

Shifting Shores of the Anthropocene: The Settlement and (Impossible) Stabilization of the North-Western Mediterranean Littoral over the 19th and 20th Centuries

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Introduction: Coastal history and Anthropocene

Human occupation of the coasts has dramatically increased in the modern era. After two centuries of continued settlement, at the turn of the twenty-first century, almost half of the world population lived in or near coastal areas.¹ The settlement of the shores has been accompanied by a profound reconfiguration of coastal ecologies and morphologies. Massive investments in large-scale infrastructure stabilized the shores to make them suitable for multiple forms of economic exploitation and social activities, from leisure to industrial processing. By-products of urban and industrial settlements, from plastics to nitrogen, have in turn deeply altered coastal biogeochemistry and habitats. In the light of their impact, alterations of the coastal zone are an important element of current debates on the Anthropocene, the proposed new epoch of the Earth marked by human geological agency.² The transformation of the shores seems indeed to provide ample evidence of human domination that many associates to the Anthropocene. While evidence of human impact is undeniable, we argue that exclusive insistence on human impact risks to obfuscate the inherent dynamism and persisting instability of coastal environments, while erasing the differences in how historical actors coped with this dynamism. Focusing on the north-western Mediterranean, we

¹ Christopher Small and Robert J. Nicholls, 'A Global Analysis of Human Settlement in Coastal Zones', *Journal of Coastal Research*, 19, 3 (2003): 584–599.

² On the Anthropocene see the foundational Paul Crutzen and Eugene Stoermer, 'Have we Entered The 'Anthropocene'?', *Global Change Newsletter* 41 (2000): 17-18 and Paul Crutzen, 'Geology of Mankind.' *Nature* 415, 31(2002): 23. On coastal changes in this debate see: Christopher J. Crossland, Hartwig H. Kremer, Han J. Lindeboom, Janet I. Marshall Crossland, Martin D. A. Le Tissier, *Coastal Fluxes in the Anthropocene: The Land-Ocean Interactions in the Coastal Zone*, Berlin Heidelberg New York: Springer, 2005. Coastal questions are discussed in the key paper on stratigraphy of the Anthropocene by C.N. Waters, J. Zalasiewicz, C. Summerhayes, A.D. Barnosky, C.Poirier, A. Gajuszka, A. Cearreta, et al. 'The Anthropocene Is Functionally and Stratigraphically Distinct from the Holocene', *Science* 351, 6269 (2016): aad2622.

investigate the interaction between stabilization and instability– the shifting nature of the shores.³ Through this approach we hope to shed new light on the history of coastal change, and, from this perspective, address some of the open issues with the environmental history of the Anthropocene.

Coastal change is increasingly capturing the attention of historians.⁴ Writing about the Indian Ocean, Michael Pearson associated coastal economic and demographic changes with the sunset of distinctive ‘littoral societies’.⁵ Similarly, John Gillis’s global survey maintained that the modern era brought about the replacement of people living *with* (accustomed to the shore’s dynamism) by people living *on* the coast (oblivious to it).⁶ French historian Gerard Le Bouedec highlighted the decline of forms of ‘pluriactivity’ (*pluriactivité*) typical of people inhabiting the early modern Atlantic coast of France.⁷ Isaac Land recently critiqued these arguments, underscoring the necessity to move beyond narratives of ‘despoliation and decline’ to recognize the persistence of distinctive coastal cultures.⁸ Environmental historians have also often told compelling stories of despoliation, such as in the grand North Atlantic fresco by Jeffrey Bolster,⁹ and of decline, by framing modern coastal transformation in terms of artificial stabilization, loss of biodiversity, and

³ Alice Garner used this expression in her book on Atlantic France *A Shifting Shore: Locals, Outsiders, and the Transformation of a French Fishing Town 1823-2000* (Ithaca, Conn.: Cornell University Press, 2004).

⁴ Isaac Land, ‘Tidal Waves: The New Coastal History’, *Journal of Social History* 40, 3 (2007): 731-743 and now David Worthington, ed., *The New Coastal History: Cultural and Environmental Perspectives from Scotland and Beyond* (Basingstoke: Palgrave Macmillan, 2017). From a mainly urban perspective Stephen Mosley, ‘Coastal Cities and Environmental Change,’ *Environment and History* 20, 4 (2012): 517–33.

⁵ Michael Pearson, *The Indian Ocean* (London: Routledge, 2003), pp. 37-41 and ‘Littoral Society: The Concept and Problems’, *The Journal of World History*, 17, 4 (2006): 353-373. See also Marcus P. M. Vink, ‘Indian Ocean Studies and the ‘new thalassology’,’ *The Journal of Global History*, 2, (2007): esp. p. 57.

⁶ John Gillis, *The Human Shore: The Human Shore: Seacoasts in History* (Chicago: The University of Chicago Press, 2012), p.2.

⁷ Gérard Le Bouédec, ‘Pour une histoire sociale de l’étranger français,’ *Annales de Bretagne et des Pays de l’Ouest*, 117, 4 (2010): 135–64.

⁸ Isaac Land, ‘The Urban Amphibious’, in Worthington, *The New Coastal History*, pp. 31-48.

⁹ W. Jeffrey Bolster. *The Mortal Sea: Fishing the Atlantic in the Age of Sail* (Harvard University Press, Cambridge, Mass. 2012).

loss of coping capacity through the decline of what Petra Van Dam calls “amphibious cultures”.¹⁰ These environmental history accounts gain a new relevance in the light of the Anthropocene debate, and the very important place of the coastal zone in it. However, the despoliation and decline narrative also problematic from an environmental viewpoint: even the engineered coasts of the Anthropocene remains hardly stable, as they are continuously laboured by the interaction of winds, currents, sediments, nutrients, non-human species, human infrastructure, and activities. As reminded by Stephen Mosley in a survey on coastal cities, and convincingly argued by Debjani Battacharyya in her study on Calcutta, coastal settlements are relentlessly under pressure due to this dynamism and must constantly adjust to it.¹¹ Human-induced climate change and sea level rise, moreover, are rapidly reshaping the geographical configuration of the world’s shores, menacing of partial or complete submersion of many densely inhabited areas.¹²

Proposing the framework of ‘terraqueous histories’, Alison Bashford has argued that a history of seacoasts sensitive to instability might ‘help us formulate global histories in the Anthropocene’.¹³ The place of the Anthropocene in historical narratives, however, is contested. The notion of anthropogenic transformation of the Earth system can marshal the integration of the Anthropocene into history frameworks, as done by McNeill and Engelke with their history of the Great Acceleration after 1945.¹⁴ Dipesh Chakrabarty, however, has pointed out the difficulty in conceptualizing the collapse of human and geological history heralded by the Anthropocene, as

¹⁰ Petra Van Dam ‘An Amphibious Culture. Coping with floods in the Netherlands,’ in: Peter Coates, David Moon, Paul Warde (eds.) *Local Places, Global Processes* (Oxford: Oxbow Books 2016), 78-93, esp. p.86. For a US example see also the otherwise excellent Christopher Pastore, *Between Land and Sea: The Atlantic Coast and the Transformation of New England*, (Cambridge, Mass.: Harvard University Press, 2014).

¹¹ Mosley, ‘Coastal Cities and Environmental Change’: 517–33 and Debjani Bhattacharyya, *Empire and Ecology in the Bengal Delta The Making of Calcutta* (Cambridge University Press, 2018).

¹² Intergovernmental Panel on Climate Change, *Climate Change 2014: Synthesis Report* (Geneva, Switzerland: IPCC, 2014).

¹³ Alison Bashford, ‘Terraqueous Histories,’ *The Historical Journal*, 60, 2 (2017): 271.

¹⁴ John R. McNeill and Peter Engelke, *The Great Acceleration: An Environmental History of the Anthropocene since 1945* (Cambridge, Mass.: Harvard University Press, 2016).

bringing together incommensurable processes and timescales.¹⁵ Furthermore, some scholars have critiqued the notion of an all-encompassing ‘Anthropos’ implied by Anthropocene framework, and underscored the importance of bringing the fore multiple (and sometimes conflicting) human and non-human agencies.¹⁶ We argue that a focus on the historical interactions between actors of coastal settlement and the persisting dynamism of the shores can help moving beyond reductionism to an undifferentiated human agency, while avoiding the anthropocentrism implied by the narrative of human domination of nature.

We focus here on the north-western Mediterranean littoral (see **figure 1**). This is the historical crib of industrialization and urban growth in Mediterranean Europe, as well as the first hub of modern coastal tourism in the Mediterranean basin. This study investigates this region through the analysis of secondary sources from an annotated database of more than 1,000 titles in five languages (Italian, French, Catalan, Spanish, and English). We propose a tripartite analytical framework. Firstly, we analyse the different understandings of the coast emerging from the mid-nineteenth century and their actors. Secondly, we discuss the way these views were accompanied by the integration of this littoral into increasingly large and fast networks of circulation and exchange. Thirdly, we analyse the physical transformations of the coastal environment and their unintended consequences. In the conclusive section, we summarize the insights gained through our framework and how it helps us to make sense of coastal change in the Anthropocene. Before moving into each of the three parts of our framework, let us first turn briefly to the historical and geographical features of the transnational shores on which we will focus our investigation.

¹⁵ Dipesh Chakrabarty, ‘The Climate of History: Four Theses,’ *Critical Inquiry* 35 (2009): 197-222 and Id. ‘Climate and Capital: On Conjoined Histories.’ *Critical Inquiry* 41 (2014): 1-23.

¹⁶ F. Biermann, X.i Bai, N.Bondred, W. Broadgate, et al. ‘Down to Earth: Contextualizing the Anthropocene’, *Global Environmental Change* 39 (2016): 341-350. Christophe Bonneuil and Jean-Baptiste Fressoz, *L’Événement Anthropocène : La Terre, l’histoire et nous* (Paris: Seuil, 2013). Andreas Malm and Alf Hornborg, ‘The Geology of Mankind? A Critique of the Anthropocene narrative’, *The Anthropocene Review* 1, 1 (2014): 62-69. On non-human agency see also Dolly Jørgensen, ‘Not by human hands: Five tenets for environmental history in the Anthropocene’, *Environment and History*, 20 (2014): 479-489.

The North-Western Mediterranean Shore in the Modern Era

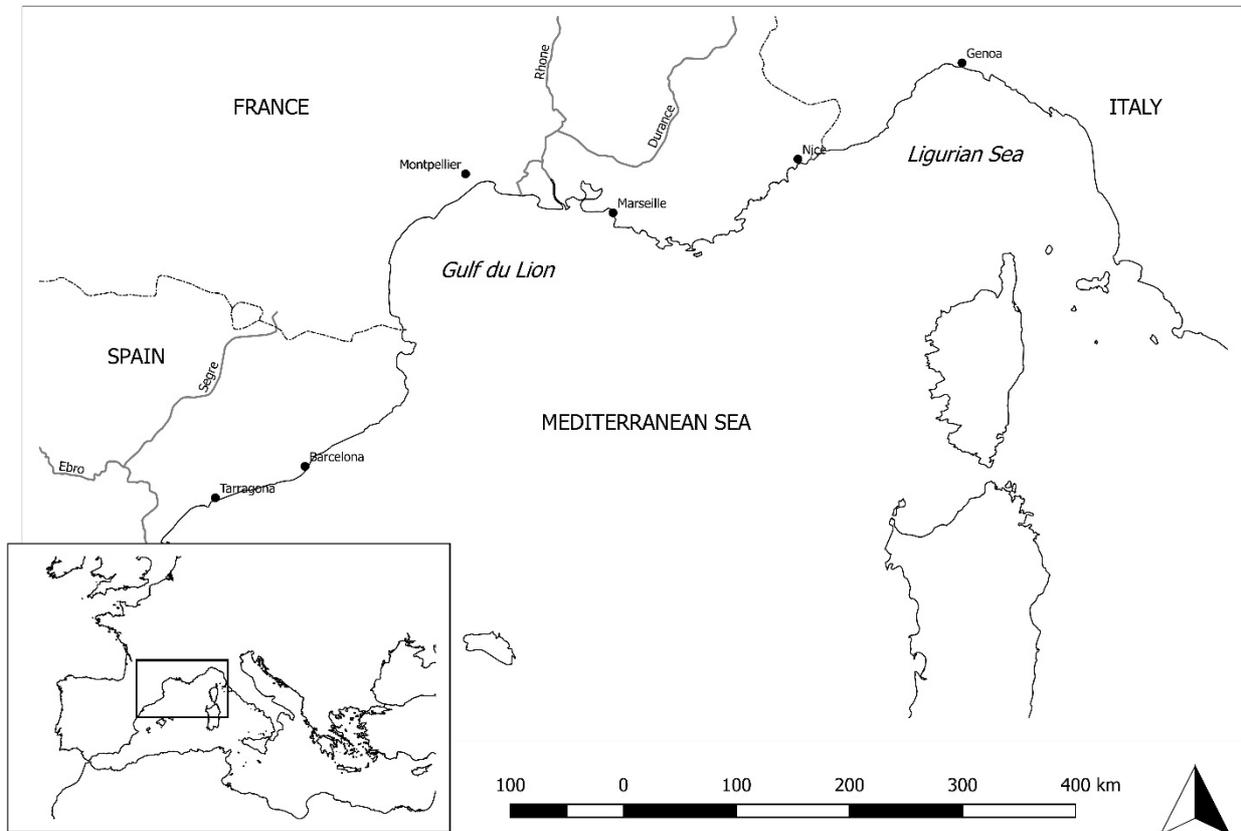


Figure 1: The region under investigation. Cartography by the authors.

The littoral ranging from Catalonia, Spain, to Liguria, Italy, encompasses at least three major coastal environment types. From the eastern limits of Liguria to the eastern periphery of Marseille, the coast is a narrow edge at the meeting point of the western Alps and the north-eastern Apennines. Short, sediment-heavy torrential rivers punctuate the littoral, ending in small coastal plains and bays where most cities and towns are located, including the large industrial city of Genoa. These bays are separated by steep cliffs, which abruptly descend into the sea and, after very narrow continental shelves, continue into deep underwater depressions and trenches. The Marseille metropolitan area marks the end of the cliffs and the beginning of the Rhone River delta with its low-lying humid littoral, the second coastal environment type of this area. Wetlands, sandbars, large beaches, and brackish lagoons continue eastward until the beginning of the coastal Pyrenees at the French-

Spanish border. This stretch of littoral faces the Gulf du Lyon, a wide gulf which encompasses a large and shallow continental shelf. In this area, major settlements, including Montpellier, have been historically located relatively far from the humid coast, on firmer grounds and away from the nuisances of wet environments. Down to the southwest, the Pyrenees create a marked discontinuity in the littoral along the French-Spanish borderlands and are responsible for the steep cliffs and narrow bays that characterize the landscape of the northern Costa Brava. The coastal landscape changes again when the Pyrenees are replaced by the hilly reliefs of the Catalan coastal range which descend more gently into the sea and by the humid areas around the Llobregat and Ebro river deltas. The Catalan deltaic coast hosts the metropolitan area of Barcelona and, to the south, Tarragona and its industrial concentration.

In this area we find numerous examples of processes that have contributed to coastal environmental transformation over the last two centuries, as well as typical forms of contemporary coastal settlements and use. This stretch of coast corresponds to the most built-up and polluted stretch of the entire Mediterranean Sea.¹⁷ Industrial port cities of long tradition and with a sizable population, such as Marseille, Genoa, and Barcelona, significantly contribute to this primate. However, this is also due to highly polluting industrial complexes, such as petrochemical plants in Vado Ligure (Italy), Fos (France), and Tarragona (Spain). Moreover, some of the most renowned and densely inhabited tourist regions of the world are concentrated in this shore: the stereotypical Italian and French Rivas, the recently developed Languedoc-Roussillon with its modernist new towns, and the heavily urbanized Spanish Costa Brava and Costa Daurada. Whereas large-scale fishing fleets such as those of the Atlantic or Pacific Oceans are absent in the Mediterranean, the north-western coast boasts industrialized fisheries along with traditional and stationary small-scale fisheries.¹⁸ The entire coast, finally, is punctuated with hundreds of fishing and leisure harbours,

¹⁷ J. Donald Hughes, *The Mediterranean: An Environmental History* (Santa Barbara, Calif.: ABC-CLIO, 2005), p.147.

¹⁸ Daniel Faget et Gilbert Buti, 'Pêche', in *Dictionnaire de la Méditerranée*, edited by Dionigi Albera, Maryline Crivello et Mohamed Tozy (Arles, Actes Sud), pp.1175-1178.

which complement the large-scale container hubs of Barcelona, Genoa, and Marseille.

The roots of this coast's development can be traced back to the early nineteenth century. Historiography on industrialization in Italy, France, and Spain converges in identifying the mid nineteenth century as the starting point for coastal industrial growth: in the 1830s in Marseille, especially centred on chemical production (soda, soap, and sugar); in the 1830s Barcelona (textile); and a decade later in Genoa (steel).¹⁹ The development of health resorts and of elite tourism also dates back to the same period in France and Italy, in places such as Sanremo and Nice. Selected areas of the Catalan coast surrounding Barcelona followed in the second half of the nineteenth century. Coastal urbanization, often tightly linked to both industry and tourism, also has a comparable periodization. The expansion of built-up areas in Marseille, Genoa, and Barcelona towards the coastal hinterlands followed closely the phases of urban-industrial development of these cities, and the demographic growth which accompanied it. Likewise, the expansion of smaller settlements along this coast followed the subsequent waves of tourism development. While political events such as the Spanish Civil War created significant spatial-temporal discontinuities in tourism and industry, urban-industrial growth accelerated after 1950 across the entire coast, following the pattern of the post-Second World War 'Great Acceleration'.²⁰

¹⁹ Xavier Daumalin et Olivier Raveux, 'Marseille (1831-1865). Une révolution industrielle entre Europe du Nord et Méditerranée', *Annales. Histoire, Sciences Sociales*, 56, 1 (2001): 153-176 ; Gérard Chastagnaret, 'L'industrie en Méditerranée : une histoire en construction', *Méditerranée*, 87, 3 (1997): 5-12; Olivier Raveux, 'Marseille et Barcelone (1831-1848) : Contrainte énergétique et industrialisation', in Robert Belot, Michel Cotte, Pierre Lamard, eds., *La technologie au risque de l'histoire* (Paris : Berg International, 2000), pp. 43-50; Mario Abrate, *Lo sviluppo della siderurgia e della meccanica nel Regno di Sardegna dal 1831 al 1861* (Louvain: Bibliothèque de l'Université, 1960), pp. 115-120. Luigi Bulferetti and Claudio Costantini. *Industria e commerci in Liguria nell'età del Risorgimento (1700-1861)* (Milano: Banca commerciale italiana, 1965), pp.511-514. Jordi Maluquer de Motes i Bernet "La gran transformació. Industrialització i modernització a la Catalunya del segle XIX. Introducció" in Jordi Nadal, ed., *Història Econòmica de La Catalunya Contemporània*. Volume I. *La Formació d'una Societat Industrial* (Barcelona: Enciclopèdia Catalana 1989), pp 123-184.

²⁰ J.E. Hermitte, 'L'aménagement routier des rivieras française et italienne', *Méditerranée*, 2, 3, 1961, pp. 65-92. Francesc González Reverté, 'La segunda residencia en Cataluña. Caracterización, impactos y retos', in Tomás Mazón, Alejandro Aledo, eds., *Turismo residencial y cambio social: nuevas perspectivas teóricas y empíricas*, (Alicante: Universidad de Alicante, 2005), pp. 73-104.

By focusing on this region, we do not seek to make claims on the Mediterranean as a whole. Much has been written on Mediterranean unity after Fernand Braudel's masterpiece.²¹ Subsequent generations of scholars have sought to investigate the cultural underpinnings of this supposed unity. This has sometimes led to radical critiques. For Michael Herzfeld, for example, claims of a Mediterranean unity are rooted in outdated physical geography, untenable cultural generalizations, or, in the worst cases, European imperialist projections.²² Horden and Purcell's attempt at redefining historically Mediterranean unity on a different basis than Braudel's has stopped at the threshold of urban-industrial modernity. Their model based on the notion of 'networks of connectivity' among 'microecologies', does not hold for the contemporary era due to the involvement of Mediterranean 'coastal nations in the credit economies, political alliances, technologies and communication networks of the North and West or the Far East'.²³ David Abulafia's grand fresco of Mediterranean history from 22,000 BC to our era ends with the explosion of the region's unity first after the construction of the Suez Canal and later with twentieth-century mass tourism.²⁴ Edmund Burke's recent attempt to find a way forward to a history of the modern Mediterranean is based on replacing the region within world-scale transformations.²⁵ With the notable exception of historians McNeill and Hughes, discussion of the environmental unity of the Mediterranean has also been largely evacuated (if not contested, as in Horden and Purcell) from historical treatments of the region.²⁶

Whereas not necessarily representative of a Mediterranean historical or geographical unity,

²¹ Fernand Braudel, *La Méditerranée et le monde méditerranéen à l'âge de Philippe II* (Paris : Armand Colin, 1949).

²² Michael Herzfeld, 'Practical Mediterraneanism: Excuses for Everything, from Epistemology to Eating,' in W. V Harris, ed., *Rethinking the Mediterranean*, (Oxford: Oxford University Press 2005), pp. 45–63.

²³ Peregrine Horden and Nicholas Purcell, *The Corrupting Sea: A Study of Mediterranean History*, (Oxford: Blackwell, 2000): 3.

²⁴ David Abulafia, *The Great Sea: A Human History of the Mediterranean* (Oxford: Oxford University Press, 2011), esp. 541 and 638.

²⁵ Edmund Burke III, 'Toward a Comparative History of the Modern Mediterranean, 1750-1919', *Journal of World History*, 23, 4 (2013): 907-939.

²⁶ John McNeill, *The Mountains of the Mediterranean World: An Environmental History*, (Cambridge, UK: Cambridge University Press 1992). J. Donald Hughes, *The Mediterranean*.

the region is a globally relevant case of integration and Anthropocene transformations. Moreover, it remains sufficiently limited to allow for extensive investigations on secondary sources. In this geographically diverse coastal area, encompassing cliffs and wetlands as well as three European nation-states, similar processes seem to have been going on from the nineteenth century onwards, which have led to comparable outcomes. Which kinds of visions drove people and activities towards the coast? How did these processes relate to expanding scales of connectivity and global integration that historically qualify the Anthropocene? How did the peculiar features of this diverse coast interact with these processes? We will now answer these questions in turn, starting from the first one.

New eyes on the coast

Historian Alain Corbin argued that the Western perception of the seaside underwent a fundamental shift from negative to positive at the threshold of modernity.²⁷ This shift, in turn, motivated the growth of coastal settlements from the mid-nineteenth century: new actors, from close and far, began to look at the shore with new eyes and to promote a new kind of coastal activities. Scholars such as Gillis, Pearson, and Le Bouedec interpreted this change as a colonization of the shore by non-coastal actors and the main cause of the sunset of distinctive littoral societies. New cultural values and the ensuing growth in coastal human presence are also associated with the physical transformations of the coastal environment that scholars mention about the Anthropocene. This process, however, was not homogeneous: new historical actors did not see and value the coast in the same way and for the same reasons. Different forms of valuation of coastal environments, moreover, were often in conflict among them.

The emergence of the seaside as a place of health and pleasure is key to this history. The attribution of curative powers to seawater, alongside changing cultural attitudes towards the coast,

²⁷ Alain Corbin, *Le territoire du vide. L'Occident ou le désir du rivage (1750-1840)* (Paris : Aubier, 1988).

was a significant driver for coastal tourism development in much of the Western world (and beyond) through the establishment of bathing stations and sanitary institutes.²⁸ In the Mediterranean, this combined with the climatic features of the region: dry, mild winters and abundance of sunny days. Booklets and scientific publications across Europe underscored the qualities of the Mediterranean littoral climate, explicitly recommending curative stays along the seaside to northern Europeans affected by all sorts of pathologies. To meet this international demand, already in the 1830s and 1840s, several health resorts and curative bathing stations emerged in Languedoc,²⁹ Barcelona seaside and Maresme country,³⁰ and western Ligurian Riviera (Sanremo and Alassio).³¹ The emergence of leisure tourism in the same decades was also linked to the peculiar features of the coastal environment. In this case, the coast was valued not only for the curative powers of water or air, but also for the pleasures of seaside climate and landscapes, especially over winter like in the early of elite resorts of the Cote d'Azur.³² The massive tourist development of the second half of the twentieth century would encroach on these first poles and

²⁸ For a global overview see also John K. Walton, 'Seaside Tourism and Environmental History', in Genevieve Massard Guilbaud and Stephen Mosley, *Common Ground: Integrating the Social and Environmental in History*, (Newcastle: Cambridge Scholars Publishing 2011), pp.66-85.

²⁹ François Doumenge, 'Un type méditerranéen de colonisation côtière. Palavas', *Bulletin de la société languedocienne de géographie*, 22, 1, (1951): 3-124 ; Alain Saussol, 'Un siècle de mutations sur le littoral languedocien : le cas de Gruissan (1860-1990).' In Jean Rieucou and Gérard Cholvy, eds., *Le Languedoc, le Roussillon et la mer : des origines à la fin du XXe siècle. Tome II. 1960-1990* (Paris: L'Harmattan, 1992), pp. 59–71.

³⁰ Mercedes Tatjer, 'Els establimentes de banys a Barcelona al segle XIX entre la higiene i l'oci de la societat industrial.' In *I Jornades d'Arqueologia Industrial*, 1 (1991): 270- 276. Mercedes Tatjer, 'La innovación médica en la ciudad del siglo XIX los establecimientos hidroterápicos de Barcelona (1845-1901).' In Capel, Lopez Pinero y Pardo, eds., 1992, vol. I, p.257-264. Mercedes Tatjer, 'En los orígenes del turismo litoral: los banos del mar y los balnearios marítimos en Cataluña. *Scripta Nova*. Vol XIII, núm 296 (5) 2009, URL: <<http://www.ub.es/geocrit/sn/sn-296-5.htm>>

³¹ Andrea Zanini, 'Da health resorts a salons d'Europe. Sociabilità culturale e turismo d'élite in Liguria nel Secondo Ottocento', *Memoria e Ricerca* 46 (2014): 95–110. Marco Doria, 'Vacanze in Liguria: dal Grand Tour alle seconde case.' In Giovanni Assereto and Marco Doria, eds., *Storia Della Liguria* (Roma: Laterza, 2007), pp. 363–378. Alessandro Bartoli, *Le colonie britanniche in Riviera tra Ottocento e Novecento* (Savona: Fondazione A. De Mari della Cassa di Risparmio di Savona, 2008), pp. 19-25. Elisa Tizzoni, *Il Turismo e la costruzione dell'Europa nel periodo tra il 1918 e il 1960* (Unpublished PhD dissertation, Università di Pisa, 2010), esp. p. 12 and 31.

³² Marc Boyer, *L'invention de la Côte d'Azur : L'hiver dans le Midi* (La Tour-d'Aiguës : L'Aube, 2004). Leisure and health tourism coexisted in the Cote d'Azur way into the twentieth century. See Tania Woloshyn, 'Le Pays Du Soleil: The Art of Heliotherapy on the Côte d'Azur,' *Social History of Medicine* 26, 1 (2013): 74–93.

expand into new ones.³³ This last phase of tourism development, however, would not substantially change the environmental reasons why a growing number of people would research a seaside experience along the shores of the Mediterranean: climate and landscape.

Other actors, however, were also looking with growing interest to the seaside, but for quite different reasons. In the early nineteenth century, the north-western Mediterranean was also attracting investors interested in building factories. Coming from the economic capitals of Spain, France, and Italy, but also from the world-leading London financial markets, these investors were more interested in cheaper and faster access to raw materials and commodities than in the interior, as well as easier access to global outlet for finished products. These two factors, variedly combined among them, were arguably long-term advantages of port cities, but they became increasingly significant with the intensification and expansion of global cycles of commodities production in the nineteenth century, and especially so after the opening of the Suez Canal.³⁴ The establishment of textile factories in Catalonia and steel plants in Liguria in the early nineteenth century was directly linked to these (real or perceived) situational advantages.³⁵ Coastal locations were also favoured as the sea provided an easy (or less contested) outlet for industrial by-products.³⁶ The diluting power of the sea and dispersion ensured by marine current seemed a perfect solution to the most toxic residues of industrial manufacturing, like those of chemical plants in mid-nineteenth-century Marseille.³⁷ Coastal location was certainly not enough to warrant industrialization. The port city of

³³ Andrea Zanini, *Un secolo di turismo in Liguria: dinamiche, percorsi, attori*. (Milano: Franco Angeli, 2012), pp. 17-40. Doria, 'Vacanze in Liguria,' pp. 363-378. Ellen Furlough, 'Making Mass Vacations: Tourism and Consumer Culture in France, 1930s to 1970s.' *Comparative Studies in Society and History* 40, 2 (1998) : 247-86. Vincent Andreu-Boussut, *La nature et le balnéaire: le littoral de l'Aude* (Paris : L'Harmattan, 2008); Jean Sagnes, 'L'aménagement touristique de la côte du Golfe du Lion.' In Jean Sagnes, ed., *Deux siècles de tourisme en France XIXe-XXe siècle*, (Béziers and Perpignan: Presses universitaires de Perpignan, 2001), pp. 27-53.

³⁴ See the example of Trieste in Abulafia, *The Great Sea*, pp. 560-561.

³⁵ Nadal, *La Formació d'una Societat Industrial*, pp. 32-33; Abrate, *Lo sviluppo della siderurgia*, p.112.

³⁶ Mosley, 'Coastal Cities and Environmental Change': 526.

³⁷ Xavier Daumalin et Olivier Raveux, 'Les calanques, espace de relégation des industries les plus polluantes', in Xavier Daumalin et Isabelle Schwob, eds., *Les Calanques industrielles de Marseille*

Sète witnessed several unsuccessful attempts to establish steel production from the 1860s, which sought to benefit from commercial exchanges in the harbour, namely from minerals imported from Italy, Spain, or colonial Algeria.³⁸ Whenever it succeeded, however, coastal industrialization was sustained by a precise view of the littoral as a strategic interface for commodities flows and a sink for industrial by-products.

The emergence of these new forms of valuation did not obliterate older ways of seeing and valuing the coastal zone. The rich coastal ecotones made of fishing were a crucial resource of littoral societies for centuries and played a key role in the European expansion in the North Atlantic.³⁹ Coastal folk par excellence, fishermen valued the coastal interface first and foremost for the presence of abundant marine life. In the north-western Mediterranean, this view was at the roots of many documented conflicts between groups of fishermen. The real or perceived modification of the biological abundance of the coastal interface led to conflicts between stationary coastal fisheries such as tuna's *madragues* against mobile fleets, accused of depleting the coastal environment. In the same vein, over the nineteenth century, French fishermen opposed Catalan and Italian fishermen, who were accused of invading foreign fishing territories and markets.⁴⁰ As the abundance turned into scarcity, moreover, fisheries would seek to recreate abundance artificially via forms of local

et leurs pollutions: une histoire au présent/Pollution of Marseille's industrial Calanques : the impact of the past on the present (Aix-en-Provence : REF.2C, 2016), pp. 11-91.

³⁸ Louis Dermigny, *Naissance et croissance d'un port. Sète de 1666 à 1880* (Sète and Montpellier : Institut d'Etudes économiques, maritimes et commerciales de la ville de Sète, 1955), p. 107-109; Lionel Dumond, 'Les haut fourneaux de l'arrière-port sétois à la fin du XIXe siècle: l'échec d'un 'rêve industrialiste'', Lionel Dumond, Stéphane Durand, Jérôme Thomas, eds., *Ports dans l'Europe méditerranéenne : trafics et circulations, images et représentations, XVIe-XXIe siècles* (Montpellier : Presses universitaires de la Méditerranée, 2007), 135-151.

³⁹ See for example Bolster. *The Mortal Sea* or Poul Holm, 'Historical Fishing Communities.' In Kathleen Schwerdtner Máñez and Bo Poulsen, eds., *Perspectives on Oceans Past. A Handbook of Marine Environmental History* (Dordrecht: Springer, 2016), pp. 31-46.

⁴⁰ Gilbert Buti, 'Techniques de pêche et protection des ressources halieutiques en France méditerranéenne (XVIIe-XIXe siècle), in Valdo D'Arienzo and Biagio Di Salvia, eds., *Pesci, barche, pescatori nell'area mediterranea dal medioevo all'età contemporanea* (Milano: Franco Angeli 2010), pp. 105-122. Gilbert Buti, 'Madragues et pêcheurs provençaux dans les mailles des pouvoirs (XVIIe-XIXe siècles)', in Gérard Le Bouëdec et François Chappé, eds., *Pouvoirs et littoraux du XVe au XXe siècle* (Rennes : Presses universitaire de Rennes, 2000), pp. 57-73 ; Daniel Faget, *Marseille et la mer: hommes et environnement marin (XVIIIe-XXe siècle)* (Rennes : Presses universitaires de Rennes, 2011), pp.42-49.

‘self-regulation’ (such as Marseille’s *prud’homie*) or would abandon the littoral altogether towards deep-sea fishing.⁴¹ Scholarship on California, the Gulf Coast, and Atlantic France has shown the persistence of traditional coastal activities such as fisheries even in the context of manufacturing and tourism development, thus empirically undermining linear narratives about the demise of littoral societies.⁴² While comparable historical studies in the north-western Mediterranean are lacking, fishing remained important in this region, and valuation of the coastal biological abundance was shared by other littoral actors. The valuation of coastal biological abundance was the very *raison d’être* of scientific organizations such as the Oceanographic Institute in Monaco, founded in 1910 and key to the establishment of the International Commission for the Scientific Exploration of the Mediterranean.⁴³ Tourism-linked leisure fishing, moreover, drove major marine ecological restoration efforts in the late twentieth century.⁴⁴

Different views about the use and development of same coastal space easily led to conflicts. Nature enthusiasts, for example, would value the littoral differently than adepts of luxury hotels, and this led to conflicts about the destination of specific portions of the littoral. As early as the late nineteenth century, hiking clubs were instrumental to the establishment of protected areas in Marseille’s polluted *calanques* and nearshore islands such as Port-Cros and Porquerolles.⁴⁵ The

⁴¹ On *prud’homie* in Marseille see Daniel Faget, *Marseille et la mer*, pp. 51-107.

⁴² Connie Chiang, *Shaping the Shoreline: Fisheries and Tourism on the Monterey Coast*, (University of Washington Press: Seattle 2008); Taylor Priest, ‘Shrimp and Petroleum: The Social Ecology of Louisiana’s Offshore Industries’, *Environmental History* 21 (2016): 488-515; Alice Garner, *A Shifting Shore*; Johan Vincent, *L’intrusion balnéaire. Les populations littorales bretonnes et vendéennes face au tourisme (1800-1945)* (Rennes : Presses universitaires de Rennes, 2007).

⁴³ Edouard Bonnefous, Philippe Roy, *Institut océanographique : Fondation Albert Ier Prince de Monaco* (Institut océanographique, Monaco 1951).

⁴⁴ Antonella Primi, ‘Barriere artificiali: esperienze in provincia di Savona’, In Alberto Celotto, ed., *Gestione delle Risorse Biologiche e Sviluppo Sostenibile: Le Attività di Pesca nella Riviera Ligure Di Ponente*, (Genoa: Regione Liguria), pp. 98-99.

⁴⁵ Geneviève Masséna-Gourc, ‘La protection à l’épreuve de la diversité des usages. Le massif des Calanques’, *Études rurales*, 133, 1 (1994): 149-162; Jean-Marie Guillon, ‘Les îles d’Hyères aux XIXe et XXe siècles’, Jean-Pierre Brun, eds., *Les îles d’Hyères: fragments d’histoire*, (Arles: Actes sud, 1997), pp. 105-160; Xavier Daumalin, ‘Les beautés ‘naturelles’ méditerranéennes à l’épreuve des multinationales industrielles : l’affaire de la calanque de Port-Miou’, Marie-Françoise Attard-Maraninchi, Xavier Daumalin, Stéphane Murlane et Isabelle Renaudet, eds., *Engagements:*

establishment in 1975 of the French Conservatoire du Littoral, a special state-funded agency devoted to buy coastal land and preserve it from development, was also heralded as a way to promote a different and more respectful form of littoral tourism.⁴⁶ The valuation of coastal sites for their ecological features and the beauty of their landscape could also lead to fierce opposition to tourism development initiatives by local groups. In the Costa Brava, most projects of leisure harbours implied a confrontation between local environmental groups (often against) and the municipalities (often in favour) with the Catalan government arbitrating and generally pushing for the harbour construction.⁴⁷ In the mid-1970s, however, a mega project aiming to create a marina (called Port Llevant) was stopped after a vigorous campaign by environmental organizations. In 1983, this spot would be part of the very core of the newly created Empordà wetlands natural park.⁴⁸ The establishment of a national protected area in the Rhone delta in 1975 was also conceived to preserve coastal scenery and valuable ecosystems from the pressures of a destructive coastal tourism.⁴⁹ Conflicts with manufacture and tourism also dot the history of fisheries in the north-western Mediterranean, often linked to the consequences of pollution such as in the case of fishermen's opposition to the installation of a chemical plant by Rio Tinto along Marseille's

culture politique, guerres, mémoires, mondes du travail, XVIIIe-XXIe siècle, (Aix-en-Provence : Presses universitaires de Provence, 2016), pp. 361-374.

⁴⁶ Aurélie Joveniaux, "Le Conservatoire du littoral, quarante ans après : quel bilan et quelles perspectives ?," *Hérodote*, 165 (2017): 91–112.

⁴⁷ Gerard Gelonch, 'Una realitat del Maresme: ports esportius i regeneració de platges', *Espais: revista del departament de política territorial i obres públiques*, 18 (1989): 31-35. Joan Vicente, « Sant Feliu de Guíxols. Turisme, port i model urbà » In Oriol Nel.lo (ed), *Aquí no! Els conflictes territorials a Catalunya* (Barcelona: Edicions Empúries 2003), pp. 206-226.

⁴⁸ Jordi Sargatal, 'Els aiguamolls de l'Empordà amenaçats.' *Presència*, 07-17-1976, 8-9.

Anonymous, 'Las tierras pantanosa del Alto Ampurdán, una batalla ganada,' *Revista de Girona*, 31, 110 (1985):12-38.

⁴⁹ Raphaël Mathevet et Alexandre Couespel, ' Histoire environnementale et political ecology des marais du Scamandre en Camargue occidentale ', Tor Benjaminsen et Denis Gautier , eds., *Environnement, discours et pouvoir*, (Versailles : Editions Quæ, 2012), pp. 65-86 ; Alexandre Serres, 'La mise en réserve des étangs de Camargue. Un laboratoire de la relation de l'homme contemporain à l'environnement naturel', Charles-François Mathis et Jean-François Mouhot , eds., *Une protection de l'environnement à la française ? (XIXe-XXe siècles)* (Seysssel : Champ Vallon, 2013), pp. 159-169.

shore.⁵⁰ Modern coastal development, in summary, hides a plurality of views and actors that could led to divergent results: from heavy pollution to environmental protection.

Networking the shores

Changes in the valuations of the coast and conflicts cannot be dissociated to the growing integration of coastal areas into larger networks of exchange and circulation of people, ideas, and commodities. Horden and Purcell refer to scaled-up interconnectedness to justify the inapplicability of their model to the post-nineteenth-century Mediterranean, whereas David Abulafia makes this the rationale for the transition to a fifth epoch in Mediterranean history. As reminded by Marcus Vink, this argument is also recurring in debates on the frontiers and pertinence of oceanic histories beyond the nineteenth century.⁵¹ In the north-western Mediterranean, several elements empirically support this model. In this section we will focus on energy and transportation: these aspects are particularly significant both as vectors of global integrations and as drivers of Anthropocene's coastal changes.

To Edmund Burke III, one of the most striking features of the Mediterranean compared with North-Western Europe is the absence of large coal fields.⁵² In the north-western Mediterranean, pre-nineteenth-century industrial metabolism largely resorted to local resources: in the case of Ligurian steel production, for example, charcoal and waterpower from the Apennines. The introduction of coal in industrial processing in the nineteenth century, however, depended on new geographies of energy flows. In Liguria and Catalonia, coal directly arrived from the mines of the United Kingdom (and, in the case of the Ligurian steel industry, was combined with iron coming from the Tuscan archipelago).⁵³ In Catalonia, at first, coal import played against coastal location. The economic

⁵⁰ Daniel Faget, 'Stratégies de communication et émergence de nouvelles expertises : les pollutions industrielles de l'usine marseillaise Río Tinto à l'Estaque (1882-1914),' in Laura Centemeri and Xavier Daumalin, eds., *Pollutions industrielles et espaces méditerranéens: XVIIIe-XXIe siècle*, (Paris : Karthala, 2015), pp. 149–63.

⁵¹ Vink, 'Indian Ocean Studies': 58-59.

⁵² Burke, 'Toward a Comparative History': 919-920.

⁵³ Mario Abrate, *Lo sviluppo della siderurgia*, p. 112. Mario Fumagalli, 'I mutamenti nei fattori di localizzazione della siderurgia dalla metà del Secolo XIX ad oggi: il caso particolare dell'Italia', In

burden of imported coal pushed cotton producers to seek for more competitive energy sources in the inland river valleys of Catalonia. This movement, however, was paralleled by the interconnection of these valleys via railroad with the coast and the port of Barcelona, where cotton producers could access raw cotton from the Americas.⁵⁴ In Marseille, most of the coal increasingly used by local industries came in fact largely from inland mines ranging from the neighbouring Gardanne to the Loire valley and was transported via river or railroad to urban factories.⁵⁵

The growing use of oil and gas in industrial processing changed again the geography of industrial metabolism. Oil and gas fields in North Africa and the Middle East were connected to large petrochemical plants in the north-western littoral via boat first and later also via underwater pipelines. The industrialization of the Étang de Berre, west of Marseille, is a prominent example. Mostly devoted to traditional fisheries at the turn of the twentieth century, the brackish lagoon was chosen by British Petroleum–affiliated Société Générale des Houilles de Petrole to build a new refinery, soon complemented by a similar plant in the vicinity. After the Second World War, the eastern section of the lagoon was transformed in a major Mediterranean hub for oil tanks, and a new refinery was built by Esso in Fos, soon followed by a major steel production plant. This example is not isolated: the new flows of oil from the Middle East and North Africa are linked to the creation

La siderurgia italiana dall'Unità ad oggi, (Piombino: Cooperativa editrice universitaria Firenze, 1978), p. 339. Marcello Penner, *Una fabbrica all'ombra del Priamàr: l'industria del ferro e dell'acciaio a Savona: 1861-1993* (Savona: Società Savonese di Storia Patria, 2010), p. 17. Mario Abrate, 'L'impiego del carbon fossile nella siderurgia italiana, 1861-1913', *Archivio economico dell'unificazione italiana. Serie I* (1965), p. 17.

⁵⁴ Esteve Deu i Baigual; Muriel Casals i Couturier, "El tèxtil" in Jordi Nadal (ed), *Història econòmica de la Catalunya Contemporània. Volum VI: S.XIX, Indústria, finances i turisme*. (Barcelona: Enciclopèdia Catalana 1990), pp 13-80. James K.J Thomson, 'Explaining the 'take off' of the Catalan cotton industry.' *The Economic History Review* 58, 4 (2005): 701-735. James K.J Thomson, 'El comercio español de algodón americano: sinergias atlánticas en la época de la Ilustración'. *Revista de historia económica* 26, 2 (2008): 277-314. James K.J Thomson, 'Consideracions sobre la indústria cotonera i la seva evolució a Barcelona, 1730-1840.' *Barcelona quaderns d'història*, 37 (2011): 317-330. Pau Vila and Jordi Cassas, *Barcelona i la seva rodalia al llarg dels temps* (Barcelona: Aedos 1974), pp. 275-277.

⁵⁵ Daumalin and Raveux, 'Marseille (1831-1865)': 153-176, Raveux, 'Marseille et Barcelone (1831-1848)': 43-50; Olivier Raveux, 'La prépondérance des débouchés industriels locaux', in Xavier Daumalin, Jean Domenichino, Philippe Mioche et Olivier Raveux, eds., *Gueules noires en Provence* (Marseille: J. Laffitte, 2005), pp. 59-76.

of petrochemical plants in Tarragona, Spain, and Vado Ligure, which were both already hosting several industrial plants and became major petrochemical hubs.⁵⁶

The reconfiguration of energy flows and the growing integration of the littoral into broader networks did not only entail maritime linkages, but also terrestrial ones. The advent of long-distance electricity transmission liberated waterpower users from the geographical limitations attached to mechanical energy.⁵⁷ It was now possible to transport for great distances waterpower converted in electric energy and use it on the location of choosing. This new spatial flexibility allowed Catalan textile factories to move factories back to the coast, to benefit from direct access to global flows of commodities and to the marine sink. In Liguria and Catalonia, the exploitation of hydroelectric power in the mountainous hinterlands supplied the expansion of mechanical, steel, and chemical production along the littoral.⁵⁸ Through these new energy flows, coastal industries (and cities) were physically interconnected with inland river basins, contributing to the large-scale manipulation of river systems via infrastructure such as dams and reservoirs.

Changes in transportation enabled growing flows of people to and from the coast and major changes in coastal settlement geography. Marseille became a main stop of steamboat cruises as early as the 1830s.⁵⁹ Genoa was connected to northern European ports by freight vessels which

⁵⁶ On Tarragona see especially Jordi Rosell i Fluxà, 'El Procés d'industrialització de Tarragona (1958-79): Una Reflexió Crítica,' *Revista Econòmica* 70 (1984): 1–12. On Vado Ligure see Almerino Lunardon, *Vado Ligure: antologia di immagini, 1890-1940* (Savona: Liguria, 1981).

⁵⁷ On geographical limitations see Terry S. Reynolds, *Stronger than a Hundred Men: A History of the Vertical Water Wheel* (Baltimore: Johns Hopkins University Press, 1983), p. 326.

⁵⁸ Albert Carreras, 'El aprovechamiento de la energía hidráulica en Cataluña, 1840-1920. Una aproximación a su estudio.' *Revista de Historia Económica*, 1, 2 (1983): 31-63. David Pavón Gamero, 'L'embassament de Boadella: antecedents, execució i repercussions locals d'una infraestructura hidràulica.' *Annals de l'Institut d'Estudis Altempordanesos*. 34 (2001):179-217. Ramon Garrabou Seguera, Josep-Maria Ramón Munoz, 'Aigua, agricultura i regadiu a la Catalunya contemporània, 1800-2010,' *Estudis d'història agrària*, 23 (2010): 27-57. Nello Cerisola, *Storia delle industrie savonesi* (Genova: Liguria, 1965), pp. 405-417. Gaetano Ferro, *La Liguria*. (Genova: M. Bozzi, 1967), p. 62. Penner, *Una fabbrica all'ombra del Priamàr*, p. 80. Lorenzo Arecco, *Cotonificio ligure: un secolo di storia* (Savona: Liguria, 1994), pp. 27, 37 and 129.

⁵⁹ Xavier Daumalin, 'Le tour de la Méditerranée en vapeur: arrêt sur image', in Xavier Daumalin, Daniel Faget et Olivier Raveux, eds., *La mer en partage: sociétés littorales et économies*

were increasingly used by visitors to reach the French and Ligurian Rivas. ⁶⁰ At the turn of the twentieth century, the Hamburg Amerika Line inaugurated a regular service, by a paddle steamer, to connect Nice to Genoa, with stops in the emerging elite resorts of the Italian and French Rivas. ⁶¹ However, the development of smaller-scale networks also played a major role. Railroad started to connect the less urbanized littorals of Catalonia, Italy, and France with inland and coastal cities from the 1850s onwards. Genoa was linked to Turin via railroad as early as 1854, while Savona in 1874. At the end of the 1870s, littoral railroad lines linked Savona with Ventimiglia and Sestri-Levante with La Spezia in Liguria. ⁶² In the same period, short-distance railroad connected urban centres in Languedoc with their littoral hinterlands: Montpellier was linked with the coastal village of Palavas in 1872 and Béziers with Valras in 1878. ⁶³ These regional connections to and from the coast, in turn, facilitated the growth of seaside tourism. ⁶⁴

Each new phase of tourist development along the coast was accompanied by further shifts in transportation. Already in the 1930s, tourists arrived in the Liguria border zone more frequently by car than by train, stimulating further investments in road infrastructure. ⁶⁵ Private automobilism and the related expansion of paved road networks through and towards the littoral of Catalonia, France, and Italy was important in enabling post-1945 growth. ⁶⁶ Likewise, private aviation and commercial

maritimes, XVIe-XIXe siècle : études offertes à Gilbert Buti (Aix-en-Provence : Presses universitaires de Provence, 2016), p. 241 and 253.

⁶⁰ Zanini, *Un secolo di turismo in Liguria*, p. 27.

⁶¹ Bartoli, *Le colonie britanniche in Riviera*, p. 25.

⁶² Zanini, *Un secolo di turismo in Liguria*, pp. 27-29.

⁶³ André Amouroux, 'Valras, étude d'une station touristique du Languedoc méditerranéen', *Méditerranée*, 1, 1 (1960) : 67-91 ; Claire Sarda, *L'électrification des Pyrénées-Orientales*, (Paris : Paris 4, 1984), pp. 135-139 ; See also Jean Sagnes, 'L'aménagement touristique de la côte du Golfe du Lion', pp.31-33.

⁶⁴ Ellen Furlough and Rosemary Wakeman, 'La Grande Motte: Regional Development, Tourism, and the State,' in Shelley Baranows and Ellen Furlough (eds), *Being Elsewhere: Tourism, Consumer Culture, and Identity in Modern Europe and North America* (Ann Arbor: University of Michigan Press, 1998), pp. 348-372.

⁶⁵ Andrea Zanini, *Un secolo di turismo in Liguria*, p. 54.

⁶⁶ Enric Llarch, *Dimensió econòmica i territorial del Barcelonès* (Barcelona: Caixa d'estalvis de Catalunya, 1987). J.E. Hermitte, 'L'aménagement routier des rivieras française et italienne', *Méditerranée*, 2, 3 (1961): 65-92.

airports significantly contributed to the flow of seasonal tourists to the littoral.⁶⁷ Built in 1922 in the Berre lagoon, already in 1929 the airport of Marseille was linked to Paris, Berlin, Barcelona, and Madrid in Europe and to Alger, Tunis, Beirut and Casablanca in North Africa.⁶⁸ The scale and size of the flows enabled by these new transportation links grew after 1945, bringing vacationers from Europe, Asia, and North America beyond the traditional clusters of the Riviéras. However, it would be wrong to assume long-distance flows as the only factor. In Languedoc-Roussillon coast, population growth in seaside resorts and towns between the 1970s and 1980s was largely linked to seasonal migration from the hinterland, as proved by data on homeownership.⁶⁹

Energy and transportation also affected fisheries. North-western Mediterranean fisheries remained largely within the shallow waters of continental shelves until the nineteenth century, either in ponds and lagoons or in *almadrabas*, *madragues*, and *tonnare* (tuna fishing stations). The introduction of fossil fuel-powered engines and refrigeration changed that, by allowing vessels to tap offshore Mediterranean fishing grounds while keeping the product fresh for its commercialization back on the littoral. This, among other things, contributed to a movement of coastal vessels from the north-western littoral towards the less exploited fishing continental platforms of North Africa, but also to the development of deep-sea fishing.⁷⁰ Furthermore, the establishment of railroad from the mid-nineteenth century entailed direct competition of fresh fish from the Atlantic in the markets of the north-western Mediterranean littoral.⁷¹

The arrival of oceanic catches in the Mediterranean markets did not mean the disappearance of small-scale littoral fishing. The extension of the railroad also meant the possibility to export canned fish from the Mediterranean more easily, thus favouring the growth of canneries in France

⁶⁷ Furlough, 'Making Mass Vacations': 260. On charter flights in Spain see Sasha D. Pack, *Tourism and Dictatorship: Europe's Peaceful Invasion of Franco's Spain* (Basingstoke: Palgrave 2006), pp.96-97.

⁶⁸ Louis François, 'L'aéroport Marseill-Marignane', *Géocarrefour*, 5, 1 (1929): 163-165.

⁶⁹ See Vincent Andreu-Boussut, *La nature et le balnéaire*, p. 74-88.

⁷⁰ Maurizio Gangemi, 'Pesce, spugne e coralli: la grande pesca italiana dal Mediterraneo all'Atlantico (1879-1938)', in D'Arienzo and Silva, *Pesci, barche e pescatori*, pp. 144 and 149.

⁷¹ Faget et Buti, 'Pêche', p.1177.

and Liguria.⁷² In the second half of the twentieth century, however, the irruption of cheap frozen fish on the market represented a powerful challenge. In the case of the Empordà region in Catalonia, for example, frozen fish in the early sixties was between three and four times cheaper than the fresh fish captured from local fishermen, causing major economic disruption to local fisheries.⁷³ Even in the case of fisheries, like in manufacturing and tourism, energy and transportation contributed to the spatial reconfiguration of the coast. Both the scale of coastal networks and their reach profoundly changed, connecting more firmly the north-western littoral with people and places from close and afar. This accompanied and enabled the emergence of new forms of coastal valuation that we tracked in the previous section. It also contributed to the dramatic environmental transformation of coastal zones themselves.

Impossible stabilization

New forms of coastal valuation and use converged on one point: the attempt to regulate coastal ecologies and stabilize coastal morphology. These attempts had a major impact on the coastal environment, substantially contributing to biological impoverishment and to biochemical and geomorphological alterations which Earth scientists discuss as potential markers of the Anthropocene. But these attempts were also affected by the coastal environment, through unwanted interactions with its web of multi-scaled interdependencies.

Studies of coastal metropolises in North America have shown the strict linkages existing between coastal urban growth and reconfiguration of littoral geomorphologies.⁷⁴ In the north-

⁷² François Doumenge, 'La Pêche et le commerce du 'poisson bleu' en Roussillon', *Bulletin de la société languedocienne de géographie*, XXIII (1952), p. 151–69 and Andrea Zanini 'La pesca in Liguria tra Sette e Ottocento : tecniche, uomini, capitali ', in D'Arienzo eand Silva, *Pesci, barche e pescatori*, pp. 225-237.

⁷³ Jesús Olmedilla Martínez, 'La coyuntura económica de la pesca en el Ampurdán.' *Annals de l'institut d'Estudis Empordanesos*, 5 (1964): 59-73.

⁷⁴ See for example Colten, *Unnatural Metropolis: Wrestling New Orleans from Nature* (Baton Rouge, La: Louisiana State University Press, 2005); Michael Rawson, *Eden on the Charles: The Making of Boston* (Harvard University Press, Cambridge, Mass., 2010); Ted Steinberg, *Gotham*

western Mediterranean, depending on the original features of the urban site, this entailed filling lagoons, building dykes, concreting the shore, and reclaiming land from the sea. In Marseille, a new navigable channel cut open the Berre lagoon in 1919, paving the way to the transformation of the shores of the lagoon into an industrial area after the Second World War.⁷⁵ In Genoa, where coastal flat land was lacking, steel producer Ansaldo expanded its production plant by building huge dykes offshore and filling the sea in between.⁷⁶ In the same period, industrial plants and new port infrastructures expanded along Genoa's littoral, ultimately covering 33 km of shoreline protected by concrete dykes.⁷⁷ In Marseille, Genoa, and Barcelona, the second wave of industrialization in the twentieth century led everywhere to the expansion of the old harbours and later the construction of airports, which in the case of Genoa entailed new land reclamation and dyke construction.⁷⁸

Industrial waste disposal in the sea, as we saw, was one of the key motives for investment in coastal manufacturing. In Marseille and its region, already in the nineteenth century chemical plants rejected significant amounts of toxic wastes in the water, especially in the rocky *calanques* east of

Unbound: The Ecological History of Greater New York (New York: Simon & Schuster, 2015). For a review of this literature see Mosley, 'Coastal Cities and Environmental Change.'

⁷⁵ Jean Domenichino, 'De la barre au conteneur, du portefaix au docker. Marseille et l'évolution de la manutention portuaire : un cas exemplaire ?' et Roland Caty, 'Un exemple d'évolution des transports maritimes. Le cas de Marseille (XIXe-XXe siècle)' (Montpellier, Presses universitaires de la Méditerranée, 2007), pp. 269-279; Maurice Wolkowitch, 'Les rapports entre espaces portuaires et espaces urbains : l'exemple de Marseille', *Villes et ports. Développement portuaire, croissance spatiale des villes, environnement littoral* (Paris, CNRS, 1979), pp. 163-171.

⁷⁶ Roberto Tolaini, 'Il peso dell'acciaio. Siderurgia e ambiente a Genova, 1950- 2005', in Salvatore Adorno and Simone Neri Serneri, eds., *Industria, ambiente e territorio: Per una storia ambientale delle aree industriali in Italia* (Bologna: Il Mulino, 2009), pp. 90-92.

⁷⁷ Bruno Gabrielli, 'La dilapidazione del territorio', in Antonio Gibelli and Paride Rugafiori, eds., *La Liguria* (Torino: Einaudi, 1994), p. 785. Daniela Manetti, 'La cantieristica e le costruzioni navali,' in Giorgio Mori, ed., *Storia dell'Ansaldo. 7. Dal Dopoguerra al Miracolo Economico. 1945-1962* (Roma: Laterza, 2000), p.138. Marco Doria, *Ansaldo: l'impresa e lo Stato*, (Milano: Angeli, 1989), pp.196-197.

⁷⁸ Danilo Cabona and Remo Terranova, 'Le aree portuali nell'evoluzione della costa tra Genova e Voltri' In 26. *Congresso geografico italiano* (S.l., 1992), p. 61. On Genoa's airport see Gaetano Ferro, *Le variazioni del litorale della Liguria occidentale, da capo Noli a Voltri, nell'ultimo decennio* (Trieste, 1961), p. 1. Edward J. Anthony, 'Problems of hazard perception on the steep, urbanised Var coastal floodplain and delta, French Riviera', *Méditerranée. Revue géographique des pays méditerranéens / Journal of Mediterranean geography*, 108 (2007) : pp. 91-97.

the city.⁷⁹ Alumina production in Gardanne led to the construction of a 5 km pipeline in the 1960s to dump toxic red mud directly into the Cassidaigne trench, offshore of Cassis.⁸⁰ In 1976, Tarragona groundwater was found contaminated with oil spill from neighbouring petrochemical facilities,⁸¹ whereas the Llobregat river (south of Barcelona) has had high levels of chloride due to coal mining, potash mining, sand and gravel extraction, and detergent discharge.⁸² More recently, fish and shellfish in the Ligurian sea have been found severely contaminated by mercury, cadmium, and lead.⁸³ The same reasons why the coast was considered valuable for manufacturing, in sum, have contributed to the alteration of coastal biology and biogeochemistry which characterizes the Anthropocene.

As reminded by John Walton in his global overview, coastal tourism has also had a major (if differentiated) environmental impact worldwide.⁸⁴ In the north-western Mediterranean, the construction of hotels and second residences was invariably achieved by urbanization of former agricultural land, deforestation, wetland drainage by pumping or filling, or destruction of dune-beach ecosystems. Perhaps the most telling example of such kind of modification is the planned redevelopment of the Languedoc–Roussillon littoral in the 1970s, which entailed the construction of five new towns and the considerable expansion of existing settlements.⁸⁵ Coastal wetlands were drained to make room for buildings and infrastructure and reduce breeding grounds for mosquitos.

⁷⁹ Daumalin and Raveux. ‘Un territoire marqué par les pollutions.’ Faget. ‘Stratégies de communication’, pp. 149-163. Pierre A Vidal-Naquet, *Les ruisseaux, le canal et la mer: les eaux de Marseille* (Paris, L’Harmattan, 1993), pp. 121-155.

⁸⁰ Philippe Mioche and Marco Bertilorenzi, ‘Les résidus de l’alumine à Portovesme en Italie et à Gardanne/Cassis en France des années 1960 à nos jours,’ in Centemeri and Daumali, *Pollutions industrielles*, pp.275-300.

⁸¹ Alfons Quintà, ‘Resuelta la contaminación de agua en Tarragona por filtraciones de petróleo’ *El País* 29/06/1976, now in <https://elpais.com/diario/1976/06/29/espana/204847217_850215.html>

⁸² Prat. N et al. *El Baix Llobregat, Història i actualitat ambiental d’un riu* (Barcelona: Centre d’Estudis Comarcals del Baix Llobregat 2004), pp 100-150.

⁸³ See Giorgi I., Abete M.C., Squadrone S., Tarasco R., Arsieni P., Pellegrino M., Leogrande M., Prearo M. ‘Contaminazione da metalli pesanti nel pescato del Mar Ligure.’ *A.I.V.I.*,6 (2009): 68–72.

⁸⁴ Walton, ‘Seaside Tourism and Environmental History’, pp.66-85.

⁸⁵ Boussut, *La nature et le balnéaire*; Sagnes, ‘L’aménagement touristique de la côte du Golfe du Lion’, pp. 27–53. Furlough and Wakemann, ‘La Grande Motte’, pp. 348-372.

To achieve the latter goal, spraying campaigns were conducted up to the 1970s and beyond, with the likely contamination of soil and water.⁸⁶

A common outcome of coastal tourism growth in the region was also the modification of coastal morphologies. One of the most significant was the construction of marinas in the second half of the twentieth century, which, with the diffusion of small boats, became a key feature in the economic competition of coastal towns.⁸⁷ The Mission Racine promoted the construction of several new marinas, as also done in numerous localities of Costa Brava, Maresme, Costa Daurada, and Ligurian Riviera.⁸⁸ Harbours and settlements, then, required in turn the stabilization of the shoreline against erosion, usually achieved by breakwater, seawalls, or cliff-base structures.⁸⁹

As proved for the case of Portugal by De Freitas and Dias, these interventions were rarely devoid of side effects.⁹⁰ Coastal stabilization infrastructure was often at the origin of accentuated episodes of coastal erosion and siltation of neighbouring harbours, such as in Grau du Roi in Languedoc from the 1950s, with damaging consequences on local fisheries.⁹¹ In the Étang de Berre, as early as 1908 the state bought and shut down three stationary fisheries to facilitate the

⁸⁶ Jean Sagnes, 'L'aménagement touristique', pp. 42-43.

⁸⁷ Jean-François Pinchon, 'La création des ports de plaisance de la Mission interministérielle d'aménagement du littoral du Languedoc-Roussillon et le développement du nautisme', (Montpellier, Presses universitaires de la Méditerranée, 2007), pp. 65-73 ; Jean-Pierre Augustin, 'Les pratiques de plaisance en Languedoc-Roussillon : nautisme et sports de glisse', in Rieucan and Cholvy, eds., *Le Languedoc, le Roussillon et la mer*, pp. 217-234 ; Andrée Dagonne, 'L'artificialisation des espaces côtiers littoraux méditerranéens', *Norois*, 133, 1 (1987) : 181-200.

⁸⁸ Luisa Piccinno, and Andrea Zanini, 'The Development of Pleasure Boating and Yacht Harbours in the Mediterranean Sea: The Case of the Riviera Ligure', in *International Journal of Maritime History*, 22, 1 (2010): 83-110. Salvador Ferradás Carrasco 'El Turismo náutico en el Mediterráneo,' *Cuadernos de Turismo*, 9 (2002): 19-32. Pau Lanau, Carme Vinyoles, Miquel Torns, 'La febre dels port esportius,' *Revista de Girona*, 147 (1991): 26-33. Pierluigi Brandolini, 'Modificazione della fascia costiera compresa tra Portofino e Zoagli (Liguria orientale) a seguito dello sviluppo turistico', *Memorie geografiche* (1995), p. 250. See also the multiple examples discussed in Maria Carla Cigolini and Maria Rosa Crocem, *Il turismo sulla costa ligure: urbanistica e architettura dalla metà '800 a oggi* (Genova: Erga, 1997).

⁸⁹ Miguel Angel Marqués, Ramón Julià, 'Littoral processes and defence structures on the Costa Daurada' *Thalassas*, 4 (1986): 143-150.

⁹⁰ De Freitas and Dias, "A Historical View on Coastal Erosion", 217-252.

⁹¹ Letter to the Prefect of Hérault, 18th December 1962. 932W53, Archives départementales de l'Hérault.

construction of a navigation canal.⁹² Fisheries were also menaced by competing uses of coastal environments: in Languedoc, water sports practitioners demanded the conversion of freshwater ponds into saltwater ponds, with consequent damages to local fisheries.⁹³ Tourism-linked urbanization, moreover, caused water pollution in fishing lagoons. In the Thau lagoon, near Sète, nutrients flowing into the lagoon from the 1970s caused eutrophication episodes known as *malaïgues* and the consequent crisis of shellfish farming.⁹⁴ The construction of new marinas increased anthropic pressure even in protected areas.⁹⁵

Fishermen, however, also had a significant ecological impact. Aggressive techniques such as trawling; dynamite fishing; or *lamparo* fishing increased the rate of catches above the threshold of sustainability and species reproduction, killing juveniles and destroying crucial nursery habitats such as *Posidonia* meadows.⁹⁶ The ecological impact of fisheries motivated at times attempts to stabilize coastal marine ecosystems. While in France state regulations sought at various moments to protect the ecological basis of coastal fisheries,⁹⁷ in Catalonia the state aimed above all to increase catches, often with the opposition of associations of fishermen.⁹⁸ States, scientific societies, and

⁹² Charles Parain, *La Méditerranée: les hommes et leurs travaux* (Paris, Gallimard, 1936), p. 57.

⁹³ M. Ambert, 'Milieu naturel et aménagement de l'étang de Mauguio'. In *Le Languedoc, le Roussillon et la mer*, pp. 23–33.

⁹⁴ Pierre-Yves Hamon, Catherine Vercelli, Yves Pichot, Franck Lagarde, Patrik Le Gall, Jocelyne Oheix, *Les malaïgues de l'étang de Thau. Tome 1. Description des malaïgues. Moyens de lutte, recommandations*. (Paris, Ifremer 2003).

⁹⁵ Benjamin Durand, *La politique de protection de l'environnement au parc national de Port-Cros*, (Aix-en-Provence : IEP d'Aix-en-Provence, 1993); Jean Miège, "Le parc national des îles d'Hyères", *Revue de géographie de Lyon*, 51, 2 (1976):151-161.

⁹⁶ Daniel Faget, 'Violences de guerres ? Pêcheurs dynamiteurs en Provence (1914-1945)', Marie-Françoise Attard-Maraninchi, Xavier Daumalin, Stéphane Mourlane et Isabelle Renaudet, eds., *Engagements: culture politique, guerres, mémoires, mondes du travail, XVIIIe-XXIe siècle* (Aix-en-Provence : Presses universitaires de Provence, 2016), pp. 389-399; François Doumenge, 'La Pêche et le commerce du 'poisson bleu' en Roussillon,' *Bulletin de la société languedocienne de géographie*, 23, 1 (1952): 151-169.

⁹⁷ Alain Cabantous, André Lespagnol, and Françoise Péron, *Les Français, la terre et la mer, XIIIe-XXe siècle* (Paris, Fayard, 2005); Faget, *Marseille et la mer*, pp.51-106.

⁹⁸ Juan Luis Alegret, 'Space, Resources, and Historicity: The Social Dimensions of Fisheries in the Northwestern Mediterranean,' in David Symed, ed., *Europe's Southern Waters: Management Issues and Practice* (Oxford: Blackwell), p.58.

private actors experimented with aquaculture at least since the nineteenth century.⁹⁹ From the 1970s, stabilization of coastal marine ecosystems included the creation of artificial reefs. In Liguria, four artificial reefs have been built off the coast of Varazze, Loano, Spotorno, and Alassio between the 1970s and the 1990s to hinder illegal trawling, to protect *Posidonia* meadows, and to support traditional fishing. In the case of Alassio, the reef should facilitate leisure fishing.¹⁰⁰ However, as a paradoxical testimony to the contradictions and feedback loops of littoral configurations, leisure fisheries have been identified as responsible for damages to marine ecosystems in protected areas such as Portofino in Liguria and Isles Medes in Catalonia.¹⁰¹

Stabilization, in fact, has eluded the efforts of generations of coastal developers. Erosion and subsidence have become common along the shores of the north-western Mediterranean. River deltas are the most dramatic examples: after centuries of protrusion, many Mediterranean deltas are now retreating slowly but constantly.¹⁰² The Ebro and the Rhone River delta are two prominent cases: after centuries of protrusion, after World War II they begun retreating, undermining coastal stabilization infrastructure and imperilling coastal activities.¹⁰³ The causes for this phenomenon are numerous, but among the most significant is human infrastructure in river basins, starting from

⁹⁹ On France see Daniel Faget, ‘Cultiver la mer : biodiversité marine et développement de l’ostréiculture dans le Midi méditerranéen français au XIXe siècle’, *Annales du Midi : revue archéologique, historique et philologique de la France méridionale*, 119 (2007), pp. 207–26.

¹⁰⁰ Primi, ‘Barriere artificiali’, pp. 105-107.

¹⁰¹ Nicoletta Varani, ‘Aspetti geografici delle Aree Marine Protette: il caso del Mar Ligure,’ in Adalberto Vallega et al., eds. *La Liguria e il mare* (Pontedecimo: Brigati Glauco, 1991), pp. 63–98. Giulia Prato, Celine Barrier, Patrice Francour, Valentina Cappanera, Vasiliki Markantonatou, et al.. ‘Assessing interacting impacts of artisanal and recreational fisheries in a small Marine Protected Area (Portofino, NW Mediterranean Sea).’ *Ecosphere, Ecological Society of America*, 7, 12 (2016), pp.e01601. Raquel De la Cruz Modino, Vendrell Simón, Begoña, José J Pascual Fernández, ‘¿Un mar de oportunidades? Innovaciones turístico-pesqueras en espacios marinos protegidos.’ *Pasos*, 10, 1 (2012): 19-30.

¹⁰² Manon Besset, Edward J. Anthony, François Sabatier, ‘River Delta Shoreline Reworking and Erosion in the Mediterranean and Black Seas: the potential roles of fluvial sediment starvation and other factors,’ *Elementa: Science of the Anthropocene*, 5, 54 (2017): 1-20.

¹⁰³ On the Rhone see Grégoire Maillet et al., “Transferts sédimentaires dans le Bas-Rhône depuis le milieu du 19e siècle : essai de quantification,” *Géographie physique et Quaternaire* 61, 1 (2007): 39–53 and François Sabatier and Serge Suanez, “Evolution of the Rhône Delta Coast since the End of the 19th Century,” *Géomorphologie : Relief, Processus, Environnement* 9, no. 4 (2003): 283–300. On the Ebro see Damia Vericat and Ramon J Batalla, “Sediment transport in a large impounded river: The lower Ebro, NE Iberian Peninsula” *Geomorphology* 79, 1-2 (2006): 72-92.

hydroelectric reservoirs that trap river sediment, as well as sand and gravel mining for the construction industry. As discussed in the previous section, hydroelectric reservoirs played a major role in powering coastal urbanization and industrialization. So did sand and gravel mining, which literally made the booming resort towns of the Mediterranean coast. By interfering with geomorphological interdependencies, these activities also contributed to accelerating coastal instability.

Other coastal infrastructures conceived to stabilize the shore have ironically contributed to instability. The massive enlargement of dykes in the port of Barcelona since the 1980s contributed to erosion in the Llobregat delta, as the dykes retained sea currents and the sediments they carried.¹⁰⁴ Coastal erosion was further increased by the enlargement of Barcelona Airport in 1990, which further impaired sediment fluxes to the delta.¹⁰⁵ The resulting retreat of the Llobregat delta, along with expansion of the built space, has caused the gradual disappearance of agricultural land and agricultural workforce in the delta villages.¹⁰⁶ When affecting beaches, erosion jeopardized also tourism. In such cases, beach nourishment has become a common practice. In La Pineda beach near Vilanova i la Geltrú, some 100,000 cubic meters of sand were added in 2005 to counter erosion. However, as the sand added was thinner than the sand naturally occurring in the area, it was easily washed away by the sea.¹⁰⁷ The shores of the north-western Mediterranean, in sum, keep shifting.

¹⁰⁴ Nuria Sanz Moliner, *Impactos territoriales y socio-ambientales del puerto de Barcelona y de las infraestructuras de acceso* (Master thesis, Universitat Politècnica de Catalunya, 2002), pp. 77-88.

Óscar Marcos Valiente, 'Canvis recents a la línia de costa del delta del Llobregat.' *Treballs de la Societat Catalana de Geografia*, 39 (2002): 45-72.

¹⁰⁵ Lluís Solé i Perich, 'El risc d'inundacions al delta del Llobregat. Viure contra l'aigua?,' *Treballs de la Societat Catalana de Geografia*, 42 (2005): 223-264.

¹⁰⁶ Jaume Mateu Giral, 'Aproximación a la progresiva pérdida de las actividades agrarias del Barcelonès, del Baix Llobregat y del Maresme.' *Quaderns Agraris*, 5 (1985): 17-45. Jordi Sempere Roig, 'La Pagesia del delta del Llobregat.' *Documents d'anàlisi geogràfica*, 43, (2004): 45-68.

¹⁰⁷ Francesc González Reverté, 'Instruments per a la recuperació, manteniment i gestió de les platges,' In Salvador Antón Clavé, ed., *10 lliçons sobre turisme. El repte de reinventar les destinacions* (Barcelona: Ed Planeta, 2012), pp. 125-140.

Conclusion

The history of the north-western littoral over the nineteenth and twentieth centuries is undoubtedly a history of growing human impact upon the environment. Transportation links and energy flows weaved the coast of the north-western Mediterranean into webs which spanned continents. Areas up to that point marginal became attractive to new actors coming from afar. Enabled and stimulated by these forces, new industrial, tourist and urban settlements deeply reconfigured the coastal zone's ecology and morphology. However, this was not a homogeneous process. Actors of coastal settlements were animated by different motives and views of the shore: as a spatial interface and a sink in the case of industrialists, as a beneficial physical environment and climatic features for tourists and second-homers, as a landscape endowed with aesthetic and ecological values for nature enthusiasts, and as a hotbed of aquatic life for fishermen and marine scientists. The diversity of views had direct implications on coastal environmental change. The valuation of the coast as a sink induced specific uses – such as discharge of toxic by-products – which were markedly different from (and sometimes opposed to) those linked to its valuation as a landscape or as a hotbed of aquatic life. Different uses, in turn, meant different types of interaction with the coastal environment and its web of geomorphological and ecological interdependencies, determining undesired feedback loops.

The history of the shores that emerges through this framework should lead us to temper narratives proposed by scholars such as Gillis, Pearson, or Le Bouedec or by environmental historians of coastal and marine environment such as Bolster. Whereas many social historians depicted the modern shore as a colonized and homogenized space, and many environmental historians as a degraded and depleted environment, we see it as a dynamic space of continued and non-linear interactions. We do not want to deny the occurrence of major transformations of coastal societies and environments. In many respect, the present-day shores of the north-western Mediterranean are less ecologically diverse and morphologically dynamic they were at the

beginning of the nineteenth century. This fundamental change, in turn, is certainly linked to major social transformations, to a large extent led or accompanied by the arrival of actors from afar, be them industrial investors or tourists. However, as proponents of the New Coastal History such as Land and Worthington argue, local cultures certainly morphed but did not cease to count, and coastal people continued to play a distinct role, from the protection of Empordà's wetlands to the conflicts opposing Languedoc fisheries with tourism. Moreover, while deeply transformed both ecologically and morphologically, coastal environments remained dynamic and unstable. Perhaps their dynamism is less spectacular than in the early nineteenth century: while it used to change from one year to the other, the geography of water in the humid lowlands of Languedoc is nowadays carefully managed. Yet storms keep moving sand and reshaping the coastline, sea level rise brings water where it is not wanted, and mosquitos' population must be constantly kept under control.

Climate change and its multifarious impacts emphasize this persisting instability. Should the emission of CO₂ and other greenhouse gases continue unabated, sea level rise in the Mediterranean might reach more than 1m by the end of this century.¹⁰⁸ Sea rise effects on coastal erosion, however, are already visible. In Languedoc-Roussillon, the humid coast that the French state redeveloped in the 1960s and 1970s into a major seaside destination, the authorities recently wrote down plans for "strategic retreat".¹⁰⁹ Many towns and resorts built or expanded as part of the 1960s redevelopment scheme, will have to be abandoned: keeping them dry against the raising sea is simply too costly, if not physically impossible. If the coast has always been shifting, in sum, its geography is bound to change even more, undoing much of the stabilization of the last two centuries.

The acknowledgement of the shores' persistent dynamism carries an important lesson on the Anthropocene. Anthropocene proponents tend to depict environmental change as the unilateral

¹⁰⁸ Wolfgang Cramer et al., "Climate Change and Interconnected Risks to Sustainable Development in the Mediterranean," *Nature Climate Change* 8, no. 11 (November 2018): 972.

¹⁰⁹ See the plans and reports on the official website of the Languedoc-Roussillon region <http://littoral.languedocroussillon.fr/Etat-des-lieux-sur-le-recul-strategique.html> URL last visited on July 26, 2019.

imposition of an undifferentiated humankind's agency to the functioning of the Earth system. By looking from the perspective of shifting shores, this idea should be tempered. The history of the North-Western Mediterranean shore reveals how the motives of coastal actors were varied and not all of them led to attempted stabilization or biochemical alteration. Moreover, all attempts of stabilization had to negotiate with sediment fluxes, wetlands or mosquitoes. Stabilization, moreover, was never achieved once and for all: the construction of a coastal dyke often caused unwanted siltation or erosion downstream. The scale and scope of coastal infrastructural intervention in land reclamation, beach nourishment, or artificial reef construction is a testimony to the continued challenges posed by coastal dynamism to the modern settlement of the shores and its actors. If a fundamental feature of the history of the Anthropocene is human attempt at stabilizing and controlling the environment, the evidence of coastal dynamism shows that this control is in fact a continued negotiation with natural forces, and one whose outcomes are always provisional.