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ADAPTING COASTAL CITIES AND TERRITORIES TO SEA LEVEL RISE

POLICY BRIEF



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Climate change is having growing impacts on coastal areas. The Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) predicts that by 2100, sea level could rise by 1.01 meters while the related extreme events could become more frequent if greenhouse gas (GHG) emissions continue to increase (SSP5-8.5) (1). These phenomena have many incidences, including coastal erosion, flooding and marine submersion over large areas, land salinization and coastal ecosystems' destruction (2). They also have significant socio-economic impacts in regards to the increasing demographic and economic pressure on the coastline. Therefore, by 2025, more than 70% of the world's urban population will be living on the coast (3).

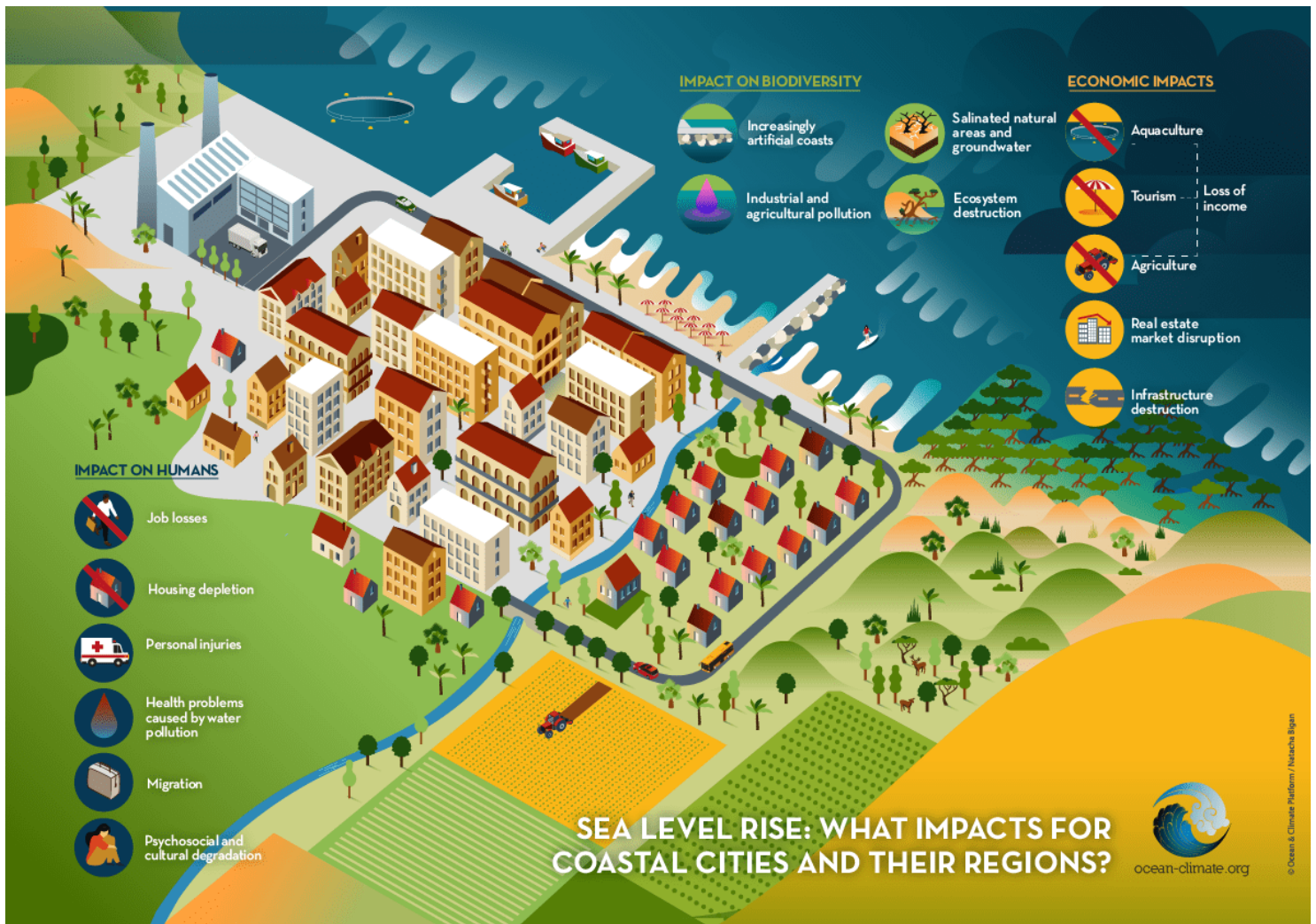


Figure 1 – What are the impacts of sea level rise on coastal cities and their surrounding regions?



Developing effective adaptation strategies to cope with sea level rise requires the integration of geographical, socio-economic and cultural factors specific to each city and territory. Integrating these features implies the planning of coherent adaptation strategies at the appropriate territorial scale. Additionally, resistance and defiance against adaptation measures further highlight the necessity to include local actors in policy-making. Thus, in a context that calls for urgent adaptation of coastal cities and territories, what challenges does sea level rise adaptation entail? Moreover, to achieve a fair and sustainable adaptation, what are the main stakeholders and issues to be integrated into the rearrangement of these territories?



OCEAN & CLIMATE CONFERENCE

On 13 April 2021, the Ocean & Climate Platform organised an Ocean & Climate Conference on the topic of "**Adapting coastal cities and territories to rising sea levels**", bringing together a panel of experts including **Hélène Rey-Valette**, Professor at the Faculty of Economics of the University of Montpellier, **Gérard Blanchard**, Vice-President of the Urban Community of La Rochelle, **Anne-Sophie Leclère**, Chief Executive Officer of the Association Nationale des Elus du Littoral, **Matthias Bigorgne**, Deputy Director of the Conservatoire du Littoral and **Raphaël Cuvelier**, Vice-President of the Ocean & Climate Platform.

1 Planning the adaptation of coastal regions in a context of uncertainty and growing political and financial needs

The elaboration and implementation of adaptation policies are confronted with numerous scientific, psycho-social, political and financial obstacles. Indeed, adaptation is carried out in a situation of risk uncertainty, reinforcing cognitive and social biases that can hinder the participation of stakeholders. Meanwhile, the lack of political and financial resources can contribute to delaying the decision-making process.

Risk knowledge

The identification of priority areas and actions in coastal cities and territories relies on risk exposure and vulnerability level assessments over precise time scales and in given spaces. Whilst average data exists globally, models fail to integrate all the features determining local variations of sea levels. Furthermore, there is significant uncertainty regarding the physical risk exposure as scientists cannot accurately predict hazard magnitudes or evolution rates entailed by climate change. In addition to an accurate understanding of the degree of risk exposure, coastal areas need to assess the resilience of their ecosystems and populations so as to determine their vulnerability level. The ecosystemic and human resilience evaluation is multifactorial and depends on a wide array of indicators specific to each situation. For instance, the National Oceanic and Atmospheric Administration (NOAA) combines indexes of socio-economic vulnerability (demography, wealth, ethnicity, gender, etc.), structural vulnerability (building features, transport facilities, etc.) and natural resource vulnerability (ecosystem distribution and health, etc.), cross-referenced with coastal risks (4). Other indicators relating to economic diversity, governance and exogenous variables should also be considered when assessing vulnerability (5), such as the economic attractiveness, governance capacities and layouts, and the insurance systems of the populations (fig. 2).

Cognitive and social biases

In addition to the complexity of assessing risks and vulnerability, cognitive and social biases can also hinder the mobilization of the coastal populations and managers. Among communities, the attachment to assets and landscapes as well as the tendency to ignore risks that have never or rarely been experienced, reinforce optimism bias; defined as “the propensity of individuals to underestimate the probability of negative events occurring and, on the contrary, to overestimate the occurrence of positive events.” (6). Based on the comparison of ten quantitative surveys carried out between 2007 and 2017, a synthesis of the perceptions and constraints relating to the acceptability of measures has highlighted the importance of institutional factors (12), e.g. the legitimacy and confidence in the institutions responsible for implementing policies, or the feeling of fairness or unfairness deriving from financial undertakings. In parallel, researchers have investigated the behaviour of elected representatives to be the result of the status quo bias. As such, the lack of scientific local knowledge, as well as the fear of social contestation and additional costs, can exacerbate political inaction (6). Furthermore, cost-benefit analyses tend to underestimate the future benefits of some adaptation measures, especially the relocation of populations. Although being positive over the long run, relocations entail important short-term costs which, due to the discount rate, may not be offset by long-term benefits.



Nevertheless, by sharing experiences and promoting the medium and long-term interests, elected officials could be encouraged to implement adaptation measures. At the same time, raising awareness among populations and stakeholders can improve the grasp of risks and, thus, facilitate collective support for adaptation policies (6) (13). As part of their plan for achieving carbon neutrality (La Rochelle Territoire Zéro Carbone), La Rochelle City Council decided upon this approach by using an interactive exhibition (Climat-Océan) to inform the public and mobilize all the stakeholders around climate issues and adapting their city (7). As for the practical details of implementing measures, a clear consensus is emerging for a public execution and lead (i.e. State authorities), combined with financial solidarity mechanisms (national or regional) and additional conditions on the transparency and legitimacy of the managing institutions.

Political and financial needs

Local and regional authorities have jurisdiction over the spatial planning of coastal areas, the protection of natural spaces and socio-economic development. Given the urgent need to implement adaptation strategies, a considerable increase and realignment of capacities and resources are required. Yet, the wide array of public jurisdictions, stakeholders and fields of expertise tend to intricate the undertaking of decisions and reduce the coherence of policies (8). Similarly, funds can be uneven among territories to the extent that urban and rural areas sometimes compete for resource allocations. In France, the tax funding method for the management of aquatic environments and flood prevention (the so-called GEMAPI) tends to favour the most densely populated and most urbanized communities (9). Hence, appropriate and fairly distributed financial resources provision constitutes a key lever for the implementation of adaptation measures.

Indeed, the complexity of planning adaptation in a context of uncertainty and growing needs for policy and financial engineering emphasizes the necessity to redesign the approach to decision-making and the implementation of public policies (13). With the integration of regions and their populations in a coherent, cohesive and flexible way, over long-term trajectories, coastal communities can potentially strengthen their adaptation capacities.



2 A systematic approach to adaptation: territorial cohesion and temporal dynamics

Adaptation measures raise social issues that require regional actors to work together. In other words, adaptation must be built in collaboration with all stakeholders by considering the issues of the areas affected by sea level rise beyond the coastline. This systemic approach takes place over a long-term scale so that strategies can adjust to risk evolution.

Achieving adaptation in partnership with regional actors

The consultation of both coastal and hinterland stakeholders is a necessary condition to achieving adaptation measures that are effective, fair and sustainable (13). Indeed, coastal adaptation issues affect many regional actors such as residents, industrial and tourism sectors, shopkeepers, infrastructures managers, transport services, as well as civil society and research representatives. While both raising individual awareness and developing a collective risk culture remain essential, it is critical to favour a consultation encouraging cooperation among all stakeholders around the co-design of solutions (13).

It is precisely this consultative approach that is central to La Rochelle's net-zero project, which provides for the creation of a citizens committee bringing together more than 130 regional stakeholders alongside five founding entities: the city council, the urban agglomeration council, the University of La Rochelle, the maritime port and the low-carbon technology park (7).

On a larger scale, the co-design of adaptation policies can be envisioned within networks of experience-sharing among coastal cities and regions. Indeed, identifying similar features and sharing experiences can facilitate the transition of coastal areas. Based on archetypes representing France's regional diversity, a French research group has identified "adaptation pathways" (5) (Figure 2).



The study highlighted typical adaptation trajectories by identifying the diversities and focal points of the physical, socio-economic and historical conditions of coastal regions. The study further points towards an adaptation understood as a process that leverages collective intelligence, all the more effective when territories share their feedback with one another. The Sea'ties initiative (see text box) draws on this knowledge and feedback sharing approach.

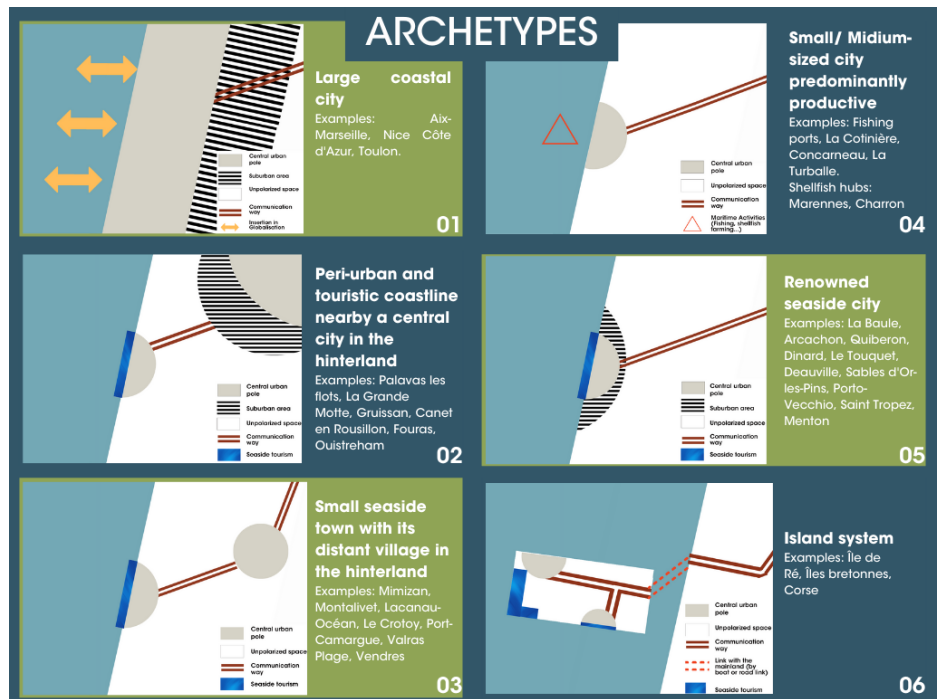


Figure 2 – Archetypes of situations determining adaptation pathways in Metropolitan France (5)

SEA'TIES

Sea'ties is an initiative of the Ocean & Climate Platform that aims to facilitate the development of public policies and the implementation of adaptation solutions for coastal cities threatened by rising sea levels (9). It proposes to create a space for experience sharing and sustainable solutions between actors of medium-sized cities in various parts of the world (Europe, West Africa, Mediterranean, US West Coast, South Pacific) and presents a diversity of climatic, geographic, social, economic and political contexts.

To achieve this, Sea'ties focuses on three main themes:

- 1 Compiling and disseminating scientific knowledge on solutions deployed by coastal cities around the world.
- 2 Fostering the emergence of “good practice” and facilitating the implementation of solutions by mobilizing scientists, elected representatives, administrators and stakeholders of coastal cities ([Map of Solutions](#))
- 3 Promoting the integration of adaptation challenges into public policies among local, national and international decision makers.

Re-designing coastal areas within a coherent regional whole

Adaptation challenges exceed the administrative limits of coastal communities directly concerned with the consequences of climate change. While the interests of coastal populations are generally integrated into adaptation strategies, those of the inhabitants of coastal hinterlands are not always taken into account even though their livelihoods will be impacted by the territorial redefinition (10). The relocation of housing or infrastructures contributes to the settling of new populations and activities in the inner lands. Meanwhile, the uses that communities make of the coast are also bound to be altered. Therefore, it is critical to include the coastal hinterland and its inhabitants in the co-design of adaptation strategies (13).

Likewise, the spatial scale of adaptation extends to natural areas. Integrating them is crucial and offers numerous benefits. Indeed, they foster biodiversity, ecosystem services, and regional attractiveness whilst also strengthening the resilience of coastal systems. These ecosystems constitute a buffer zone between the sea and the land, ensuring the protection of coastlines from erosion and waves of submersion. The restoration of natural areas is the primary goal of Adapto, a project administered by the French Coastal Protection Agency, which recommends flexible management of the coastline to balance the sediment transport, absorb wave energy during storms, and reduce the overall coastal risk (11). La Rochelle city council also integrates such natural areas through wetlands renovation that act as carbon sinks, preserve biodiversity and dissipate wave energy (7).

Implementing dynamic and hybrid adaptation strategies

The adaptation of coastal territories is a long-term process. Given the uncertainty surrounding climate and risk trajectories, adaptation policies must be dynamic and hybrid. Dynamic because adaptation is built upstream and downstream of the decision. As mentioned earlier, initially it requires the strengthening of the political, financial and scientific capacities, and the development of a collective risk culture to set up mechanisms for cooperation and co-designing adaptation solutions with every stakeholder. The policy must then be adaptable to developments in knowledge and climate change while accounting for the effects of measures already implemented. Scientific observations and modelling can both facilitate predictions and steer the changes that need to be implemented, strengthening the necessity to consolidate relations with research centres and universities. It is the approach adopted by La Rochelle's council and University through the development of research applied to the urban area (7).



The occurrence of extreme events can also lead to changes in the reconfiguration of territories. Finally, the adaptation policies must be evaluated in order to integrate their environmental and socio-economic effects and to respond accordingly. Solutions must be hybrid over time because an adaptation policy comprises short, medium and long-term actions. In the short term, this means the strengthening of coastal defences to address extreme events. In the longer term, it means engaging in solutions that require progressive implementation or whose results are not immediate. Such measures include relocating populations and businesses, renaturing specific areas, and developing mitigation policies. In line with this approach, La Rochelle net-zero project provides for the reinforcement of seawalls, the renovation of natural lands and the reduction of the city's carbon footprint (7).

Eventually, planning coastal cities and territories adaptation to sea level rise implies considerable political, technical, scientific and social challenges. Nonetheless, by implementing a systematic approach compatible with a long-term trajectory, the adaptation could constitute a pivotal moment to redesign cities more fairly, democratic and aware of the importance of their environment. ■

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