

Change in the way we live and plan the coast: stakeholders discussions on future scenarios and adaptation strategies



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ABSTRACT

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A scenario of increased risks due to climate change and coastal erosion, coupled with a stringent economic recession, is threatening the Portuguese coast. Three particular locations are the focus of CHANGE – Changing Coasts, Changing Climate, Changing Communities, a 3-year study (2010-2013) that aims to understand social perceptions about coastal risks and to examine new ways of adaptive management. The project involved assessing peoples' representations about the coastal present and possible coastal futures and discussed coastal change with local populations, in a country in which the protection of vulnerable coast to date has had little public involvement. The three coastal stretches studied face increasing coastal risks and the perspective of reduced public spending, fuelling uncertainty about their future. Public participation in coastal management has been almost entirely absent, which makes the social science based contribution of this research even more relevant. This research combines: a) scientific assessments on the past and future evolution of the shoreline, taking into account the impacts of climate change; b) interviews with policy-makers, coastal experts and stakeholders, as well as local public opinion surveys; c) the outputs of a model for coastal governance and community building, based on local discussions through focus groups and workshops. This paper is based on the surveys and focus groups undertaken in the case-study area most at risk from coastal change, Vagueira. We conclude that there is a growing perception of coastal threat and potential for the development of adaptive coastal management, taking advantage of local knowledge and initiative.

ADDITIONAL INDEX WORDS: *Coastal changes, climate scenarios, coastal communities, focus groups, Vagueira.*

INTRODUCTION

Portuguese coasts are currently facing significant challenges. In the last few decades, large stretches of coast have been swallowed by erosion and advancing sea, with a tendency to worsen due to the impacts of climate change, namely sea level rise. Coastal populations are particularly vulnerable, since their homes and livelihoods are increasingly exposed to these risks, with important impacts on local economies. Given the current recession of the Portuguese economy and the perspectives for a more conditional delivery of EU funds in the future, the development of more adaptive and inclusive models of coastal governance becomes crucial. With this in mind, three coastal stretches were selected as case studies within the research project in which this paper is based - Central, Lisbon and Southern regions of Portugal (see Figure 1). They have in common their fast and recent urban occupation, as well as their vulnerability, and may be taken as an

example of the coastal changes occurring throughout the country.

While acknowledging the importance of understanding people's perception about coastal risks and the historical causes that have led to the current situation, in this particular paper we will focus on the future of the Portuguese coasts through the lens of the case study area – the coastal stretch South to Aveiro harbour (Vagueira) - in which the situation is most critical, according to recent research (Alves *et al.*, 2011), and where adaptation measures will become more important in the short and medium term. Table 1 characterises this study area.

Our purpose with this paper is to demonstrate that stakeholders not only understand coastal changes, their multiple causes and that they are concerned about the future. Residents are also capable of proposing solutions and forms of adaptation to the impacts of coastal erosion and climate change. In doing this, we will also try to illustrate how these forms of adaptation and solutions for the future are associated with certain views and conceptualizations of the coast. To fulfil these objectives we combine two types of methodologies. To describe the views of local populations about coastal risks, we use the results of a quantitative survey. In order

to assess views about landscape evolution, the future of these coasts and the solutions people propose to tackle and to adapt to coastal change, we also analyse the content of a set of focus groups conducted with key stakeholders in the area. These sessions included the presentation of future flooding scenarios on different time horizons, following the methodology described in Vargas *et al.* 2012.

SETTING THE SCENE

Climate change, namely impacts such as sea level rise, more frequent storms and coastal floods (Nicholls *et al.*, 2007) - combined with decades of urban, economic and tourism growth on coastal zones - have increased public concern over social impacts of coastal retreat and flooding. To cope with this, the first IPCC report describes three main strategies that may be developed - retreat, accommodation or protection (IPCC, 1990). Each of these options demands an effective involvement by coastal communities, especially those entailing the relocation of houses, public services and businesses (Tompkins, 2008; Schmidt *et al.*, 2012).

Over the last couple of decades, public policies and also the literature on adaptive capacity, resilience and climate adaptation strategies have been increasing. Adaptive capacity, management and governance are concepts applied to coastal adaptation (Adger *et al.*, 2009; O'Riordan and Nicholson-Cole, 2010). Recent research on the engagement of stakeholders in adaptation strategies (Tompkins 2008; Lorenzoni and Hulme, 2009) assessed stakeholders' views on possible measures through the discussion of future scenarios. Although stimulating reflection on the risks faced, the discussion of future scenarios does not necessarily lead to direct action or the formulation of new attitudes.

Studies being undertaken all over the world stress the importance of carefully assessing the diversity of factors, including political, cultural or even religious - influencing the willingness of stakeholders to be involved in coastal adaptation strategies (Barnett and Adger, 2007; Tompkins, 2008; Sales, 2009). Mustelin *et al.* (2010), who studied the local adaptation strategies of coastal communities in Zanzibar, also found that stakeholders' preferences for different options are directly related to their past experiences and carry different values.

Research on stakeholders' visions for the future and local knowledge on adaptation practices has mainly been undertaken in developing countries such as Bangladesh (Mallik *et al.*, 2009), Tanzania (Mustelin *et al.*, 2010) or the Philippines (Sales, 2009). The latter is one of the rare examples in which the three IPCC adaptation options have been directly applied to the discussion and analysis of stakeholders' preferences regarding coastal adaptation.

In Europe, where top-down approaches to coastal management have been developed for decades, and Integrated Coastal Zone Management (ICZM) program is addressing coastal governance issues (O'Riordan and Nicholson-Cole, 2010; Adger *et al.*, 2009), there is a consistent body of literature on coastal adaptation and management. However, there is still a need for further research on local adaptation practices and knowledge (Delicado *et al.*, 2012).

In Portugal, despite having one of the European coasts most threatened by the impacts of climate change - due to sea level rise and other impacts such as shifts in wave direction (Santos and Miranda, 2006) - public participation in coastal policies has been weak, an issue widely recognized in the literature (Lopes-Alves and Ferreira, 2004; Veloso-Gomes, 2007; Schmidt *et al.*, 2013).

The contribution of social sciences to coastal adaptation participative strategies in Portugal is still embryonic. Recently, there have been some studies trying to capture the perceptions of



Figure 1. The case study area corresponds to a 10 km coastal stretch located South to Aveiro harbour (270 km from Lisbon)

local residents on coastal hazards (Martins *et al.*, 2009) and a number of research projects that are being carried out on Portuguese coastal zones include workshops with local communities. But most of this work is only beginning as fieldwork and little is designed through a comprehensive social sciences perspective. While the costs of coastal defence increase, there is a gap of knowledge on possible future financing arrangements (Schmidt *et al.*, 2013), as well as on the willingness of local communities to be involved in financing.

A full process of participatory coastal adaptation - which takes into account the impacts of climate change, the need for alternative management strategies, assessing and taking appropriate advantage of the local adaptation practices and knowledge - is still not in place. CHANGE - Changing Coasts, Changing Climate, Changing Communities (2010-2013) - project supported by the Portuguese Foundation for Science and Technology (PTDC/CS-SOC/100376/2008) - aims to contribute to the fulfilment of those objectives, through an integrated approach linking social and natural sciences. This is sought through collaboration between two teams, from the Institute of Social Sciences and the Faculty of Sciences (University of Lisbon). The latter created the susceptibility maps for the focus group discussions described in this paper (figure 4).

METHODS

We based our empirical work on two types of methodologies: a qualitative methodology drawing on the results of a set of focus groups with stakeholders in Vagueira; and a quantitative approach, consisting on the analysis of a local survey conducted to a representative sample. Both methods benefited from 20 exploratory semi-structured interviews to local stakeholders conducted earlier in the project. The results of the interviews and the survey informed the design of the focus group discussions.

For a characterization of the opinions and perceptions of the populations in Vagueira we used a door-to-door **personal survey**, conducted during August and September 2011 (N=210). We used a quota type sampling method, representing the universe of the residents (owners or tenants) and non-residents (seasonal

Location and geomorphology	Coastal erosion rates and defence structures
- On the north-western coast, south of the Aveiro Port. - Low coastal plains, with extensive sandy beaches. - Vagueira is located between the sea and a lagoon, important to the sediment equilibrium of this fragile area.	- Groynes built in Costa Nova in the 70s caused increased erosion on this stretch; groynes and seawall built in Vagueira in 1984. - During the 1980s the retreat rates were 10 to 15 m/yr. - New seawall built in 1995; two groynes replaced in 2006.
Brief historical approach	Settlement and demography
The history of this coastal area is interlinked with the history of the port, which influences both the coastal geomorphology and economic dynamics. The huge infrastructure of the port is generally considered an important factor influencing erosion on the beaches further south, namely Vagueira.	Three distinct settlements in this study area – Barra; Costa Nova do Prado and Vagueira. Part of the buildings in Vagueira is below the sea level. All this coastal stretch has 24626 inhabitants and 16604 dwellings; in the parish of Gafanha da Boa-Hora (includes Vagueira) second homes (1930 dwellings) almost double the number of permanent residencies (953).

Table 1. Characterisation of the study area – coastal stretch Barra-Vagueira (Central Region)

homeowners, business premises or other firms) of the study area. The quotas related to age, gender, length of residence, and proximity from the seashore. The data collected were inserted and analysed using the statistical software SPSS (version 20).

On a more qualitative stance, we examined the content of a set of **focus group** discussions conducted in Vagueira (July, 2012). The participants were selected based on their interests on the coast and were clustered in three different groups: Administration (with local, regional and national authorities), Local businesses (local actors with economic stakes on the coast, restaurant and hotel owners, businesses associations) and Community (interested people rooted in the coastal zone, local associations, fishermen, and surfers). Each group had between 7 and 9 participants and discussions lasted between two and a half and three hours. As Collier and Scott (2010) point out, these group discussions can help identify potential participants for addressing planning reforms and adaptive coastal change. The protocol was the same for the three groups and discussions had three distinct moments: (1) the past and landscape evolution, (2) the current situation where participants discussed interventions, coastal management, participation, science and communication, and (3) a last section where, departing from the presentation of flooding scenarios in three different time horizons (2025, 2050 and 2100 years), participants discussed the future of their coastal area and adaptation strategies. The content of the discussions was fully transcribed and analysed through NVivo10.

RESULTS AND DISCUSSION

Views of the population

Our survey results show there is widespread awareness of coastal erosion in Vagueira. 70% of the population considers it a serious problem that is going to get worse in the future, and 41% think it is already affecting local communities (Figure 2).

Not only people are well aware of the seriousness of the situation, but they have also formed solid opinions about the causes of coastal erosion and advancing sea. Almost 50% of respondents refer to natural causes in general, followed by climate change impacts. All other aspects mentioned are anthropogenic causes, especially sand extraction.

Knowledge about the solutions that have been adopted to stall erosion and protect the coast is also widespread (57% of respondents). Hard defences such as seawalls and groynes are considered more effective (38% and 32% think these interventions were effective or very effective, respectively), than softer interventions such as artificial dunes (26%), relocations (20%) and sand nourishments (14%), but overall results show interventions are not perceived as very effective.

When confronted with the future, it comes as no surprise that the population in Vagueira is entirely favourable to coastal protection (Figure 3). Over 90% consider that it is important or very important to keep the coastline exactly where it is now and to protect it at all cost. For more than a half of respondents, the State should remain the only responsible for these costs (53%). Even

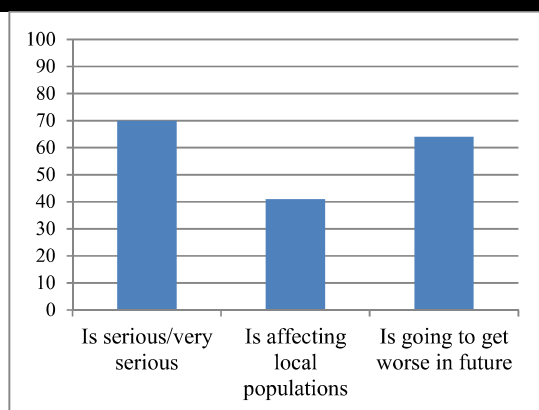


Figure 2. Perceptions of coastal erosion in Vagueira (%)

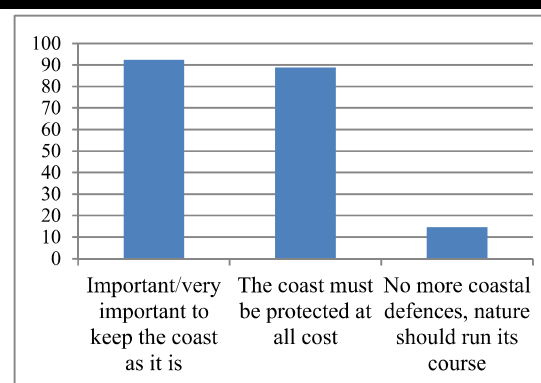


Figure 3. Opinion regarding coastal protection (%)

though 42% consider the State has not been able, to date, to properly manage the problems of their coastal zones.

Stakeholder views: focus group discussions

Coastal changes: landscape evolution and current situation

Although discussions followed an open and free-flowing format, the moderator led the conversation using a chronological order, starting from past events and bringing up the reflections of participants about the coast. Most people, in all three groups, have a memory of a different landscape, with wider beaches and traditional activities, like fishing:

"In my memory I have the extensive sandy beach in Vagueira, with the Xávega fishing, first with the bulls and then with tractors." (FG Local businesses)

Discussions also brought up memories of storm events and narrowing beaches:

"North of the Mira beach, in the fishermen area, in just a few days the sea advanced into the land, even in the summer." (FG Administration)

"After 1980 our beaches started to disappear. After the sand extraction the coast started to retreat in Vagueira and Costa Nova. Since then it hasn't stop disappearing." (FG Community)

As the survey results had also shown, community stakeholders understand the causes of beach loss and coastal erosion, but they also talk about the inability of coastal authorities to solve these problems and manage the coast, an opinion somewhat shared by some members of the local administration that complain about the high number of authorities that rule the coast and the overlapping responsibilities:

"What we see is lack of land use planning..." (FG Community)

"It has been a plethora of bodies that intervene (...). It has not been easy. I am municipal officer. It is also important to have

access to the best technical information to help technicians and decision makers. Sometimes there is little access to information that leads to decisions." (FG Administration)

The lack of scientific data, or rather the failure of getting adequate access to pertinent information, is admittedly a problem which many local authorities face. Nevertheless, most stakeholders in administration, business and community groups recognized the significance of science and the role of scientists as being very important. Yet, most also admit that there is a disconnection between scientific results and decisions made by authorities. Communication of science is also seen as crucial and some members of the administration highlight the importance of adequately targeting information to different audiences:

"I think there is no dialogue between science and implementation. Basically there are lots of studies on practically everything and very little is done. You have to go to practice." (FG Business)

"It would be important to convert scientific studies to messages and images relevant to the general population." (FG Administration)

But efforts to communicate with the public and involve all stakeholders in decisions rarely take place and authorities tend to consider that citizens lack civic culture.

"There is passivity. If we put up a notice convening for a meeting but don't take the meeting to the people themselves, they don't show up. People today have several forums to participate, the forums are everywhere." (FG Administration)

On the other hand, community groups reports difficulties and blockages regarding access to information and participation in decisions.

"People haven't participated. When the public debate comes - which is mandatory by law - not everyone has access to documents; often these documents are inaccessible in terms of

	FG Administration	FG Business	FG Community
Planned Retreat	"Tomorrow if we need to retreat the costs will be higher than today." (port admin.); "There is a set of actions that have been discussed for 20 years like the retreat of the existing settlement. How do we implement this in practice?" (regional administration)	"One of the scenarios being equated in the North (...) is the retreat of populations, it is not excluded. Here we still don't talk about it." (beach concessionaire) "Nobody will be able to retreat, in case the adequate protection is not guaranteed" (restaurant owner)	"Retreating has costs (...). I think this is an asset that has to be protected." (farmer)
Accommodation	"While we do not assume that we need a larger protection zone (without construction), <i>non aeficandi</i> areas, we can't guarantee the protection of the population." (regional administration)		
Protection	Hard "All building and activities must be protected." (local authority); "The sea is coming, that is for sure. We need to discuss coastal defence works, not beach defence." (port administration) "Building dykes, reinforce and maintain groynes, sand dredging" (port administration) Soft "I defend dune protection" (local author.)	Hard "We could build detached breakwaters and we would still have a view and a better protection." (beach concessionaire) Soft "If they do a by-pass, transporting sand from north to south, if they don't sell the sand and if the sand dredged is put on the tidal zone I'm convinced we won't have any problems." (business owner)	Hard "...the only solution is to put stone...build dykes like the Netherlands did..."; "Retreat can cost a lot more. We could build a groyne from North to South to safeguard our houses." (fishermen) Soft "In my properties I have a green dune. I planted vegetation to sustain the dunes (...). In some areas the dune has increased 3m. I got letters from the Ministry of Environment with 25,000 Euros fines..." (farmer)

Table 2. Adaptation measures mentioned by stakeholders in the three focus group discussions in Vagueira.

comprehension,(...) finally they conduct the meeting, but decisions are made in their offices.” (FG Business)

“I have a desire to physically participate, so things can change, but...” (FG Community)

Future: coastal views, scenarios and forms of adaptation

In the final section of the focus groups discussions a presentation of future climate scenarios for the Vagueira coastal area was delivered to each group. This intended to set the stage for a more in-depth discussion about the future of the coastal area and the kinds of solutions that can be implemented.

Perhaps contrary to what was originally expected by the research team, most of the participants were not shocked or upset upon the presentation of the scenarios that hypothesize the complete inundation of the Vagueira urban area in 2100 (or earlier, depending on a combination of storminess, storm surges and future sea level rise). Especially in the community and local business groups, people did not seem surprised with these scenarios and some participants, like fishermen – particularly knowledgeable about the sea – some farmers and local business owners, even stated such situations could happen much earlier considering the vulnerability of some stretches.

“If that wall breaks open it’s the end of Vagueira!” (FG Community)

“Sometimes jokingly we say that those buildings in the first line will be the seawalls and groynes. Almost sure they will.” (FG Business)

“If it floods, we will all have to move inland.” (FG Community)

We witnessed a different reaction from the administration group. While accepting the scientific validity of the scenarios presented, some local authority representatives do not seem comfortable with the idea of presenting the scenarios to the public and were visibly worried about the possible effects of revealing these studies to the general population.

“We can’t release perspectives of a catastrophe of this dimension. We have to inform people according to a time frame that they recognize, like 5 or 10 years.” (FG Administration)

“We need to talk about this carefully. We can’t just say that one day Vagueira will be swallowed by the sea; it would be irresponsible to give such information, as it would be irresponsible to say there is no reason for concern. We need to be balanced. Nobody is interested in hiding this from the population.” (Municipality, FG Administration)

However, this is not consensual and some representatives at the local and national level think people need to be informed, not only so they can understand what is happening, but also so they can be accountable and “behave properly”.

“I disagree with that point of view [that the public shouldn’t see the scenarios]. And there is the danger that after possible catastrophes people complain because these events were studied and they were not informed about it. Information is crucial for people to behave properly.” (FG Administration)

Despite the somewhat catastrophic view about the future of the coast and powerlessness before such a threatening sea, people still think it is worth protecting their coast at all costs (survey results had already shown the population thinks the same):



Figure 4. Susceptibility map for Vagueira (scenario for 2100)

“Since August I have been telling them the sea will come: ‘there’s no money, there’s no money...’, the authorities say. But when the sea comes I’m sure the money will come too.” (FG Business)

“... This is an asset that is worth protecting, but things have to change a lot.” (FG Community)

The lack of trust in the administration reinforces this catastrophic view about the future. These stakeholders criticize the institutions’ lack of planning and long term strategy. They also believe reactive measures will continue in the future and that only a catastrophe will bring serious action.

“Measures are always reactive...” (FG Business)

“Only the prediction of a catastrophe will bring some investment.” (FG Business)

What the results of the focus groups show is that, contrary to the perceptions of administrators, the public is well aware of the magnitude of the problem and, even if lacking technical background, can understand the existence of different scenarios and courses of action in the future. Table 2 shows, through direct quotes, the sort of measures proposed by the participants.

In the group discussions, a scenario of **planned retreat** is rarely considered. In the administration group it was mentioned only by the regional level authorities and port officials. Local authorities tend to resist to the idea, as this quote shows: “I get very confused when I hear discussions about retreat...” This is also not an option for most participants in the community group, who argue relocation would cost a lot more than protecting the urban front of Vagueira. **Accommodative strategies**, in the sense of adapting the existing buildings and structures, do not seem a realistic approach in such densely built urban areas like Vagueira. The representative of the environment regional authority mentioned this type of strategy in the sense of land use restrictions and creation of “*non aedificandi areas*”, as this participant puts it).

Yet, despite the recognition that interventions so far have not been fully effective and the catastrophic view that many participants hold about the future, strong preferences for hard forms of **protection** – such as seawalls and groynes – prevail. The general idea, especially in the community and businesses focus groups, is that the coast needs to be protected at all costs and a “hold the line” approach is often used as an example of what needs to be done. Thus, most of the solutions proposed by

stakeholders focus on maintaining the coast unchanged, through continued anthropic influence, and they reflect an “artificialized” view of the coast. More “naturalized” views of coastal adaptation, based on the reinforcement of sand dunes and on the use of vegetation to create “green dunes”, are rare. In fact, these local, bottom-up initiatives may even lead to conflicts with environment authorities, as one participant reported.

CONCLUSION

Having conducted a local survey and a set of focus groups in a especially risky coastal area in Portugal, this research assessed the reactions of local stakeholders to future climate scenarios, collecting their perspectives on adaptation strategies.

Our research suggests that local communities – specifically social groups such as fishermen and farmers – not only understand and are concerned with the changes that have occurred and will take place in their coastal area, but also know about what has been done to address the problem and are able to evaluate the effectiveness of these interventions.

The type of solutions proposed has much to do with the view people have of the coast, which is generally an artificialized coast. Most stakeholders of the three different groups stress that the coast must remain unchanged.

Despite holding a catastrophic view of the future - which is now reinforced by the scenarios presented - stakeholders in Vagueira still argue for this “hold the line” strategy and rarely consider more “naturalized” forms of looking at the coast such as planned retreat or softer forms of protection (sand nourishment, reinforcing dunes, using vegetation and building new dunes).

Local stakeholders propose their own solutions and adaptation strategies, within the framework proposed by the IPCC for coastal adaptation. However, they show a high preference for protection, especially with hard infrastructures. Softer accommodative options are poorly known or understood and organized retreat is widely rejected. In order for new options to be considered, further knowledge and dialogue on coastal adaptation must be fostered. Exploratory discussions such those we undertook in Vagueira constitute a first meaningful step on that possibly long pathway.

Local communities possess a knowledge on coastal changes and adaptation which could be taken into consideration when defining strategies for the future. The rare local practices adopted so far - especially by farmers - eventually lead to conflicts with the environment authorities, suggesting that there is scope for further engaging local stakeholders in coastal management in this area.

Yet this research also suggests that with good social science design, it is possible to bring out from residents the scope for adaptation in the light of credible coastal change scenarios. The key here is to work on both the case study specifics of society and economy in different coastal locations and to build up confidence in reshaping national and regional authorities and their ways of operating. This can be initiated with the kind of local discussions through which we are successfully engaging both stakeholders and policy managers. Such discussions create new communication channels between the different stakeholders and institutions and may contribute to generate common visions, thus opening new possibilities for a more sustainable future of coastal zones.

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