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Territorial inertia versus adaptation to climate change. When local authorities discuss coastal management in a French Mediterranean region

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ABSTRACT

Adaptation to climate change is a critical issue in coastal areas, at risk from sea-level rise, erosion, and sea flooding. In territories strongly urbanized and long oriented toward tourism and a residential economy, a change in coastal management and territorial development is hard to initiate. In Provence-Alpes-Côte d'Azur (France), a leading tourism region, this article explores how local authorities perceive climate change and talk about adaptation strategies. Interviews with municipal-level authorities, both elected officials and technical agents, reveal the influence of territorial inertia, with persistent statements promoting the beach- and residential-oriented economy and a *wait-and-see* attitude regarding climate change. Beach erosion is the only coastal risk interviewees really recognize, while sea-level rise and sea flooding are barely perceived. Yet evidence supporting the possibility of a future change in position is provided by the younger generation of interviewees, who are more aware of environmental challenges. Providing original data for a coastal region often considered as a model of development throughout the world, this article also proposes an original and transferable method combining geographical sampling of municipalities, text statistics and qualitative analysis of interviews, to apprehend the social representations of the coast, of climate change and coastal risks. Such a methodology is recommended prior to any quantitative assessment of climate action at local scale.

1. Introduction

Implementing adaptation measures is now increasingly recommended to limit the consequences of climate change on territories (Magnan et al., 2022; IPCC, 2022). In coastal areas, climate change effects like rising sea levels, increasing extreme weather events, and accelerated shoreline erosion make adaptation a critical issue (Glavovic et al., 2022; Vousdoukas et al., 2020). The stakes are high: coastal areas, in their current geographical extension, host very large urban agglomerations and high population densities (Barragán and de Andrés, 2015; Neumann et al., 2015). Of major ecological and economic importance (Felsenstein and Lichter, 2014; Martínez et al., 2007), they are also prime recreation and holiday destinations (Miller and Hadley, 2005).

1.1. Adaptation to climate change in coastal areas

Adaptation to climate change in coastal areas involves various measures. They range from constructing hard (seawall, dikes, levees, groynes, artificial reefs) or soft (beach nourishment, dune restoration)

coastal protection to maintain existing populations and facilities in situ, to strategic retreat of dwellings and infrastructures via gradual redevelopment or spatial recomposition of the territory accompanied by complementary accommodation measures (Baills et al., 2020; Bongarts et al., 2021; Cooper and Pile, 2014; Harman et al., 2015). Choosing between maintaining existing developments and strategic retreat is difficult, involving hydrogeological, economic, social, cultural, and political considerations that are always location-specific (Duvat et al., 2022; Birchall et al., 2022; Birchall, 2020; Durand et al., 2018; Nordstrom et al., 2015; See and Wilsem, 2020). Worldwide, strategic retreat remains rare (relocation of a coastal road, a campsite, etc.) because it is costly, both economically, socially and politically. Also, implementation is often more difficult in urban areas. Yet there is growing public awareness of the scale and speed of climate change, especially following disasters (Lemée et al., 2019) or in regions where its effects are very rapid like under northern latitudes (Bonnett and Birchall, 2020) or in atoll islands (Duvat et al., 2022). This is encouraging the development of more anticipatory urban planning policies, particularly aiming at strategic retreat operations. Their implementation methods are the subject

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of much reflection on chronological development, urban planning, governance, coordination, and support for the stakeholders and populations involved (van der Hurk et al., 2022; Hasnoot et al., 2021; Magnan et al., 2022; Moser and Ekstrom, 2010; Rocle et al., 2021; Rocle et al., 2020).

1.2. Adaptation to climate change at local level

Scholars have shown that adaptation highly depends on governance issues. As shown by van der Hurk et al. (2022), policy can be initiated at different governance levels and is more efficient when explicit interactions occur between them. However, the ability to promote and engage adaptation measures may vary upon governance structure and other barriers (Birchall et al., 2023; Eckstrom and Moser, 2014). Also, actions and decisions are often more difficult to build locally (Birchall et al., 2022). At local level, because of place-rooted political, institutional, economic or cultural factors, climate change can be refuted; if that is not the case, then either adaptation measures are more hard coastal structures oriented than accommodation oriented or they simply do not exist (Birchall et al., 2022; Bonnett and Birchall, 2020; Bowden et al., 2019). This is paradoxical as climate change effects are experienced locally and local decision makers are very much aware of the numerous related challenges. Moreover, adaptation measures are considered more efficient when implemented locally (Birchall et al., 2022; Meascham et al., 2011). Therefore, risk perception and climate adaptation planning have been studied at a municipal level, through large surveys based on questionnaires (Lalancette and Charles, 2022) or more in depth studies at a community level (Birchall et al., 2022; Birchall, 2020; Bowden et al., 2019; Meascham et al., 2011). It is indeed important to question those with political, administrative, or technical responsibility at local level, to understand how they perceive risks, the need to adapt to them, and the way to build municipal adaptation planning (Meascham et al., 2011). Nevertheless, risk management and adaptation to climate change cannot be isolated from other aspects of their charge as local leaders and managers, since local planning involves handling many other issues and because planning practices may greatly differ from one place to another (Bjarstig et al., 2018; Lyles et al., 2016; Prévost and Robert, 2016).

1.3. Policy for coastal adaptation to climate change in France and Provence-Alpes-Côte d'azur region

In France, the national policy on coastal adaptation was initiated by the State in the 2010 s, after storm Xynthia (Chadenas et al., 2014; Chauveau et al., 2011; Kolen et al., 2013; Vinet et al., 2012). It is based on several strategies and laws (Rocle et al., 2021): National Strategy for Integrated Coastline Management (SNGITC, 2012); National Flood Risk Management Strategy (SNGRI, 2014); National Strategy for the Sea and the Coast (SNML, 2017); GEMAPI (Management of aquatic ecosystems and flood prevention) Law (2014 applicable in 2018); Climate and Resilience Law (2021), and is implemented at an infra-national level in collaboration with local authorities. Indeed, French regional and local authorities have extensive control over spatial planning, as a result of the decentralization process that has been reducing the State's prerogatives in this area for several decades (Prévost and Robert, 2016). However, it has been shown that implementing French national policy objectives for coastal risk management at a local level raises many issues (Mineo-Kleiner et al., 2021). As a result, climate change coastal adaptation strategies are unevenly developed throughout the country, because regional governments have different priorities and structures, as has also been observed in Canada for instance (Birchall et al., 2023). Of the eight regions of metropolitan France bordering the sea, Provence-Alpes-Côte d'Azur (PACA) is the least engaged on this track. While the SNGITC recommended creating regional observatories for coastline management back in 2012, the process was only initiated in this region in 2018. Moreover, it was the State, concerned about lack of progress,

that initiated it by financing an initial study to assess the feasibility of a regional platform where local stakeholders could exchange information on sustainable management of the coastline. This weak commitment of local authorities is noteworthy, as the region faces strong beach erosion (Anthony, 2007; Brunel and Sabatier, 2007; Cohen and Anthony, 2007), cliff erosion (Claeys et al., 2017), and is regularly hit by deadly coastal floods (Brigode et al., 2021; Chalvet and Claeys, 2011; Vinet et al., 2012).

1.4. Aims and approaches

Local climate adaptation being a critical issue today, there is a need to gather lessons from different case studies to better understand constraints and identify levers for adaptive policy building. Also, there is a need for a variety of approaches to enter into the issue with various angles, through decision makers, planning documents and policies, citizens, media, etc. In this perspective, we propose to question the local decision makers' and public agents' representation of the territory, in order to better understand what underlies local climate action and coastal adaptation strategies. Taking the coastal zone of PACA region as a case study, this article explores the extent to which municipal public authorities are aware of climate change-related issues, the risks to their territory, and the need to develop an adaptation policy. The paper first introduces the conceptual framework of the research and provides a presentation of the study area (section 2). The following section develops on the methodological approach (section 3). We then present the main findings (section 4) and discuss them (section 5), looking for any shared representation of the issue of adapting coastal territories and exploring the feasibility of a collective response at regional level.

2. Conceptual framework and study area

Our research combines two main concepts in social sciences: territory, as conceptualised in geography, and social representations, as developed in social psychology. Indeed, rising sea levels, accelerated shoreline erosion, and increasing severe weather events are both modifying coastal geographical space and challenging society. Referring to the territory and social representations concepts helps frame the issue as a whole, since local adaptation policies are rooted in the area where a community lives. These two concepts are briefly presented in this section as well as the study area.

2.1. The concept of territory

Thinking about adaptation implies thinking about both the spatial context (objectively more or less risk-inducing), and the social, economic, cultural, and political realities defining society's ability to adapt. In this perspective, our research was designed with reference to the concept of territory, as defined by French geography (Moine, 2006; Brunet, 2001; Le Berre, 1995).

A territory is an inhabited and administered portion of geographical space, which implies that it has geographical, legal, social, cultural, and even affective dimensions (Brunet, 1993). It is an area where inhabitants are more or less anchored, in relation to place attachment (Brown et al., 2003; Scannel and Gifford, 2010; Taylor, 1988). According to Moine (2006), who proposed a systemic conceptualization, a territory comprises both a spatial component, with physical, ecological, social, and anthropic properties, and a social component, made of stakeholder categories who interact with each other as well as with the spatial component in question (Fig. 1). Thus, every territory can be considered as a system of interactions between a community and the place it lives in. The community corresponds to the social sub-system and aims at developing the spatial sub-system (area) which, in return, provides constraints and amenities. The two sub-systems interact through the community's representations of the spatial system, i.e. the set of psychosociological filters that are shared and situated in time (Fig. 1).

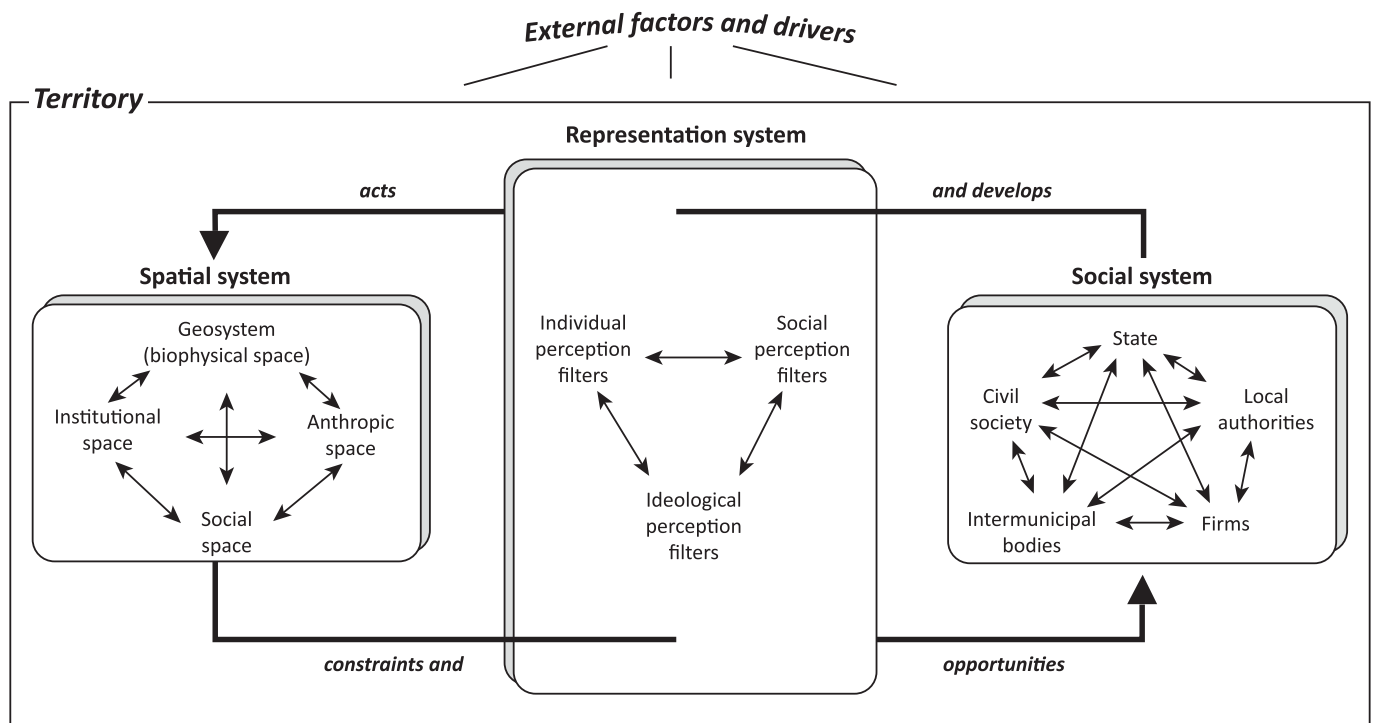


Fig. 1. A systemic view of the concept of territory (adapted from Moine 2006).

This conceptualization sheds light on how local authorities consider the need to adapt to climate change-induced risks on the coast. It highlights the fact that the management of a territory involves several categories of stakeholders and different ways of thinking about area-specific opportunities and constraints, and that these characteristics influence public policy. This conceptualization also suggests the inherent complexity of territorial management and action, so that an issue like risks, however important, is always part of a wider set of issues facing the territory. It is therefore relevant to study how risks figure in a more general discourse on the coastal zone, its evolution, and its challenges for the future, rather than exploring them directly.

2.2. Social representations theory

As shown in Fig. 1, the concept of territory is linked to that of representation, more specifically social representations. From a theoretical point of view, these correspond to all forms of knowledge a group of people share concerning an object or a phenomenon and which condition their behaviours (Moscovici, 2008). These representations are the result of a collective construction (Jodelet, 1989) and correspond to more or less extensive and homogeneous human groups, living at a specific time in a specific place. The study of social representations thus provides insight into what characterizes a social group in its manner to see its environment, social or bio-physical. Following Abric's structural approach (1994, 1993), social representation can be technically characterised by its central core, which consists of the most shared and stable contents, and the peripheral system, which comprises other contents introducing heterogeneity and possible evolutions.

In our study, local stakeholders with political, administrative or technical responsibility for the coastal territory can be considered as a social group. What makes them a group is their jobs serving the local population, within the administrative and political perimeters of PACA's coastal municipalities. All have management duties in the field of public action and are responsible for territories with specific geography, territorial dynamics, and environmental issues. In France, municipalities are managed by a local political assembly renewed every 6 years by direct universal suffrage. They are headed by a mayor, supported by a

municipal council, who conducts local policy on town planning, housing, environment, management of nursery and elementary schools, etc., with dedicated technical support. Although some of these responsibilities are pooled at the inter-municipal level, municipal actors are central figures in territorial management and development, both in practice and in public perception. They can therefore be assumed to have their own representations both of the coastal zone and of the issues linked to climate change and adaptation to risks.

2.3. Study area

Provence-Alpes-Côte d'Azur is one of the three French administrative regions bordering the Mediterranean. Politically and administratively, it has six provinces (*département* in French), three coastal: Bouches-du-Rhône, Var, and Alpes-Maritimes (Fig. 2). There are 65 coastal municipalities as defined by the Coastal Law of January 3rd, 1986. Together, they total nearly 2.6 million inhabitants in 2020, i.e. half the regional population and a population density of 743 inhabitants/km² (French National Institute for Statistics and Economic Studies - INSEE, 2020), the largest French coastal population. Reasons for this density include: long-standing urbanization, anchored on strategic port towns for commercial (Marseille), military (Toulon), and industrial (Marseille, La Ciotat, La Seyne-sur-Mer) purposes; strong development of coastal resorts and tourism from the 19th century, with internationally renowned destinations (Nice, Cannes, Menton, Saint-Tropez, Hyères); high residential attractiveness since World War 2, leading to widespread urban sprawl (Robert, 2016); a national policy of developing large industrial port complexes from the 1960s onwards (Fos-sur-Mer).

Economically, this coastal territory is oriented toward tourism and second homes. The Sea and Coastal Plan published in September 2019 by the Region highlights: 135 marinas and fishing ports, 350 bathing sites with water quality monitored, 2.5 million cruise passengers before the Covid-19 pandemic, and visits by 40% of the world's yacht fleet, particularly on the Côte d'Azur (Région, 2019). Moreover, of the 120,000 maritime jobs in the region, 69% are linked to coastal tourism (Région, 2019). This recreational and tourism function is particularly strong in the Alpes-Maritimes and Var provinces, with their famed

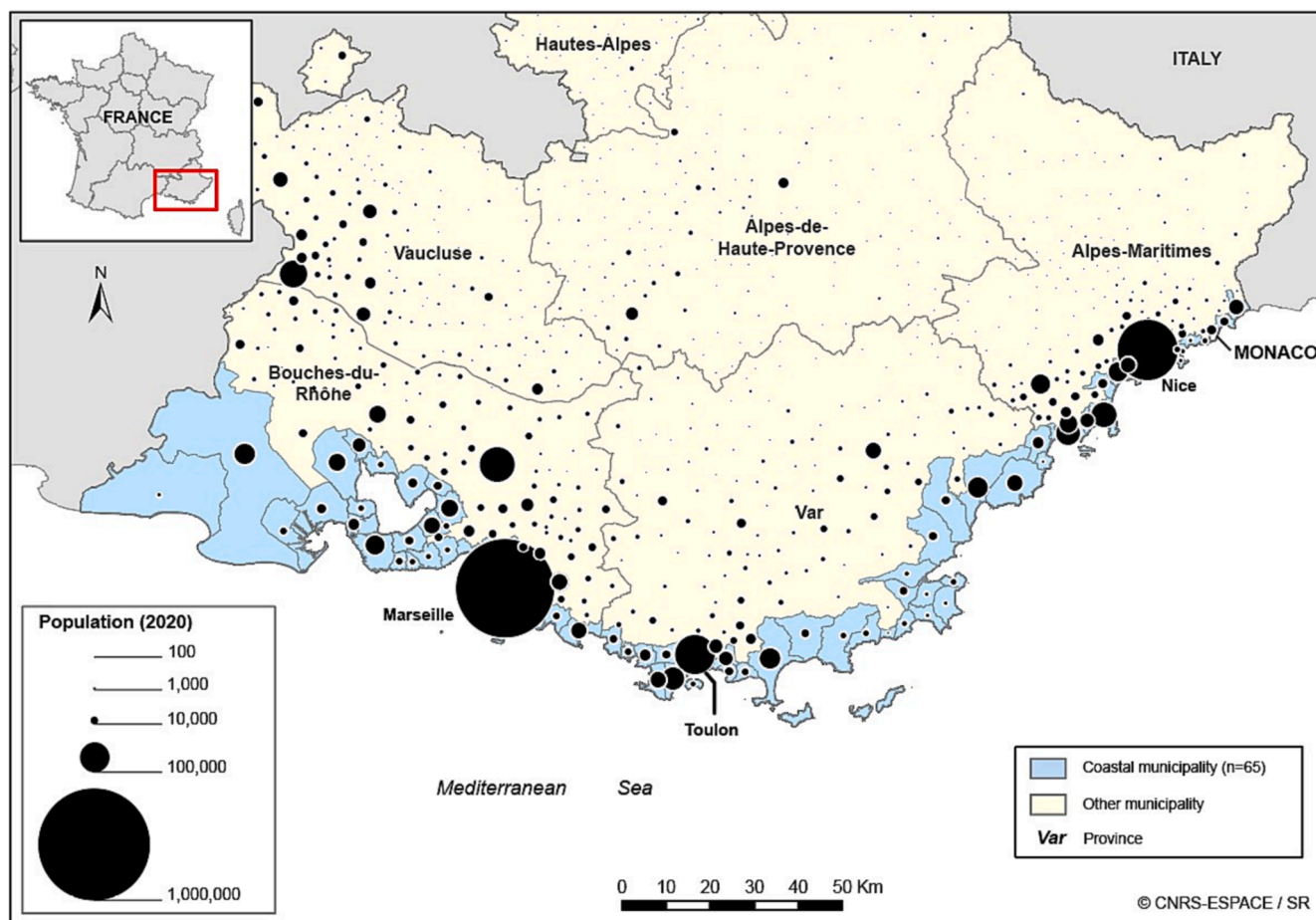


Fig. 2. Demographic weight of coastal municipalities in Provence-Alpes-Côte d'Azur.

seaside resorts such as Hyères, Saint-Raphaël, Saint-Tropez, Nice, Cannes, and Antibes. In addition, the coast hosts important commercial ports (mainly Marseille, France's major port) and passenger ports (3.5 million ferry passengers in 2018).

Environment-wise, the almost 1000 km-long coastline is rocky and indented, apart from the Rhone delta in the west. The rugged topography includes only a few coastal plains and is marked by small archipelagos or isolated islands at a short distance from the coast. Widespread urbanization has deeply transformed much of the land-sea interface, with land reclaimed from the sea, port and airport infrastructures, marinas, artificial beaches, and coastal erosion protections (Anthony, 1997). These developments contribute to the coast's vulnerability in the context of climate change. However, although destructive and deadly floods sometimes follow violent rainfall events (Anthony, 2007; Vinet et al., 2012), and most beaches are eroding (Cohen and Anthony, 2007), these phenomena are not new. Moreover, despite their dramatic nature, they do not involve the degree of threat or damage observed, for example, on the French Atlantic coast (Chauveau et al., 2011; Kolen et al., 2013) or the coast of England (Kantamaneni et al., 2022). Moreover, the regional authorities' awareness and assessment of climate change and its consequences seems limited. The risks only appear in a very secondary or even incidental manner in the Region's Sea and Coastal Plan, and anticipation of these risks in the town planning documents of coastal municipalities has been documented as scanty (Robert and Schleyer-Lindenmann, 2021).

3. Research approach and methodology

To study the local decision-makers' and public agents' social

representation of the territory, we conducted interviews at the municipal level. This section describes how we selected the municipalities to include in the study, how we collected the data, and the analysis we made of the materials collected.

3.1. Sampling design

The coastal municipalities of PACA are heterogeneous in surface area, landscape, coastal hazards, demographic weight, socio-economic profile, land use, and urban planning policy. To select those to interview, we used a hierarchical approach, categorizing them in three levels based on a GIS and a geographical and statistical database of the entire regional coastal zone.

At level 1, municipalities were divided into two groups based on the study by Robert and Schleyer-Lindenmann (2021): those mentioning coastal risks in the presentation report of their town planning document (*Plan local d'urbanisme* or *Plan local d'urbanisme intercommunal*, in French), and those not mentioning these risks or without such a document. At level 2, each group was divided into two sub-groups according to degree of marine flooding hazard in the case of a temporary rise in the average sea level during a storm by 2100 (average sea level raised by +0.60 cm compared to today), as assessed by the French Geological Survey - BRGM (Stéphanian et al., 2017). Our categorization relied on geomatic processing of the cartographic data produced in this study, whose methodology is presented in Appendix 1. For each municipality, the 0–500 m coastal strip was considered relevant to assess coastal risks in the territory, because the predominantly rocky profile of the region's coastline and the associated topography strongly limit the areas exposed to marine submersion, as underlined by Stéphanian et al. (2017). First,

the percentage of the 0–500 m coastal strip subject to marine flooding hazard was calculated with the GIS. Municipalities with a percentage higher than the median value in the region were classified as “Strong hazard”. Those where the percentage is lower were classified as “Weak hazard” (Appendix 2). At level 3, each level 2 sub-group was divided into two groups reflecting high or weak human vulnerability according to a synthetic index of the socio-economic issues characterizing the coastal strip. This index was based on sociodemographic data from the French National Institute for Statistics and Economic Studies (INSEE) and land-use data from the Regional land use database (Ocsol PACA, based on Corine Land Cover land use classes) on three factors: demography (population density in the 0–500 m strip, share of the municipality’s population living in the 0–500 m strip); development (proportion of artificial areas in the 0–500 m strip, share of the municipality’s total urbanization in the 0–500 m strip); and economy (proportion of second homes in the municipality). The full procedure divided the 65 coastal municipalities of the region into 8 classes (Fig. 3 and Appendix 2).

This strategy ensured that our selection of municipalities provides: evenly-represented municipality categories; coverage of all three coastal provinces; a range of types of municipality (demographic size, economic orientation toward tourism, presence of a port, etc.). The interviews took place in 2020 during the Covid-19 crisis, characterized in France by a generalized lock-down from March 17th to May 3rd, 2020 and postponement of municipal elections to June 2020, in particular. In the end, out of the 35 municipalities pre-selected for the study, 29 were actually interviewed (Fig. 3).

3.2. Data collection

Following the principles of the exploratory approach in social sciences; i.e. an open but focused and systematic approach to allow for the expression of the variety of possibilities concerning the subject studied (Stebbins, 2001), we performed semi-structured interviews with key informants from the selected municipalities. Accordingly, an interview guide was used with four broad themes, on which interviewees could develop their thoughts and representations freely: general characteristics of the territory and coast; perception of climate change; management of the territory and coast; vision of the future (Table 1). To apprehend the spontaneous place of coastal risks and adaptation in their discourse, no direct questions were asked on these topics (interviewers did not use these words nor words like marine flooding, flooding, erosion, tsunami, strategic retreat, relocation). Informants were invited to express their views on the coast as they saw fit, enabling us to evaluate the extent to which the issue of risks and adaptation to climate change permeated their statements.

Interviews were conducted face-to-face (n: 21) or took place via video call during the spring 2020 lock-down (n: 8). They were recorded with the interviewees’ consent, in accordance with French and European Union (“General Data Protection Regulation”) regulations, and subsequently transcribed. Interviews lasted an average 58 min, varying between 26 min and 1 h 40 min depending on interviewees’ availability. The differences in length are not an issue for the analysis, but rather evidence of the individual and authentic nature of the respondent’s statements made without undue constraint from our protocol.

Of the 29 interviews conducted, 11 were with elected officials (including 2 mayors) and 18 with local authority employees in urban

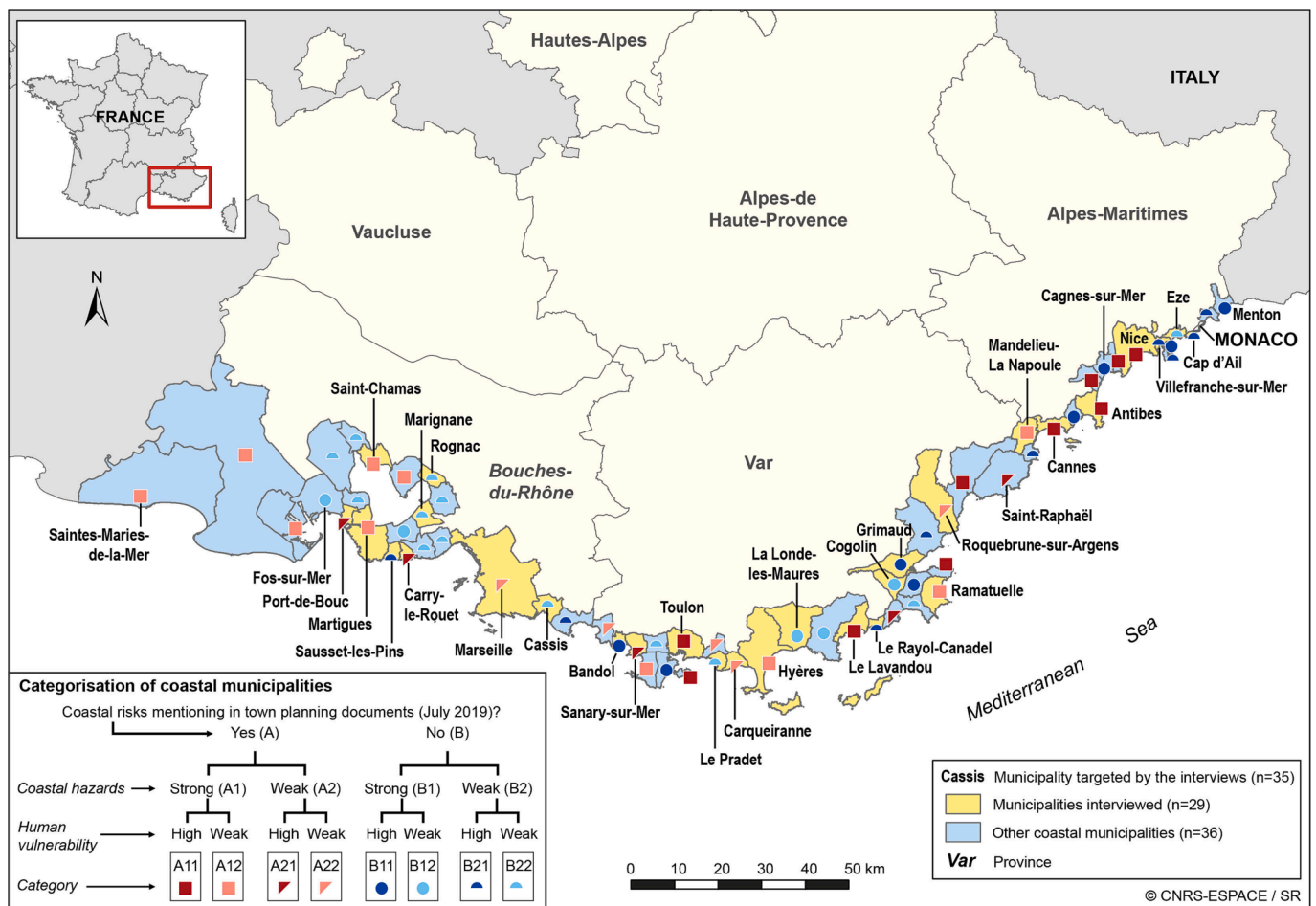


Fig. 3. Municipalities targeted by the interviews and municipalities eventually interviewed.

Table 1
Themes in the interview guide and questions guiding the exchange.

| Themes |
|--|
| <p>1- Vision of the coastal zone Objective: to get the interviewee to talk about the coast in general [Opener]: What is your vision of your territory and its coast? [Prompt]: What are its specific features compared to other coastal areas? [Prompt]: How has your coastline evolved over the last few years?</p> |
| <p>2- Perception of climate change and its effects Objective: to make the interviewee talk more specifically about coastal risks [Opener]: What do you think about climate change? [Prompt]: Do you see any effects on your territory? [Prompt]: if effects are observed: What do you think? if no effects observed: Do you think there will be any in the future? [Prompt]: How can you manage these effects on your territory?</p> |
| <p>3- Coastal management and development policy Objective: to get the interviewee to talk about adaptation [Opener]: What is the municipality's/your policy on land and coastal management and planning? [Prompt]: How does local policy relate to regional and national policies? [Prompt]: Are you aware of the policies/projects of the municipalities neighboring your coastline? [Prompt]: In terms of local development, do you feel that your coast presents opportunities and/or constraints? [Prompt]: Do you rely on organizations/institutions for your coastal management and planning policy? [Prompt]: Is there any consideration or participation of the inhabitants in the management of the coast in your commune?</p> |
| <p>4- Future vision of the coastline Objective: to make the interviewee talk about the future and its anticipation. [Opener]: How would you like your coast to look in 15/20 years? [Prompt]: What do you fear might happen to it? [Prompt]: Which scenario do you think is most likely? Why or why not?</p> |

planning and the environment. In terms of gender, the panel of interviewees is very unbalanced: 23 men and 6 women, only one of whom was an elected official. This reflects the over-representation of men in positions of responsibility in local authorities. In terms of age structure, the 40–60 age group is the largest (13), followed by the over-60 s (9), and the 20–40 s (7). Elected representatives are noticeably older (7 out of 11 are over 60).

3.3. Data processing and analysis

The recorded interviews were transcribed in extenso. Once validated (after eliminating errors in spelling, punctuation, typos), these text files were subjected to double analysis: a textual statistics analysis (Guérin-Pace, 1998) based on the principles of similarity analysis (Bouriche, 2005), and an analysis by manual categorization following a thematic analysis grid.

The statistical analysis was performed with the IRaMuTeQ software (*Interface R pour les Analyses Multidimensionnelles de Textes et de Questionnaires*; <https://www.iramuteq.org/>), which provides lexicometric analysis, visualization of corpus components, analysis of word networks, and multivariate statistical analysis. The software's reference base consists of dictionaries in several languages (French, English, Spanish, etc.), each containing a large number of words in their various forms (gender and number variations for nouns, pronouns, adjectives; conjugated forms for verbs; etc.), although not exhaustive. The French dictionary was therefore enriched with terms specific to the study (words such as "posidonie", expressions such as "Côte_d_Azur", or acronyms such as "DPM", which stands for *Domaine public maritime*), to cover the full content of the interviews. The analysis was applied to a corpus consisting in a single text file merging all transcripts where all interviewer's interventions were deleted, resulting in A4 format (Arial font, size 11, single-spaced), i.e. 12,400 lines and 195,000 words in French. The corpus was analyzed counting words and expressions, ranking them, and examining their quantitative associations in order to identify dominant themes or objects via similarity analyses

(Bouriche, 2005). Since French features gender and number variations, analyses were performed on a corpus reduced through lemmatization (all forms of a word are reduced to a root form: for example, "beaches" is considered the same as "beach"). As we were not addressing interviewees' style of expression or linguistic features of the interviews, the analyses focused on two categories of words, nouns and adjectives, which carry the most meaning.

The quantitative approach was complemented by a thematic analysis of each interview revealing nuances and identifying ideas that, although not frequently expressed in the overall discourse, are relevant or original in the study context. This was performed independently by three analysts-interpreters, each of whom completed an analysis grid composed of seven themes: the four from the interview guide and three additional themes identified from the interviews: coastal risks (hazard, vulnerability, management); coastal development, management, and protection; data, knowledge, and challenges regarding coastal management. Relevant ideas on our chosen themes were identified, synthesized and/or extracted in extenso (verbatim), and recorded in a data table cross-referencing all the interviews (in lines) with all the themes and sub-themes (in columns). The three analysts' work was then compared to confirm the features and arguments identified, a prerequisite for overall interpretation.

4. Results

Our objective was to identify salient dimensions of the social representations of the coast, and the importance given to risks. This section highlights the main findings from the interviews, that can be summarized in four themes: a beach-centred discourse; a concern for coastal risks dominated by erosion; a predominantly *business-as-usual* view of coastal area management; and a structural adaptation of the coast largely ignored. It provides statistics and verbatim, referred by their code by province (AM: Alpes-Maritimes; BdR: Bouches-du-Rhône; VR: Var) and complemented in Appendix 3.

4.1. Beach-centered discourse dominated by the vocabulary of development

4.1.1. Beaches and urban development

Text statistics show that of the 2871 nouns and 1013 adjectives in the corpus, the word "beach" is the most frequently used (Fig. 4). It appears 692 times, ahead of "coast" (n: 672) and "municipality" (n: 621). This very high use of "beach" is remarkable because, although statements on beaches were expected, no heading or question in the interview guide referred to it (unlike the words "coast" and "municipality").

Interviews are also strongly marked by the vocabulary of territorial planning and management. Among the 100 most frequent forms in the corpus (Fig. 4), words connected to this theme rank high: project (rank 10), space (12), development (18), study (26), management (27), urban planning (34), territory (35). This finding is not surprising, since our interviewees have responsibilities in spatial management and planning at local level and commonly use words related to public action in the territories. However, no specific field of intervention or theme emerges from their statements, with the notable exception of urban development. In other words, asked to discuss the coast and their municipality in terms of specific features and challenges for the future, particularly in relation to climate change, they show a clear concern both for urban planning and for territorial management and enhancement through buildings.

4.1.2. Beaches at the heart of the discourse

The centrality of "beach" in the interviews is confirmed by the similarity analysis. In Fig. 5, each word is linked to the word with which it is most frequently associated in the interviews. The more a word is linked to others, either directly or indirectly, the more significant it is in the corpus. Clearly, "beach" occupies a pivotal position, between a semantic universe around "sea" and another around "coast" and "municipality", a

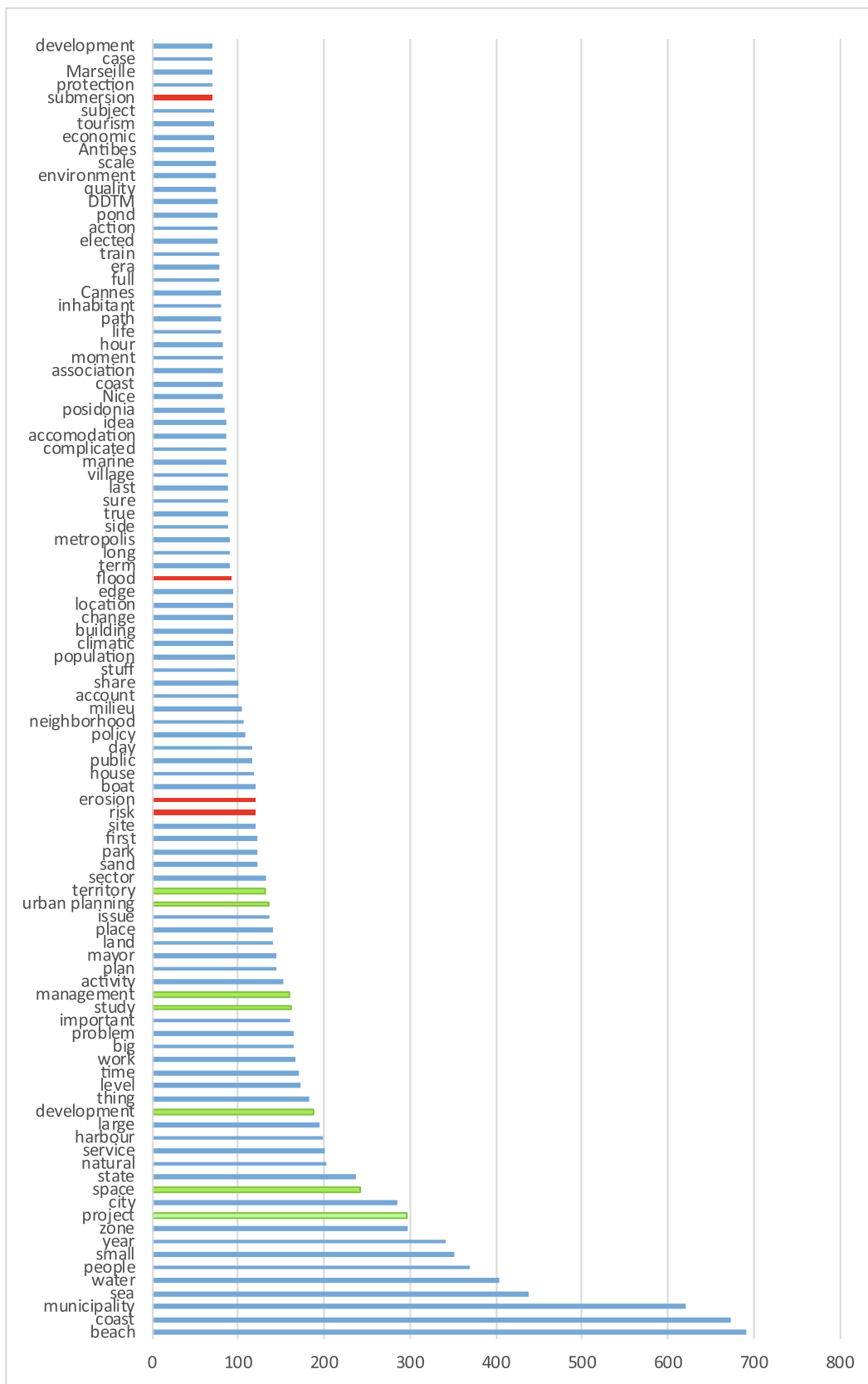


Fig. 4. Frequency of words (nouns and adjectives) used more than 100 times. Words listed from the most used (bottom of the graph) to the least used (top). In red: Words referring to risks. In green: Words referring to territorial management and development.

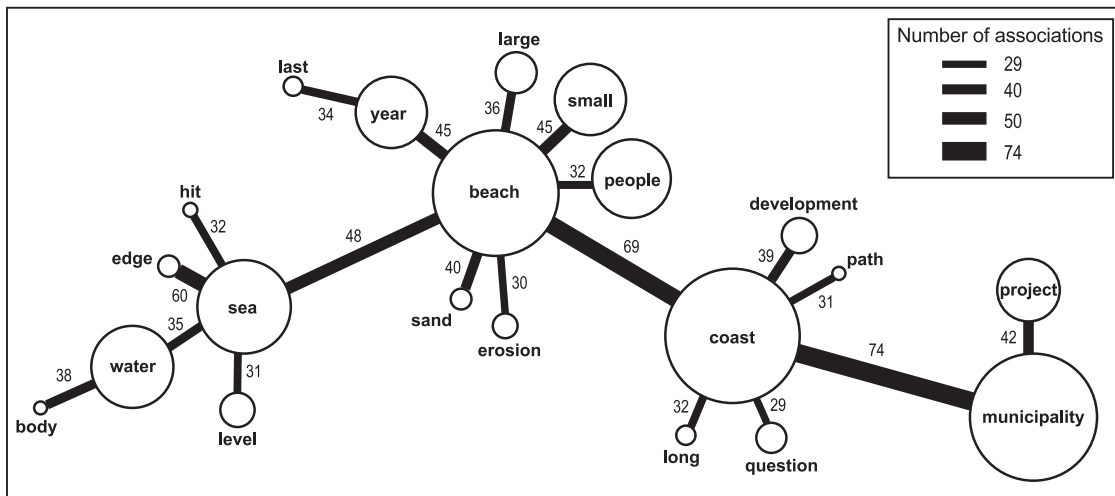


Fig. 5. Maximum link tree (above 29). Each word is linked with the word with which it is most associated in the corpus. Each word is represented by a circle proportional to its frequency. Only links exceeding 29 (the number of interviewees) are represented.

logical position since beaches are an interface between land and sea. Note also that the terms evoking coastal risks are related to sea-based hazards (“hit” of the “sea”; “level” of the rising “sea”), and mainly affect “beaches” (suggested by “erosion” and “sand”). Finally, public action for the management of the coastal territory, including risk management, is represented by the links between “planning” and “coast” and between “project” and “municipality”.

Fig. 6 represents all the relations between words above a threshold adopted for ease of interpretation. It shows that the central core of the discourse, in the structural analysis sense of social representations (Abrieu, 1993), concerns the triptych “beach-coast-municipality”, the words most frequently used and associated. This finding confirms the

beach as a major element of the representation of the coastal zone, since “coast” and “municipality” are words of general scope. In other words, when interviewees evoke the coastal zone in their municipality, they mainly and frequently talk about “beaches”. More mention could have been expected of « harbour », a word appearing 198 times (Fig. 4) and which refers to a very noticeable coastal feature. The words “sea” and “year” are the most important elements of the periphery of the central core, as they are linked to each of the three words that make up the core, which means that they influence it and can make it evolve. The interviewees appear to consider that the sea has an influence on the beaches, on the coastline as a whole, and even on entire municipalities. It contributes to the coast’s attractiveness, but also to its vulnerability

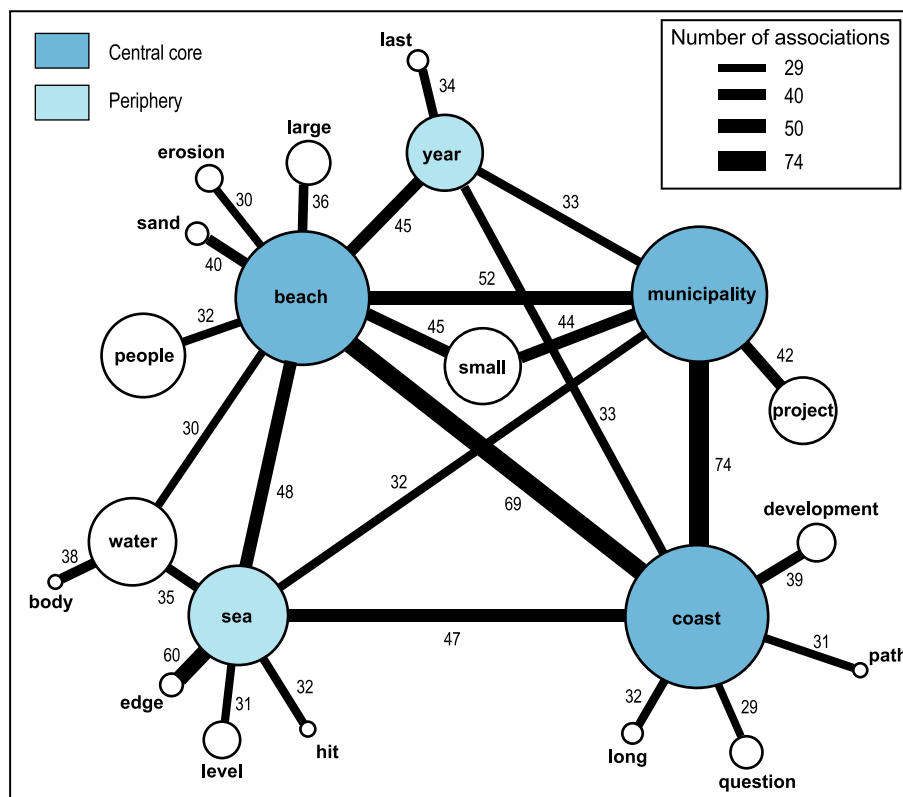


Fig. 6. Associations between words in the corpus. Each word is represented by a circle proportional to its frequency. All links exceeding 29 (the number of interviewees) are represented.

due to hydro-climatic risks and sea-level rise. The word “year” evokes time, the chronological dimension and the evolving nature of each element of the central core. For example, the beach erodes and could disappear, but it is maintained every “year”, notably by adding “sand”.

4.2. A concern for risks mainly formulated around erosion

The words “risk” (n: 121), “erosion” (n: 120), “flooding” (n: 92) and “submersion” (n: 71) are the 41st, 42nd, 59th and 96th most employed (Fig. 4). Coastal risks thus appear a secondary concern in the interviews, but not necessarily minor, as the issue is also evoked through other terms like “beach”, “development”, “problem” or “issue”.

4.2.1. Strong discourse on beach erosion

A particular recurring concern is beach erosion. This phenomenon is the most frequently mentioned risk (Fig. 7), with the vast majority of interviewees mentioning it in relation to beaches and secondarily to the coast as a whole: “The beach is not that wide, I’ve known it to be wider” [AM #1]. Comments generally reflect concerns about beach regression, which endangers the seaside economy: “I know very well that beaches are our treasure. Tourism is essential in our economy, and 90% of it is based on sand” [VR #1]. Accordingly, fears about their disappearance are clearly expressed: “Erosion is a very, very big fear for the future, yes” [BdR #2].

4.2.2. A precise and sometimes dramatic evocation of river flooding

Interviews also frequently mention river flooding. Associated with marine submersion, as revealed by the quantitative treatment (Fig. 8), the risk of flooding is evoked by specific events engraved in memory: “I’m telling you, the [watercourse], I saw it change, from 10 cm of water over 1 m wide, to the equivalent of the Rhône in 2 h. And remember, the Rhone is a 60 m wide river with a 5–6 m depth and huge force! Caravans and trees were passing by ... in front of my house I could see trees falling...” [AM #3]. Often, floods are evoked, stressing their remarkable and destructive intensity: “We had 20 deaths, and more than 800 million euros worth of damage to professional activities. It was a big issue. So that was the floods” [AM #4].

4.2.3. Relative under-reporting of sea-level rise and sea flooding

Sea flooding is the least mentioned risk. However, it is perceived as a problem that can affect the coast (Fig. 9). Some interviewees note the increased frequency of sea flooding: “There, we had surges, submersion hazards (...) Usually, we had maybe one or two per year and still..., extreme events every two, three years... and there we had six in the winter” [VR #8]. Also, surges and sea flooding are mentioned in connection with the increasing frequency and intensity of storms: “Our main concern is the

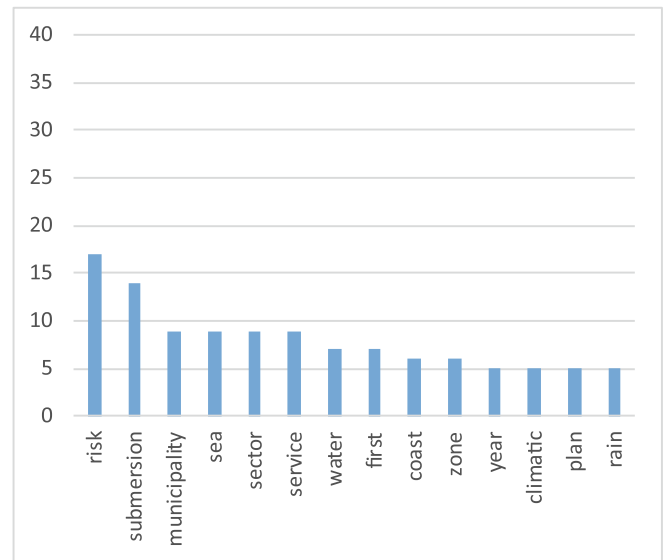


Fig. 8. Words most often associated with flooding (association: 5 or more).

east, south-east storms, which cause... Little by little, they are becoming more and more frequent. At the time, when there was one... now there are maybe 4 or 5” [BdR #4]. However, most interviewees do not consider sea-level rise a current risk. They see it in a more or less distant future, citing the key dates mentioned in international scientific reports: “Marine submersion is an insignificant issue compared to flooding. It will be a problem by 2100” [AM #4].

4.3. Coastline management dominated by business-as-usual

4.3.1. Frequent use of defence and coastal maintenance activities

Several practices and strategies regarding risks are mentioned in the interviews. Outside the restoration required following a disaster, interviewees express a frequent desire to maintain existing developments, without questioning them or evoking the option of strategic retreat. Thus, risk management through the construction of protective structures remains the dominant practice, particularly for erosion: “We would like to be able to restore these dykes later on, because it isn’t cheap” [VR #5]. In many municipalities, the management of erosion also includes constant maintenance of beach surfaces threatened by the sea. These operations (nourishment, levelling, etc.), recalling the myth of Sisyphus, can be explained by the economic importance of beaches and by their role as a

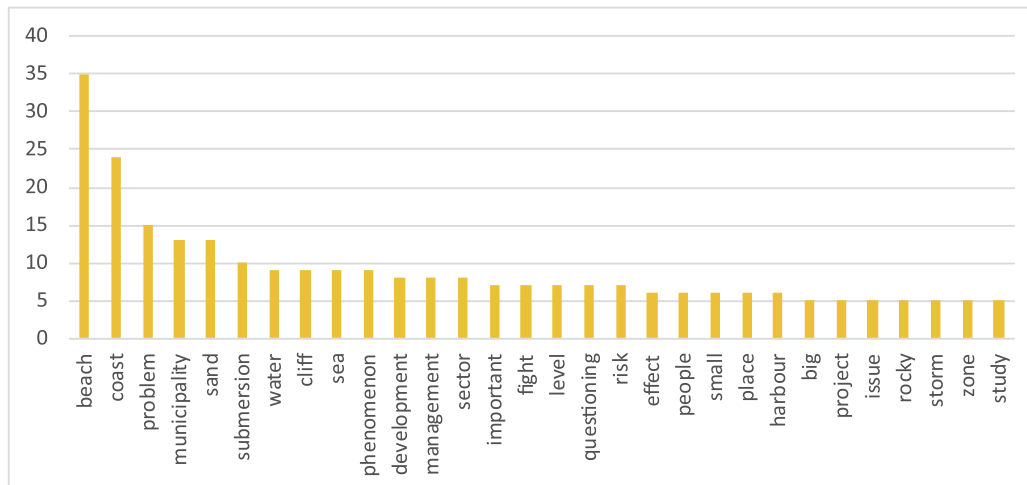


Fig. 7. Words most often associated with erosion (association: 5 or more).

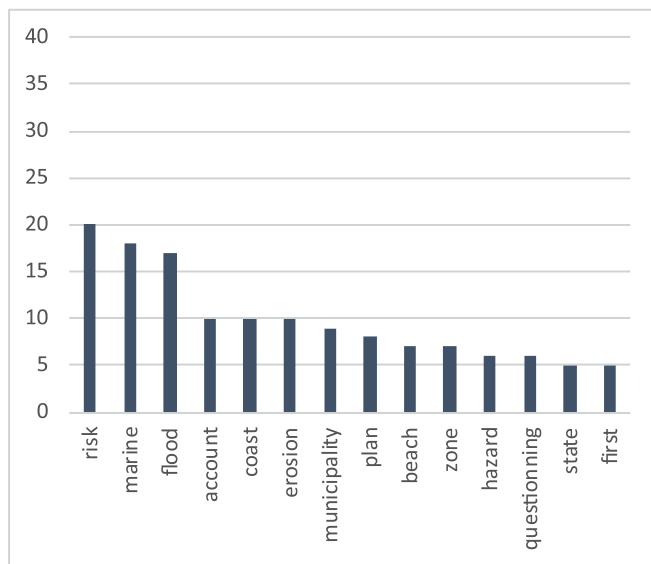


Fig. 9. Words most often associated with submersion (association: 5 or more).

protective buffer for inland areas: “Every year, we intervene on the coast. We wait until after the major weather events to try to move the coastline further away while offering a still acceptable strip of beach. So each year, it becomes more and more difficult, and requires a fairly substantial amount of sand to replenish the beach. But that also depends on yearly weather conditions” [VR #5]. More flexible management of the coastline, in line with more ecological practices, is also mentioned, such as the management of dead *Posidonia* mats: “Regarding the management of the beaches, we say that the dead *Posidonia* that are brought in during the winter are only removed in May and we let them come back from September onwards” [BdR #6].

4.3.2. A few references to disengagement and strategic retreat

Although maintaining coastal development in its current form seems the main objective, a few interviewees consider that strategic retreat operations will probably be necessary. They mention prospects for spatial recomposition and cite examples of adaptation corresponding to a withdrawal from the coast, a reduction in developments that will have to be accepted sooner or later: “Limiting construction on the water’s edge, that I think we’ll have to do, maybe even prohibit it. Too bad if some people lose a boat garage...” [VR #4]. The main argument is sea level rise and the increased frequency of river and sea flooding: “There will be no miracle solution to cope with rising water levels. We will have to relocate in any case. But it’s true that today we’re looking at a horizon that is still far off, so it’s difficult for the population to take it into account” [VR #9].

4.3.3. A persistent conquering spirit and pro-development attitude

The prospect of sea level rise does not, however, prevent the persistence of a desire to develop the coast for economic reasons. This thought is expressed both in less touristy and more famous towns that intend to remain attractive: “We have a magnificent coast, but it is under-exploited. [...] That is why our town planning document has evolved and we have moved into a zone where urbanization can be carried out with activities linked to tourism, whether it be hotels, restaurants or various businesses” [BdR #7]. In other words, the coast remains the municipalities’ showcase. Accordingly, it must be developed or redeveloped to remain attractive, while ensuring that developments are environmentally friendly: “Here, we are going to carry out a riprap project to preserve the smooth slope of the beach, maintain the supporting wall, and develop something that fits into the environment” [VR #5]. Comments are made in a positive and convincing way, not considering coastal risks nor climate change, which however are discussed elsewhere.

4.4. A future largely ignoring structural adaptation of the coast

4.4.1. Prevalence of barriers to adaptation

Overall, interviewees have difficulty imagining a more structural adaptation to climate change effects on the coast. Though this phenomenon is perceived, the implementation of adaptation measures, particularly to sea level rise, appears difficult to envisage.

In some municipalities, the reliability of scientific knowledge is frequently questioned: “It’s far too early. It’s just scientists’ forecasts, well the media, and then scientists who want to issue warnings. But well... In reality, they themselves know nothing about it” [VR #7]. In others, the lack of financial means to act is mentioned: “Frankly, for the moment, I can’t see myself setting up facilities to protect us from a tsunami wave or a possible sea-level rise when I don’t even have enough money to pay for a pavement” [BdR #8]. Also, adaptation seems impossible because of land constraints and existing urbanization: “It’s very complicated because everything is already fixed. It’s not like in places where, even if it’s difficult, you can move roads and campsites quite easily. Here, we would have to move the seaside boulevard and the buildings opposite” [AM #7].

Frequently, a kind of fatalism is expressed in the face of natural forces: “I don’t really see what we can do. We know very well that the sea will win” [BdR #5]. When it is mentioned, relocation raises many questions, notably the impact on inhabitants and the difficulty public authorities will have imposing it: “We’re not going to say to people: Go, go! You have settled where you shouldn’t have” [VR #8]. The economic and political aspects of relocation are also pointed out: “It’s much harder to get the population to accept it, and so in terms of political choice, it’s complicated. Especially since these are places where real estate is very, very expensive” [VR #9].

4.4.2. A few levers

However, some levers for moving toward more structural adaptation are mentioned. For example, the experience of risks; relocation is broached more easily by people who have experienced a disaster, as shown by Lemée et al. (2019): “This is also where your perception of climate change will materialize. As long as people have not had a concrete taste of it, everyone says: ‘well, yes, it’s important... sure it’s painful, but... I have to renew my boulevard, my bus, my railway arrival, my station... it’s a priority’. Once you have been hit [experienced a disaster], I can tell you that everything else becomes really optional” [AM #3].

Land availability, when it exists, is also seen by some respondents as an opportunity to be seized quickly, to initiate relocation: “I think that relocation is not going to happen overnight, if authorities decide to do it with their backs to the wall. In my opinion, we should start looking at how we can buy back the land on the hillsides...” [VR #11]. Several interviewees also think that State intervention is a key factor in initiating a genuine relocation strategy: “I believe it’s a good thing that the State authorities manage this because it’s true that it’s still a very complicated process for local elected representatives to implement” [VR #9]. Finally, insurance is also presented as a factor which, indirectly, could be decisive in future. The increasing number of disasters is increasing insurance prices, and might lead insurance companies to refuse to insure, which would have consequences on property prices and individuals’ strategies: “This would have repercussions on property prices and the strategies of individual players: [the inhabitants] are now faced with a problem, which is that the insurance companies no longer want to insure. This makes it really difficult for people to stay” [AM #3].

5. Discussion

Interviews provide very rich information on local decisions makers’ views of their territory and their consideration of the urgency of climate adaptation in the coastal areas of PACA region. Using the territory and social representations concepts as a framework, we sought to understand the logics behind their statements, and to identify any common awareness of the issue of adapting coastal territories, to explore the

feasibility of a collective response at regional level. Accordingly, three main points emerge and are discussed in this section.

5.1. Local authorities in tune with inhabitants and somewhat unambitious regarding coastal adaptation to climate change

Our findings are consistent with the well-documented challenge of adapting coastal territories to climate change, particularly in France. Actually, local authorities seem well aligned with their public and aware of their resistance to relocation (Rey-Valette et al., 2019; Rulleau and Rey-Valette, 2017). They share some of the inhabitants' doubts regarding the urgency of climate change (Birchall, 2020; Bowden et al., 2019), and also share a certain fatalism (Bertoldo et al., 2021) as well as some contradictions in their perception of the phenomenon (Hellequin et al., 2013; Krien and Michel-Guillou, 2014; Rulleau et al., 2015). Their statements, which hardly advocate the implementation of strong adaptation measures in their territories, also reflect the scarcity of regulatory provisions in local town planning documents on the coast of PACA (Robert and Schleyer-Lindenman, 2021). Thus, contrary to what might be expected, local authorities are reluctant to initiate coastal management that challenges decades-long practice: no abandonment of dykes or riprap, no reduction in economic activity close to the shoreline, and especially no strategic retreat. The interviews, which gave participants the opportunity to demonstrate a particular sensitivity to this issue as well as inventiveness and a desire to address the challenges, reveals instead a rather *wait-and-see* attitude almost *business-as-usual* because of the persistent commitment to maintaining the level of economic and social development of their municipalities. Logically enough, interviewees made no reference to the regional policy for adapting the coast to climate change and coastal risks, only in its initial phase at the time of the interviews. On the "adaptation-resistance" gradient proposed by Cooper and Pile (2013), they lean more toward the side of resistance to climate change, due to their preference for maintaining existing activities and infrastructures, rather than toward adaptation, which implies a change in the way coastal space is occupied and developed and the future of the municipality is envisaged.

5.2. Development, place identity, and territorial inertia

In line with the previous point, our findings show that adapting the coastal territory to climate change is not yet on the agenda because it runs counter to the dominant territorial development paradigm. The coast and the sea, tremendous assets for the tourism and residential economy, cannot be considered as a resource not suitable for development, as already shown in Brittany (France) by Krien and Michel-Guillou (2014), for example. The people we met always discussed the future of their territory without envisaging any major change from the current situation. Although erosion affecting beaches is seen as an issue, it is not a major concern because it has been managed for many years, allowing the area to remain attractive and not to suffer a drop in property prices, as Hein et al. (2019) found on the Queensland coast (Australia). According to some interviewees, the coast should continue to be developed to attract visitors, and because urban development contributes to local development (Grandclément and Boulay, 2015; Robert et al., 2015; Robert et al., 2019). However, anchoring local development as close to the shore as possible limits adaptation and relocation policies, as shown by Gibbs (2013). The accumulation of developments, infrastructures, and populations over time makes it more difficult and more expensive to move them.

What makes it even harder for our interviewees to imagine an alternative mode of management and development is their role as leaders representing a decades-long territorial identity based on tourism and the leisure economy, nearly a century and a half for the Côte d'Azur (Boyer, 2002). As research on place identity has shown (Peng et al., 2020), local decision makers' identity includes the identity of their territory, which is deeply linked to internationally valued landscapes

and towns, whose seaside boulevards and promenades, beaches and prestigious seafront buildings are highly renowned. It is therefore difficult for them to think of their territory without beaches, a seaside economy, holiday resorts, and all the festivities and cultural events that take place on the coast (Nice with its Promenade des Anglais, its beach, and its carnival; Cannes with its boulevard de la Croisette, its prestigious international film festival). In addition to economic considerations, their inability to address relocation or coastal adaptation is grounded in territorial identity.

All this confirms the many obstacles to adaptation to climate change already documented (Adger et al., 2009) and which contribute to a form of territorial inertia, i.e. a tendency to change nothing, to keep the territory on the same development trajectory. The coastal municipalities of PACA are deeply dependent on their seaside due to development patterns, their population's age and size, and a particularly coastal economic, cultural, and social life. Local stakeholders, especially elected representatives, appear incapable of changing their paradigm of management and development of the coast. Although aware of climate change effects on the coast, most cannot envisage relocation away from the coastline, since this runs counter to what they consider the identity of their territory (Belanche et al., 2017).

5.3. Generational effect in the representation of risk and adaptation

Although territorial inertia seems to explain why the people we met had difficulty considering a structural adaptation of the coast to climate change, this situation should not be seen as immutable. Interviewees' comments on the coast and the question of risks differ depending on age category (Fig. 10). Thus, talking about their coastal territory, the youngest (aged 20–40, 7 people) mainly use the word "municipality", far ahead of "coast" and even more ahead of "beach". Conversely, the oldest (over 60, 9 people) put "beach" in first place, clearly ahead of "municipality". In an intermediate position, the 40–60 group (13 people) put "coast" in first place ahead of "beach", while "municipality" lags behind. This suggests an age-related prism regarding the representation of the coastal territory: the youngest think of it somewhat as a whole, whereas their elders' perception tends to focus on the beach.

Risks are discussed more often by the youngest interviewees, who frequently cite sea flooding far ahead of "flooding", and even more ahead of "erosion". This result echoes the work of Besel et al. (2017), who showed that young adults tend to display a "green" posture when talking about climate change and the associated risks. It is also in line with the survey conducted by Rulleau et al. (2015) in Languedoc-Roussillon, France, where the youngest populations were found to be the most sensitive to marine submersion. The 40–60-year-old mention risks less, except for "erosion" in connection with "beaches". For this age group, representations are more structured by the triptych "beach-coast-municipality", with "coast" clearly central. The over-60 s place "beach" in central position and "erosion" is the risk most frequently mentioned. This age group perceives coastal risks exclusively through beaches, almost without considering coastal adaptation to climate change.

Thus, the social representations of the coastal territory and the risks associated with climate change differ according to age. The beach-centered vision of the older interviewees contrasts with a more across-the-board representation by the younger ones, who are more aware of the plurality of risks. We can therefore hypothesize a generational effect, and suggest that stakeholders' (particularly technical agents') professional training on the issues plays a role. Younger people are better trained and more sensitive to environmental issues, sustainable development, and the principles of integrated management, because these issues which are well discussed in society since the 90' permeated a lot their scholarship and formative years. The older generation have inherited a sectoral approach to public affairs and may be more sensitive to the social and cultural symbolism of the beach. As the younger generation acquires increasing responsibility, we might in future see a gradual weakening of the territorial inertia that is currently holding

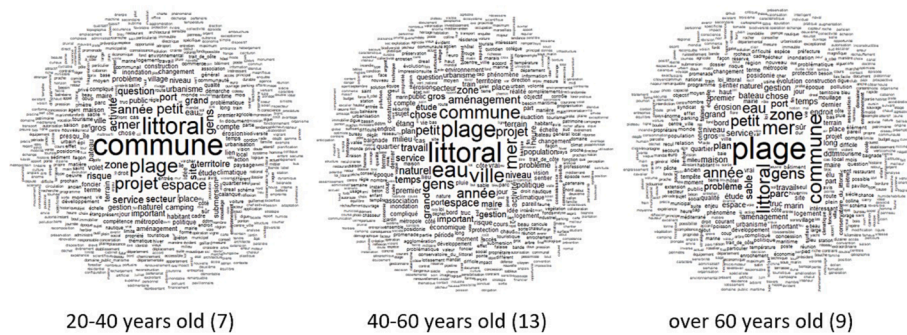


Fig. 10. Clouds of most quoted words (in French) by age.

back the region's commitment to a more ambitious policy of coastal adaptation, especially as the environmental changes already underway will continue.

6. Conclusion

Increasingly spotlighted by the media, climate change needs to be anticipated in terms of land-use planning. On the coast, however, this objective is challenging, as envisaging future sea-level rise and coastal risks remains difficult for decision-makers. Furthermore, if climate adaptation policymaking is a process involving different levels of governance, it is worth looking closely at what is developed at the local level. For the Provence-Alpes-Côte d'Azur region, France, we confirm this by highlighting the relative inaction by local officials, while the French State pushes for the design of regional strategies for coastal adaptation. We show that this is attributable to territorial inertia, a phenomenon which may be observed in other tourist-oriented coastal areas in the world.

In detail, we have highlighted the persistence of an urban development paradigm. Local stakeholders want to preserve the attractiveness of the region's coastal zone, the foundation of a powerful residential economy. While the coastal risks under climate change are not ignored, they are either considered manageable through technical means (for erosion and flooding), or difficult to perceive because not personally experienced or even contested (for marine submersion and sea level rise). As a symbol of coastal attractiveness, the beach is the main medium of discourse on coastal risks, principally considering erosion. Subject to Mediterranean rain episodes, the region's coast is also considered vulnerable to rapid flooding, which can be destructive and deadly. But coastal risks are never mentioned in a more general reflection on the territory's adaptation to climate change. Accordingly, despite a State-initiated regional strategy on adaptation now being implemented in collaboration with the Regional Council, local authorities are still largely adopting a *wait-and-see* position. Consequently, the main added-value of this study is that it shows that the way local stakeholders view their territory, climate change and the future of the coast deserve closer attention when promoting climate change adaptation. In particular, it is important not to underestimate some local authorities' resistance to change, which may lead to scenarios for maintaining developments in situ.

In addition to pointing out this absence of a paradigm shift in the current management of coastal areas, the study also reveals that changes are possible. The youngest interviewees appear better informed and more sensitive on risks and climate change. They are the ones who most emphasize the need for action, although they have trouble choosing solutions. For social scientists, a follow-up study in a few years (5 to 10 for example) with the same municipalities would then be relevant to track a possible change of representations. Also, for policy makers, this finding suggests the need to strengthen efforts to raise awareness of climate change on the coast, and to create communities of stakeholders facing this challenge, with a view to sharing experiences and developing

collective responses. The *Mon Littoral Provence-Côte d'Azur* initiative (<http://www.monlittoral.fr/>), driven by the State and now supported by the Regional Council, is likely to meet this challenge.

Finally, the study demonstrates the benefit of combining a territorial approach and a social representations perspective to assess the implementation of climate adaptation policy locally. We show the relevance of assessing local climate action through interviews with municipal decision makers, following a sound protocol. Through a sampling strategy aimed at taking into consideration the variety of the coastal municipalities in the region, and by combining text statistics and qualitative analysis, we were able to reveal the salient points in the social representations of the coast, of climate change and coastal risks, and clearly illustrate them. We recommend this transferable method prior to a quantitative assessment of climate action on any territory.

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CRedit authorship contribution statement

Samuel Robert: Conceptualization, Methodology, Validation, Investigation, Data curation, Formal analysis, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration, Funding acquisition. **Axel Quercy:** Investigation, Data curation, Formal analysis. **Alexandra Schleyer-Lindenmann:** Conceptualization, Methodology, Formal analysis, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.gloenvcha.2023.102702>.

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