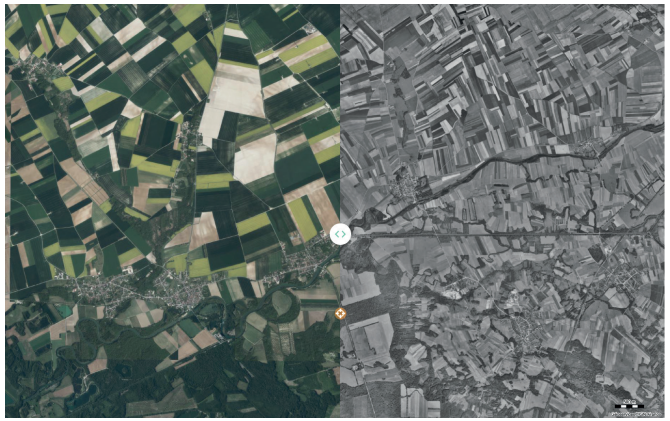
Champagne vineyards in the Cote des Bar area of the Aube department near to Baroville - Freeprod

The Upper Seine is also a wine-producing region in Marne and Aube. Viticulture centres on champagne. The downstream market, with its growing demand, structured the sector. From 13,650 hectares in 1964, the Champagne vineyard now extends to 36,300 hectares for roughly 20,000 growers and 300 houses. It is high value added, with major houses such as Moët & Chandon in Épernay. At Verzenay there are 416 hectares farmed by 376 operators, proof that small plots are viable. While agricultural landscapes have been wholly transformed, the wine landscapes have remained stable.

Although the upstream territory was already agricultural, shifting cropping patterns converted natural areas to farmland, fragmenting ecosystems. Intensive agriculture puts pressure

Champeau-en-Morvan - Communauté de communes de Saulieu

Beauce farms and grain storage silos - Thierry Cantalupo



Transformation of agricultural land in Marcilly-sur-Seine (1950–1965 on the left, today on the right) – Géoportail

on water and soils, as well as biodiversity. Although relatively limited in area for industrial crops at about 5%, agriculture still requires water abstractions for irrigation. These are taken from aquifers, but farmers may also pump directly from canals or rivers. Notable abstractions are concentrated on the Beauce plain. Intensification also brought widespread use of chemical inputs. Aube and Marne are among the French départements that consume the most pesticides and synthetic fertilisers, threatening water quality and biodiversity through run-off. Input use is a source of upstream–downstream conflict because it directly affects abstraction water quality. Even so, willing farmers are working with water producers to help preserve the resource. Eau de Paris offers payments for "environmental services", on the order of a hundred euros per hectare, to farmers who forgo plant-protection products.

2.2 Water, the driving force behind industrialisation

Water in the Seine basin has powered industrialisation, long reshaping the river landscape and the basin's economic and social conditions.

In the 11th & 12th Centuries people occupied and engineered valley floors. To meet demand for bread, medieval milling expanded, with mills installed on the Armançon and the Serein. Cistercian monasteries across the Upper Seine set up mills and millraces; traces remain on the Oise and the Bièvre. They transformed the fluvial space by draining valley-floor marshes and creating canal systems to irrigate meadows in winter. On the larger watercourses there were bridge mills and pile-supported mills. Gradually, mills multiplied in the valleys, replacing human power, including fulling mills for felting woollen cloth, and in the 12th and 13th centuries bark mills for oak bark and tilt hammers for iron. This proliferation of hydraulic installations marked the beginnings of industry.

Postcard depicting the leather industry (tanneries and spillway) in Bar-sur-Seine, in the Aube department, early 20th century - delcampe.net

A true craft economy grew up along the valleys around river trades: the cloths of Lagny and Provins, wheat from Chartres, wools from Meaux, leathers from Auxerre and Sens, parchments from Étampes, linens from Beauvais and Reims. On the Seine's tributaries these towns used running water and found markets in the capital through river trade. In Champagne-Ardenne, hydraulic resources were decisive. Industrialisation was not confined to towns. It extended through the valleys, linked to interfluves where raw materials originated, including ores, timber, and fabrics made in villages.

Postcard showing the Renault agricultural machinery factory and the Darley Steam Factory in Nemours, 1911 – fortunapost.com

Hosiery in Aube, notably Troyes, metalworking in Champagne-Ardenne, the maltings of Reims: industry was widespread upstream and drew on an excellent transport network by road, river and rail, and on a large local labour pool. Although the territory suffered decades of deindustrialisation, it adapted by specialising in sectors that match its strengths. Today the upstream area is notable for agri-food industries such as Soufflet in Nogent-sur-Seine, which benefits from the basin's cereals, and for energy production and distribution at the Nogent-sur-Seine power station, as well as chemical and pharmaceutical industries.

Industrial activities benefit from proximity to rivers for access to inland waterways and for pumping groundwater and surface water to cool processes. Upstream also attracts logistics warehouses, especially on the Paris fringe and beyond, encouraged in part by accessible, affordable land. In a predominantly rural territory, this land pressure creates conflicts of use, since the land is also valued for conserving natural landscapes in the face of land take.

The malt house in Nogent-sur-Seine is the largest facility in France of the multi-national group Soufflet, which has now been acquired by InVivo – Soufflet.

2.3 An area of electricity production

Electricity generation in the Seine basin represents 20% of national output. There are two main types of production: using water as a cooling medium in thermal generation, and using water's kinetic energy for hydroelectricity.

The basin has 4 nuclear power stations, one of them upstream. Thermal generation has very large cooling needs and is water-intensive. The Nogent-sur-Seine plant, the first built on the Seine, is a pressurised water reactor station composed of two units that produces on average

18 TWh per year, about 4% of national output. The project was studied after the 1973 oil shock, and the plant was commissioned in 1988. It required major civil-engineering works, including moving 6 million m³ of earth to build a platform raised 5 metres above the river to separate from Seine waters. In addition to substantial abstractions, the plant discharges heated water that raises river temperatures, along with other pollutants.

EDF hydroelectric dam at Pannecière - EDF

First used for its driving force, the production of hydroelectricity became a reality with power plants installed run-of-the-river, along locks and adjustable gates. Many sites then took advantage of river falls and harnessed streamflow. Upstream, there are three main sites, built by private companies that then resell to an electricity supplier: the La Cave dam (at Chartrette, Bois-le-Roi, with a 3.1 m head and an installed capacity of 2.7 MW), the Champagne dam (with a 2.9 m head and an installed capacity of 3.4 MW), and the Varennes-sur-Seine dam (with a 2.6 m head and an installed capacity of 3.2 MW). On the Cure, a tributary of the Yonne, there is a concentration of hydroelectricity with seven hydroelectric plants managed by EDF, producing 80 million kWh per year on their own. Many structures were also built after the January 1910 flood, which likewise generate hydroelectricity, such as the Morge plant near Lake Orient (14 million kWh/year), the plant at the foot of the Pannecière reservoir dam (15 million kWh/year), and the plant on the restitution canal of the Marne reservoir (4 million kWh/year). While these installations neither withdraw nor discharge water, they still impact flow rates (harmful to fish) and bank erosion.

Aerial view of the Nogent-sur-Seine power plant - EDF - MONTEAUX MICHEL

2.4 The Seine as a global tourist destination

The Seine corridor is a flagship tourist destination of metropolitan France, a monument in its own right for Paris. While the Seine Valley generates strong appeal, it is concentrated mainly between Paris, the City of Light, and the Norman coastline, which offers seaside tourism. The 'Entente Axe Seine partnership', a project launched at the end of 2013 by the Métropole du Grand Paris, commissioned a study to define a strategy for enhancing the territories connected to the Seine. It brings together 16 local authorities, all the Établissements Publics de Coopération Intercommunale (EPCI, federations of municipalities) from Paris to the sea. Along the same lines, the CPIER (Contrat de Plan Interrégional États–Région, Interregional State–Region Planning Contract) has the Seine Valley as its area of intervention, defining it as stretching from Île-de-France to Normandy. But what about the attractiveness of the Upper Seine Valley? And of the Seine's tributaries? The upstream territory is not conceived as an integral part of the Seine Valley, yet it is traversed by the Seine and its many tributaries, and offers just as many assets.

A territory between nature and culture, the upstream area has remarkable tourism potential. The upper valley abounds in picturesque villages and medieval towns in Seine-et-Marne such as Provins, a UNESCO World Heritage Site, Moret-sur-Loing and Donnemarie-Dontilly. There are châteaux at Champs-sur-Marne and Fontainebleau, and abbeys such as Vauluisant and the royal abbey of Notre-Dame-du-Lys at Dammarie-les-Lys. Industrial heritage is visible in architecture at the Grands Moulins of Corbeil-Essonnes and of Nogent-sur-Seine. As a

breadbasket, it also offers a gastronomic culture with many local products, Burgundy wine routes, and cider and press trails in the Pays d'Othe.

The upstream area has a strong landscape identity and a recognised natural heritage. Its remarkable biodiversity is reflected in numerous sites listed for their ecological, faunal, and floral interest. The territory is characterised by extensive wooded areas such as the Forêt Domaniale de Fontainebleau, a protected forest, and the Forêt d'Othe. It is a place of passage and a hub for hiking, offering varied landscapes between forest trails and riverbanks. The département of Yonne, for example, has 450 km of marked routes, including 4 GR (Grande Randonnée, long-distance hiking trails). Both artificial and natural bodies of water—such as the reservoir lakes—have given rise to areas of leisure, notably the Île de Loisirs de Bois-le-Roi[3], which offers water-based and outdoor activities. The upstream area is also the focus of major nature projects with several PNR[4] (Parcs Naturels Régionaux, Regional Natural Parks), such as the PNR du Morvan and the PNR du Gâtinais Français. These natural areas also provide local appeal for the inhabitants of the territory.

The creation of a Regional Nature Park aims to reconcile political and environmental priorities. The landscape identity of the PNR de la Forêt d'Orient, located at the junction of four natural regions (Champagne pouilleuse, Champagne humide, Barrois, Vallée de l'Aube), is shaped by the Humid Champagne axis of forests, lakes and bocage. It offers an exceptional setting, with leisure activities on and around water, including sailing, bathing and fishing. It is nevertheless constrained by the progressive drawdown of the lakes at the end of summer to support low flows. Visitor appeal is not limited to the water bodies but extends into the forest and rural surroundings. A protected natural area, the Bassée is also an attractive destination for nature lovers. However, its eco-tourism potential has yet to be fully realised.

As a national ecological corridor and landscape continuum, the Seine is a fundamental movement axis. It is the subject of a greenway project by Vélo & Territoires to connect the river's sources to the estuary, from Troyes to Normandie. Called La Seine à Vélo, the V33 route was partly funded by the CPIER between Paris and Le Havre in 2016, enabling an initial diagnostic. The upstream section of V33 between Paris and Troyes is not yet fully built, nor is there an established route committee. The upstream area is already crossed by the Scandibérique, EuroVelo 3, linking Norway to Spain. One can also note the Île-de-France Mobilités[5] initiative for the regional Vélo Île-de-France network (VIF), which by 2030 should improve cycling along the Seine as far as Melun and Saint-Fargeau-Ponthierry. These greenways need to be conceived beyond a single regional network, since they interconnect with national and even transnational routes. Building cycle routes appears to be a lever for sustainable territorial development, both for tourism and for improving active mobility for residents.

The medieval town of Provins - Richie Chan/Shutterstock

The Fontainebleau's castle - P. Crapet

Ruins of the Royal Abbey of Notre-Dame-du-Lys - Marie Striebel

3 A leisure island is an open-air leisure area in a natural setting, designed to encourage the practice of outdoor sports and activities.

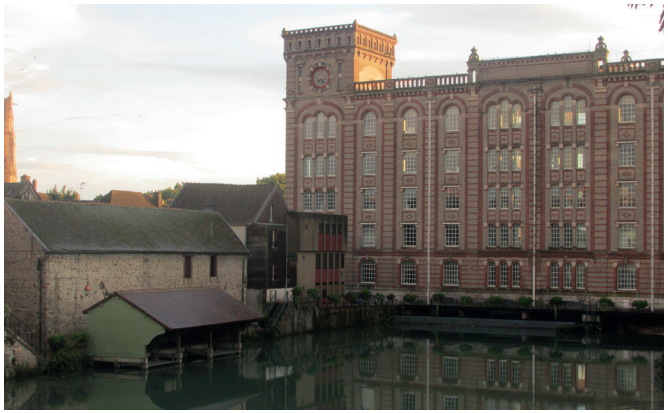
4 Regional nature parks (PNR) are protected areas for the natural and cultural heritage that contributes to their development.

5 a local public authority responsible for organising mobility at the scale of the Île-de-France region

The great mills of Corbeil - Gitka Olivier

Water sports on the Loing River - Citastudio

Landscape of the wet Champagne region, the Temple Lake in the Orient Forest - Pascal Bourguignon



The great mills of Nogent-sur-Seine - Les amis de Nogent-sur-Seine

The goat lodge, wildlife area in the Orient Forest - Espace Faune de la Foret d'Orient

Passage of the Scandibérique on the Loing - Citastudio

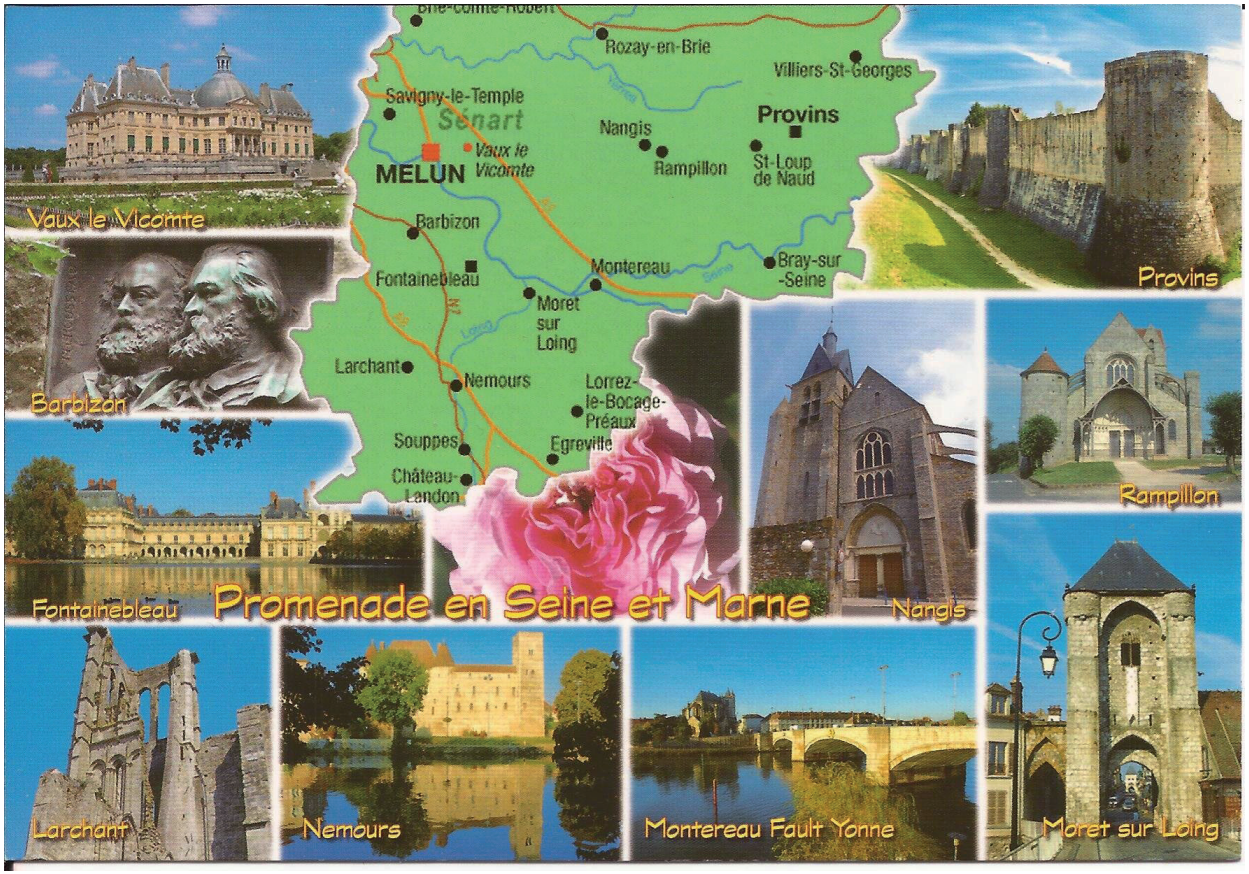
The Burgundy Wine Route, a tourist route - Ricochet69

Moret-Loing-et-Orvanne by bike - Amelie Laurin MORET

Auxois Morvan region - Philippe Hiest

Some towns have succeeded in making water an asset by promoting fluvial heritage and by managing marinas and river halts. River tourism, including navigation, river walks and cruises, is expanding, notably on the Yonne, the Loing and the eastern canals.

Despite the richness of the tourism offer and promotion by dedicated bodies such as Seine-et-Marne Tourisme, tourism remains limited. Given the territory's size, the rail network becomes sparse as one moves away from Paris, making car use almost unavoidable. Accommodation options are relatively undiversified and insufficient. Local authorities offer routes and packages that sometimes lack promotion and networking. The basin's landscape assets sometimes lack facilities, which requires land control and the ability to mobilise public and private actors across the whole landscape. Tourism initiatives can also run up against the requirements of environmental and biodiversity conservation. Some towns have succeeded in making water an asset by promoting fluvial heritage and by managing marinas and river halts. River tourism, including navigation, river walks and cruises, is expanding, notably on the Yonne, the Loing and the eastern canals.



Postcard "Stroll in Seine et Marne"

Focus sheet: The Bassée nature reserve, the blue lung of the Île-de-France region

La Bassée is a complex network of flood channels created by the Seine, which in the valley floor has formed a braided, shifting web of channels, side arms, meanders and water bodies. Lying where the Seine's floodplain widens, it plays a role in flood management comparable to the great Champagne reservoirs. It is one of the largest floodplains in the Upper Seine basin. Set in a low alluvial valley with alluvial soils and subsoils, it provides a drinking-water resource and a highly productive water table. Located between Nogent-sur-Seine and Montereau-Fault-Yonne, it covers 40,000 hectares.

Settled since the 5th millennium BCE, the alluvial forest was cleared for arable and grazing. Long made up of hay meadows and pasture, La Bassée was a major producer of fodder for Parisian livestock and horses, including those of the Republican Guard, as well as for local stockbreeding. With regional agricultural industrialisation, hay meadows gave way to large-scale arable farming. Wheat, barley, oilseed rape and maize now account for 70% of the Surface agricole utile (SAU)

A unique natural area of ecological interest

Today La Bassée is designated as a Zone naturelle d'intérêt écologique, faunistique et floristique for its remarkable vegetation, including alluvial forests and meadows, and for its fauna, including birds, reptiles, insects and fish. It is one of 87 wetlands of national importance identified in the Bernard report of 1994. Since 2002 it has been a National Nature Reserve, which places it within a national strategy for protected areas and species monitoring. It also forms part of the Natura 2000 network for conserving species and natural habitats at European scale. There are two Natura 2000 sites here: "La Bassée" for the preservation of habitats, fauna and flora, and "Bassée et plaines adjacentes" for wild bird conservation. The network aims to maintain rural biodiversity while taking account of human activities, including farming, forestry, hunting and fishing. La Bassée is part of the inter-municipal authority Communauté de Communes Bassée Montois, which brings together landowners, administrations, local authorities and associations to ensure territorial coherence. The Community chairs the steering committee for the Natura 2000 sites.

Computer-generated image of the pilot station pumping station by Atelier 2/3/4 - Atelier 2/3/4

Installation of Renos mattresses for the pilot locker layout - maccaferri

View over a few La Bassée lakes - Les étangs de la Bassée

Of high biological value, La Bassée also provides many natural functions, including flood expansion, aquifer recharge and water purification. The effectiveness of these functions has been reduced by works and alterations that serve human activities, such as navigation improvements on the Seine and agricultural drainage and hydraulic works, with impacts on habitat quality and ecological functioning.

An extraction landscape serving the upstream

La Bassée is a major area for aggregate extraction. Its landscapes have been reshaped to support intensive exploitation of sand and gravel deposits. It produces nearly 8 million tonnes of aggregates, followed by the Marne valley around Meaux with 2 million tonnes,

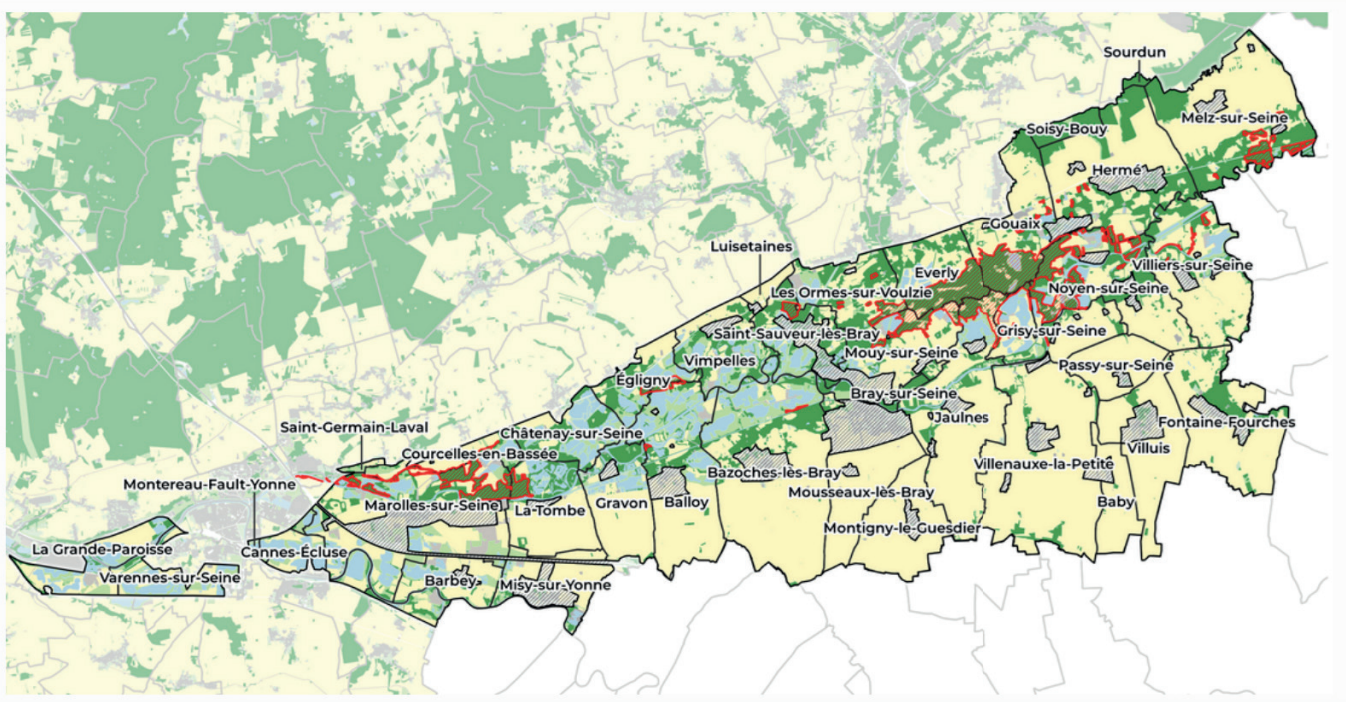
where deposits are becoming exhausted. Île-de-France has favourable geology, notably in La Bassée, but also in the lacustrine limestones of central Brie, the slopes of the Loing and the chert of the Bocage gâtinais. Because aggregates are expensive to transport, extraction close to use sites meets growing demand. The Paris conurbation consumes 3 million tonnes of materials each year for building stock and infrastructure. Extraction requires groundwater inflow that floods pits to create gravel lakes. About 10% of the plain has been inundated in this way. In 70% of cases these pits occupy arable land. The lakes can be repurposed for recreation, such as angling and bathing, or retained as natural habitat for flora and fauna.

Quarry site in Marcilly-sur-Seine - L'est Eclair

Between ecology and economy, controversial projects

Even before the 17th century, La Bassée saw works to improve navigation and the floating of firewood. Hydraulic modifications intensified in the seventeenth and eighteenth centuries with meander cut-offs, then in the second half of the nineteenth century with diversion canals, and since the 1960s to allow larger vessels.

La Bassée is a territory with environmental and economic stakes that are hard to reconcile. Two



Map of La Bassée and its numerous lakes (in red: protected nature reserves) – Ministry of Planning

projects are particularly controversial: the pilot storage cell, and the Nogent-sur-Seine to Bray-sur-Seine canal upgrade.

To support the role of the reservoir lakes and strengthen flood protection, an additional storage scheme is being tested in La Bassée with a first "casier" or storage cell. Led by EPTB Grands Lacs, the aim is to create 55 million m³ of storage by capturing water at the peak of the Yonne flood and returning it to the river after the flood wave has passed. In effect it is an artificial re-creation of natural flooding. The pilot site covers 386 hectares: 192 ha of water bodies (50%), 87 ha of natural habitats (23%), and 13 ha of farmland (3%). According to the project owner it also seeks to restore wetland. In practice it is closer to creating new aquatic habitats than to restoration, since it does not re-establish exchanges with the river.

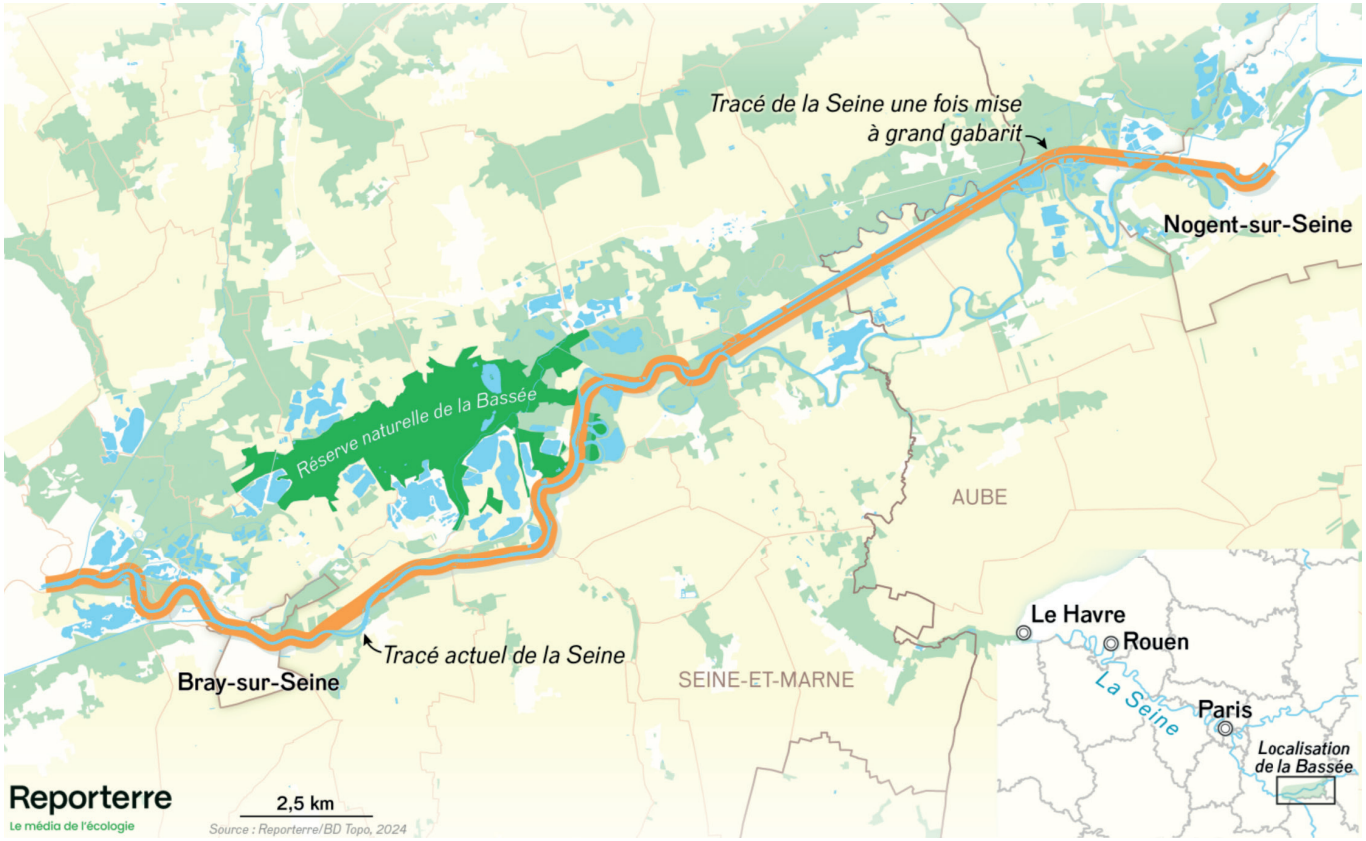
The Nogent-sur-Seine to Bray-sur-Seine canal project would upgrade the waterway to large-gauge navigation so that 2,500-tonne vessels can pass, more than double current capacity. It entails reshaping the Seine's bed and straightening bends to increase freight capacity in the name of modal shift from road to water.

Since the 1995 Barnier law on strengthening nature protection, a public debate is a mandatory step in the legal process for declaring major projects of public utility. A debate was therefore held for the La Bassée project and, at the same time, for the large-gauge upgrade between Bray-sur-Seine and Nogent-sur-Seine in 2011–2012. Works for the pilot storage cell began in 2022

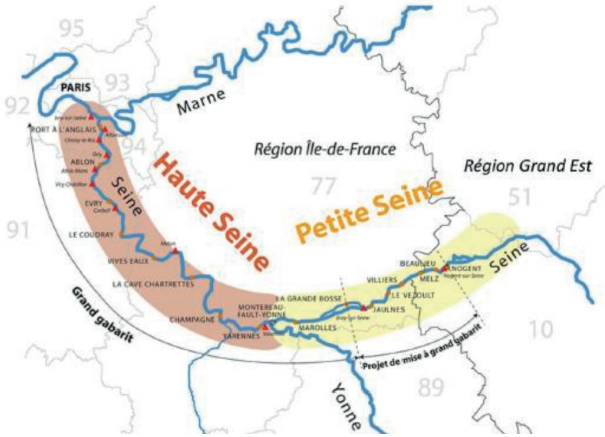
and it entered a test impoundment phase in January 2025. Owing to the non-payment of expected European subsidies, the large-gauge upgrade was frozen in early 2025.

Both the pilot storage cell and the canal upgrade face strong opposition from local stakeholders, including residents, farmers, fishers and elected officials, for varied reasons. Farmers in arable and forage legumes, and landowners, fear loss of agricultural land and devaluation of their properties. Foresters are concerned about tree mortality. Fishers fear impacts on fish communities, since filling could mix species and affect reproduction, with losses of others. Hunters of big and small game, including waterfowl, risk losing established species. Artisanal barge traffic could disappear. Elected officials question the project's landscape integration. How will compensation work for parcels acquired by the State? Some communes lease out parcels that provide essential income for municipal budgets. What tourist facilities will be planned around the pilot cell.

Impacts on natural habitats and biodiversity are significant in an area designated as a National Nature Reserve for its exceptional diversity, with 700 plant species and 650 animal species. Although the project claims to restore wetland, the proposed submersion periods are too short to allow a genuine development of aquatic fauna. WBoth projects are also criticised for appearing to serve agri-industry interests by adapting the plain to cereal export needs and offering a better outlet to the Seine and to seaports. The latter also raises land-use concerns, since upgrading to large gauge would bring a dense web of logistics zones that favour freight interests.



The proposed route for upgrading the Seine to a larger gauge appears in orange, slightly diverging from the course of the Seine (shown in blue) - Reporterre



The project to upgrade the Seine to a larger gauge between Bray-sur-Seine and Nogent-sur-Seine concerns the upstream section of the Seine, nicknamed 'the Little Seine' – Bassée-Montois Community of Communes

Part 2: Living upstream

1. An attractive area

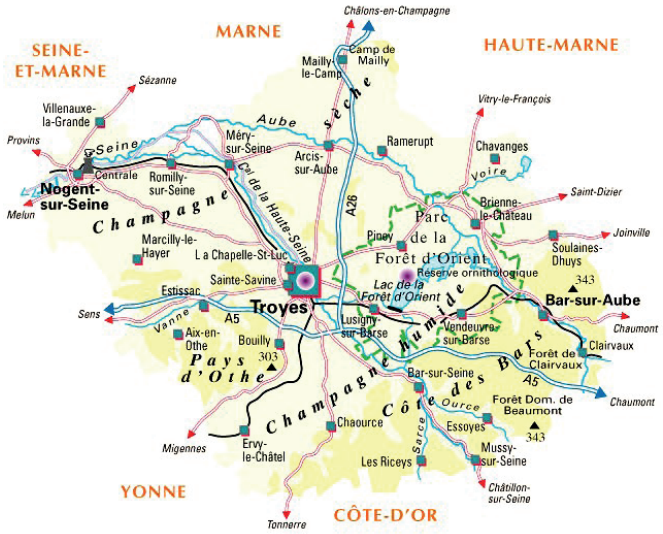
1.1 Unique landscapes and identities

Upstream landscapes are diverse. The Seine and its tributaries shape them according to their geological foundations. Two large sets stand out by geology: the Burgundian plateaux and Champagne.

Aqueduct of La Vanne - Bruno Mazodierblue) - Reporterre

- **Burgundian plateaux**, in the east of the basin. Formed of thick Jurassic limestones. Bounded to the west by the Humid Champagne, a narrow clay band that forms a wet depression, and extended northwards by the Argonne massif of harder sandstone.
- **Chalk Champagne** (Champagne crayeuse), also called Champagne pouilleuse. In contrast, this is a dry, uniform plateau crossed by the wide alluvial valleys of the Seine, the Aube and the Marne. Composed of small plateaux, it offers vast open plains dominated by large-scale arable farming, with marked relief in places, such as thalwegs that cut across the great arable expanses, and residual outlier hills. Surface water is little in evidence.
- **Humid Champagne** (Champagne humide), on the eastern fringe of the Chalk Champagne. Set in a very flat-floored depression with a few hills. Water is omnipresent, with many constructed ponds, although often screened by extensive woodlands and the generally level relief.

AUBE



Map of the Aube department (10) - francefrancefrance.free.fr

In the **Aube** département the valleys of the Seine and the Aube show little relief. The rivers have carved a few small slopes. One slope dominates to the north of the Bassée: the Île-de-France cuesta, the scarp that separates the central Paris Basin plateaux from the Chalk Champagne plain and overlooks the Seine valley. Wide arable plains and natural areas interlock. Agricultural landscapes have evolved. Enlarged cereal fields have come at the cost of vegetated structures such as hedgerows and copses, and of wetlands, for example bank hardening and low-value hydraulic works. Even so, heritage agricultural landscapes are emerging, linked to specific crops: the Humid Champagne, the Pays d'Othe with its hills and cider orchards, and the Barrois wine country with its cleared slopes.

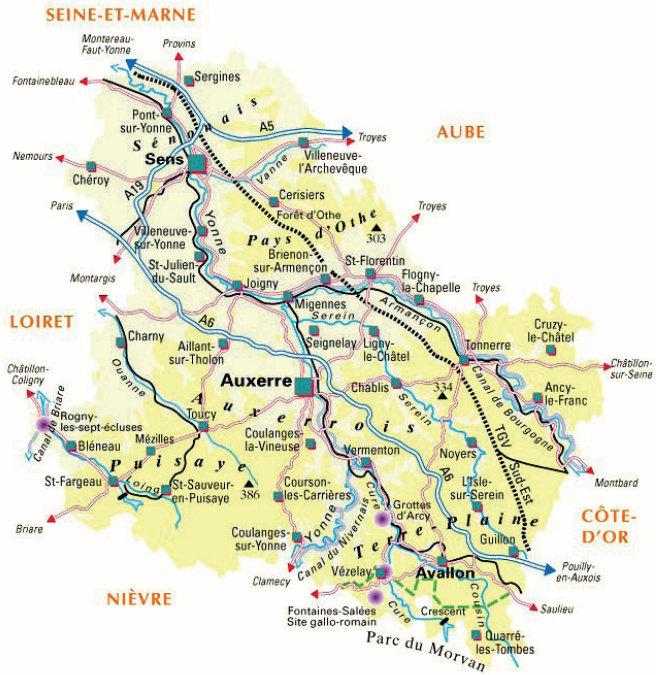
Water appears in many forms: river and main-channel arms, the Bassée, canals and millraces linked to former gravel pits, ponds and pools, which contrast with the arid chalk plains. Its presence is reflected in historic hydraulic architecture: canals, bridges, washhouses and factories. Poplar stands line the alluvial floors of the Seine and Aube valleys.

Rural settlement patterns are varied. A recurring urban form in the département is the string of linear street-villages, set against the small slopes of the Seine and the Aube, successive but not merging. Valley floors hold many compact, isolated villages. There are also numerous crossroads villages, placed strategically at junctions and surrounded by open land. Around medium-sized towns such as Troyes and Romilly-sur-Seine, urbanisation is growing and placing pressure on agricultural and natural landscapes.

YONNE

The **Yonne** département lies on two extensive plateau systems cut by valleys: a chalk set with the Gâtinais and Puisaye plateaux in the west, and a limestone set with the Champagne sénonaise and Pays d'Othe plateaux in the east. Relief is generally moderate, animated by undulations, outlier hills,

cuesta fronts and slopes in the valleys of the Yonne, the Cure and the Cousin. Landscapes are marked by dominant large-scale arable farming and discontinuous forests, with big blocks and small woods. Agricultural intensification has simplified these landscapes and fragmented habitats. Surface-water networks vary with the soils. There are limestone plateaux and valleys where water is scarce on the Burgundy plateaux, represented mainly by the Cure, the Armançon and the Serein, and impermeable plateaux and plains on the Morvan piedmont where landscapes are wetter, with small valleys, ponds and pools.



Map of the Yonne department (89) - francefrancefrance.free.fr

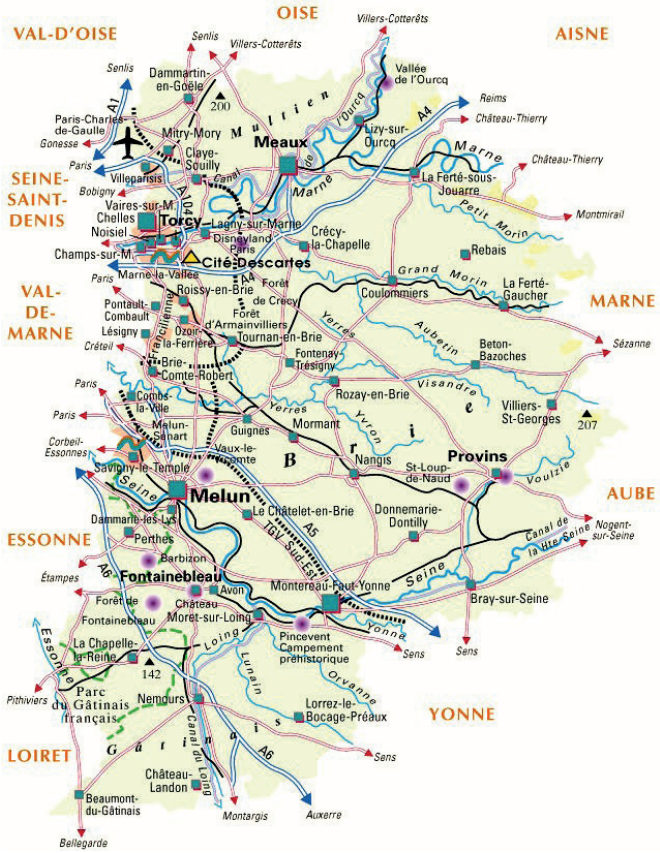
Architectural heritage is tied to staging water, both where it is rare, in permeable limestone sectors that sought to showcase it, and where sources are numerous and water was essential to the local economy.

Druyes Springs Basin - Arsène Jurman

This built heritage is often utilitarian: bridges, quays, dykes, sluices and locks. Water played a central role in the local economy and formed the backbone of the département's urban structure. The Yonne was a key axis for moving timber from the Morvan forests. Towns in the Yonne valley (Auxerre, Tonnerre, Joigny and Sens; Villeneuve-sur-Yonne, Saint-Florentin, Pont-sur-Yonne, Champs-sur-Yonne, Vincelottes, Coulanges-sur-Yonne) developed in close relation to water, near rivers, valleys or floodplains. Village patterns are uneven, but built volumes are dense.

SEINE ET MARNE

Seine-et-Marne comprises three major natural units: the regions of Auxois, Goële and Multien in the north, the broad agricultural plain of the Brie-Montois sector in the centre, and the Gâtinais and the Fontainebleau forest to the south. The département is crossed by the Seine, which receives the Yonne, the Loing and the Yerres, and by the Marne, which receives the Morin and the Ourcq. Despite its proximity to Paris, Seine-et-Marne remains predominantly rural. Only the western fringe, bordering Paris and including the new towns of Marne-la-Vallée and Sénart, is highly urbanised. Agriculture, which covers 56% of the département, has shaped built forms and landscapes here too. The département enjoys a much-valued natural setting, thanks to the protection of about 130,000 hectares of forest, 24% of its area, and its 1,850 km of watercourses.



Map of the Seine-et-Marne department (77) - francefrancefrance.free.fr

1.2 Challenges for attractiveness: a multitude of bassins de vie[6] (functional living areas)

A territory at odds with the Paris Basin

The Seine basin is dominated in its centre by the highly urbanised Paris conurbation, which contrasts with the upstream rural world where intensive agriculture is the mainstay. The Upper Seine stands apart from Île-de-France and shows all the hallmarks of a rural area: demographic profile, low population density, an older population, distance from services, and poor accessibility.

This break with the conurbation is visible in settlement patterns, activity types, and how concentrated they are. Greater Paris forms a continuous urban fabric of 2,000 km² with more than 12 million inhabitants and steady growth. Densities are very high, up to 21,000 inhabitants per km² in Paris. Île-de-France concentrates employment areas and has an over-representation of the highest socio-professional categories. It also concentrates universities and higher-education programmes, and benefits from a strong territorial network and excellent public transport.

The upstream area is characterised by low population density which in reality stems from the extent of agricultural land and the dispersal of settlements and by a tendency towards depopulation, with a negative migration balance resulting from flows towards large cities and the general ageing of the population. The eastern part of the Upper Seine Valley is crossed by the **diagonale des faibles densités**[7], where construction and population density are lower than the national average. However, the upstream départements show positive demographic trends, significantly above the national average, driven by the influence of urban centres such as Troyes (+0.4% between 1990 and 2009). The area is made up of rural communes and urban communes not attached to the Paris agglomeration.

Paris and its urban density - Dcommedrone

6 A "bassin de vie" is a statistical concept defined by Insee. It refers to the smallest geographical unit in which residents can access everyday facilities (such as shops, schools, and healthcare) and employment. It is often used in planning and territorial studies to describe functional living areas beyond administrative boundaries.

7 The "diagonale des faibles densités" (literally "diagonal of low densities") is a geographical concept in French demography, referring to a broad band of territory stretching from north-east to south-west France. It is characterised by low population density, rural depopulation, and fewer urban centres compared to the national average. The term is often used in planning and geography studies to highlight demographic imbalance.

Table 1: Sources: Insee (Institut national de la statistique et des études économiques – National Institute of Statistics and Economic Studies), RP2016 and RP2022 (Recensement de la population – Population Census), principal data, geographical reference as of 1 January 2025.

Population	Département Aube	Département Yonne	Département Seine-et-Marne	Region Île-de-France
Population in 2022	311076	333896	1452399	12 380 96
Population density (inhabitants per km²) in 2022	51,8	45,0	245,5	1 030,7
Population change: average annual rate between 2016 and 2022, in %	0,1	-0,3	0,6	0,4

The Upper Seine is ambivalent. It bears the imprint of a strong industrial history that once attracted people but is now in decline. At the same time, and perhaps above all, it is a territory of nature that can still attract for its living environment, accessibility, housing offer, and artisanal, agricultural and wine-making traditions.

A high-quality living environment

Upstream offers exceptional quality of life, with wide open spaces and preserved natural landscapes of rivers and forests. These natural areas support varied leisure: walking, fishing, hunting, cycling, and water activities. This large rural territory offers quality of life and proximity to the urban poles it relies on. Nearness to Île-de-France by road and rail is a major factor in its appeal. These two factors attract new rural residents who can combine work with a more pleasant living environment.

The rural area is also a recreational space. There is a pattern of weekend second homes in the south-east of the Paris region extending into Yonne and Côte-d'Or. Yonne and Aube, for example, have notable rates of second homes, 10.5% and 5.1% respectively.

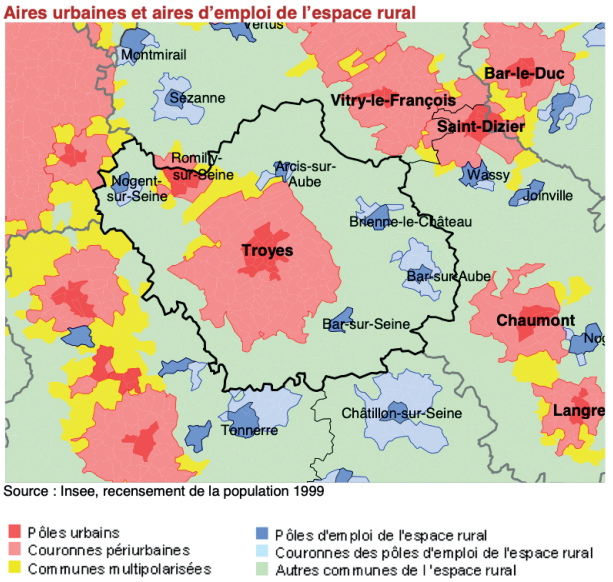
A rooted agricultural and industrial identity

Upstream territories have strong agriculture, and their industrial share is above the national average. Favourable practices on cereal plains and plateaux and in the Champagne vineyards have helped. Upstream also carried long-standing, lower value-added industries such as foundries, hosiery and assembly workshops, using river power and easy fluvial access to Paris via the Marne. The area specialised in major sectors such as Reims textiles and Ardennes steel, and in other activities including extraction, metalworking, joinery, ceramics, agri-food and paper making. For a long time, these job opportunities made upstream attractive. Under land pressure in neighbouring countries, notably Belgium, the Upper Seine drew foreign workers thanks to low land prices in Champagne. Seasonal agricultural labour still comes, especially for the grape harvest.

The progressive industrial decline of the 1980s reshaped models. Agri-food replaced traditional Champagne-Ardenne industry, with wine production and vinification and with food processing such as sugar, cheese, and meat processing and preservation. After de-industrialisation, some firms closed and others moved headquarters and operations closer to Paris, and the workforce followed, with Champagne-Ardenne[8] employment down 25% between 2001 and 2011, in search of opportunities.

8 A former administrative region of the north-east, it has since been part of the Grand Est region following the territorial reform of 2016.

From the medium-sized town to the village: a network across a large territory



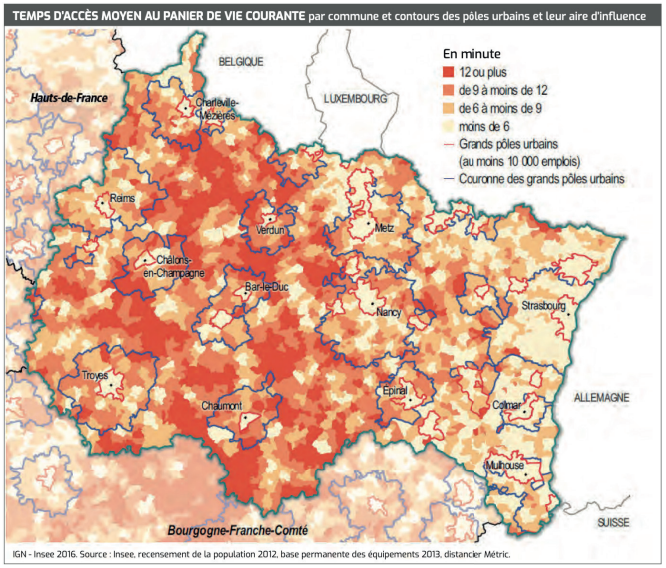
Urban areas and employment areas in rural areas in the Aube department In red, urban areas. In blue, employment poles in rural areas. In green, rural areas.

Each town grew from multiple drivers, whether tourism, administration or industry. Almost all upstream towns formed and developed around water as a central element. Water steered many towns towards transport or industry. Growth in Upper Seine towns is also tied to the transformation of their rural surroundings; they act as central places for rural zones, though their reach remains limited. Agricultural specialisation also structures urban poles by assigning strategic and logistics roles near production sites. Auxerre, for example, concentrates meat processors.

Medium-sized towns such as Troyes, Saint-Dizier,

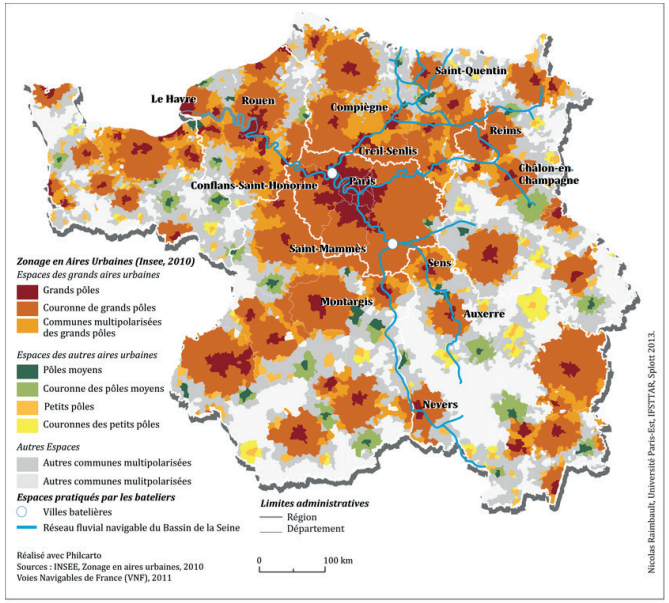
Sens, Auxerre and Châlons-en-Champagne polarise space and attract population, acting as urban poles essential to rural vitality. Long neglected in national spatial policy, and despite deindustrialisation, they still provide central functions, employment, services such as health and personal care, and large-format retail in contexts where small shops tend to disappear from the countryside, all essential to rural communes. Some towns act as multi-functional intermediate poles with a tertiary bias, such as Troyes or Épernay. Others act as intermediate poles offering public services and local services, such as Châlons-en-Champagne.

There are many bassins de vie upstream and they are not limited to medium-sized towns. The upstream forms a network of complementary poles across neighbouring territories: major urban centres, then communes that act as relays to those poles with complementary offers, and finally local poles that cover everyday needs.



Average travel time to shopping centers for everyday goods by municipality and urban centers and their areas of influence in the Grand Est region - IGN, INSEE

Road corridors structure the territory and make it accessible by linking living areas. A relatively dense road mesh supports business parks at strategic locations and patterns of peri-urban growth. Road and rail networks are less dense than in the heart of Île-de-France, leaving room for large agricultural parcels. Île-de-France Mobilités, the regional transport authority, links part of the upstream territory to the conurbation by rail via Transilien line R, with competitive journey times to Paris. Elsewhere, public transport is primarily road-based, through départemental and basin-level networks run by local authorities and delivered by multiple private operators.



The Seine Basin and Urban Area Zoning - Nicolas Raimbault

Towards economic renewal

Upstream territories are evolving, with development projects to revitalise the local industrial fabric and modernise business areas. Yonne has leveraged significant industrial and artisanal potential thanks to major transport infrastructure that makes it a bridge between Paris and Burgundy. Yonne's industrial base is dense, with strong shares in intermediate goods and agri-food. With a substantial labour market of around 20,000 firms, including Auchan, Renault and Hermès, Yonne is the most attractive département in the region. Other territories, such as the Communauté de communes Moret-Seine-et-Loing, which includes towns like Montereau and Champagne-sur-Seine, attract specialist firms in newer sectors, for example Céramide, ADR and Phytorestore.

As rural territories, upstream areas benefit from numerous national public policies that support economies in decline and strengthen territorial cohesion. Examples include **Action Cœur de Ville**, a flagship government programme to enhance the attractiveness of medium-sized towns and their central-place role. It covers key themes for territorial development: housing, economic and retail development, accessibility and mobility, urban form and local facilities. In Aube, towns such as Troyes (new higher-education offers in the city centre), Auxerre (rehabilitation of industrial brownfields) and Sens benefit. For the intermediate tier, towns under 20,000 inhabitants, such as Arcis-sur-Aube, Chaource and Nogent-sur-Seine, are supported by **Petites Villes de Demain** (Small Towns of Tomorrow), which helps strengthen their central role for their bassin de vie. Finally, **France Ruralité Revitalisation** (FRR), formerly **Zones de Revitalisation Rurale** (ZRR), supports socio-economically fragile territories by attracting firms with favourable tax and social measures, including tax exemptions.

Contrasting situations

In this basin with a working-class and industrial tradition, employment supply still leans towards skilled productive jobs or skilled manual work. In Aube (40.2% of salaried staff) and Yonne (38.6%), the most represented sector is commerce, transport and various services, followed by public administration. Rural areas have more self-employment, particularly in agricultural communes. Employment is also more precarious, with fixed-term contracts, agency work and part-time. The employment structure is quite heterogeneous upstream. Some territories have a significant presence of executives and higher professional categories, which drives commuting beyond their territory to major urban centres and even to the capital. There is also a high share of retirees, outnumbering other socio-professional groups.

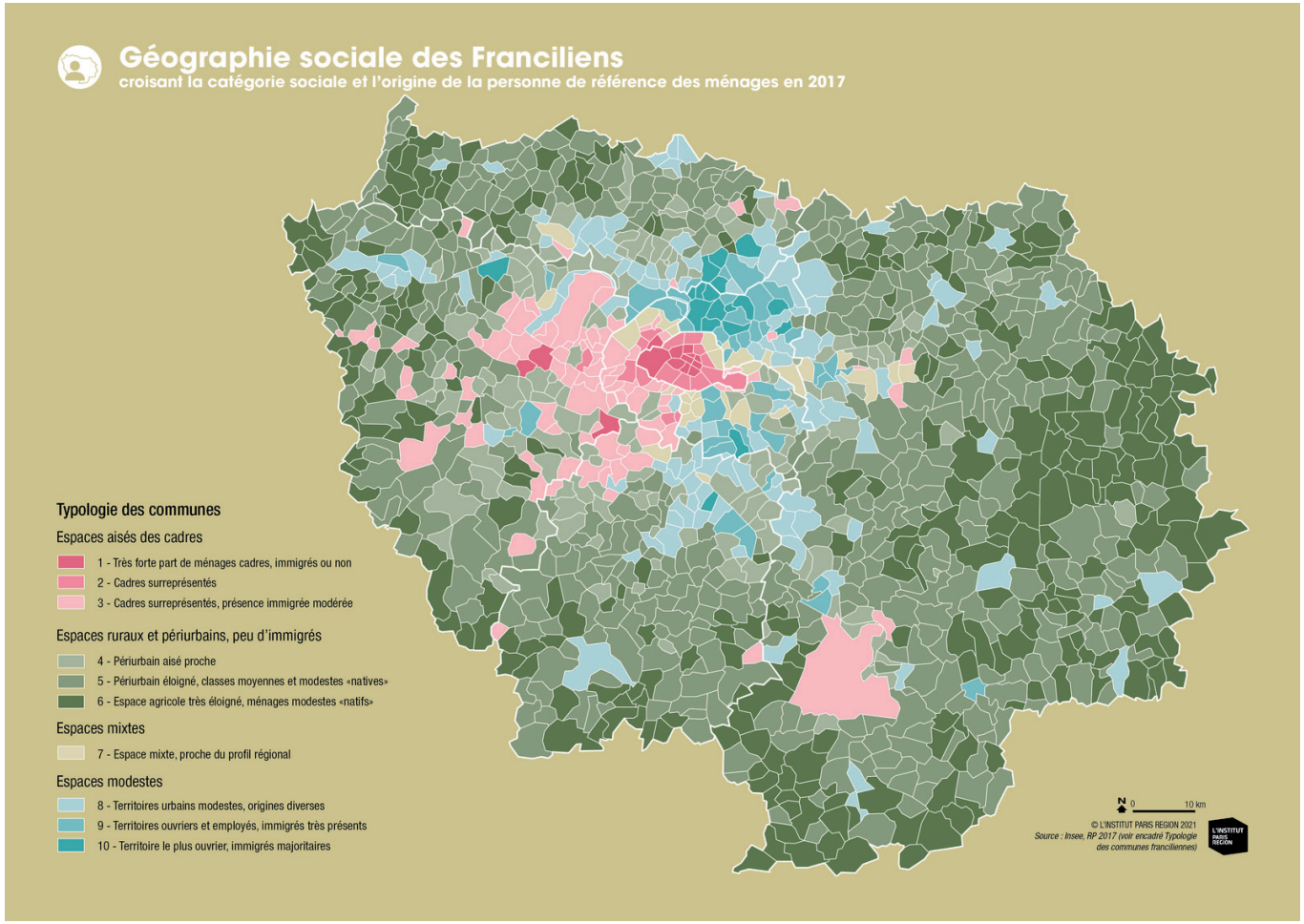
This diversification of employment translates into disparities in living standards across the basin. At département scale, upstream départements have lower median incomes than Île-de-France, based on 2021 figures: Aube €21,530, Marne €22,830, Yonne €21,940, compared with €25,480 in Île-de-France. These figures do not capture the territory's varied social realities, including income gaps between socio-professional classes and within them, for example between farmers and wine-growers. Some communes are better off due to proximity to large urban poles or a strong wine economy, as in Champagne.

Land dynamics and attractiveness

In this sparsely populated territory, land is a key attraction thanks to accessibility and price. The upstream has an appealing housing stock, with prices lower than the national average of €3,115 per m². While the average price in Paris is €9,569

Table 2: Population aged 15 and over by current or previous socio-professional group in 2022

Socio-Professional group	Département Aube	Département Yonne	Département Siene-et-Marne	Region Île-de-France
Farmers (Self-Employed)	1,5	1,2	0,2	0,1
Craftsmen,Shopkeepers, and Business Owners	3,0	3,6	3,3	3,2
Managers and Higher-Level Professionals	6,1	5,6	11,7	20
Intermediate Profession	12,7	12,2	17,7	15,5
Clerical and Service Employees	15,7	15,1	18,3	15,5
Manual Workers	14,6	14,9	11	8,2
Retired persons	30,9	34,3	21,7	19,7
Unemployed	15,6	13,2	16	18

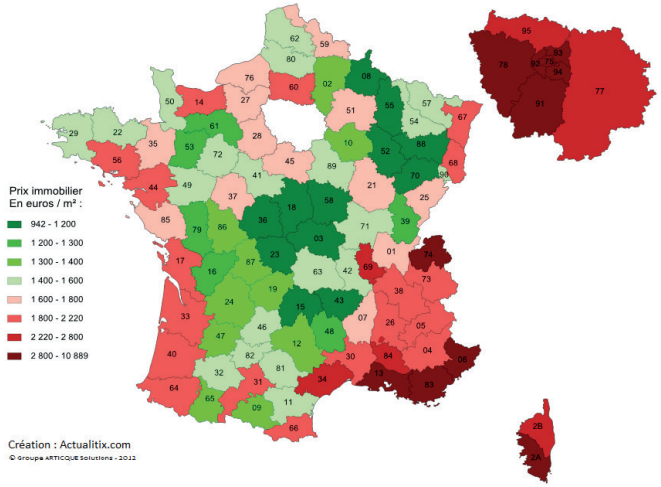


Social geography of residents of the Paris region: social category and origin of the reference person in households in 2017 - Institut Paris Région

per m², it is €2,827 in Seine-et-Marne, €1,571 in Aube and €1,287 in Yonne.

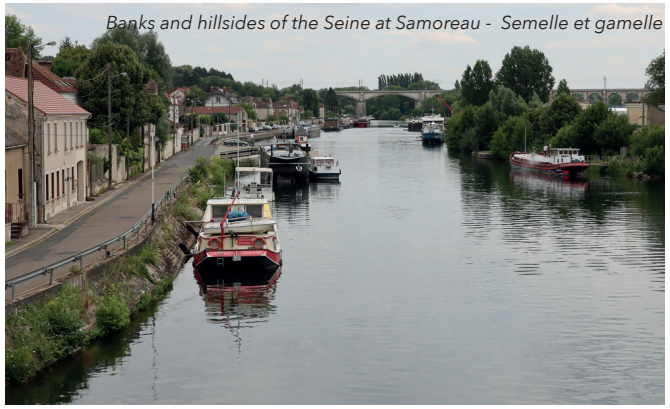
Upstream territories, particularly those on the Île-de-France fringe, benefit from residential decentralisation by Île-de-France households. Thanks to affordable land, families and single people can access individual home ownership. Urban sprawl is growing near communes close to Paris, such as Montereau-Fault-Yonne, Champagne-sur-Seine and Moret-Loing-et-Orvanne, because of accessibility and the strength of their bassins de vie. These edge-of-village extensions add new artificial surfaces and create conflicts of use, since they fragment land earmarked for agriculture or environmental protection. They also redraw village skylines and wider landscapes.

At the same time, vacant housing is rising, 9.5% in Aube and 11.7% in Yonne, partly due to new-build supply and to falling populations in small towns, intermediate urban centres and rural communes.



Map of real estate prices in euros and per square meter in France - actualix.com

Troyes - L'Est Eclair



Banks and hillsides of the Seine at Samoreau - Semelle et gamelle

Samoreau, a town in Seine-et-Marne on the edge of the Forest of Fontainebleau - https://maquettesamoreau5.jimdofree.com/le-village/samoreau-en-image

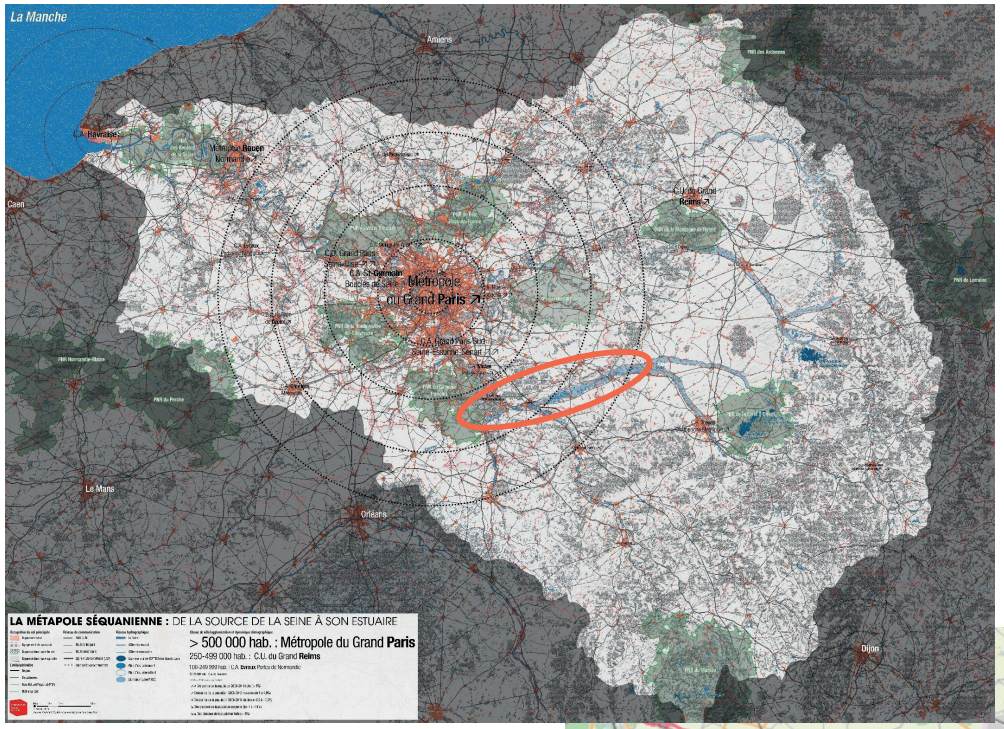
Rural Youth: What Next?

In France, higher education is concentrated in major metropolitan areas. Upstream territories do not meet higher-education demand, which pushes young people towards the Paris conurbation or urban poles, whether major centres such as Troyes or secondary poles such as Montereau-Fault-Yonne or Sens. Young people who stay in rural areas after 18 tend to follow shorter routes such as apprenticeships. New baccalaureate-holders who leave for Paris are more likely to enter executive or intermediate professional roles and have little chance of returning.

Bourgogne-Franche-Comté is the 3rd region with the highest loss of new baccalaureate-holders. In Yonne, the offer is not very diversified, with an over-representation of BTS[9] programmes, which nonetheless meet local labour-market needs in service occupations and agriculture-focused BTS. A similar pattern appears around Fontainebleau, where apprenticeship tracks are oriented to tourism.

9 Brevet de Technicien Supérieur (BTS): a vocational, non-university qualification.

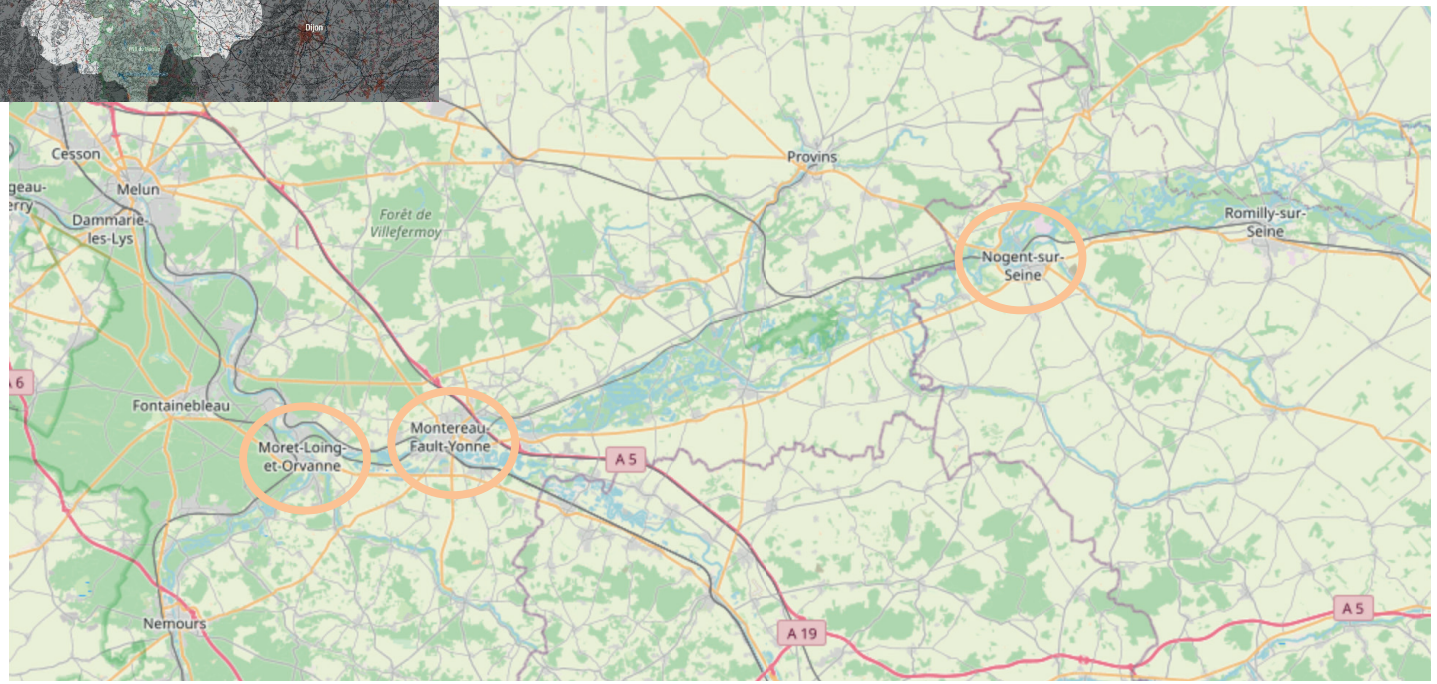
1.3 Focus on territories of interest



1. Montereau-Fault-Yonne, at the confluence of the Seine and the Yonne

2. Moret-Loing-et-Orvanne, a designated heritage site

3. Nogent-sur-Seine, a town at the crossroads of three regions



1. Montereau-Fault-Yonne, at the confluence of the Seine and the Yonne

- **Département: Seine-et-Marne (77)**
- **Region: Île-de-France**
- **Municipal population: 21,840 residents, 25% aged 0–14**
- **Area: 9.10 km²**
- **Density: 2,400 inhabitants per km² (annual change +2.0%)**
- **River network: Seine, Yonne**

Table 3: Population aged 15 and over by current or previous socio-professional group in Montereau-Fault-Yonne

Socio-Professional group	%
Farmers (Self-Employed)	0,0
Craftsmen, Shopkeepers, and Business Owners	2,7
Managers and Higher-Level Professionals	3,1
Intermediate Profession	9,4
Clerical and Service Employees	17,5
Manual Workers	16,5
Retired persons	20,9
Unemployed	29,8

Table 4: Land use in Montereau-Fault-Yonne (Corine Land Cover, 2012)

Land use	%
Urbanised areas	42
Industrial and commercial areas and transport networks	25,2
Inland waters	14,2
Arable land	9,2
Heterogeneous agricultural areas	6,2
Artificial, non-agricultural vegetated areas	3,1

Upper town and lower town of Montereau-Fault-Yonne - investir à Montereau-Fault-Yonne

At the meeting of the Seine and the Yonne, the town's identity is shaped by the rivers that run through it. Formerly a seigneury, Montereau-Fault-Yonne sat on the march between the royal domain, the County of Champagne and the Duchy of Burgundy. It held commercial importance thanks to produce from its rural hinterland and to Burgundy wines. Like other river towns, it industrialised in the nineteenth century with crafts such as tanneries and faience works, and it benefited from the arrival of the railway. The commune has rich biodiversity in both flora and fauna, with Natura 2000 sites and ZNIEFF listings (Zones naturelles d'Intérêt Faunistique et Floristique).
Located 69 km from Paris, it lies within the capital's area of influence. The municipality is betting on transport and proximity to Paris. It is the terminus of Transilien line R, with Paris Gare de Lyon 58 minutes away. The station car park, recently renovated, has 890 spaces. As early as 2015, 23% of Montereau-Fault-Yonne's working residents were employed in Paris. There are commuter flows from nearby towns and from further afield. Several roads cross the commune,

Location of Montereau-Fault-Yonne in the department - Poudou99

linking to Provins, Nemours, Fontainebleau, Melun and Nogent-sur-Seine.

Hit by the deindustrialisation of the 1980s, Montereau-Fault-Yonne still bears the scars, with

a worrying poverty rate of 36%, ranking ninth among Île-de-France communes with the highest proportion of people below 60% of median income, compared with 14.1% for metropolitan France. The local economy grew around the 130-hectare Confluent business park, which includes the industrial zone and a river port. The park historically served as a strategic hub for grouping and storage to redistribute goods across Greater Paris, employing 1,130 people and generating significant local tax revenue. Today the park is losing momentum.

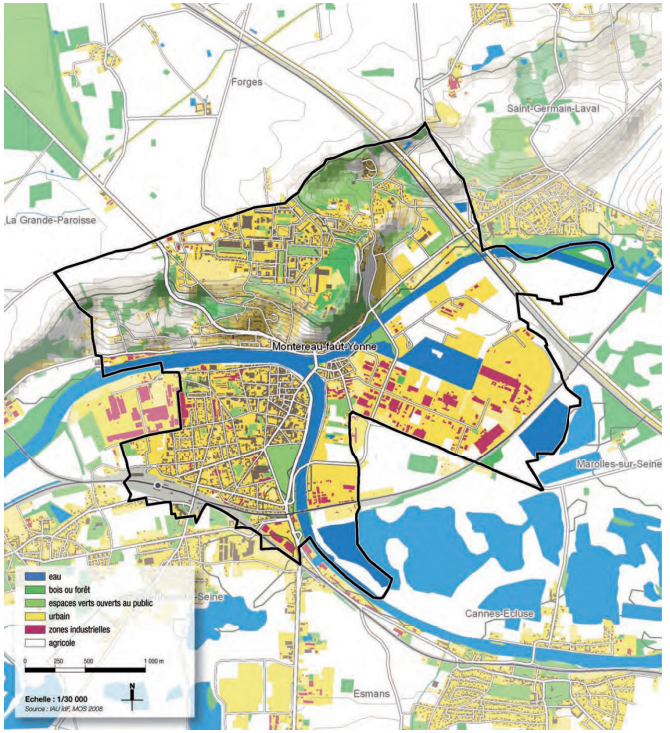
Even so, the town is working to rebuild its industrial fabric with firms such as Hermès and Silec Cable. At its commercial port, 61 local companies specialise in inland waterway freight. The main employment sectors are commerce, transport and miscellaneous services, and public administration, education, health and social care.

The urban fabric can be read in three phases: the upper town, the lower town and the industrial town.

- The lower town, in the upstream part of the confluence, is the historic core, with traditional housing along the Seine, later extended by detached housing on the slopes.
- The upper town stands on the Surville plateau. Formerly rural, it was fully laid out in the 1960s to absorb Seine-et-Marne's demographic growth. It is a ZUP[10] neighbourhood (Zone à Urbaniser en Priorité), historically working class, with social housing. It lies in a flood-prone area. Connections between quarters rely on a bridge over the Yonne and the Seine, which creates a spatial break.

As the centre of its inter-municipality, the town offers many services, including public services, shops, facilities, public transport and amenities. Yet the population's precarious situation, with pauperisation in the lower town and a high share of social housing in the upper town, undermines the local economic and retail fabric. The historic centre faces competition from peripheral retail zones. The town benefits from the national "Action Cœur de Ville programme".

Along the riverbanks, there are issues with continuity, crossing points and conflicts of use. In the Confluence ZAE (zone d'activités économiques) the bank supports economic activity, preventing a continuous riverside promenade. Along the Seine, part of the bank remains natural, with no specific pedestrian layout. To strengthen its relationship with its rivers, the town has launched works on 500 metres of bank on the right bank of the Yonne.



Land use in Monterau-Fault-Yonne - PLU de Montereau-Fault-Yonne

10 Translated as "Priority Urban Development Zone"

Confluence of the Yonne and Seine rivers and façades of houses on the Quai de Seine - France-voyage.com

Aerial view of Montereau-Fault-Yonne - Philippe Pallu

Aerial view of the shared-use quay at Montereau-Fault-Yonne - Haropat Port

2. Moret-Loing-et-Orvanne, a designated heritage site

- **Département: Seine-et-Marne (77)**
- **Region: Île-de-France**
- **Municipal population: 12,576 residents in 2022, 22% aged 45–59**
- **Area: 33.4 km²**
- **Density: 376 inhabitants per km² (annual change +0.2%)**

River network: Seine, Loing, Orvanne, Lunain, Canal du Loing, Vanne aqueduct

Table 5: Population aged 15 and over by current or previous socio-professional group in Moret-Loing-et-Orvanne

Socio-Professional group	%
Farmers (Self-Employed)	0,1
Craftsmen, Shopkeepers, and Business Owners	2,9
Managers and Higher-Level Professionals	15,2
Intermediate Profession	17,6
Clerical and Service Employees	14,8
Manual Workers	6,9
Retired persons	30,6
Unemployed	11,9

Table 6: Land use in Moret-Loing-et-Orvanne

Land use	%
Forests and semi-natural areas	40,4
Built-up areas	31,7
Agricultural areas	18,8
Water bodies	9,1

The present commune dates from 2015, when Moret-sur-Loing merged with surrounding communes (Écuelles, Épisy, Montarlot, then Veneux-les-Sablons).

Division of the delegated municipalities that make up Moret-Loing-et-Orvanne http://michel.lalos.free.fr/cadrans_solaires/autres_depts/seine_et_marne/cs_77_fontainebleau.php

The town is defined by its many watercourses: the Loing and its tributary the Orvanne, the Canal du Loing and the Seine. On the left bank of the Loing (Veneux-les-Sablons and Moret-sur-Loing) the urban fabric is dense and continuous, edged by woodland and opening towards the Fontainebleau forest. On the right bank (Épisy, Écuelles and Montarlot) there are valleys and agricultural plateaux, a looser urban fabric, and major economic activity zones around Écuelles. The commune's landscape is structured by a strong presence of nature across its five valleys, the Fontainebleau forest and cultivated plateaux. The territory is framed by the Orvanne to the east and the Loing to the west, where the Lunain and the Villemer stream join, the Seine to the north-east, and many ponds, pools and wetlands.

On the edge of the Fontainebleau forest,

Moret-Loing-et-Orvanne is a jewel of Île-de-France tourism, designated a site patrimonial remarquable. A former medieval town, it reinforces its cultural appeal as an Impressionist landscape territory beyond Normandy and Paris, with views immortalised by Alfred Sisley, who lived in Moret. The Benedictine sisters of Moret are credited with inventing barley sugar.

Moret Bridge crossing the Loing River - Robert Radlinski

Beyond cultural tourism, the commune attracts nature tourism thanks to the Scandibérique route that crosses it. There are many paths, including farm tracks that make pleasant walking and hiking routes. River tourism is also developing through the river halt at Moret-Loing-et-Orvanne, its proximity to the mariners' village of Saint-Mammès, and the Canal du Loing. The commune is well supplied with water-sport facilities, including canoeing, and the Loing's banks are popular in the summer season. Its architectural and natural heritage gives it strong regional appeal.

Despite a prefectural decree banning swimming in 2022, the banks of the Loing River in Moret-Loing-et-Orvanne are stormed every summer

by tourists from the Paris region and abroad. A 'dream spot' in an idyllic setting, Moret-Loing-et-Orvanne is promoted on social media platforms such as TikTok. However, this practice is opposed by local residents and the town council, who consider it a nuisance and a danger.

Employment links to the labour markets of Paris, Fontainebleau, Melun–Dammarie-les-Lys, Montereau-Fault-Yonne and Champagne-sur-Seine, which explains the high share of intermediate professions. At 61 km from Paris, the town is served by TER and Transilien line R, with trains every 15 minutes at peak times and every 30 minutes off-peak. Locally, jobs fall mainly into three sectors: public administration, education, health and social care; commerce, transport and miscellaneous services; and industry. The commune has six ZAE zones, the largest being Les Renardières at the eastern gateway. EDF, which has established a hub here, is the principal industrial employer. Aggregate quarrying was an important industry until activity ended in 2019. The commune's Surface agricole utile (SAU), mainly cereals, has been shrinking for about a decade, and farm numbers have fallen from 37 in 1970 to 10 in 2020.

The delegated commune centre of Moret-sur-Loing is very popular for its traditional setting and quality of produce. Elsewhere the retail offer is complemented by peripheral retail parks. That said, there is a high vacancy rate in commercial premises, 27%, mainly in Écuelles and Épisy. The commune is part of the national Petites Villes de Demain programme aimed at revitalising town centres.

The commune has a high share of retirees. Households are mostly single-person or couples without children. Owner-occupation is high.

Associational life is strong, with about 70 arts, culture and leisure associations, 55 civic associations and 50 sports associations.

- **Axes of the PLU**

The PLU (Plan local d'urbanisme, Local Urban Plan) sets four priority axes:

Axis 1 Accelerate the territory's energy and ecological transition while protecting and enhancing natural and landscape heritage.

Axis 2 Support harmonious development of the new commune, respectful of its architectural and heritage value.

Axis 3 Ensure the durability and attractiveness of activity hubs and encourage economic and retail dynamism that generates jobs.

Axis 4 Manage the development of all modes of travel across the new commune.

- **Orientations d'aménagement et de programmation (OAP)**

As a component of the PLU, OAP define spatial development intentions for a sector or neighbourhood. Two examples in the commune:

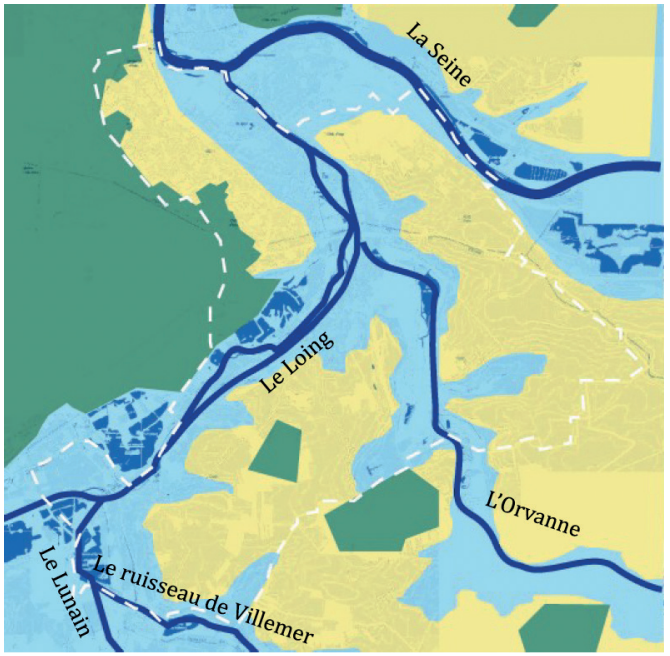
OAP no. 4 Eco-domaine Cabanes Nature. Covers parcels between the Étang de Moret to the east and the backfilled Piketty quarry area. The plan is to build an eco-estate of 30 cabins to frame development on these listed sites.

OAP no. 5 Canal-side. A long-standing industrial sector linked to the canal, with brownfields or end-of-life sites. As extraction activities wind down, the town intends to redevelop the area. Located in the heart of the delegated commune of Écuelles, the site currently divides the urban fabric north–south. The OAP seeks to rethink this hinge by creating a new centrality with public facilities and craft activities.

OAP can also take a thematic, more strategic approach. The commune sets two thematic OAP:

OAP "Trames écologiques". Green and blue infrastructure aim to conserve biodiversity, enhance listed sites in the Loing and Orvanne valleys, and keep the blue network elements open to the sky and continuous.

OAP "Artisanat et Commerces." Revitalise town centres, maintain a diversified local retail offer, and ensure coherence in the location of retail facilities.



Map of the Moret-Loing-et-Orvanne river system - PLU de Moret-Loing-et-Orvanne

Town Hall Square - CommunicationMLO

Medieval heart of Moret-Loing-et-Orvanne - www.lasourisglobe-trotteuse.fr

Aerial view of Moret-Loing-et-Orvanne - MSL Tourisme

Moret-Loing-et-Orvanne from the Loing river - www.lasourisglobe-trotteuse.fr

The banks of the Loing in summer- https://actu.fr/ile-de-france/moret-loing-et-orvanne_77316/sud-seine-marne-loing-nouvel-eldorado-baigneurs-lenfer-riverains_25628755.html

The mills of Moret-Loing-et-Orvanne - Anne Landois-Favret

3. Nogent-sur-Seine, a town at the crossroads of three regions

- **Département: Aube (10)**
- **Region: Grand Est**
- **Municipal population: 5,673 residents (annual change −0.9%)**
- **Area: 20 km²**
- **Density: 283 inhabitants per km²**
- **River network: Seine, fed by the Aube, the Ardusson and the ru de Mâcon**

Table 7: Population aged 15 and over by current or previous socio-professional group in Nogent-sur-Seine

Socio-Professional group	%
Farmers (Self-Employed)	0,2
Craftsmen, Shopkeepers, and Business Owners	2,4
Managers and Higher-Level Professionals	7,3
Intermediate Profession	13,1
Clerical and Service Employees	13,9
Manual Workers	17,6
Retired persons	32,0
Unemployed	13,4

Table 8: Land use categories (source: Corine Land Cover)

Land use	%
Agricultural areas	40
Forest areas	21
Built-up areas	26
Grasslands and shrub or herbaceous habitats	10
Water bodies	1,6

Originally a rural borough, the town is crossed west to east by the Seine valley. Its economic appeal has always revolved around the port. In the Middle Ages the port of Nogent-sur-Seine, under the Abbey of Saint-Denis, was among the region's most important. The town lies on the alluvial plain of the Seine with little relief. It belongs to the Bassée–Voulzie hydrographic unit and is marked by wetlands. Although the footprint of surface water is limited, some built-up areas are exposed to groundwater flood risk. The territory is dominated by cultivated farmland, about 800 hectares or 40%, and by extensive natural areas, including 21% forest and 10% meadows and shrubby or herbaceous habitats. Agriculture is therefore essential for adding value to local products and to the rural landscape.

Location of Nogent-sur-Seine in the Aube department - Mission d'autorité environnementale Grand Est

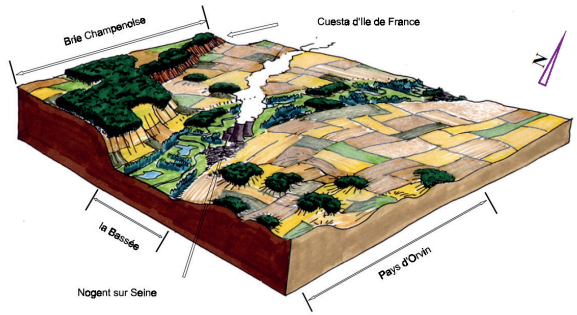
Located 95 km from Paris and 50 km from Troyes, the town sits at the junction of several départements and regions. In Grand Est, on the western edge of Aube, it borders Seine-et-Marne to the west and Yonne in Bourgogne-Franche-

Aerial view of Nogent-sur-Seine - L'Est-Eclair

Comté to the south. The road network is dense, with one nationally important axis to Paris and six regionally important routes to towns including Épernay, Montereau-Fault-Yonne and Troyes. Most trips are by car, with 70% of commuting done by private vehicle. Nogent-sur-Seine has a high level of facilities in administration, sport and education, which makes it a central-place commune.

Nogent's rise rests on its port, marked by Philip of Valois's creation of salt granaries in 1340. By 1789 activity had diversified to barge freight of flour, timber, iron and wine, and to passenger travel by coche d'eau. The port was abandoned in 1968, outcompeted by the railway. With the return of inland waterway transport, the port of Nogent-sur-Seine, on the Petite Seine with the Soufflet quay and Le Mériot, is now one of France's largest agricultural ports. It can take barges up to 650 tonnes. Nogent is the epicentre of the large-gauge upgrade project between Nogent-sur-Seine and Bray-sur-Seine to allow 2,500-tonne barges. Nogent sees this as an opportunity to strengthen its attractiveness and open to the European scale. Many firms use the waterway, including Soufflet, Saipol, Vivescia, Emin-Leydier and UNM. Most goods handled are agricultural, about 74% and oriented to export, along with containers. Proximity to the port and farmland drives agri-industrial activity such as potato packing, biofuel production, and preparation of fruits and flavourings for food.

Nogent-sur-Seine is also known for its nuclear power station. Planned from 1974, construction was backed by elected officials, notably for local and département-level tax receipts. Despite strong opposition, the plant was approved as being of public utility and built in 1981. The site covers 212 hectares with two 1,300 MW units. It has contributed greatly to urban development in Nogent and the region by attracting workers. The resulting demographic growth supports local commerce. The plant employs about 750 staff plus 250 contractors, and an additional 600 to 2,000 people during maintenance. It is a flagship technological site for the département and draws many visitors.



Location of Nogent-sur-Seine - Atlas des paysages de la région Champagne-Ardenne

Nogent-sur-Seine offers architectural and heritage tourism, for example the Château de La Motte-Tilly and the stained glass of Villenauxe-la-Grande, and industrial heritage at the hosiery works in Romilly-sur-Seine and the nuclear plant. It promotes themed routes such as "À la découverte de la Bassée", which follows the banks of the Seine and the Monteuil area of meadows, wet woodland, backwaters and lakes, and cultural trails such as in the footsteps of Flaubert[11], which showcases notable heritage features in the commune. After its historic development through river trade, Nogent is again turning towards river tourism with a new river halt near the town centre. Moorings for pleasure craft were previously limited.

The town sits on a site of multiple constraints and opportunities: its hydrographic network with the Seine and flood-prone zones, woodlands and wetlands, and essential transport infrastructure.

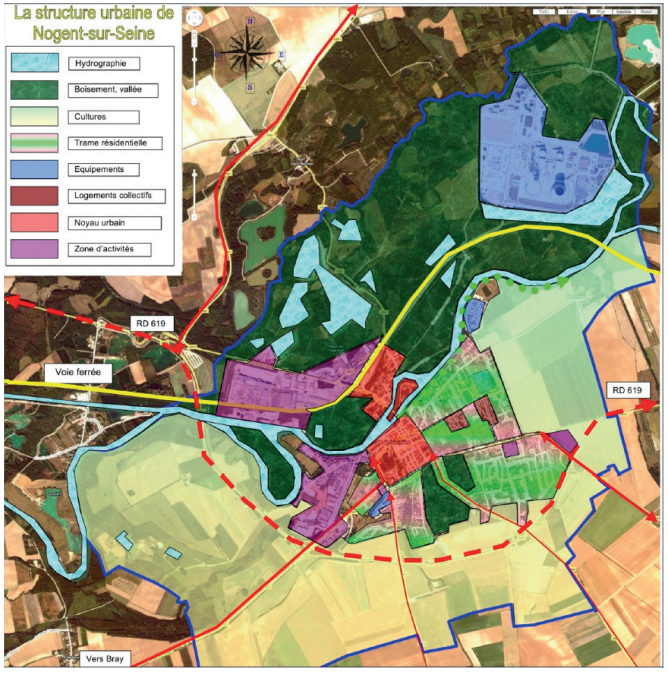
Nogent therefore faces significant water-related issues. Some built-up areas lie in zones at risk of groundwater flooding. The commune has significant biodiversity to protect. At the gates of the Bassée, it includes several protected natural areas: a Natura 2000 site, an Important Bird Area (ZICO[12]), and five ZNIEFF sites. Several wetlands linked to the Seine valley punctuate the territory.

Urban structure is dual around a north–south axis. To the west, beyond the railway in the north and on the left bank of the Seine, are activity zones with many industrial areas. This side has good road, river and rail access. To the east are residential districts and the medieval town centre with narrow streets, historic core and timber-framed houses. Shops and services cluster in the historic centre. The greater Nogent area includes detached-housing extensions and suburban subdivisions at the periphery that break with the centre's traditional architectural forms. Housing is marked by a high share of flats, 46% in 2013, and a high share of rented dwellings, 59%. Associational life is dense, with more than 80 associations across sport, culture, social, patriotic and heritage domains.

11 Famous French novelist from the 17th century.

12 ZICO (Zone Importante pour la Conservation des Oiseaux) – Important Bird Area (IBA). This designation, established under international ornithological criteria and adopted in France, identifies areas of major significance for the conservation of bird species and their habitats.

Location of Nogent-sur-Seine in the Lower Voulzie basin - Agence Eau Seine Normandie



The urban structure of Nogent-sur-Seine - PLU de Nogent-sur-Seine

- **Projet d'aménagement et de développement durables (PADD)**

  A central element of the PLU, the PADD sets the local political vision for the commune's future. It defines the general orientations for:

  - spatial planning, facilities, urbanism and landscape
  - protection of natural, agricultural and forest areas
  - conservation and restoration of ecological corridors

- **Selected objectives and ways to implement them include:**

  Valuing Nogent-sur-Seine's appeal through its architectural character and natural setting, including an urban requalification study and new open public spaces for a lively, popular town centre.

  Taking account of sensitive natural landscapes through appropriate regulations, including maintaining and caring for hiking trails.

  Meeting growing mobility needs by developing intermodality across rail, river and road, and completing the greenway in the Seine Valley from Nogent-sur-Seine to Méry-sur-Seine.

  Managing urbanisation across housing, industrial and retail zones.

- **Orientations d'aménagement et de programmation (OAP)**

  Town gateways. The town has five gateways whose landscape quality varies. The municipality aims to harmonise them to reinforce place identity.

Aerial view of the town of Nogent-sur-Seine - PLU de Nogent-sur-Seine

Aerial view of the Nogent-sur-Seine nuclear power plant - EDF

2. Towards territorial interventions for a shared vision: between social and ecological rehabilitation

2.1 Interventions and ecological restoration

Riverbanks are where multiple uses meet. They have economic functions such as industry and logistics, and ecological functions such as flood risk management and biodiversity. They also host transport infrastructure, including public moorings and small marinas, and add social value through active travel, tourism and everyday amenity. For a long time, daily life turned its back on the river, which was embanked and engineered to protect against floods and then to serve industry. By the late twentieth century a new approach took hold. Cities began putting rivers back at centre stage through programmes to reclaim the riverfront, regenerate neighbourhoods, pedestrianise the banks and reuse brownfield sites. In a changing climate, this riverside renewal goes hand in hand with stronger environmental goals and the need to reduce urban heat, which in turn is driving action for biodiversity.

In rural areas, reworking the banks serves different aims. The focus is on restoring the river ecological corridor, which may include designating parts of the banks as a nature reserve or as a zone naturelle d'intérêt faunistique et floristique (ZNIEFF, a natural area of ecological, faunal and floral interest). The priority is ecological, using nature-based solutions such as re-meandering, removing weirs and other barriers, and planting riparian woodland. Most projects are modest in scale. Efforts to protect and restore wetlands also extend beyond the river channels, through agroecology and agroforestry practices that respect natural balances.

In towns, projects on rivers and streams have become a priority for riparian communes. Past development for navigation and industry has degraded the banks, but rivers are now also seen as a lever for territorial value, through tourism, everyday quality of life and the local economy. Water has become a land asset. Municipal objectives vary. Most waterside towns are pursuing riverside revitalisation and renewal with schemes such as waterfront housing, street improvements and new promenades. Some place stronger emphasis on tourism or heritage with leisure and sports facilities. Former riverside industrial sites are being converted to housing, offices or retail, which in practice can limit everyday public access to the banks.

These interventions raise questions of governance, shared use and risk management. In principle, riverbanks belong to the State's public river domain and Voies navigables de France (VNF) is responsible for maintenance. On non-state watercourses, adjacent landowners are responsible for upkeep, which is often neglected where no immediate interest is perceived. Many communes want continuous riverside walks but face access issues and broken links. A great many communes, often small ones with under 3,500 inhabitants, lack land control along the banks, in part because some stretches are private.

Examples of riverside schemes upstream in the Seine basin

- **Syndicat d'aménagement de la Vallée de la Seine, downstream of Méry (Aube, Grand Est).** Created in 1955 to cut aquatic vegetation and remove trees that clogged channels after private owners abandoned bank maintenance. The river-warden role was secured in 1994 with Water Agency funding to manage vegetation along banks and side channels. Today wardens both maintain and enhance, including by planting local species. Wild reaches receive ecology-led works, village reaches a more landscape-led treatment.
- **Saint-Mammès (Seine-et-Marne, Île-de-France).** At the confluence of the Seine and the Loing, once a fishing then bargemen's village, it flourished in the eighteenth century. The town now builds on that identity for tourism and leisure boating. A riverbank renstoration in 2000 honoured the mariners despite falling freight traffic. It created a community river halt, quay promenades that now host everyday life such as the Sunday market and Batel'Expo, enhanced neglected natural edges along the Seine, and restored a former lock.

Saint-Mammès river stop and promenade quay - Seine-et-Marne Vivre en Grand

- **Troyes (Aube, Grand Est).** Built in a marshy, flood-prone area within the Seine's major floodplain, the city is drained by embanked canals – Canal de la Moline, Canal de la Planche-Clément, Canal des Trévois and the Canal de la Haute-Seine – that require major safety works according to a 2021 assessment. Dykes that are outdated or under-used are being repaired and upgraded as a core part of a social, economic and environmental programme. The environmental strand includes protecting local fauna and flora by creating fish spawning grounds, re-naturalising the bed and banks, and restoring and daylighting streams. The programme also includes reopening an old channel of the Seine. Now in the public inquiry and works-authorisation phase, construction is scheduled to start in 2026.
- **Nogent-sur-Seine (Aube, Grand Est).** In 2022 the Seine banks underwent repairs. Erosion caused by wash from passing vessels was identified along the path. Works to repair and widen the banks aim to make the area safer for residents, walkers and cyclists, and form part of an ecological stewardship approach.

Bolloré dyke in Troyes on the right bank rehabilitated after works - Troyes Champagne Métropole

Bolloré dyke in Troyes on the right bank rehabilitated before works- Troyes Champagne Métropole

After the riverbank restoration work in Nogent-sur-Seine - Ville de Nogent-sur-Seine

Before the restoration of the riverbanks at Nogent-sur-Seine - Ville de Nogent-sur-Seine

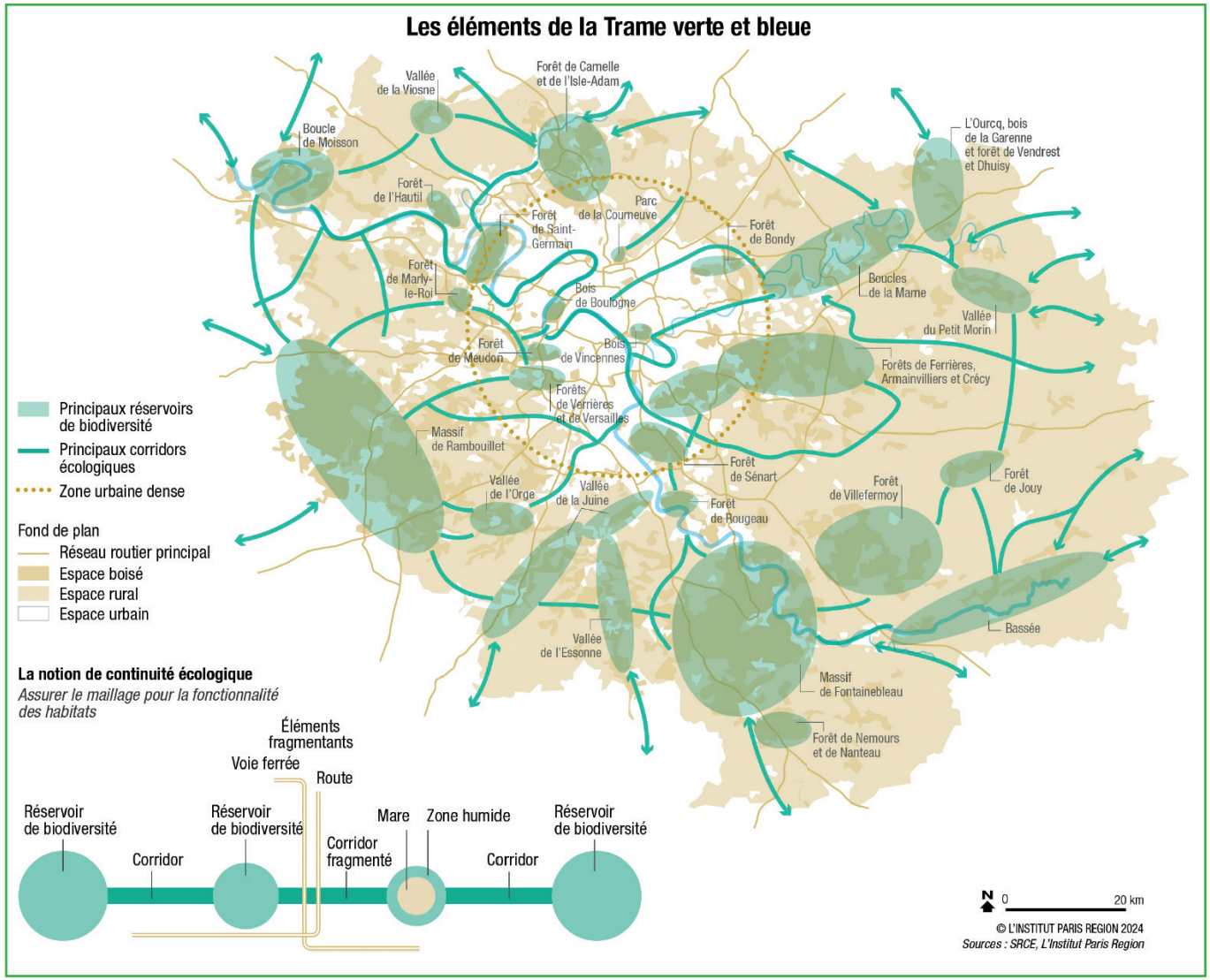
Thinking about water beyond the territory itself

The trame verte et bleue(blue-green infrastructure) is a strategy to maintain and rebuild a network that allows animal and plant species to move, feed, reproduce and rest so they can complete their life cycle. It aims to embed biodiversity conservation in spatial-planning decisions, improving quality of life and residential and tourism appeal. It is made up of biodiversity reservoirs linked by ecological corridors. At Île-de-France scale, the Schéma régional de cohérence écologique (SRCE) applies this through actions to strengthen ecological continuity. Identified as an axis of national importance, the Seine valley can serve as a corridor that links natural areas across the territory, including slopes, neighbouring valleys and farmland. The relationship with the river depends not only on continuity along the banks but also on the perpendicular fabric that connects the town to the water.

Two practical questions follow. How can the continuity of a natural corridor be ensured beyond administrative boundaries. How can all the actors be brought together, and at what scale.

An instructive example is the Syndicat mixte Marne Vive, working on the lower Marne catchment and its tributaries on the edge of Paris, notably the Morbras and the Merdereau. With a statutory goal of delivering the SAGE[13] Marne

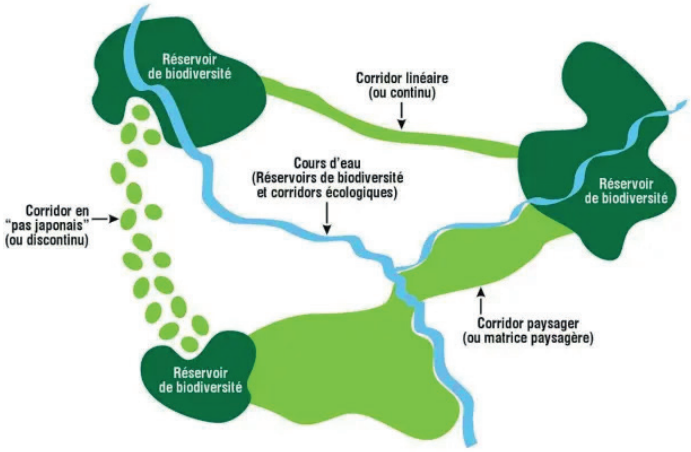
13 The Schéma d'aménagement et de gestion des eaux (SAGE, Water Development and Management Scheme) Marne Confluence covers 270 km² and 52 communes across Seine-et-Marne, Seine-Saint-Denis, Val-de-Marne, and Paris. It lies at the interface between the Marne basin and the dense urban area of the Paris metropolitan region.



Mapping of green and blue infrastructure elements across the Ile-de-France region - Institut Paris Région

Confluence water-planning scheme, Marne Vive launched a Plan de paysage as a toolbox for basin stakeholders, setting a strategy and reference framework for enhancing waterscapes in all their forms, from stormwater and wetlands to designed spaces. It is a collaborative project that builds progressive ownership, starting with water-sector actors across planning, landscape and economic development, and elected officials, then reaching civil society.

Another example of an appropriate scale is the Communauté de communes Bassée-Montois, which creates links and networks with neighbouring territories to achieve territorial coherence. The inter-municipality ran an Atelier des territoires process in 2018 to build a project at that scale. Bassée-Montois is a peri-urban territory whose landscape is shaped by agriculture and by the extraction of resources serving urban areas. The work identified several axes: revitalising village centres, developing leisure activities, and creating looped walking routes to knit the territory together.



Different types of ecological corridors - THEMA Environment

2.2 Living with water: how Upper Seine residents use and perceive it

Le cours d'eau « est le témoin d'une histoire, et des valeurs culturelles et symboliques qui lui sont associées » (Lévêque, 2019). ("The watercourse bears witness to a history, and to the cultural and symbolic values associated with it.")

The late twentieth century saw a decline in water-related activities. The rise of the car changed leisure habits. River works such as dykes and dams altered channels and their appearance. Swimming bans multiplied, and with them the loss of riverside pastimes like popular dances and guinguettes[14].

Today new recreational spaces are appearing along watercourses, with cultural events such as festivals and performances on the water, and with new schemes including activity parks and riverside improvements. Guinguettes, cultural symbols in their own right, have returned to the banks of the Marne. Nature-based social activities, from walking and angling to kayaking, canoeing and running, are on the rise. This renewal speaks to a demand for nature and a better living environment, and it is rebuilding ties between city dwellers and their rivers. The relationship is first individual, for rest and leisure, and increasingly collective, through local campaigning and stewardship.

How users relate to rivers depends on political will to value the river and its banks, on the network of committed actors, and on the pattern of land ownership along the banks. Well-designed riverfronts help people take ownership of the river. Even so, because of brownfields and poor-quality links, routes are often discontinuous. Not all banks are equally walkable. The question is how to reconcile ecological and landscape continuity while safeguarding the activities that underpin an entire territory. In Paris the Seine is now seen as a source of urban nature and visual and literal cooling. In rural settings the Seine and its tributaries are still first and foremost working corridors for logistics and industry.

Rivers shape ways of life, but local issues and uses of water and banks vary from place to place. There are differences in exposure to river risk, cultural value, nature-based activities and water quality. Several factors govern how people use these spaces. How accessible are they from the town. Are banks privatised. What kind of paths exist. Which leisure uses are encouraged.

Upstream, everyday river use is mostly by neighbouring neighbourhoods and adjacent communes, and it is often limited to the short stretch people know, which does not encourage seeing the river as part of a wider basin. That said, upstream rivers draw Île-de-France residents in summer who seek cool water for

No swimming in Moret-Loing-et-Orvanne - Facebook Moret-Loing-et-Orvanne

14 A guinguette is a traditional French open-air riverside café or tavern, originally popular around Paris along the Seine and Marne. They served food and drink, often with music, dancing, and a festive atmosphere. Many have been revived today as casual leisure venues on riverbanks.

bathing.

Swimming in the Seine has been banned since 1923 because of conflicts with navigation and risks linked to industrial banks. The Paris 2024 Olympic Games opened a new perspective with open-water events in the river, paving the way for a return to public bathing. This requires better microbiological water quality, supported by pollution-control systems for discharges to natural environments. As a legacy of the Games, some sites on the Seine and the Marne have been made permanent bathing areas. Île-de-France now has 27 bathing sites, including eight in Seine-et-Marne such as the Île de Loisirs de Bois-le-Roi and the Souppes-sur-Loing leisure base.

Beyond water quality, industrial pollution, litter and the danger of strong currents are seen by residents as barriers to bathing. Bathing sites do not enjoy the same popularity across the basin and often face conflicts of use. Ecological concerns include protecting fauna and avoiding deterioration in water quality. Social concerns include public order and cleanliness of public spaces.

In 2022 the mayor of Moret-Loing-et-Orvanne issued an order banning bathing in the Loing. The decree of 6 June 2022 prohibits swimming and diving within 75 metres upstream and downstream of the Moret bridge to avoid overcrowding of the banks and the degradation of a designated heritage site, and to ensure residents' peace and quiet. Mayor Dikran Zakeossian opposed "wild" bathing and the colonisation of the banks with inflatables, barbecues, tents, chairs and tables. The order followed the death of a young woman trapped in a sluice under the bridge in 2021. The Loing is described as a treacherous river for its strong post-storm currents, unstable beds and suction phenomena. More recently, on 20 July 2025, a young man was swept away by the powerful current. With the first summer heat, Moret-Loing-et-Orvanne becomes a well-known bathing spot. Social networks amplify the appeal by promoting it as an exotic, restorative place, drawing both locals and Parisians. This mass attendance demonstrates a strong social demand for nature.

Local ownership even extends to the water-transfer infrastructure that supplies Paris. The Avre aqueduct, visible as an aerial engineering work, is a piece of local heritage that the Agglomération du Pays de Dreux showcases through guided visits and occasional open days. As part of its heritage policy, Eau de Paris has authorised public footpaths along parts of the structure's corridor.

Hydrosocial territory and territorial solidarity

Introduced by R. Boelens et al.[15] in 2016, the "hydrosocial territory" concept explores the spatial and scalar dimensions of the relationship between water and society. It draws on territorial pluralism, the coexistence within one place of multiple actors with different visions and interests. In the Seine basin there is a clear contrast between dominant actors who control water and access to it by defining its uses, and dominated actors who endure changes that call their own use-values into question. Imposed water uses are many, from large hydraulic projects to schemes for conserving water and biodiversity.

Vulnerability to flooding is not uniform across the Seine basin, yet the consequences of a major flood would ripple across the whole catchment. Flood-prone zones cover only about five percent of Île-de-France. Managing risk at basin scale relies on well-known upstream–downstream territorial solidarity. The open questions concern environmental solidarity and the socio-spatial acceptability of projects.

In the upstream territory, the footprint of structures and schemes is a source of tension. Eau de Paris, the municipal utility supplying the capital, is the leading water user in the Avre basin, which frequently faces drought. Water abstracted there is used outside the Avre. Permanent abstraction fuels a sense of injustice about how the resource is used. While Parisians benefit from low-cost water, upstream territories experience landscape change, limits on agricultural potential to protect water quality in catchment protection zones, and pollution from activities such as extraction and industry. Bodies at multiple scales, from basin to river, provide forums to think locally about solidarity between territories. Examples include EPTB Grands Lacs, which regulates flows to support low-water periods, and the Commissions locales de l'eau, where users and local actors meet to draw up SAGE water-management plans.

15 BOELENS, R., HOOGESTEGER, J., SWYNGEDOUW, E., VOS, J., & WESTER, P. (2016). Hydrosocial territories: A political ecology perspective. Water International, 41(1).

2.3 From reclaiming the watercourse to civic action: towards a collective relationship with space

In this collective relationship with nature, local actors drive consultations, make proposals and act as opinion shapers. Taking ownership of the river through everyday use stimulates citizen action around water and for water.

Many environmental associations work to protect landscapes, groundwater, and wildlife and plant life. France Nature Environment, the French federation of nature and environmental protection associations, brings together hundreds of upstream groups offering a wide range of activities: legal expertise, nature outings, hands-on restoration to improve ecological continuity, public debate, citizen mobilisation, and environmental education and awareness. Themes vary, from sustainable mobility to forests, agriculture and sport. Whatever the focus, conserving nature and ecosystems is almost always central. These associations are key local players opposing major projects such as the large-gauge upgrade and the Bassée pilot storage cell because of their impacts on ecosystems and landscape change. They play an essential role in building environmental awareness among residents.

Leisure representatives are also important territorial actors because of their direct contact with nature. Angling is the leading freshwater pastime. In Yonne there are about 15,000 anglers and 44 associations; in Aube there are 32 associations. Fishing is regulated to protect aquatic environments and ensure good ecological conditions. Fish farming has introduced many species into the Seine basin, which now hosts a wide variety. Anglers are united within the L'Union des Fédération de Pêche du Bassin Seine Normandie (UFBSN), which carries out wetland and river restoration to improve aquatic ecosystems. They contribute to thinking on river continuity.

Faced with a mosaic of public and private spaces that complicates bank and river management, and with overlapping uses, associations mobilise to involve local populations in the ecological project.

La Seine en Partage et ses affluents is an association of communes along the Seine and its tributaries, created in 2001, that brings territories together around a shared Seine identity. Originally La Seine en Partage, in 2017 it "opened up" to all riparian communes on the river and its tributaries, recognising shared assets and common issues, and became La Seine en Partage et ses affluents. It now also includes associations, such as Club Aviron Nogentais and Vigilance Environnements, and companies, including CHEPP France and ETPO[16], that support its mission. It campaigns for inland waterway development, enhancement of watersides, and preservation of wetlands and biodiversity. For several years it has run the Berges Saines operation, relayed by riverside mayors upstream and downstream. This eco-citizen clean-up day, focused on litter picking, is a way for residents to reclaim the banks while raising awareness of water issues, biodiversity protection and tackling pollution. It brings together thousands of volunteers from all backgrounds, ages and settlement types, from towns to villages.

16 Company specialised in construction and public works

Operation Berges Saines in Nogent-sur-Seine in 2022 - Ville de Nogent-sur-Seine

Cover of the book Objectif Seine, an educational project studying the tributaries of the Seine in Seine-Maritime with Cycle 3 classes - https://fondation-lamap.org/sites/default/files/pdf/objectif-seine.pdf

Part 3: Water governance

1. Institutional framework

1.1 Water policy and management in France: land tenure and overlapping responsibilities

In France, water law has been built up progressively through three major statutes that shaped water governance.

- **Act of 16 December 1964 on water use, allocation and anti-pollution measures**

The first major law to bring actors and users to the same table to regulate pollution and share surface waters. It created basin agencies, designed to manage water at river-basin scale. Metropolitan France has six hydrographic basins

- **Act of 3 January 1992 on water**

Declares water the "common heritage of the Nation". It introduced planning tools: SDAGE (Schéma directeur d'aménagement et de gestion des eaux, basin management plans) and SAGE (Schéma d'aménagement et de gestion des eaux, sub-basin water plans). It strengthened municipal powers and required all communes over 2,000 inhabitants to have wastewater collection and treatment.

- **Act of 30 December 2006 on water and aquatic environments (LEMA)**

Reformed how Water Agencies are funded, recognised a right to water for all, and brought climate-change adaptation into water-resource management.

Other texts support the management of water and aquatic environments:

- **Act of 2 February 1995 on strengthening environmental protection, known as the Barnier Law**

Introduces the polluter-pays principle: everyone must contribute to repairing environmental damage under the law. It also created PPRI flood-risk prevention plans that set building rules and conditions in flood zones.

- **EU Water Framework Directive (WFD), 2000**

As an EU member, France must meet European obligations. The WFD sets objectives for protecting aquatic resources, achieving good ecological and chemical status of water bodies, reducing pollution from hazardous substances, and complying with standards in protected areas. Transposed into French law in 2004.

- **Act of 12 July 2010 on the National Commitment to the Environment (Grenelle II)**

Defines the trame verte et bleue (green and blue infrastructure) and its goals. It also launches a "new ecological governance," promoting upstream public participation through revamped public inquiries and involving environmental-education associations, and it includes provisions on biodiversity, agriculture, species and habitat protection, sanitation and water storage.

1.2 Urban Planning in France: tools for development

Territorial planning in France involves many actors and many planning documents. A key principle is carrying strategic aims across scales, from the State down to local authorities, so that documents are mutually consistent within the territorial hierarchy. National orientations are translated at regional, inter-municipal and then communal levels.

- **National scale**

The Urban Planning Code, Environment Code and national service frameworks set the broad lines for planning documents.

- **Regional scale**

Île-de-France is governed by the SDRIF (Schéma Directeur de la Région Île-de-France), a strategic land-use plan for the whole region. It guides urban growth, land use and the region's international standing, planning towards 2050 around three priorities: connect and structure for a more connected, more sustainable region; focus and balance for a more diverse, vibrant and attractive region; protect and enhance for a greener, more nature-rich region.

- **Inter-municipal scale**

The strategic document is the SCOT (Schéma de cohérence territoriale), which sets 20-year development orientations. It must align with the SDRIF and with the SDAGE and SAGE described below. SCOTs are produced by EPCI inter-municipal bodies (communities of communes, agglomerations, urban communities, métropoles) and provide the reference frame for communes when drawing up their PLU.

- **Commune scale**

PLU (Plan local d'urbanisme) or PLUi (inter-municipal PLU) define long-term development directions for the territory they cover. The municipal council initiates the PLU, conducts prior public consultation, debates the draft in council, then adopts it.

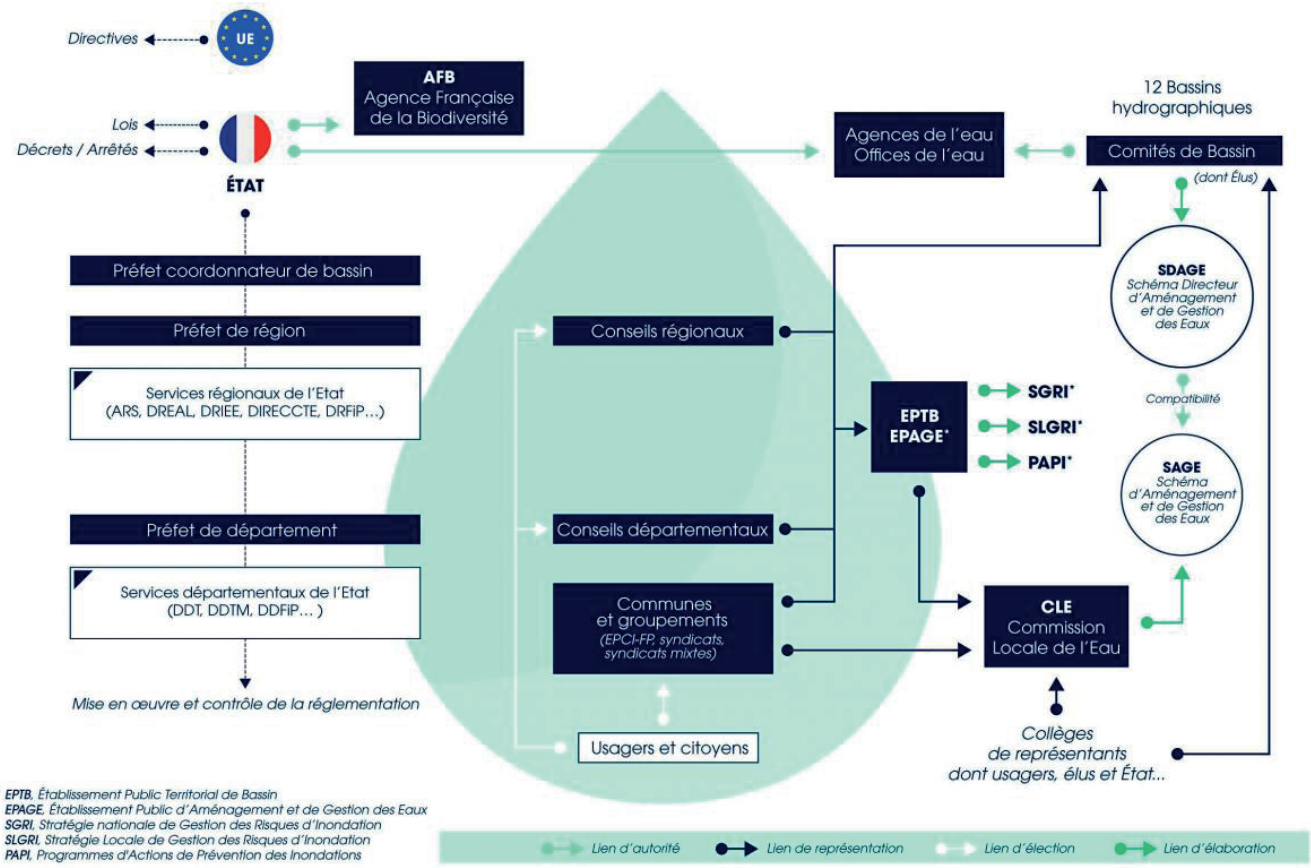
Water management also has its own planning instruments, as set out in the 1992 law.

SDAGE (Schéma directeur d'aménagement et de gestion des eaux) applies water policy at large river-basin scale, managing the resource and aquatic ecosystems.

SAGE (Schéma d'aménagement et de gestion des eaux) localises this at sub-basin or issue-based perimeter.

SAGE objectives include: preventing floods and protecting aquatic ecosystems, sites and wetlands; protecting waters and tackling all forms of pollution; restoring water quality and resilience; developing, mobilising, creating and protecting the water resource; valuing water as an economic resource, including for renewable electricity production, and sharing that resource; promoting efficient, economical and sustainable use; and restoring ecological continuity.

SAGE are drawn up by the CLE (Commission locale de l'eau), which brings together elected officials and the full range of local users and actors, and they are approved by the basin coordinating prefect. A steering committee oversees the process, comprising State services, representatives of local authorities, the Seine-Normandie Water Agency, and the Regional Health Agency (ARS).



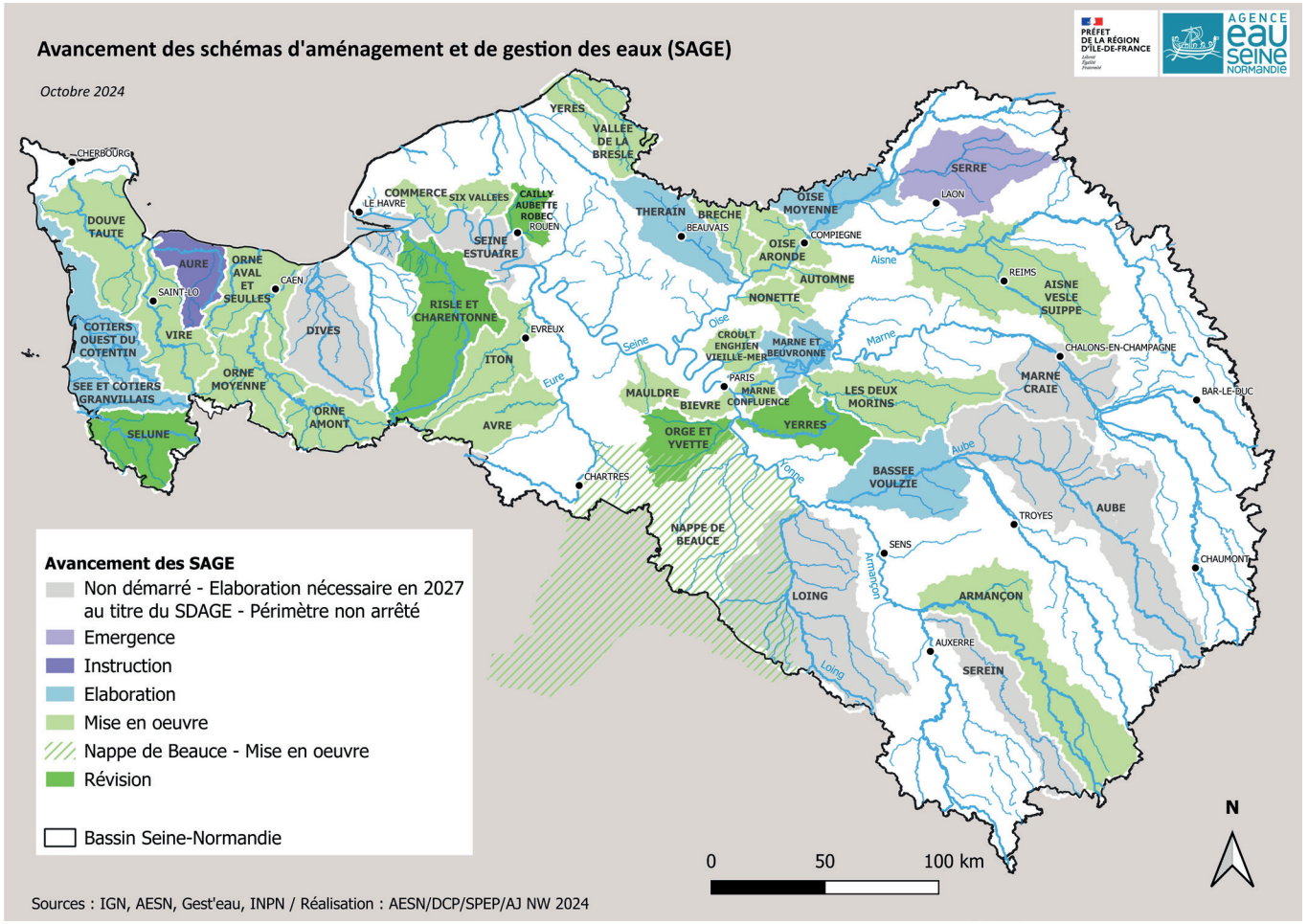
Mapping stakeholders in the water sector - ©Manifeste pour une eau durable, France Eau Publique

2. Key Actors

2.1 Water actors: a decentralised system

Water policy is set and coordinated nationally, but management is organised at river-basin scale. In the Seine basin, the competent Water Agency is Agence de l'Eau Seine-Normandie (AESN). It redistributes funds to projects, provides technical support to project owners, and can contribute to national and regional biodiversity strategies. It issues the SDAGE (Schéma Directeur d'Aménagement et de Gestion des Eaux, basin management plan). The AESN has a basin committee, a forum bringing together users (farmers, associations, industry), local authorities (regions, departments, communes) and the State (deconcentrated services, public bodies) to discuss basin-wide water issues. The AESN follows five priorities set by the Ministry for Ecological Transition: achieving the good status objectives for water bodies under the SDAGE; adapting to climate change; restoring biodiversity; mobilising stakeholders and fostering solidarity between territories; protecting public health.

Each basin is split into sub-basins for finer-grained management tailored to local features. EPAGE (Établissement public d'aménagement et de gestion de l'eau) are mixed-authority syndicates at sub-basin scale. They pool local authorities to uphold territorial solidarity, notably through flood-expansion zones. Their remit covers project ownership for "aquatic environments" and "flood prevention". They differ from river syndicates, which focus on day-to-day management and restoration of watercourses. Not all rivers are covered, and coverage can be



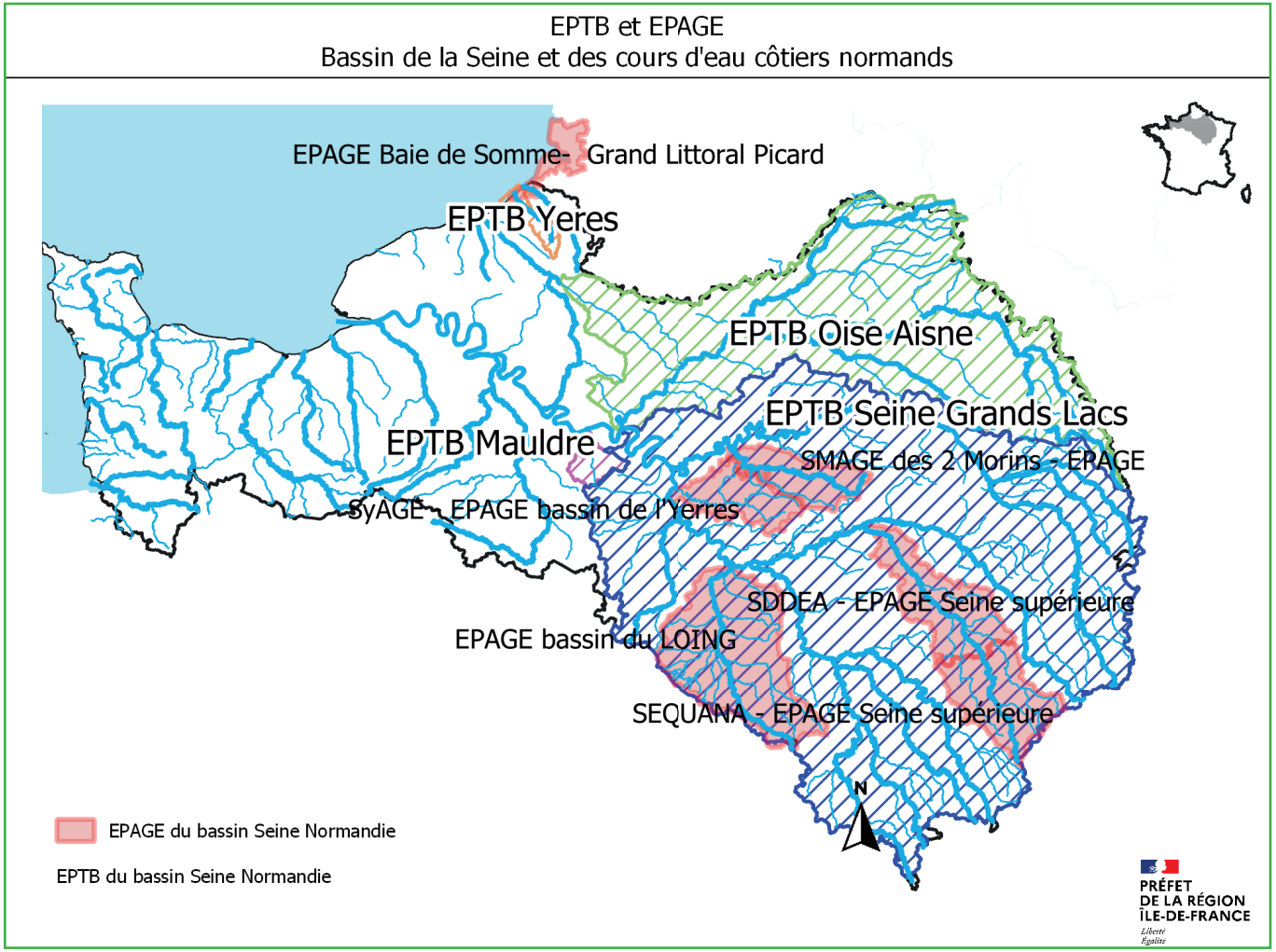
Map showing progress on water development and management plans (SAGE) for the Seine basin as of October 2024 - Agence Seine Eau Normandie
The green areas are plans that are finalized or being updated, while blue ones show studies towards the implementation of water plans. The grey areas are areas that shall get a plan by 2027 but studies have not started.

uneven. River syndicates play an essential role locally by delivering ecosystem actions.

The Seine basin is not fully covered by EPAGE. There are six, including four in the Upper Seine: EPAGE Sequana, EPAGE du Loing, EPAGE de la Seine Supérieure Champenoise and EPAGE du Morin. They receive support for coordination, technical engineering and finance from EPTB Grands Lacs, and have been selected for their high potential water-retention volumes.

At sub-basin scale, Commissions locales de l'eau (CLE), created by the prefect, set the SAGE perimeter. They include representatives of local authorities, users and the State. Other actors can contribute to SAGE or to flood-prevention action programmes (PAPI), for example regional nature parks (PNR Haute Vallée de Chevreuse, PNR du Gâtinais français, PNR du Vexin français) or associations such as AQUIBRIE, which led the territorial water and climate contract for the nappe du Champigny aquifer.

Établissements publics territoriaux de bassin (EPTB) were created by the 2003 law. They group local authorities at basin scale to deliver "flood prevention, balanced and sustainable water-resource management, and the preservation, management and restoration of biodiversity in aquatic ecosystems and wetlands, and contribute, where relevant, to preparing and monitoring the SAGE" (Environment Code, L213-12). EPTB Seine Grands Lacs is an administrative public body whose syndicate committee includes the City of Paris, several departments in Île-de-France including Seine-Saint-Denis and Val-de-Marne, the Métropole du Grand Paris, the Région Grand Est, and the agglomeration communities of Troyes Champagne Métropole, Saint-Dizier Der et Blaise, and Pays de Meaux. Its core mission



Map of EPTBs and EPAGEs in the Seine basin - @IGN-BD TOPO

is to maintain, develop and operate the four reservoir lakes, with a wider role in informing, coordinating and supporting local authorities.

Economic actors and associations

Agriculture and industry are major upstream activities and have seats at the table, notably via the Chamber of Agriculture, in the water-sector decision forums. Farmers work with drinking-water producers such as Eau de Paris to safeguard resources at abstraction points. Industrial users are represented by federations and chambers such as CCI and UNICEM for their various uses of water, from cooling to process abstraction. Associations play a hands-on role locally, putting forward proposals, shaping opinion, and in some cases acting as project owners for basin contracts or aquifer

management. Each stakeholder group brings its own priorities and concerns for rivers.

State public bodies

The Seine basin involves several key public operators:

Eau de Paris: an industrial and commercial public utility that produces, transports and distributes drinking water for Paris, with a strategy of resource protection and ecological asset management.

Voies navigables de France (VNF): an industrial and commercial public body that runs the State fluvial domain. It manages ports, organises inland-waterway logistics, maintains navigability, ensures the river's operational viability, manages and valorises waterside public land, and promotes river tourism.

HAROPA: the public port authority responsible for operating, maintaining and policing public commercial port installations, and for creating, extending, improving, renewing and rebuilding those installations.

Office français de la biodiversité (OFB): leads action to protect aquatic environments and dependent species, and contributes to drafting SDAGE basin plans.

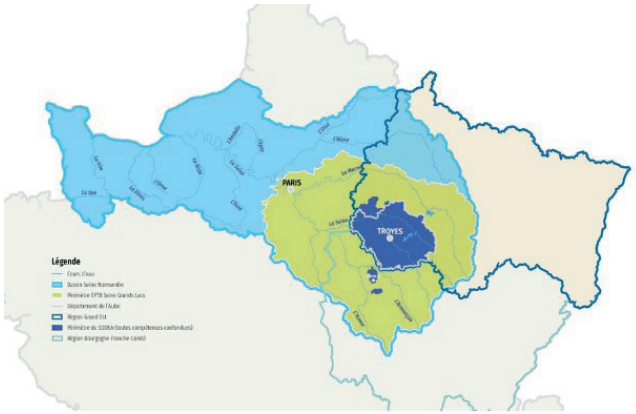
2.2 Water-related responsibilities

Communes are responsible for local water management, with some competences delegated to inter-municipal bodies.

- **GEMAPI (Gestion des milieux aquatiques et prévention des inondations):** a mandatory competence for métropoles, urban communities, agglomeration communities and communities of communes. It can be transferred to a mixed syndicate or an EPAGE. Actions include basin works, maintenance and development of rivers, canals, lakes and water bodies, flood defence, and wetland protection and restoration.
- **Drinking-water distribution:** a major public-health service owned by the inter-municipality. It sets the distribution plan but may not itself produce, transport or store the water. Under the "water pays for water" principle, drinking-water services are self-financed by user charges.
- **Wastewater sanitation:** communes must prepare a collective sanitation plan detailing collection assets and how wastewater is conveyed. They are also responsible for inspecting non-collective systems such as septic tanks.
- **Urban stormwater management:** a communal competence covering collection, conveyance, storage and treatment. It is mandatory for agglomeration communities. Objectives include, quantitatively, avoiding worse flooding and erosion and supporting aquifer recharge, and, qualitatively, preventing deterioration of receiving waters.

Focus brief: Syndicat Départemental des Eaux de l'Aube (SDDEA)

Founded in 1945, the syndicate took over from the Aube Departmental Association for Water Distribution created in 1943. In 2016 it became an open mixed syndicate and set up an in-house public operator to match evolving local-authority



Map of the SDDEA perimeter - SDDEA

missions and transferred competences.

SDDEA has five Responsibilities: drinking-water production, collective wastewater sanitation, non-collective sanitation, GEMAPI, and mosquito control. The SDDEA in-house operator manages drinking water plus collective and non-collective sanitation.

Collective sanitation, drinking water and GEMAPI are handled at local and territorial levels. Non-collective sanitation and mosquito control are managed across the SDDEA perimeter.

A major producer of drinking water in the Aube, the mixed syndicate's remit covers 501 communes and 346,000 inhabitants. It works across three hydrographic units: Bassée-Voulzie, Upper Seine, and Aube.

SDDEA has mapped the territory into eight areas to think through shared issues and generate projects at that scale. Beneath the territorial tier sits the local tier with COPE water-policy councils, which oversee day-to-day service management.

Stratégie 2100. In response to climate change and to safeguard the resource, SDDEA launched Stratégie 2100 in 2018, an integrated, territorialised approach to sustainable water management looking eighty years ahead. Three flagship actions:

- Modelling how climate change will affect water resources and uses
- Place-based coordination with the Aube Chamber of Agriculture
- A drinking-water supply plan for the entire SDDEA perimeter

The strategy is supported by the Seine-Normandie Water Agency (AESN) and the Aube Departmental Council, and is designed and delivered with other bodies such as the Aube Chamber of Agriculture and water actors including EPTB Seine Grands Lacs, all focused on future water challenges.

A core pillar of Stratégie 2100 is the creation of a long-term forum for maturation and exchange: the Observatoire de l'Eau. This participatory forum structures the ecosystem of water actors within the SDDEA area, sharing ideas and resources and highlighting common interests. It also evaluates SDDEA public policy.

COTEAUX DU NOGENTAIS

Paysage de coteaux caractérisés par des écoulements rapides et notamment la partie nord par la présence de pertes et résurgences.

- Présence de karst et d'écoulements souterrains rapides
- Pression phytosanitaire et azotée élevée sur les coteaux (grandes cultures)
- Zone de préservation des zones humides et milieux associés

PLAINE DE TROYES

Principal territoire urbanisé traversé par la Seine et ses affluents. La moitié de la population du département y est concentrée. Présence de l'agriculture en grandes cultures et polyculture-élevage

- Inondations par remontées de nappes ou débordements
- Nappe alluviale présentant des phénomènes de dénitrification importants à préserver
- Pression phytosanitaire et azotée modérée mais ayant un impact ponctuel sur les ouvrages de production d'eau potable
- Pression urbaine forte (assainissement : rejet de stations d'épuration et eaux claires parasites, imperméabilité des sols, pollutions industrielles, ouvrages de régulation, ...)
- Densité d'ouvrages d'eau potable et d'assainissement (vulnérabilité aux inondations)
- Cours d'eau anthropisés (fonctionnalité altérée, morphologie, ...)
- Présence de zones humides relictuelles à préserver

OTHE

Paysage vallonné de craie altérée, boisé sur les hauts de coteaux et agricole (grandes cultures) en fond de vallée.

- Nombreux petits systèmes de production d'eau répartis sur le territoire
- Pression phytosanitaire élevée. Pression azotée modérée
- Zone de ruissellement avec coulées de boues pouvant influencer les activités
- Hydromorphologie altérée avec un manque de connaissance de la ressource superficielle
- Nombreux réseaux d'hydraulique agricole
- Sources en coteaux, généralement protégées par la présence des forêts

ARMANCE

Extension du corridor argileux traversant le département mais plus vallonné que ce dernier avec un développement plus important de zones d'élevage.

- Zone agricole présentant une pression modérée en termes de phytosanitaires et nitrates mais pour lesquels de la donnée reste à acquérir
- Présence de zones de ruissellement ou d'infiltration préférentielles des eaux
- Peu de zones de production d'eau hormis les nappes d'accompagnement de cours d'eau plus sensibles à la pression agricole
- Forte présence de zones humides avec différentes intensités d'usages et donc différents gradients de fonctionnalité hydraulique et d'accueil de biodiversité
- Présence importante de forêts exploitées dont le réseau hydrographique a été fortement altéré par endroits pour favoriser l'évacuation des eaux

CORRIDORS FLUVIAUX

Aube domaniale – Seine influencée – Bassée

Corridors fluviaux du département, fortement marqués par la présence humaine, l'agriculture (grandes cultures) et le développement d'activités économiques.

- Zone à forts enjeux inondation (urbanisme, industries, captages à enjeux, stations d'épuration)
- Présence de zones de dénitrification permettant de préserver les captages vis-à-vis des nitrates
- Forte densité d'ouvrages de production d'eau potable alimentant la majorité des collectivités du nord du département
- Cours d'eau de bonne qualité, dynamiques malgré l'intensité des aménagements subis. Forte connectivité avec les milieux annexes pouvant encore être développée. Présence d'ouvrages hydrauliques structurants
- Aube Domaniale et Seine Influencée fortement soumises aux modalités de gestion des lacs
- Seine de la Bassée dépendante des conditions rencontrées à l'amont de la confluence

BARROIS DE LA SEINE ET DE L'AUBE

Territoire à dominante viticole ponctué de zones de boisements reposant sur les calcaires du jurassique et présentant un comportement pseudo-karstique à écoulement rapide (dolines, gouffres). Les coteaux sont marqués par la résurgence de sources (karst) et les plaines alluviales sont étroites et fortement réactives aux pluies.

- Zone marquée par un fort ruissellement et érosion (turbidité des eaux)
- Captages présentant des ruptures de production pour faire face aux usages (tension quantitative)
- Pression phytosanitaire élevée voire très élevée, beaucoup plus modérée en azote
- Hétérogénéité du milieu entraînant une fluctuation importante de la qualité des eaux
- Réseau hydrographique de tête de bassin versant fortement vulnérable aux extrêmes climatiques et altéré par les aménagements hydrauliques humains
- Les rus préservés présentent des potentialités biologiques fortes (certains sont classés réservoirs biologiques dans le SDAGE)

CHAMPAGNE CRAYEUSE

Territoire agricole (grandes cultures) reposant sur la craie du crétacé caractérisé par l'inertie du milieu et présentant une hétérogénéité. Le milieu a été fortement remanié par l'Homme au cours des dernières décennies.

- Pression phytosanitaire et azotée très élevée sur l'ensemble du territoire
- Tensions quantitatives sur les ressources souterraines et superficielles
- Présence de zones de ruissellement ponctuelles et mal identifiées
- Fonctionnalité des cours d'eau à rétablir
- Forte inertie du milieu souterrain

PLAINE DE BRIENNE

Grande plaine alluviale de l'Aube et de ses affluents avec une occupation agricole du territoire (grandes cultures, polyculture-élevage et bovins) ponctuée de zones boisées.

- Présence de zones de dénitrification préservant la nappe alluviale de la pression azotée
- Pression agricole modérée (phytosanitaires et azote)

CHAMPAGNE HUMIDE

Grande zone argileuse traversant l'Aube de sa limite orientale jusqu'au sud-ouest en passant par le territoire de l'Armance. Les lacs réservoirs sont assis sur ce compartiment géologique. Le paysage est marqué par la présence de vastes forêts.

- Absence de sites permettant une production d'eau hormis le chevelu des nappes d'accompagnement des cours d'eau du territoire
- Présence agricole modérée et diversifiée (grandes cultures, polyculture-élevage, bovins)
- Absence de possibilité d'infiltrer les eaux posant des difficultés pour la gestion des eaux de pluie, les réseaux d'assainissement et les exutoires de stations d'épuration
- Forte densité de zones humides et plans d'eau avec potentiel biologique intéressant
- Cours d'eau secondaires au fonctionnement modifié par la présence des lacs

ESTIMATION DES IMPACTS DU CHANGEMENT CLIMATIQUE

- **Augmentation de la fréquence des épisodes extrêmes**
- **Précipitations :** + 4 à - 24 %
- **Évapotranspiration potentielle :** + 15 à 35 %
- **Volumes d'eau disponibles à l'écoulement :** + 2 à - 50 %
- **Débits de la Seine :** - 15 % à - 43 %
- **Niveaux piézométriques :** baisse de plus de 10 m sur les plateaux et moindre en zones de plaines

Source : Impact du CC sur les ressources en eau du bassin versant de la Seine – PIREN-SEINE – décembre 2011

SDDEA ET SA RÉGIE – *Stratégie 2100*

CAPTION 82: Territory SDDEA

Focus brief: EPAGE of the Loing Basin

The EPAGE du bassin du Loing is a mixed syndicate holding the GEMAPI competence for the Loing basin.

It has operated at basin scale since 2019, from the Loing's sources down to its confluence with the Seine at Saint-Mammès. This new scale followed reflection among neighbouring river syndicates and the exceptional 2016 flood on the Loing, which exceeded the 1910 level.

The EPAGE groups 266 communes across three departments – Yonne, Loiret, Seine-et-Marne – and three regions – Bourgogne-Franche-Comté, Centre-Val de Loire and Île-de-France. The Loing catchment covers 4,150 km², fed by many small tributaries. Given its hydrographic importance, it is subdivided into 14 basin committees. Land use is predominantly rural and agricultural at 72 percent of the area.

The EPAGE relies on two main tools: the Contrat territorial Eau et Climat (CTEC) and PAPI flood-prevention action programmes.

- **Contrat territorial Eau et Climat (CTEC).**

An action programme for managing aquatic environments aimed at achieving good ecological status of water bodies, restoring biodiversity, and adapting to climate change. Flagship CTEC actions identified by the EPAGE include:

- basin-wide hydrological and hydraulic study;
- works to disconnect artificial water bodies and to create or enhance wetlands;
- restoring ecological continuity in central Nemours;
- a study to restore ecological continuity in a key fisheries sector;
- a land-acquisition strategy to secure areas with high ecological value.

- **Programmes d'Actions de Prévention des Inondations (Flood Prevention Action Programs) programmes of intent.**

The goal is to improve understanding of risk and reduce the vulnerability of people and property by making stakeholders more responsible and better prepared, including elected officials, associations and households.

Alongside these measures, the EPAGE runs communication and awareness campaigns on managing aquatic environments and flood risk, with activities such as school workshops, public meetings and guided walks for a wide audience, including the general public, schools and out-of-school groups, local event-goers, elected representatives and technical partners.

Development of the Nogent-sur-Vernisson wetland area - Epage du Loing

Map of the EPAGE du Loing perimeter - EPAGE du Loing

Appendix

Document 1 : WATER IN ALL ITS FORMS AND DYNAMICS: SCARCITY/SURPLUS/QUALITY

by Armelle Varcin and César Silva Urdaneta

Water flows, stagnates, meanders, floods, overflows, gushes, sings, nourishes, refreshes, quenches thirst, moistens... Sometimes water heats up, evaporates and becomes scarce, or, on the contrary, it floods, backs up and overflows.

Water comes from the earth, the sky, the ground or the sea.

Water is plural. Clarification is needed to identify the qualities and uses of different types of water: rainwater, river water, groundwater and seawater.

Who do they belong to, what are their functions, what are the effects of excess or scarcity of one or the other, what compensatory measures have already been tried and tested...?

This table summarises the answers according to the type of water: river, rainwater and groundwater. It does not include marine water, canals, lentic water, ponds, marshes, pools or lakes.

	RAINWATER	RIVER WATER	GROUNDWATER
DEFINITION	- Rain: liquid water droplets falling from clouds. A cyclical and random phenomenon, the intensity of which varies over time. - "return period" = average time interval between two events at least as strong as the one taken into account to calculate the dimensions of the structure. Often chosen between 5 and 50 years, with 10 years having been the benchmark for a very long time. The construction of a network carries with it the risk of flooding, overflowing, etc. Construction extension/low point of the old town: For example, the use of a sewerage network for the collection and disposal of rainwater does not protect against the risk of flooding, but on the contrary often greatly amplifies this risk. Combined sewer system: a sewerage system in which rainwater is mixed with wastewater (grey water or domestic water and sewage from toilets). Separate system: a sewerage system that does not mix rainwater and wastewater.	Article L215-7-1 of the Environment Code, 2016: "A watercourse is defined as a flow of running water in a natural bed, fed by a source and with sufficient flow for most of the year. The flow may not be permanent, depending on local hydrological and geological conditions. To distinguish a watercourse from a ditch: Key criteria: - The existence of a natural bed at its source - Fed by a source - Sufficient flow for most of the year Additional indicators: - The presence of banks and a bed with specific substrate - The presence of aquatic life, - Upstream/downstream continuity. The riverbank is the geographical environment that separates aquatic and terrestrial environments. => riparian => rivalry The bank is the sloping embankment that separates the minor bed from the major bed.	Groundwater consists of water reserves stored in porous and permeable rocks in the subsoil. Far from being isolated from the water cycle, it communicates with surface water environments. Present throughout France, it is nevertheless very heterogeneous, due to the nature of the rocks in the subsoil." https://www.eaufrance.fr/les-eaux-souterraines They are fed by infiltration into the soil. Depending on their depth, they circulate more or less quickly in the soil. Groundwater table: water close to the surface Aquifer: water reserve dispersed in rock

		The floodplain is the floodplain. It is limited by the highest waters. The extreme parts of the floodplain are only flooded during extreme floods with a fairly low water level	
GLOSSARY	Rain, shower, downpour, squall, squall, squall, drizzle, drizzle, monsoon, typhoon, precipitation, storm... Derivatives of rain: fog, meteor, snow, avalanche, hail, hailstone...	Watercourse, channel, stream, brook, rivulet, river, torrent, nant, becque, torrent, wadi, ravine, exorheic or endorheic watercourse Meander, bank, shore, Tidal range, flow, highest known water levels, low water levels Minor/major bed Resurgence, spring, estuary, delta, cataract, waterfall	Water table Confined aquifer Aquifer Perched water table Saturated zones
POSSIBLE FUNCTIONS	- Irrigation - Watering plants, gardens/plantations in urban areas and agricultural plots. - Cooling - Supplying water reservoirs, ponds, groundwater, etc. - Washing/cleaning roofs and public spaces (reducing pollution). - Soundscape - Visual spectacle	- Drinking water production - Navigation - Transportation of goods, waste, people - Tourism - Ecosystem in the water and on the banks, riparian forest, maintenance or enrichment of their biodiversity - Air cooling - Drainage - Hydroelectric power generation - Cooling of engines/processes in industry and in thermal and nuclear power plants - Amenities, living environment, walks along waterways - Leisure activities, sports/water sports - Recreational or subsistence fishing	- Drinking water production - Geothermal energy - Watercourse supply - Water reserves for soil: feeding plants and wildlife essential to soil life
OWNERSHIP OF ...	Rain belongs to the owner of the land on which it falls: - Article 641 of the Civil Code of 1804: "Every owner has the right to use and dispose of the rainwater that falls on their land." - Art. 640 of the Civil Code of 1804: "Lower-lying land is subject to higher-lying land to receive water that flows naturally without human intervention. The lower-lying owner may not build a dyke that prevents this flow. The higher-lying owner may not do anything that aggravates the servitude of the lower-lying land."	State-owned: belongs to the state Non-domanial: belonging to the residents Distinction of easement - Domanial watercourse Navigable or floatable Then widened Non-navigable - Non-public waterways Private	Property of the landowner or subsoil owner, water abstraction rights

		Easement along navigable waterways: towpath Colbert Regulation 1669 (see François I 1520) Napoleon I (decree of 22 January 1808): 30 feet = 9.75 m 10 feet = 3.25 m	
WATER OVERFLOW POSSIBLE NEGATIVE EFFECTS	- Reservoir supply - Saturation of underground drainage systems - Backflow of rainwater and wastewater - Crusting and mudslides on bare agricultural land - Saturation of treatment plants for combined sewer systems - Bypass of combined sewer systems and discharge of wastewater into watercourses= pollution - Soil leaching and production of polluted effluents (biological, chemical) in watercourses: e.g. hydrocarbons, mouse droppings, etc. and water contamination, which is a problem for fish and drinking water collection	- Increased flow rates, increased turbidity (problems with water quality, problems for fish respiration, overflowing of the minor bed - Flooding/overflowing of the minor bed into the major bed - Impossible to navigate: transport and related economy - Energy security issues, defence issues, etc. In the MA: flood defence system in the plains	- Soil saturation - Soil incapacity, absorption and filtration problems - Backflow
PREVENTIVE OR COMPENSATORY MEASURES	- Urban hydrology: delay runoff access to the outlet, store SLOW DOWN flows, REDUCE volumes, DELAY transfer to the outlet Infiltrate Retain water at source Buffer Cap Relieve - Regenerative hydrology Creation of drainage ditches (perpendicular to the slope), restoration/planting of hedgerows according to local specificities Public spaces Structured multifunctional spaces. The sanitation function disappears in favour of use.	Large reservoir lakes Flood expansion zone Dike and associated "lock" Construction of low walls Planned installation of cofferdam Suspension of navigation Creation of a flood expansion zone (ZEC)	Protecting boreholes Protect water catchment areas Limit obstacles to water flow (building or infrastructure foundations)

	Rehabilitation of agricultural vocabulary. Unites elected officials and local residents through its representation. Territorial marketing "Freezes land" Creates free space. ... If Cat Nat: Barnier fund		
SCARCITY / WARMING	Soil dehydration Heat	Low water level issues Warming of water bodies Cooling problems at nuclear power plants Environmental degradation and disruption of ecosystems Evaporation Fording possible Cessation of navigation	Soil dehydration: Soil shrinkage Agricultural problems Salinisation
POLLUTION	- Four distinct types of discharge: - Mixture of wastewater and rainwater that has passed through the treatment plant and undergone treatment there;	For streams, pollution from animal carcasses or excrement. Discharges Floating	Discharges Pollution at collection points and in boreholes
	- Mixture of wastewater and rainwater discharged directly from storm drains without any treatment. - Water collected by separate rainwater networks and discharged without any treatment. - Water collected by separate rainwater networks and discharged after specific treatment.	Chemical Mixture of wastewater and rainwater that has passed through the treatment plant and undergone treatment there; Mixture of wastewater and rainwater discharged directly from storm drains without any treatment. Water collected by separate rainwater networks and discharged without any treatment. Water collected by separate rainwater networks and discharged after specific treatment.	
COMMENTS	-dimensioning of underground networks "national" Caquot formula Technical circular CG 1933 INT 77, 1977 Loriferne: Surface water treatment The city and its sanitation 2003: systemic approach, long-term, plot-by-plot management...	Alert - vigicrue https://www.vigicrues.gouv.fr	

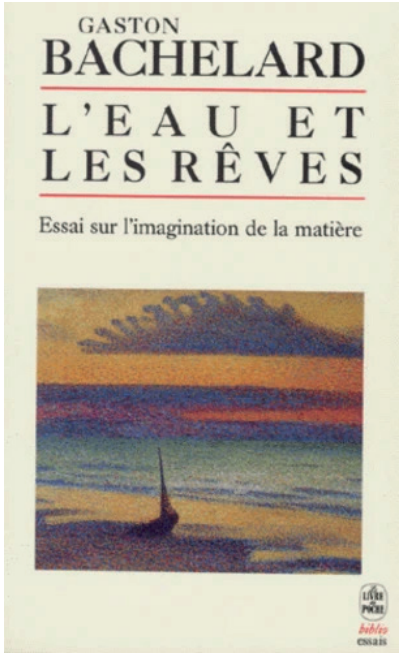
Document 2 : Water and dreams

by Armelle Varcin and César Silva Urdaneta

Let us not forget an iconic figure associated with water and this region, the birthplace of philosopher Gaston Bachelard (1884–1962), who wrote so eloquently about "water and dreams". A waterfall fountain in Bar-sur-Aube, near Troyes and Lake Orient, celebrates his memory. "Water and Dreams"[1] is a philosophical essay published in 1942 that explores the imagination of matter through the prism of water. It analyses how water is perceived in different cultures and literatures, highlighting its multiple meanings. It explores poetic and literary imagination (for example, the theme of the river of the dead in Edgar Allan Poe and in the myth of Ophelia) as well as his own musings. It explores aquatic metaphors, where water often represents emotions and states of mind. The approach is both methodological and thematic.

The book begins with an analysis of clear, sparkling waters, which give rise to fleeting images, then turns its attention to still, heavy waters, symbols of death and depth. Water thus materialises human musings, moving from the shimmering surface to the dark depths where myths and fantasies reside. It is a purifying element, a source of life, but also a destructive force. The author examines dreams of water, dreams of drowning or sailing, and their psychoanalytic interpretation. Water is a symbol of transformation and fluidity, reflecting the inner changes of human beings. He also explores the duality of water, which is both soothing and threatening, calm and tumultuous. He concludes that water, in dreams and the imagination, is a fundamental element that reveals the depths of the human unconscious. For Bachelard, water is fresh water, rather calm, from a stream or river. It is never sea water, torrent water or river water. From this reading, we will retain for the Grand Jardin Séquanien the evocative and symbolic power of this element, its familiarity and its universalities, which make it a unifying medium for reflection and action.

1 Bachelard G., 1985 (1942), L'eau et les rêves : essai sur l'imagination de la matière, Paris, Corti.



Cover of the book L'eau et les rêves by Gaston Bachelard

Document 3 : Identity card for the Île-de-France region

Paris, a global city

Paris is considered a 'global city', as described by Saskia Sassen. It is home to many of the headquarters of the world's most powerful multinationals and is also one of the world's leading financial centres. The La Défense business district accounts for 20% of the Île-de-France region's GDP and is considered one of the world's leading business districts. It is also an important centre of political leadership, as it is the capital of France, the world's sixth largest economy, represented in numerous international organisations. It is also home to a high concentration of high-level tertiary activities (40% of French executives) and is a major research hub (59% of French researchers). Furthermore, it is located at the heart of a very important communications network, making Paris one of the most accessible cities in the world and a major international conference centre. It is also a major transport hub. Paris is therefore, along with New York, Tokyo and London, one of the four dominant centres of the global megalopolis archipelago, at the heart of international trade. It is located at the heart of one of the most dynamic urban regions in Europe and the world. «Located at the crossroads of European and global trade, Île-de-France is the leading economic region in France and one of the leading regions in Europe. Comprising eight departments, 1,295 municipalities and arrondissements, it has a population of 12.2 million (1) (19% of the French metropolitan population), which is younger than the national average.» (IAU IDF, INSEE, CCI Paris-Île-de-France, 2018)

Territorial structure

France is divided administratively into 18 regions (including five overseas territories) and 101 departments. Île-de-France is one of these 18 regions. Within Île-de-France, the heart of the region is the city of Paris, divided into 20 arrondissements. Paris is also a department. The city is bordered by a ring road that connects it to the inner suburbs.

The inner suburbs are the area made up of the three departments bordering the city of Paris. Until the end of 1967, most of this area, together with Paris, formed the department of Seine.

The three departments of the inner suburbs are: Hauts-de-Seine (92), the smallest department in the region (17,541 hectares), comprising 36 municipalities. Seine-Saint-Denis (93), a department covering an area of 23,581 hectares, comprising 40 municipalities. Val-De-Marne (94), a department covering an area of 24,411 hectares, comprising 47 municipalities.

The outer suburbs comprise four departments: Seine-et-Marne (77), Yvelines (78), Essonne (91) and Val-d'Oise (95). Seine-et-Marne is the largest department in the region (591,665 hectares and 510 municipalities). Yvelines, a department covering an area of 227,088 hectares, comprises 262 municipalities. Essonne, covering an area of 180,439 hectares, comprises 196 municipalities. Val-D'Oise, a department covering an area of 124,857 hectares, comprises 184 municipalities.

Hydrography and geography

The geography of Île-de-France is marked, in physical terms, by its location at the centre of a basin, the Paris Basin. This basin, with its relatively flat terrain, is irrigated by a navigable river, the Seine, whose main tributaries converge precisely in this region. Île-de-France is irrigated by a dense network of rivers, with a combined length of approximately 4,000 km.
The Seine is the region's largest river. The other main rivers are tributaries of the Seine. The major navigable waterways are the Marne, the Oise, the Yonne, then the Grand Morin, Petit Morin, Yerres, Essonne, Orge, Loing, Mauldre, Yvette, Bièvre and Ourcq. In addition, there are the canals (Saint-Denis, Chelles, Ourcq, Loing, etc.) and the network of channels created in the past to supply the Palace of Versailles.
In other words, the rivers in Île-de-France are part of the region's identity through the landscapes of their banks and shores (both urban and rural), the richness of their natural environments, and also as locations for human activities (with ports in Gennevilliers, Paris, etc.), which have produced a diverse built heritage and remarkable sites.

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