

Managed Retreat in low urbanized high-risk coastal areas: Proposal for a new Methodology Application to the Portuguese coast

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ABSTRACT

In Portugal, the planning and management of the coastline is carried out through coastal management plans (POOC) and programmes (POC) as territorial management and decision support instruments.

Based on the recognition of the worsening of coastal erosion and the increase in the frequency and intensity of extreme meteorological phenomena resulting from climate change, the new POC legal regime requires a more effective response in the application of the precautionary principle, concretised in the adoption of adaptation measures - protection, accommodation and Managed Retreat (Relocation), which reduce the exposure of people, activities and infrastructures.

Managed Retreat refers to a strategic decision to anticipate relocating people, homes and infrastructure from vulnerable coastal areas to reduce or eliminate exposure to intolerable risk.

However, it is a controversial approach because it raises difficult questions about justice and fairness and forces people to confront the inevitability of change.

Two of the most signalled causes are the top-down decision-making process and the "uncritical" approach to stakeholder and public participation.

Aiming to facilitate the implementation of Managed Retreat, particularly in coastal areas in Portugal, a methodology is proposed for a proactive approach, proposing a different form of planning and implementation. As a result, Managed Retreat can be developed as a dynamic and strategic long-term project broadly supported by all the entities involved, particularly with the community's participation in creating the relocation vision.

Keywords: Coastal Zone; Managed Retreat; Planned Retreat; Relocation; Managed Retreat-community participation.

RESUMO

Em Portugal, o planeamento e a gestão da orla costeira são efetuados através de planos (POOC) e programas (POC) de gestão costeira, enquanto instrumentos de gestão territorial e de apoio à decisão.

Com base no reconhecimento do agravamento da erosão costeira e do aumento da frequência e intensidade de fenómenos meteorológicos extremos resultantes das alterações climáticas, o novo regime jurídico destes programas exige uma resposta mais eficaz na aplicação do princípio da precaução, concretizada na adoção de medidas de adaptação - proteção, alojamento e Recuo Planeado (Relocalização), que reduzam a exposição de pessoas, atividades e infraestruturas.

A Retirada Planeada refere-se a uma decisão estratégica de antecipar a deslocalização de pessoas, habitações e infraestruturas de zonas costeiras vulneráveis para reduzir ou eliminar a exposição ao risco.

No entanto, trata-se de uma abordagem controversa porque levanta questões difíceis sobre justiça e equidade e obriga as pessoas a confrontarem-se com a inevitabilidade da mudança.

Duas das principais razões assinaladas são o processo de tomada de decisões top-down e a abordagem "acrítica" à participação das partes interessadas e do público.

Com o objetivo de facilitar a implementação da Retirada Planeada, particularmente nas zonas costeiras de Portugal, é proposta uma metodologia para uma abordagem proactiva, propondo uma forma diferente de planeamento e implementação. Como resultado, espera-se que a Retirada Planeada possa ser desenvolvida como um projeto dinâmico e estratégico a longo prazo, amplamente apoiado por todas as entidades envolvidas, particularmente com a participação da comunidade na criação da visão de relocalização.

Keywords: Coastal Zone; Managed Retreat; Planned Retreat; Relocation; Managed Retreat-community participation.

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Writing a thesis is a voyage of discovery. Not only a scientific discovery but, above all, a personal one. During this journey, I have spent many days in deep devotion to a subject that has been very challenging for me. It has also been a time of great challenges on various levels of life, but without doubt a very happy time.

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FOREWORD

This document concerns the Doctoral Thesis of the Doctoral Programme in Civil Engineering (PRODEC), within the specialisation in Hydraulics, Water Resources and the Environment.

This curricular unit aims to present and introduce the topic to be researched and draw up the study programme to be developed highlighting the objectives, main tasks and schedule, as well as the materials, resources and methods required.

Structurally, this document is organised into five chapters with the following layout:

- Chapter 1 - Introduction.

The introduction chapter briefly presents and frames the research topic and the primary motivations for choosing it, emphasising the relevance of the subject and the importance of its investigation, the general objectives, the methodology and the research questions it aims to answer.

- Chapter 2 - State of the Art

The state-of-the-art chapter presents a review of the international literature on Managed Retreat to provide a structured understanding of them.

- Chapter 3 – Managed Retreat in Mainland Portugal

Chapter 3 provides a characterisation of the Managed Retreat in Portugal, based on the main legislative documents that regulate the implementation of this strategy. The case studies that support the research are also presented.

- Chapter 4 – Managed Retreat Methodology

This chapter proposes a new methodology to be applied to the Portuguese coast based on a proactive perspective of managed retreat. It begins by presenting the concepts that support the methods and then considers their application to Portuguese cases.

- Chapter 5 - Conclusions and Future Works

Chapter 5 provides the answers to the research questions that guided the research and a brief conclusion. It concludes by outlining further work on this research.

- References

In the end is lists all the bibliographical references used to support the document.

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ACRONYMS

AC – Critical Areas of Protection, Accommodation and Planned Setback

ANEPC – National Authority for Emergency and Civil Protection (Autoridade Nacional de Emergência e Proteção Civil)

APA – Portuguese Environment Agency (Agência Portuguesa do Ambiente)

ARH – Hydrographic Region Administration (Administração de Região Hidrográfica)

CBA – Cost-Benefit Analysis

CCDR – Regional Coordination and Development Commission (Comissão de Coordenação e Desenvolvimento Regional)

DAPP – Dynamic Adaptative Policy Pathways

DGT – Portuguese National Mapping Agency (Direção Geral do Território)

DPH – Public Hydric Domain (Domínio Público Hídrico)

DPM – Maritime Public Domain (Domínio Público Marítimo)

ENGIZC – Integrated Coastal Zone Management Strategy (Estratégia Nacional da Gestão Integrada da Zona Costeira)

GTL – Coastal working group (Grupo de Trabalho do Litoral)

HHWLT – Higher High Water Large Tide

ICNF – Institute for Nature Conservation and Forests (Instituto de Conservação da Natureza e das Florestas)

IGT – Territorial Management Instruments (Instrumentos de Gestão Territorial)

IPCC – Intergovernmental Panel on Climate Change

LMPMAVE – Maximum High-Tide of Equinoctial live waters Higher (HHWLT)

PDM – Municipal Master Plan (Plano Diretor Municipal)

PE – Special Plans (Planos Especiais)

PEOT – Special Territorial Management Plans (Planos Especiais de Ordenamento do Território)

PGRI – Flood risk Management Plans (Planos de Gestão dos Riscos de Inundação)

PMOT – Municipal Land-use Plans (Planos Municipais de Ordenamento do Território)

POC – Coastal Management Programs (Programas de Ordenamento da Orla Costeira)

POOC – Coastal Management Plans (Planos de Ordenamento da Orla Costeira)

POPNLN – North Coast Natural Plan (Plano de Ordenamento e Gestão do Parque Natural do Litoral Norte)

PROT – Regional Territorial Management Plans (Plano Regional de Ordenamento do Território)

REN – National Ecological Network (Reserva Ecológica Nacional)

RDM – Robust Decision Making

UOPG – Planning and Management operating unit (Unidade Operativa de Planeamento e Gestão)

1. Introduction

Sea level rise is a concern for low-elevation coastal areas worldwide. Anticipated changes in wave heights and directions and the magnitude of storm surges could trigger increased frequent and severe coastal inundation and erosion episodes.

Although coastal erosion is a natural process by which coastlines adjust to varying sea levels, energy levels, sediment supply and existing topography, coastal erosion problems arise mainly from human interaction.

The modification of the sediments budget, by interruption of longshore drift caused by artificial harbour structures, the presence of adjacent coastal defences, and the alteration of sediments supply by dredging, removal or river impoundment leads to an inequitable large-scale redistribution along the coastlines, causing erosion.

The management options available to protect and adapt to coastal erosion and/or inundation, specifically when properties are threatened, involve hard engineering constructions, like the groins, offshores structures and adherent defences, other engineering approaches like beach recharge/nourishment, or accepting the changes and adapt, considering natural-based engineered and social responses.

Under a variety of designations, these natural-based engineered and social responses include (a) non-interventions, accepting erosion evolution and some infrastructure losses, (b) Managed Retreat, (pro) -actively moving infrastructure and constructions landward or their total removal from the coastline and (c) management realignment, endorsing active flooding of low-lying areas to promote the creation of salt marshes as natural defences.

The Managed Retreat decision-making process is overseen by the economic scope and based essentially on the value of the resources at risk versus the costs of their protection. Hard engineering solutions have been prevalent worldwide in urban areas to resist coastal erosion, in some way rationally positioned in cases where private property or communities are threatened. Beach nourishment is the complementary approach.

In this context, Managed Retreat is usually considered when other strategies are ineffective or unavailable, and it is recommended in small population clusters or places with scattered buildings.

Its implementation is often very controversial on a political and social level and involves economic and legal constraints.

Public acceptance is low due to a general need for more understanding of the real benefits of Managed Retreat. Several economic, social and cultural issues may arise significant challenges for relocated communities, specifically for those deeply connected and reliant to local values of the land, home and livelihoods. Municipalities may also be reluctant to change their plans if setback zones are seen as a loss of attractiveness and economic development potential.

For the success of this strategy, all people affected by Managed Retreat must be involved from early stages in the planning and decision-making process. The advantages and disadvantages of the approach should also be clearly identified and communicated.

This thesis is written based on national and international literature on Managed Retreat to conceptualise the context and explore different ways and perspectives surrounding Managed retreat strategies, perceptions, challenges faced and recommendations.

The results indicate that: (1) effective stakeholder and local community engagement is essential for successfully implementing a Managed Retreat scheme and overcoming potential barriers; (2) uncertainty about the rhythm of sea level rise and other climate change phenomena has led to dynamic adaptative planning approaches based on sequential decision-making; (3) setting the date to implement measures is no longer the main issue, instead, it is essential to identify the decision criteria, and the circumstances deemed necessary to do it, and; (4) to implements the Managed Retreat strategies, particularly relocation, key governance mechanisms are the interaction of decision-making levels and the informed participation of all the entities involved, especially the population.

Why study Manage Retreat? What is the relevance of the theme of this thesis?

The author defines a successful Managed Retreat strategy as an action achieved through negotiation and compromise, that benefit communities, local government and the environment.

In this sense, its decision and implementation strategy must be the result of a cross-participatory decision by all stakeholders, resulting in the construction of a more inspiring territory than the existing one for residents, local authorities, municipalities and all its users, and trying as far as possible to recognise neither winners nor losers.

The displacement of people due to environmental changes and natural disasters has a long history but has gained renewed attention in the context of climate change.

The recognition that the impacts of climate change are not just a technical problem to be addressed through structural protection and pure engineering but, above all, a social, economic and political issue requiring changes in socio-spatial and demographic patterns of development, land use, housing policies and economic development systems, contributed to this. There are clear benefits to living in a coastal location and enjoying its natural resources and amenities!

Thus, increasing security and resilience without losing benefits seems unquantifiable freedom for the peaceful enjoyment of property and their rights, for a fair balance between public and private interest, and a preserved natural coastal landscape, functioning as an ecosystem and creating the recreational value of the environment.

In this vision, Managed Retreat should be seen as a transformative and empowering spatial planning tool for all involved.

For this reason, it is inspiring to realise how the decision and implementation of Planned Retreat could be more socially and technically balanced and cosmoethical.

1.1 RESEARCH THEME

The Portuguese coast is classified as highly vulnerable to coastal erosion and has suffered severe losses of territory, mainly due to the reduction of sedimentary sources

Demographic pressure is also high, with 75 % of the country's population concentrated in coastal municipalities. This territorial occupation corresponds to 26 % of the total area in urban terms.

The Portuguese coastal zone is strategically environmental, economic, social, cultural and recreational.

In this context, increasing coastal resilience and protection in areas at high risk of erosion and inundation is one of the line actions to address the main impacts and vulnerabilities identified for the Portuguese coast, particularly in built-up areas and/or urban centres.

Specific adaption measures for some areas include Managed Retreat strategies to increase robustness in the long term and flexibility of vulnerable systems.

Population relocation is one of the responses considered in the implementation of this strategy, and it has a considerable consequence on the vulnerability of communities dependent on local ecosystems, namely because of the significant social, cultural, psychological, and financial impacts it can have.

Aware of this scenario of coastal vulnerability and the challenge that is the implementation of a Managed Retreat/ relocation plan, the motivation for a structured contribution to an action plan has been the driving force behind an in-depth study over the years and the reason for this doctoral thesis.

In 2013, as part of the master's dissertation, "Retirada Planeada" de Áreas Edificadas em Zonas Costeiras de Elevado Risco" (Oliveira 2013), the research development began to understand what Managed Retreat is, what it consists of, and what its main constraints are, which in most cases are factors that slow down the implementation process, given its complexity.

Feeling that the Managed Retreat strategy was very interventionist and not very flexible and adaptable to the territory in question, and therefore very complex to implement, the result of this phase was the presentation of a vision that was intended to be more 'open' of the Managed Retreat measure: 'The 3R's Policy: Remove, Relocate, Readapt'.

The 3R's Policy emerges as a proposal for management and adaptation to different types of occupation of the coastal zone and degrees of risk, aiming to minimise their impacts on people and property through subdivision into three more 'flexible and adaptable' strategies while maintaining the focus on the objective of maintaining a buffer zone between the sea and the built fronts, along the coastal strip.

Nevertheless, a crucial question remains: How can the Managed Retreat be implemented, and how can the instruments be designed to facilitate and minimise the associated constraints?

Given the limited implementation of the guidelines established by regulatory instruments for implementing the Managed Retreat measure and the increasing relevance of risk situations, intensified by the current context of climate change, it is proposed to continue this research to contribute to empowering action.

It emphasises the need for active and adaptive planning suitable for defining the intervention of "Planned Retreat" so that this land management option can be assumed, in identified situations, as an economically viable and socially accepted alternative, respecting cultural traditions and with reduced environmental impacts.

Given how vast this subject is or can be, it is easy to get bogged down in thinking about it, so the need arises to define the research area that will frame and guide the work to be carried out, which is the objective of the following chapters.

1.2 AIMS OF THE RESEARCH

Given the growing strategic importance of coastal zones in terms of environmental, economic, social, cultural, and recreational, it is essential to harness their potential and resolve or mitigate the inherent conflicts of interest as part of a sustainable development policy based on integrated management.

Therefore, to promote the development of a transparent and rational process of Managed Retreat from the coastline, with a view to the coexistence of different uses, visions and activities, it is essential to define and consider practical, adaptive and necessary measures to protect the environment, prevent risks and guarantee the community's identification with the action.

The objective of the thesis is realised by valuing the diversity and specific opportunities of each territory, avoiding uniform logic that does not correspond to each specific context, and seeking to establish the basis for a multi-level decision.

The proposed research aims to improve the implementation of Managed Retreat by developing a methodology to facilitate the interpretation and knowledge of the technical, social, economic, legal and environmental constraints which, in most cases, slow down or make impossible processes due to their complexity.

1.3 METHODOLOGY

The methodology to be developed should be a key element in the elaboration of the intervention strategy, duly adapted to the morphological context and the occupation pattern of the coastline, where each case is different, and constitute an implementation and decision support tool that should be of great use to the following:

- (a) Institutions responsible for risk management in coastal areas.
- (b) Institutions responsible for urban planning – municipalities.
- (c) Decision makers and scientific and technical community's
- (d) Local communities

The research methodology Figure 1 will be based on the analysis of international and national literature on the subject, technical visits for data collection and informal interviews with the groups directly involved in implementing the Managed Retreat measure and community members.

The national literature will be based mainly on regulatory and technical planning documents, given the scarcity of scientific articles specifically on Managed Retreat.

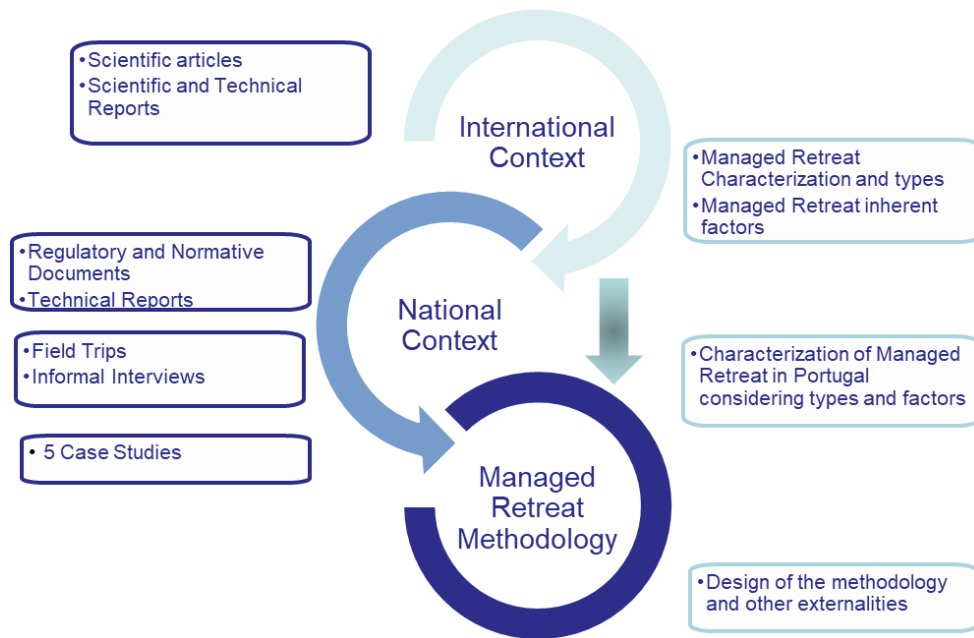


Figure 1 Research Methodology framework

1.4 RESEARCH QUESTIONS

To guide the research, the Thesis Project presented a research question that guided the research methodology and several complementary questions that helped the process.

Research question:

In built-up coastal areas that are critical in terms of risk, legality of occupation and environmental value, under what conditions should Managed Retreat be considered as opposed to stabilisation or protection?

Additional questions:

- (a) Why have the Managed Retreat, under consideration since 1999, generally not taken place?
- (b) What are the criteria for Managed Retreat in Coastal Management Plans and Programmes? Scientific criteria? Political criteria? Other criteria?
- (c) Is the Managed Retreat in a hazardous area mainly controlled by technical, legal, or social components?
- (d) Have alternatives for coastal protection been considered and evaluated in the Managed Retreat?
- (e) What is the role of the responsible entities and actors in the Managed Retreat process? Is it well-defined? How are the limits of action defined? How is the population involved?
- (f) What are the results of the follow-up analysis after the implementation of Managed Retreat?

2 State of the art

This chapter is based on a review of the international literature on Managed Retreat to gain a structured understanding of Managed Retreat as a strategy for adapting to climate risks, particularly coastal risks.

The most relevant themes are then extrapolated to guide the discussion on the state of Managed Retreat in mainland Portugal.

Essential issues to note are that:

- (a) most studies rely on cases where relocation was implemented in response to a flood event rather than proactive. Once this is not the main reality in Portugal, all the information gathered aims to understand better what makes Managed Retreat successful or not.
- (b) all the guidelines suggested at the end of this chapter are generally based on case studies interventions, so they can be seen as lessons learned and principles to provide constructive identification for Managed Retreat /relocation practices.
- (c) Relatively few papers examine only the Managed Retreat strategy. Most papers refer to the governance process in the context of climate change through comparative studies of different adaptation strategies. As such, the information is very repetitive. For this reason, the methodology used in this chapter was to select more recent and more specific work on the Managed Retreat strategy in order to develop the state of the art. Older documents were analysed to support a particular view whenever it was deemed necessary to go into greater depth.

2.1 FRAMEWORKS

Coastal climate adaptation, as a response to the increasing risk for coastal settlements and infrastructure, is a global challenge, as long-term adaptation planning to manage associated flood impacts still struggles with uncertainty and contested stakeholders' priorities (Ramm et al. 2018).

Policies aiming the adaptation, typically categorised into three broad categories, 'protect, manage/accommodate and retreat', advocate new approaches seeking to reduce the vulnerability of densely urbanised coastal zones, primarily through Managed Retreat or anticipatory (Rocle et al. 2021).

In the vision of (Hino et al. 2017; Dyckman et al. 2014) a Managed retreat can have two different features: deliberate intervention to managed hazard risk, planned Managed Retreat, and unplanned Managed Retreat, as a result of a post-disaster situation leading to a disorganized retreat or abandonment of land ((Neal et al. 2017).

In this work, Managed Retreat is seen as an adaptation strategy to climate change, sea level rise and other coastal hazards, such as sea inundation and erosion. The main objective is to remove people and assets from already hazardous areas, proactively and permanently.

Although historically recognised as an adaptation strategy to respond to climate change and climate hazards, two keynotes should be salient:

- (a) The designation and definition of Managed Retreat may vary depending on the author's perspective. According to (O'Donnell 2020), one possible explanation is that although not new, adding climate change threats as an impetus for Managed Retreat has meant that the term has become "politically perilous".
- (b) Although identified as a coastal climate adaptation approach seeking to reduce the vulnerability of densely urbanized coastal zones (Rocle et al. 2021), few projects do exist, fewer have been implemented (White 2022), and fewer have been evaluated (Gibbs 2016).

According to (Perry et al. 1997), by 1986 permanent relocation was no longer considered novel, although it was only sporadically used. In the broader context of water planning in England and Australia, relocation as a hazard mitigation strategy has been accepted since the early 1970s as an alternative to protective measures when they were of limited effectiveness and safety or when the monetary cost was too high.

Another interesting note is that although relocation is currently integrated into the Managed Retreat concept, principles for the use remain the same. It is the preferred option when it is impossible to implement structural measures, or their costs are too high (Mach and Siders 2021).

According to (Siders 2019), Managed Retreat has only recently received attention from academia and the media, and how Managed Retreat has been managed and what outcomes have been achieved is therefore still emerging.

A shared vision is that Managed Retreat is a unique strategy. It has its own political, social, and legal difficulties and requires a decadal lead time to be planned and implemented equitably (Wolff et al. 2023). Most relocations of coastal communities have been partial at best and restricted to small communities (Neal et al. 2017a).

In Europe, the few retreat projects that exist have mainly been implemented in more small rural areas to restore salt marshes and support coastal defence systems, and in the United States, which has the most extended history of retreat programs globally, Managed Retreat has been documented primarily in urban areas (Wolff et al. 2023). Identifying and mapping the impact zones of coastal hazards is the basis for establishing regulations that govern moving property and people away from storm-impacted shorelines.

Managed Retreat can be applied in pre-and-post-disaster settings to reduce exposure to natural hazards. It is often adopted in low-lying coastal areas (below 20 m of elevation in the concept used for European Research), which are potentially sensitive to erosion, sea level rise and storm surges (Armstrong et al. 2019).

Through this strategy, reconstruction of the beach and dunes systems can be allowed, providing excellent protection from erosion and strengthening people and infrastructure security, enabling the maintenance of the littoral's core economic activities and the improvement of the landscape aesthetics value and natural habitats, with positive effects on tourism and recreational activities.

Although effective in reducing vulnerability by reducing exposure (Rey-Valette et al. 2015), Managed Retreat will not be the appropriate answer for every place (A. Siders 2013).

Managed Retreat implementation must be coordinated at the proper spatial scale, fit the specific local context and be compliant with national and subnational regulations and plans, which requires coordination with higher levels of governance and integration in land use planning. According to (Rocle et al. 2021), sea action impact will differ according to the timescale, the area topography and future urbanisation dynamics.

Researchers' general conclusion is that Managed Retreat is controversial and often an overlooked adaptation tool, which projects have languished for years (Mach et al. 2019), but although being difficult is a "must have" in terms of design, process and conversations (Siders et al. 2019).

2.2 MANAGED RETREAT WHEN AND HOW

Countries may have different strategies for deciding when and how to implement proactive Managed Retreat. The most common Managed Retreat policy decision-making process is based on Cost-Benefit Analysis CBA.

Nevertheless, in some countries, like Australia, Managed Retreat policy decision is mainly based on a technical feasibility description supported by hydrological modelling, showing that technical options cannot be implemented or are too expensive. In the United States of America, for example, the law recognised relocation as a more economical, more permanent, and more realistic way of dealing with long-term erosion and flood problems, pointing out that risk management policy should avoid transferring the risk of structural protections or systems to their neighbourhood communities.

According to cost-benefit analysis, decision-making related to significance is one of the more debated issues in scientific review. The main conclusion is that it can disproportionately promote initiatives in lower-income areas because of the lowest property values and may fail to fully account for the impact of coastal hazards or the impacts of Managed retreat communities, as it often neglects the wide range of social, cultural and psychological impacts addressed to relocation processes.

Whatever the case may be, the implementation is gradual. It can take several decades, is very costly to implement, involves highly complex planning processes and requires a holistic management strategy (Dedekorkut-Howes et al. 2021). Planning procedural and decision-making rely on a top-down model centralised in government authorities (Hino et al. 2017). It is frequently imposed through expert-led models of planning and "uncritical" approaches to stakeholders' and population participation (Tubridy et al. 2022).

Managed Retreat is viewed as a policy aimed at adaptation to coastal hazards, seeking to reduce vulnerability, and having as a principal task within the specific framework anticipatory relocation (Rocle et al. 2021). The main practical element to implementing a Managed Retreat is enforced Retreat through eminent domain, police power, or public trust doctrine (A. R. Siders 2019).

Land use and development plans are the central base to integrating Managed Retreat through implementing laws and regulations to control development in high-risk coastal areas and enforce Retreat where necessary (Siders et al. 2019). Risk assessments are conducted by government authorities to identify areas at high risk of sea action impacts or significant erosion rates, using uniform criteria to assess vulnerability across different regions and developing a centralised GIS

database to support decision-making (Hino et al. 2017). Metrics used to evaluate success are usually the number of relocations, reduction in risk, and cost-effectiveness.

Managed Retreat governance and coordination often require different levels of government entities - National, Regional and local. Policies, legislation, and guidelines for Managed Retreat are allocated to national levels (Siders et al. 2019).

Regional government entities (Regulatory body for the environment) are responsible for state-level frameworks that support local Managed Retreat implementation, providing technical assistance and funding to local governments and working with them on coastal adaptation (McGinlay et al. 2021).

Municipalities often have the major paper in developing and implementing Managed Retreat locally, ensuring successful community relocation (Mitchell et al. 2024)

Local government determine land use and zoning and controls where development occurs (A. R. Siders 2019a), provides compensation or compulsorily acquisition of vulnerable coastal land and suitable land to relocate (O'Donnell 2020), ensures community awareness of threat and information of the process (Rocle et al. 2021), and management staff responsible (planners and engineers) for strategic and development, plans(Hanna et al. 2021).

Researchers' common opinion is that this type of Managed Retreat model tends to be inflexible and has substantial challenges at governance and policy levels, including a lack of community support, inefficient resource allocation, and suboptimal outcomes.

2.3 MANAGED RETREAT GENERAL CONSTRAINS

Compared to typical management options, Managed Retreats have two unique barriers rarely seen with other management options: the logistical and financial challenges of relocating large numbers of people, buildings and assets (Lawrence et al. 2020), and community attachments to place (Thaler et al. 2020). This reality often makes the process complex and contentious (Dyckman et al. 2014), raising several constraints with socio-economic, political, and legal implications (Gibbs 2016).

In (Lawrence et al. 2020) review work, based on previous literature, several constraints were outlined concerning the development and application of proactive Managed Retreat strategies, as reproduced in Table 1.

Table 1: Main constraints of proactive Managed Retreat (based on Lawrence et al., 2020)

Type of constraints	Stressors factors
Contextual issues	Potential large scale of relocation of human settlements Uncertainty over scale and timeframes of Managed Retreat Limited understanding of available data and changing risk profiles Limited capability and capacity to apply, appropriate decision-making tools for Managed Retreat Disagreements, mostly over risk thresholds and trigger points Limited availability, suitability and affordability of sites for resettlements
Governance issues	Weak and inconsistent political leadership, and a focus on the short term

	Failure to integrate Managed Retreat within strategic policy-making frameworks Uncertainty over allocation of responsibilities and decision-rights for Managed Retreat between different levels of government Limited coordination capacity across key policy domains, as such public services, spatial planning and fundings Limited institutional capacity for designing, negotiation, engaging and implementing large-scale Managed Retreat Decision-making inertia and delays, exacerbating uncertainty and increasing adaptation costs Unwillingness of decision-makers to admit “defeat” in the face of the growing hazard
Public opposition	Strong connection to place Lower risk tolerance for new risk compared with experienced risks Mistrust and rejection of expert risk assessments and advice Community preference for protection over retreat and/or rejection of strategies Opposition to retreat from communities in and adjacent to hazard areas due to expected negative impacts on property and amenity values, and reduced public services Uncertainty over level, forms, and eligibility for public compensation or other public assistance Legal action to challenge retreat as an adaptation option
Planning arrangements	Inconsistent and inflexible application of planning rules and procedures that can address changing risk profiles with time Pressure from developers to continue coastal development Inadequate provision for public participation in decision-making processes Uncertainty over the timeframes for property buyouts and relocation Poor management and use of the vacated land
Funding Issues	Inadequate overall public resources for the scale of retreats required Ad hoc and inconsistent funding arrangements that focus on funding post-disaster, rather than pre-emptive Managed Retreat Sub-national governments often lack borrowing rights or have limited taxation options Co-funding arrangements which add complexity and exacerbate delays No pre-funding of the long-term costs of Managed Retreat Political disagreement over public compensation for private losses
Equity issues	Low-income households disproportionately affected Many low-income households cannot afford to relocate Limited coverage of private insurance

As argued by (Neal et al. 2017) Managed Retreat projects must address three main challenges:

- (1) must anticipate and reduce significantly future damages,
- (2) must be an equitable process and
- (3) must preserve the attractiveness of coastal areas.

The items highlighted in the table 1 suggest that those three challenges are nevertheless affected by uncertainty, limitation, and acceptability (opposition/disagreement) faced by communities and entities responsible for the project.

In the next paragraph, some brief considerations will be made about the causes of this stressor's factors in terms of social, economic, political, and legal dimensions.

2.4 SOCIAL CONSTRAINTS IN MANAGED RETREAT

The Managed Retreat process provokes lively debates about the acceptability of the measures in the populations, especially in those directly affected and attached to the amenities derived from living close to the sea (Rey-Valette et al. 2015; Rocle et al. 2021), once they are confronted with radical changes in their livelihood (Thaler 2021a).

As argued by (Thaler 2021a) families and communities in this situation must deal with multiple long-term adaptations that will impact their livelihoods and socio-economic development, considering their vulnerability and capacity to respond.

The loss of social and family ties, negative physical and mental health impacts (Mach et al. 2019) and difficulties accessing appropriate alternative housing (Mach et al. 2019), are some of the constraints that they can have.

As such, the possible loss of livelihoods arising from relocation, and even more importantly, the loss of residential property, make people resist Managed Retreat if they equate Retreat with defeat or if they do not like the options available (A. R. Siders 2019b)

From this point of view, uncertainty can arise from the inability to visualise the future.

Another stressor factor within a community is the socio-spatial inequalities (Tubridy et al. 2022).

Several coastal areas have socially vulnerable populations mixed with resident owners of higher social status and second-home properties used for weekends and spare time or holidays.

According to (Siders et al. 2019), Managed Retreat disproportionately affects low-income and minority communities. Economic analyses of coastal adaptation suggest it should occur in areas with sparse properties and low values. At the same time, resistance measures should be prioritised in areas of high-value assets and dense populations.

Low-income residents tend to be easily relocated due to their low ability to respond and lack of access to critical resources. The key issue is ensuring access to employment and appropriate housing (Tubridy et al. 2022).

Nevertheless, the relocation process must often improve timing, assistance, and integration (Lawrence et al. 2020).

Relocated communities and receiving communities can both feel reluctant. To leave those who must relocate and integrate new residents from the perspective of host communities. (Rocle et al. 2021) due to cultural and loss of place identity (O'Donnell 2020).

Homeowners and second-home owners have different perceptions of the risk of inundation and are often very attached to the property, making it difficult to mobilise them (Rey-Valette et al. 2015).

Many have lived in their properties for over 20 years, and most expect to still live there in 20 years and that their children inherit the property, or sometimes, some second-home owners are

natives of the area and often become permanent residents when they retire. This factor explains why they are attached to property and may consistently be unconcerned by coastal risks.

Managed Retreat oppositions may also arise if landowners lose the right to build on their land, which puts them at a significant disadvantage (Wolff et al. 2023) Generally, they are more likely to think that coastal climate hazards do not affect their property but do affect property value, and so have their preferences for hard techniques such as breakwaters or groynes (Rey-Valette et al. 2015).

Direct risks posed to property include inundation, loss of physical property and associated economic and social costs (Warren-Myers et al. 2018).

Much private property near the beach is of higher monetary value, which can devalue due to decisions not to protect coastal areas (Tubridy et al. 2022) Questions about who is responsible for the vulnerability of private property and associated right(s) in climate adaptation responses often arise (O'Donnell 2020).

Another inertia factor is the existence of cognitive biases regarding residents' perception of risk (limitation). People tend to underestimate risk and overestimate the effectiveness of protective measures (Göransson et al. 2021).

According to (A. Siders 2013), repeated disasters can increase the accuracy of risk perception. However, people have short memories and will overlook even personal experiences if they have an attachment to a place.

Even when aware of the risks, people maintain the status quo (known as status quo bias). Second-home owners have little perception of impacts once they are less present during winter when storms mainly occur.

2.5 POLITICAL AND GOVERNANCE CONSTRAINTS IN MANAGED RETREAT

Several types of political stress factors can be considered in the Managed Retreat process. Addressing them requires integrating economic, social, and ethical considerations into decision-making.

Political factors can influence policy and legislation, process leadership, financial support and economic considerations, governance, community participation and stakeholder involvement and implementation of the process (Gibbs 2019).

According to (O'Donnell 2022), policy and institutional planning for Managed Retreat have been frequently polarising.

Political risk is one of the reasons why pre-emptive Managed Retreat may never get implemented (Rocle et al. 2021).

Adverse reactions from the community and stakeholders can provoke some that policies may not be approved by the government, in an active avoidance of negative press in tabloids and, increasingly, social media, as well as litigation in the short term.

This same idea was highlighted by (Perry et al. 1997) explaining that Managed Retreat will inevitably involve delays, complications and discouraging experiences that should be able to be anticipated based on information from other agencies and sub-contractors and inform and prepare citizens in advance to understand the problems.

Another stress factor may be the ongoing reversal when governments change between political parties with varying views on climate risk (Dedekorkut-Howes et al. 2020). As Managed Retreat usually requires a decadal long time to implement, inconsistent political involvement may stagnate the overall process (Wolff et al. 2023).

Effective long-term adaptation policymaking and planning require commitment and consistent political involvement across the major political parties to prioritise the problem and commit significant public resources to response (Dedekorkut-Howes et al. 2021).

According to (O'Donnell 2020), it is essential to acknowledge the inherent difficulties of implementing a Managed Retreat.

One of them is the vast number of governmental agencies and entities representing different political jurisdictions working together. Legal tension may arise from policy and legislation, since responsibility regarding management retreat implementation has been placed on local government entities (Warren-Myers et al. 2018).

According to (Cottar and Wandel 2024) municipalities can be reluctant to modify their plans, while Managed Retreat options are perceived as losing the territory's attractiveness and economic development potential. Managed Retreat plan will necessarily conflict with urban planning regulations in terms of local-level priority given to tourism and economic issues (Rocle et al. 2021)

This implementation can reduce the tax base and, in the limit, threaten the community's long-term sustainability, causing, for that reason, a lack of political interest to pursue a formal Managed Retreat program (Cottar and Wandel 2024; A. R. Siders 2019a).

Another critical point of view presented by (Ramm et al. 2018) is that local governments are at the forefront of community decision-making. As such, Local government have an essential role in communicating climate change risk and supporting local adaptation planning.

However, local governments typically have unclear responsibilities, limited financial capacity and technical expertise, governance constraints and face liability concerns about adaptation policies (Siders 2019; Cottar et al. 2024; Tubridy et al. 2022).

As such, local governments can be constrained by "the lack of clear and consistent national level frameworks for integrated coastal planning and management, inadequate state and territorial policy and legislation" (Dedekorkut-Howes et al. 2020).

This issue highlights another factor that can be carefully considered: the presence of several actors and multi-level governance. The main objective is to provide legitimacy, credibility, applicability, and acceptability of Managed Retreat policy

According to (A. R. Siders 2019a) practice barriers may be linked to a need for more information about Managed Retreat-specific management approaches and outcomes. Lack of transparency and coordination between institutions and management levels, population awareness and dialogue with inhabitants are often stressed (Rey-Valette et al. 2015).

Additional complications arise where inherited legal systems devalue indigenous knowledge and prioritise institutional hierarchies that are less, or not at all, cognizant of environmental geographies, vulnerabilities and limitations (O'Donnell 2022).

This type of approach results in strategies disconnected from local realities, significant and mismatched costs of implementation, and an inadequate decision-making framework (Tubridy et al. 2022).

2.6 FINANCIAL CONSTRAINTS TO MANAGED RETREAT PROGRAMS

Managed Retreat strategy involves substantial financial impacts on individuals, communities, and government entities. It is a sensitive and complex issue that often makes the process complex and contentious and is dealt with differently across countries. Emphasis can be given to the UK, where typically there is no compensation for property lost or devalued due to decisions not to protect areas of the coast, and the USA, in some states, where Managed Retreat is synonymous with compensation programmes.

The availability and fairness of financial compensation have been a critical topic of discussion in the literature, as it is identified as a prerequisite for the success of the implementation.

According to (Tubridy et al. 2022), actual planning models are characterised by a reductive focus on financial cost assessment. The cost-benefit analysis must account for all the comprehensive economic impacts of Managed Retreat on the communities affected.

The analysis focuses typically on the operation's direct costs, including physical costs of moving people and infrastructures and renewal of the area. It often neglects indirect costs, including economic disruption, loss of business income, increased transportation costs for people relocated tax rates, and delay costs (Guthrie 2023), in addition to compensation.

In most cases, the valuation and compensation mechanisms often prioritise primary residents and low-income populations, accounting for the necessity to find suitable land to relocate and the demand for house construction up controlled prices. Public funding is the central financial resource for public intervention in every area.

Primary residents who do not want to relocate and second homeowners with private property rights usually have monetary compensation for expropriated assets.

Nevertheless, the financial consequences of Managed Retreat are heavily emphasised towards the loss of residential property (O'Donnell 2022).

As argue by (Rey-Valette et al. 2015), the coastal retreat approach requires the relocation of private property away from at-risk locations but does not account for the possibility of loss of property values or devaluation and increase of an already economically vulnerable situation. Some homeowners may have to lead with higher insurance premiums and, in some cases, cut in financial protection against future losses. For many, compensations may not fully cover the expenses, leading to economic hardship.

Second-homes or property homeowners with better levels of living usually have financial models, including insurance and investment returns, that complicate the Managed Retreat process once they might have different levels of insurance coverage and financial resilience compared to low-income residents (Mach et al. 2021).

Communities may face economic disruptions, particularly in areas where livelihoods are closely linked to coastal tourism or amenities, like fishing or farming (Tubridy et al. 2022), and where local government, namely the small ones, may be affected due to potential decreases in tax revenue (A. R. Siders 2019).

In those municipalities, economic opportunities tend to conflict with responsible development. The progress of the Managed Retreat is compromised by whether there is a financial programme (Guthrie 2023).

The main conclusion is that governments must allocate significant resources to planning and implementing Managed Retreat, and more attention should be paid to economic support. Adequate compensation and support systems should be achieved to help communities transition smoothly (Plastrik and Cleveland 2020).

2.7 LEGAL CONSTRAINS OF MANAGED RETREAT

The legal procedure is one of the main limitations of the Managed Retreat (Tubridy et al. 2022).

Legal tension arises from the attempt to implement the Managed Retreat, either through land-use planning or the physical implementation of the measure itself, due to strong opposition from landowners, prioritisation of private property laws and rights, and political barriers (Wolff et al. 2023).

On the one hand, the value of properties can be significantly affected by the threat of risk; on the other hand, regulation on land use, by prohibiting or restricting development in vulnerable areas, can also create significant challenges for investor owners.

A question that often arises is who is responsible for damage to or loss of private property and/or associated rights. According to (O'Donnell 2022) realising coastal management frameworks is difficult because private property rights confuse and complicate planning legislation's attempts to regulate land use. Difficulties stems from the fact that the government regulates through policies concerning the need for a climate change policy and legislative changes over private property. Many have invoked responsibility to justify action against climate change in coastal localities.

Another factor that may cause legal constraints is using the public domain to acquire private property for public use. Expropriation implies fair monetary compensation, which value, can be of complicating valuation.

The discordance between property owners and government entities regarding the correct value may lead to legal battles that may delay the process.

2.8 MANAGED RETREAT SUCCESS FACTORS BENEFITS AND HIGHLIGHTS

A common vision shared by all the authors cited in this chapter is that Managed Retreat can have significant benefits and the potential to transform social, economic and ecological systems, providing an opportunity and incentive to redesign underlying norms and infrastructure.

Implement Managed Retreat is a multi-level governance process which can be highly effective if well-coordinated and supported by robust regulatory frameworks and communication strategies.

Although challenging, it is not impossible to generate the social, political and economic momentum needed for preventive Managed Retreat programmes to become the norm.

The success of interventions requires high public involvement, consensus, and good relations between residents and government in various forms. Critical success factors are ensuring flexibility throughout the process and a deep knowledge and understanding of the challenges posed by local resistance.

Earlier involvement of the community in the process is a 'must' to find collaborative solutions and implement transformative visions for communities, considering their territorial conditions. This involvement in decision-making can take the form of public meetings, surveys and workshops, ensuring transparent and clear communication of the process's risks, benefits and challenges, both by the authorities responsible for developing the process and by the needs and aspirations of the affected population.

The existence of an element of proximity and liaison between communities and authorities is a crucial factor in building trust in the process.

The strategy's feasibility can be enhanced if it is part of a comprehensive long-term plan.

A comprehensive long-term plan should be developed based on a robust and context-sensitive approach that addresses immediate and long-term sustainability in developing resilient strategies for Managed Retreat.

These plans will integrate a comprehensive local risk assessment; stakeholder engagement; detailed design and implementation plans and robust policy frameworks; a comprehensive relocation plan that may include housing, infrastructure and community services, and ecosystem restoration through the restoration of natural buffers such as wetlands and dunes to enhance resilience; a comprehensive financing model that includes different financing mechanisms and innovative approaches to ensure the availability and efficient use of resources; and a comprehensive monitoring plan to monitor retreat outcomes and adjust strategies, as well as a well-defined timeframe.

Proactive commitment and dynamic planning are critical to implementing Managed Retreat measures, including integrated land-use planning and zoning efforts, which will need to take a broader, holistic approach.

According to (A. R. Siders 2019a), this approach can achieve significant benefits and the potential to transform social, economic and ecological systems, providing an opportunity and incentive to redesign underlying norms and infrastructure.

According to (Tubridy et al. 2022), Managed Retreat co-benefits involve biodiversity improvements, long-term cost-effectiveness, and benefits for tourism and recreation by creating new undeveloped coastal spaces and providing further ecosystem services.

In the vision of (O'Donnell 2022), retreat can maximise the use of the coastal land over time by allowing human settlement/ development in some locations until the risks associated with the location's vulnerability are not too high. At this time, the settlements or developments are lost or relocated. The people who remain in the place may help retain connections and social cohesion. Those who relocate may help prepare receiving communities for population growth. It allows communities to reinvent themselves and forge new beginnings on safer ground (A. R. Siders 2019).

As such, the main highlights to note, based on the authors' perceptions, are:

- (a) Managed Retreat strategies need key governance mechanisms and dynamic interplay scales and actors presented.
- (b) Social and institutional conditions are essential for putting relocation on the agenda and implementing Managed Retreat Programs.

- (c) Resident relocation in the medium term needs to be addressed at a larger scale, integrating hinterland communities and anticipating both the unwillingness to leave and the reluctance and resistance of hinterland populations to integrate new elements.
- (d) Dynamic adaptative planning approaches based on sequential decision-making are the key to dealing with the uncertainty of the rhythm of coastal hazards.
- (e) Critical steps in a preliminary phase are modification of regulations, namely the procedures for buying back properties, increased number of new experiments, development of new tools for monitoring and evaluating the results, and reinforcement of communication and awareness actions.
- (f) The Managed Retreat framework can involve a range of practical actions, including limitations on the use of structural protection and restrictions on development, as well as the acquisition and relocation or abandonment of property.
- (g) Private and public stakeholders must co-develop and implement strategies to mitigate and adapt property to withstand future challenges.
- (h) Better outcomes for residents if Managed Retreat strategies are available sooner and offered as part of a broader range of coastal protection options.

The primary lesson learned is that tackling challenges in Managed Retreat implementation will require understanding a set of priorities that must be addressed to facilitate the process.

3 Managed Retreat in Portugal

3.1 INTRODUCTION

The mainland Portuguese coastline is nearly 987 km long, between the mouth of the Minho River in Caminha and the mouth of the Guadiana River in Vila Real de Santo António, disposed of in a West Coast (Rio Minho – Cape St. Vicent) and a Southwestern Coast, correspondent to the Algarve Coast.

The biophysical support is of great diversity and is, composed of coastal lagoons, estuaries, cliffs, rocky areas, barrier islands and, in significant prevalence, approximately 60%, of low-lying sandy dunes.

The dominant wave regime on the Western coast is mainly from NW and is characterized as high energy (Velooso Gomes 2007). On the south coast, the dominant waves are from W-SW. The mean significant wave heights on the coast reach 1-3 m, and the maximum wave height is 9-15m.

The sediment transport is associated with the littoral drift currents and can be also very severe (Velooso Gomes et al. 2003), generally with the direction of North to South on the western coast. The estimated potential transport capacity of waves is between 1 -2 Mm³/year on the W coast and a few hundred thousand m³ on the Algarve Coast (F Velooso Gomes et al. 2006).

Since the 70s, the mainland Portuguese Coast has experienced significant occupation and economic growth, currently housing around 75% of the Portuguese population, generating around 80% of the gross national product (Duarte Santos et al. 2014).

Coastal flooding and Coastal erosion are the major problems, affecting already around 45% of the sandy dunes system (APA 2024b). The leading causes identified are mainly weakening river sediment sources, dredging of navigation channels and sand mining for construction, and coastline urbanization (Taveira Pinto et al. 2009).

According to (APA 2024a) the most sensitive stretches are in the north and central parts of the west coast, namely between Ofir and Cedovém, Cortegaça and Furadouro and Cova Gala and Costa de Lavos, showing a trend towards a slight acceleration in the medium and long term of the values of retreat of the coastline. The remaining stretches identified include Costa-Nova-Mira Beach, Costa da Caparica and Faro Beach, with a trend suggesting relative stability in the medium and short term Figure 2.



Figure 2 Mainland Portuguese shoreline stretches under erosion (adapted from (APA 2022c))

The decision to use managed retreat in Portugal, is largely integrated with the Integrated Coastal Zone Management Plan, (ENGIZC – approved by Resolution of the Council of Ministers nº.82/2009, of 8 September) like what happens in other countries across Europe.

The Managed Retreat in Portugal should be essentially preventive.

It is known that there are some cases of Managed Retreats that have already been implemented and are referred to in this document. However, it is assumed that they are not all referenced because there are few of them, and not on a scale that has so far attracted interest for study.

At the level of coastal areas, the measure is explained in the National Coastal Plans and Programs as an adaptation option to be implemented in relatively small urban areas. It has several designations, such as managed retreat, demolition, and relocation, having been classified as Planned Retreat in the recent Coastal Programs.

It is therefore the aim of this chapter to write about Managed Retreat in mainland Portugal.

In the first subchapters, a general description will be made of how Managed Retreat is structured and implemented, with the aim of clearly framing and positioning this measure within the framework of integrated management of coastal areas.

Points that are intended to be clarified are its role as a risk minimization approach, its selection criteria, and the strategy/action plan by which its implementation is governed.

The entire analysis is essentially based on the (POOC), Coastal Management Plans, the Coastal Management Programs (POC) and national documents, produced by or for the Portuguese Environment Agency (APA) and which address in more detail the issue of Managed Retreat.

It is important to highlight that no scientific documents were found on the Managed Retreat in Portugal.

It is also essential to clarify that the focus of study is the measure itself and not the comparative study with the other adaptation approaches, since it is considered that all measures are valid, necessary and efficient in their spectrum of action, and that each case is a case.

The investigation is based on the analysis of some case studies along the continental Atlantic coast, with the aim of highlighting lessons learned, opportunities and constraints, with the aim of obtaining inputs that can facilitate and empower future Managed Retreat actions in the Portuguese context.

Regarding the case studies, in addition to the cited bibliography, the information that composes them includes clarifications obtained from informal meetings with the three main entities involved, the Portuguese Environment Agency (APA), local authorities and communities.

As a note, it is worth informing that, aware of the sensitivity of the measure, all the information will not be accessible, respecting the trust that was placed by each party, which the author greatly values and thank.

At the end of the chapter, it will be possible to answer the questions: How, when where and why and learn about the opportunities and sensitivities of implementing Managed Retreat in Portugal.

3.2 APPLIED CONCEPTS

This sub-chapter presents the concepts used throughout the document based on Coastal Management Plans.

Coastline – General term that describes portions of the territory that are influenced directly and indirectly by the proximity of the sea

Coastal zone – portion of territory influenced directly and indirectly in biophysical terms by the sea (waves, tides, winds, biota or salinity) and which may have a width typically of the order of kilometre on the land side and extends, on the seaside, up to the limit of the continental shelf.

Coast – portion of the territory where the sea directly exerts its action, assisted by wind action, and which typically extends towards the land side for hundreds of meters and extends, on the seaside, up to the bathymetric level of 30 m (encompassing the closing depth).

Coastal flooding and overtopping – Flooding of the land area adjacent to the coastline resulting from marine storms, areas affected by the wave run and overtopping of natural morphological elements and existing structures on the coastline.

Coastal erosion – Destruction or retreat of beaches and dune systems. Decrease in the volume of sand on the beach and adjacent dunes, with progression towards the interior and towards the underside of the dominant drift movement of an erosive berm.

Beach – Accumulation of unconsolidated coastal sediments (generally sand or gravel) related to the processes of marine dynamics on the coast.

Dunes – These are systems that have aeolian accumulations of marine sands, constituting specific ecosystems due to the plant composition adapted to the saline environment and the stabilization of sand mobility.

3.3. REGULATORY FRAMEWORK FOR MANAGED RETREAT IN THE POOC AND POC

In Portugal, coastal planning and management are essentially implemented in Coastal Plans and Coastal Programs, as territorial management and decision support instruments.

Since the beginning of the POOC, regulated under Decree-Law no. 309/93, of September 2, there has been a broad reform of the legal and institutional framework in terms of territorial planning and protection and valorisation of water resources.

The document, with the objective of protecting the coast and coastline, understood as “particularly sensitive areas, from an environmental point of view and characterized by a great diversity of uses, simultaneously constituting support for economic activities, in particular tourism and related activities, as recreation and leisure”, (Ministério do Ambiente e Recursos Naturais 1993), came to regulate the criteria for attributing private use of land in the Maritime Public Domain (DPM), establishing rules for beaches and the entire coastline, covering both the Maritime Public Domain and a land protection strip with a maximum width of 500 m.

The recommended intervention measures were dominated by reactive and problem-mitigating approaches, largely through the installation of coastal protection infrastructure, sediment transfer or replenishment, with relocation being considered very occasionally (Fidélis et al. 2022)

In 2007, under Decree-Law no. 316/2007, of September 19, the objectives of these special territorial planning plans ceased to be the establishment of uses and became the establishment of regimes for safeguarding natural resources, risks and values. and the definition of the management regime compatible with the sustainable use of the territory.

Under the new law on the General Bases of Public Policy on Land, Spatial Planning and Urban Planning, in 2014, the Special Spatial Planning Plans (PEOT), which include POOC, were reconfigured as Special Programs (PE), becoming the Coastal Management Programs (POC).

Figure 3, is intended to show the evolution in time of the transition between the POOC and the POC. Annex A has a brief presentation of Legal Documents supporting coastal management, Table 21 and Table 22.

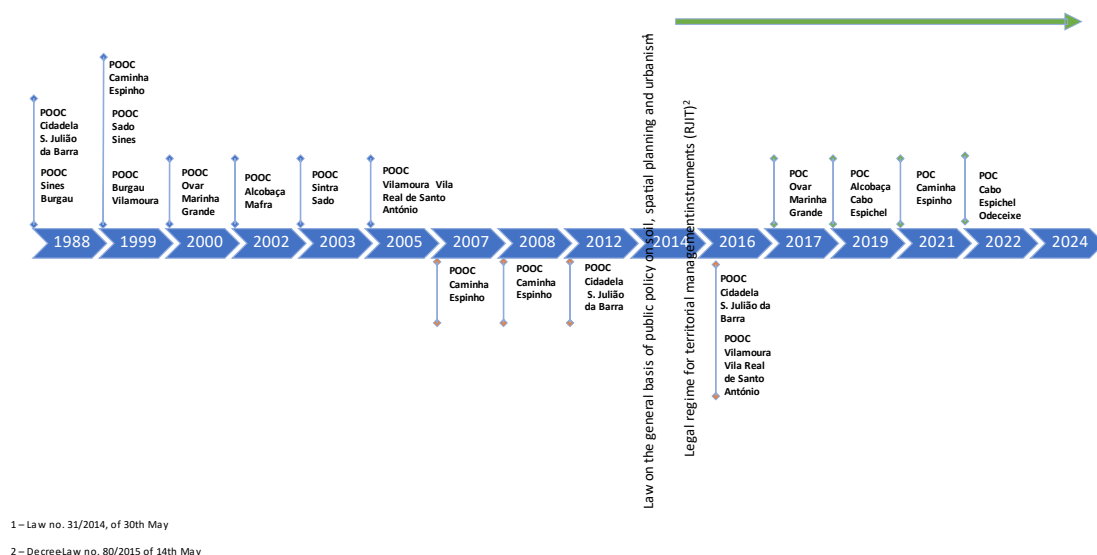


Figure 3 Timeframe of the evolution between POOC and POC.

In this new form, POC begin to exclusively establish regimes to safeguard natural resources, values and risks, through measures that establish permitted, conditioned or prohibited actions depending on the objectives of each program.

With this paradigm shift, Special Programs are given a strategic character, meaning they no longer directly and immediately bind individuals through the definition of a land use regime, but only bind public entities through their normative content relating to resources and values.

In a practical way, the general standards constitute guidelines of a strategic nature aimed at public entities with planning and management responsibilities for the coastline. The specific standards should be transposed, after the entry into force of the POC, to the level territorial plans, plans municipal or intermunicipal with spatial incidence in the intervention area of each POC, whenever they condition the occupation, use and transformation of land.

In particular, as far as municipalities are concerned, specific standards must be considered when drawing up, reviewing and amending territorial plans, which are the only territorial management instruments directly binding on individuals.

Thus, the law moves from a philosophy of a land use regime to a regime for safeguarding natural resources, risks and values and management compatible with the sustainable use of the territory.

In this new form, the POC cover the entire coastline, including port areas and coastal sections not covered by the POOC planning rules, and the respective terrestrial protection zone (ZTP). This zone extends from the edge of the sea waters and a strip measured horizontally, with a width of 500m, counted from the line that limits the margin. It can be extended from 500 m to 1000 m, when justified by the need to protect biophysical systems, namely dune systems, cliffs, coastal lagoons, estuaries, salt marshes and other coastal wetlands.

This delimitation of the POC intervention area, with regard to the definition of the Terrestrial Protection strip, differs from that defined in the POOC, which was delimited from the line of the

Based on the recognition of the worsening of coastal erosion and the increase in the frequency and intensity of extreme weather phenomena, resulting from climate change, the new POC legal regime requires a more effective response in the application of the precautionary principle, implemented in the adoption of adaptation measures - protection, accommodation and relocation, which reduce the exposure of people, activities and infrastructure.

In this context, POC move from the zoning regime through regulation to the identification of risk zones and the establishment of safeguard regimes for these zones, depending on their uses and occupations, from a medium and long-term perspective.

The Managed Retreat thus goes from being a measure to be considered or implemented in the territory for some coastal urban agglomerations within the scope of some territorial units integrated into the UOPG, to one of the possible management strategies adaptive, planned for critical areas, under the name of Planned Retreat.

The principles of prevention and precaution are central in the definition of the adaptive planning and management model for the coastal zone, clearly if prevention involves not increasing exposure to risks, containing occupation in places or coastal sections that present greater susceptibility to the destruction of coastal resources and values, natural or anthropogenic (MAAP 2023).

Taking as a reference the report of the Working Group for the Coast (Duarte Santos et al. 2014), the planned retreat is defined as an intervention that aims to retreat the urban occupation zone in relation to the coastline, relocating uses and infrastructures and ensuring the re-naturalization of these areas.

As a strategic management principle, it is advised that the remaining accommodation options and measures to reduce coastal erosion and manage the evolution of the coastline should be considered in cases identified as being at high risk.

It involves the removal of buildings in areas defined as “Critical Planned Retreat Areas”, which include natural spaces, productive spaces and/or urban spaces that are more susceptible to the destruction of coastal, natural or anthropogenic resources and values.

Its identification results, as a rule, from the overlapping of coastal erosion risks caused by the action of the sea with the effects of land invasion by the sea because of the occurrence of extreme events (ocean overtopping and coastal flooding), for the 2050 scenario, and historical knowledge of the occurrence of maritime overtopping and/or erosion phenomena.

“For the Managed retreat to be carried out correctly, prospective studies of planned retreat must be carried out in locations with a high risk of overtopping, flooding and erosion based on cost-benefit analysis and multi-criteria analysis that include the medium and long term” (APA 2021).

The concept of relocation appears associated with the accommodation strategy, defined as an intervention to adapt to coastal risks based on changing the forms of occupation of coastal areas with greater susceptibility.

In Annex B, are presented the position of each POC relating Managed Retreat, (Table 23 to Table 26).

In addition to POOC and POC, the retreat is also included in the Action to reduce risk category – Reduction of exposure, provided for in the Flood Risk Management Plans (PGRI), and enshrined in the Municipal Spatial Planning Plans (PMOT), aiming to develop interventions that promote the retreat of the urban occupation zone, in relation to the coastline, relocating uses and

infrastructures and ensuring the re-naturalization of these areas, given their susceptibility to coastal risks.

3.3.1 DECISION MODEL FOR IMPLEMENTING MANAGED RETREAT

Based on the recognition of the worsening of coastal erosion and the increase in the frequency and intensity of extreme weather phenomena resulting from climate change, the decision support model for adopting adaptation measures that reduce the exposure of people, activities and infrastructure gains consistency.

Although there is no in-depth reflection on the criteria that support the decision to adopt Managed Retreat in coastal areas in Portugal, the POC present some considerations on the conditions under which it should be foreseen as an adaptation measure. The information grouped by POC can be consulted in Table 27 to Table 32 of Annex B.

From its assessment it can be concluded that the Managed Retreat aims to retreat the urban occupation zone in relation to the coastline to reduce the risk of events associated with climate change, limiting its potential effects. It is particularly relevant in low build-up spaces covered by safeguard strips of overtopping, flooding or erosion and must be adopted in extreme situations for safety reasons.

In consolidated coastline urban fronts, in the same conditions, POC considerations related to risk minimization are primarily based on protection, preferably on sediment management and recovery of the sediment profile.

Managed Retreat is proposed for small clusters of dispersed buildings, where priority should be given to acting on occupation to reduce the risk and only in the absence of viable protection or accommodation alternatives or when costs become excessive. It may also be considered when specific cases of relocation opportunities arise.

For each case, Managed Retreat must be adopted and quantified case-by-case, considering the local's existing protection and coastal dynamic, supported by a cost-benefit analysis and multi-criteria analysis that include the medium and long-term.

Following the Managed Retreat, the coastline's evolution must be managed by adapting the occupation of the territory to the natural dynamics of the coast.

3.3.2 COST BENEFIT ANALYSIS

The information relating to this subject can be consulted in Table 27 to Table 32 of Annex C , based on the elements available in the various POCs in force and from which the following conclusions result.

The conceptual model that supports the cost-benefit analysis includes a set of steps, defined as follows, according to (APA et al. 2018)

- (a) Step 1: Identification of the reference situation to identify the problem
- (b) Step 2: Defining base scenarios to support the type of response
- (c) Stage 3: Assessment, for each scenario, of the economic, social and environmental dimensions

(d) Step 4: Assessment of the cost/benefit ratio of each scenario under evaluation

The identification of the area's most susceptible to the effects of climate change is made in the Reference Situation diagnosis, in which the combined effects of overtopping and coastal flooding and coastal erosion (caused by various phenomena) are considered, which allows the vulnerability to be verified. The analysis is carried out assuming pessimistic scenarios of average sea level rise.

In general, four scenarios are evaluated: scenario 0 - Emergency Reaction / Emergency Protection, Scenario 1 - Planned Retreat / Relocation Strategy, Scenario 2 - Protection Strategy / Planned Maintenance: and Scenario 3 - Mixed Protection / Anticipation Strategy Planned

Each of them is approached from short-term perspectives (5 years), essentially in scenario 0, medium (10, 15 years) and long-term (50 years) in the remaining scenarios.

The analysis subsequently carried out is based on different types of intervention, whose actions are classified as fundamental, complementary and basic actions, in each scenario.

In each scenario, descriptors in the economic, social and environmental dimensions of the various actions are also evaluated by assigning a sensitivity weighting.

This results in a critical analysis of the results and the definition of the most favourable adaptation solution for the territorial area in question.

3.3.3 MONITORING AND ACHIEVEMENT INDICATORS

Ensuring regular monitoring of uses and activities in coastal strips is one of the main challenges facing POCs for the future. The premise is to ensure better knowledge of the evolution of the territory and better support for a proactive approach to risk mitigation (APA 2018a).

In this context, its importance is highlighted for carrying out cost-benefit analysis that allow the basis of future adaptation strategies, including planned retreat, ensuring a timely and more appropriate response (APA 2021a).

One of the difficulties currently experienced at national level is the loss of capacity to acquire knowledge, due to failure to regularly and systematically monitor sedimentary dynamics, the evolution of the coastline and the performance of coastal protection works carried out (APA et al. 2018a).

Especially in the post-intervention scenario, it is considered essential to establish a monitoring program, supported by integrated databases, which allows evaluating the suitability of solutions used in various clusters, encouraging the sharing of knowledge and the definition of new intervention priorities (APA 2016).

The monitoring assessment will be ensured through a system of performance indicators with the objective of monitoring the execution of planned actions and measuring the results achieved with implementation, in addition to the process of collecting, analysing and presenting results.

Regarding the Managed Retreat, the different POC consider the following achievement indicators (Table 2).

Table 2: Managed Retreat Achievement Indicators

POC	Indicator	Unit	Information Source	Frequency
POC CE	Removal of buildings	No.; Value in euros	APA	Annual
POC OMG	Demolitions/reconstructions carried out	No.; Value in euros	APA	Annual
POC ACE	Interventions to relocate populations to places less susceptible to risk	No.; Value in euros	APA	Quadrennial
POC EO	Cost-benefit analysis study of the Managed Retreat from Troia peninsula	No.; Value in euros	APA	Annual

3.3.4 GOVERNANCE MODEL

The Portuguese coastal zone is a territory characterized by a great diversity of entities with different skills and scope of action.

Thus, in general, special importance has been attributed to territorial cooperation and institutional coordination in the management of coastal areas.

In an overall diagnosis, the Portuguese coastal governance system is characterised by a lack of political clarity and disjointed continuity, underpinned by insufficient and unreliable political will, difficulties in coordinating institutions and stakeholders, and weak and ineffective science, which is seen as a failure to integrate scientific knowledge into coastal policies (Schmidt et al. 2013).

This perspective underpins a multi-level model of coastal governance, involving all actors responsible for managing the coastline and adopting participation, co-responsibility and operational mechanisms (APA 2021a)

In this context, the need to improve inter-institutional and multi-level coordination is highlighted, as well as the necessity to define more robust articulation and information mechanisms that contribute to integrated management, to introduce greater efficiency and transparency in decision-making (APA 2021c; 2022b).

Figure 6 Actors within Coastal area (adapted from (Almodovar 2017))reproduces the model presented by (Almodovar 2017) highlighting the Entities at different levels of intervention in the integrated management of the coastal zone in Portugal:

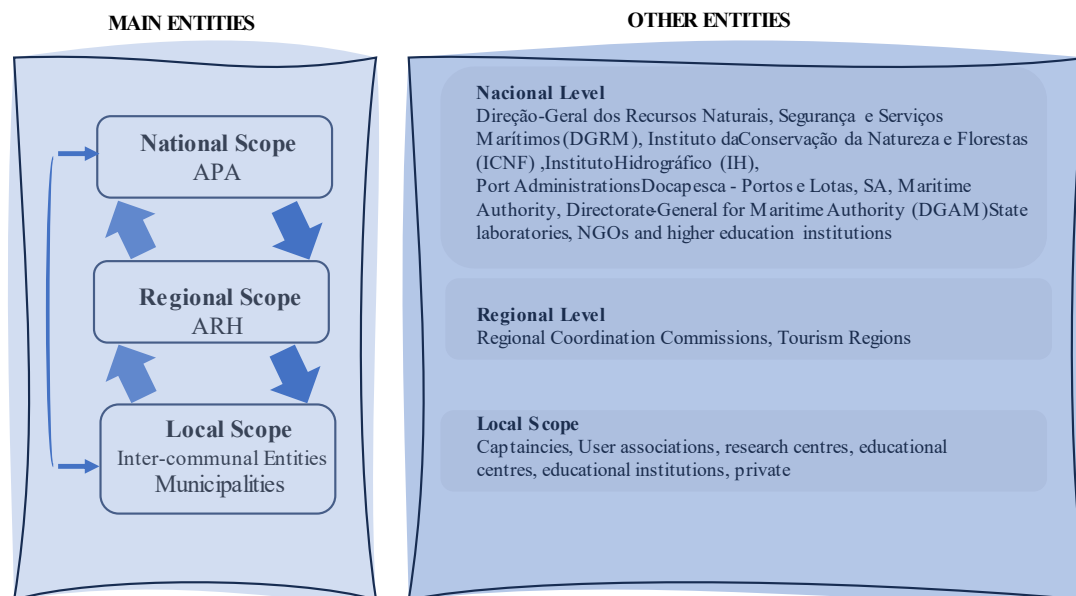


Figure 6 Actors within Coastal area (adapted from (Almodovar 2017))

The coordination role is assumed by the APA and its territorially decentralized services in the Hydrographic Region Administrations (ARH), whose competence in terms of coastal protection and DPH management is to encourage coordination between entities with responsibility for coastal management, ensuring compatibility with the remaining territorial management instruments and planning instruments and ensure regular monitoring of their implementation by the various entities.

There is greater responsibility on the part of local actors in coastal management, namely Municipalities and inter-municipal entities, and involves the participation of different actors at different levels of intervention.

The improvement of mechanisms that enable effective coordination and good articulation therefore becomes essential in the Governance Model, to prioritize the sharing of information and in order to introduce greater effectiveness and transparency in decisions (APA 2022b).

This objective allows for greater sustainability of options in social, economic and environmental terms, as well as considering coastal risks in strategic options for environmental qualification and urban occupation. (APA 2021c).

Specifically in relation to the implementation of Managed Retreat, the governance model is structured by management and monitorization, aiming to ensure effective and participatory coordination of implementation (APA 2022a).

The most current model found is based on the scheme presented in the document entitled Tagides Litoral developed by (ARH do Tejo 2009) and in some considerations about the subject mentioned in (ANEPC 2010).

The scope of action of the Coastal Plans and Programs applies in a space between the bathymetric line of -30 meters towards the sea and the distance of 500 meters towards the land side, in the case of POOC, which can extend up to at 1000 meters in the case of POC (Figure 7).

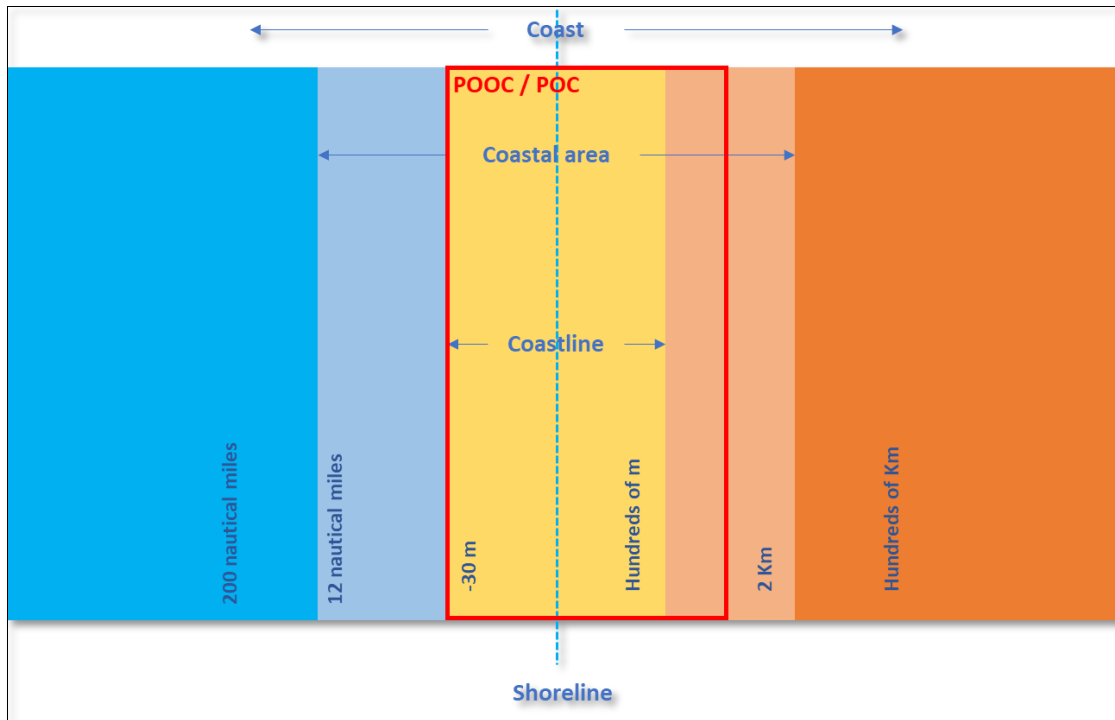


Figure 7 Concepts related to coast (adapted from (ANEPC 2010))

Specifically attending to the territorial units in which Managed Retreat is planned, namely the UOPG in the case of POOC and Critical Areas of Planned Retreat in the case of POC, there are several entities involved in the management of the coastal zone.

The governance model advocates the responsibility for coordinating the intervention of the Portuguese Environment Agency (APA), especially through the Hydrographic Region Administrations (ARH), with the various entities with responsibility for acting on the territory within the coastal zones being involved in the process, namely the Regional Coordination and Development Commission (CCDR), the Municipalities and the Maritime Authorities (ARH do Tejo 2009).

In the general intervention process, the interventions planned within the Public Domain are coordinated and of the responsibility of the ARH and outside of this, they are coordinated by the Local Authorities in collaboration with the ARHs and implemented by the Local Authorities.

All entities with responsibility for the coastal zone covered are involved in the operations, in addition to coordinating entities such as the Maritime and Port Authorities, the Institute for Nature Conservation and Forests (ICNF) and the Regional Development Coordination Committees (CCDR) (ANEPC 2010). This involvement is essentially done at the project level, with the issuing of opinions on the activities to be carried out within its scope of territorial responsibility.

In addition to coordination, the Local Authorities play a fundamental role in managing the project and design teams, obtaining financial resources, involving the population and managing the entire process of removal and relocation of the affected population.

It is currently in charge of executing the implementation protocols, relocating the population and negotiating compensation in the case of first-home residents who do not want to be relocated and second-home owners.

Another aspect to consider is the role that local authorities may have in the context of these concerns, meaning that opportunities for intervention may arise here, not always aligned with the concepts outlined above, but which are important to reference and encourage.

It is also important to consider the dynamics of cases that involve litigation or acquired rights, and which may introduce very different dynamics to those previously mentioned.

Within the scope of the Coastal Plans and Programs, it is planned to prepare a set of studies, plans and specific projects, for the application of integrated management measures or the implementation of requalification works relating to certain stretches of coastline that, due to their characteristics, they are individualized in relation to the general coastline.

In most cases, these are sections of territory with particularly complex problems, so the implementation of the measures established in POOC, for each of these areas, implies the implementation of a set of studies, plans, projects and works, which implies a lengthy, complex process in which a diverse set of entities are involved.

With regard to studies, plans, projects and works, they must continue to be carried out by the Authorities, APA/ARH, in accordance with the provisions of the POOC/POC, privileging, when justified, the format of technical- financial or program contracts, to be celebrated on a case-by-case basis, depending on the issues at hand, with the aim of providing technical and financial support for their development.

The timing of the operation is defined annually within the scope of municipal strategies and depending on the clarification of the legality of the situations and the financing of the intervention is essentially public through European community funds and financing programs, local in the case of Municipal Councils.

3.3.5 ACTION PROTOCOL

Knowing how to develop a Managed Retreat process is an essential issue to achieve the success of the intervention. Some approaches have been described in disperse reports and documents produced by APA, which involve a stage action regarding property rights and legality.

According to (ARH do Tejo 2009) Managed Retreat is essentially synonymous with demolition. The goal is to remove buildings that do not comply with the law (considered a priority in the redevelopment of the coast), or that present a non-minimizable risk situation. The action protocol consists of two phases:

- (a) The first phase involves constructions whose maintenance is not included in the POOC and for which, actions to restore the situation prior to their occupation may have already been initiated.
- (b) The second phase pertains to constructions whose usage licenses expire within the scope of adaptation processes to the standards defined by the POOC or processes related to the implementation of specific studies and projects, arising from the implementation of Operational Management Units (UOPG) provided for in the POOC

The framework of procedures for carrying out demolitions is governed by the following steps:

- (a) Notification of the owners of the facilities about the non-compliance situation in which they find themselves and information about what the law recommends.

- (b) Hearing of interested parties within the framework of their rights.
- (c) Issuance of the decision that appears adjusted with a view to restoring legality.
- (d) Activate coercive demolition, with all the inherent legal and administrative procedures, when there is no room for restoring the situation prior to occupation on a voluntary basis, as the administration has the duty to intervene to replace the defaulters.

In addition to the demolitions associated with the necessary requalification of the beaches, within the scope of the adaptation process to the Coastal Plans and Programs, there is still a significant universe of undue occupations on the coastline, namely:

- (a) Those that involve occupation of the Maritime Public Domain (DPM), mainly the sea margin and often the seabed itself,
- (b) The constructions that are in *non-aedificandi* areas outside the public domain and that constitute violations of administrative easements, conditions and restrictions of public utility and protection regimes defined by the POOC/POC, or are in areas subject to the regime of REN, and,
- (c) The cases in which there are doubts about the fact that they affect an area integrated into DPM. In these situations, is necessary the demarcation of the line correspondent to the Higher High Water Large Tide (HHWLT) in each section, which is the responsibility of the APA.

In many instances, determining illegal occupation requires a thorough analysis of the technical aspects that help clarify the true extent of the seashore, as defined by the current legal framework. This understanding is crucial for providing the necessary legal basis for most decisions regarding the restoration of legality, achieved through the demolition of existing buildings. Removing the construction is based on action priorities, depending on the type of the situation as is listed below and outlined in Figure 8 (see expanded figure in Annex E):

1st - Demolitions of Priority 1 – Situations in which ARH/APA can have a direct and faster intervention. - These are occupations on the margin without a title of use, not legalizable in light of current legislation and not covered by any intervention project in the area, in which ARH/APA can resort to the legal regime of the Water domain (Water Law and Decree-Law n° 226/2007, of May 31st) being able to act based on their competences, both in the demolition order and at the level of the entire administrative procedure.

2nd - Demolitions of priority 2 or 3 – Situations covered by UOPG, Beach Plan or concrete requalification projects – These are structures whose demolition and removal must be coordinated with the implementation of projects, as some of them guarantee provisionally support services for bathing activities. Its removal must be carried out according to the programming of planned interventions.

3rd - Situations outside the Water Domain – Situations outside the DPM (outside the margin), but in non-compliance with the POOC and POC.

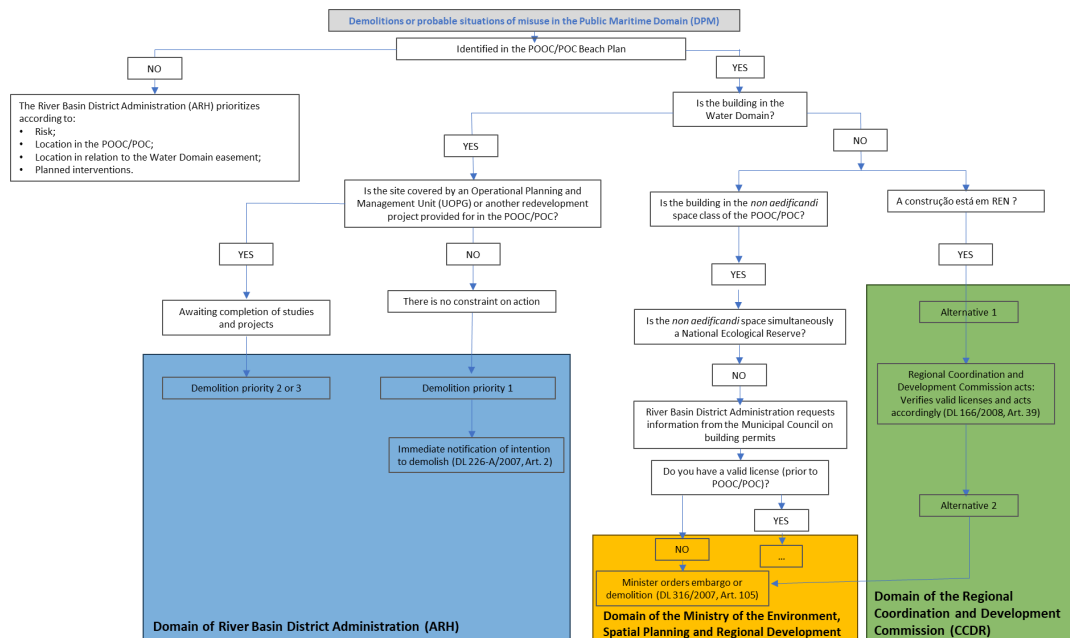


Figure 8 Diagram to implement demolition (adapted from (ARH do Tejo 2009))

In addition to the situations listed, (ARH do Tejo 2009) also emphasizes that each case is different, and there may be reasons that could change the priorities mentioned. Examples are cases involving first homes or economic activities that depend on connection with the sea, which, given their nature, may require greater consideration of complementary measures.

Of all the documents that make up the Coastal Plans and Programmes, only the POOC Vilamoura – Vila Real de Santo António presents a procedure for action, which essentially covers cases of residential homes:

- Survey of all existing occupations with identification of the construction type (first or second home), the activity of residents of the first homes, (particularly if it is associated with local resources, namely fishing).
- Identification of relocation alternatives for residents who are confirmed to be their first and only residence.
- Creation of incentives for relocation, which should preferably include transfer to centres to be restructured in the same area of residence.
- Programming the progressive extinction of existing buildings, establishing the extinction schedule that should begin with constructions located on the primary dune and in risk areas and that correspond to illegal second homes.
- Determination of a maximum period for the vacancy of buildings, their demolition and recovery and total renaturalisation actions.

Regarding cases of economic activities that depend on connection to the sea, within the Public Domain the procedure is well identified since Decree-Law No. 468/71, of November 5, 1971, as these establishments can only operate under a license exploration or concession.

Outside the water domain, but within the territorial scope of POOC/POC, the action procedure is not explained.

Allusions can, however, be made considering the process adopted for the case of Managed Retreat from São Bartolomeu do Mar (PLN 2010), in a similar way it applies to owners of second homes, who prove the right of ownership, i.e. its legal status:

- (a) Survey of existing economic activity buildings.
- (b) Determination of the legality situation.
- (c) Calculation of the compensation value, considering the value of the construction, the value of the land on the plot, the value of improvements and losses in the case in which the liberal activity is interrupted.

Taking into account the points mentioned above and inspired by the scheme presented by (ARH do Tejo 2009), Figure 9 and Figure 10, (see expanded figures in Annex E) seek to summarize the action protocol in different cases.

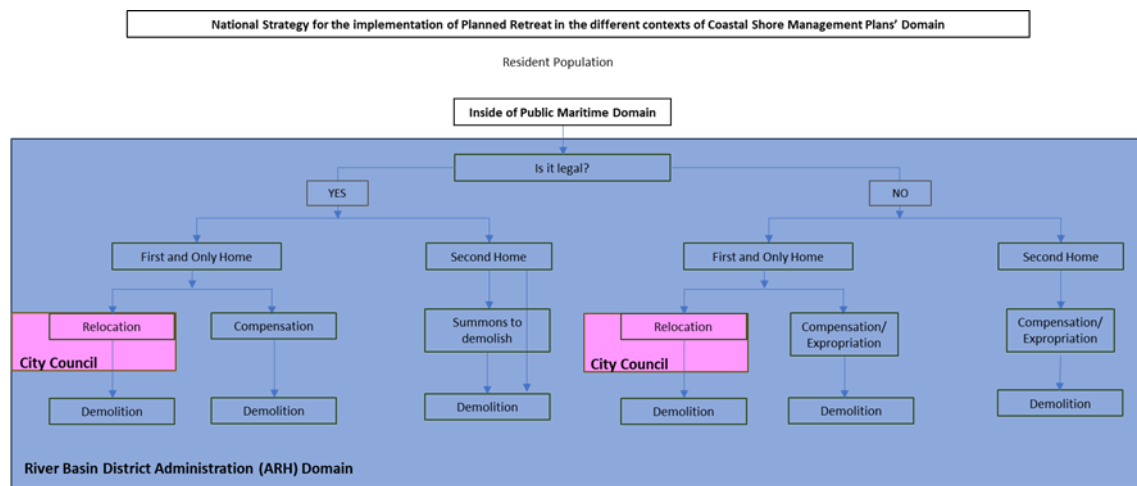


Figure 9 Diagram to implement demolition over in DPM

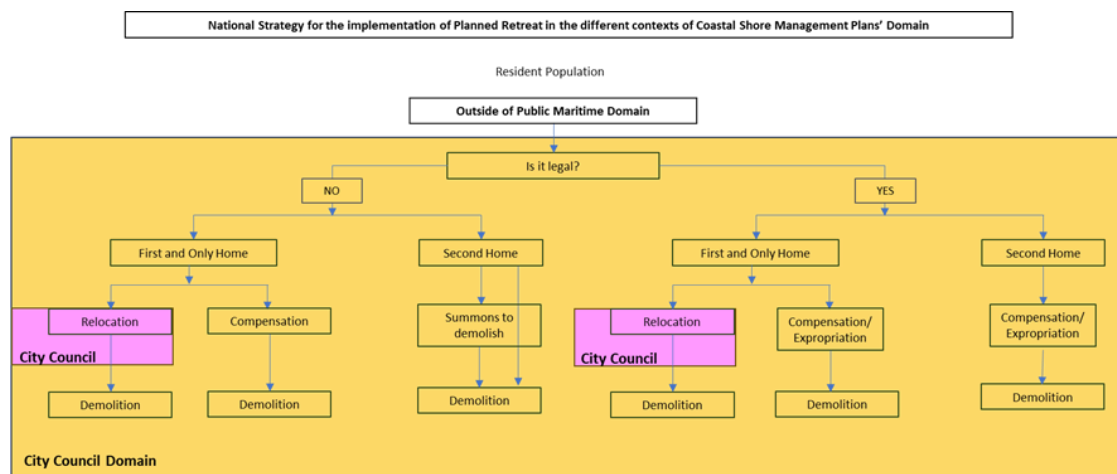


Figure 10 Diagram to implement demolition outside DPM

Service buildings within the Public Domain are dealt with at the level of beach plans, so action protocols are not explored here.

Regarding the above, some considerations are important as it has been around 15 years since they were written.

The first one is related to the definition of Managed Retreat presented - “Demolition”. About this subject it is important to mention that only with the entry of Coastal Programs the definition of this adaptation measure is defined gains some consistency.

A good framework is provided by (APA 2021b), which regarding the relevance of removing buildings clarifies the following:

“Several of the areas identified as the target of planned retreat interventions (removal of buildings) correspond to building centres that, over the years, have been developing towards the sea, and which, in view of the increasing action of this, have become subject to events mentioned extremes, currently requiring their removal and possible relocation to safer and less exposed areas. The removal of buildings must be studied to qualify infrastructure and services in a context of social, tourist and landscape enhancement, supported by natural, fishing (if any) and bathing characteristics.”

The second consideration concerns about the issue of the legality of constructions in coastal areas. This is a complex subject, and little developed in this document, as it is not the objective of this specific study, but that deserves some reflections.

Most of the cases are related to private occupation of the Public Maritime Domain (DPM).

In Portugal the concept of Water Public Domain in Portugal exists since 1864, although was with the decree-law no. 487/1971 of 5 November, that the definition of Public Maritime Domains was set as well as the regulation principles of use of those coastal areas.

The concept of Water Public Domain in Portugal exists since 1864, although was with the decree-law no. 487/1971 of 5 November, that the definition of Public Maritime Domains was set as well as the regulation principles of use of those coastal areas, and with the POOC from 1998, that was began to be delimit in cartographic plants.

By definition, DPM include the water and respective maritime bed and margins, having a width of 50 meters inland, counted from the line corresponding to the maximum high tide of equinoctial spring tides (HHWLT) and are considered non-construction areas, having a proper legal regime and principles that regulates private property uses.

This highlighted an important question that is the fact that although having a fixe width, the DPM is based on a line in the field (HHWLT) that depends on the wave run-up under average waves heights conditions, and that is variable from place to place and in time. Besides the difficulty in evaluating the HHWLT this also means that some buildings on the shore, now identified inside de DPM may not have been there at the time of their construction.

Like most POOCs, POCs also do not look thoroughly at the Managed Retreat protocol.

However, it is possible, with the information provided, to outline some more points to include in a Managed Retreat action protocol, updating the defined model:

- a) The Managed Retreat must provide for phasing and the possibility of partial implementation in the face of emergency situations.

- b) Priority must be given to the removal of constructions of illegal origin, which are in the Safeguard Strip on the Sandy Coast – Level I.
- c) In relation to relocation, expeditious negotiation mechanisms should be privileged, including the transfer of buildability of constructions in risk areas to suitable areas, in conjunction with local authorities, through the creation of equalization mechanisms or exchange of land in safeguard strips for others located outside of these.
- d) In areas subject to Managed Retreat interventions, renaturalization must be planned and include the reconstitution and reinforcement of the dune system.
- e) Its implementation must be properly framed within inter-municipal and municipal territorial plans,
- f) The possibility of transferring buildability to more suitable areas should be considered and developed within the scope of territorial plans and respective implementation instruments.

These notions reveal greater openness in the Managed Retreat implementation process, more adjusted to adaptive and dynamic planning.

3.3.6 IMPLEMENTATION MODEL IN THE TERRITORY

Managed Retreat, as a strategic principle for managing the area's most susceptible to coastal risks, was considered in the 1st generation POOC, either through the Beach Plans, which identified the buildings to be removed, or through the Operational Planning and Management Units (UOPG) that provided for scheduled removals of buildings and populations.

If we recall the territorial model presented in the Figure 5, it can be seen that in POC the zoning regime involves the identification of risk ranges within which Critical Planned Retreat Areas are defined, which include natural spaces, productive spaces and/or spaces urban areas that are more susceptible to the destruction of coastal, natural or anthropogenic resources and values.

In addition to these areas, POOC and POC, other zones or strips are identified on the territory, depending on the case, for which restrictive rules are inferred regarding construction or to be respected regarding the construction or non-construction regime, such as:

- (a) Interdictions on the opening of new communication routes or access, construction or expansion
- (b) Provisions on urban development, such as its positioning in relation to the coastline.
- (c) Definition of *non-aedificandi* areas.
- (d) Definition of urban decompression areas and progressive accommodation of existing buildings to the risk of coastal flooding

Considering what was discussed in the previous chapter on the different Managed Retreat models, it can be said that in addition to concrete action on the territory in urban agglomerations, Managed Retreat can have another, more strategic facet that can be implemented at the level of regulations and rules on territorial planning.

Analysing from this point of view, it can be said, as a starting point, that the Managed Retreat in Portugal is based on two aspects: one regulatory and the other interventional, even though that may not have been the initial idea, but it is worth considering.

3.4 DIAGNOSIS OF MANAGED RETREAT IN THE COASTAL AREA

Managed Retreat in coastal areas in Portugal has been considered for several years, namely with the creation and entry into force of the Coastal Management Plans (POOC), in 1993, under Decree-Law no. 309/93, of September 2nd.

Within the scope of these instruments, from north to south of the country, built areas located within areas at risk of erosion and sea overtopping were flagged, in which progressive retreat, removal of existing buildings and buildings to be demolished should be considered.

3.4.1 CASES OF MANAGED RETREAT IN POOC

Grouped by the respective POOCs, the exercise was carried out to list, within the group of areas in which constructions were expected to be demolished, those that were considered to specifically refer to a Managed Retreat

To overcome this difficulty, areas were selected, in the description of which keywords were used, such as retreat, progressive retreat, removal of buildings, relocation and priority relocation program. The selection is presented in Table 3 to Table 8, with a total of 23 situations being recorded.

Table 3: Specific cases of Managed Retreat provided for in POOC- Caminha – Espinho

POOC-Caminha – Espinho (1st cycle)			
Locations	UOPG	Concept	Justifications
São Bartolomeu do Mar Beach	UOPG NO.3	Progressive removal of buildings	
Pedrinhas/Cedobém*	Pedrinhas/Cedovém specific intervention area	Removal of existing buildings	Recovery of the dune system, maintaining local activities
Paramos Cluster	UOPG NO.16	Removal of the settlement	Analysing the removal of the settlement, studying an alternative location and/or different hypotheses

**included in the 3rd revision with the entry into force of the North Coast Natural Park (POPNLN).

Table 4: Specific cases of Managed Retreat provided for in POOC- Ovar – Marinha Grande

POOC-Ovar – Marinha Grande (1st cycle)			
Locations	UOPG	Concept	Justifications
Built-up areas to be restored in Esmoriz and Cortegaça	Esmoriz and Cortegaça Detail Plan	Demolition and Relocation (priority rehousing programme)	Restructuring the urban front

Esmoriz Cortegaça: Cortegaça fishing centre	Esmoriz and Cortegaça Detail Plan	Demolition and Relocation (priority rehousing programme)	Environmental recovery zone
Costa Nova	Costa Nova Urbanization Plan	Priority rehousing programme	Urban regeneration zone (urban regeneration of degraded housing areas)

Table 5: Specific cases of Managed Retreat provided for in POOC- Alcobaça- Mafra

POOC-Alcobaça – Mafra (1st cycle)			
Locations	UOPG	Concept	Justifications
Água de Madeiros	UOPG NO.1	Relocation of buildings, through rehousing actions	Risk situation
Vale Furado	UOPG NO.3	Demolitions and expropriation actions	Illegal occupation, risk situations, urban redevelopment
Bom Sucesso	UOPG NO.8	Removal of buildings	Threat from the advancing sea; management of buildable areas
Santa Rita -Porto Novo	UOPG NO.15	Urban conversion; relocation	Location in a risk zone; situations of misuse in water domain
Sizandro River Mouth	UOPG NO.18	Removal of buildings	Threat from the advancing sea

Table 6: Specific cases of Managed Retreat provided for in POOC- Sintra-Sado

POOC-Sintra – Sado (1st cycle)			
Locations	UOPG	Concept	Justifications
Aguda Beach/ Grande Beach	UOPG NO.4	Demolition of buildings	Urban redevelopment, framework for fishing activity
Maças Beach	UOPG NO.5	Removal of buildings	Revitalising urban spaces; reducing building pressure; compatibility of uses in risk zones
Cova do Vapor a São João da Caparica	UOPG NO.10	Progressive demolition of buildings	Renaturalization and conversion of the area
Fonte da Telha	UOPG NO.17	Demolition of illegal constructions, rehousing of fishermen	Urban reconversion for public use
Albufeira Lagoon	UOPG NO.18	Progressive demolition of illegal constructions	Recovery of the area in the National Ecological Reserve

Table 7: Specific cases of Managed Retreat provided for in POOC- Sintra-Sado

POOC-Sines – Burgau (1st cycle)			
Locations	UOPG	Concept	Justifications
Coastal zone between Cape Sardão and the entrance to Barca	UOPG NO.3	Demolition	Reconversion and redevelopment project for the centre of the Barca entrance
Amoreira and Monte Clérigo beaches coastal zone	UOPG NO.4	Demolition	Urban redevelopment of the Vale da Telha urban centre. The built-up centre of Monte Clérigo should be the object of a reconversion and requalification project.
Arrifana	UOPG NO.5	Eliminated	Development of the coastline and the built environment

Table 8: Specific cases of Managed Retreat provided for in Vilamoura – Vila Real de Santo António

POOC-Vilamoura – Vila Real de Santo António (1st cycle)			
Locations	UOPG	Concept	Justifications
Faro Island	UOPG III	Programmed removal of buildings; Rehousing of first home residents	Occupation in water domain and unaffected area of water domains; Risk safeguard
Culatra Centre	UOPG IV	Demolition of second homes. Re-housing actions	Maintain dominance of the water domains; Regularization of the situation of existing buildings; Requalification of primary housing buildings; Demolition of second housing constructions **
Armona Centre	UOPG V	Demolition and removal of uninhabitable, hazardous and/or illegal buildings	Change of bounded area by Armona Island Urbanization; Restoring legality; Risk protection; Renaturalisation and requalification of the area

From the analysis of the tables above, it was clear that despite being framed as a risk minimization measure, the Managed Retreat includes other motivations in its practical development, such as, for example, the restoration of legality and urban requalification of the site.

It is clear that it is only considered for residential buildings or neighbourhoods, due to the specific references to the type of permanent or secondary occupation and the consideration, in some cases, of the need for priority rehousing programs.

However, in almost all beach plans, buildings to be demolished are identified, with various usage patterns, conservation status and types of construction, and under the most varied motivations, in addition to risk minimization.

The strong use of the word demolition, particularly of catering facilities and services, leads us to conclude that these cases do not seem to be considered as Managed Retreat, and should they not also be given this designation?

It is true that these buildings have a different, or at least, clearer framework in Portuguese legislation, however there is a whole business, and a dynamic created in the place, for owners, users and the region that will be changed.

Another characteristic that draws attention is the fact that it is difficult to understand what motivates authorities to opt for a managed retreat, as a measure to minimize risk.

In reality, considering that the concept of managed retreat refers to the removal of something from the risk area, which presupposes demolition as an action, more cases should probably be considered, however concrete knowledge of some situations also prevailed here, to do this selection.

In (ARH do Tejo 2009) the objective of demolition is presented as the “Removal of buildings that do not comply with the law or that involve situations of non-minimizable risk”. Demolition actions are part of the redevelopment of the coast, where the removal of buildings that do not comply with the law is one of the strategic objectives for this purpose.

The justification that the buildings are dissonant with reality or are in DPM, undermines the purpose of avoiding risk and promotes doubt about the true intention of demolishing these buildings.

3.4.2 CASES OF MANAGED RETREAT IN POC

In 2009, as determined by Order No. 22620/2009, of October 14th, later amended in 2010 by Order No. 7171/2010, of April 23rd, the review of the POOC was determined, giving rise to the Coastal Management Program (POC).

Referring to the report of the Working Group for the Coast (GTL), (Duarte Santos et al. 2014), the various POC adopted the term of planned retreat and its definition as an intervention that aims to retreat the urban occupation zone in relation to the coastline, relocating uses and infrastructures and ensuring the re-naturalization of these areas.

The concept of relocation appears associated with the accommodation strategy, and action is defined as an intervention to adapt to coastal risks based on changing the forms of occupation of coastal areas with greater susceptibility.

In the same way, the exercise was carried out to list these areas, grouped by the respective POC in force at the date of this study, (Table 9 to Table 12).

Table 9: Specific cases of Managed Retreat provided in POC Caminha-Espinho

POC-Caminha – Espinho (1st cycle)			
Locations	Critical Area	Goals	Justifications
Amorosa Beach	AC10	Removing buildings at risk and elimination of illegal occupation of the DPM	Occupation of the dune system (primary dunes); Restoring legality. Safety of people and goods in the medium term.
Pedra Alta	AC11	Removal of buildings at risk; Maintaining conditions for artisanal fishing.	Restoring legality. Coastal section undergoing a strong erosion process and the advance of the sea over housing areas.
Suave Mar Beach	AC17	Safeguarding people and property; Dune recovery.	Occupation of dune system (primary dune), partial occupation of margin; Obstruction of dune regeneration.
Ofir South Beach	AC20	Dune regeneration	Dune occupation; Partial occupation of the shore; Occurrence of oceanic overtopping and erosion.
Pedrinhas/Cedovém	AC22	Elimination of illegal occupations in DPM; Allow dune regeneration.	The need to safeguard the conditions for relocating economic activities located there is emphasised
Aver-o-Mar	AC26	Removing buildings at risk; Elimination of illegal occupation of the DPM.	
Árvore	AC30	Removing buildings at risk	
Mindelo Beach	AC32	Safeguarding people and property; removal of buildings in areas of immediate risk; Elimination of illegal occupation of the DPM.	
Vila Chã North Beach	AC34A	Safeguarding people and property; Elimination of possible illegal occupation of the DPM.	
Pocinho Beach	AC35	Preservation of the protected area; Elimination of buildings in the risk area Elimination of illegal occupation of the DPM.	

POC-Caminha – Espinho (1st cycle)			
Locations	Critical Area	Goals	Justifications
Marreco Beach	AC37	Removal of buildings at risk and/or in an illegal situation	
Madalena Coastline	AC41	Removal of buildings at risk and/or in an illegal situation	
Paramos Beach	AC46	Removal of buildings at risk and/or in an illegal situation	
Espinho Wastewater Treatment Plant	AC46B	Removal of infrastructure	

Table 10: Specific cases of Managed Retreat provided in POC Ovar – Marinha Grande

POC-Ovar – Marinha Grande (1st cycle)			
Locations	Critical Area	Goals	Justifications
Cortegaça beach		Relocate the campsite	
Esmoriz Beach		Demolition of houses in the fishermen's quarter; Resettlement of the population in a new quarter (30 dwellings)	Increased frequency and intensity of ocean gales, precarious housing

Table 11: Specific cases of Managed Retreat provided in POC Alcobaça – Cabo Espichel

POC-Alcobaça – Cabo Espichel (1st cycle)			
Locations	Critical Area	Goals	Justifications
Água de Madeiros	AC10	Remove buildings at risk; Elimination of illegal occupation of the DPM.	Illegal dwellings in DPH; High susceptibility to landslide risk.
Vale Furado	AC11	Removing buildings at risk; Maintaining conditions for artisanal fishing activities.	Housing in areas of high risk susceptibility (cliff instability)
Consolação Beach	AC17	Decreased vulnerability and risk exposure	Housing in areas of high risk susceptibility (cliff instability)
Foz do Sizandro	AC20	Reduce exposure to risk and vulnerability	Illegal housing in an area highly susceptible to hydrological risk (flooding)
Cova do Vapor	AC22	Elimination of illegal occupation of the DPM	Illegal housing estate. Location in an area vulnerable to natural hazards.

Parques de Campismo Sul da Costa da Caparica	AC26	Relocating buildings at risk	Positioning in an area vulnerable to natural hazards
Fonte da Telha	AC30	Safeguarding people and property; Ecological restoration.	Fishing centre occupied by illegal housing; Location in an area vulnerable to natural hazards.

Table 12: Specific cases of Managed Retreat provided in POC Espichel - Odeceixe

POC-Espichel – Odeceixe (1st cycle)			
Locations	Critical Area	Goals	Justifications
Troia Peninsula	AC10	Proactive prevention	Vulnerable/sensitive area to sea level rise

From the analysis, 24 areas have been identified for what is considered a Managed Retreat. These figures do not include the cases foreseen in the POC Odeceixe - Vilamoura and POC Vilamoura - Vila Real de Santo António, which are still under preparation, nor the case foreseen in the POC Espichel – Odeceixe. The POC Espichel – Odeceixe identifies the Troia Peninsula as one of the most vulnerable areas to sea level rise and other changes in the sedimentary cell in which it is included and provides references for a cost-benefit analysis of Managed Retreat. However, as no site has been identified, it has not been included in the count.

Interestingly, although the measure is already included in the different POC as a planned retreat, following the GTL guidelines in 2014, in the development of the respective documents the various POC use different designations, largely using the terms remove, relocate, eliminate and Managed Retreat.

The associated motivations for proposing a Managed Retreat remain risk reduction, restoration of legality and urban requalification.

In terms of the number of cases, although similar in both POOC and POC, the cases are not all the same. Figure 11.presents an overview of the differences in Managed Retreat cases between POOC and POC.

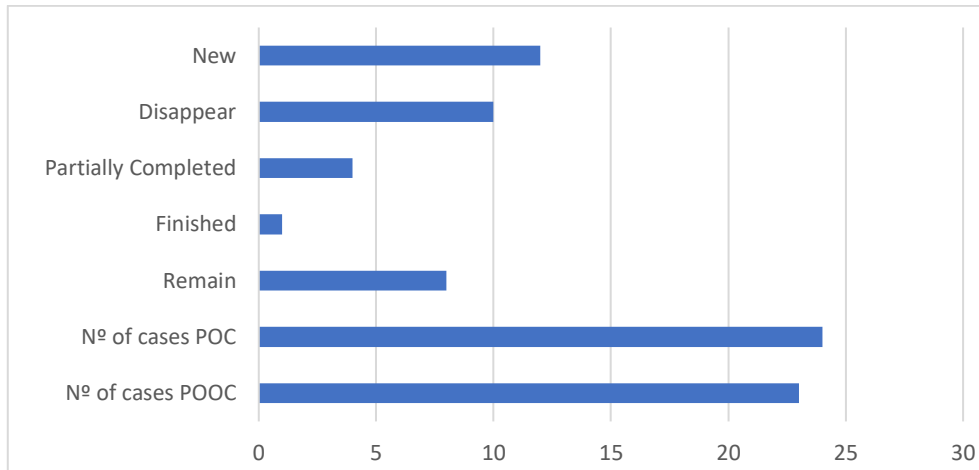


Figure 11 Differences in the cases of Managed Retreat between the POOC and the POC.

POC Caminha - Espinho is the one with the highest number of cases and also the one with the newest cases.

Despite the general definition adopted in all Planned Retreat POCs, several designations are used to describe each case, namely Construction Removal.

Analysing the objectives presented for each case, it appears that several different actions are highlighted. Regarding this fact, the question remains whether the action presented indicates the type of action to be implemented, or whether it is just a question of semantics.

In the concept of Managed Retreat there can be two actions, removing the population from a place, by simple demolition of existing homes, or removing the population from a risk zone, considering their relocation to another area, outside this zone.

Specifying terms with a purpose can be seen as an indication of what to expect from the Managed Retreat process, namely in terms of variables to be considered, but, without a purpose, it can lead to an ill-prepared process especially regarding its preparation and determination of the financing amount.

3.5. CASE STUDIES

Five case studies were considered for the research (Figure 12) (see expanded figure in Annex E). The aim was to compare and evaluate the different institutional frameworks developed for the implementation of the Managed Retreat.

To this end, informal interviews were conducted between 2014 and 2024. The interviewees included members of regional governance bodies (3), municipal bodies (2) and the population (4). The data from the interviews was noted down and analysed. Content analyses provided information on the position of each of these entities in cases of Managed Retreat.

Direct observation of the selected sites was also carried out.



Figure 12 Case Studies Location (adapted from (APA 2021a))

The five case studies analysed correspond, one to a Managed Retreat case that has already been implemented, two partially implemented cases, one in the preparation phase of the implementation process and one in which the initiatives have not yet been implemented.

3.5.1 SÃO BARTOLOMEU DO MAR

São Bartolomeu do Mar is in the municipality of Esposende, approximately 20 km south of Viana do Castelo (Figure 13).



Figure 13 Location of São Bartolomeu do Mar (adapted from (DGT 2024; Google Earth©, assessed 23 June 2024))

The small settlement consisted of 27 dwellings and one store. The buildings were generally used to storing fishing and farming equipment and for harvesting sargassum and were improved for residential use. Many buildings were used as summer homes, including for rent, and some were already uninhabited.

It is a site with a diagnosis of worsening coastal erosion with a consequent increase in the core's risk situation and high sediment deficit, and that, in the context of climate change, there is a variation in the direction of unrest, the persistence and frequency of storms and the generalized rise in average sea level, worsening the hydrodynamic actions.

The Managed Retreat initiative was triggered by the development of a Detailed Plan within the scope of the approval of the POOC of Caminha-Espinho, in 1999. In June 2010, studies began to assess the political and socio-economic conditions for proceed with the Managed Retreat intervention, developed by Polis Litoral Norte.

On June, 2014, the project to requalify the seafront of S. Bartolomeu do Mar began, which ran until 2015.

Figure 14 shows the timeline of the intervention in São Bartolomeu do Mar:

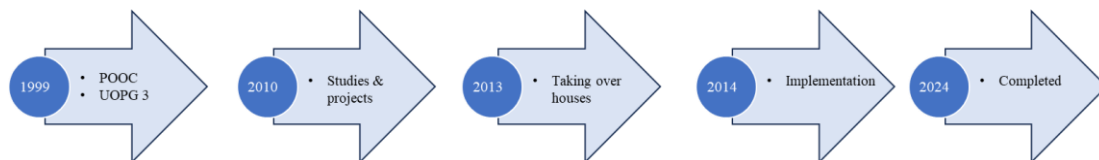


Figure 14 Timeline of the Managed Retreat in São Bartolomeu do Mar case study

As seen in the timeline, although it is a successful case, implementing it takes fourteen years.

The work was developed by Polis Litoral Norte, with a global investment of 2.9 million euros, financed by the Thematic Operational Program for the Enhancement of the Territory in 70% and by the Portuguese State and the Municipality of Esposende in 30%.

The council's justification for the action was that the buildings were in a high-risk area and that sooner or later, no matter how much engineering and protection was carried out, they would be washed away by the advance of the sea. The overall perception was that the owners and residents “understood” the dangerous situation and agreed to negotiate the respective compensation, with no need for any expropriation

The perspective on the entire implementation is that it is an exemplary intervention, highlighting the climate of complete social peace in which the entire process took place. Figure 15 shows the before and after of São Bartolomeu do Mar.

The case study was analysed from the perspective of favourable and unfavourable factors for implementing the action and the driving forces for its success (**Error! Reference source not found.**)



Figure 15 Managed Retreat in São Bartolomeu do Mar case study (Google Earth©, assessed 23 june.2024)

Table 13: Favourable and unfavourable factors and driving forces in São Bartolomeu do Mar case study

Favourable factors	Unfavourable factors	Driving Forces
Small community Low quality-built heritage Second homes Low economic activity location Lower middle-class population Unattractive bathing due to beach conditions Financial capacity to negotiate Relatively low cost intervention The project has enabled the main tourist attraction of the area to be preserved.	One catering building, with an investment in the protection from the sea.	Diminished beach profile and loss of attraction for bathing Visible increase in risk due to coastal erosion Relatively easy intervention with low implementation costs No need to relocate the population Opportunity for time and funding to realize the project Rapid acceptance of the project by the local population

The new space continues to be a meeting place for the local community. In the interviews, the authorities emphasised the relative ease with which the whole process was carried out and the calm with which the population accepted the decision.

The cleared space was later restored to its natural state, which continues today. Post-intervention monitoring was a small investment.

3.5.2 PEDRINHAS AND CEDOVÉM

Pedrinhas and Cedovém are small settlements located in the Esposende municipality, above the river Cávado, in the Apúlia region (Figure 16).

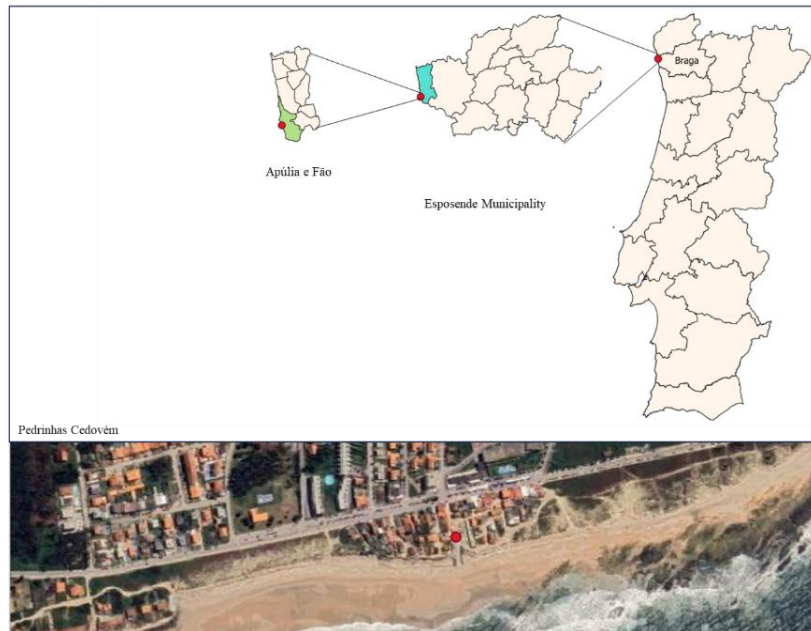


Figure 16 Location of Pedrinhas and Cedovém (adapted from (DGT 2024; Google Earth©, assessed 23 June 2024))

The Pedrinhas and Cedovém settlement is part of the set of Managed Retreat cases, in the second review of the POOC Caminha-Espinho with the approval of the Regulation of the Planning Plan for the Natural Park of the North Coast (POPNLN).

With the review of the POOC-CE and entry into force of the POC-CE, approved in 2021, by Resolution of the Council of Ministers 111/2021, of August 11, this area becomes part of the critical planned retreat area AC22 – Pedrinhas/Cedovém. It is characterized by a high priority for resolution in light of the risk, and for which the need to safeguard the conditions for relocating economic activities located there is also highlighted.

It is one of the coastal areas in the northern region with the greatest susceptibility to coastal erosion phenomena, with rates varying between -1 to -3m/year.

The population cluster is made up of around 190 buildings, made up of single-family homes for the first and second homes and one front and seven restoration buildings.

Characterized as a place where “initially, existing buildings served to support local activities such as fishing and sargassum harvesting and to store boats – “Apresto de Pescadores”, over time they accommodated some homes and other buildings and activities linked to restoration, currently giving way to permanent and summer housing.

According to (Monte 2015), the occupation of the territory mirrors four major phases distinct by era and theme: Occupation, Roman and Medieval, Dominion of the Sea, Agricultural Production and Tourism and Leisure.

The first feasibility studies were carried out in 2010 accompanied by a first survey of the existing built heritage. In 2021, work began again, and the basic project was presented to public consultation in June 2023 (Figure 17).

The project presents the consideration of two distinct phases, considering in the first phase the intervention in Cedovém and in a second phase in Pedrinhas. For Cedovém, 14 housing relocations are planned to be built on land that the municipality will acquire expressly for this purpose, in an investment of 400 thousand euros, and the 7 existing restaurants, whose facilities will be demolished and replaced by others, further away from the coastline and built in wood and removable.

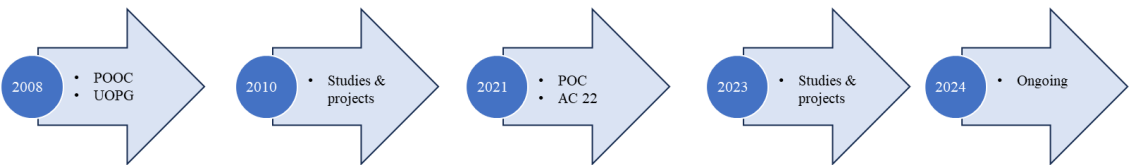


Figure 17 Timeline of the Managed Retreat in Pedrinhas e Cedovém Case Study

This case of Managed Retreat is highly sensitive, meaning that little data is revealed publicly. One of the biggest constraints is the great opposition from the resident population, whose reactions have been felt since the site was identified in POOC, with the recommendation for Managed Retreat.

The case study was analysed from the perspective of favourable and unfavourable factors for implementing the action and the driving forces for its success (**Error! Reference source not found.**).

Table 14: Favourable and unfavourable factors and driving forces in São Bartolomeu do Mar case study

Favourable factors	Unfavourable factors	Driving Forces
Small community Low quality-built heritage Existence of illegal housing Increased vulnerability to coastal risks	Strong public opposition Strong emotional attachment to the place Need to buy land outside the risk area Need to build new housing to relocation Need for relocation	High shoreline retreat Increasingly harsh winters Advance of the sea over buildings Political will and perseverance Financial and timing opportunity

The project still ongoing since the first studies in 2010. Managed Retreat was not yet been implement (Figure 18). Nevertheless, some few constructions have been already damaged by the sea.



Figure 18 Pedrinhas Cedovém case study between 2013 and 2024 (Google Earth©, assessed 23 june.2024)

According to the interviews conducted, the authorities believe in the project being developed and that the Managed Retreat is urgent, both because of the risk and because of the site's health, and they are in line with the objective. The population's position is that the coastline should be protected, as they believe that the situation of coastal retreat has worsened since the construction of the groin at the north of Pedrinhas. Although they disagree with the project, they accept that some houses should be demolished, especially the uninhabitable ones in Cedovém.

As for the notion of risk, they agree that the winters have been harsher and that the sea has advanced over Cedovém, but in Pedrinhas, it is still relatively projected.

In terms of the level of community involvement in the Managed Retreat project solutions, there is a feeling that the local community's ideas for the site have not been taken into account.

Regarding the relocation of the families that have already been identified, the municipality has stated that it is already negotiating a plot of land, given the population's desire to stay in this area and close to the sea.

They are also considering relocating the restaurants on the site, with accommodation measures such as raising the floors and temporary structures. The positions on this situation are also contradictory. The authorities believe that some understanding has already been reached with some owners, who are now more in agreement. The local population is also expected to remain vehemently opposed to the project being prepared because they believe that the planned new buildings will not safeguard the existing business level and will, therefore, severely affect the local economy.

The project in progress during the public consultation was also consulted for this information. For reasons of sensitivity, the project information cannot be consulted.

3.5.3 ESMORIZ FISHERMAN'S QUARTER

Located in the municipality of Ovar, on the Esmoriz, Cortegaça and Furadouro coastal axis, the Esmoriz Fisherman's Quarter (Figure 19) is an example of the social aspect of adaptation of communities vulnerable to the effects of the sea, caused by the relocation carried out, within the scope of mitigation strategies for coastal erosion, from POOC Ovar-Marinha Grande.



Figure 19 Location of fishermen's quarter of Esmoriz (adapted from (DGT 2024; Google Earth®, assessed 23 june.2024))

It is a fishing neighbourhood formed largely by illegal constructions, whose construction type is based on haystacks, shacks, prefabricated houses of low construction quality. The occupation is essentially residential, and first home and the socioeconomic level of the families is low (Jorge 2010).

Urban settlements were at risk of being destroyed by the sea, which is one of the most critical situations nationally (Velooso Gomes 2023). The average shoreline retreat rate between 2018 and 2021 was -3.6 m/year (Narra et al. 2015).

The coastal front from Esmoriz to the north of Maceda is defended by a field of 4 groins built between 1972 and 1989, and by an extensive frontal defense in rockfill. In the period between 1999 and 2011, 6 emergency interventions were carried out in Esmoriz, carried out by the current Portuguese Environment Agency (APA), by the Regional Administration of the Center (ARHC) and by the Commission for Coordination and Regional Development of the Center (CCDR), (Narra et al. 2015).

With a timeline, Figure 20, developed between 2000 and 2015, a small part of the families was relocated to new homes outside the first risk perimeter.

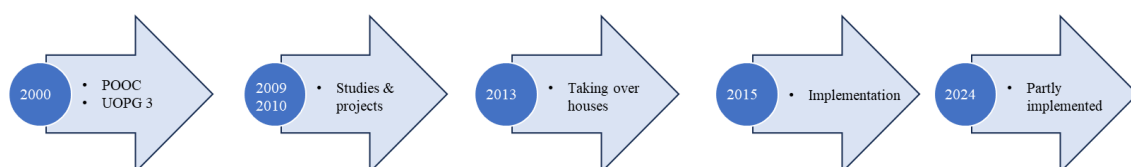


Figure 20 Timeline of the Managed Retreat in fishermen's quarter of Esmoriz Case Study

In 2016, the ruins of the uninhabited houses from the old Esmoriz neighborhood still existed on site. Currently, there are still some abandoned buildings and some of the freed-up areas are being reoccupied by the population (Figure 21).

Resistance to relocation is high. Most inhabitants in these do not want to move house. Around 70% of people are aware of the risk situation in which they live, 90% believe that the coast should be protected at all costs and new urbanization should not be allowed (Narra et al. 2015).

The case study was analysed from the perspective of favourable and unfavourable factors for implementing the action and the driving forces for its success (Table 15).

Table 15: Favourable and unfavourable factors and driving forces in fishermen's quarter of Esmoriz case study

Favourable factors	Unfavourable factors	Driving Forces
Small community Low quality-built heritage Low economic activity location Lower middle-class population Existence of illegal housing Increased vulnerability to coastal risks Unattractive bathing due to beach conditions Financial capacity to negotiate Existence of a local government official with good relations with the population	Strong public opposition Need to buy land outside the risk area Need to build new housing to relocation Need for relocation High number of compensation claims Existence of popular catering buildings	High shoreline retreat Increasingly harsh winters Advance of the sea over buildings Political will and perseverance Financial and timing opportunity

Managed Retreat has been implemented phased. Future work will involve trying to relocate more families. Priority is now given to Cortegaça campsite; another location signalled to Managed Retreat in Ovar Municipality.

From the interviews, one of the salient things was the previous work done near the community by the municipality. Because the population recognises someone in the municipality who can trust, it is easier to envisage conversations.

Figure 21 present the evolution in fishermen's quarter of Esmoriz between 2013 and 2023.



Figure 21 Fishermen's quarter of Esmoriz case study between 2013 and 2024 (Google Earth©, assessed 23 june.2024)

3.5.4 COVA DO VAPOR

Located on the south bank of the mouth of the Tagus River, in the municipality of Almada, Cova do Vapor (Figure 22) is a small urban agglomeration of informal origins, without any type of planning, relatively recent, since the 1930s of the 20th century, in which there are 2 beaches, Primeira Praia and Praia da Cova do Vapor, or Praia do Albatroz (Ramalhete et al. 2019).

The occupation of approximately 270 existing buildings is essentially residential. It is a location that stands out for its strong sense of community and the growing number of owners from other European countries, with a higher level of education.

It is subject to extreme weather phenomena, especially sea storms, which occur during winter. Despite the recognized significant retreat of the coastline in the area of Cova do Vapor and Costa da Caparica, observed since the 1940s, currently the position of the coastline is relatively stable according to data from the Cosmo program.



Figure 22 Location of Cova do Vapor Settlement (adapted from (DGT 2024; Google Earth®, assessed 23 June.2024))

Interventions to protect the population on the coastline date back to 1964, with the creation of stone barriers, with the aim of protecting homes from sea flooding and have been reinforced over the years, as a result of planned actions or reactions. of emergency. The north side of Cova do Vapor, corresponding to the mouth of the Tagus River, is thus completely artificialized.

Although Managed Retreat action has been planned since the entry into force of POOC Sintra-Sado in 2003, its implementation has not yet (Figure 23).

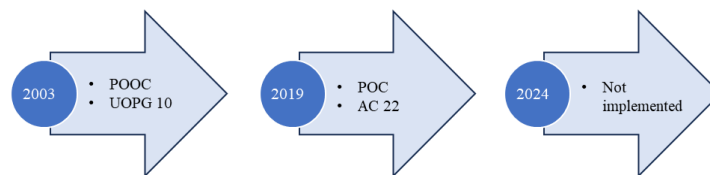


Figure 23 Timeline of the Managed Retreat in Cova do Vapor Case Study

The case study was analysed from the perspective of favourable and unfavourable factors (Table 16) for implementing the action and the driving forces for its success. Figure 24, shows the evolution between 2013 and 2023.

Table 16: Favourable and unfavourable factors and driving forces in Cova do Vapor case study

Favourable factors	Unfavourable factors	Driving Forces
Small community Low quality-built heritage Low economic activity location Lower middle-class population Existence of illegal housing Flooding from the sea during winter storms	Relatively stable shoreline profile Strong sense of community Strong opposition to Managed Retreat Increasing foreign community living in the area, with higher levels of education Attractive bathing beach	Increasingly harsh winters Advance of the sea over buildings



Figure 24 Cova do Vapor case study between 2013 and 2023 (Google Earth©, assessed 23 June 2024)

3.5.5 BARRIERS ISLAND – RIA FORMOSA

Barriers Island in Ria Formosa are in southern Portugal, in Faro District, Figure 25.

The Ria Formosa encompasses a lagoon system supported by a set of sandy barrier islands and individualized by tidal bars that ensure the circulation and renewal of the tidal prism within the lagoon.



Figure 25 Location of barrier Island in Ria Formosa (adapted from (DGT 2024; Google Earth®, assessed 23 june.2024))

In the 1970s/1980s, a large movement of unruly and illegal occupation of the dune areas of the barrier islands in the Public Maritime Domain area began, with more than a thousand buildings (Pestana et al. 2019).

The Ria Formosa Natural Reserve was created in 1978, reclassified as the Ria Formosa Natural Park (PNRF) in 1987, within which the intention to demolish illegal constructions and recover natural areas was presented, which has been reinforced in successive plans planning, namely the POOC Vilamoura – Vila Real de Santo António (Pestana et al. 2019).

With the Planning Plan for the Ria Formosa Natural Park (1991), rules were established for the recovery of natural areas (dunes) and demolition of illegal constructions, but it was with the creation of the Polis Litoral da Ria Formosa Society in 2008, mandated to carry out the renaturalization actions provided for in the POOC that the process began.

The proposal included the restructuring and renaturalization of 89 ha of islets and barrier islands, proceeding with the demolition of buildings in DPM, and the requalification and valorisation of urban centres, the islands of Faro, Culatra, Armona and Tavira, among others.

The inventory resulted in the identification of 873 buildings for demolition, of which 121 were first homes (Figure 26).

Table 17: Data relating to demolition processes per island and islets

Island	Identified buildings	First homes	Buildings demolished	Buildings to be demolished	Household resettlements carried out	Precautionary measures	First instance wins	Lost Cases	Process phase	Execution period
Fuzeta	77	0	77		0	0	0		Concluído	2010-2011
Ilhotes (Côco, Ratas e Cobra)	193	4			4	5	5		Concluído	2013-2015
Península de Ancão	245	100	112	133 (100 de 1ª habitação)	102	22	18	4 (1ª habitação)		2014-2016
Hangares	148	6	28	120	3	28	26	2 (1ª habitação)		2010-2019
Farol	214	3	33	179	4	33	33	0		2015-2019

The critical aspects highlighted were the need for relocation and the precautionary measures installed, namely due to its media coverage of the “Chameleon Process” on the island of Farol and Hangares between April 2015 and April 2016, with the pretext of “Protecting the habitat of the Chameleon in gardens of illegal constructions”. The precautionary measure installed was accepted at the first instance and rejected by the Central Administrative Court.

Managed Retreat process still ongoing, but no new builds were removed from coast. The case study was analysed from the perspective of favourable and unfavourable factors for implementing the action and the driving forces for its success (Table 18).

Table 18: Favourable and unfavourable factors and driving forces in barriers islands - Ria Formosa case study

Favourable factors	Unfavourable factors	Driving Forces
Low quality-built heritage High % of the population with a low level of economic resources High percentage of illegal dwellings (first and second homes) High percentage of second homes Flooding from the sea during winter storms	Relatively stable shoreline profile Strong sense of community Strong opposition to Managed Retreat An area of great tourist attraction Beaches with excellent bathing facilities Numerous economic activities linked to the resources of the estuary and the sea Proceedings interrupted by injunction Inconsistent political will for action Needs for relocation	Increasingly harsh winters Advance of the sea over buildings High percentage of illegal second homes Houses within the Eminent domain and biodiversity and natural protected areas

Figure 28 shows the evolution on Faro beach since 2013 and 2023. Some constructions have been removed, namely the one from the first dune.



Figure 28 Faro Island in barrier Island case study between 2013 and 2023 (Google Earth©, assessed 23 June 2024)

3.6. LEGAL CONSTRAINTS OF PLANNED RETREAT IN PORTUGAL – (NATURE OF BARRIERS TO OVERCOME FOR IMPLEMENTING MANAGED RETREAT)

Coastal areas, due to their natural wealth, are great attractions for economic activities with high monetary value, particularly regarding real estate actions, which in many cases lead to urban concentrations that are inappropriate and incompatible with the biophysical particularities of the location.

The Managed Retreat, acting as a regulatory imposition by environmental law and adapting to risk in future situations, on private rights acquired over the territory, translates into an extremely delicate process.

In general, the legal constraints associated with a Managed Retreat arise from the intention to demolish buildings, which causes discomfort to people who in some way have rights over them.

Although the Managed Retreat included in the POOC as one of the adaptation measures to coastal risks, the reality is that this motivation ends up fading when consulting the motivations presented for each case in both the POOC and the POC, frankly supported by the restoration of legality and urban reconversion.

Opinions differ, and communities feel frankly harmed by the action, with the most expressed feeling being a lack of transparency.

Based on the knowledge of several cases in which people take legal action to have their rights recognized and, without much analysis on the subject, as it far exceeds my technical capacity, I carried out the exercise of analysing several actions in court in a to understand, on the one hand, what people complain about and, on the other, how the state defends itself, which laws are at stake here.

Thus, in general it can be said that the main reasons for taking actions to court are:

- a) The owners' objection to the intention of demolition, invoking civil liability rights over the action, namely due to imminent loss of income resulting from the action. On the entities' side, the justification is the need to demolish the construction as it is in the public domain.
- b) Recognition of private property rights over water resources. The owners base their argument on the longevity of ownership of the building (before 1951), the fact that it is integrated into an urban area within the Municipal Master Plan (PDM) and the land is located outside the risk zone. On the entities' side, the motivation for the demolition is the fact that the building is in the Public Domain and illegal.

The experience is that the processes of restoring legality through the eviction of the Maritime Public Domain are lengthy and complex, taking more than 20 years, both from a technical-legal point of view, as well as from a social and political point of view, further enhanced due to the negative media effect of demolition actions and distortion of information transmitted to the general public, which can lead public actors at local and national level to hesitate or even give up moving forward (Pestana et al. 2019).

Regarding compensation for owners in the case of Managed Retreat, the rule seems well defined. When they are first homes, regardless of legality, people are rehoused or fairly compensated for their property, the state does not leave anyone without a home.

When they are second homes, the issue of legality is considered. If the houses are legal, the law says that people must be expropriated and fairly compensated, when they are illegal houses there is no place for monetary compensation and in theory, the owners themselves must demolish the buildings.

However, although the law says that if the state is demolishing, people must pay for this work, in reality this does not happen, as the state does not ask for this money.

Another sensitive issue is the fact that some owners pay IMI fees and, in the situation of retreat, are ordered to demolish due to illegality, or have to prove that the property is private.

Regarding the issue of illegality, some authors question the situation. In general, and according to the existing bibliography, these constraints can be divided into the following groups:

Qualification and Legality of Occupations

One of the stages of implementing the Managed Retreat concerns the identification of occupations in the Maritime Public Domain, and the collection and presentation of the respective information regarding their legality.

In most cases, occupations do not have a license, or the license is out of date. The incidence is greater than 90%.

The issue here relates in particular to the amount of IMI fees that owners pay to the municipality. They are illegal to demolish, but for several years they paid all these fees, which means they are not illegal? On the other hand, the matter is forgotten by inspection, which allows construction in places where it is not permitted to build.

Property rights and possession:

When the responsible public entity decides to order demolition, owners can argue that their rights as owners are being violated and, in many cases, request monetary compensation for the loss of the property. This situation can lead to disputes in court and claims over possession.

Zoning and land use regulations:

Local zoning and land use regulations play a significant role in determining what can be built in coastal areas. Laws and regulations may need to be updated to accommodate Managed Retreat strategies. Changing planning regulations can involve legal challenges, especially if property owners believe their property values will be negatively affected.

Public domain:

In some cases, governments may need to use public domain powers, namely public utility statute, to acquire private property for the purpose of Managed Retreat or creation of buffer zones to protect against coastal erosion and flooding from sea overtopping. Legal issues surrounding the public domain can be complex and contentious, involving issues of fair compensation and due process.

Environmental regulation:

Coastal areas often have environmental regulations in place to protect ecosystems, wetlands and other natural resources. When planning a Managed Retreat, these regulations may need to be considered to ensure compliance with the existing environment while also meeting the needs of displaced and evacuated communities.

Financing and Public Financing:

Funding for Managed Retreat projects may come from public sources, and there may be legal and political challenges associated with allocating these funds for these purposes. It is essential to ensure that funds are used efficiently and transparently.

Community Involvement and Consent:

Communities and landowners affected by Managed Retreat must be involved in the decision-making process. Obtaining community consent and resolving concerns can be crucial to avoiding litigation and promoting cooperation.

Civil Liability and Insurance:

Liability issues may arise if people or entities with interests in coastal areas are harmed due to the implementation of Managed Retreat policies. Additionally, property and business owners may face difficulties obtaining insurance coverage in areas considered high risk for coastal hazards.

In conclusion, the legal issues associated with Managed Retreat can be complex and multifaceted, therefore requiring a careful balance between the protection of public safety and the environment and private property rights.

3.7. CONSIDERATIONS ON THE STATUS OF MANAGED RETREAT IN PORTUGAL

To support the assessment to be made in this chapter, the stress factors presented in chapter 2, and which are transcribed here, were classified regarding their representativeness in Managed Retreat in Portugal. The results are presented in

Table 19, on a sensitivity's scale, as follows: +++ “very representative”, ++ “moderately representative”, + “little representative” and, 0 “not at all representatives”.

Table 19: Classification of the stress factors regarding its representativeness in Managed Retreat in Portugal

Type of constraints	Stressors factors	Classification
Contextual issues	Potential large scale of relocation of human settlements	+
	Uncertainty over scale and timeframes of managed retreat	+++
	Limited understanding of available data and changing risk profiles	+++
	Limited capability and capacity to apply, appropriate decision-making tools for managed retreat	+++
	Disagreements , mostly over risk thresholds and trigger points	0
	Limited availability , suitability and affordability of sites for resettlements	+
Governance issues	Weak and inconsistent political leadership, and a focus on the short term	+++
	Failure to integrate managed retreat within strategic policy-making frameworks	+++
	Uncertainty over allocation of responsibilities and decision-rights for managed retreat between different levels of government	+
	Limited coordination capacity across key policy domains, as such public services, spatial planning and fundings	+
	Limited institutional capacity for designing, negotiation, engaging and implementing large-scale managed retreat	+++
	Decision-making inertia and delays, exacerbating uncertainty and increasing adaptation costs	+++
	Unwillingness of decision-makers to admit “defeat” in the face of the growing hazard	+
Public opposition	Strong attachment to place	+++
	Lower risk tolerance for new risk compared with experienced risks	++
	Mistrust and rejection of expert risk assessments and advice	++
	Community preference for protection over retreat and/or rejection of strategies	+++
	Opposition to retreat from communities in and adjacent to hazard areas due to expected negative impacts on property and amenity values, and reduced public services	+++
	Uncertainty over level, forms, and eligibility for public compensation or other public assistance	+
	Legal action to challenge retreat as an adaptation option	+++

Planning arrangements	Inconsistent and inflexible application of planning rules and procedures that can address changing risk profiles with time Pressure from developers to continue coastal development Inadequate provision for public participation in decision-making processes Uncertainty over the timeframes for property buyouts and relocation Poor management and use of the vacated land	++ +++ +++ ++ 0
Funding Issues	Inadequate overall public resources for the scale of retreats required Ad hoc and inconsistent funding arrangements that focus on funding post-disaster, rather than pre-emptive managed retreat Sub-national governments often lack borrowing rights or have limited taxation options Co-funding arrangements which add complexity and exacerbate delays No pre-funding of the long-term costs of managed retreat Political disagreement over public compensation for private losses	+ + ++ +++ +++ +
Equity issues	Low-income households disproportionately affected Many low-income households cannot afford to relocate Limited coverage of private insurance	+++ ++ +

The challenges to Managed Retreat in Portugal are primarily linked to short-term economics and short-term thinking.

From the exposed above its possible to conclude that there are not an active involvement of residents and communities in early discussions or indeed for most of the decision-making processes until the stage of public consultation shortly before the final project approval.

This results in plans that do not reflect the needs and claims of local communities and exclude aspects of importance such as cultural preservation. This results in a generally low level of trust between governmental and non-governmental actors.

Managed Retreat process in Portugal seems to be more a mechanical process - a task to be done whit special focus on the operation, relativizing the apparent wellbeing of those moved.

Challenges to managed retreat include not only financial or technical issues, but essentially deal with the integration, mobilization of key stakeholders and citizens and the ability to adapt flexible.

In the analysed documents of the POOC and POC it can be seen that they assume the role of coordination between the international and national general lengths for intervention in coastal areas, but weaknesses are found regarding the justification of the strategic principle and the lack of design of the operational instruments that incorporate adaptive management criteria, fund allocation and a specific calendar of action and achievement of objectives appropriate to a changeable and fragile environment such as the coastal zone.

The Managed Retreat foreseen in the POOC for certain cases along the Portuguese coast, reflects a very long view in time and that removing the population will be inevitable, given the geomorphological characteristics of the location, and the existing and future hydrodynamic conditions.

Possibly in some cases, the implementation of the Managed Retreat does not even have to be immediate, but rather planned and prepared in time. In other words, for these cases, Managed Retreat must be seen as dynamic and adaptive planning as certain “alarm” conditions approach, indicating the “final limit” for retreat.

From this perspective, two main conclusions emerge:

- a) Planning a Managed Retreat for a short period of time without maturing your learning is a shot in the dark.
- b) Planning for a fixed execution timeline, to have an allocated budget without maturing existing conditions, is probably immature and will allocate funds unnecessarily.

Sustaining a well-planned project adjusted to the location is one of the main success factors.

Therefore, not all Managed Retreat cases provided for in POC/POOC must be completed, much less in the time allocated to them. This may be the reason why many of the Managed Retreat have been implemented for years and many others never will be.

Coastal managers fail to adequately balance long-term planning with quick actions in coastal retreat.

Managed Retreat projects cannot be carried out as a project to implement another adaptation strategy. This is one of the main reasons why planned cases of Managed Retreat are very difficult to implement and projects are heavily hampered by legal actions.

The plans, projects and studies referred to in the POOC and POC make perfect sense because you effectively need to develop the Managed Retreat strategy, which needs to be planned on a case-by-case basis.

Public participation here should not be what is commonly done, with the aim of presenting an almost closed project to the affected population and trying to obtain consent for what is to be carried out.

In these cases, projects must be developed with the population in question, creating a vision of the future of the place that everyone identifies with. Public entities here are support elements that help guide alternative solutions that are created in collaborative actions.

The conventional design paradigm is no longer valid.

It makes sense that at a macro level, climate change adaptation solutions can be defined with the interaction of all entities with oversight in the area, but from there they must be designed with the population.

Here the involvement of the population is on two levels, with the interest of both the population that will be removed and the receiving population, since important changes in the daily life and dynamics of the community will be affected.

This example arises above all when rehousing plans are put in place for the most disadvantaged families. Creating cost-controlled housing to provide for these families and others who need to be rehoused can be a time bomb and especially very embarrassing for the community that already

lives in that place, whose day-to-day life will be frankly changed. On the other hand, in the case of a fishing community, it is important to recreate conditions in which this characteristic can manifest itself.

It is also important to understand that the Managed Retreat project cannot be a static project. It is a dynamic project with years of implementation and several stages until the end of a free space, occupied by nature and functioning as a buffer zone. The important thing is to understand which thresholds indicate the time for implementing the next stage.

Another note is that Managed Retreat is not just demolishing buildings and removing people from the site. Managed Retreat is made up of several strategies which are carried out by different tools.

4 Managed Retreat Methodology

By acting on land use and conditioning the rights of landowners, Managed Retreat creates a series of political, social, economic and legal constraints that are difficult to resolve.

The tool used for its implementation is the determination of risk zones on the coastal territory where areas are identified and defined to favour the development of Managed Retreat.

The instrument that makes it possible to remove the buildings is a legal instrument that recognises the legality of the situation and the power to act under public utility to justify an environmental need.

This imposition of power makes the process rigid and unilateral and is perceived by the population as a compulsory imposition that, often, is felt as a deprivation of their rights to enjoyment.

Whether or not relocation takes place, it is a costly intervention, both because of the compensation to the population and because of the intervention itself. If the population is relocated, the cost of at least the housing will increase. In addition to the intervention costs, there may also be additional costs due to legal proceedings brought by the owners.

The intervention is funded by public financing sources, which usually do not cover all the actions to be implemented, and it is necessary to combine them with other financial resources.

The fact that they are associated with a fixed timetable, which is generally shorter than that needed to implement the strategy, is another limiting factor.

In the preparation phase of the intervention process, all the organisations with responsibility for the territory are involved to assess the feasibility of the action and some of the region's strategic stakeholders.

The population is involved at key moments of public consultation and negotiation, and there may or may not be a prior moment to raise awareness of the action. This involvement is informative in nature and not very open to the active contribution of communities to the solutions to be implemented.

In most cases, this approach fosters a strategy that is very efficient from a technical point of view but does not consider the needs and vision of the communities for the site, which is why it generates strong opposition from the affected populations.

In most cases, the local government is responsible for the development and implementation of the Managed Retreat, accompanied by the regional government with responsibility for regulating the environment and water resources.

Monitoring of the process and post-intervention is not common practice and is limited to accounting for costs and the number of buildings removed.

The general feeling is that it is currently an emotionally charged strategy, very rigid and very competitive in terms of power over the territory.

Considering the findings in the previous chapters and the resume made in the paragraphs above, while the aim is not to solve all the problems inherent in the Managed Retreat, the object of this chapter is to propose a methodology that can alleviate some of these constraints and facilitate the planning and implementation process.

4.1 PROPOSAL PRESENTATION

The methodology developed aims to present a proactive perspective on Managed Retreat, proposing a different form of planning and implementation.

This objective is supported by the two main conclusions of Chapter 3:

- (a) Managed Retreat must be developed as a dynamic and long-term project, sustained in several stages, until the ultimate end of a natural open space functioning as a buffer zone, and.
- (b) Community involvement should be throughout the process and used to create the vision for the relocation.

Figure 29 Proactive perspective on Managed Retreat (see expanded figure in Annex E) shows the methodological scheme on which it is based.

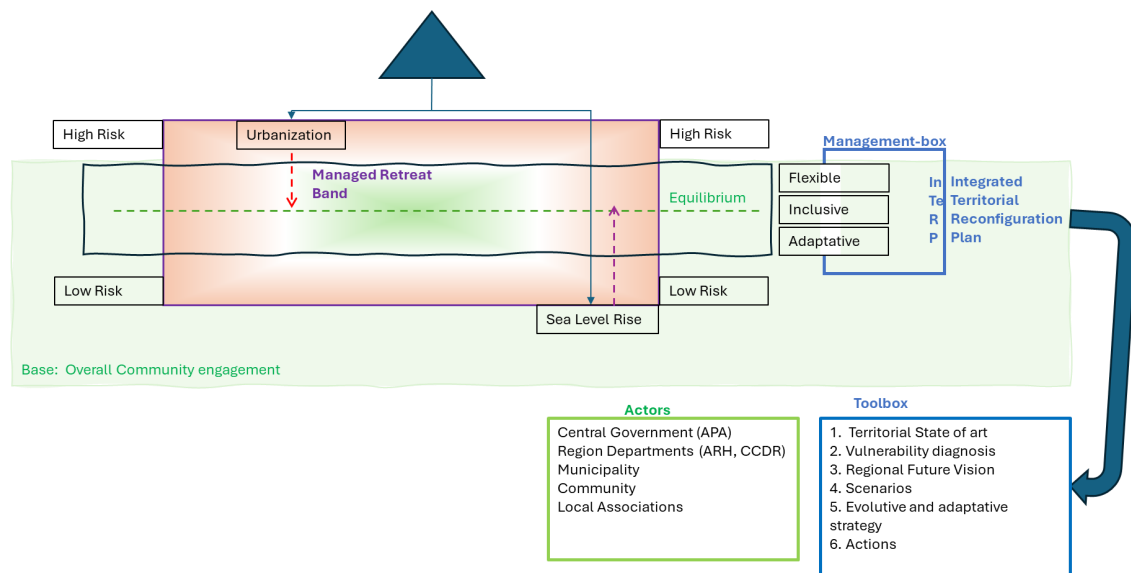


Figure 29 Proactive perspective on Managed Retreat

The proposal is for a flexible, inclusive and adaptive methodology, supported by a set of tools whose implementation is progressively adjusted to the evolution of the site's morphodynamical conditions.

It aims to be a tool adapted to the challenges of the territory through an action plan - InTeRP (Integrated Territorial Reconfiguration Plan), mobilising a maximum number of resilience levers and resulting from the integrated vision of the community and management entity for the site.

To implement it, it is important to develop objective actions, prioritised according to their quality and timeliness, supported by dominant task typologies.

To this end, it is necessary to assume that:

- (a) Managed Retreat designed as multiple tools strategically used in the pursuit of future objectives is fundamentally different from a Managed Retreat designed as an option to adapt to risk when there are no other options.
- (b) from this perspective, the strategies or perspectives applied with a view to achieving the objectives proposed in the programme itself may have opportunities and challenges throughout the implementation process.
- (c) it is necessary to coordinate all the entities involved (government, local stakeholders and the community) and to be attentive to the challenges and opportunities that arise by thinking about whether the tasks make sense for that specific case and whether, during the process, there is a need to target the resources used.

The following "Key-findings", obtained mainly from Chapter 2, contributed to these assumptions:

- (a) Managed Retreat is one of the multiple strategies that can be implemented in coastal areas with a high risk of flooding and maritime overtopping and coastal erosion.
- (b) In the current climate context, characterised by high uncertainty, it is becoming increasingly important to manage Managed Retreat in a more proactive, intentional and efficient way.
- (c) A more proactive understanding of Managed Retreat can be very beneficial for a better perception, implementation and practice.
- (d) Managed Retreat is an opportunity to redesign the way we live with nature and coastal dynamics, which completely changes the way we currently deal with risk.
- (e) Community engagement process can be used to create a **vision** for a Relocation.

Continuous monitoring is the fundamental basis for its definition, implementation and follow-up in the post-intervention, thus implying the development of procedures for monitoring and evaluating the most appropriate measures.

Under the consideration that Managed Retreat consists of the application of coastal zone management and risk mitigation tools designed to "move" existing and planned urban development away from the risk zone in the short and medium term, the strategy is based on a proactive philosophy of recognising that the dynamics of the coastal zone should dictate the type of management to be employed.

This approach considers the Managed Retreat as an integral part of a more cooperative and comprehensive strategy, configured in an action plan - Integrated Territorial Reconfiguration Plan, which incorporates the retreat itself as part of the routine and the process.

What makes it possible is the strong involvement of the local community in a frank and open partnership, realised right from the initial diagnostic phase. Considering an approach based on the involvement of the population and sustainable planning strategies allows us to think about redefining space as a state asset for private use.

It is underpinned by the fact that the Managed Retreat usually requires an extended period for its implementation, on average 10 years, so it is a more or less long-term roadmap for action, albeit in a more dynamic and interventionist way.

Coastal adaptation has often and historically been framed as requiring "protect, accommodate and retreat" options for the most risk-sensitive coastal zones, developed to balance the varied, and often competing, economic, social, cultural, legal and environmental needs and interests (O'Donnell 2022).

According to (IPCC 2018). "Planned adaptation is adaptation that results from a deliberate policy decision, based on the realisation that conditions have changed, or are about to change, and that action is needed to return to, maintain or achieve a desired state"

As such, it takes capacity for a system to adjust to climate variability and its extremes, to moderate the potential damage and to take advantage of opportunities or deal with the consequences (EEA 2024).

A dynamic adaptive plan can offer an appropriate response and favour more opportunities to learn more about the likely trajectory of large uncertainties in flood patterns or shoreline change, particularly during storm periods, build an understanding of climate variability in the meantime and support strategic decision-making (Climate-ADAPT 2024).

It is therefore increasingly emphasised as an appropriate approach to adapting coastal zones.

In this context, Managed Retreat offers a valuable toolkit for creating visions of adaptation, articulating goals and values (Mach et al. 2021), as its implementation principles emphasise the need for time scales and an approach in terms of adaptation pathways and progressivity in response to developments. (O'Donnell 2022).

Due to the logistical challenges of relocating people, buildings and infrastructure, and the community's affective attachment to the place, the proactive-reactive balance of Managed Retreat must then shift towards proactive planning and adaptive intervention (Hanna et al. 2019).

According to (Mach et al. 2021), the main characteristics of effective adaptation processes and decision support are: flexibility, active monitoring and evaluation, integration and meaningful public deliberation (Figure 30).

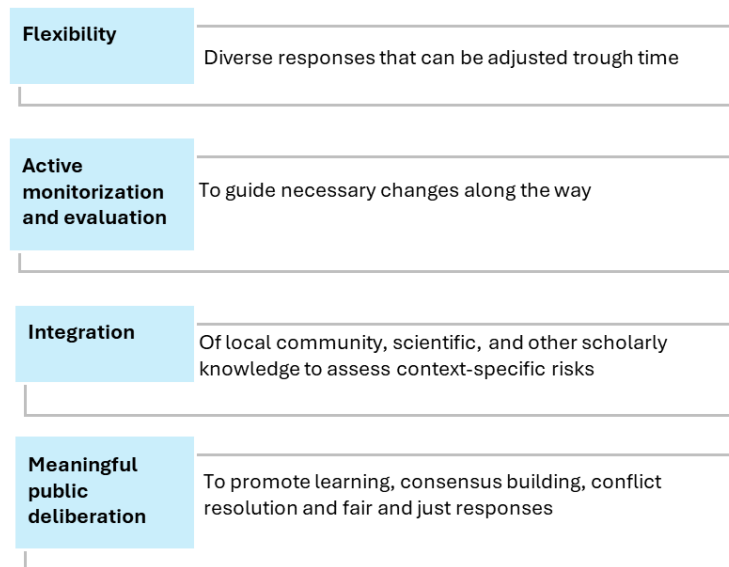


Figure 30 Key features of effective adaptation processes and decision support

Flexibility is a key attribute as multiple option are kept open to decision-makers in future (Mach et al. 2021) is established through the monitoring system and associated action (Ramm et al. 2018). Creative processes such as design often begin by considering wide rangers of possible options before narrowing down, encouraging participants to question assumptions and ignore limitations (White 2022).

Redundancy and diversity are considered key characteristics of resilient practices and a value as high-level planning framework. That include other approaches and the engagement of a diversity of actors in other to achieve the “big-picture” ((Doberstein et al. 2019).

Implementing a dynamic adaptative strategy implies adjustments in public action procedures and a strengthening of monitoring and evaluation measures (Rocle et al. 2021). To do this will require practitioners planning to deal with some levels of uncertainty and considered history of extreme events as a vivid reminder of “new normal”, where historical flood events are no longer reliable predictors of future trends (Rocle et al. 2021).

Another key role is local authority involvement, collaborative governance and popular trust in the authorities in the development of any integrated regional planning strategy (Wolff et al. 2023; Sayers et al. 2022).

Development of dynamic adaptative approaches based on sequential decision-making, identifying decision criteria and the circumstances deemed appropriate to implement relocation strategies (Mach et al. 2021).Implementing a dynamic adaptative strategy implies adjustments in public action procedures and a strengthening of monitoring and evaluation measures (Rocle et al. 2021).

Pathways to managed retreat add value, once this strategy constitutes a multidecadal sequence of actions, include community engagement, vulnerability assessment and land use planning, permitting advances practical knowledge how they can pave the way for flexible and positive transformational adaptation (Haasnoot et al. 2021).

Adaptation pathways represent sequences of promising options that provide alternate ways for decision-makers to achieve objectives through time (Ramm et al. 2018).

Robust Decision Making (RDM) and dynamic adaptive policy pathways (DAPP) are two adaptation pathways to support strategic decision making.

RDM offers insight into conditions under which problems occur and makes trade-offs transparent. DAPP emphasizes dynamic adaptation over time and offers a natural way for handling the vulnerabilities identified thru RDM (Kwakkel et al. 2016).

These approaches can be used to facilitate decision-making under deep uncertainty and to explore managed retreat options (Kool et al. 2020). The aim is of moving practice from static and time-bound planning to dynamic decision making that enables adjustments over time without creating lock-in of policy decisions.

As explained by (Haasnoot et al. 2013), central to adaptation pathways are adaptation tipping points, which are the conditions under which an action no longer meets the clearly specified objectives. Before such a threshold is reached, there will be early signals that planning for another adaptation option should be initiated.

The timing of the adaptation points for a given action, its sell-by date, is scenario dependent. The adaptations Pathways approach presents a sequence of possible actions after a tipping point in the form of adaptations tree. Any given route through of the tree is an adaptation pathway.

All routes presented satisfy a pre-specified minimum performance level, (a threshold that determines whether results are acceptable or not) and, the moment of an adaptation tipping point (terminal station), and available actions after this point are shown. Due to unacceptable performance of some actions in a selection of scenarios, some routes are not always available (dashed lines).

With the adaptation map, decisionmakers can identify opportunities, no regret actions, lock-ins, and the timing of an action, to support decision-making in a changing environment.

The adaptation map can be used to prepare a plan for actions to be taken immediately, and for preparations that need to be made to be able to implement an action in the future in case conditions change.

In combination with a scorecard of the costs and benefits for the pathways, a decisionmaker could make an informed decision.

An example of an Adaptation Pathway map is presented in Figure 31.

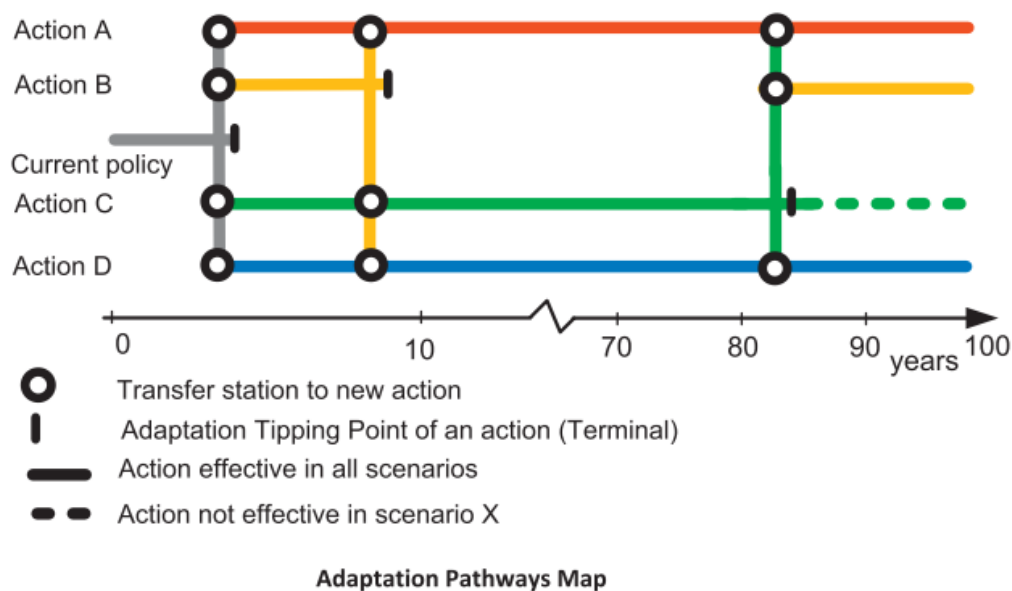


Figure 31 Adaptation Pathways Maps example, (adapted from (Haasnoot et al. 2013))

Ongoing engagement with local people is essential as part of a combined RDM and DAPP approach to preserving the community's way of life.

The basic model for developing the proposed plan is essentially based on the experience and interpretation (Kluszczewski et al. 2020; QINCD 2017). More information can be found in Annex D, related with a French Case.

In this approach, the InTeRP is a document and a guide for implementing the action. Its aim is to provide a concerted, multi-annual framework on which its actions are based, and which can be seen as a roadmap for the longer or shorter term.

In the general context of the methodology, it plays the role of facilitator and guide for all stages of the process. Its role is carried out based on a diagnosis of the territory, making it possible to mobilise local players and institutional partners and determine a strategy by identifying priority strategic guidelines.

Based on the experience of the authors, its content generally comprises three main chapters:

- (a) **The diagnostic chapter** identifies the scope of the study, the background and territorial context and analyses vulnerability to the different risks.

Its aim is to answer the question "Managed retreat for whom, what, where when and why?". In its development Flood Risk Plans for (regional) sites can be used to identify houses or infrastructure that are likely to be high priority for municipal acquisition and removal or "retreat".

- (b) **The projection chapter** presents the Managed Retreat strategy to be implemented at regional or local level and aims to answer the questions: what is the project? What is its scope? What are the final objectives? What is the objective in the short term (5 years), medium term (10 years), long term (20 years), very long term (50 to 100 years)? What is the goal to be achieved in each of them?

- (c) **The action chapter** develops and presents the action plan or InTeRP, consisting of the breakdown of the strategy into actions to be implemented considering both the final objective and the transition periods.

The aim of this plan is to inform the priorities and actions to be developed on site, with a view to the question of how the priorities and needs of a given community can be reflected in the long term, in terms of planning and solution design.

This chapter will allow to answer the questions: what is the final objective and that of the transition periods? what are the short- and long-term actions? How can short-term actions be integrated into long-term actions? How can all the actions be financed?

It is the cross-analysis between the objectives defined by the project and the incidence/variation of natural risks that should guide the possible actions to be implemented and analysed, both at a spatial and temporal level.

From this planning perspective, Managed Retreat can include various strategies and actions and can also be included as a tool within the strategy itself.

In order to implement this approach, it is necessary to bear in mind that the key factors for success are capacity as a reference document, political support for its realisation and its development through a collaborative approach.

In this way, the plan can be an essential framework in the integrated range of the necessary adaptations of places to the changes in the hydrodynamics of the site with the ultimate aim of the Managed Retreat, guaranteeing the resilience of the territory in the face of the risks associated in the meantime.

InTeRP should also make it possible to mobilise multiple forms of financing, helping to minimise the constraints associated with financing long-term intervention plans, and include a chapter on changes that would have to take place in legislation, anticipating the necessary changes in good time and before the operation takes place.

It should also include a monitoring and performance chapter to track and evaluate the strategy through cross-functional project management, proper communication and the implementation of a dynamic process with appropriate indicators.

The final chapter considers resilience and how the municipality/civil protection can prepare for the consequences of a flood to ensure a safe recovery.

Some important information to consider when developing the plan are:

- (a) Risk modelling for various return periods
- (b) Limit lines for action.
- (c) Inventory of existing vulnerabilities in relation to the actions of the sea and requests for improvement and reinforcement of protective infrastructures.
- (d) Targets that reflect a good understanding of current conditions and future aspirations and needs for the site.
- (e) It should reflect the different scenarios
- (f) Relocation should reflect what is expected of the new site and how the current landscape will change over time and how people will reacclimatise to the new phases.

With this tool, the Managed Retreat is no longer defined as a single objective, but is made up of several sub-objectives, which ensure the maximum objective is the creation of a natural buffer zone.

From this perspective, there are various tools that can be used to streamline the overall objective of the Managed Retreat (Spidalieri 2020).

These tools have the functionality to implement actions slowly and more smoothly. This requires planning professionals to deal with a degree of uncertainty and to consider the history of extreme phenomena as a vivid reminder of the 'new normal', where historical floods are no longer reliable indicators of future trends.

The idea here is to give an example of some of the tools considered by different authors for different countries to implement Managed Retreat (

Table 20). The presentation is not lengthy since not all measures are feasible to implement in all cases and countries:

Table 20: Managed Retreat tools

Avoid exposure	Includes disallowing development in flood plains, via zoning decisions or land use restrictions), establishing zones where construction is not allowed, “setback zone, rolling setbacks.
Resilience approach	property acquisition/expropriation and structural removal from floodplains
Coastal accommodation	raising floor levels of the built environment to accommodate water flows
Soft protections measures	include things like sand dune renourishment, intended to maintain a particular shape or geomorphology, of coastline/beach.

Retreat can therefore be maximizing the use of the coastal land over time by either allowing human settlement/development in some locations for a period, until the risks associated with the vulnerability of the location are too great at which time, the settlements or developments are lost or relocated (O’Donnell 2022).

But this option is not always viable neither applicable for every coastal zone as a climate change adaptation. Many tensions tend to append at political and legal level.

It is also important recognise that inherent difficulties or effectiveness are a part of the process when implementing Managed Retreat, specifically when this is an anticipatory/preventive climate adaptation.

4.2 APPLICATION TO THE PORTUGUESE CASES

As emphasised in the previous chapter, the Managed Retreat strategy involves several actions and can be implemented at various levels (Figure 32):

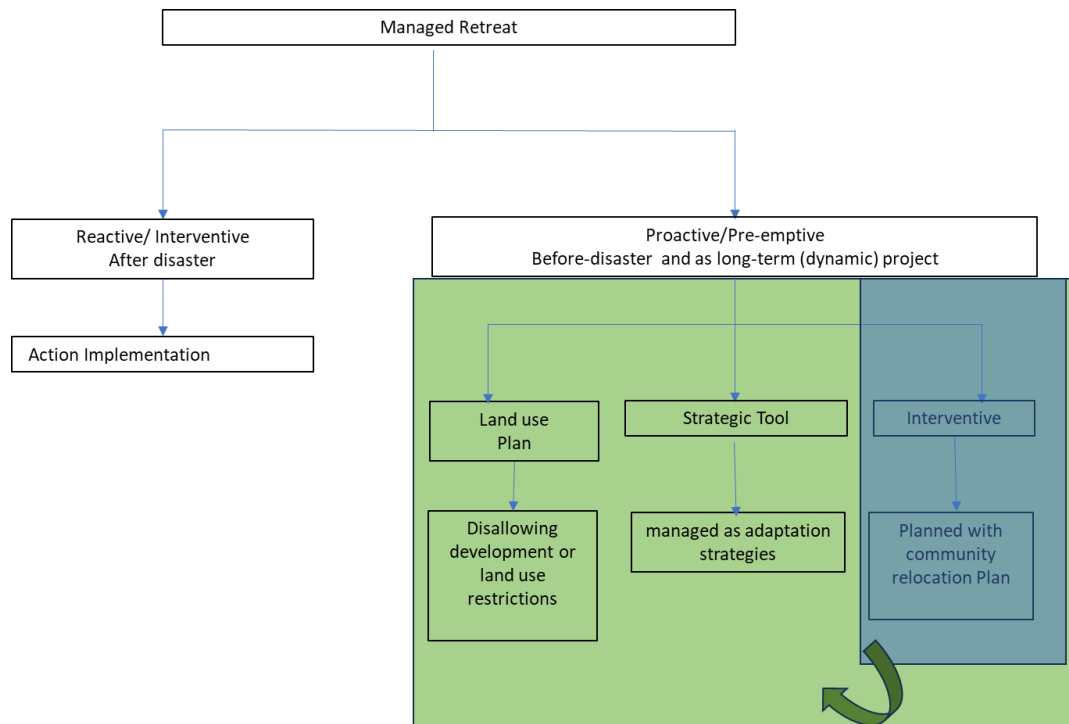


Figure 32 Managed Retreat application map

In the Portuguese case, the implementation of Managed Retreat is essentially preventive and seen as an action on the territory. What is proposed is that its implementation should also consider Managed Retreat as a toolbox of strategies and be developed in the form of legislation. In other words, Pre-emptive as a long-term dynamic project.

For example, in some locations within the Critical Areas, only the housing at risk should be removed in the short term and a legislative tool should be used for the medium term, such as determining a shoreline retreat limit, from which the land must be cleared and returned to the Public Domain.

What allows this timeframe to be set are the short, medium and long-term risk scenarios, based both on the diagnosis of the vulnerabilities that currently exist at the site and those that are expected to occur in future scenarios.

What the methodology presented proposes is that we can start to think more flexibly about the implementation of the Managed Retreat, broadening the vision of what the strategy is and what its implementation can be.

For this reason, one suggestion is that in POCs, for example, the risk bands should no longer be fixed and could be instituted as rolling setbacks.

Accommodation measures may well be considered intermediate measures of Managed Retreat, as well as relocation, or even recovery of the beach profile by artificial sand nourishment.

This approach allows the motive for action to be based on risk, relieving the pressure to use the legal imposition of public domain to achieve an environmental objective. On the other hand, it is

clearer and more acceptable to landowners who do not feel threatened in their rights and objectives.

Developing these tools and Managed Retreat adapted to the context of Portugal and the various types of agglomerations and geomorphology of the site is future work.

For the time being, in the Portuguese context it could be said that there will have to be more focus on the planning aspect of Managed Retreat and that a key tool could be to create a trusted office (Figure 33), made up of an entity external to the governing body, which can centre the planning and development of the action on itself.

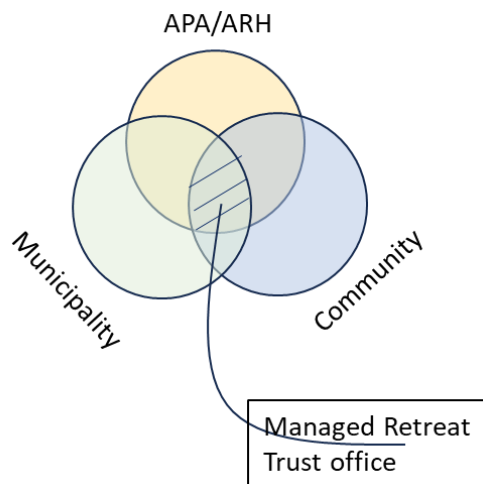


Figure 33 Managed Retreat Trust Office

This entity must be defined by the three main organisations involved in the process - APA/ARH, the municipality and the community - and to be impartial, it must be funded by a public financing instrument that makes it possible to cover this situation 100%.

The premises for selecting this entity must be clear and with a high degree of trust from the population involved in the Managed Retreat or relocation.

From this point of view, community involvement starts right at the beginning, after the vulnerability situation has been diagnosed. In other words, the critical areas of planned retreat are no longer a rigid imposition on the territory but are seen as a warning of the need to reconfigure the urban use of the site in relation to the activity of the sea.

Consider managed retreat as crucial adaptation strategies component, requires a willingness to embrace change, and think critically about which elements of the current system should be maintained and which should be purposefully altered.

5 Conclusions and Future Works

Managed retreat as an adaptation option to coastal risks is one of the most demanding measures to implement. It takes several years to implement and requires a lot of resources. There are several barriers to overcome, mainly because it is difficult to understand what managed retreat is.

One of the conclusions of this research is that managed retreat has been seen as purely technical and directive, which needs to be reviewed.

It is a strategic intervention that requires a significant paradigm shift at a technical and legislative level.

Several questions were posed to guide the research on the subject, and the answers are presented below in this chapter.

5.1 ANSWERS TO RESEARCH QUESTIONS

A research question and six complementary questions were made to guide the overall process. The answers achieved for everyone are written below.

In built-up coastal areas that are critical in terms of risk, legality of occupation and environmental value, under what conditions should Managed Retreat be considered as opposed to stabilisation or protection?

Based on what is generally presented and adopted in the coastal programmes of mainland Portugal, as embodied in the planning principles resulting from the report of the Working Group for the Coast (GTL), (Duarte et al. 2014)), planned retreat/Managed Retreat appears as a strategic principle for the management of areas most vulnerable to coastal risks, advised over other options in cases identified as having a high risk of maritime overtopping, flooding and erosion.

It will only be applied when other protection and adaptation solutions are ineffective or economically unfeasible.

Priority will always be given to protecting the coastline of urban waterfronts through engineered structures and artificial sand nourishment techniques. The protection of dispersed buildings will not be encouraged.

The decision should always be supported by cost-benefit analyses, including the medium and long term, and the proposed based on the implementation of prospective studies of Managed Retreat.

In cases of greater vulnerability, regular monitoring of uses and activities in the safeguard zones is strongly recommended to support cost-benefit analyses to justify relocation.

Therefore, the answer is not straightforward and must be given on a case-by-case basis, and there is no single recipe, at least in this macro-analysis.

From the point of view of the legality of the occupation of coastal areas, the priority is to restore them by demolishing buildings of illegal origin, especially those located in the level 1 safeguard zone and whose legality cannot be proven or realised.

The added environmental value of the Managed Retreat is unquestionable. It aligns with the principles of the coastal zone plans and programmes, as they establish regimes for protecting natural resources and values. However, it is not an overriding option in the decision-making process.

(a) Why have the Managed Retreat, under consideration since 1999, generally not taken place?

The international scientific community agrees that the implementation of Managed Retreat is a long-term process, averaging 10 years (Hanna et al. 2019). Portugal is neither unique nor exceptional in this respect.

As pointed out by (Neal et al. 2017a), examples of Managed Retreat are hard to find and even fewer were realised, and they usually refer to small communities.

There are two levels of planning for a Managed Retreat, one at the macro level of what would be technically best for the place for reasons of risk, and the other at the local, minor level of de facto acceptance and agreement of the need for a Managed Retreat.

Since the process is essentially at the level of territorial planning and is supported mainly by regulation, unless it is triggered in an emergency or post-disaster, its implementation is complex.

On the one hand, spatial planning from a risk resilience perspective is opposed to the municipality's economic development perspective, colliding interests in the same physical space.

On the other hand, the bureaucracy inherent in the process, with a particular focus on the initial part to support implementation in terms of legislation and regulations, is a demanding factor in terms of time and resources, particularly at the local authority level, which is, with few exceptions, the government entity with the most responsibility.

In Portugal, APA helps with coordination and monitoring, but the responsibility for implementation lies with the municipality, which must coordinate the provisions of the special planning programmes and make them compatible with the municipal plans.

This mismatch leads to a lack of implementation and planning at the local level, which is the primary basis for carrying out a Managed Retreat program.

On the other hand, the adverse reaction generally shown by the affected population is a political disincentive for implementing the strategy based on what is defined as political risk.

Risk literacy is also an essential factor in the drive towards implementation. Perceptions of risk based on knowledge of local reality are often at odds with long-term predictions based on mathematical forecasting and simulation models.

Therefore, risk acceptance is often devalued, and initiatives such as Managed Retreat are seen as inappropriate. Because these are long processes, they may have to go through different political

cycles with different environmental priorities, and the resilience and political will to implement them may not be found.

(b) What are the criteria for Managed Retreat in Coastal Management Plans and Programs? Scientific criteria? Political criteria? Other criteria?

The immediate answer to this question seems simple: Should be scientific criteria.

The proposal for a Managed Retreat is based on the logic of reaction and minimising the risk to people and property. This knowledge is based on scientific studies showing the degree of erosion and flooding to which some parts of the coastal zone are subject. For example, the POC supports the use of Managed Retreat, referring to the evidence of the GTL, which endorses it as a strategic principle for managing areas most vulnerable to coastal hazards.

Policies and strategies at the global level should be driven by scientific research, which ultimately influences global, European and ultimately national regulations.

When considered at the national and local levels, the question takes on new contours.

In the POOCs, this measure is proposed for urban areas in defined risk areas subject to operational management and planning units (UOPG).

The motivations or objectives are generally based on minimising the risk to people and property, restoring legality, demolishing houses in the first line within the Public Maritime Domain, and urban conversion.

In the POC, the action is envisaged in critical areas because of their more exposed location to the effects of the sea, namely erosion, flooding and sea storms. In addition to minimising the risk, there is also a need to restore legality and urban conversion.

So, in this case, the most correct answer is both! Implementation could also be based on the question of relocation possibilities.

(c) Is the Managed Retreat in a hazardous area mainly controlled by technical, legal, or social components?

Although all the components can be driving or limiting factors for action, the social component is undoubtedly crucial to the success of Managed Retreat.

International literature emphasises that justice and fairness are crucial values to be respected, and that acceptance is critical in successfully implementing Managed Retreat (Thaler 2021b; Cooper et al. 2008).

Many processes are stalled by legal action by the population, especially private property owners, who have had their rights harmed.

The four social pillars of acceptance are:

- (a) the socio-economic status of the affected population,
- (b) the level of education,
- (c) the degree of social and political influence within the community and
- (d) the emotional attachment to the site.

In Portugal, the most representative cases of Managed Retreat case studies reflect this. The cases that have already been implemented have been in places where the socio-economic level of the population, the financial income from local resources and the living conditions were low. Although there are exceptions, populations in these situations are more likely to accept the possibility of being relocated to another place with better housing conditions.

In places where private property is more valued, and the owner's higher education level and higher socio-economic status, Managed Retreat have not taken place or have been seriously slowed down by legal action.

The financial availability of public entities is also an essential factor in implementing Managed Retreat.

Managed Retreats are economically expensive. The multiple costs and implementation times involved require, on the one hand, a large amount of public funds to be made available for the development of the action and, on the other hand, flexibility in the use of funds that are poorly adapted to the implementation schedule of these programmes.

Different action within a Managed Retreat process will likely need to have different types of funding sources. In addition, the funding programmes usually only cover part of the costs, so the municipalities must have their financial resources for the rest.

In conclusion, although the social component is the most important in phasing out, other components, such as the economic one, also play an influential role in its implementation.

(d) Have alternatives for coastal protection been considered and evaluated in the Managed Retreat?

In most cases, the answer is yes.

As mentioned in the research question, the Managed Retreat is only indicated when other protection and adaptation solutions are ineffective, or their implementation is not economically feasible.

In addition, the decision-making process is based on a cost-benefit analysis developed for different intervention scenarios, including the 'do nothing' scenario.

(e) What is the role of the responsible entities and actors in the Managed Retreat process? Is it well-defined? How are the limits of action defined? How is the population involved?

These are four fundamental questions to reflect on the governance process adopted to define and implement the Managed Retreat.

One of the main conclusions of this research is that the Managed Retreat is a multi-level governance process. It involves the actors responsible for coastal management, co-responsibility, operationalisation and monitoring of the action, and the development and implementation of participation mechanisms.

Given the dynamics and complexity of the process, the model must be integrative and multidisciplinary. Given the diversity of activities and resources in coastal zones, these areas are

overlapping jurisdictions, which is an obstacle to solving systemic problems and generally requires integrating approaches and greater institutional coordination.

Although the Portuguese Environment Agency is responsible in Portugal for developing programmes and plans for the coastal zone, its territorial scope of action covers an area larger than the Public Maritime Domain (DPM).

In most cases, the development and implementation of the Managed Retreat process is entrusted to the local authorities, with the collaboration and supervision of the Portuguese Environment Agency.

During the project phase, of a local Managed Retreat intervention all the entities with jurisdiction and different levels of responsibility over the coastal area are involved to obtain a favourable opinion on the action and identify the key points to be respected and ensured in the development of the project objectives. The result of this action is the knowledge of the actions that are allowed, subject to specific implementation parameters and prohibited within the territorial implementation of the process.

The actions to be implemented within the DPM are the responsibility of the Portuguese Environment Agency in the form of its decentralised management units, the River Basin District Administrations (ARH). Outside these boundaries, they are the responsibility of local councils.

In general, community engagement can take place in two or three stages. The first phase is the public announcement of the intention to carry out the project, bringing together all the authorities responsible for the area to provide the necessary information to the people affected. The second phase is concerned with proving the legality of the project and negotiating the compensation to be granted, and the third, the pre-implementation phase, is when the implementation project is presented and explained to the public.

The project is also presented for public discussion at the end of the preliminary project phase. Some elements of the project are made available for public consultation and the collection of their opinions, which are then analysed by the entities and their relevance considered in any changes to be included in the implementation project.

In this process, the public can express their opinion on the project but refrain from actively participating in constructing the solution to be implemented.

(f) What are the results of the follow-up analysis after the implementation of Managed Retreat?

Follow-up monitoring after implementation is still a rare action in the process and is another of the main conclusions of the research.

Although there is unanimous agreement that monitoring plays an essential role in the adaptation and resilience of coastal zones, it is currently only ensured through a system of indicators that counts the number of buildings removed and the cost of the operation.

The results observed on the ground, particularly in terms of the environmental recovery of the affected areas and the effectiveness of the measures implemented, are generally not monitored, nor is the monitoring of the resettled populations.

However, it plays a fundamental role as an input for new projects, which would greatly benefit from the lessons learned from previous projects and the knowledge of the parameters to be considered to increase the efficiency of future interventions.

5.2. SYNTHESIS AND CONCLUSIONS

As coastal climate risks are increasing, attention has been paid to how and when communities should be relocated from areas prone to flooding due to sea level rise and erosion.

Although Managed Retreat is not the best adaptation everywhere and will only be implemented in some places, it encourages serious considerations regarding climate-related transformations.

Conversations around Managed Retreat have increased substantially in the last 15 years. The tendency is for this to continue in the future.

Managed retreats have the potential to be bold in their search for futures better prepared for climate shocks that promote and improve quality of life and foster stronger relationships between people and nature.

However, it is controversial because it challenges the status quo, has the potential to cause significant and unjust losses, raises difficult questions about justice and forces people to confront the inevitability of change.

In this context, it is essential to consider that there is a climate gap between expert and community perspectives on risk and vulnerability.

The generality of the studies on Managed Retreat shows that the limitations of many initiatives and their disproportionate negative socio-economic and cultural impacts are due to a full range of impacts on communities and an overemphasis on immediate financial losses.

That fact can be linked to top-down decision-making processes and "uncritical" approaches to stakeholder and public participation, as well as the inherent limitations of cost-benefit analysis as a means of informing decision-making and the general predominance of expert-led planning, which often fails to consider local priorities and the social dimensions of risk and vulnerability.

Public acceptance can also be reduced by a lack of community awareness or understanding of natural risk phenomena and how this measure mitigates coastal flooding and erosion.

One of the biggest challenges of this adaptation option is that it requires people and businesses to relocate.

People affected by relocations are confronted with profound changes in their lives and a substantial impact on private property rights. A lack of acceptance can occur, especially when land with high perceived property value and development potential is affected and may result in strong opposition.

Legal constraints can be faced due to the complex nature of private property rights and the choices underlining landowner's compensation.

Another two points related to legal aspects is that retreat policies involving the relocation of houses and people usually involve a long process, and, in another dimension, retreat policies may need to consider national property legislation and national and subnational land use plans.

On the other hand, municipalities, which are usually responsible for implementing the Managed Retreat, can also be reluctant to change their plans if it is seen as a loss of attractiveness of the territory and economic development potential.

In addition, selecting land for set-aside can be challenging and limit the application of this option. The scarcity of land or higher prices in the new area may prevent relocation.

The main cost for this option is usually the cost of purchasing the land exposed to flooding or other hazards. The costs depend on the site, settlements, infrastructure, or land use.

Costs may increase further if it is necessary to dismantle human-made infrastructure in the new planned setback zone.

Another constraint is the high time required for the implementation. In general, implementing a managed retreat constitutes a multidecadal sequence of actions, including community engagement, vulnerability assessment, land use planning, active retreat, compensation, and repurposing.

To ensure adequate stakeholder consultation and social acceptance, long-term and strategic planning is required to implement managed retreat initiatives.

Despite this, retreating from high-risk areas also brings benefits beyond the increased safety for people and infrastructures. Managed retreats may favour the ecological restoration of coastal areas by providing new habitats for species as well as space for the creation, restoration, and conservation of dune ridges and salt marshes.

The emerging literature vision is that a collaborative process can bring multiple knowledge sources and types together to address complex long-term problems.

Based on the review literature, the main priorities for the implementation of Managed Retreat are:

- (a) Politicians and community leaders must put long-term communal expectations above short-term economic or political gain.
- (b) Relationships with the risk and what it means to own property need to be reconceptualised.
- (c) Managed Retreat must be reconceptualised as an opportunity rather than defeat.
- (d) Barriers to Managed Retreat implementation must be identified and better understood.
- (e) Practitioners must learn from historical events.
- (f) A consistent policy approach within nation-state jurisdiction is essential.
- (g) Goals and metrics should be identified as critical steps both in the execution and evaluation of Managed Retreat programs.
- (h) Implications for housing availability and affordability should be considered.
- (i) Avoidance of creating new or exacerbated existing socio-spatial inequalities.
- (j) The existence of some degree of control over where people relocate because movements can be to nearby areas equally at risk of flooding.

- (k) Ensuring that space created by the retreat is not redeveloped, becoming a local benefit, and namely for providing coastal protection and biodiversity benefits while also ensuring public access.
- (l) Compensation must be identified as a prerequisite for a fair programme of Managed Retreat.
- (m) Access to employment and appropriate housing should be provided.
- (n) Technical and psychological support should be provided during the relocation process.
- (o) There is a need for fundamental change in planning decision-making and community participation approaches.
- (p) Managed Retreat needs a good community engagement process that encourages all groups to be involved, as well as government leadership and support.
- (q) Local and state government action is required for a successful retreat strategy.

The main conclusion outlined in this document is that to be successful, a Managed Retreat requires overcoming the emotional attachment to the place, adapting to the new environment, coping with the financial burden, and rebuilding the model of the managed retreat approach.

Achieving more adaptive and integrated planning for coastal zones is a necessity. To this end, a more consistent commitment to a participatory and co-creative process that identifies more consensual and articulated approaches between the different levels of government and sectors interested in coastal zones is imperative.

5.3. FUTURE WORKS

As part of the Managed Retreat implementation strategy, it will be necessary to develop a participatory process, in the form of a workshop, to co-create a set of visions of what a Managed Retreat could look like and the challenges of such an adaptation strategy to:

- (a) Understand how stakeholders perceive managed retreat and the challenges of implementing it as a strategy to deal with flooding and sea level rise.
- (b) Develop visions of how coastal communities might develop in the short and long term and how managed retreat might fit into these broader visions.
- (c) Apply combined RDM and DAPP approach to manage retreat strategies

That was a fundamental limitation in developing the proposed methodology, as community engagement would be required to assess adaptation objectives and the level of tolerable loss of territory or other event impacts.

Future work will also include testing the methodology in a specific case study to measure the results and improvements to be made and developing a guideline for the Technical Report on Recommendations for Adaptation Scenarios for Retreat Planning, adapted to the Portuguese coastal zone.

Monitoring Programme and assessment of Retreat Management case studies, including natural (coastal forcing, coastal evolution, natural values), technical (construction and demolition works,

renaturalization, risk update), economic (cost-benefit update), juridical (legal processes, new laws) and social issues (community, public and stakeholders' perception, cultural and economic evolution of the community).

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Annexes

ANNEX A

Legal Documents supporting coastal management

Table 21: Before the basic law on spatial planning and urbanism policy of 2014

YEAR	LEGAL DOCUMENT	SUMMARY OF THE LEGAL DOCUMENT	SPECIFIC CONTRIBUTIONS
1864	Royal Decree of 31st December of 1684	It makes the waters of the sea and their beds and banks public, to safeguard assets of public interest from the arbitrary sale to which they had been subjected by a decision sustained by the absolute power of the king, which sometimes did not coincide with the interests of the state itself.	Origin of the concept of "public domain" and creation of the concept of "Maritime Public Domain" (DPM) , also establishing the concept of "margin of the waters of the sea", which would correspond to a zone with special constraints, to protect accessibility.
1919	Water Law Decree no. 5.787 - IIII of 10-05-1919 <i>(repealed by Law no. 54/2005 of 15th November)</i>	It contains several provisions on public domain and private domain waters and establishes transitional provisions on this matter. Regarding public waters, it provides for their use and exploitation by concession, namely for public utility. As for private waters, it provides for their utilization and easements relating to their use.	It establishes coastal saltwater, among other water resources, as a public domain , with its use becoming the subject of special legislation. It also includes the environmental and conservation component and clarifies the methodologies for recognizing private plots on the shore of sea waters.
1971	Decree-Law no. 468/71, of November 5th <i>(repealed by Law no. 54/2005 of 15th November)</i>	Revises, updates and unifies the legal regime for land in the Public Water Domain (DPH), which includes the beds and banks of sea waters, watercourses, lakes and lagoons, to facilitate their utilization for the several uses to which they are economically susceptible.	It includes matters relating to the environment and conservation and clarifies some procedures for recognizing private plots on the edge of sea waters and private uses on plots of public land. It introduces and defines the concepts of Adjacent Zone and Zones Threatened by the Sea and determines the land affected by the retreat and advance of the waters.
1976	Land Law Decree-Law no. 794/76 of November 5th <i>(repealed by Law no. 31/2014, of 30th May)</i>	Approves the soil policy.	It defines the fundamental principles and rules of land policy and concentrates and systematizes provisions scattered throughout separate laws. It provides for the application of preventive measures to avoid alterations to existing circumstances and conditions that could jeopardize the execution of the urbanization plan or public enterprise project of another nature or make it more difficult or costly.
1998	Basic Law on Spatial Planning and Urbanism Policy (LB POTU) Law no. 48/98, of 11th August <i>(repealed by Law no. 31/2014, of 30th May)</i>	Establishes the foundations of spatial planning and urbanism policy.	It characterizes the territorial management system and defines the Territorial Management Instruments (IGT), identifying the Coastal Shore Management Plans (POOC) as instruments of a special nature, more specifically, Special Territorial Management Plans (PEOT). It defines the goal of spatial and urban planning as safeguarding essential natural values, ensuring that the coastline (among other territorial resources) of particular interest to nature conservation is protected in a way that is compatible with the normal enjoyment by the population of its specific potential.
1999	Legal Regime for Territorial Management Instruments (RJIGT)	Establishes the legal regime for territorial management instruments.	It implements the program of legislative action complementary to the basic law, defining the system for coordinating the national, regional and municipal levels of the territorial management system, the general land use system and the system for drawing

YEAR	LEGAL DOCUMENT	SUMMARY OF THE LEGAL DOCUMENT	SPECIFIC CONTRIBUTIONS
	Decree-Law no. 380/99, of 22nd September <i>(repealed Decree-Law no. 80/2015, of 14th May)</i>		up, approving, implementing and evaluating IGTs, including POOCs, as PEOTs. It establishes the material and documentary content of PEOTs, stating that they must include a regulation defining the system for safeguarding natural resources and values and the management system compatible with the sustainable use of the territory. To harmonize interests, it identifies the coastline as a territorial resource with strategic relevance for environmental sustainability and intergenerational solidarity and defines that it should be duly identified by the IGTs as a public interest with territorial expression.
2005	Law on ownership of water resources Law no. 54/2005, of 15th November	Establishes the ownership of water resources.	It lists the assets - waters and related land - that make up the DPH, including the DPM, and defines their special protection regime, to ensure that they fulfil the public utility purpose for which they are intended, a regime that removes them from the legal discipline of private domain assets, making them inalienable, unseizable and imprescriptible. More specifically, it defines the notions of bed and margin, establishes the conditions to be observed when water recedes or advances, lays down the rules and procedures to be observed when recognizing private ownership over land plots of public beds and margins and sets out the general lines of delimitation of the DPH and DPM. It defines the conditions for delimiting and classifying an Area Threatened by the Sea as an Adjacent Area and the respective public utility restrictions, including in terms of building occupation. Each classification decree defines, in this case, whether it is prohibited or subject to specific rules, establishing the respective licensing and inspection procedural conditions.
2005	Water Law Law no. 58/2005, of 29th December	It transposes the Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council of October 23rd) into national law, establishing the bases and institutional framework for sustainable water management.	It defines the concept of "Coastal Waters" and other concepts directly or indirectly related to this territorial resource. It includes coastlines as one of the water resources subject to management and planning measures to protect the quantity and quality of water, aquatic ecosystems and sedimentological resources. It establishes the preparation and implementation of POOCs as one of the competences of the National Water Authority, to guarantee the appropriate planning of the uses of coastal waters. It defines POOCs as water policy planning instruments, as IGTs that include appropriate measures for the protection and enhancement of water resources in the area to which they apply, to ensure their sustainable use, binding on the public administration and private individuals. They must also organize the different uses and specific activities of the coastline, classify beaches and regulate their use, and provide a framework for the development of specific

YEAR	LEGAL DOCUMENT	SUMMARY OF THE LEGAL DOCUMENT	SPECIFIC CONTRIBUTIONS
			activities and the respective basic sanitation, among other strategic options. It establishes that these PEOTs must be drawn up with the protection and enhancement of water resources as their main goal, which, in the case of POOCs, includes coastal and inland maritime waters and their beds and margins, as well as maritime and land protection zones (to be defined in specific legislation or within the scope of each plan). It also provides f complementary measures to those contained in the river basin management plans for the systematic protection and enhancement of water resources, including the conservation and rehabilitation of the coastal zone.

Table 22: After the basic law on spatial planning and urbanism policy of 2014

YEAR	LEGAL DOCUMENT	SUMMARY OF THE LEGAL DOCUMENT	SPECIFIC CONTRIBUTIONS
2014	Law on the general basis of public policy on soil, spatial planning and urbanism Law no. 31/2014, of 30th May	It approves the revision of the general bases of public policy on land, spatial planning and urbanism, merging LBOTU and the Land Law into a single law and ensuring proper coordination and compatibility with the other laws that give concrete form to the Land Law in various specific areas, such as the legal framework for planning instruments, the legal framework for land, the legal framework for urbanization and building, the legal framework for the National Ecological Reserve, among others.	It enshrines a universal right to rational, proportional and balanced spatial planning, so that the pursuit of the public interest in land, spatial planning and urbanism is carried out with respect for legally protected rights and interests. Among the aims of this public policy is the safeguarding and valorization of the coastline. It regulates the implementation of plans by instituting a new system of land classification, into urban and rural land, which opts for a logic of effective and appropriate allocation of urban land to land that is partially or totally urbanized or built upon, eliminating the operative category of land that can be developed. This avoids the proliferation of individual urban operations, the excessive and irrational increase in urban perimeters and the persistence of expectant urban and land that can be developed. It differentiates between territorial programs and plans, which materialize the way in which public land-use policies and sectoral policies with a territorial impact are implemented, respectively in the spheres of government/central administration and municipalities/local administration and regulates the forms of integration and mutual articulation between the different instruments. Territorial plans (at inter-municipal or municipal level) will now be the only ones to determine the classification and qualification of land use (as well as the respective implementation and programming), instituting a typological change in territorial management instruments of a special nature, now known as Special Programs (PE) and with a strategic nature at national level.

			The PEs pursue goals of national interest and establish the guiding principles and rules for the discipline to be defined by the regional programs; they must exclusively establish systems for safeguarding natural resources and values, through measures that establish actions that are permitted, conditioned or prohibited according to the objectives of each program, taking precedence over territorial plans at inter-municipal and municipal level. Whenever a PE comes into force, it is compulsory to amend or update territorial plans at inter-municipal and municipal level. All territorial programs and plans must also be coordinated and made compatible with national maritime spatial plans, whenever they concern the same area or areas that, due to the structural or functional interdependence of their elements, require integrated planning coordination.
2015	Legal regime for territorial management instruments Decree-Law no. 80/2015 of 14th May	Approves the revision of the RJIGT.	It lays the foundations for public policy on land, spatial planning and urbanism, defining the system for coordinating the national, regional, inter-municipal and municipal levels of the territorial management system, the general land use regime and the system for drawing up, approving, implementing and evaluating IGTs. Territorial plans (at inter-municipal or municipal level) are now the only instruments that directly and immediately bind private individuals (except for Regional Forest Management Programs), to ensure the compatibility of different rules in a single plan and avoid overlapping rules and conflicting objectives. It introduces a substantive change to territorial management instruments of a special nature, in that they no longer directly and immediately bind private individuals; their material content now only establishes actions that are permitted, conditioned or prohibited according to the systems for the protection and enhancement of natural resources; and their documentary content no longer includes a regulation but an implementation program and financing plan. It also makes it compulsory for special plans to be integrated into the content of territorial plans (at inter-municipal or municipal level), so that private individuals will be able to see in a single plan the rules that were scattered throughout the various special plans.

ANNEX B

Table 23: Managed Retreat's position within POC – CE (APA 2021a; 2021b; 2021c)

Planned Setback is defined as:

- (a) the retreat of populations to reduce the risk of climate change events by limiting their potential effects;
- (b) interventions aimed at retreating the urban occupation zone in relation to the coast shore, relocating uses and infrastructures and ensuring the renaturalization of these areas;
- (c) it is particularly important in built-up areas covered by Safeguard Zones, where buildings in a more serious situation from the point of view of coastal risks should be relocated.

The solution is recommended for areas where there is a high risk of overtopping, flooding or erosion, and should be adopted in extreme situations.

It is recommended over the other two options in cases of high risk.

Following on from this, the evolution of the coastline must be managed by adapting the occupation of the territory to the natural dynamics of the coast.

The relocation of equipment, infrastructures and urban constructions resulting from planned retreat processes must be framed for safety reasons related to the dynamics of the coastline.

Planned setback measures should be considered and quantified on a case-by-case basis, based on existing protection and coastal dynamics, and a retreat plan should be defined that provides for phasing and the possibility of partial implementation in emergency situations, in the absence of viable alternatives, when the costs become excessive or occasional cases of relocation opportunities arise.

The costs of removing buildings in high-risk areas must be quantified with a view to a planned retreat when, from an environmental, economic and social point of view, there are no viable and sustainable alternatives based on protection and accommodation, or following extreme episodes that make this advisable.

Their implementation must consider the following:

- (a) Be duly framed in territorial plans at inter-municipal and municipal level, and their implementation be ensured in liaison with APA, I.P.
- (b) Consider the possibility of transferring buildings to more suitable areas, to be considered and developed within the scope of the territorial plans and the respective implementing instruments.

Table 24: Managed Retreat's position within POC – OMG (APA 2015; 2016)

There is an urgent need to adopt measures to adapt to extreme coastal and climatic phenomena that will allow future generations, within the resources available to them, to choose whether to continue with an approach of protecting coastal settlements, or whether to remove them or move buildings back.

Minimising risks, particularly those related to ocean gales, must also include a coastal protection approach, primarily based on sediment management and the recovery of the sedimentary profile of the coastline.

Planned retreat measures should be considered and quantified on a case-by-case basis, based on existing protection and coastal dynamic phenomena, and a retreat plan should be defined that provides for phasing and the possibility of partial implementation in emergency situations, in the absence of viable alternatives, when costs become excessive or when occasional cases of relocation opportunities arise.

Prioritise the removal of illegally generated constructions that are located in the Sandy Coastal Safeguard Strip - Level I.

The costs of removing buildings in high-risk areas should be quantified with a view to a planned retreat when, from an environmental, economic and social point of view, there are no viable and sustainable alternatives based on protection and accommodation or following extreme episodes that make this advisable.

This POC defines relocation (planned setback) as one of the strategies. To reduce coastal risk, there are essentially two complementary actions that constitute one of the main recommendations of this proposal: reducing erosion through artificial nourishment and acting on occupation to reduce the risk it poses, through accommodation and relocation strategies (planned retreat). Associated with these actions, the process of monitoring the coastline must always be present.

About relocation:

In coastal areas where there is a high risk of overtopping, flooding or erosion, it is recommended that relocation be considered. The relocation strategy presupposes removal from high-risk areas, given the protection and accommodation options. Therefore, it is recommended that in the medium- and long-term time horizons, coastal stretches be identified where it is necessary to adopt a protection strategy that maintains the coastline, due to its national strategic importance, and those where the most appropriate adaptation strategy in social and economic terms is relocation. In cases where relocation is chosen, it is recommended that the evolution of the coastline be managed by adapting the occupation of the territory to that natural dynamic.

Relocation should favour expedient negotiation mechanisms, including the transfer of buildings in risk zones to suitable areas, in conjunction with local authorities.

It is recommended that prospective relocation studies be carried out in locations with a high risk of overtopping, flooding and erosion, based on cost-benefit analyses and multi-criteria analyses that include the medium and long term.

Table 25: Managed Retreat's position within POC – ACE (APA 2015; 2016)

This is particularly important in built-up areas covered by buffer zones, where there must be an intense effort to adapt, while at the same time the most serious situations must be relocated.

Regularly monitoring uses and occupations in the areas covered by buffer zones, extreme weather events and slope movements, as well as the costs resulting from damage and destruction, with the aim of carrying out proactive adaptive management of settlements, which considers planned retreat supported by cost-benefit analyses.

Minimising risks, particularly those related to ocean gales, must also include a coastal protection approach, primarily based on sediment management and the recovery of the sedimentary profile of the coastline.

Critical Areas - Relocation - areas covered by the Safeguard Strip where the existence of highly dangerous situations in the short to medium term requires, within the framework of the coastal risk adaptation strategy adopted by the POC-ACE, priority interventions to remove and relocate buildings.

Develop an integrated adaptation policy, in its three aspects - protection, relocation and accommodation - for built spaces, inside or outside settlements and legally or illegally installed, adopting removal measures and active coastal protection actions that should be considered in territorial programmes and plans.

Relocation measures should be considered and quantified on a case-by-case basis, based on existing protection and coastal dynamics. A removal plan should be defined, providing for phasing that allows for partial implementation in emergency situations, in the absence of alternatives or when costs become prohibitive or occasional cases of opportunity arise.

Develop priority interventions for the removal and re-naturalisation of built-up areas.

Priority should be given to removing and re-naturalising the built-up areas in the Safeguard Strip that are most dangerous, namely the situations identified in the Territorial Model as Critical Areas - Relocation of Água de Madeiros, Vale Furado, Praia da Consolação, Foz do Sizandro, Cova do Vapor, Fonte da Telha and campsites in the dune system south of the Costa da Caparica, in which buildings that are more than 50% covered by the Safeguard Strip should be removed.

Table 26: Managed Retreat's position within POC – EO (APA et al. 2022b; 2022a)

Acceptance of the development of an integrated policy, in terms of protection, relocation and accommodation, for built spaces, inside and outside settlements and legally or illegally installed, adopting removal measures and active coastal protection actions that should be considered in territorial programmes and plans.

Prioritise the protection of the coastline to safeguard urban fronts, discouraging the protection of dispersed buildings, except for works that result from sediment policy or are part of public initiatives.

Consider and quantify relocation measures, on a case-by-case basis, based on existing protection and coastal dynamics. A removal plan should be defined, providing for phasing that allows for partial implementation in emergency situations, in the absence of alternatives or when costs become prohibitive or occasional cases of opportunity arise.

Prioritise the removal of illegally generated constructions that are in Level I - Sandy Coastline Safeguard Zone.

The costs of removing buildings in high-risk zones should be quantified with a view to a planned retreat when, from an environmental, economic and social point of view, there are no viable and sustainable alternatives based on protection and accommodation, or following extreme episodes that make this advisable.

Regarding the method of action, promote the reduction of use and occupation of vulnerable zones by progressively moving existing buildings and structures to locations outside the safeguard strips, through the creation of equalisation mechanisms or the exchange of land in safeguard strips for other land located outside them.

Regular monitoring of uses and activities in the safeguard zones to support cost-benefit analyses to justify relocation.

ANNEX C

Critical Areas of Planned Setback in POC

Table 27: Criteria to defining Critical Areas of Planned Setback in POC – CE (APA 2021a; 2021b; 2021c)

POC Caminha- Espinho	
Critical Areas of Planned Setback	14
Features	Built-up and/or infrastructure centres
Implementation	Within inter-municipal and municipal plans and their implementation must be ensured in liaison with APA
Setback Option	Consider, whenever justified, the possibility of transferring buildings to more suitable areas
Decision Methodology	Cost-benefit analyses, developed considering four different scenarios: Scenario 0 - Emergency Reactive / Emergency Protection: Maintenance of the policy of heavy works and/or localised intervention, based essentially on emergency interventions, from a short-term perspective. Scenario 1 - Planned setback / relocation strategy: Planned removal of buildings in coastal areas at high risk of overtopping, flooding and/or erosion, from a long-term perspective, considering social and economic aspects. Scenario 2 - Protection Strategy / Planned Maintenance: Maintenance of the existing system of defence structures in the medium term, with the respective reinforcement or adaptation, also including the reinforcement of the dune cordon when possible, with the aim of defending the built heritage by reducing the frequency of overtopping and flooding and limiting possible damage to infrastructure and property; some reduction in the size of the beaches and possible loss of landscape and recreational value is accepted. Scenario 3 - Mixed Protection Strategy / Planned Anticipation: Approach with possibly mixed solutions, restoring the sediment cycle through artificial nourishment, complementary interventions to protect the coastline, recourse to innovative protection and/or accommodation solutions supported by pilot cases, and/or a combination of these alternatives.

Types of intervention considered in the cost-benefit analysis scenarios and combinations considered in each scenario. POC evaluates the actions in: basic actions (AB); fundamental actions (AF) and complementary actions (AC), to be considered in each scenario

Table 28: Managed Retreat Cost-Benefit analysis in POC – CE (APA 2021a; 2021b; 2021c)

Types of intervention	Scenarios			
	Scenario 0	Scenario 1	Scenario 2	Scenario 3
1. Artificial beach nourishment	AB	AC	AF	AF
2. Strengthening the dune cordon	AB	AC	AF	AF
3. Replacement of sedimentary traffic / Sand transposition		AC	AB	AF
4. Rehabilitation of damage to coastal protection and public enjoyment structures due to storms	AF	AC	AB	AC
5. Periodic maintenance of existing defence structures		AC	AF	AC
6. Reconfiguration/demolition of existing defence structures		AC	AF	AC
7. Construction of new adherent defences		AC	AC	AB
8. Construction of new spurs		AC	AC	AB
9. Construction of detached breakwaters		AC	AC	AB
10. Construction of submerged defence works in a pilot area		AC	AC	AB
11. Cliff stabilisation		AC	AB	AC
12. Landscape and environmental valorisation / Recovery of degraded areas		AC	AB	AC
13. Planned setback of buildings at risk		AF	AC	AC

Table 29: Criteria to defining Critical Areas of Planned Setback in POC – OMG (APA 2015; 2016)

POC Ovar-Marinha Grande	
Critical Areas of Planned Setback	14
Features	Built-up and/or infrastructure centres
Implementation	Within inter-municipal and municipal plans and their implementation must be ensured in liaison with APA
Setback Option	Consider, whenever justified, the possibility of transferring buildings to more suitable areas
Decision Methodology	Cost-benefit analyses, developed considering four different scenarios: Scenario 0 - Emergency Reactive / Emergency Protection: Maintenance of the policy of heavy works and/or localised intervention, based essentially on emergency interventions, from a short-term perspective. Scenario 1 - Planned Setback / Relocation Strategy: Planned removal of buildings in coastal areas at high risk of overtopping, flooding and/or erosion, from a long-term perspective, considering social and economic aspects. Scenario 2 - Protection Strategy / Planned Maintenance: maintenance of the existing system of defence structures in the medium term, with the respective reinforcement or adaptation, also including the reinforcement of the dune cordon, when possible, with the aim of defending the built heritage by reducing the frequency of overtopping and flooding and limiting possible damage to infrastructure and property; some reduction in the size of the beaches and possible loss of landscape and recreational value is accepted. Scenario 3 - Mixed Protection Strategy / Planned Anticipation: Approach with possibly mixed solutions, restoring the sediment cycle through artificial nourishment, complementary interventions to protect the coastline, recourse to innovative protection and/or accommodation solutions supported by pilot cases, and/or a combination of these alternatives.

Table 30: Managed Retreat Cost-Benefit analysis in POC – OMG (APA 2015; 2016)

Types of intervention	Scenarios			
	Scenario 0	Cenário 1	Scenario 0	Cenário 3
1. Artificial beach nourishment	AB	AC	AF	AF
2. Strengthening the dune cordon	AB	AC	AF	AF
3. Replacement of sedimentary traffic / Sand transposition		AC	AB	AF
4. Rehabilitation of damage to coastal protection and public enjoyment structures due to storms	AF	AC	AB	AC
5. Periodic maintenance of existing defence structures		AC	AF	AC
6. Reconfiguration/demolition of existing defence structures		AC	AF	AC
7. Construction of new adherent defences		AC	AC	AB
8. Construction of new spurs		AC	AC	AB
9. Construction of detached breakwaters		AC	AC	AB
10. Construction of submerged defence works in a pilot area		AC	AC	AB
11. Cliff stabilisation		AC	AB	AC
12. Landscape and environmental valorisation / Recovery of degraded areas		AC	AB	AC
13. Planned setback of buildings at risk		AF	AC	AC

Table 31: Criteria to defining Critical Areas of Planned Setback in POC – ACE (APA 2015; 2016)

POC Alcobaça – Cabo Espichel	
Critical Relocation Areas	6
Features	Built-up and/or infrastructure centres
Implementation	Within inter-municipal and municipal plans and their implementation must be ensured in liaison with APA
Setback Option	Carrying out priority interventions to remove and relocate buildings
Decision Methodology	Cost-benefit and multi-criteria analyses to estimate the associated impacts, benefits and costs, developed considering four different scenarios, based on erosion dynamics and land use and occupation patterns. Proposed scenarios: Scenario A - No intervention Scenario B - Stabilisation/Consolidation Scenario C - Managed Retreat Stages developed: Stage 1: Identifies the reference situation, highlighting the problem Stage 2: Definition of three basic scenarios that structure the response (or non-response), pointing out the main supporting characteristics, type of intervention, estimated implementation costs and maintenance costs, based on the forecast of the evolution of the situation in the short term (0-4 years), medium term (5-12 years) and long term (12-50 years). Stage 3: Evaluation of the economic, social and environmental dimensions for each scenario, through sensitivity analyses of the various descriptors that structure each of the dimensions (benefit analysis) and the attribution of a degree of positive impact. (on a scale between 1 and 5; gradually from low to very high) or negative (on a scale between -1 and -5), and finally a weighting according to the relevance of each of the dimensions analysed. Stage 4: New weighting, based on the estimated costs and the benefits identified by dimension, to support the calculation of the cost/benefit ratio for each of the scenarios under evaluation. Scenarios: Scenario A - No intervention Scenario B - Stabilisation/ Consolidation Scenario C - Managed Retreat

Table 32: Descriptors assessed in each of the dimensions for all scenarios in POC – ACE (APA 2015; 2016)

Economic Descriptor	Social Descriptor	Environmental Descriptor
Tourist activity (residential tourism, ...)	Safety of the public and bathers	Coastline maintenance
Support activities (catering, ...)	Building safety	Coastal dynamics
State revenue (taxes, licences)	Changes in tourism and support activities	Dune system
Municipal revenue (taxes, licences)	Opportunity to redevelop the area	Flora values
Negotiation and legal process (Compensation)	Negotiation and legal process (Compensation)	Landscape

ANNEX D

French Case Study

Acceptabilité et mise en œuvre des politiques de relocalisation face aux risques littoraux : perspectives issues d'une recherche en partenariat

(Kleszczewski and Méditerranée 2020)

For the authors, the reflection was conditioned by the following three assumptions: relocation programmes must be carried out in the public interest, with the lowest possible level of public funding, while ensuring the owners' interest.

The owners' interest is necessary for facilitating the social acceptability of planned withdrawal/relocation options and is also aimed at the collective interest. Their research has led them to emphasise that it is impossible to separate financing from private ownership of the project and the methods of implementing the relocation.

According to these authors, the principles leading to an integrated approach to relocation are:

From their research, they have obtained several conditions for relocation policies:

Relocation policies must be conditioned by several principles in order to ensure the anticipation and planning of operations:

- a) The need to jointly consider protection, mitigation and relocation actions on a territorial scale, whereby the relocation of activities and assets will only concern particularly vulnerable sectors of the coastline and before the actual relocation of assets or in areas to be relocated later, the application of temporary mitigation and protection measures may be considered.
- b) There is a need to define the period after which risk exposure will be considered socially unbearable (regarding personal safety and recurrence of damage) and to use hazard modelling to delimit exposed areas over time.
- c) The need to think in terms of gradual implementation, incorporating a vital consultation and awareness-raising component, and defining new forms of temporary occupation of the territory, i.e. of limited duration;
- d) The need to identify a rationale, in terms of revenue and costs avoided, that justifies the general interest of these operations;
- e) There is a need for strong, long-term political support, accompanied by the definition of governance adapted to these very long-term programmes.

These principles suggest relocation as a global project for the area, designed to integrate not only the risks but also the need for innovation to improve the quality of life and support the competitiveness and attractiveness of the area.

Thus, the aim of anticipating and planning relocations must guarantee the safety of people and minimise the costs of damage and loss of property value for owners but also allow for the modernisation and restructuring of housing and tourist infrastructures, maintaining a dynamic of economic investment favourable to the attractiveness of coastal communities.

In this way, political support for the project and its social acceptance are facilitated since it is seen as an opportunity rather than a constraint.

In this logic, it is possible to combine relocation with creating eco-neighbourhoods (benefiting from specific funding), housing renovation to help people in difficulty, or even, more generally, creating facilities to boost the area's tourist appeal.

So, it's not just a question of reducing vulnerability but of an integrated and concerted project to reconvert the area.

In France, these development projects can take the form of widely used schemes such as ZAC (Zones d'aménagement concerté) or PUP (Projets urbains partenariaux), associated with OPAH (Opérations programmées d'amélioration de l'habitat) or ORIL (Opérations de réhabilitation de l'immobilier de loisirs).

ZAC - Zones of concerted development;

PUP - Urban partnership projects

OPAH - Housing improvement programmes

ORIL - Remodelling of leisure and recreational areas

In the case of sandy coasts, the areas freed up along the seafront will be restored or "renatured" (recharging and rebuilding dune belts). This action contributes to maintaining the beaches and the ecosystem services they provide in terms of protection against storms (MEA, 2005), as well as improving quality of life and tourism opportunities. Removing the first lines will improve the landscape and beach access conditions (parking, shuttles, etc.). It will favour the development of "green" tourist activities, which will benefit the local economy.

The ex-ante definition of a spatial and temporal zoning system that allows for anticipation

Relocation projects, due to their social and financial aspects, necessarily take place over the long term. However, by the recommendations of the National Plan for Adaptation to Climate Change (ONERC, 2011), the relocation programme should be designed dynamically from the outset, distinguishing between several phases and several sub-areas progressively affected by the risks of erosion and flooding.

ANNEX E

In this appendix we present the figures from the main text which, because of their relevance, need to be better read.

Figure 5 Territorial Model of POOC and POC (adapted form (APA 2021c))

Changing the Paradigm of Coastal Shore Planning and Management

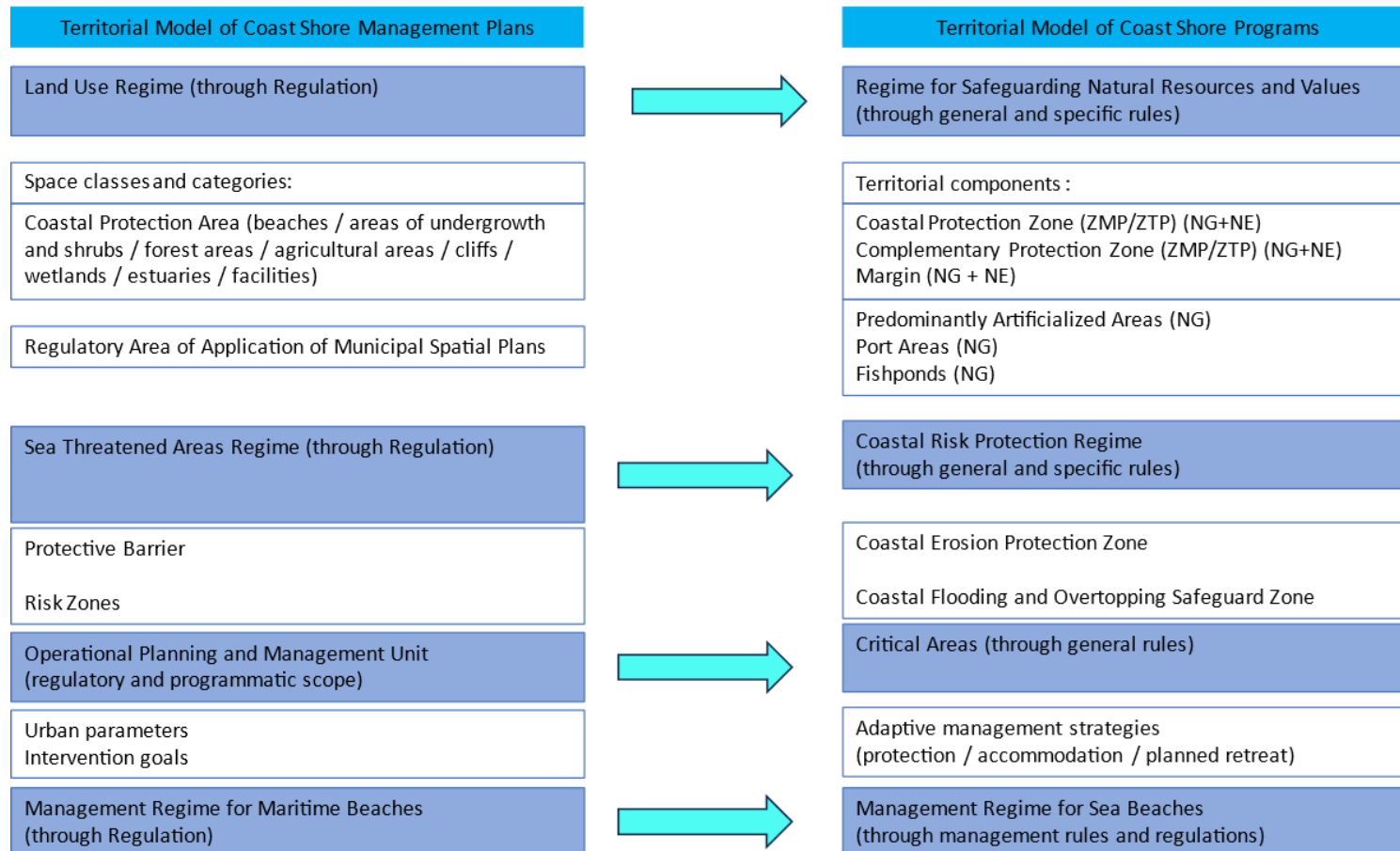


Figure 8 Diagram to implement demolition (adapted from (ARH do Tejo 2009))

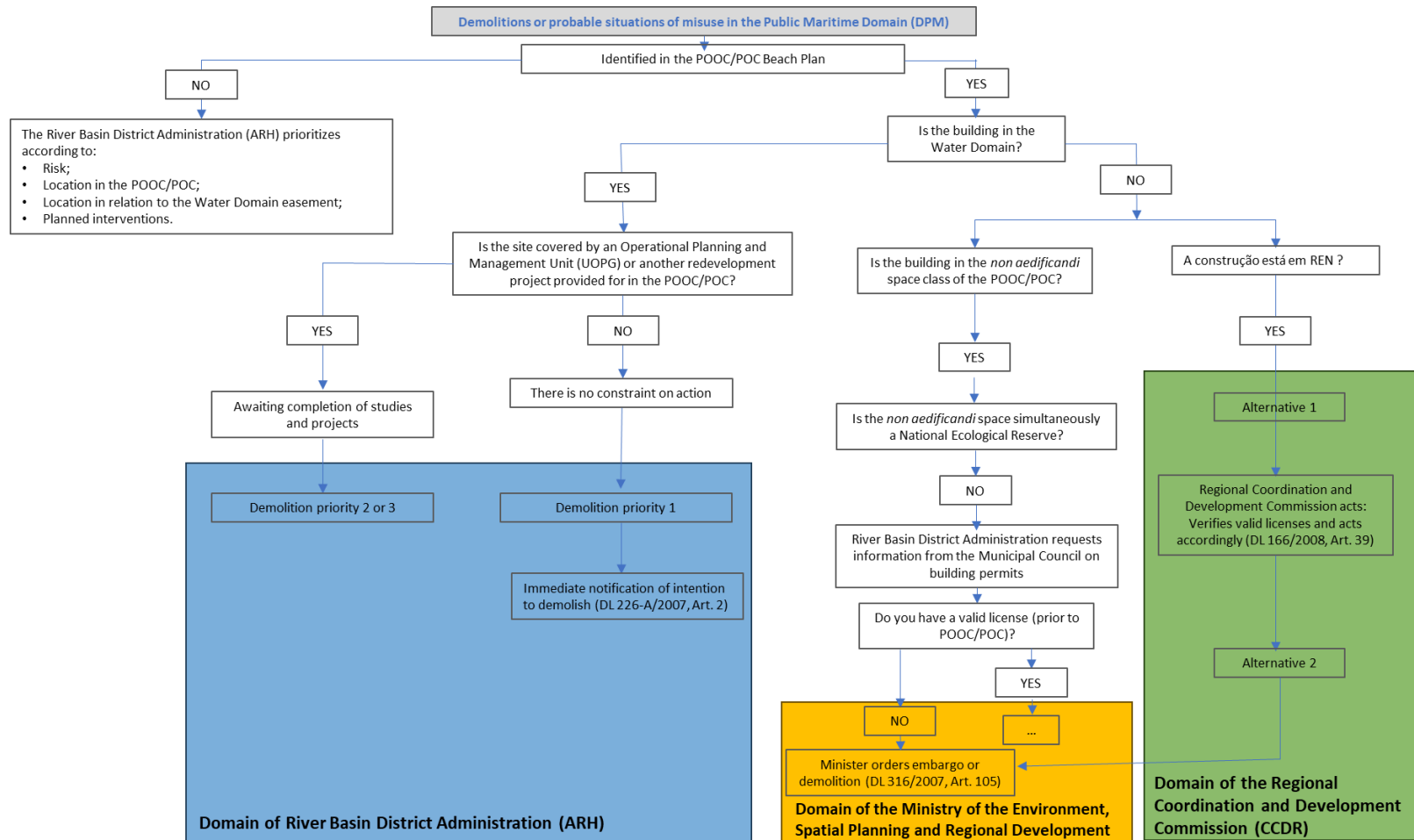


Figure 9 Diagram to implement demolition over in DPM

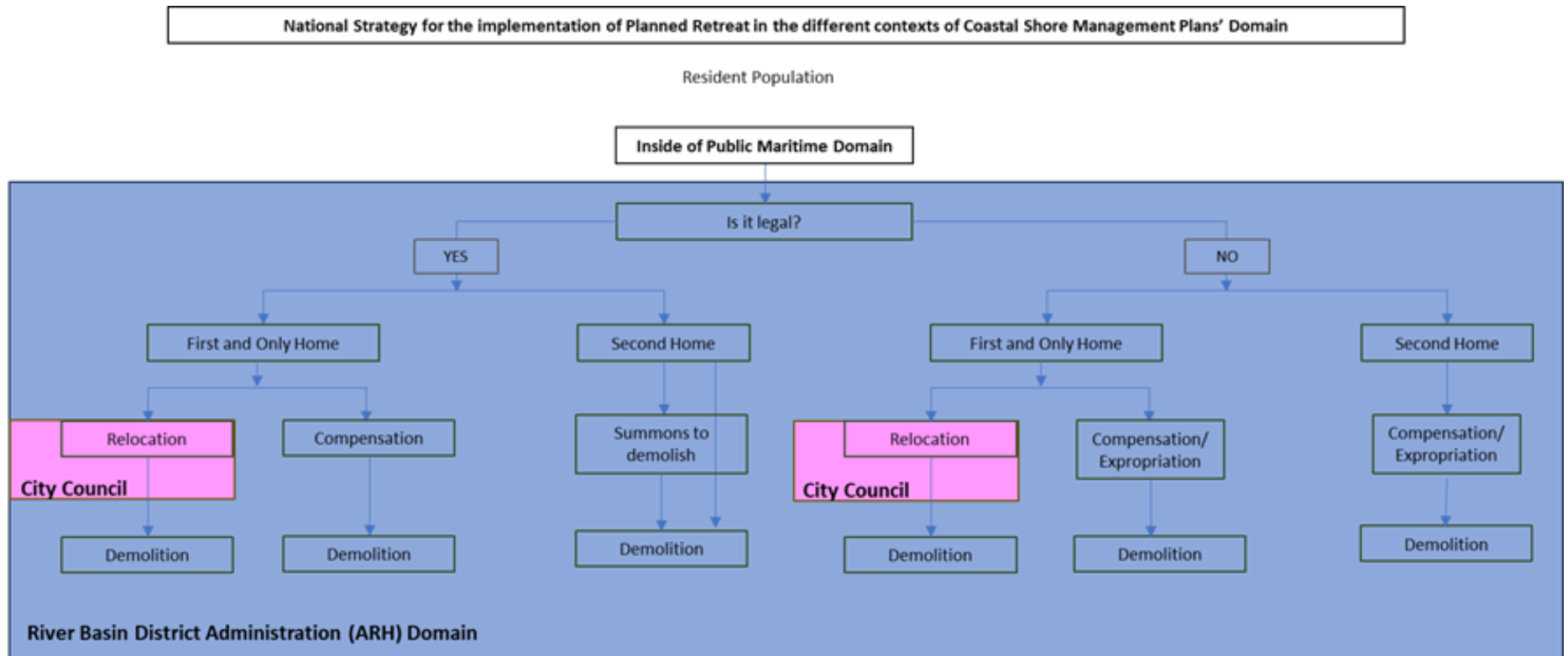


Figure 10 Diagram to implement demolition outside DPM

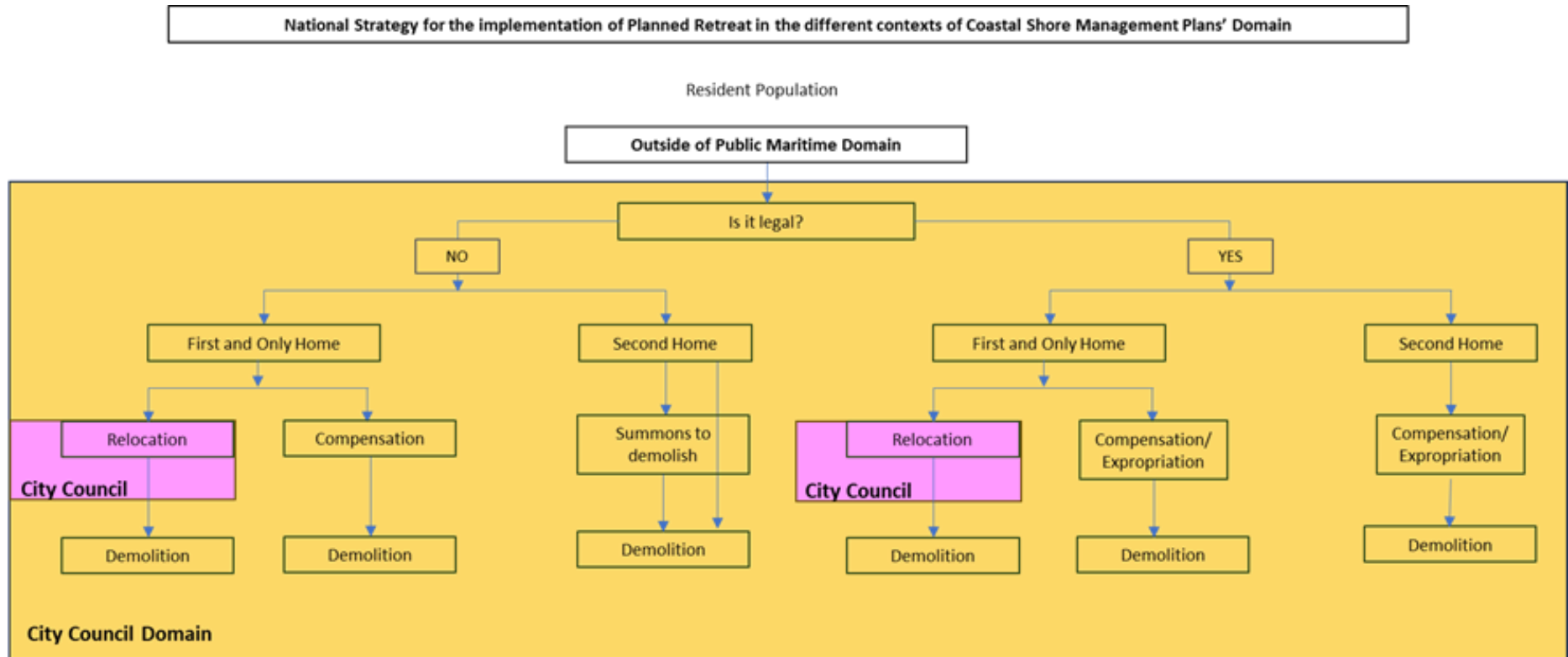


Figure 12 Case Studies Location (adapted from (APA 2021a))



Figure 29 Proactive perspective on Managed Retreat

