



# Forward planning to maintain the attractiveness of coastal areas: Choosing between seawalls and managed retreat



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## ABSTRACT

This paper aims to inform forward-planning policies in the face of sea-level rise due to climate change, focussing on the choice of reducing the vulnerability of property at risk through managed retreat or protection behind seawalls. This adaptation is important not only to reduce the cost of future damage but also to maintain the beaches which are an attractive feature for tourism, of vital importance for coastal areas. Some 421 residents with main and secondary homes were surveyed in Hyères-les-palmiers in the Var department (Southeast France). The survey sought to compare the willingness of residents to contribute financially to building a seawall or to relocating sea-front property. Preferences depend both on common variables and variables specific to the proposed arrangement. They reveal common concerns focused on effectiveness and the determining factor of property ownership. The results also show some awareness of the long-term advantages of managed retreat, despite some opposition from older people, who are also more sceptical about the reality of the risk incurred.

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## 1. Introduction

In France, storm Xynthia which caused the destruction of some 1200 dwellings in risk-prone locations (Cour des comptes, 2012), was a turning point in the policy to manage marine inundation risks. In particular, the implementation of “Natural Risk Prevention Plans (NRPP)”<sup>1</sup> was speeded up, and a national inundation plan was rapidly established together with a plan to strengthen seawalls. An inventory of priority coastal NRPPs was compiled; 303 were identified and, by March 2015, 273 had been implemented (Hubert and Leclerc, 2015).

The prospect of increased marine inundation due to sea-level rise is a concern for insurance companies which are considering modifying their insurance and compensation criteria. Gopalakrishnan (2013) estimates that worldwide there were 4241 natural disasters over the period 2000–2010 with 2.5 billion people

affected and damages totalling some US\$1002 billion, of which only 26% was insured. In France, although there have only been 84 cases of marine inundation in the last thirty years for a total compensation of €1 billion (€800 million of which concerned storm Xynthia alone), there may be a fourfold increase by 2040 (AFA, 2015).

The evolution of insurance policies is a particular issue in countries with solidarity-based systems such as the French natural disaster mechanism (André, 2013; AFA, 2015). This scheme is based on all insured parties contributing financially to the protection against such disasters, regardless of their risk exposure, through a supplementary “Natural Disaster” premium collected on all buildings insurance contracts. This approach is often criticized for not encouraging responsible owner behaviour (Huteau, 2015; Grislain-Letrémy and Villeneuve, 2015). Furthermore, it contributes to maintaining the attractiveness of coastal areas despite their high level of risk. The prospect of increasing compensation is leading some to recommend the diversification of funding sources, particularly through a greater involvement of local government (Cour des comptes, 2012; Grislain-Letrémy and Villeneuve, 2015).

These projections have led to changes in coastline management approaches. Proposed new measures are based on either adaptation – reducing risk exposure through property and activity relocation – or compromise – living with the risk (MEDDE, 2012). However, managed retreat is hindered by the reluctance of both

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<sup>1</sup> The “Natural disaster prevention plan” (“Plan de prévention des risques naturels”) is defined by the State. It regulates land use according to risk, by establishing zones where building is forbidden and others where building must comply with various conditions.

elected representatives, the laypeople, and by funding issues. Hence the French Ministry for Ecology, Sustainable Development and Energy has undertaken an experimental programme on five pilot sites as part of the “National strategy for the integrated management of the coastline” (MEDDE, 2013). These experiments led to two types of recommendation: (i) to increase knowledge and (ii) to implement territorial strategies by tailoring planning documents and promoting broad approaches of spatial recomposition (Comité de suivi, 2015). These recommendations cover the five themes proposed by the *Commissariat Général à l'Égalité des Territoires* [General Commission for Territorial Equality] (2015) to increase territorial resilience in the face of climate change: (i) improve knowledge, (ii) raise awareness, (iii) promote good practices, (iv) adapt planning and governance frameworks and (v) adapt the natural environment.

Against this background, our study focuses on coastal residents' preferences for different climate change adaptation policies. The survey undertaken aims to understand the motivations underlying the choices between the different approaches to anticipate sea-level rise and adapt the coastal areas in consequence. As noted by Eriksen et al. (2015), such policies involve a compromise between individual and collective determining factors. They should, through surveys, take into account subjective perceptions, given the numerous biases inherent in risk representations, in particular long-term risks, which also pose an intergenerational dilemma (Hallegatte, 2009), and the changes in representation of regulatory measures towards progressive approaches emphasizing a “No regrets approach” (Eriksen et al., 2015). Our survey concentrates on the willingness to contribute financially to traditional measures (such as the construction of seawalls) compared with vulnerability reduction measures (such as the relocation of property and activities that are most at risk). This work aims to inform public decision-making under uncertainty. Above and beyond the legal tools and the protection modalities, in order to be efficient, the variation of insurance pricing requires a detailed knowledge of an area's risk exposure and vulnerability as well as a global and progressive management plan (Gibbs et al., 2013; Hurlimann et al., 2014; André et al., 2015). Whether this concerns seawalls or managed retreat, such plans must examine people's perceptions (García de Jalon et al., 2013; Rey-Valette et al., 2012; Lambert, 2013) and their preferences, and include a significant awareness-building component. This means that it is necessary to strengthen people's commitment to anticipatory policies, to create warning and coordination mechanisms and also to generate a risk culture in order to reduce inappropriate behaviour, and therefore damage, during inundation episodes.

The first part of this paper highlights some key points on the issue of climate change adaptation for coastal areas before the methodological protocol is explained in detail in the second part. The third part presents the main results which are then discussed in the fourth and final part.

## 2. Adaptation and resilience of coastal areas

The expected heightened risk of erosion and marine inundation related to sea-level rise requires forward planning to reduce coastal area vulnerability as recommended by the new doctrine of public intervention towards relocation (Kelly and Adger, 2000; Klein et al., 2001; Boateng et al., 2007; Nicholls et al., 2007; Adger et al., 2008).

However, ideally, an adaptation policy includes measures which aim to (i) reduce risks for people, property and activities in order to avoid future costs and (ii) maintain beaches for both their natural protective and recreational roles in coastal areas. Beaches play a key role in the tourist and residential attractiveness of these areas as shown for example by Cooper and Lemckert (2012).

Consequently, the vulnerability of beaches and coastlines to the impact of climate change leads to the “territorial vulnerability” of coastal zones (d'Ercole and Metzger, 2007). This type of vulnerability results in treating risks on a hierarchical basis depending on the magnitude of their effects in an area, but also to a broader territory because of interdependences. The economics and the management of coastal cities have a determining influence on the neighbouring towns. This is especially true for tourism-related employment, for beach amenities like outdoor recreation or their contribution to a better living environment and for the key-role of some economic or cultural infrastructures. Thus the vulnerability of coastal littoral results in vulnerabilities on a broader scale. In addition to hazard or risk maps, maps of sensitive areas that determine vulnerability at the larger scale are needed (d'Ercole and Metzger, 2007).

Traditionally, adaptation to inundation risk encompasses two visions (Klein et al., 2001)<sup>2</sup>: (i) “technical” hazard management, based on an engineering vision where man tries to control the risks and (ii) action on vulnerability with the objective of adapting to, and dealing with, the risk. Building seawalls falls within the first approach. It is particularly relevant in heavily-populated or very low-lying areas and this option is still often considered: for example, in France the implementation of the Seawall Plan (Plan Digue) at a national level in 2011 (Huteau, 2015), the Thames barrier, the Oosterscheldekering in the Netherlands or the flood defence projects in New-York. These measures nonetheless have their drawbacks. One condition seems to be to control urbanization behind them (Titus, 2011) because in the case of cracks or openings, damages can be very significant as shown during hurricane Katrina in New-Orleans (2005) or storm Xynthia in France (2010). Current significant vulnerability is due, to a very large extent, to the amount of building and demographic concentration in risk-prone areas. A study undertaken in the Haut-de-France region of France (Caumont and Fasquel, 2012) showed that house prices, which would provide a strong signal for the population, are not affected by the risks related to climate change due to their far-in-the-future nature. Grislain-Létrémy and Villeneuve (2015) point out that maintaining urbanization on “Grand Isle” in Louisiana, despite the very high recurrence of major storms (fifty over 130 years), has cost the federal government some US\$1 million per dwelling in subsidies over the period. Furthermore, in France, unlike England, responsibility for seawall maintenance is not centralized (Hourdeau-Bodin, 2015). Finally, it should be noted that seawalls ultimately cause the disappearance of beaches, which, as discussed, are important both for coastal area tourism (and the numerous jobs this entails) and as natural protective infrastructure (Luisetti et al., 2011). As a result, beach nourishment operations are required but their cost is likely to increase significantly in the future as a result of sediment shortages.

Managed retreat, which is in line with the second approach of Klein et al. (2001), requires a fundamental change in representations, recognising the natural mobility of the coastline and the illusion involved in wanting to control nature. Some projects to relocate roads or diffuse habitats have already been undertaken for example in England on Northey Island (1991) and on the Freiston shore (2001), in France in Criel sur Mer (2011) or in Sète (2011). However the small number of residential dwelling relocations do not provide sufficient insights as to the social constraints concerning these operations, especially if they are carried out in

<sup>2</sup> Of course, in practice, managers have to reconcile the two approaches depending on the density and the nature of building in their area (Hurlimann et al., 2014; Gibbs, 2015) and on the economic, institutional, legal and socio-cultural context (IPCC, 2014).

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