ARTICLES

PROTECTING COASTAL AREAS: A TRANSDISCIPLINARY RESEARCH

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Abstract

This article examines the protection of coastal areas and develops two themes. The first concerns methodology and raises a number of issues that question the fundamental approaches used in the analysis of coastal areas. These questions relate not only to conventional legal approaches, particularly the theory that the separation between land and sea constitutes the primary law of the planet – and the paradigm predicated on individual legal ownership – but also to established distinctions among law, geography, and other social sciences. The second theme posits that the integration of law and the sea, rather than their separation, is not only consistent with existing knowledge but also makes sense of the practical solutions proposed by national, international, and supranational legal frameworks. These solutions include the use of indicators and planning instruments, as well as the denial or revocation of building permits in coastal areas vulnerable to rising sea levels.

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1. Introduction

The work presented here has developed from a research project conducted over the past three years by a consortium of universities. The project was launched with the aim of ascertaining, in an important area of law and society, the extent to which advancements in knowledge may be based not only on a critical analysis of traditional legal theories, such as the firmly held belief that the separation between land and sea is the first and fundamental law of the planet, but also on transdisciplinary research. The meaning and nature of transdisciplinary research are themselves complex inquiries, due to the diversity of views on what transdisciplinary research is and entails. The article then focuses on several theoretical aspects. There is a discussion of the concept of 'space', which is central to this topic, from the perspective of the integration of land and sea. Next, the article argues that coastal areas should be considered in a dynamic or evolutionary manner, as their uses have changed over time. The tasks of public authorities – at the national, international, and supranational levels – have also changed. The last part of the article discusses practical aspects, including the formulation of indicators concerning coastal areas, the precautionary principle, and the possibility of identifying best practices for stakeholder involvement.

2. Why coastal areas?

One or two words can help explain our decision to rethink coastal areas. First, a good approximation to clarify what we mean when we refer to coastal areas is the definition provided by the Commission of the European Union, which states that coastal areas can be defined as the areas "where land and water surfaces meet (border each other)"[1].

These areas are important from several points of view, including society, economy, and environmental protection. In many countries around the world, a large part of the population lives in such areas; notably, half of the U.S. population, and more than four-fifths of Australians[2]. Economically, coastal areas are increasingly important for trade due to harbors, navigation, and tourism. From the environmental perspective, coastal areas have always been particularly vulnerable due to tides, waves, and winds. They are even more vulnerable today due to climate change, particularly the oceanic coasts of Australia and Bangladesh, the coasts of southern France and Spain, and those of Italy, as is shown in the recent report published by the Italian Geographical Society[3].

There is, however, diversity of opinion concerning the nature and causes of climate change. According to the vast majority of experts, global warming is primarily attributable to modern societies producing gas emissions[4]. The sequence is as follows: an

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[1] European Commission, *Glossary: coastal area*, available at https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Coastal_area#:~:text=Short%20definition%3A%20Coastal%20areas%20are,meet%20(border%20each%20other).

[2] See the website of the Australian government:https://soe.dcceew.gov.au/coasts/pressures/population#:~:text=Australia%20is%20an%20urban%20coastal,now%20calling%20the%20coast%20home. On the U.S., see L. Garten, *The Coastal Zone Management Act: A Mixed Success*, 16 Consilience 1 (2016).

[3] *Paesaggi sommersi. Geografie della crisi climatica nei comuni costieri italiani* (2025), 9, available online at: https://www.greenreport.it/images/news/pdf/Rapporto_PAESAGGI_SOMMERSI_compressed.pdf (for the remark that vast portions of Italian coasts are subject to the treat of inundation).

[4] For an overview, see M. Maslin, *Climate Change: A Very Short Introduction* (2015); W. Nordhaus, *The Climate Casino. Risk, Uncertainty, and Economics for a Warming World* (2013). Interestingly, the preamble of the UN Framework Convention on Climate Change (1992) affirms that the adverse effects of climate change are a "common concern of humankind", though noting that "there are many uncertainties" in predictions relating to it.

increase in industrial activities, the use of fossil energy, the emission of gases, their permanence in the atmosphere, global warming, and climate change, which gives rise to an overall mutation. For these experts, climate change is the most serious environmental damage. For others, climate change "is a relative risk, not an absolute one"[5]. For still others, global warming depends mainly, or even solely, on natural causes[6].

Although this is an important debate, there is no need to take sides, for three reasons. First, it is well known, even beyond the circles of experts, that some choices made by our societies have had, and continue to have, a huge impact on coastal areas[7]. Among these choices are the construction of dams and sea-wave barriers. The construction of dams significantly reduces the amount of sand and rocks reaching the sea by trapping sediment in reservoirs, which leads to starved beaches, coastal erosion, and weakened barrier islands. In brief, without new sand input, beaches erode more quickly. The construction of sea barriers, which began during the nineteenth century and intensified during the twentieth century, often damages beaches by intensifying wave energy, increasing erosion at their bases and depriving downdrift areas of sand at the extremes of every "hard barrier". This is the phenomenon known as "coastal squeeze": while beaches naturally tend to move, seawalls act as barriers, preventing natural beach migration.

Secondly, regarding climate change, regardless of its causes, there is evidence that the melting of glaciers and polar caps poses a concrete risk of flooding and inundation in certain areas, particularly in some parts of the world [8]. This is particularly evident for many islands in the Indian and Pacific Oceans. It is evident, too, for some coasts of both France and Italy.

Thirdly, and more importantly from a legal perspective, there are significant differences of opinion among policymakers

[5] See M. Hulme, *Five Lessons of Climate Change: a personal statement* (2008), available at https://www.mikehulme.org/wp-content/uploads/the-five-lessons-of-climate-change.pdf.

[6] B. Lomborg, *Climate Change is not an Apocalyptic Threat – Let's Address It Smartly* (2024).

[7] See C. Clus-Auby, R. Paskoff, *L'érosion des plages: les causes, les remèdes* (2007).

[8] See M. Stallworthy, *Sustainability, Coastal Erosion and Climate Change: an Environmental Justice Analysis*, 18 J. Environmental L. 357 (2006).

about how to address climate change, as evidenced by their diverging choices with regard to the Paris Agreement of 2015[9].

This divergence reflects important value judgments and political preferences. What is of more immediate concern for us here is that some regional regimes concerning coastal protection achieve more concrete results due to less diversity in national priorities and easier coordination. An instructive example is the Barcelona Convention for the Prevention of Pollution in the Mediterranean Sea, enriched by an additional protocol on the integrated protection of coastal and marine areas[10]. In contrast, global regimes often struggle to define a shared policy agenda and ensure compliance. There are, therefore, asymmetries across the globe, depending on whether there are "regional" regulatory regimes to address the ramifications of climate change.

It is, therefore, both interesting and important to examine whether different national systems face the same problems and use similar solutions, if not the same ones. Thus, for example, how should local authorities consider scientific data when deciding whether to issue permits for construction in areas close to the sea? If they are willing to grant those permits, should they do so by way of "rolling easements", which allow new buildings on condition that everything will be removed if the shoreline advances towards them[11]?

Conversely, if public authorities do not issue such permits, should they compensate for damage in the light of constitutional provisions governing expropriation? What are the repercussions of the delimitation of private property? If the rising sea level poses

[9] For a more optimistic opinion, based on the consensus reached by the Intergovernmental Panel on Climate Change, see M. Higgins, *Legal and Policy Impacts of Sea Level Rise to Beaches and Coastal Property*, 1 Sea Grant Law and Policy Journal 43 (2008). See also O.R. Young, *The Paris Agreement: Destined to Succeed or Doomed to Fail?*, 4 Politics and Governance 124 (2016) (for the view that, though the objective could be hard to achieve, greater awareness of existing problems was likely to be obtained).

[10] The Preamble of the Madrid Protocol simply states that the contracting parties are "worried by the risks threatening coastal areas due to climate change, which is likely to result, inter alia, in a rise in sea level".

[11] See M. Higgins, *Legal and Policy Impacts of Sea Level Rise to Beaches and Coastal Property,* cit. at 8, 51.

serious threats to houses and resorts built decades ago, should public authorities issue orders to demolish them[12]?

Arguably, resolving these practical questions requires a solid grasp of theories. It is not just a matter of not reinventing the wheel. Theories provide a structured framework – explanatory models – much like a map for a journey. Moreover, it is in the context of background theories that we can better understand the rationales underlying the standards that guide effective action. From both points of view, without adequate theory, practice risks being disconnected from broader understanding.

More specifically, three theoretical issues will be discussed in the following pages. First, there are two firmly held sets of beliefs and ideas: the theory that the separation between land and sea is the planet's principal law, and the paradigm of individual legal ownership. Second, it will be argued that, for a better understanding of both issues and solutions concerning coastal areas, it is necessary to move beyond conventional scientific boundaries and integrate fields such as law, geography, economics, and other social sciences. However, this is no easy task. The basis of this claim is discussed here within an assessment of transdisciplinary research after an analysis of the deficiencies of the two traditional legal approaches.

3. Beyond traditional legal theories

As stated, a first general point is that coastal areas can only be properly understood against the background of a legal theory that is not bound by unchecked assumptions and received ideas, while our general point concerning methodology regards the considerable advantages that transdisciplinary research may provide. It can be helpful to initially explain which legal theories are relevant, outlining their deficiencies.

3.1 Legal theories concerning coastal areas

Lawyers have traditionally paid great attention to the formulation of general theories. For some, it can be said that, while much remains to be done in the analysis of recent legal realities, we can boast a fairly adequate framework in which to explore these

[12] The Australian dispute about *Gippsland Beach* provides an instructive example of the first case: see § 5.3.

matters. These frameworks constitute paradigms in the meaning that Thomas Kuhn has assigned them: "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners"[13]. In other words, paradigms are sets of shared assumptions and concepts that shape how a group of scholars understand the world, defines problems, and sets standards for their solutions. However, no such framework can be said to exist for the issues that concern us here. There are two shared sets of ideas, but they are not adequate patterns for thinking and resolving issues for different reasons.

The first is the theory that the separation between land and sea is the fundamental law of the planet. Elaborated by Carl Schmitt, a German public lawyer and political scientist in the 1940s, this theory – as will be explained in the next section – rests on the assumption that land and law are not simply distinct "elements" but are subject to radically different beliefs, ideas, social practices, and legal norms. Such a theory may be thought of as a historical or sociological view; rather, it seeks to explain why the norms that govern the land are necessarily different from those that govern the sea, and which policies will be pursued in the future. This is why it must be regarded as a normative theory. However, it is not a realistic one in the sense of describing existing legal realities, namely legally relevant institutions, norms, and practices.

In the second approach, several lawyers have placed considerable emphasis on the ownership of coastal areas, viewing them as part of the natural domain. There is nothing wrong with this, provided there is adequate awareness of two important qualifications. On the one hand, there is no such thing as a "natural" or "rational" legal construction of the public domain, according to which coastal areas necessarily belong either to the State or to other public bodies, excluding private individuals. Indeed, in the U.K., the U.S., and elsewhere, private individuals can be, and often are, the owners of beaches. On the other hand, the nature of public ownership cannot be understood based on the assumption that it is analogous to private ownership. What increasingly matters is the protection and use of coastal areas.

[13] T. Kuhn, *The Structure of Scientific Revolutions* (1970), viii.

3.2 The separation between land and sea

The starting point of our analysis is the separation between land and sea, as drawn by Schmitt. His idea of separation has had a huge influence on social science literature. Whether land and sea should be regarded in that manner is, however, an issue on which there exists a diversity of opinion. This issue will be considered in more detail when we discuss the contribution that transdisciplinary research is likely to make from a theoretical perspective. For the present, a brief summary of Schmitt's dichotomy between land and sea will suffice.

A preliminary *caveat* concerns Carl Schmitt, a German jurist of the Weimar and Nazi periods[14]. For our purposes here, there is no need to take issue with his political ideology, including his theory that hegemonic powers exist and operate within a larger territorial space (the *Großraum*)[15]. Suffice it to observe that the cardinal principles of international law after 1945 – including the equality and independence of all States and self-determination – contradict his ideology. What we purport to do here is to judge one of his ideas on its intellectual merits. It is an idea that he developed after falling into disgrace with Nazi politicians in the late 1930s: the existence not simply of a distinction, but of a divide between land and sea.

That idea was elaborated before Schmitt published *The Nomos of the Earth*, his treatise on law and globalisation, in which he observed that the circumnavigation of the globe gave rise to a great

[14] In a similar vein, the US public lawyer Adrian Vermeule discussed Schmitt's works predating his involvement with the Nazi party: see A. Vermeule, *Our Schmittian Administrative Law*, 122 Harv. L. Rev 1095 (2009). For an analysis of Schmitt's opposition to the Kantian vision of international law, see S. Benhabib, *Carl Schmitt's Critique of Kant: Sovereignty and International Law*, 40 Pol. Theory 688 (2012) (for the observation that Schmittian critiques have inspired political theorists and experts of international relations, such as Hans Morgenthau). See also C. Minca & R. Rowan, *The question of space in Carl Schmitt*, 39 Progress in Human Geography 268 (2015) (pointing out the "rediscovery" of his political thought, a common feature with other social sciences). For a review of other studies, see P.C. Caldwell, *Controversies over Carl Schmitt: A Review of Recent Literature*, 77 The Journal of Modern History 357 (2005). Mention should also be made to one of the rare interviews of Schmitt after 1945, made by an Italian professor of constitutional law, F. Lanchester, *Un giurista davanti a sé stesso. Intervista a Carl Schmitt*, 1 Quaderni costituzionali 5 (1983).

[15] On Schmitt's theory of *Großraum*, see C. Minca & R. Rowan, *The question of space in Carl Schmitt,* cit. at 13 (for critical remarks about its connection with Nazi spatial thinking).

appropriation of land and sea and led to the first global legal order[16]. That idea was set out in a shorter essay, whose title, *Land and Sea*, is telling[17].

There are four interrelated and not always clearly distinguished general points in this essay. The first is the observation that, culturally, for the ancients, both Greeks and Romans, there was a fundamental divide between land and sea, since the latter was hospitable to human beings, while the other was dangerous and inhospitable[18]. The second general point was equally general, but of a juridical nature; that is, the claim that "every basic order is a spatial order", insofar as the fundamental norms of a legal order, its *nomos*, must deal with space in one way or another[19].

The third point was the assertion that "the separation between land and sea" was the "first planetary spatial order", because appropriation was possible only on the former, whereas "the sea would belong to nobody"[20]. Within this view, unlike the land, the seas and the coasts, which followed their legal regime, belonged "to nobody or to everybody"[21]. In other words, they could not be divided and used in the same way as the land.

Fourthly, and lastly, Schmitt criticized some doctrines of international law, including the freedom of the seas. At the roots of his criticism lay not simply the contrasting choices made by Britain and France (which, under Colbert, "decided in favour of land and against the sea")[22], but there was a deeper contrast, a divide, between two conceptions of international law: the British and the continental European. In Schmitt's own words, "all the standards

[16] C. Schmitt, *Der nomos der erde im Völkerrecht des Jus Publicum Europaeum* (1950), English translation by G. Ulmen, *The Nomos of the Earth* (2003). For many, this was Schmitt's "*magnum opus*".

[17] C. Schmitt, *Land und See. Eine weltgeschichtliche Betrachtung* (1942), English translation by S. Draghici, *Land and Sea* (1997).

[18] *Ibidem*, 1 ("all our existence, our happiness … are the 'earthly' life for us").

[19] *Ibidem*, 37 (the rest of the phrase is as follows: "to talk of the constitution of a country is to talk of its fundamental order, of its nomos", a claim which was later developed in C. Schmitt, *The Nomos of the Earth,* cit. at 15).

[20] *Ibidem*, 46. This claim is reiterated in other parts of the essay, including at 48 ("the severance of land from sea became the fundamental law of the planet").

[21] *Ibidem*, 46.

[22] *Ibidem*, 27, 23 (for critical remarks about the conduct of Queen Elizabeth I and her captains), and 46 (for the observation that, though the sea would belong to nobody, "in reality, it would belong to a single country: England").

and criteria of British politics became incompatible with those of all the other European countries"[23].

Of these four points, the first is of interest mainly for purposes of erudition. What resonates most in contemporary debates about international politics is the last one, which is closely connected to Schmitt's theory of sovereignty and his opposition to the doctrine of the freedom of the seas[24]. Less attention is devoted to his second and third points concerning the opposition between land and sea. However, these are two basic elements of his theory of space that require independent treatment. This task will be accomplished in two ways in the following section. As a first step, we will critically analyse the idea of separation. Next, we will show that it is in sharp contrast with the evolving use of coastal areas.

3.3 A critical analysis of the idea of separation

Like Schmitt, we hold that the relationship between land and sea is the decisive issue both for conceptualising the fundamental functions of a social and legal order – the *nomos* in his terminology – and for solving practical issues, as is inevitable for lawyers. However, the law uses analytical reasoning and problem solving that focus on human behaviour and regulation rather than natural phenomena. But we part company at this point. Not only do we disagree with his interpretation of the separation between land and sea as natural elements, but we also believe that it is wrong to convert a physical distinction into a legal norm.

From the first point of view, Schmitt underlined throughout his essay the "*elemental opposition between land and sea* … acknowledged throughout history", the "struggle between sea and land" [25]. But the physical or naturalistic basis of this radical "elemental opposition" was only affirmed, not demonstrated. Nor was there an attempt to qualify this separation considering the diversity of coastal areas. One of the examples he mentioned, on the other hand, the city of Venice[26], can be said to show the continuity or integration between land and sea. It is not fortuitous, therefore, that Schmitt himself deemed it necessary to clarify that the

[23] *Ibidem*, 51. For further remarks, see see C. Minca & R. Rowan, *The question of space in Carl Schmitt,* cit. at 13, 279.
[24] For further discussion, see J. Derman, *Carl Schmitt on land and sea*, 37 History of European Ideas 181 (2011).
[25] C. Schmitt, *Land and Sea,* cit. at 16, 6 (emphasis added).
[26] *Ibidem*, 8-9.

distinction between the "elements; land and sea" had not to be understood to mean that they were "purely scientific entities, lest they dissolve into chemical substances, in other words, into historical nothingness"[27]. In other words, he did not consider land and sea merely as physical elements.

Once it has been ascertained that there was not so much an "elemental opposition" but, rather, a distinction based on social usage and legal norms, then both must be considered differently from the ways followed by Schmitt. In his opinion, land and sea were subject to radically different practices and legal prescriptions. Land has three distinct functions: first, the delimitation of areas (in this respect, the Treaty of Tordesillas marked an innovation, as it operated on a global scale); second, the demarcation between public and private property; third, the protection and exploitation of the land[28]. Quite the contrary, the other element was subject to a radically different principle, that is, the freedom of the seas, which for Schmitt was justified neither by its intrinsic rationality, nor by history. In his view, this was simply the solution imposed by Britain in order to maximise its interests.

There are, however, three problems. First, it is, to say the least, doubtful whether the principle of freedom of the seas was different from past ideas and practices within the framework of Greek and Roman civilization. The Romans, whom Schmitt knew very well, elaborated a very sophisticated distinction between the "things" that belonged either to the State or to private individuals (*res publicae* and *res privatae*, respectively) and those which, by contrast, belonged "to nobody or to everybody"[29], that is, *res communes omnium*. Among these common things were the air, the sea, and, in connection with it, the coasts. It was precisely on this cultural and legal basis that, since the nineteenth century, U.S. lawyers and judges have elaborated the public trust doctrine.

Meanwhile, it was precisely on the basis of this legal theory that Grotius elaborated his doctrine of freedom of the seas, outlined in *Mare Liberum* and subsequently confirmed in his *magnum opus*,

[27] *Ibidem*, 4.
[28] *Ibidem*, 4. See also C. Schmitt, *The Nomos of the Earth,* cit. at 15, 54 (on the antithesis of land and sea)
[29] *Ibidem*, 46. On the influence of Roman ideas, see P.T. Fenn, *Justinian and the Freedom of the Sea*, 19 Am. J. Int'l L. 716 (1925).

the *Jure Belli ac Pacis*[30]. Grotius argued that oceans are *res communes omnium* – that is, common property of mankind and not subject to appropriation by any people. Free navigation and trade were thus justified. In this way, Grotius challenged the monopolies asserted by the Portuguese and the Spaniards, and laid the foundations for the modern international law of the seas. He also challenged the ideas and beliefs which, at that time, prevailed in England and were subsequently expressed by John Selden[31]. It was not England, but the United Provinces that developed the doctrine of the freedom of the seas, fostering open access for maritime nations, which was essential for global trade. Our second critical observation is that Schmitt's analysis lacked both accuracy and precision.

The third observation builds on the second as follows. Not only Selden, but Grotius himself was fully aware that the scope of application of his doctrine of *mare liberum* was limited to the oceans or high seas. Quite the contrary, the maritime areas closer to the land were subject to domination. The clearest example was, again, that of Venice, which considered the Adriatic Sea as its reserved area. Accordingly, although the freedom of the seas was a cornerstone of international law, it could not be viewed in the absolute way in which Schmitt saw it. Things were more complex and differentiated than his schematisation purported. They became even more so in the centuries to follow, as several nations claimed exclusive maritime dominion. This claim was eventually recognized, at least in part, by the Convention of Montego Bay.

3.4 Changing practices and legal standards

There is another reason we disagree with Schmitt's claim that the opposition between law and sea was the "fundamental law of the planet". As observed earlier, Schmitt famously argued that the first and fundamental function of each social ordering, the *nomos*, in his terminology, was to regulate the land. More precisely, he distinguished three functions: the division of space, the demarcation between areas subject to public and private ownership, and the protection and exploitation of the land. It is precisely with regard to the latter two functions that a closer look

[30] Grotius, *Mare Liberum* (1609), French translation by A. de Courtin, *De la liberté des mers* (1703; 1990), available on the website http://diue.unimc.it/e-library/mer_fr.pdf; Grotius, *Ius Belli ac Pacis* (1624), French translation by P. Pradier-Fodéré, *Le droit de la guerre et de la paix* (1867; 2005).
[31] J. Selden, *Mare Clausum seu de Dominio maris libri duo* (1635).

at legal practices and rules shows that land and sea were not separated.

A gradual transformation occurred, albeit at different times in the various corners of Europe. Three phases in this transformation are particularly significant: the adoption of Colbert's maritime ordinance in 1681, the changing uses of beaches in the early nineteenth century, which gave rise to new types of disputes, and the adoption of legislative provisions aiming to protect the coasts after 1980.

Colbert's maritime ordinance is both interesting and important for more than one reason. First, there was a clear influence of the norms and practices of the Dutch provinces on the contents of the ordinance[32]. Moreover, and more importantly for our purposes, the ordinance did not regulate only the exercise of police powers on ports, coasts, and bays; it also established an innovative definition of the shoreline, based on the action of tides and taking into account ordinary waves, as distinct from extraordinary ones[33].

Thirdly, and equally importantly, the ordinance regulated use. It allowed the use of beaches for sailing and fishing. It prohibited the building of structures and the installation of anything that could be harmful to sailing. It established sanctions for transgressors, including the destruction or confiscation of materials and the imposition of fines. The prohibition of any type of building marked a clear discontinuity with *ius commune*, in particular with the Roman law doctrine according to which beaches were *res communes omnium* – that is, they belonged to nobody and to everybody. Under the new legal framework, beaches belong to the State. The drafters of the French Civil Code maintained that

[32] See R. Warlomont, *Les sources néerlandaises de l'Ordonnance maritime de Colbert (1681)*, 33 Revue belge de philologie et d'histoire 333 (1952) (mentioning the fact that Colbert sent a French lawyer to study those norms and practices), while the traditional opinion is that the ordinance codified local laws: H.A. de Colyar, *Jean-Baptiste Colbert and the Codifying Ordinances of Louis XIV*, 13 Journal of the Society of Comparative Legislation 56 (1912). On the development of the ordinance, see also J. Chadelat, *L'élaboration de l'ordonnance de la marine d'aout 1681*, 31 Revue Historique de Droit Français et Étranger 74 (1954).

[33] The original text of title VII, Article 1 is as follows: "*sera réputé bord et rivage de la mer tout ce qu'elle couvre et découvre pendant les nouvelles et pleines lunes, et jusqu'où le plus grand flot de mars se peut étendre sur les grèves*". For further remarks, see R.-J. Valin, *Ordonnance de la Marine du mois d'Aoust 1681, commentée et conferée sur les anciennes ordonnances* (1760), 141.

conception of beaches more than a century later. Similarly, the *Conseil d'État* referred to this conception in its oft-cited ruling in *Kreitmann* (1973), which we will return to later.

Meanwhile, it may be helpful to mention the emergence of new practices and legal standards. The new practices were induced by several concurrent causes, including the diffusion of new views – such as the report promoted by Edwin Chadwick on sanitary conditions in Great Britain[34] – based on the assumption that public authorities must not only protect but also promote public health and the emergence of new pastimes and sports. As a consequence, consolidated ideas – for instance, that coasts were inhospitable and unhealthy – were either abandoned or revised, and new uses, such as swimming, emerged and were rapidly adopted by a growing number of individuals. Two instructive examples, concerning England and France, respectively, illustrate these social and legal changes.

In England, the leading case was *Blundell v. Catterall*[35]. In the early 1820s, a dispute arose between the management of a hotel and the owner of the manor of Great Cosby and the surrounding area. The hotel began offering its clients a new service: horse-drawn carriages, which enabled them to easily reach the sea to bathe or swim. The owner of the manor challenged this practice on the grounds that he had an exclusive right to fishing and related uses, including beaching fishing boats. He brought an action of trespass against the hotel management. The respondent claimed that there was a common law right for the public to cross the foreshore to exercise their right to swim or bathe in the sea. This claim was supported, among other things, by a quotation from Bracton, a famous jurist of the thirteenth century. The King's Bench admitted, as a matter of principle, that new rights could be based on evolving uses and custom. However, the majority – with the dissent of Justice Best – rejected this claim, affirming that there was no right to cross the foreshore to exercise the right to swim or bathe in the sea.

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[34] *Report on the Sanitary Condition of the Labouring Population of Great Britain* (1842), accessible on https://www.parliament.uk/about/living-heritage/transformingsociety/livinglearning/coll-9-health1/health-02/1842-sanitary-report-leeds/. On France, see A.F. La Bergee, *The Early Nineteenth-century French Public Health Movement: the Disciplinary Development and Institutional of 'Hygiène Publique'*, 58 Bulletin of the History of Medicine 363 (1984).

[35] *Blundell v. Catterall* (1821), 106 E.R. 1190.

Two elements of the court's reasoning warrant further consideration. The first concerns property rights. Bracton, influenced by Roman law, opined that the foreshore was an accessory of the sea ("*litora maris, quasi mari accessoria*"), which was a "res communis omnium", namely, a *res* belonging to nobody and to everybody[36].

By contrast, the King's Bench's reasoning was based on the assumption that the foreshore was a *res publica*, as distinct from a *res communis*, and was owned by the king, who could sell property rights to individuals. As will be observed later, this conception of property was only partially similar to the one that prevailed in continental Europe. The second element concerns the uses of the foreshore. As noted earlier, the hotel management argued that the public had a right to bathe or swim in the sea. The court rejected this view, because it relied on the opinion of lawyers such as Lord Hale, who published a treatise on maritime uses at the end of the previous century[37]. As crossing the foreshore to swim or bathe was a new use, it could not be said to be protected by common law. This explains the dissent of Justice Best, for whom "the free access to the sea is a privilege too important for Englishmen to be left dependant on the interest or caprice of any description of persons"[38].

Two opposite views of the law emerge here. For the traditional view, the common law – of which Blackstone was one of the main advocates – that formed the basis of the law of England was recognised due to long use and endorsement. For the critics, in particular Jeremy Bentham, one of the main weaknesses of the common law was that it was not only confused and uncertain, but it prevented the law from adequately dealing with the rapidly changing social and economic conditions of the late eighteenth century. The other main defect was that the common law was the domain of a professional élite of lawyers and judges who shared a

[36] Bracton, *De legibus et consuetudinibus Angliae*, § 40, available at https://archive.org/stream/delegibusetconsu02brac/delegibusetconsu02brac_djvu.txt.

[37] M. Hale, *A Treatise relative to the maritime law of England* (1787), accessible online at: https://archive.org/details/bim_eighteenth-century_a-treatise-relative-to-t_hale-matthew-sir_1787/mode/2up. For further remarks, see D. Yale, *Public Rights in the Foreshore and Adjacent Waters*, 25 Cambridge Law Journal 164 (1967).

[38] Cited by D. Yale, *Public Rights in the Foreshore and Adjacent Waters,* cited at 38, 168.

technical and often "mysterious" language[39]. Interestingly, two centuries after Bentham's attack on the common law, an English judge still affirmed that "bathing is not a public right, but goes on by tolerance"[40].

The same problem was handled very differently on the other side of the Channel. In the mid-nineteenth century, the French *Conseil d'État* was requested to adjudicate a dispute between a local authority in Normandy, Trouville-sur-Mer, and some providers of carriages. Similarly to the beach of Great Cosby, the one in Vernes was increasingly used by people who wanted to bathe and swim. But in this case, it was the local authority that legitimised these activities and established a monopoly on the use of changing cubicles. Some providers of those services contested the local authority's decision to establish a monopoly. The *Conseil d'État* endorsed their claim, affirming that the seashore was part of the public domain and that access to it was free[41].

Five years later, the administrative court reiterated this holding in a dispute involving another local authority, Boulogne-sur-Mer. In this case, the local authority enjoyed the exclusive right to provide a transport service (horse-drawn carriages) to reach the beach. Such a service was necessary because of the width of the sands. As the local authority's exclusive right prevented private enterprises from providing that service, some challenged the local monopoly. The *commissaire du gouvernement* Robert (that is, the member of the *Conseil d'État* who was entrusted with the task of illustrating the relevant legal provisions and judicial decisions) expressed the opinion that the exclusive right lacked justification on grounds of police or general interest but served only to increase the revenues of the local authority. It was, therefore, unlawful. Interestingly, he reiterated the principle of free access to beaches. The *Conseil d'État* endorsed his opinion and annulled the decision taken by the local authority[42].

A twofold comparison with the English case discussed earlier is instructive. First, in both England and France, the foreshore (that is, the area between the high tide and low tide marks on a beach) was no longer regarded as *res communis omnium*. It was,

[39] J. Bentham, *A Fragment on Government* (1766), 58, available at https://www.earlymoderntexts.com/assets/pdfs/bentham1776.pdf.
[40] Harman L.J. in *Alfred F Beckett Ltd v Lyons* [1967] Ch 449, CA.
[41] *Conseil d'Etat*, 19 May 1858, *Vernes*.
[42] *Conseil d'Etat*, 30 April 1863, *Bourgeois c. Ville de Boulogne*.

rather, a *res publica*; that is, it could be subject to appropriation. However, in England, property rights could belong not only to the sovereign but also to individuals. In contrast, in France, the coasts were part of the *domaine public maritime* and could not therefore be owned by private individuals or corporations. Second, while public rights over the foreshore and its adjacent waters were limited in England by common law, in France, at the end of the nineteenth century, the public's right to access and use the beach was affirmed[43].

3.5 From ownership to protection and usage of coastal areas

The preceding remarks can be supplemented by a general point concerning the changing mindset and its ramifications for coastal areas. In every society, the definition, allocation, and protection of property rights are among the most complex and difficult issues for policymakers. This is because a property right includes a twofold exclusive authority. The first is the authority of the owner – in the wording of the French Civil Code – to "dispose of things … in an absolute manner"[44]. The other is the authority to use those things in an equally absolute manner, with the notable exception of usages prohibited by laws or regulations.

Whatever its intrinsic soundness[45], this conception of property rights suffered certain deficiencies when transposed from the private to the public sphere. A structured survey of these deficiencies would exceed the limits of this essay. However, at least three problems can be identified, all of which relate to the limited applicability of the traditional concept of ownership. First, a distinction must be made between the conception of ownership in common law systems and civil law systems. Second, there is an increasing realisation that coastal areas need to be protected as part of our environment. This need must be taken into account when

[43] G. Jèze, *Du droit des individus de se servir des dépendances du domaine public*, 1 Revue de Droit Public 307 (1932).

[44] French Civil Code, article 544 ("*la propriété est le droit de jouir et disposer des choses de la manière la plus absolue, pourvu qu'on n'en fasse pas un usage prohibé par les lois ou par les règlements*").

[45] On the consequences that may arise from the questionable assumption that private property is unlimited, see J.M. Meyer, *The Concept of Private Property and the Limits of Environmental Imagination*, 37 Political Theory 99 (2009).

deciding on the various uses of coastal areas in the light of climate change.

As noted earlier, the traditional conception of ownership is based on the assumption that the owner has the "absolute" authority to dispose of things, including the right to exchange or sell the resource on mutually agreeable terms. It can be added that even within the Western legal tradition, this is not always the case. Of course, it would be interesting to test the validity of this assumption from a broader comparative perspective, including other regions of the world; however, it would require further analysis.

In civil law systems, assets in the public domain cannot be sold to individuals or business enterprises. With regard to coasts, this prohibition is reinforced by the interdiction of adverse possession. Because of these prohibitions, individuals cannot become owners of a beach or any other part of the coast. Not only does the owner of coastal areas not enjoy exclusive authority to dispose of things and exchange them with others, but their authority regarding usage is also limited. Included within this authority is normally the exclusive right to choose the uses of a resource, as well as the right to its services. Thus, for example, the owner of an apartment has the right to decide whether to live in it themselves or rent it out, and, if so, to determine how and to whom, including the right to receive rent. Public ownership differs from these other ways of using a resource. For example, it cannot be said that the members of the city council are the only ones entitled to use a given beach, because that right belongs to the public.

The ruling of the European Court of Human Rights in *Brosset-Triboulet* is an instructive example of such a prohibition. Moreover, the Court carried out a comparative analysis, showing that, of the sixteen States included in its analysis, fourteen established the exclusive nature of the maritime public domain (Croatia, Germany, Greece, Ireland, Italy, Malta, Montenegro, Slovenia, Spain, the Netherlands, and Turkey), while only four did not do so (Albania, Bosnia and Herzegovina, Sweden, and the United Kingdom)[46].

In our research, we conducted a "factual analysis" – i.e., of some hypothetical cases – on a more limited sample (Greece,

[46] ECtHR, judgment of March 29, 2010, *Brosset-Triboulet v France* (No. 34078/02), available at https://hudoc.echr.coe.int/eng#{%22itemid%22:[%22001-98009%22]}.

France, Italy, Portugal, and Spain), and the result was that such prohibitions are enforced by public authorities, if necessary, through the exercise of coercion and the imposition of fines on transgressors[47]. Regarding common law systems, the powers of public authorities are not unlimited. Thus, for example, in the U.S., the Property Clause established by the Constitution provides that public land may only be disposed of with congressional authorisation, and the less recent practice of congressional acquiescence towards presidential executive orders has been reversed by legislation repealing any implicit withdrawal authority[48].

Moreover, and more importantly for the line of reasoning advanced here, there is a wholly new administrative dimension of coastal areas, based on the assumption that local or national public authorities are entrusted with the power to decide not only if, but also how, they can be managed. Thus, for example, economic and social uses of a bay or a beach can be subject to the condition that only a limited number of people may have access to it. Alternatively, a section of a beach may be reserved for a specific social group or business enterprise, while the public must be able to use another. This public right is so important that legislators and judges increasingly impose a duty on the owners of adjacent areas, namely the duty to allow public access to coastal areas. For example, in the U.S., the higher courts of several states have ruled against regulations, contracts, and practices that limited public access to coastal areas, often for discriminatory purposes (the so-called "Jim Crow" measures). Similarly, in France, this right has been recognised and protected by administrative courts and has later been codified by recent legislation. In England, however, the courts are still reluctant to recognise that the public has a right to free access to coastal areas, though they acknowledge that public access is increasingly tolerated by private landowners adjacent to the coast and is often promoted by local authorities. Incidentally, this shows that there is no such thing as a "divide" between civil law systems and common law systems.

[47] This comparative research will be published in a separate volume.
[48] US Constitution, Article IV, Section 3, clause 2.

4. Boundary Crossing: a transdisciplinary research

Thus far, we have discussed the difficulties posed by two paradigms that, in our view, affect our capacity to understand legal norms and realities pertaining to coastal areas. It is now time to discuss an issue of more general interest, as it involves moving beyond conventional scientific boundaries, integrating different fields to address complex problems, and fostering collaboration through shared platforms and methodologies, thereby breaking down the traditional borders. This approach, known as 'interdisciplinary' or 'transdisciplinary', simply implies boundary crossing. Such an approach is essential for addressing global challenges such as climate change.

As observed initially, the implications of transdisciplinary research for the analysis of both theoretical and practical issues are matters on which opinions can differ. This is a consequence of the diversity of views regarding what transdisciplinary research entails, and its usefulness. Certain predominant lines of thought can, however, be delineated. For some, the appropriate type of research is still, first and foremost, if not exclusively, disciplinary research. Other approaches should be confined within very strict limits. Others reject such a narrow approach. Precisely what transdisciplinary research means and implies is a matter of disagreement. For this reason, the structure of the argument in this article should be made apparent from the outset. This is itself a complex issue, since different strands of thought have been brought together under the label "transdisciplinary research".

In this section, three lines of reasoning will be illustrated. As a first step, the meaning of "transdisciplinary research" will be examined. Secondly, the arguments in favour of – and against – transdisciplinary research will be considered. Next, the reasons supporting this type of research in coastal areas will be illustrated.

4.1 Disciplinary, interdisciplinary, and transdisciplinary research

To begin with, it can be helpful to say a few words about the various types of research that may be relevant, especially with a view to protecting the environment. The first, and obvious, distinction is the distinction between the various areas of knowledge, or disciplines into which scientists organise themselves; that is, geography, history, philosophy, political science, medicine, chemistry, engineering, and so on. In this sense,

as Thomas Kuhn famously argued, science has a 'disciplinary matrix'[49].

Before discussing whether, and the extent to which, an interdisciplinary or transdisciplinary approach may be helpful, at least another distinction should be mentioned. It is the distinction between the different techniques, including theoretical, experimental, or applied research. Thus, for example, many lawyers – though not all – see their tasks in terms of problem solving; another way to express the same idea is to say, as was suggested earlier, that jurisprudence is a practical science. Similarly, engineers are applied scientists, not because they refrain from theorising, but because they place strong emphasis on solving problems. It is precisely for this reason that some years ago the American public lawyer Jerry Mashaw argued that, although there are important differences between lawyers and engineers, they have "at least this much in common: both harbor the intellectual conceit that a well-defined problem is not only a necessity, but almost a sufficient condition for a successful solution"[50]. He went so far as to say that "engineers think much like lawyers, who are often described as 'social engineers'[51].

If science has a "disciplinary matrix", does it make sense to seek to organise the work of scientists from the perspective of "interdisciplinary research"? This topic has been the subject of considerable discussion in recent years. There is now a large body of literature discussing its possibility and uses. Space limitations prevent us from illustrating this literature here, but it may be helpful to observe that there are various ways to understand it. For some, the term 'interdisciplinarity' concerns the relationships between two or more disciplines or branches of learning. But this tells us very little about the nature of such relationships. Moreover, the term has been used so loosely by scholars in many disciplines that, in practice, "interdisciplinarity has a tendency to be all things to all people"[52]. We need, therefore, to see whether other ways of understanding interdisciplinarity can be more fruitful.

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[49] T. Kuhn, *The Structure of Scientific Revolutions* cit. at 12, 181.
[50] J.L. Mashaw, *Law and Engineering: in Search of the Law-Science Problem*, 66 Law & Contemp. Probs. 135, 136 (2003).
[51] *Ibidem*, 136.
[52] D.W. Vick, *Interdisciplinarity and the Discipline of Law*, 31 Journal of Law & Society 163, 164 (2004).

A cue can be found in the definition of interdisciplinary research elaborated some years ago by a U.S. committee of scientists; that is, "a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice"[53]. This is a very broad definition and, for some, a somewhat 'fuzzy' one[54]. However, it has at least two advantages. It puts adequate emphasis on knowledge transfer, concerning information, data, techniques, perspective and theories. Moreover, it distinguishes between advancing understanding and resolving problems. It is especially the former purpose – that is, the advancement of understanding – that is emphasized by some approaches that seek to make sense of interdisciplinary or transdisciplinary research. They distinguish interdisciplinarity from multidisciplinary and transdisciplinary research. For them, multidisciplinary research involves studying a topic in not just one, but in more than one discipline, for example, constitutional law and history. It thus concerns the "transfer of methods from one discipline to another". Transdisciplinary research concerns what remains between the various disciplines. The emphasis here is not on methodology but on the cooperative solving of problems[55].

The general point of interest is that interdisciplinary research can be viewed as a continuum, ranging from lesser to greater degrees of synthesis[56]. In practical terms, at the very least, an interdisciplinary approach can help us to view a discipline, such as law, economics or geography, "through the lenses of other disciplines". More ambitious research can establish an interconnection – or integration – between different academic disciplines or bodies of specialized knowledge. In this respect, transdisciplinary research seeks to create a bridge or a space of

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[53] Commission on Facilitating Interdisciplinary Research, *Facilitating Interdisciplinary Research* (2004), 2.

[54] D. Owen & C. Noblet, *Interdisciplinary Research and Environmental Law*, 41 Ecology L.Q. 887 (2014).

[55] B. Nicolescu, *Multidisciplinarity, Interdisciplinarity, Indisciplinarity, and Transdisciplinarity: Similarities and Differences*, 2 R.C.C. Perspectives 19 (2014).

[56] M. Nissani, *Fruits, Salads, and Smoothies: A Working Definition of Interdisciplinarity*, 29 Journal of Educational Thought 121, 124 (1995).

encounter between such disciplines. A space of encounter in the sense just outlined may also give rise to a new field of study. Thus, for example, for some, the connection between law and geography is particularly important in the current phase of globalization. Others criticize the "law and geography" analysis, arguing that "the 'special relationship between law and geography' crosses the boundaries between disciplines" and that, accordingly, their interrelations should be addressed in terms of 'legal geography'"[57].

4.2 The pros and cons of transdisciplinary research

Other approaches pay less attention to definitions. They focus, rather, on the ways in which interdisciplinary or transdisciplinary research can be helpful. Various distinct modes have been identified. First, this type of research can help expand knowledge of existing realities. Second, they can improve the quality of human actions in relation to such existing realities. Third, they can help us to view a discipline, such as law or political science, "through the lenses of other disciplines"[58]. Last but not least, they can create a space for encounter among various disciplines. In this way, research advances knowledge and can foster interaction among all disciplines involved.

Although the above shows the benefits that interdisciplinary and transdisciplinary research can provide, their challenges should also be addressed. It is sometimes contended that certain undesirable consequences would ensue from these approaches. At the cost of simplification, these critical remarks can be distinguished based on whether the assertion is that interdisciplinary or transdisciplinary research is either futile or perverse, or that it might even jeopardize achieved results. It should be added that these fears are by no means universally shared, and some of the critics would probably apply their critiques only to certain types of interdisciplinary research.

What may be labelled the futility thesis is the position that argues all attempts to develop an interdisciplinary or transdisciplinary approach are doomed to failure. The reason is that knowledge is the product of specialization within a variety of discrete disciplines. Thus, for example, any attempted interaction between lawyers and geographers will only give rise to

[57] M. Nicolini, *Legal Geography. Comparative Law and the Production of Space* (2022), 4.

[58] K.M. Sullivan, *Foreword. Interdisciplinarity*, 100 Mich. L. Rev. 1221 (2002).

"amateurish dabbling with theories and methods the researchers do not fully understand" [59]. The second critique of interdisciplinarity differs from the first because the perversity thesis assumes that any attempt of this type will have the opposite effect to what was intended[60]. In this sense, recent theories of language suggest that members of a discipline develop their own distinctive languages, thereby ascribing meaning to things. Thus, for example, "public goods" means different things in law and economics, respectively. Lastly, the jeopardy thesis is not just a variation of the perversity thesis. Indeed, while perversity criticizes what it sees as a backlash, jeopardy asserts that any step in the direction of interdisciplinary research will jeopardize previous achievements. For example, among some lawyers, there is a strong feeling that the law's identity is under threat from ideas imported from outside, such as those elaborated by economics, with no regard for ethical values.

4.3 Why coastal areas require transdisciplinary analysis

The critical remarks summarized above should not be dismissed out of hand, as they provide a healthy *caveat* against any undue and naïve optimism about transdisciplinary research. However, they are not immune to weaknesses. For our purposes here, there is no need to take a side in the debate about transdisciplinary research in itself. We submit a more modest proposition. We propose that such research can be helpful from the perspective chosen here: research concerning coastal areas.

As far as the first critique – futility - is concerned, it is undeniable that interdisciplinary or transdisciplinary research is hard work, if it is understood properly and, more importantly, if it is to be done well. However, some strands in the social sciences – including, for example, law and economics – show that such work can be done and can also be helpful for practical purposes. Considering perversity, it can be said that transdisciplinary research approach neither renders disciplinary research unnecessary nor undermines its basic concepts. For example, a geographer's perspective on the various techniques that can be employed to protect a beach may be quite helpful to an expert in

[59] D.W. Vick, *Interdisciplinarity and the Discipline of Law,* cit. at 51, 164.

[60] The distinction between the arguments based on futility, perversity and jeopardy is drawn from A.O. Hirschmann, *The Rhetoric of Reaction: Perversity, Futility, Jeopardy* (1991).

planning or to a lawyer who must develop a local authority's plan for this purpose.

Lastly, as regards the jeopardy thesis, while a group of scholars' wish to protect their cultural tradition is understandable, it is not easy to see why previous achievements would be jeopardised. An apposite example concerns judicial decisions. Whereas traditional legal scholarship used a 'qualitative approach' based on a few judicial decisions, sometimes regarded apodictically as the 'most significant' ones, the use of quantitative empirical studies is now an accepted mode of legal analysis and has brought considerable new knowledge – for example, concerning the case law of both the European Court of Justice and the European Court of Human Rights[61].

Three further observations are fitting at this stage of our analysis. The first is that without analysis from various specific academic fields – including geography, economics, engineering, and, last but not least, law, which is important for all social ordering – it will be more problematic for individual researchers or groups to gather accurate information and, thus, to fully understand the challenges our societies face[62]. The second point is that, without a shared space for interaction among these discrete disciplines, it is harder to develop policies that guide the necessary changes to the coastal protection system required by climate change, as explained in the next section. Finally, from a more pragmatic point of view, there are various ways in which lawyers may, and often do, contribute to resolve the problems facing coastal areas. These ways include, *inter alia*, working with other experts to determine what mix of mechanism is best suited to the needs of each particular area, reviewing the obligations stemming from international treaties, and helping to draft plans for coastal management that are integrated with other national and local plans[63].

5. Research outcomes (I): knowledge

The illustration of the evolving natural and legal landscape provides a suitable transition point to the analysis of two dimensions for which transdisciplinary research can be helpful. The

[61] A. Stone Sweet, *The Judicial Construction of Europe* (2004).
[62] *Paesaggi sommersi* cit. at 3, 49.
[63] R. Beckman and B. Coleman, *Integrated Coastal Management: the role of Law and Lawyers,* 14 Int'l J. Marine & Coastal L. 491 (1999).

first concerns scientific concepts and categories, including those related to space, and introduces a new way of conceiving the *nomos*. The second dimension concerns the instruments that can be used to protect and improve coastal areas. The first dimension will be discussed in this section; the other will be discussed in the following section.

5.1 Research for the advancement of knowledge

Earlier discussions have shown that a transdisciplinary approach can aid in better understanding various features of coastal areas. This has been evident at various points in the preceding analysis. The fact that, in the last decades of the twentieth century, differing legal systems – such as those of Spain and the U.S. – adopted primary legislation to protect coastal areas is both interesting and important. A further turn occurred in the new century with the increasing awareness of the ramifications of climate change. Various changes in the conduct of public authorities sprang from the political belief that new planning instruments were required to face new challenges and that some measures previously adopted had to be modified or even withdrawn.

It might be felt that these changing mindsets were based on a growing political and social consensus, but that they did not have implications from the perspective chosen here. This assumption would, however, simply bear witness to the way we think in "pigeon holes" and the limited nature of our cultural constructs.

An instructive example of the limits of exclusively disciplinary approaches is the vexed question of the issuing of licences ("concessions", in the terminology employed by several legal systems of Continental Europe) for the management of beaches. Emphasis has been placed uniquely on the procedures and techniques that must be employed by public authorities in order to ensure respect for the principles of free competition when selecting who is authorized to use a beach. Whatever one's views about the desirability of a greater degree of competition in the assignment of licences, considerable concern must be felt about the neglect of sustainability. In brief, climate change jeopardizes coastal areas, which are part of society's patrimony. This implies, among other things, that public policies in this field should be characterized by the involvement of all stakeholders, including local communities. We will return to this point later.

Meanwhile, as stated at the beginning of this article, a new approach is necessary. In this respect, three remarks are apposite. First, adequate emphasis must be placed on the satisfaction of a "need for knowledge". In other words, the primary purpose of our research is to advance knowledge. It is precisely for this reason that, in our view, it is high time to revisit spatial concepts such as the divide between land and sea. This task will be accomplished in the next section.

Second, we argue that such a purpose can only be achieved by moving away from purely disciplinary or juxtaposed studies towards the creation of a space of encounter among various disciplines, opening the field to new perspectives. In the first year and a half of our research, lawyers have benefited from different perspectives on coastal areas, as well as from discussions about the involvement of local communities in new policies. Geographers, in turn, have been able to take into account the views of economists and statisticians on indicators when elaborating the atlas of environmental sustainability for coastal areas. Lastly, planning experts who are developing management plans for coastal areas have learnt about existing norms and procedures. As additional scientists have become involved in the workshops, the creation of a space for encounter has demonstrated further benefits.

Thus, for example, those who study physical processes in the seas, such as tides and waves, have explained why natural barriers, such as sand dunes[64], are preferred over artificial ones that were so often used in the past, for example, in the Adriatic Sea. Similarly, other experts have explained that shore vegetation protects the shoreline in two ways that are related but distinct: by decreasing wave run-up and by reducing sand loss from wave backwash.

That said, our third observation is that practical considerations should not be totally ruled out in favour of 'pure' research. They can be considered part of a continuum. At one extreme is the view that transdisciplinary research can be instrumental in defining new policies and instruments. At the other extreme is the view that transdisciplinary research serves to gather and verify data to improve our understanding of the world we live in. There are also legitimate and helpful intermediate positions,

[64] For further observations, see the document 'Sand dunes offer clues to coastal erosion and how to prevent it', May 2, 2023, accessible at https://projects.research-and-innovation.ec.europa.eu/en/horizon-magazine/sand-dunes-offer-clues-coastal-erosion-and-how-prevent-it.

depending on the main purposes of each researcher or group of researchers. Delineating a continuum rather than clear-cut boundaries helps clarify that the goal of our research is to gain more and better knowledge than is presently available. Although such research may have some practical implications, these will be considered in the following section, which concerns instruments.

5.2 Conceptions of space

It was noted earlier that, following Kuhn's characterization of paradigms, these, "for a time provide model problems and solutions to a community of practitioners"[65]. They do so because they are more appealing than other models. In Kuhn's words, a paradigm attracts "an enduring group of adherents away from competing modes of scientific activity"[66]. On the other hand, for him, a paradigm is also "sufficiently open-ended to leave all sorts of problems for the redefined group of practitioners to resolve"[67]. A problem arises with the discovery of what is perceived as an anomaly, that is, there are realities, or phenomena, and issues that cannot be adequately explained and solved on the basis of the paradigm. This problem can be addressed in more than one way. One is to seek to minimise the anomaly's importance and significance. Another is to admit that the existing paradigm may only explain some realities, not others. There is still another, and more radical way, which consists in the establishment of a new paradigm, if the old one is inadequate.

Kuhn's work, which has exerted a vast influence, is particularly interesting for our purposes. It presents development in the natural sciences in a rather different way from being simply centered on the existence of "truth". It suggests that there can be competing models. It is in this sense that we will seek to encourage other scholars to reconsider ideas and beliefs previously accepted – notably the separation between land and sea – to recognize the incompatibility between such ideas and beliefs and the scientific evidence now available, and perhaps to notice the implications that follow with regard to the practical issues mentioned initially in section 2. Arguably, there is much that lawyers, political scientists, and planning experts can learn from the debate among geographers over the concept of space and, more specifically, the relationship

[65] T. Kuhn, *The Structure of Scientific Revolutions* cit. at 12, viii.
[66] *Ibidem*, 10.
[67] *Ibidem*, 10.

between land and sea. These discussions can directly shape how we think about coastal areas.

A helpful way to begin is to briefly consider the asserted separation between land and sea. Not only lawyers, but also geographers have shown interest in Schmitt's theory[68]. However, research in both physical and human geography has shed more light on the relationship between land and sea[69]. Without entering into the details of this conventional distinction, suffice it to say that physical geography studies Earth's natural features (landforms, climate, ecosystems). In contrast, human geography, and in particular political geography, examines how human communities interact with space and territory, including borders and other dividing lines.

As a first step, it may be useful to consider some advances in physical geography relating to the post-industrial ecumene in the process of globalization. These mainly concern the growing land-sea relationships resulting from the impact of human conduct on the oceans[70], the frozen part of the hydrosphere, the cryosphere (Arctic and Antarctic). They relate to discoveries concerning the planet's thermoregulation mechanisms present in the atmosphere, which stem from a branch of geographical knowledge that uses physical-mathematical models, climatology. We refer, in particular, to the demonstration of anthropogenic alteration currently affecting this fundamental ecosystem service – the so-called 'Earth's thermostat' – linked to the natural carbon cycle and the content of other greenhouse gases in the atmosphere[71]. All this has a significant impact on coastal contexts and their relationship with maritime space.

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[68] See, among others, C. Minca & R. Rowan, *The question of space in Carl Schmitt,* cit. at 13, F. Galluccio, *Della delimitazione e dello Stato: per una lettura geografica di Carl Schmitt,* 109 Rivista geografica Italiana 255 (2002); M. Marconi, *La posizione come problema geopolitico: fatto, differenza e relazione in Friedrich Ratzel e Carl Schmitt*, 2 Quaderni del Semestrale di Studi e Ricerche di Geografia 163 (2023).

[69] *Paesaggi sommersi* cit. at 3, 48.

[70] See A. Vallega, *Ecumene oceano* (1985) and Id., *Geografia umana* (1989), 375 (referring to "ecumene ocean" to point out new context of space organized in geosystems).

[71] See the pioneer research by R. Revelle & H.H. Suess, *Carbon dioxide exchange between atmosphere and ocean and the question of an increase of atmospheric CO2 during the past decades*, 9 Tellus 18 (1957) and C.D. Keeling, *The concentration and isotopic abundances of carbon dioxide in the atmosphere*, 12 Tellus 41 (1960).

In terms of backstory, it all began with the International Geophysical Year 1957–1958, which brought a specialised branch of geography, oceanography, to the attention of the scientific world. At that time, oceanography was applying a new technology, echo sounding, which enabled the first observations and mapping of the ocean floor. The study of the ocean floor confirmed A. Wegener's theory of continental drift at the beginning of the century, and a new global interpretative model of the lithosphere was developed with the publication of Harry H. Hess's theory of plate tectonics. This was corroborated by subsequent research by Heezen and Tharp on the role of mid-ocean ridges, beginning with the Atlantic Ridge[72].

What is the relevance of all these considerations for our research on coastal areas? Since the lithosphere is segmented into 'regions' ('plates'), made up of "portions of the ocean floor" and land masses, the boundary between land and sea "has no structural significance"[73].

Moreover, underpinning the general tectonic model is the identification of an additional essential ecosystem service, the lithogenic cycle, which facilitates the critical production and renewal of the Earth's crust – an indispensable abiotic constituent of ecosystems – originating at the ocean floor and subsequently impacting terrestrial masses. This makes the interactions between land and sea even more inseparable and, most importantly for us, between human communities and the maritime space.

In this new context of environmental awareness, triggered by research in geophysics, oceanography, and climatology, human geography explores the theme of the humanisation of the sea and its transformation into an ecumenical space. This renders the interactions between terrestrial and marine environments increasingly inseparable and, more importantly for our purposes, between human communities and the maritime domain. The first is the start of the exploitation of certain sea resources, previously unknown and therefore unused, in the context of the 1973 oil crisis, which was overcome first by research and then by the development of offshore methane and oil fields in the North Sea, Arctic Ocean,

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[72] H.H. Hess, *History of Ocean Basins,* Petrologic Studies 599 (1962); A Wegener, *Die Entstehung der Kontinente und Ozeane* (1915); B.C. Heezen & M. Tharp, *Tectonic Fabric of the Atlantic and Indian Oceans and Continental Drift,* 258 Philosophical Transactions of the Royal Society of London 90 (1965).

[73] A. Vallega, *Geografia umana* cit. at 68, 390.

South China Sea, Caribbean Sea, Persian Gulf (Qatar, Iran), the western Atlantic (USA, Brazil, Canada), and the eastern Atlantic (Angola and Nigeria). These activities no longer concern only the continental shelf but also the deep-seabed, which is also exploited for polymetallic nodules and, more recently, for rare earths.

The second is the strategic role of the seas and lands surrounding the Arctic and Antarctic (Alaska, Greenland, Falkland Islands), which are the subject of international tensions and negotiations [74], military bases (air, naval, nuclear submarine), airspace control systems (North Warning System), new maritime borders, certain key straits (e.g. Bering, Cape Horn, Drake, etc.), the location of scientific bases and – once again – oil installations and pipelines. Furthermore, in recent years, the oceans have been attracting growing investment from multinationals in the energy, mineral and biological resources (fishing and aquaculture), international trade, communications, tourism, renewable energy and industrial research sectors. Finally, the new sustainability initiatives launched by the publication of the Club of Rome's report '*The Limits to Growth*' and continued with the 'Framework Convention on Climate Change' have led to the 'Blue Economy' model and the 'High Seas Treaty' approved by the United Nations in 2023, which give new centrality and functionality to coastal areas[75].

Added to this, of course, are issues relating to the development of new tourism activities linked to the sea; the impact of new theoretical and applied research on maritime space; the development of new contexts and objectives for environmental protection, such as the study of excess CO_2 absorption by the oceans and its consequences on the acidification of marine waters; policies and agreements for the mitigation of environmental risks (Sendai), in particular seismicity, volcanism, storm surges, and other extreme weather events caused by excessive marine warming; and the possibility of producing energy from renewable

[74] See the Montego Bay Convention (UNCLOS, 1982), the Declaration of Ilulissat (2008), the Polar Code (2017), the Antarctic Treaty (ETS, 1959), and the Madrid Protocol (1991) added to the Barcelona Convention. See also the *United Nations Atlas of the Oceans*, https://www.oceansatlas.org/about/en/.

[75] See Club of Rome, *The Limits to Growth* (1972). Another manifestation of the strategic and economic importance of oceans is provided by Copernicus, the EU program for the satellite oversight of the planet, which has created an open source service of surveillance on the oceans, the Copernicus Marine Service.

sources and exploiting materials for the replenishment of receding low-lying coasts. Hence, Vallega's definition of 'ocean ecumene' describes the new processes of humanisation of the planet in globalization, relating to geopolitical power relations, the need to use marine resources, ensuring environmental sustainability, and characterized by the resulting radical transformations of coastal practices.

Coastal space is traditionally defined by geographers as the area between land, stagnant waters (wetlands), and the sea, including its edge where the waterline varies over time and space, influenced by eustatic movements (due to climate change) and isostatic movements caused by vertical uplifts or subsidence of the Earth's crust floating on the upper mantle, known as the asthenosphere. It is the dynamic transition area between the mainland and the sea, characterized by an emerged coastal strip and the sea facing it[76]. With globalization, this geographical space, with its ports and their onshore and offshore extensions, its moorings for submarine cables and pipelines, and other coastal infrastructure, has increased in complexity and reciprocity, becoming a succession of terminals for land-sea interactions. Underwater mineral resources, ocean industry, global trade, fisheries and aquaculture, land-based discharges (riverine, industrial, urban), defense, research, and environmental protection activities, and a significant portion of the space's progressive urbanization and tourism development have become elements and factors of a single post-industrial geographical space.

All these uses of coastal space occur within coastal geosystems, i.e., territories managed, organised, and continuously reorganized by local communities, economic actors, spatial planning decisions, ongoing spatial processes, and consumption patterns. Geographers have the task of studying the trans-scalar dimension, the systemic and reticular structure of coastal territorial organization, and maritime space, where reticular structure refers to a space marked by high population density, a tendency toward urban polarisation, high spatial mobility, and interactions that generate both positive and negative feedback processes.

The delicate and legally significant problem of the boundary between land and sea shows, in the new situations just mentioned,

[76] IGU (International Geographical Union), International Geographical Glossary, drawn up by the International Geographical Terminology Commission. We refer here to the Italian edition: *Glossario Geografico Internazionale* (1998).

to those who conduct geographical research (physical, anthropic, and geohistorical) a tendency to overcome Schmitt's antithesis or opposition. The paradigm of separation between land and sea – the first planetary spatial order – has clear weaknesses, as the possibilities for exploiting and appropriating the hydrosphere have increased enormously. By the end of the 20th century, about 40% of ocean surfaces already fell under national jurisdictions[77].

The other evidence is that coastal areas are struggling to transition from their role as terminals for land-sea interactions to that of hubs, understood as focal points, coordination centres and connecting points for achieving sustainability objectives in terms of economic growth, as well as social, institutional and environmental sustainability.

In contemporary coastal geosystems, which are predominantly influenced by a linear economy-based development model, a serious problem appears to be that local actors often act in a self-referential manner, ignoring or having limited awareness of the interactions of their individual and social actions. As a result, coastal areas can simultaneously experience conflicting relationships (e.g. industrial discharges and aquaculture), mutually beneficial relationships (e.g. submarine pipelines and offshore terminals), relationships that are risky for both uses (e.g. military training areas and traffic channels), relationships that are disadvantageous to one of the two uses (e.g. polluting river mouths and bathing areas), and relationships that are advantageous to one of the two uses (e.g. scientific research and ocean mining)[78].

All this represents another strong point in favour of adopting transdisciplinary research practices, which would appear to be potentially better equipped to produce advances in knowledge and other research objectives, namely the dissemination and diffusion of scientific results, since they involve the active participation of stakeholders in all stages of research.

In the following sections of the article, we will examine, at a methodological level, some practical aspects of transdisciplinary research applied to coastal areas, with particular reference to the reflective use of geographic information systems. These systems must take into account multiple geographic reference scales (not only the local one) and consider the complexity and non-linear

[77] A. Vallega, *Geografia umana* cit. at 68, 394.
[78] These examples are drawn from the matrix elaborated by A. Vallega, *Geografia umana* cit. at 68, 400-1.

trends of the changes taking place – also marked by environmental crises and geopolitical tensions – which require a 'precautionary principle-based' approach.

5.3 An atlas of coastal areas

Building an atlas of sustainability levels and integrated management of coastal areas in Italy, based on a transdisciplinary approach, involves solving several problems. These relate to advancing research through a problem-solving approach, enhancing disciplinary skills (in our case, legal, geographical, urban planning, economics, and statistics), and addressing stakeholders' knowledge and demands. At the same time, functional cartography must be developed to provide an empirical means of analysis and to facilitate the dissemination of knowledge among researchers and non-specialists alike.

The objective is to create a tool for analysis and comparison that can produce favorable conditions for multi-level participatory regulation and management of coastal areas, exploiting its ability to analyze, at different geographical scales, the factors that influence the health and sustainable development of coasts, as well as the challenges related to climate change mitigation and adaptation[79].

In our case, the creation of the atlas was preceded by the development of a geographic information system in a GIS environment – an open source, interactive, georeferenced database of simple and summary indicators of coastal sustainability (which will be discussed in detail in the following paragraph) – as well as the georeferencing of information and requests from the project's economic, social, institutional, and environmental stakeholders relating to a number of case studies. These are cartographic choices attributable to reflective, critical and participatory cartography practices, i.e. representations of the territory that certainly stem from geographical analysis but also from tables proposed by other researchers involved in the project and from a cartography of the demands of coastal stakeholders. These are cartographic choices attributable to reflective, critical, and participatory cartography practices; that is, representations of the territory that certainly stem from geographical analysis, but also from tables proposed by other

[79] See A. Riggio, *Clima e coste: prassi di ricerca transdisciplinare per l'adattamento ai cambiamenti climatici nei territori costieri italiani*, 1 Documenti Geografici 45 (2025).

researchers involved in the project and from a cartography of the demands of coastal stakeholders[80].

The aim is to increase the level of interrogation of the maps and the geodatabase by using cartographic semiology capable of highlighting the research results and, at the same time, the different points of view and perceptions of the actors and users of the coast, what Casti defines as the social meaning of the territory.

Given these premises, the atlas consists of five chapters: General Maps – Environmental Sustainability – Social Sustainability – Institutional Sustainability – and Economic Sustainability. The approach geographers are pursuing is trans-scalar. The maps in the atlas will refer to the national, regional, municipal, river basin and coastal metropolitan area scales, since the geographical factors and planning tools that affect the coast are trans-scalar and multi-level. The main issues and best practices will be analysed through case studies.

Another general objective of the atlas is to identify and measure levels of coastal sustainability in Italy in relation to prevailing land uses through a reflection on the strengths and weaknesses, opportunities and constraints of Integrated Coastal Zone Management and the perception of conflicting aspects and converging interests by local stakeholders and coastal users.

The georeferenced database has therefore taken on the role of both an initial shared platform and a product of applied research, providing the various components of the project with satellite images, georeferenced indicators, and maps of coastal sustainability levels. The GIS environment is interactive, and all indicators and satellite images come from open source repositories that take into account the interoperability criteria recommended at European level[81].

One of the initial hypotheses formulated by the researchers is that the updating of regulations and the integrated management of coastal areas are currently hampered by overlapping

[80] E. Casti, *Cartografia critica* (2013), 304 (see the whole chapter on "Il cantiere della cartografia"); G. Burini, *Cartografia partecipativa* (2016), 156; T. May & B. Parry, *Social research and reflexivity* (2010); J.W. Crampton & J. Krygier, *An introduction to critical cartography*, 4 ACME. An International E-Journal for Critical Geographies 11 (2005).

[81] The main statistical sources used are those elaborated by the National Statistical Office (ISTAT), the Regional agency for environmental protection (ARPA), the Department of Health and Domain Agency, Legambiente, ISS, regions, 'blue flag' programme.

competences, a lack of trans-scalar geographical information, and a lack of strategic partnerships between research actors and local stakeholders. The expected impact of cartographic research in a GIS environment therefore refers to four main points: a) the advancement of knowledge of natural, social, economic, legal and management frameworks resulting from the choice of an interdisciplinary and collaborative approach; b) a new involvement of stakeholders (until now, consultation processes in Italy have generally only involved representatives of beach resorts), and the contribution of strategic partnerships (research bodies, supervisory authorities, maritime State property, etc.); c) increased understanding and awareness among researchers themselves and local stakeholders of the vulnerability of coasts to climate change; d) a different approach to public policy attributable to Public Science, understood as an interdisciplinary approach to the study of public policy and the social role of science, given that the project involves identifying gaps in data and participatory governance practices, and defining new strategic indicators.

5.4 A new *nomos*: the integration of land and sea

As remarked earlier, there is a voluminous literature on Schmitt's essay "*Land and sea*", which examines it from almost every conceivable perspective. The analysis that follows makes no pretence of being a complete survey of these differing approaches. It does, however, attempt to address the subject in a way that is important for both geographers and lawyers and has broader significance beyond any particular social science. The analysis will proceed as follows. First, we will briefly recall the separation between land and sea. The second part of the argument will consider whether there is a divergence between that theory and the essential facts and legal realities.

The central theme of Schmitt's essay is the distinction between law and the sea. This has been regarded as a dichotomy of crucial importance in determining the possibility of both ownership and use. The essence of this dichotomy can be conveyed in three brief propositions. First, he asserted that there is a fundamental physical distinction between land and sea. Second, for him, this physical distinction also became a legal dichotomy, in the sense that "the severance of land from sea became the fundamental law of the

planet"[82]. Third, within this view, the seas and the coasts, which followed their legal regime, belonged "to nobody or to everybody"[83]. In other words, they could not be divided and used in a manner comparable to that of the land.

We can all agree on the existence of the physical distinction between land and sea. However, Schmitt's initial claim that only the former is hospitable, while the latter is not, is questionable. There is a wealth of literature on the importance of coastal areas, including bays and ports, to human life. There is, moreover – and more importantly – a twofold difficulty in the legal significance of the severance of land from the sea. First, we may ask whether the physical distinction can be translated into a social distinction and thus into a legal dichotomy. The least that can be said is that it is not necessarily so, because different legal systems may treat such distinctions in different ways. Second, if Schmitt's (asserted) fundamental law of the planet were taken for granted, several national and international norms would be condemned or upheld as conforming with, or contrary to, the severance of the land from the sea. Both arguments will now be illustrated more fully.

There is an interesting point from which to commence our inquiry concerning the extent to which a physical distinction between the two "elements", land and sea, may be converted into a legal demarcation point. This is to assume that the law is connected to geography and climate, but it does not simply reflect them. Montesquieu developed this argument in the first pages of his treatise *L'esprit des lois*. He argued that laws have, or ought to have, a constant reference to the climate and the quality of the soil, as well as to the religion, commerce, and situation of each society[84]. "These relations … together constitute the Spirit of the Laws"[85].

He thus introduced the dimension of space (climate and soil) into the discussion of the nature of the laws governing societies. However, he did not attempt to derive political and legal principles exclusively or mainly from climatic or geographic conditions. The reason is that, for him, political and legal principles depended

[82] C. Schmitt, *Land and see,* cit. at 16, 48.
[83] *Ibidem*, 46.
[84] Montesquieu, *De l'esprit des Lois* (1748), English translation by T. Nugent, *The Spirit of the Laws* (1949), Book 1, ch. XVII, 7.
[85] *Ibidem*, 8.

mainly on the general state of society, viewed from the twin angles of tradition and progress[86].

We see here the method by which Montesquieu authoritatively redefined the scope and method of the study of public law, which has had a profound influence ever since, despite some excesses, such as those of the German Historic School. It is in the light of this approach that it can be said that, while the "*nature of the things*" has a role in shaping our views about the laws, to convert it into a set of legal precepts would, we hold, be to deny the importance of other factors that influence the laws.

That having been said, the rejection of Schmitt's attempt to convert the elemental opposition between land and sea into the fundamental law of the planet, in a political and legal sense, does not lead us to reject the value of science. Rather, it opens up a more complex and challenging view of the relationship between scientific and legal realities. The task of theory, in relation to the social and political world, in our view, is precisely to render explicit all the factors that influence the laws. From this point of view, our conjecture is that a new nomos has emerged as a consequence not only of more accurate scientific evidence and studies but also of the increasing awareness that, whatever the respective weight of human and natural causes, climate change generates increased risks for coastal areas. Although space constraints do not allow us to fully present the results of our analysis, the essence of the argument is simple. one concerns national laws, and the other concerns international and supranational regulatory frameworks.

During the last century, mindsets have changed in several political and legal systems regarding the importance of protecting coastal areas. National legislation is highly relevant in this respect. Two elements will be considered: ends and means.

It is important, at the outset, to have some idea of the general rationales for public regulation. Legislation identifies two broad rationales. In one view, regulation of coastal areas is justified – for instance, in the UK *Coastal Protection Act* (1949) – by the protection of the coasts from erosion, as well as the removal of any obstacles to navigation. Other countries prioritise protecting public ownership, which, in this case, includes the maritime public domain (France, Spain, and other countries). This rationale may

[86] F. Neumann, *Editor's Introduction*, in Montesquieu, *The Spirit of the Laws,* cit. at 82, xiv (explaining that Montesquieu did so because he believed history was man's attempt to control the blind forces of nature).

coincide, in many respects, with the traditional position; thus, for example, the Spanish *Ley de Costas* protects the maritime domain[87]. But this regulatory control can subsist in addition to the police powers provided under less recent legislation, such as the French, Italian and Spanish civil codes. Thus, for example, the French "*Loi littoral*" (1986) had a twofold goal: to prevent coastal erosion and to spur the economic development of coastal areas.

An additional public-interest justification for regulatory intervention arises when legislation delineates a specific objective aimed at advancing the rehabilitation of coastal areas, while concurrently ensuring adequate protection of ecosystems and biodiversity. An illustrative example is provided by the Queensland *Coastal Protection and Management Act* (1995) in Australia. Its objectives are a) to conserve and rehabilitate "the coastal zone, including its resources and biological diversity", b) the sustainable development in the use of the coastal zone; c) the safeguard of life and property from the threat of coastal hazards; d) the enhancement of knowledge of coastal resources and the effect of human activities on the coastal zone. On this view the very existence of regulation is seen as a function of the collective interest which would benefit from adopting not just a negative approach, such as prohibition to build in certain areas, but rather a positive approach, through greater knowledge and the use of public money[88].

When considering the necessary means to these ends, legislation enables public authorities to exercise a wide range of functions and powers. The ways in which this legislation has been interpreted by the relevant regulatory authorities show that three different tasks are being performed in this area. The first is the demarcation of areas, not only between public and private ownership, but also with regard to parts of coastal areas where building new houses is strictly prohibited – for example, because there is a nature reserve or a beach that needs to be protected. The second task is administrative planning. It has some innovative features, both procedural and substantive. Procedurally, regulators are more often than not required to involve the public in their actions. Thus, for example, the Queensland *Coastal Protection and Management Act* establishes that the coastal plan must be

[87] *Ley de costas* (1988), Article 2.

[88] *Coastal Protection and Management Act*, Part 2, section 3, accessible at https://faolex.fao.org/docs/pdf/qs40547.pdf.

"developed in consultation with the public" [89]. Importantly, administrative plans transcend the traditional dichotomy between law and sea. This topic will be examined in the next section.

Meanwhile, in the remaining part of this section, we will seek to complete our endeavour to render explicit and systematic the various ways in which international and supranational regulatory regimes shape not only our views about the subject – land and sea – but also the principles that govern it. At the global level, there is a clear connection between the general attempt made by the Stockholm Conference (1972) and the UN Framework Convention on Climate Change (1992), the Barcelona Convention for the Mediterranean Sea (1976) and the additional Protocol signed in Madrid (2008)[90].

At least four components of this protocol deserve mentioning. Firstly, and teleologically, the preamble clarifies that the shared intent of the contracting parties (that is, all Mediterranean countries plus the EU) is to preserve the coastal areas of the Mediterranean Sea "for the benefit of present and future generations". Secondly, and consistently with scientific views, the coastal zone is defined as a "geomorphologic area either side of the seashore in which the interaction between the marine and land parts occurs in the form of complex ecological and resource systems made up of biotic and abiotic components coexisting and interacting with human communities and relevant socioeconomic activities"[91].

As the task of theory, as we observed earlier, is to clarify the conceptual structures that shape our views on the subject, the general point that must be made is that the marine and land parts interact, and that coastal areas, considered as a whole, interact with human communities. In other words, the two acquisitions of physical and political geography are at the basis of these regulatory regimes. Thirdly, and consequently, public authorities are requested to adopt and follow an "integrated coastal zone management", that is, "a dynamic process for the sustainable management and use of coastal zones, taking into account at the

[89] *Coastal Protection and Management Act*, Part 2, section 4(b).

[90] *Protocol on Integrated Coastal Zone Management in the Mediterranean Sea*, available online at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22009A0204(01).

[91] *Protocol on Integrated Coastal Zone Management in the Mediterranean Sea,* Article 2(1)(e).

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"[92]. Using the metaphor of the various theories on a subject as "constituting rival maps of the terrain"[93], it can be said that while Schmitt mapped the space on the assumption that land and sea were separated, the same space is now mapped with contours that reflect and show the integration between land and sea. Last but not least, the first of the general principles of integrated coastal zone management is that the marine and land parts form "a single entity".

As the value of the map is revealed by seeing "how well you can go around with it"[94], it may be helpful to look briefly at how these definitions and broad standards contribute to shaping the legal norms issued by the EU in its Directive n. 2014/89 establishing a common framework for maritime spatial planning. Thus, its operational norms not only require each Member State to establish and implement maritime spatial planning, but they also specify that, in doing so, they "shall take into account land-sea interaction"[95]. While various initial paragraphs of the Directive refer to land-sea interaction, it is in its operational norms that we can find a clear choice in favor of "maritime spatial planning", viewed as the instrument for "taking into account land-sea interaction and enhanced cross-border cooperation"[96]. As the first minimum requirement for maritime spatial planning is to take into account land-sea interactions[97], it is evident that the theory that best fits the common framework is one that recognises their interdependence, as opposed to their separation.

[92] *Protocol on Integrated Coastal Zone Management in the Mediterranean Sea,* Article 2(1)(f).
[93] The quotation is drawn from M. Loughlin, *Public Law and Political Theory* (1992), 36.
[94] *Ibidem*, 34.
[95] *Protocol on Integrated Coastal Zone Management in the Mediterranean Sea,* Article 4(1) and (2).
[96] *Protocol on Integrated Coastal Zone Management in the Mediterranean Sea,* Article 1(2).
[97] *Protocol on Integrated Coastal Zone Management in the Mediterranean Sea,* Article 6(2)(a).

6. Research Outcomes (II): Instruments

The preceding section examined certain theoretical implications of our transdisciplinary research. It will now be beneficial to underline several practical implications. Three of these will be discussed in the subsequent analysis. The discussion begins with the elaboration of indicators and proceeds to planning and stakeholder engagement. Subsequently, a study is conducted on two issues increasingly contested in judicial forums, namely, the issuance and revocation of permits for construction in coastal zones.

6.1 Defining indicators

Developing indicators is an important part of our transdisciplinary research. The project can be said to have significant impact prospects if it achieves the final objective of producing new summary indicators for assessing coastal areas. Several physical indicators can be defined and refined in the logic of sustainability. There is, however, another group of indicators that should be taken into account: those concerning openness, transparency, and accountability.

The selection and definition of indicators in transdisciplinary research require a participatory approach and the identification of strategic indicators. In our case, as mentioned above, we also agreed to transfer data from open source, freely accessible repositories to the geodatabase. The research activities also include a reflection on the identification of gaps in data availability and interoperability, with one expected result being the introduction of new summary indicators [98].

The indicators are divided into two general reference categories: the thematic component of the transition to environmental, social, institutional and economic sustainability[99];

[98] The synthetic indicators used are well known, including the Gini indicator, defined by ISTAT for Italy, concerning social sustainability, and the RICE indicator defined in the context of the Eurosion project (Radius of Influence of Coastal Erosion) to monitor the impact of climate change on coastal areas. The research group is elaborating an indicator for each pillar of sustainability.

[99] Thus, for example, article 9 (1) (f) of the Madrid Protocol on ICZM requires the contracting parties to "define indicators on the development of economic activities to ensure sustainable use of coastal zones", while Article 18 add that they "shall define appropriate indicators to evaluate the effectiveness of integrated coastal zone management strategies, plans and programmes, as well as the progress of implementation of the Protocol".

the thematic component of Integrated Coastal Zone Management, subdivided into Protection and management of coastal areas, Adaptation to climate change; and Public safety, anthropogenic activities and coastal functions – anthropogenic uses of the sea[100]. These unquestionably take into account international discussions on sustainability indicators, first within the OECD (Organization for Economic Cooperation and Development) and subsequently within the UNCSD (United Nations Conference on Sustainable Development) and the European strategy for Integrated Coastal Zone Management (ICZM), which also uses Copernicus and CISE (Common Information Sharing Environment specialising in coastal and maritime space) data.

The current state of research on benchmarking the transition to sustainability indicates a tripartite selection of strategic indicators for coastal and maritime regions, categorised into Driving Force, State, and Response factors[101].

The definition of indicators is also based on a trans-scalar approach: some indicators refer to the local scale, allowing for the identification of case studies; others refer to the regional scale (to construct maps relating to coastal metropolitan areas, coastal regions, and river basins); and a final section uses the national and supranational scales for national and international comparisons. The indicator chain includes quantitative and qualitative indicators, such as those relating to landscape, public policies, economic and social development models, and naturalistic and ecological values in coastal areas. Other chains refer to 'denotative' indicators, the tangible aspects of territorial practices such as human impact on the lithosphere-atmosphere-hydrosphere-biosphere, on the organisation of the territory and the direct impact on the coasts and the sea. Other indicators are 'connotative', referring to intangible aspects of practices related to culture, models, and values, such as indicators functional to sustainability and ICZM, or those relating to the transition to the circular economy, the blue economy, and the territorial energy transition.

These values and their georeferencing can measure and represent the state, pressure, impact, and response of coastal geosystems in relation to ongoing territorial processes resulting

[100] For each indicator, a brief description, the scale (municipal, regional or national) and the source are provided.

[101] For a synthetic view of the evolving ideas about sustainability indicators, see again A. Vallega, *Geografia umana* cit. at 68, 63-70.

from public policies and can reconstruct the strengths and weaknesses of the contextual situations affecting the transition to sustainability in coastal areas.

6.2 From administrative adjudication to planning

There are many activities for which a person (either an individual or a firm) requires a licence because the uses they propose for coastal areas either limit or exclude public use, which is the primary interest. Included among these activities are, of course, the authorisations or concessions for the reserved use of the coast (sea, beach, waterfront). There are also authorisations or concessions for building manufacts on the coast, whether or not they must be removed at the end of the season. There are, finally, authorisations or concessions to take sand from the coast for a variety of purposes (e.g., refilling another beach or using it for construction). All these measures are part of administrative adjudication, a process by which public authorities apply laws to individual cases, often through fact-finding and hearings, and impose duties on individuals, social groups, and legal entities. It is a core function of the executive branch, distinct from rule-making and planning[102].

In recent decades, many legal systems have increasingly adopted new plans. There are various reasons supporting administrative planning. A plan may provide guidance to public administrators, thereby limiting the amount of discretion they exercise when adopting individual measures. Plans are, moreover, a popular tool for setting long-term priorities for cities and nations, and thus require joint efforts and coordination between a variety of public authorities and social actors. Spatial planning[103], in particular, is important because it defines admissible uses for the various parts of the territory. The process of defining a plan is important precisely because public authorities and social actors seek to express their views and exert influence on the determination of priorities.

While the practice of adopting plans is relatively widespread in urban planning, spatial planning concerning coastal areas is a relatively recent concept. Until a few decades ago, few countries

[102] For a comparative analysis, see G. della Cananea & A. Ferrari Zumbini (eds.), *Administrative Rulemaking and Planning in European Laws* (2025).

[103] The fourth recital of Directive 2014/89/EU refers to "maritime spatial planning".

had established norms for the processes and tools of coastal planning. A change occurred at the beginning of the twenty-first century due to the actions of regulatory regimes and supranational legal orders, such as the Barcelona Convention and the EU, respectively.

First, let us consider the Madrid Protocol on integrated coastal management. Its preamble asserts that, to ensure the preservation of coastal areas, both planning and management constitute essential components of the ICZM. It is not fortuitous, therefore, that the first objective of the ICZM is to "facilitate through the *rational* planning of activities, the sustainable development of coastal zones by ensuring that the environment and landscapes are taken into account in harmony with economic, social and cultural development"[104]. In addition to the rational character of plans, they must have a broad scope of application, "covering urban and socioeconomic activities"[105]. More specific plans serve particular purposes, such as desalination and the protection of wetlands[106].

EU Directive 2014/89, which is specifically devoted to establishing a common framework for maritime planning, confirms that the EU adheres to the ICZM and lays much emphasis on the fact that "marine and coastal activities are often closely interrelated"[107]. Its operational norms clarify that the strategy implies a cycle of activities, including problem identification, information collection, planning, decision-making, implementation, revision or updating, and monitoring of implementation[108]. Moreover, as observed earlier, they require each Member State to establish and implement maritime spatial planning and specify that, in doing so, they "shall take into account land-sea interaction"[109].

Of course, it is one thing is to establish a requirement to define plans, and quite another to see them adopted. Some countries, including Italy, have lagged behind, and the EU Commission has had to monitor their attempts and, at times, threaten to commence an infringement procedure, or even to do so.

[104] Directive 2014/89/EU Article 5(1)(a), emphasis added.
[105] Directive 2014/89/EU Article 6(1)(f).
[106] Directive 2014/89/EU Article 9(2)(e)(i) and 10(1)(a).
[107] Directive 2014/89/EU recital 16 and 18.
[108] Directive 2014/89/EU Article 3 (2).
[109] Directive 2014/89/EU Article 4(1) and (2).

But the plans for managing coastal areas are now a reality. This opens up the field for another line of research, based on the comparison between national plans. This would be a very interesting enrichment of our knowledge about the protection of coastal areas.

6.3 Best practices for involving stakeholders

A second area in which the establishment of a space of encounter among various disciplines yields positive effects is public decision-making.

At the level of European institutions, participatory governance processes for the adoption of regulatory acts and territorial planning tools can rely on reference models, established procedures and analyses of their impact and strengths and weaknesses. But the plans for managing coastal areas are now a reality. This refers to the involvement of participants, especially in research projects involving human subjects, and to procedures for transparency and informed consent[110].

This general picture has recently been complemented by transdisciplinary research practices in which the contribution of stakeholders (both top-down and bottom-up) is significant because it concerns co-design and the achievement of various scientific objectives. These practices require a very high level of attention and coordination on the part of researchers. Below, we will attempt to focus on the main theoretical and methodological steps in relation to the study of coastal space. These concern the choice of stakeholders, the methodologies and tools used in engagement, and consultation practices, and the impact of their participation on research activities.

Identification of stakeholders. The choice of stakeholders was primarily based on the thoughtful use of the geographical reference scale and, in particular, on a trans-scale approach (local, regional, and national). The geographical space considered is supra-local, extending to basin authorities, regions, and coastal metropolitan areas.

From the choice of reference scales, we moved on to context analysis and field research on the four pillars of sustainability, which can be considered another basis for our reasoning, along

[110] See B. Ballerini, *La dinamica degli interessi nella gestione delle coste e il ruolo delle consultazioni*, 3 Rivista Quadrimestrale di Diritto dell'Ambiente 243 (2024).

with listening to local stakeholders who have a direct influence on the coastal area (tourists, policymakers, ministries, environmental associations, local action groups, and other associations). This geographical approach was enriched by contributions from various scientific and disciplinary sectors and the universities involved in the project, which aided in selecting and identifying key interlocutors in the legal, urban planning, and economic fields, mainly based on previous research experience but also attributable to the university-territory relationships themselves.

Reflecting the plurality of views of the subjects that determine the meaning of places and influence the perception and use of coastal geosystems requires a 'bottom-up' approach – listening to categories of citizens, consumers, economic operators, social actors, and environmental and cultural stakeholders – and a 'top-down' approach – discussion with other leading researchers not involved in the project, specialised research bodies, and multi-level institutional actors involved in the management and surveillance of coastal, port and maritime areas. Our project also involved listening to representatives of workers, including the business world, including the industrial, tourism, commercial, fishing and financial sectors, to name but a few, as well as coastal cultural heritage management bodies.

Consultation and engagement methodologies and tools. The stakeholders included in the project proposal submitted for the 'PRIN 2022 PNNR' call at Milestone 7, 'Outline for Regulatory Assessment - Stakeholders' Engagement', were consulted from the public presentation phase of the research project. They are playing an active role in medium-term research activities and will be involved in the presentation and evaluation of the final results (communication, dissemination, and promotion) as well as in post-project activities for the further implementation and maintenance of the database.

All Research Units were therefore allocated man-months and resources for the creation of strategic research partnerships and the involvement of key stakeholders. In addition, each scientific seminar was organised in two main sessions: Scientific Communications and Round Tables with stakeholders dedicated to topics relating to the scientific reports. Geographers, in particular, took on the task of mapping stakeholders and georeferencing their requests in the geodatabase using specialised tools – georeferenced questionnaires – which, in addition to identifying the importance

of the territorial subject, focus on the degree of interest and the perception of sustainability levels and integrated coastal zone management.

Impact of participation on research activity. The effect of stakeholder involvement and consultation touches on several aspects. The first aspect is the integration of knowledge and increased awareness of the requests, expectations, and converging and conflicting interests of professionals, as well as of institutional and private territorial entities. A second impact concerns the creation of partnerships and collaboration agreements (e.g. with the Maritime State Property Agency) and with other research projects, institutions, laboratories, and scientific associations involved in coastal issues. These involve scientific collaboration, coordination of activities, the exchange of expertise, and the provision of data and information that can be freely accessed by the parties involved. All this increases the research project's social and economic impact and lays the foundations for new negotiations and the development of post-project activities, including the objective of entrusting the implementation of the coastal sustainability database to a project partner at the end of the two-year research period.

From a scientific point of view, the most important objective of transdisciplinary practices involving stakeholder participation is certainly to open up new research perspectives. In this regard, new research perspectives have led to the emergence of new scenarios and knowledge about coastal contexts, as well as the possibility of using innovative tools – particularly cartographic and GIS tools – to address legal and urban planning issues and build participatory regulatory practices. In addition, it has been possible to develop new cartographic analyses to represent the perspectives of territorial actors, as well as new strategic indicators to assess levels of sustainability and integrated coastal management.

Lastly, we have entered a more complex area of research in which coastal geosystems – once passive terminals, often unaware of land-sea interactions – can draw on knowledge and expertise to take on the role of hubs, serving as focal points and spaces for coordination and connection to achieve sustainability objectives, including economic growth, social, institutional, and environmental sustainability, integrated protection, and new ways of inhabiting the coasts in the Anthropocene.

6.4 Science *and* law: the precautionary principle

For all the importance of plans, much remains to be decided by public authorities through adjudication. This entails complex issues of procedural and substantive justice. Procedurally, different legal systems may give more or less weight to the safeguards for individuals and legal entities affected by administrative decisions. But in one way or another, procedural justice will have applications in this area, in the sense that some elements of procedural fairness will normally be required, although precisely which ones apply depends on the nature of the issuing authority.

The precautionary principle is an instructive example. There is a wealth of literature exploring this principle, including its relationship to science. However, the very nature of the precautionary principle remains contested. Moreover, and more importantly for us, little attention has been devoted to coastal areas, even though numerous administrative plans and individual decisions affect them. In this paragraph, the argument proceeds in three stages. The first is conceptual and focuses on the reasons *why* the precautionary principle is becoming increasingly important in this field. The second stage examines *how* the principle has been applied in a few cases across different jurisdictions. The final stage of our argument regards the normative aspect.

The importance and structure of the precautionary principle have been the subject of debate within regional and global institutions, such as the EU and the UN, respectively. The EU Commission began by distinguishing between reliance on the precautionary principle and the search for zero risk, which is rarely found. As a result, it continued, an approach based on precaution is required when scientific information is insufficient, inconclusive, or uncertain[111]. It also noted that the principle should be taken into consideration, particularly in the field of environmental protection. Its approach was endorsed by the two political institutions of the EU, the Parliament and the Council. Moreover, the principle was included by the European Court of Justice among the general principles of EU law, for example, in the context of the

[111] Communication from the Commission on the precautionary principle, COM(2000), 1. See also European Parliament, The Precautionary Principle. Definitions, applications, and governance (2015), 9, accessible at https://www.europarl.europa.eu/RegData/etudes/IDAN/2015/573876/EPRS_IDA(2015)573876_EN.pdfhttps://www.europarl.europa.eu/RegData/etudes/IDAN/2015/573876/EPRS_IDA(2015)573876_EN.pdf.

authorisation of medicines for human use. For the Court, the principle should be broadly interpreted when it is applied to nature conservation [112] . In another dispute concerning wastewater treatment, the ECJ held that a degree of probable causality was sufficient to require national authorities to adopt protective measures[113]. At the international level, the 1992 Rio Declaration on Environment and Development endorsed the view that "the precautionary principle should be widely applied", but added that States should do so according to their capabilities. Subsequent treaties referred to the principle, including the 1992 Helsinki Convention on the Baltic Sea. The UN included it between the ten principles of its Global Compact with the following formulation: "business should support a precautionary approach to environmental challenges".

However, the precautionary principle divides opinions. For some, it is unscientific and is (or is used as) an obstacle to progress, especially when there is uncertainty about the hazards and therefore the costs. Various academics have developed this theme. For example, a well-known political scientist, Aaron Wildavsky, made a case for "rejecting the precautionary principle"[114]. He made two remarks that were related, but distinct: one empirical and the other moral. Empirically, he observed, "one should not assume; one has to demonstrate, to supply evidence and argument, to justify the fact that that 'take no chance' is empirically valid in protecting health" [115] . Without accurate data and good, evidence-driven reasons, he argued, the health or environmental gains from regulation cannot be substantiated. On moral grounds, he contested the primary weight given to environmental considerations. For him, "emphasizing a single value, to which all others must be subordinated, is a sign of fanaticism"[116]. Critical voices prevailed in the U.S., also among lawyers, including Cass R. Sunstein. According to him, if the precautionary principle is understood in its strong form, namely as imposing a burden of proof on those who create potential risks, then it should be rejected. The reason is that, for Sunstein, understood in this sense, the

[112] ECJ, judgment of 7 September 2004, in C-127/02, *Waddanzee*.
[113] ECJ, judgment of 23 September 2004, in C-180/02, *Commission v France*.
[114] A. Wildavsky, *But Is It True? A Citizen's Guide to Environmental Health and Safety Issues* (1995), 427.
[115] *Ibidem*, 428.
[116] *Ibidem*, 429.

principle is literally paralysing, leading to stringent regulation and preventing social actors from acting[117].

For others, the precautionary principle is a necessary instrument of public decision-making and is acceptable precisely because it is science-based. It is a necessary instrument because, in its essence, it is based on a proposition with which everyone may agree; that is, prevention is better than cure. There is plenty of evidence that ex post costs are much higher than those that must be incurred if a threat is prevented, especially when the resource is non-renewable. Moreover, from an interest-balancing perspective, a precautionary approach requires decision-makers to set explicit goals and consider various ways to achieve them. Lastly, even though science and technology can sometimes be unable to predict the precise consequences of human conduct and the degree of threat it entails, in other circumstances, they can explain why a certain scenario is more likely than another and which consequences would follow[118].

Before considering how the courts have applied the principle of precaution, it is important to keep in mind that every reviewing court interprets the legislation and substitutes its judgment for that of the administrative authority, deciding whether the statute can be used for the challenged purpose or whether the contested action is relevant. If the latter bases its decision on irrelevant considerations or fails to consider relevant ones, then its decision is struck down on those grounds.

The ruling of the Victorian Civil and Administrative Tribunal, an Australian court, in the Gippsland Beach case is illuminating[119]. The local authority deemed that a request to build new houses in a coastal area very near the beach could be approved. The national authority entrusted with protecting coastal areas dissented and challenged the decision in court. The relevant considerations in the judgment about precaution, in terms of the interests at stake, were the concern of the national authority that building new houses so close to the beach could prevent the natural

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117 C.R. Sunstein, *Beyond the Precautionary Principle*, 151 U. Penn. L. Rev. 1003 (2003).

118 See M. O'Brien, *Making Better Environmental Decisions. An Alternative to Risk Assessment* (2000) (for the thesis that an approach based on precaution is much to be preferred to risk assessment).

119 Victorian Civil and Administrative Tribunal, Administrative Division, *Gippsland Coastal Board v South Gippsland* (2008).

re-adjustment of the dunes and the local authority's belief that the construction of the houses was tolerable from an environmental viewpoint. The court held that a presumption of tolerability was insufficient to support a permit to build new houses. In this instance, the persuasive argument against the presumption was that "applying the precautionary principle, … increases in the severity of storm events coupled with rising sea levels create a reasonably foreseeable risk of inundation of the subject land and the proposed dwellings, which is unacceptable" [120]. In the architecture of the court's argument, three elements prevailed: the absence of overriding reasons support the building of new houses in the proposed site, the fact that "rising sea levels are to be expected" even beyond our actual capacity to predict them, and that, as a result, the risks that characterised the building project extended beyond an acceptable degree of reasonableness. In other words, the local authority's decision was unlawful because it infringed the precautionary principle and because these factors far outweighed those in favour of the building of new dwellings.

The important relationship between science and law is also evident in the case decided by the French *Conseil d'État* concerning a municipality located on the coast of the Atlantic Ocean, the *Commune de Soulac-sur-Mer*[121].

In the 1960s, the local authority authorised the building of a house on the waterfront. Some decades later, a new plan for the prevention of environmental and housing risks established an absolute prohibition on building in the dune area ("*une zone rouge inconstructible du plan de prévention des risques d'avancée dunaire et de recul du trait de côte*"). When the private owners of existing houses requested a permit to protect them, the prefect – a State authority – rejected it. After two lower courts expressed their views, the *Conseil d'État* issued a well-structured judgment. It held, first, that the appeal court had correctly referred to the scientific knowledge concerning the evolution of natural phenomena in the coastal area, with a view to understanding the seriousness of the risks to houses and human lives; secondly, and consequently, it concluded that the owners of the house were not entitled to avail themselves of the legislative provisions concerning expropriation for public utility. The provisions to be applied, rather, were those concerning the

[120] *Ibidem*, § 48.
[121] *Conseil d'Etat*, 16 August 2018, n. 398671.

exercise of police powers[122]. Even though, in this instance, the administrative court did not expressly refer to the precautionary principle, which in France has constitutional bearing[123], its reliance on scientific data and knowledge ("*la bonne connaissance scientifique du phénomène naturel en cause*") confirms the science-policy interface.

As stated initially, the third stage of our argument is normative. It follows from the above that the precautionary principle is, on the one hand, established within several regional and global regulatory regimes, hence its legitimacy as a ground for judicial review, at least within the States that have joined such regimes. On the other hand, although our analysis concerns some legal systems based on certain values (democracy, transparency, and respect for the rule of law), the precautionary principle can also be applied within other types of well-ordered polities that lack some features of liberal democracies, such as the protection of fundamental rights[124].

Consequently, it can be argued that even a well-administered polity differing from a liberal democracy may find it helpful to review decisions made by lower or local authorities on precautionary grounds, at least to ensure that its international obligations are respected.

6.5 Rising sea levels and withdrawal of permits

As a continuation of the previous discussion, it is worth considering the ramifications of climate change – more specifically, rising sea levels – when the public authority is not requested to decide on an application but rather on the withdrawal of a concession or a permit[125]. By and large, decisions concerning an application, renewal, revocation, or withdrawal of a concession or permit are subject to increasingly stringent legal standards. The underlying assumption is that, in the case of a revocation or withdrawal, for instance, of a permit to build a dwelling in front of

[122] *Conseil d'Etat*, 16 August 2018, n. 398671, §§ 6 and 8.

[123] The principle, initially defined by ordinary legislation (the Rural Code of 1995), is now enshrined in Article 5 of the *Charte de l'environnement*, whose constitutional status has been affirmed by the *Conseil d'État*, 19 July 2010, n. 248233, *Association du quartier «Les Hauts de Choiseul»*

[124] For this distinction between liberal democracies, other well-organized polities, and other political regimes, see J. Rawls, *The Law of Peoples* (1993), 5.

[125] For an analysis of other types of disputes, see M. Stallworthy, cit. at 8.

a beach, the individual or firm is entitled to more intense protection, which includes an unbiased adjudicator, notice, and a hearing, whereas, in the case of an application, less intense protection is required. This is because, with the initial decision and the passage of time, the interest of that individual or firm deserves more protection, both procedurally and substantively, in the sense that there is a right not to be deprived of the benefits deriving from the concession or permit if all legal rules and conditions have been respected. However, there may be areas in which the interest at stake in a new application is considerably more important than that involved in a renewal in a different area, especially if the concession or permit constitutes a valuable commodity[126]. Renewal of a concession or permit falls into an intermediate category, since the individual may have a legitimate expectation that it will be renewed[127].

It is against this background that the ramifications of climate change may be examined. Thus, for example, a recent ruling by a French administrative court endorsed the decision of the relevant local authority to withdraw a building permit in the light of evidence showing coastal erosion and the high risk to houses legitimately built decades earlier on land increasingly assailed by tides and waves. As a consequence, it was decided that such houses had to be demolished; furthermore, the owners were entitled to receive compensation[128].

In a different legal landscape, that of the U.S., the federal Supreme Court was asked to review the decision made by the Supreme Court of South Carolina in *Lucas*, a case concerning the protection of a beach[129]. In brief, the relevant local authority enforced the State's *Beachfront Management Act* (1988) rejecting the request for a permit to build on an island in front of the coast of South Carolina. The applicant contested the denial of the permit, on the grounds that he was entitled to receive compensation as if the State had expropriated his property. While the lower court endorsed his argument, the State Supreme Court reversed the

[126] P. Craig, *Administrative Law* (2003), 449.
[127] *Ibidem*, 449.
[128] *Conseil d'État*, 16 August 2018, n. 398671 (concerning the municipality of Soulac-sur-Mer).
[129] US Supreme Court, *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992). On the distinction between expropriation and police power, see J.S. Sax, *Takings and the Police Power*, 74 Yale L. J. 36 (1964).

ruling, applying the old maxim *sic utere tuo ut alienum non laedas* (that is, use your own property in such a way that you do not injure other people's). However, in a divided federal Supreme Court, the majority held that, as a consequence of the denial of the permit, the right of property was devoid of any economic value "*in the name of the common good*" and this triggered a request for compensation. The dissenting judges objected that the majority was in contrast with the opinion of the scientific community, according to which building new houses in coastal areas posed risks to those areas as well as to the houses. They added that the uncertain and unjustified interpretation given to the conditions for compensation in these cases subordinated the protection of coastal areas to the payment of high costs[130].

This is an interesting debate from which much may be learnt. Sometimes, the imposition of more stringent constraints on private property entails some form of compensation; in other cases, it does not. The differences between the solutions adopted reflect not only national priorities in the management of coastal areas but also the legal doctrines shared by lawyers and judges – in other words, their traditions.

7. Conclusion

No attempt will be made to summarize the various remarks presented thus far. It is sufficient to acknowledge that numerous scientific disciplines play a fundamental role in understanding coastal regions. Contrary to earlier perspectives, land and sea are not considered distinct entities: they are mutually interconnected. Theories that demonstrate an awareness of their interaction are, therefore, to be preferred. Moreover, a range of policy instruments, including planning and stakeholder engagement, are frequently based on the premise of land-sea interactions. Our concerns regarding democracy and transparency are intrinsically linked to the methods by which coastal areas must be planned and managed.

[130] *Ibidem*, 1036, according to Justice Stewart, 1040 ("the State has the power to prevent any use of property it finds to be harmful to its citizens"). In a later case, *Palazzolo v. Rhode Island* (2001), the Supreme Court discussed the possibility that private lands retain "significant economic worth", notwithstanding regulation.