

## Legal Perspectives of the Concept of Nature-Based Solutions in Costal Areas

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The Littoral is not defined in French law. The 1986 French law on the coastline refers this work of definition to geography. Article L. 321-1 of the Environmental Code defines it as a geographical entity that calls for a specific policy of development and protection. Geography defines the coastline as "an area under the exclusive influence of the sea..., a wider area that encompasses the immediate hinterland, coastal hinterland and shallow coastline" [1]. The French metropolitan coastline is 5,853 km long. The overseas departments have about 1,500 km of coastline [2]. This area is subject to high population density, high levels of artificialization and construction, and economic activities related to the sea [3]. The coastline is directly affected by the effects of climate change on biodiversity, sea level rise, ocean acidification, storms and cyclones [4]. The IUCN estimates that all French coastal departments are significantly impacted by the coastline recession [5]. These hazards on the human or ecological systems described give rise to quite significant coastal risks.

To respond to and combat these risks, the IPCC in its synthesis report of March 2023 and the recent national Biodiversity Strategy 2030 of July 2023 propose nature-based solutions to mitigate and adapt to the effects of climate change. Nature-based solutions (NBS) are a concept that is emerging in climate policy. They are the result of the paradigm shift that has taken place in recent decades around nature conservation. Their enshrinement in political instruments is the result of a historic process undertaken by the French committee of the International Union for Conservation of Nature (IUCN) [6]. They were promoted by this association, for the first time, on the international scene at the Conference of the Parties to the United Nations Framework Convention on Climate Change in Copenhagen in 2009. In 2015, as part of the hosting of COP21, the committee is organizing a seminar on "Nature-based Solutions to Combat Climate Change". In 2016, IUCN published its framework for NBS. At the Community level, political and legal tools for adapting to climate change are beginning to be acutely addressed. The European Commission further emphasizes that NBS must benefit biodiversity and support the provision of a range of ecosystem services [7]. The European Parliament and the Council discussed the concept in the "European Climate Law" of 30 June 2021. This regulation precises, in its preamble, that « Nature-based solutions, in particular, can benefit climate change mitigation, adaptation and biodiversity protection ». The same Regulation precise in the fourth paragraph of Article 5 that Member

States promote, in their national adaptation strategies, nature-based solutions and ecosystem-based adaptation. In addition, in the new European strategy "Building a resilient Europe" of 24 February 2021, the Commission gives pride of place to nature-based solutions. They are one of the three cross-cutting priorities for more systemic adaptation [8].

In France, NBS are in an "experimentation and demonstration" phase. They have not yet been enshrined within the meaning of national law. It's "an experimental moment in adaptation policies" in which all disciplines, including law, should participate. This is why legal science is questioning the legal rules applicable or likely to apply to the implementation of NbS. It is also necessary to reflect on the potential participation of NbS in the integrated governance of French coastlines.

To answer this question, we will situate NbS in French science, public policy, and law (I). It will be shown that NBS are not legally defined but are present in the scientific literature and in public policies. In addition, we will insist on the importance of NBS in the integrated governance of coastlines if they were legally enshrined (II).

### I- NbS at the Interface Between Science and Public Policy in Coastal Zones

The NbS have not yet been the subject of a real legal consecration. Its benefits and relevance are still being demonstrated in the scientific world in order to avoid conceptual millefeuille.

### A- The Benefits of the Concept in Demonstration in Sciences

Nature-based solutions are a source of enormous potential demonstrated by science. This concept has the merit of attracting the attention of researchers from various fields, thus building

itself around interdisciplinarity [9]. They are therefore of interest, without being exhaustive, to the research of lawyers, geographers or ecologists [10-12]. NbS enable climate change mitigation and adaptation while bringing benefits for biodiversity, territories and human societies. As several studies demonstrate, the climate and biodiversity crises are closely linked [13]. Climate change is exacerbating the erosion of biodiversity, while ecosystems paradoxically play a key role in greenhouse gas flows. NBS mitigates and adapts to the adverse effects of climate change

through the conservation, restoration and protection of aquatic and coastal ecosystems [14].

### Benefits for Biodiversity

NBS, through its actions to protect, manage and restore biodiversity, produces benefits for biodiversity itself and thus serves as a sound scientific foundation for the concept of NBS. Meinhard Doelle and Tony George Puducherry demonstrate that ecosystems such as mangroves, coral reefs, and seagrass beds are "green walls" facilitating the implementation of NBS to combat extreme weather events, coastal community adaptation, and climate change mitigation [15]. To this list can be added Arctic biota that will not be treated [16]. Mangroves are ecosystems that lie between land and sea. Before the 1960s and 1970s, they were seen as an unhealthy, repulsive, impenetrable environment [17]. Since the 1970s, with the emergence of modern environmental law, their ecological value has been strongly recognized. They play a decisive role in resisting coastal erosion, pollution and provide buffer zones against natural hazards [15]. They sequester a good amount of carbon and provide many ecosystem services [18]. Yet they are highly vulnerable to sea level rise [19].

Coral reefs, on the other hand, are colonial organisms composed of individual polyps, which live in symbiotic symbiosis with single-celled microalgae (zooxanthellae) in their body tissue" [15]. It is estimated that coral reefs alone are home to a quarter of all marine species [20]. Even if these reefs are threatened by anthropogenic climate change, they play a crucial role in climate change adaptation and mitigation. Seagrass beds, described as the "lungs of the sea", are the only plants that grow under the sea. Found all over the world, they are essential for marine biodiversity and for life on land. They help fight climate change through carbon sequestration, which accounts for 18% of the world's ocean carbon [21].

These coastal ecosystems play a very important role in the sequestration of "blue carbon" [20]. They capture carbon dioxide from the atmosphere and store it in living biomass and soil, acting as carbon sinks. Several NbS can focus on these ecosystems, through restoration, conservation, and protection actions [22]. These NbS aim to address societal challenges including biodiversity loss, climate change, land degradation, desertification, food security, disaster risk, urban development, water availability, poverty eradication, inequality, and unemployment, as well as social development, sustainable economic development, human health, and ecosystem services [23].

### Social Benefits: Human Well-Being

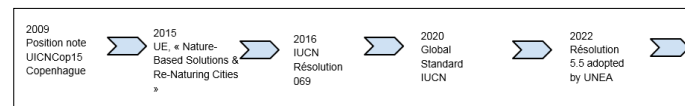
NbS must be built in a logic of social inclusion, through the reconciliation of biological diversity and the diversity of human practices [12]. From this perspective, Denis Covet and Frédéric Ducharme describe NBS as "nature-based and citizen-based solutions". As can be seen in the definitions of NBS, they must respond to human or societal challenges.

NBS can have effects on human labor productivity. Denis Covet and Frédéric Ducharme believe that nature-based and citizen-based solutions lead to a reduction in human labor measured quantitatively and monetarily [12]. Organic farming, for example, is less productive per worker, but uses less energy, unlike conventional agriculture, which is more productive per worker but uses more artificial fertilizers and pesticides. This example shows how reducing production, seen from an ecological perspective, can also be positive in the sense that it promotes better preservation of biodiversity.

NBS can only produce benefits for human well-being if the local populations concerned are included in these actions. The effectiveness and feasibility of an SFN can depend fundamentally on the buy-in and involvement of the population [24]. Human well-being can be sought in the degree of involvement and buy-in of the population.

### B- The Lack of a Legal Definition of the Concept of NbS

As far as we know, there is no definition of the concept of NbS in law, or at least in the sense of hard law.



First, a proposed definition was selected by IUCN in 2016. The latter defines them as "actions aimed at protecting, sustainably managing and restoring natural or modified ecosystems to directly address societal challenges in an efficient and adaptive manner, while ensuring human well-being and producing benefits for biodiversity"[25]. The European Commission, on the other hand, defines them as « Nature-based Solutions to societal challenges are solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social, and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes, and seascapes, through locally adapted, resource- efficient, and systemic interventions. Nature-based Solutions must benefit biodiversity and support the delivery of a range of ecosystem services [7]. Finally, the United Nations Environment Assembly (UNEA), by a resolution of 2 March 2022, defines them as « actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits» [26].

As the UNEA definition is more recent and is the result of the IUCN and European Commission definitions, we will focus our analysis on it. It would therefore be necessary to define all its components. NBS is an action to protect, conserve, restore, use, and sustainably manage natural and modified ecosystems. As Agnès Michelet points out, these actions are supported in law by the principle of prevention and precaution [10]. But beyond that, and if we stick to paragraph II of Article L110-1 of the French Environmental Code concerning ecosystems, these actions are also inspired by the polluter-pays principles, information, participation, ecological solidarity, sustainable use, complementarity and non-regression [27]. These actions must respond to social, economic and environmental challenges in an effective and adaptive way. These challenges include biodiversity loss, climate change, land degradation, desertification, food security, disaster risk, urban development, water availability, poverty eradication, inequality and unemployment, as well as social development, sustainable economic development, human health and ecosystem services [5,28]. Since the answer must be adaptive, this issue is particularly important in coastal areas. NBS must take into account the specificities of each coastal zone.

In the end, NBS are "efficient" actions. Efficiency is a complex concept to define in law. A distinction is made between factual or sociological effectiveness and effectiveness in law. According to Marie-Anne Chindit, the effectiveness of a standard is " the relationship between the objective officially pursued by the

legislator by means of this standard and the result obtained in practice" [29]. This presupposes a determination of indicators that make it possible to realize that an action claiming to be "NFS" responds effectively to social, economic and environmental challenges. These indicators are still imprecise [30]. The traditional methods and tools of the jurist do not allow us to measure this effectiveness. Finally, so-called NFS actions ensure "simultaneously human well-being and ecosystem services, resilience and benefits for biodiversity". Simultaneously is an adverb meaning "at the same time, at the same time, together, abreast or in concert" (Le Robert Dictionary). Well-being has no legal definition. The law is interested in this through "an approach linked to quality of life" [31]. It is measured through a series of tools such as expertise, the precautionary principle, ecological democracy and risk governance, the whistleblower, programmers and the role of the judge [31]. Ecosystem services refer to "the tangible or intangible benefits that humans derive from ecosystems" [32]. These are socio-economic benefits derived by humans from their sustainable use of the ecological functions of ecosystems [33]. It is a utilitarian and anthropocentric conception that is strongly criticized [34]. Resilience, on the other hand, in the environmental and climate context, "refers to the ability of a system, community or society exposed to hazards to resist and absorb them, to adapt to their effects and to recover from them quickly and effectively" [35]. Finally, biodiversity benefits are the net benefits that NBS provide to biodiversity (criterion 3 of the standard) [36]. To respond simultaneously, in concert or at the same time to these concepts would, in our opinion, be to respond to the principle of ecological solidarity and to the concept of "one health" which recognizes the interdependent relationships between humans and ecosystems [37].

In conclusion, NBS is a concept that has no legal definition from the point of view of binding law. The definition that could potentially have legal value is that of the United Nations Environment Assembly. However, this definition is not legally binding because of the legal value of resolutions under international law [38]. The legal challenges that arise, although numerous, are, on the one hand, to find a legally binding definition of the concept, and on the other hand, to build and organize its legal regime in international law, European law and French domestic law so that it promotes an integrated governance of coastal zones.

## **II- NBS In Integrated Coastal Zone Governance**

Even if the concept does not have a solid definitional legal basis, there are several instruments, in general environmental law and in the logic of integrated coastal zone management, on which the concept can be based.

### **A- NBS In Current Environmental Law**

The law has several ecosystem protection instruments on which NbS can rely. They directly or indirectly promote the establishment of NbS. These instruments are to be sought at the international, European and domestic levels of France. Since the emergence of ecological awareness, a significant number of legal texts have attempted to protect, conserve and restore ecosystems. The concept is so broad that it mobilizes international law as a whole. We'll settle for the most relevant ones.

The World Charter for Nature of 28 October 1982 calls for the protection, sustainable management and conservation of ecosystems and natural resources through several of its principles [39]. This charter lays the groundwork for raising awareness of the importance of nature in addressing societal challenges. Even if this charter is a soft law charter, there are texts that legally protect

nature through the maintenance of biological diversity.

At the international level, this protection is provided through several conventions. The 1982 United Nations Convention on the Law of the Sea protects coastal and marine ecosystems. Part XII of this Convention entitled "Protection and preservation of the marine environment" through the obligations imposed on States in terms of the prevention, reduction and control of pollution of the marine environment (Article 194 of the 1982 Convention) [40]. The 1971 Convention on Wetlands of International Importance (Ramsar) defines wetlands and sets out the obligations of States Parties in listing these wetlands [41]. We can also cite the World Heritage Convention of 1972 because some marine and coastal ecosystems can be part of the World Heritage [15]. The Convention on Biological Diversity, 1992 (CBD) is a fundamental source. It enshrines the "conservation of biological diversity", the "sustainable use of its components" and the "fair and equitable sharing of the benefits of genetic resources". Marine and coastal ecosystems are governed by this convention through the definition of biological diversity [42]. This Convention is a central instrument in the protection of marine and coastal ecosystems. Its ecosystem approach can play a crucial role in their conservation. Other examples include the Convention on International Trade in Endangered Species of Wild Animals, the Convention on the Conservation of Migratory Species of Wild Animals, the Convention on the Conservation of European Wildlife and Natural Habitats and the Convention on Bats.

At Community level, coastal and marine ecosystems are protected through Directives 79/409 of 2 April 1979 on the conservation of wild birds (Birds Directive) and Directive 92/43 of 21 May 1992 on the conservation of natural habitats (Habitats Directive). These two directives form a pillar called Natura 2000. It is also necessary to take into account the European Commission's White Paper on Environmental Liability (9 February 2000, COM (2000)66) and the Environmental Liability Directive 2004/35/EC of 21 April 2004, which introduces the concept of damage to biodiversity.

In addition, it should be noted that the legal regime applicable to climate can be mobilized in favor of NbS. At the international level, the United Nations Framework Convention on Climate Change adopted in 1992 enshrines climate change mitigation and adaptation. However, it should be noted that it was with the 1997 Kyoto Protocol that adaptation became a real priority. The UNFCCC, through its article 4 §1 point d, encourages cooperation for the conservation and, where appropriate, the enhancement of sinks and reservoirs of all greenhouse gases. Since 2015, the Paris Agreement, the result of the previous United Nations climate regime, has enshrined mitigation but also adaptation, loss and damage. At the community level, we find the "European Climate Law" of 30/06/2021. This regulation, through Article 5, calls for the promotion of nature-based solutions and ecosystem-based adaptation through the implementation of Member States' national adaptation strategies and plans.

At the national level, nature is protected through Article 1 of the Law of 10 July 1976 amended by the Law of 2 February 1995 (Environmental Code, Article L.110-1-II). For Agnès Michelet, NbS are supported in French law by the principle of precaution, prevention and ecological solidarity. The precautionary principle "according to which the lack of certainty, taking into account the scientific and technical knowledge of the time, must not delay the adoption of effective and proportionate measures aimed at preventing a risk of serious and irreversible damage to the environment at an economically acceptable cost" (Environmental

Code, Article L.110-1-II-1°). This principle is recognized by Article 191 of the Treaty of Lisbon and by Principle 15 of the 1992 Rio Declaration.

The principle of prevention "implies avoiding damage to biodiversity and the services it provides; failing that, to reduce its scope; and, finally, to compensate for the damage that could not be avoided or reduced, taking into account the species, natural habitats and ecological functions affected" (Environmental Code, Article L.110-1-II-2°). This principle is also recognized by Article 191-2 of the Treaty on the Functioning of the EU and Article 3 of the 2004 Constitutional Charter.

Finally, the principle of ecological solidarity "calls for taking into account, in any public decision-making that has a significant impact on the environment of the territories concerned, the interactions of ecosystems, living beings and natural or managed environments" (Environmental Code, Article L.110-1-II-6°). This principle, even if it is still imperfect and scientifically criticized (Agnès Michelet dir., 2022, 215p.), is an originality of French law. In short, current environmental law, through its most relevant sources on biodiversity and climate, is fertile ground for the concept of NbS. The concept, in turn, makes it possible to establish the links between climate change and the erosion of biodiversity. Its explicit recognition can help to break down the silos between climate and biodiversity standards and to realize their interdependence. The concept questions the effectiveness of existing standards in terms of biodiversity protection.

## **B- Reflect on Integrated Coastal Zone Planning through the Concept of NbS**

Integrated Coastal Zone Management is « dynamic process for the sustainable management and use of coastal zones, taking into account at the same time the fragility of coastal ecosystems and landscapes, the diversity of activities and uses, their interactions, the maritime orientation of certain activities and uses and their impact on both the marine and land parts. » (Article 2 of the Madrid Protocol of 21 January 2008). As an action or operation for the sustainable management of coastal ecosystems, NBS participates in this process. Born out of the recommendations of the 1992 Rio World Summit, Integrated Coastal Zone Management reflects the idea of going beyond sectoral coastal zone management [43]. In order for it to be a reality in coastal zones through NBS, each State must comply with certain conditions set out in the Madrid Protocol [43].

First, integrated coastal zone management must allow for institutional coordination. It is an approach to environmental governance characterized by the decompartmentalization of coastal problems at all scales through the administration. At the international level, it finds a place in international cooperation thanks to the principle of common but differentiated responsibilities. At the European level, although it has been a party to the Madrid Protocol since 13 September 2010, there is a perception of a form of rejection of ICZM in European directives. At the national level, it takes the form of the establishment of institutions responsible for the coast. These include the Conservatoire de l'écologie Littorale et des Ravages Lacustres, the Committee of the French Initiative for Coral Reefs (IFRECOR) and the National Coastal Council. All these initiatives promote the adoption of three strategies aimed at integrated management: the National Strategy for Integrated Coastal Management (SNGITC), the National Strategy for Flood and Submersion Risk Management (SNGRI) and the National Strategy for the Sea and Coastal Region (SNML) [44]. The SNML is declined, specified and supplemented by the strategic façade

document (DSF) at the scale of the four maritime coasts of France.

Secondly, it must be based on genuine regulations specifically dedicated to coastal areas (Article 5 of the Madrid Protocol). In France, it is done through the coastal law of 3 January 1986. Finally, it must lead to the inclusion of the ecological fragility of island environments in plans and programmes. This is a condition laid down in Articles 10 and 11 of the Madrid Protocol. In any case, if the coastal law of 1986 is positioned as the essential regulation in the management of the coast, then the question arises of the urban planning document that territorializes it by pursuing an ICZM objective.

The SCOT ensures the "territorialization" of the coastal law, due to the abandonment of the SMVM. The second paragraph of Article L.121-3 of the Urban Planning Code, in its version resulting from the ELAN Law, explicitly provides that the SCOT specifies "the modalities of application of the provisions" of the Urban Planning Code relating to the coast. The SCOT is a powerful tool, "a kind of legal Barnum" [25]. The Ordinance of 17 June 2020 modernizes it and reinforces its role in the implementation of the Coastal Law. Article L.141-12 of the Urban Planning Code states that "when they include one or more coastal municipalities, territorial coherence plans may set out the fundamental guidelines for the development, protection and enhancement of the sea and the coast". The SCOT is used to implement sectoral policies, particularly those relating to urban planning, biodiversity, energy or climate. As such, the SCOT can enable a real integration of NBS in the territories through its strategic development project (PAS) and its Orientation and Objectives Document (DOO). The Local Urban Plan (intercommunal) can integrate NBS by integrating sectoral development and programming guidelines relating to NBS.

In summary, the legal recognition of NBS would make it possible to truly be in line with the spirit of integrated coastal zone management through the decompartmentalization of sustainable coastal zone management.

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