

# Excess Water: The Laws of Nature Serving the Control of Overflowing Rivers El exceso de agua y las leyes de la naturaleza en el control de los ríos desbordados

PHILIPPE BILLET

Jean Moulin-Lyon 3 University, Lyon, France

E-mail: [philippe.billet@univ-lyon3.fr](mailto:philippe.billet@univ-lyon3.fr)ORCID: <https://orcid.org/0000-0001-9346-5832>

## Abstract

Nature-based solutions can be implemented to combat flooding by harnessing the natural dynamics of rivers. The law can thus guarantee the movement of riverbeds, authorize over-flooding upstream to limit flooding downstream, require reforestation of mountains and prohibit clearing, and protect and require the restoration of wetlands. This involves allowing water to flow naturally and leaving or returning to the river its rightful space.

## Keywords

Watercourses, Flood Prevention, Nature-Based Solutions, Temporary Retention Area, Over-Flooding Area.

## Resumen

Las soluciones basadas en la naturaleza pueden implementarse para combatir las inundaciones aprovechando las dinámicas naturales de los ríos. El derecho puede, en este sentido, garantizar la movilidad de los cauces, autorizar desbordamientos aguas arriba para limitar inundaciones aguas abajo, exigir la reforestación de las montañas y prohibir la deforestación, así como proteger y requerir la restauración de humedales. Esto implica permitir que el agua fluya de manera natural y devolver o preservar al río el espacio que le corresponde.

## Palabras clave

Cauces, Prevención de inundaciones, Soluciones basadas en la naturaleza, Áreas de retención temporal, Zonas de desbordamiento.

## 1. Introduction

Water circulation depends on gravity. Gravitational force creates a situational relationship that drives water downwards in the direction of the slope, more or less quickly depending on the degree of this slope, more or less quickly depending on the quantity of water flowing, more or less quickly or in greater or lesser quantity depending on the configuration of the slope, the greater or lesser permeability of the soil and the conditions of water collection, the complexity of the environments crossed. The flow occurs without regard for these environments, whether they are inhabited or not, cultivated or not.

For several centuries, public authorities have had to organize water management in the context of preventing risks to people and property. These interventions were organized in a complementary way with, on the one hand, a “natural” management which instrumentalizes the circulation of water in the watercourse, water retention by wetlands, water flow on mountain slopes, and controlling the process by reforestation (Surell, 1841) and, on the other hand, a more artificial management, made up of water retention by dams, rectification of riverbanks, canalization of watercourses, etc.



These «natural» restoration works of the watercourses' functionalities characterize a less aggressive approach to human interventions in the environment, by using the dynamics of water and its effects on the surfaces crossed. There is thus a mobilization of what we now call «nature-based solutions», which the law will strive to promote. Over the last decades, the philosophy of water management in Europe has shifted from hydraulic control to ecological governance. For example, in France, initially, throughout the 19th century until the early 1990s, the focus was on defending against flooding by containing water in dams, levees and canals, with works that artificialised its course. Then, awareness of the environmental impacts of these developments and the need to preserve water resources and aquatic ecosystems led to a focus on flood management at the watershed level, combining concerns for safety, enhancement of landscape and cultural heritage, as well as meeting quantitative and qualitative water needs and restoring the ecological diversity of the environment. This approach was reflected in the 'Plan Loire grandeur nature' programme (1994-1999), which served as a model for subsequent plans: the Meuse plan (2003), the Rhône plan (2006) and the Seine plan (2007). Finally, without calling into question the previous actions, the legislator has mobilised the natural dynamics of watercourses (overflow, bank erosion and bed changes) to contain flooding upstream of sensitive areas (cities) and slow down the flow of water (Law of 30<sup>th</sup> July, 2003).

The law has indeed been heavily mobilized to facilitate these interventions on private property, to override the opposition of owners to public works and to allow the development of the beds of watercourses (which belong to the riparian owners), to prohibit access to mountain land which has been reforested or re-grassed in order to protect them (prohibition on felling trees and grazing herds) and thus allow vegetation to slow the flow of water and the watercourse to evacuate excess water without overflowing or by overflowing less. Nature-based solutions will acquire the right to exist in the range of solutions intended to prevent flooding, to the point of being favoured under the heading of “sustainable development”. New procedures, based on the observation of the dynamics of water and watercourses, will thus complement the tools intended to combat flooding.

And to facilitate the execution of the works and allow them to impact private properties, the law conferred upon them the status of statutory public utility easement.

## 2. Consecration of nature-based solutions

Nature-based solutions mobilise the natural functions of ecosystems to exploit the ecosystem services they produce. As defined by the IUCN, nature-based solutions are “Actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits” (IUCN, 2016, p. 2). While the IUCN provided a formal definition in 2016, the European Union had already promoted similar approaches, from a more institutional perspective: “Nature-based solutions are actions inspired by, supported by or copied from nature; both using and enhancing existing solutions to challenges, as well as exploring more novel solutions, for example, mimicking how non-human organisms and communities cope with environmental extremes.” (European Commission, 2015, Annex 1). These two definitions are considered “official” and structure the concept as well as the associated discourses. The concept stems directly from ecosystem services and remains strongly associated with them. It's not a new approach to nature conservation but a new conception of the use of nature. But it's not the only one. Pioneer, the EU Green Infrastructures Policy adopted in 2013 prefigures the nature-based solutions. Green infrastructure has been defined as “a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services.” (European Commission, 2013, § 1.2), and can be mobilized for flood control. Thus, among the examples highlighted of the many benefits of restoring natural capital is the ecological restoration of floodplain forests “*as well as*

*acting as a 'safety valve' to store water and reduce the risk of flooding in human settlements*" (European Commission, 2013, Box 3). *"Restoration measures for the floodplain forest also re-connect the river with the adjoining floodplain"* (European Commission, 2013, Box 3). Green Infrastructures are supported by the "Natural Water Retention Measures" (NWRM) "by contributing to integrated goals dealing with nature and biodiversity conservation and restoration, landscaping, etc." (European Natural Water Retention Measures (NWRM) platform, 2015, Introduction). These NWRM "are multi-functional measures that aim to protect and manage water resources using natural means and processes, therefore building up Green Infrastructure, for example, by restoring ecosystems and changing land use." (European Commission, 2014, Executive summary, p. ii). These measures form part of a broader environmental policy shift emphasizing ecosystem services as operational tools for risk management. Finally, for its part, the Ecosystem-Based Adaptation (EbA) "identifies and implements a range of strategies for the management, conservation and restoration of ecosystems to ensure that they continue to provide the services that enable people to adapt to the impacts of climate change". Developed in 2009, EbA "falls under the umbrella concept of nature-based solutions, but is only one form of NbS that focuses specifically on adaptation" (IUCN, 2009). That includes, for example, "Upland and watershed management to ensure that water storage and flood regulation services are maximised through the maintenance and enhancement of wetlands, river basins and their vegetation." (IUCN,). All these solutions, in one way or another, mobilize ecosystem services and decline the nature-based solutions. Because of their inclusion in strategies and policies, nature-based solutions are not only technical responses but also legal and governance instruments.

The nature-based solutions are divided into 3 categories of actions, which can be combined with each other or with "artificial" solutions: the preservation of functioning ecosystems in good ecological condition; improving the management of ecosystems for a sustainable use by human activities; the restoration of degraded ecosystems or the creation of ecosystems. (Ministère de la Transition écologique, 2025, p. 6).

Several considerations justify the adoption of these nature-based solutions to combat flooding, rather than technical solutions (such as flood control dams, artificial riprap or dikes): the watercourse is a dynamic system which constantly readjusts itself according to the flows which shape it, with lateral movements (banks) and an adaptation of the functioning of aquatic and terrestrial ecosystems. A "mobility zone" is created, a meander belt where the braids and twists of the watercourse can potentially be located.

Preserving this space is essential: the solid transport contributes to the balance of the river hydrosystem, and if the quantity of solid materials carried by the watercourse is less than its carrying capacity, there is erosion of the banks so that it can replenish itself with solid load. The temptation is therefore great to protect the banks to limit the movements of the waterway and to channel it. But these works can promote erosion in an area where the riverbed is most subject to reworking, with a risk of ravelling of the structures (bridge pillars, dike foundations, etc.) due to the deepening of the riverbed, as well as a loss of biodiversity due to the disconnection with the adjacent wetlands (marshes, etc.).

Artificialization of the environment by ripraps and dikes can therefore be a cure worse than the disease.

Adopting a solution based on nature before its time, the French public fluvial domain code considered the displacement of the watercourse's course in time and space, and the need to physically preserve the memory of this course due to a possible reinstallation in its former bed, to avoid overflows. This code has thus included in its nomenclature of state-owned watercourses the old river branches (swales, backwaters, etc.) so that, even without water, they benefit from all the protections of public ownership to preserve the future course of the watercourse.

### 3. Legal basis for the use of nature-based solutions to combat flooding

European Union law is the first to truly address nature-based solutions for flood prevention and restoration of floodplains but, initially, without using this nature-related qualification

The Directive 2007/60/EC of 23rd October, 2007 on the assessment and management of flood risks focuses on the least aggressive measures for the natural environment and highlights the possibilities of using natural dynamics. Thus, according to the general philosophy of the directive: “Flood risk management plans should focus on prevention, protection and preparedness. With a view to giving rivers more space, they should consider where possible the maintenance and/or restoration of floodplains” (Directive 2007/60/EC, 2007, rec. 14). This directive is fully in line with Directive 2000/60/EC of 23rd October, 2000 establishing a framework for Community action in the field of water policy, which promotes “the good ecological status of watercourses”, based in particular on “hydromorphological elements supporting the biological elements, river continuity and morphological conditions (river depth and width variation, structure and substrate of the river bed)” (Directive 2000/60, Annex V). More recently, Regulation 2024/1991 of 24th June, 2024 focused on nature restoration targets to restore degraded ecosystems, in particular “to prevent and reduce the impact of natural disasters.” (Regulation 2024/1991, § 7). From this point of view, the national restoration plan that Member States must establish must take into account the flood risk management plans drawn up in accordance with Directive 2007/60/EC. With regard to the natural environments concerned, these include, in particular, wetlands, river, lake, alluvial and riparian habitats

Viewed from a more operational standpoint, the preliminary flood risk assessment must contain:

An assessment of the potential adverse consequences of future floods for human health, the environment, cultural heritage and economic activity, considering as far as possible issues such as the topography, the position of watercourses and their general hydrological and geo-morphological characteristics, including floodplains as natural retention areas (...). (Directive 2007/60/EC, 2007, art. 4)

For their part:

Flood risk management plans shall consider relevant aspects such as costs and benefits, flood extent and flood conveyance routes and areas which have the potential to retain flood water, such as natural floodplains (...). “Flood risk management plans may also include the promotion of sustainable land use practices, improvement of water retention as well as the controlled flooding of certain areas in the case of a flood event. (Directive 2007/60/EC, 2007, art. 7.3).

In this perspective, the obligation to maintain waterways reflects these European concerns, with special regard to public authorities : legal procedures have been adopted to allow interventions in aquatic environments, whether to maintain watercourses to “keep them in their equilibrium profile, allow the natural flow of water” and “to contribute to its good ecological status or, where applicable, its good ecological potential, in particular by removing obstructions, debris and silt deposits, whether floating or not”(Code de l’environnement, art. L. 215-14), or, above all, to restore them to regain hydromorphological balance and the natural functioning of aquatic ecosystems so as to better cope with floods (Code de l’environnement, art. R. 214-1).

The French water nomenclature, a list of installations, structures, works, and activities that affect water or the functioning of aquatic systems and are subject to administrative control, takes into account these concerns and includes a section for works solely intended to restore the natural functions of aquatic environments, including the works necessary to achieve this objective.

This section notably covers: (i) the removal or lowering (levelling) of certain structures when located within the low-flow channel and affecting hydraulic conditions or aquatic environments; (ii) the relocation of the low-flow channel to improve the functionality of the watercourse or its re-establishment in the thalweg; (iii) the restoration of wetlands and marshes; (iv) the revegetation or re-profiling of banks to improve their natural functionality; (v) the daylighting of artificially covered watercourses; and (vi) the restoration of natural floodplains (nomenclature of works no. 3.3.5.0). Nature-based solutions therefore do not exclude human intervention; on the contrary, they require it to design, implement, and restore measures that re-establish natural dynamics along the entire watercourse. Their application necessarily imposes constraints on property while creating spaces of solidarity.

#### 4. Areas of solidarity and constraints on property

Intervention in the natural environment, or the absence of intervention or the prohibition of any intervention, is not without consequences for the rights of the owners of the areas concerned, whether they are public or private persons. In the name of the general interest, the rights of the owner are limited, placing them in a relationship of obligatory solidarity with the owners and users located downstream and laterally to the watercourse, to protect them against excess water.

Since the 19<sup>th</sup> century in France, this spirit has driven promoters of mountain works intended to restore land affected by excessive deforestation and grazing, to consolidate the soil, prevent solid matter (rocks, earth, wood) from reaching waterways, and ensure that water infiltrates rather than forming devastating torrents. With the support of regulations, the land affected by this work will be subject to a specific easement: “deferred grazing area”.

Based on the principle that “vegetation is the best means of defense against torrents” (Surell, 1841) and that “the extinction of torrents in France requires the complete reforestation of the mountains they devastate, other works being, in general, only temporary measures of varying duration” (Demontzey, 1894), the Forestry Code and associated laws will allow public authorities to oppose forest clearing. The owner must therefore declare their work project, before any execution “for all woods whose conservation is recognized as necessary: 1° To maintain the land, on mountains or on slopes; 2° To defend the soil, against the invasion of rivers, streams or torrents” (Code forestier, 1827, art. 219 – current Code forestier, art. L. 341-5). The public authority may oppose this project if it considers that it damages the functionality of the protection in place. The owner who clears forest in contravention of these provisions is liable to a fine but, more importantly, may be forced to restore the cleared areas to woodland. Similarly, the regulations may prohibit the grazing of livestock for 10 years on land that has been reforested or re-grassed: what is known as “enclosed grazing areas” must allow the plants to grow and become functional. Forests are thus managed to harness their natural functions: erosion protection, water regime regulation, and improved water retention capacity of highland soils.

More contemporary, the law of 30<sup>th</sup> July, 2003, relating in particular to the prevention of natural risks, mobilizes property by subjugating it to nature-based solutions, to facilitate the creation of “temporary retention zones for flood or runoff water” (Code de l’environnement, art. L. 212-1, 1°), as well as the creation of “zones of mobility of the minor bed of a watercourse” (Code de l’environnement, art. L. 212-1, 2°) in order to preserve or restore its essential hydrological and geomorphological characteristics. The system is supplemented by the preservation and restoration of wetlands known as “strategic zones for water management” (Code de l’environnement, art. L. 212-5-1), due to their importance for water retention during flood periods and the preservation of water resources during drought periods.

The natural functionality of the minor bed mobility zones (more poetically called “meander areas” (Taillefer, 1945) is preserved by the prohibition on anyone carrying out work to protect the banks, embankments, dikes and scouring, as well as, in general, any work or structures likely to obstruct the natural movement of the watercourse.

These areas are defined on the basis of the reconstitution of the successive courses of the riverbed and the definition of a historical migration envelope, in order to delimit a functional mobility area. The definition of temporary retention zones for flood or runoff waters proceeds from a similar philosophy (identifying the areas concerned) with the idea of not developing the watercourse and letting it overflow as it would naturally, but by constituting developments on the lateral plots to artificially increase their storage capacity for this water, thus making it possible to reduce floods or runoff in areas located downstream. This creates what is called “over-flooding”. In these areas, the administrative authority may prohibit any action or development likely to harm the proper functioning, maintenance and conservation of the works intended to allow the flooding of the area. In particular, it may require prior declaration of works which, due to their nature, importance or location, are likely to obstruct the storage or flow of water: it may then oppose the construction of these works or prescribe the necessary works. Unlike mobility zones, these easements entitle owners to compensation at the expense of the local authority that requested the establishment of the easement. Another compensation is provided for material damage affecting crops, cultivations, livestock, motor vehicles and buildings that would be caused to farmers by over-flooding. This French solution for flood zones is heavily inspired by solutions developed over decades in the Netherlands, involving the return of certain polders to a wild state, prohibiting any human occupation. It's mainly the “Room for the River Programme” (2007-2022) which captures our attention from our perspective: it aspired to restore the river's natural floodplain in the least impacted areas, in order to protect sensitive zones (Ch. Zevenbergen et al., 2013). This is in contrast to the approach adopted for many decades, during which rivers were confined by dikes whose height was increased, the philosophy “Room for the River” (Tielen et al., 2013). Germany has also been an inspirational framework for France, with integrated watershed management, which has led to the adoption of management by hydrographic basin, with a master plan for development and management intended to take into account the issue of water at a relevant scale.

Finally, regarding the preservation and restoration of “strategic water management areas”: to allow these wetlands to play their regulatory role, the administrative authority may require owners and operators to refrain from any act likely to harm the nature, the role, the maintenance and the conservation of the area (such as, for example, prohibiting drainage, backfilling or turning over meadows). It may also make it compulsory to remove or modify elements that obstruct the easement, at the expense of the local authority that requested the establishment of the easement.

This balance between environmental protection and private property reflects the emergence of what French doctrine calls ‘solidarité écologique.’ It implies that property rights are no longer absolute but contextual, subordinated to ecological interdependence. The rule of law is conditioned by the existence of spatial links arising from the circulation of water. The relationship between the individual and the collective is radically regulated, to the benefit of the latter, by a system of enforced solidarity. However, the community is necessary to protect individual interests.

## 5. Conclusion

Watercourses are fully functioning ecosystems, since they constitute a continuum, which implies that everything that happens upstream has a more or less significant impact downstream.

However, a watercourse is often only perceived within the limited framework of its minor riverbed, where water flows permanently. This approach is very restrictive, because the watercourse

is also characterized by its major riverbed, where water flows only at times, where it can stagnate when cut off from its source of supply, to temporarily regain a certain dynamic during a flood.

An overflowing watercourse is ecologically a watercourse and must also be considered a natural environment, even if it has temporarily left its “usual” bed. This implies that its dynamics must be respected throughout its course, both longitudinal and lateral, and that nature-based solutions intended to protect man from the effects of this dynamic must take global consideration of the water throughout its course and not just in the minor riverbed.

The new flood management policy must fundamentally align with the Sustainable Development Goals, particularly Goals 13 and 15. The former aims to strengthen countries’ resilience and adaptive capacity to climate hazards and disasters, while the latter ensures the preservation, restoration, and sustainable use of terrestrial and freshwater ecosystems and related services (especially wetlands).

Perhaps this is an invitation to reclaim the river’s territory and to mobilize the law to this end, in order to limit human occupation and, in any case, to make this occupation compatible with the river’s natural flow. The rule of law must allow for a balance to be found between property rights and the dynamics of the river ecosystem, between human land use and the natural use of the watercourse and its floods. This will be a paradigm shift.

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