AdriaClim

Climate change information, monitoring and management tools for adaptation strategies in Adriatic coastal areas

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D 5.1.1 Existing national, regional and local adaptation plan on coastalarea of Italy and Croatia

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Summary

Executive summary

The Mediterranean Sea and specifically the Adriatic coastal and marine areas are particularly vulnerable to climate-related risks. The sea surface temperature of the Adriatic Sea will increase of about +1.5/1.6°C in 2050 and sea level will increase of +7 cm with consequent negative impacts on coastal areas and marine ecosystem services, due to sea level rise, erosion, salinization and flooding. Hence, a holistic coastal and marine risk management that includes joint monitoring and forecasting, coordinated risk assessment and planning of measures in an appropriate legal and institutional framework is crucial to enhance coastal and marine areas' adaptive capacity in the region.

In this context, the ADRIACLIM " *Climate change information, monitoring and management tools for adaptation strategies in Adriatic coastal areas*" project (funded by the Interreg Italy-Croatia Programme) aims to improve climate resilience in the cooperation area, by increasing local capacity to design new climate adaptation plans and update existing ones based on high resolution, more accurate and reliable climate information (observations and integrated modelling) with a special focus on the coastal and marine areas and related economic sectors and ecosystem services.

In the framework of Work Package 5- Adaptation Plans, this report on "*Relevant existing national, regional and local adaptation plans*" aims to produce a critical analysis of existing national and regional/local adaptation plans in the project's area through an autonomous desk review, thus constituting the knowledge base for the design of adaptation plans in the pilot areas.
The guiding principle has been to select Best Practices dealing with climate change adaptation measures, specifically regarding Coastal Areas, on the basis of the innovative and/or effective tools, methods, structure and actions they present alongside their grade of alignment with ADRIACLIM topics and scopes. In addition, each best practice includes also takeaways recommendations for project partners as concrete guiding principles that may be considered in the adaptation planning process.

The present report is structured in three main chapters. After a brief Introduction, Chapter 1 presents a review of the current national and local Climate Change Adaptation Plans available in Italy and Croatia in order to inform about the existing reference framework operative for Project Areas. Considering that adaptation to climate change is a cross-cutting issue and requires an integrated approach, Chapter 2 reviews the existing sectoral plans in the pilot areas aiming at analysing how adaptation is mainstreamed in current legislation. Finally, Chapter 3 comprises several best practices outside the cooperation area as illustrative examples of the all phases of the adaptation planning, which could be useful for project partners and to some extent replicable in pilot areas. A special focus on the Integrated coastal zone management (ICZM) is presented in Annex I with some case studies within the Project area.

Considering that this report constitutes the knowledge base for the elaboration of the adaptation plans in the pilot areas, a set of recommendations on adaptation planning will be briefly presented in the next paragraphs with references to best practices addressing the specific issue.

The first step of the adaptation planning is to set the ground for adaptation and then in this phase a collection of relevant information should be undertaken, including on existing relevant policies, strategies and plans. Therefore, it is important to **refer to and align with national and regional policy framework on adaptation to climate change in Italy and Croatia**. All policy documents analysed in Chapter 1 and the Guidelines presented in Box 2 set the scene for local planning processes in the project area, thus providing useful and concrete references on strategic objectives, context analysis and assessments, priority sectors as well as include also a set of general adaptation measures as concrete pieces of advice to be tailored to the local context.

Due to the ADRIACLIM project scope, **coastal zone management should be a crucial element in the local adaptation plans**. It is fundamental to deal with coastal adaptation through **an integrated and multi-sectorial approach**, highlighting **the linkages between land and sea**, considering all the biological, ecological, economic and social variables in the planning process. Box 1 presents a high level of technical and operational guidelines on coastal defence and concretely suggests how to carry out adaptation planning in coastal areas by covering all the required steps, while Annex I focus on the Integrated Coastal Zone Management (ICZM) Protocol with concrete operational examples within the project area.

Considering that project pilot areas reported among the main limitations the lack of coordination among all the involved actors, it is recommended to **harmonise adaptation planning with other sectorial plans already in force** and **set a clear governance structure** with specific roles and responsibilities for all the involved actors as well as with coordination and communication channels, in order to avoid duplication and maximize opportunities and benefits from enhanced local adaptive capacity. Chapter 3 provides insight into the existing sectoral plans with adaptation considerations and/or specific adaptive measures in Croatia and Italy as a useful starting point for mainstreaming adaptation into current legislation.

Political support is essential to give more prominence to adaptation in the local agenda, but also **relevant stakeholders participation and engagement** is required as an essential prerequisite for successful implementation of adaptation actions. Therefore, **a participatory decision-making process** needs to be ensured in the identification and design of adaptation options. Even though mobilizing local actors and raising awareness could be time-consuming and requires great efforts, stakeholders are fundamental to local adaptation, as it is they who will comprise the “adaptation community” that is required to sustain the process. Best practice on the Clifton to Tangoio Coastal Hazards Strategy 2120 (New Zealand) illustrates in details all the steps required for the development of the decision-making process for coastal adaptation (including also methodological tools and techniques outlined in Box 4).

Finally, in order to ensure that local adaptation process is effective and sustainable over time, it is important to set **an appropriate and institutionalized monitoring and evaluation system** (as outlined in the best practice on Germany Adaptation Strategy), as it is key to track progress and identify gaps, especially in terms of what has been done, what has changed since the starting point, what is on track and what needs to be improved. Thus, **a set of indicators able to monitor the broadest range of aspects related to coastal adaptation**, including the progress and efficacy of the selected adaptation options, needs to be defined, in addition to **a well-established monitoring and evaluation timeframe**.

Methodological foreword

The aim of this report is to bring to each Partner's attention a series of meaningful documents that may be helpful in the development of ADRIACLIM tasks.

The guiding principle for the creation of the present report has been to select relevant plans and best practices dealing with climate change adaptation measures, specifically regarding the coastal areas, on the basis of the innovative and/or effective tools, methods, structure and actions they present alongside their grade of alignment with ADRIACLIM topics and scopes. After consulting this document, each Project Partner should be able to select the best practices that suit best their needs and purposes, and keep the relevant ones as reference points to be tailored to local specific conditions.

The selection of the plans and best practices is the results of two different streams of activities: a desk review and a direct survey among ADRIACLIM project partners.

The desk review was conducted by CMCC Foundation with two different scopes: an analysis of the existing plans and experiences in Italy and Croatia and a review of best practices outside the programme cooperation area.

In order to integrate the information about plans within the cooperation area, CMCC Foundation conducted a survey among ADRIACLIM's partners responsible for each pilot area. A questionnaire was designed and circulated in November 2020 and a series of virtual meetings was organized to support partners in answering it. The questionnaire was articulated in 5 main sections:

- A first section to identify the main climate hazards and impacts in the project area, in order to guide partners in shedding a light on the main potential topics relevant for the sectoral planning in their pilot area
- A second section focusing on climate adaptation planning
- A third section to detect the main sectoral plans that either integrate climate adaptation or that might be potentially relevant for climate adaptation
- A fourth section on monitoring systems
- A fifth section on climate adaptation awareness in each pilot area

Eventually, the answers collected between December 2020 and February 2021 were rich of references to adaptation and sectoral plans in different pilot areas, with different level of details. All these data were included in this report, following a qualitative analysis of the plans' content. Some of the questions were conceived to collect quantitative information about the status of adaptation planning, monitoring and awareness-raising. Nevertheless, due to a relative degree of discretion in the questions, the data collected were eventually too few and too heterogeneous for a meaningful comparison. Therefore, this second analysis is not included in the present report.

The information from the survey flows into the results of the desk review about the plans in projects' cooperation area. In particular, considering the high number of sectoral plans identified by the project partners, we deem appropriate to have a specific paragraph of the report.

Therefore, the following pages try to present the results of both the desk review and the survey by organize them into three main sections:

1. existing adaptation plans and strategies within the project's area
2. existing sectoral plans within the project's area that may be relevant for adaptation planning
3. best practices outside the project's area

In addition, the document includes two annexes about:

- The Integrated Coastal Zone Management Protocol
- The use of Sustainable Development Goals for adaptation

In each paragraph, readers can find summary tables that include a synthesis of the main takeout recommendations for each plan under analysis.

Acknowledged the high number of adaptation strategies, plans and projects currently available concerning coastal areas adaptation to climate change consultations, this work does not presume to be exhaustive.

1. Relevant existing adaptation plans within Project's Area

This section presents a review of the current Climate Change Adaptation Plans available for Italy and Croatia, with the aim of informing about the existing reference framework operative for Project Areas.

1.1. Existing adaptation plans at national level

1.1.1. The Italian national adaptation plan (MATTM 2018)

The Italian National Adaptation Plan (PNACC – *Piano Nazionale di Adattamento ai Cambiamenti Climatici*) aims to be the reference for climate adaptation planning at local level in Italy. The PNACC shares the objectives of the National Adaptation Strategy (SNAC – *Strategia Nazionale di Adattamento ai Cambiamenti climatici*) approved in 2015 and it represents their operative implementation. The PNACC proposes the same sectoral organization of SNAC but introduces key features concerning climate change-related impacts and risks and add the level of detail required to make the strategy operative.

The PNACC has not been formally approved by the Italian Government yet. Currently the plan is undergoing a procedure of Environmental Strategic Assessment (ESA).

The PNACC was conceived as a flexible tool for public administrators at local level, which was identified as the best scale for adaptation. It represents a framework to ensure a consistent and harmonic adaptive action across the whole country. Local policy-makers can use the PNACC to find:

- a detailed description of the future climate conditions;
- a rich set of adaptation measures and a methodology for their prioritization so that they are able to select the actions that best fits with the local resources and development patterns;
- a methodology and a set of selectable indicators to monitor the implementation of the adaptive actions

The flexible approach of the PNACC allows ADRIACLIM's project partners to use it as a reference for Coastal Areas Adaptation Plans in ADRIACLIM's pilot areas.

The PNACC is structured in three main parts that will be briefly described in the following paragraphs:

A. Context analysis, climate scenarios and vulnerability assessment

This section contains the analysis of current and future climate conditions and the evaluation of risks, impacts and vulnerabilities for each sector. Firstly, the Plan identifies six homogeneous climatic macro-regions and operates for each of them an analysis of future climate projections for marine areas (considering surface temperature, sea level and pH3). It then distinguishes

homogeneous climatic areas (both terrestrial and marine) which, alongside homogeneous climatic macro-regions, provides useful information for local planning and decision-making processes.

Concerning risk, impacts and vulnerabilities assessment, the Plan presents a synthetic risk index for the Italian territory obtained by integrating:

- The potential impacts index, which is composed by:
  - Hazard indicators in a context of climate change
  - Exposure indicators concerning natural capital, built capital (fixed capital and infrastructures), economic capital and human capital.
- The adaptive capacity index.

Therefore, areas exposed to the greatest risks are identified as those to focus on for further risks assessments.

Moreover, expected impacts and vulnerabilities have been analyzed for 18 socio-economic and environmental sectors. The sectors were identified in the SNAC and they have been used in PNACC's analysis in order to increase the coherence between the two documents. Local public administrators can thus find a description of the main impacts in each sector and have a complete representation of the impacts that may occur in the local area of his/her concern.

B. Adaptation actions

This section is dedicated to the analysis of adaptation actions, implementation roles, required resources and funding sources. Relevant possible actions have been identified for each sector and then associated to each sector's impacts and objectives. All actions are collected in a database which is openly available[1].

In order to identify preferable ones, the action in the database have been ranked according to a set of five criteria:

1. effectiveness,
2. economic efficiency,
3. second order effects,
4. performance under uncertainty,
5. political implementation considerations.

Local decision-makers when selecting priority measures at local level can also use these criteria.

Moreover, actions have then been grouped based on pre-defined typologies and categories. For instance, each action is tagged as *soft* (non-infrastructural action, such as the update of an administrative procedure), *green* (ecosystem-based infrastructural action, such as the creation of

[1] https://www.minambiente.it/pagina/piano-nazionale-di-adattamento-ai-cambiamenti-climatici

buffer areas to cope with coastal floods and storms) or *grey* (traditional infrastructural action, such as the construction of a dyke to protect from coastal storms). This structure helps identifying set or sub-set of measures according to the specific query of the local public administrators. All actions listed in the database have a detailed profile that summarize the main information for their implementation.

C. Involvement, monitoring and evaluation tools

This section pertains three activities: the development of a participatory approach to PNACC creation and implementation, the design of the criteria for the definition of indicators to monitor actions effectiveness and finally the elaboration of guidelines of the monitoring and evaluation system for adaptation actions impacts.

Citizens' participation is considered key to successful plan implementation and for the PNACC a participatory procedure has been carried out to gather information about the perceived most urgent actions. Moreover, the Plan introduces the possibility to establish permanent participation institutions such as a national observatory and forum with specific objectives, structure and communication and awareness tools and actions.

A section is dedicated to the definition of a monitoring and evaluation system. Local public administrators can find useful indications and guidance to establish a proper monitoring system to evaluate the progress and the efficacy of the selected actions. The PNACC also provide a detailed list of possible indicators to populate the system. These indicators have been harmonized and classified based on each main action typology.

Takeaway recommendations for ADRIACLIM project

- **Align your plan's objectives with PNACC general objectives**
  The PNACC aims to represent a reference for the alignment of local adaptation measures to a common national effort. In order to harmonize your action in the framework of the national adaptation policy, please check the coherence of your objectives with the ones stated in the PNACC.

- **Follow the PNACC structure**
  The document includes and orders relevant sections for what concerns adaptation to climate change, with high levels of accuracy and precision. A similar structure should be kept in mind and translated into reality when developing Coastal Areas Adaptation Plans in Pilot Areas.

- **Use PNACC's sectors**
  The 18 sectors used within the plan are consistent with the categories of SNAC and they are used to group the adaptation measures in PNACC's database. In order to align the local action and increase the consistency of action across all governance levels, the use of the same sectoral categories is crucial.

- **Use PNACC's climate analysis as reference for your plan (for Italian Partners only)**
  The PNACC presents a detailed analysis of the current state of Italian climate change trends as well as adaptation dynamics, which can be mainly of interest of Italian Project Partners. Through a detailed analysis of the main challenges, impacts, risks and vulnerabilities, it operates as a baseline upon which Project Partners can work and focus on when dealing with their Pilot Areas assessment.

- **Refer to PNACC's database of actions and list of indicators**
  The PNACC is also helpful because it has already operated a selection of preferable adaptation measures and the indicators to monitor their implementation, which can be considered by Project Partners, and, by linking each measure with the required funding sources and responsible bodies for the implementation, it depicts a detailed framework useful to inform Partners decisions on the matter.

1.1.2. Draft Action Plan for implementing the Strategy on Adaptation to Climate Change in the Republic of Croatia for the period from 2019 to 2023, Croatia (EPTISA Adria 2017)

The Draft Action Plan is the result of the work to make operational the Croatian Strategy on Adaptation to Climate Change. Acknowledged it is limited to a "draft" status, it is nonetheless valuable given its purpose with regard to the Strategy.

The document lists a series of adaptation measures grouped according to sectors and topics. For each activity, a detailed description adds information concerning:

1) priority designation within the Adaptation Strategy and Activity category;
2) activity explanation and Implementation method;
3) implementation period;
4) The responsible authority and associates in implementing the measure/ activity;
5) Estimated total cost (million Kuna) and Possible sources of funding;
6) Estimated cost by years of implementation (million Kuna) (over the five-year period between 2019 and 2023);
7) Implementation indicators that can be used to assess the success of the implementation of the activity.

The Draft Action Plan proceeds then with a specific section dedicated to funding analysis and another one deepening risks and obstacles assessment with regard to activities implementation.

It is important to highlight that many measures reported outside coastal areas sector are nonetheless effective adaptation measures for coastal areas. When this occurs, it can be a valuable indicator for internal consistency between intersectoral policies and objectives.

For instance: Biodiversity sector. Objective B-04 concerns "Integrated management of freshwater resources for the conservation and revitalization of natural ecosystems and biodiversity". Within its sub-measures it is declined also in terms of coastal areas involvement:

B-04-01. Ensure combined flood protection and protection from loss of biodiversity by restoring natural floodplains.

B-04-03. Prevention of salinization of coastal sources and wetland habitats by building dams, embankments and by other measures.

The mentioned objectives and related measures are only an example that can be found in several other sectors of the National Plan, which should be checked out in its entirety. So that all the relevant measures will be considered when planning the work to be done concerning adaptation to climate change in coastal areas.

Takeaway recommendations for ADRIACLIM project

- **Refer to the Action Plan's list of actions**
  The Action Plan meaningfulness towards ADRIACLIM project mainly refers to the work carried out for the identification and labeling of a set of measures and specific actions to be implemented to tackle each specific challenge. The document may represent the base upon which the ADRIACLIM's project partners can work on without being forced to start from the very bottom: by referring to Croatian challenges and subsequent specific actions they know what to focus on and the main issues to be addressed throughout ADRIACLIM project.

1.1.3. Climate change adaptation strategy of Croatia for 2040 and until 2070 (Narodne novine n. 46/2020).

The Republic of Croatia, recently approved a national adaptation strategy in April 2020 (*Strategija prilagodbe klimatskim promjenama u Republici Hrvatskoj za razdoblje do 2040. godine s pogledom na 2070. godinu*). The document reports the main information about climate projections over the country and it highlights the main climate-related impacts.

The Strategy categorizes the impacts according to eight different sectors

- Water resources
- Agriculture
- Forestry
- Aquaculture
- Biodiversity
- Energy
- Tourism
- Health

Moreover, the Strategy identifies two additional inter-sectoral dimensions:

- Urban and territorial planning
- Disaster risk management

For each of the above ten areas, experts and stakeholders in a participatory process identified specific adaptation measures and the national authority responsible for the implementation.

The total number of measures is 83 and they were prioritized according to five criteria. For each criterion the document presents the most urgent, the relatively urgent and the less urgent.

Takeaway recommendations for ADRIACLIM project

- **Use the sectoral categories**
  The Action Plan meaningfulness towards ADRIACLIM project mainly refers to the work carried out for the identification and labeling of a set of measures and specific actions to be implemented to tackle each specific challenge. The document may represent the base upon which the ADRIACLIM's project partners can work on without being forced to start from the very bottom: by referring to Croatian challenges and subsequent specific actions they know what to focus on and the main issues to be addressed throughout ADRIACLIM project.

- **Refer to the set of adaptation measures**
  The measures proposed in the Strategy have to be implemented by national authorities. Nevertheless, it is crucial that the local action takes into account what ministries and national agencies are carrying out, in order to avoid duplication, align efforts and reduce transition costs.

BOX 1: Italian Guidelines for the coastal defence from erosion and climate change effects (MATTM-Regioni 2018)

The Guidelines for coastal defense from erosion and climate change impacts (*Linee guida nazionali per la difesa della costa dai fenomeni di erosione e dagli effetti dei cambiamenti climatici*) have been updated in 2018 and are born to investigate both natural and anthropic causes for coastal erosion. This document also suggests a technical approach to assist experts and concerned entities and inform the decision-making process, aiming to control or protect the coastline in an efficient and effective way. Climate change and sea level rise impacts, as well as costs-benefits analysis, are integral part of the process.

Guidelines focus extensively on four main issues:

1) Assessment of current state of coasts, coastal dynamics and needs: a detailed overview of existing knowledge, methods, criticalities evaluation standards (e.g., erosion patterns, coastal loss) and management requirements (e.g., scenarios, risks) is presented to assess the practical needs in terms of actions and resources required. In-depth analysis, data and results are reported in Annex 1 at the bottom of the Guidelines document.

2) Defense Works and Measures: overview of the range of coastal defense work and intervention typologies, practical methods and evaluation systems to assess effectiveness and costs/benefits rate for the different intervention typologies. In-depth analysis and results related to that issue are presented in Annex 2 at the bottom of the Document.

3) Sediment Resources: overview of the knowledge base, management framework, practical methods and evaluation standards for sediments availability and sediments utilization to halt coastal erosion. In-depth analysis and results are reported in Annex 3 at the bottom of the Document.

4) Legal framework: overview of international, national and regional regulation on coastal defense and management, and identification of possible integration to current legal framework in order to improve efficiency in coastal dynamics management.

The core of the work is to be found in Chapter 4, the one dedicated to the true guidelines. Each sub-chapter covers a specific guideline, in particular:

a) recommendations to facilitate the evaluation of erosion processes (including identification and monitoring of coastal erosion drivers, monitoring coastal erosion, evaluating coastal erosion, monitoring protected marine areas, classification of events and impacts, sediments statement and technological data management);

b) recommendations to manage coastal dynamics effects (including guidelines on the adoption of a coastal management strategy, on good management practices, on sediments compatibility evaluation and on how to identify an “optimal coastline” and a “functional beach”);

c) recommendations on economic and environmental evaluations and comparison for coastal defense works (including evaluation and comparison methods among different intervention typologies and for coastal impacts, evaluation of main environmental aspects related to the implementation of defense structures);

d) recommendations on methods for data gathering to manage sediments deposits.

Acknowledged the support potentially provided by the Guidelines, they have been included in the relevant existing best practices in terms of strategies and plans already existing in ADRIACLIM area. Even though they are not structured as a Plan, they nonetheless present a high level of technical and operational details on the matter and suggest how to elaborate coastal areas strategies by covering all the required steps. As a tool for Project Partners, the Guidelines can provide a useful support in the elaboration of Climate Change Adaptation Plans for Coastal Areas.

1.2. Existing adaptation plans at regional level

1.2.1. Regional Strategy for Mitigation and Adaptation to Climate Change in Emilia-Romagna, Italy (Regione Emilia-Romagna 2018)

This document is the Regional Strategy concerning mitigation and adaptation to climate change of one of the Project Partners' areas, Emilia Romagna region. Even though it presented as Strategy and not as Plan, its level of detail and specificity is noticeable, thus making the document a valuable reference for ADRIACLIM partners, particularly for Emilia Romagna Project partners.

The cited document can be a useful guiding tool for ADRIACLIM partners efforts, mainly due to its structure, the methodology and the tools (qualitative and quantitative) for data collection and results, used to inform the strategy itself.

More in detail, the first step of the work methodology has been the review and mapping of regional plans and programs to identify all actions connected with adaptation and mitigation interventions. Then, a classification work was conducted to distinguish between adaptation and mitigation measures; and between regulatory/management measures and structural/technological ones. 15 sectors have been identified and divided between physic-biologic and socio-economic.

The next step was the assessment of current climate change risks in Emilia Romagna and the creation of a risk matrix by crossing each sector with each territorial typology to find each specific risk index[2]. Follows a chart highlighting which climate change-related risks are (or are not) intercepted by current Plans and Programs, through the Risks-Sectors correlation Matrix[3].

A third Matrix correlates climate risks and adaptation (and mitigation) actions, and shows win-win actions that benefit both emissions reduction and climate change resilience improvement (the Matrix is divided in several charts covering each sub-sector, and one is related to Coastal Areas).

Furthermore, it is worth to highlight the assessment of existing adaptation actions and measures and the identification of preferred adaptation actions and measures for future implementation. More specifically, Chapter 4 is dedicated to mitigation and adaptation actions and measures already being implemented for each of the sectors identified as subject to climate change effects; Chapter 5 deals with the proposal of mitigation and adaptation actions and measures for future plans and action programs. Proposed measures have been distinguished between mitigation and adaptation and then grouped in sector tables. Actions have been derived also from the SNAC and the PNACC and selected and tailored on the basis of regional context, vulnerability and impacts. Keeping in mind the cross-cutting effects of climate change and climate adaptation measures, Coastal Areas

[2] See for instance "Allegato 1: Matrice rischi-settori".
[3] See "Allegato 2: Matrice rischi-azioni in corso".

are identified as a sector, but they are related to the majority of the other sectors, as can be seen in the Matrices.

Takeaway recommendations for ADRIACLIM project

- **Map existing regional/local strategies and plans which include adaptation to climate change**
  The aim is to coordinate efforts, avoid duplication and therefore ensure an integrated and cost-effective local adaptation planning.

- **Adopt a win-win approach in identifying adaptation solutions**
  The win-win approach aims to define synergies and co-benefits between different adaptation options, thus contributing to overcome possible implementation barriers and to identify greater opportunities for climate resilience at local level.

1.2.2. Study on climate change and its impacts in Friuli-Venezia Giulia – Support to the development of a regional adaptation strategy and its actions, Italy (Arpa FVG 2018)[4]

This work studies climate change in Friuli Venezia Giulia Region and sets the foundations for understanding its impacts on the regional territory.

The scope of the Study is to support the Region in developing a Regional Strategy for Climate Change Adaptation and Mitigation, which is currently not existent. It therefore supplies for a systematic and organized set of information concerning climate change assessment in Friuli Venezia Giulia, which represents a valuable knowledge base for further developments in terms of climate change adaptation policies in the Region, with special regard – with respect to ADRIACLIM Project – for coastal areas.

The climate change analysis carried out as a first step of the Study presented both current climate change processes and future climate change scenarios, with the latter being the real innovative element of the document given that no previous researches were done on the matter at local level. To obtain regional climate projections, simulations with European climate models have been conducted (in collaboration with ICTP) by tailoring such models on territorial features.

4

Given that information on future climate projections is key to inform long term adaptation policies, the work carried out qualifies for its relevance in terms of unlocking further steps.

The Study is composed of three sections:

1) Climate trends and projections. The first section covers past, current and future climate variability, variations in sea level and cryosphere included;

2) Assessment of climate change impacts as described by the SNACC and PNACC, with the aim to start evaluating the different impacts' relevance for Friuli Venezia Giulia;

3) In-depth analysis concerning selected sectoral impacts (water resources, biodiversity/ecosystems, primary production) through some case studies.

Specific sections cover Coastal Areas and Marine Ecosystems topics, deepening the analysis of the impact of climate change on these sectors and their ecosystem services. Those sections are particularly relevant for Project Partners to be consulted in order to work towards a climate change adaptation plan for coastal areas, especially Friuli Venezia Giulia Partners who may base their research on the findings of this Study.

Takeaway recommendations for ADRIACLIM project

- **Carry out an in-depth analysis for coastal areas and marine ecosystems**
  Specific sections on coastal areas and marine ecosystems should be included in local adaptation strategies and plans. Therefore, an in-depth analysis on current and future climate change effects (e.g., changes in ocean temperature, salinity, ocean acidification and macronutrients) as well as on impacts on these sectors (e.g. changes in marine species, fisheries and other marine ecosystem services) needs to be carried out in order to inform decision-making processes.

BOX 2. Master Adapt project's "Guidelines for Climate Change Adaptation Regional Strategies" (Cocco et al. 2019)

Developed in 2019 in the framework of LIFE Master Adapt, the document "Guidelines for Climate Change Adaptation Regional Strategies" may be a useful reference tool for Project Partners in order to build their territorial (in the specific case, coastal) climate change adaptation Strategy and Action Plan.

The aim of the work is to offer guidance to regional authorities in order to direct the integration of climate change adaptation into ordinary planning through specific sectoral and territorial adaptation strategies.

The document is structured in two sections:

1) Guidelines for the development and implementation of a regional climate adaptation strategy.

It is underlined the importance of regional-level planning in defining adaptation policies and promoting their mainstreaming process to make general climate objectives practically operative within the territory. In addition, the Strategic Environmental Evaluation is mentioned as a tool to ensure integration between adaptation policies and sectoral territorial plans and programs.

2) Most effective methods and tools for the strategy development and implementation.

This section illustrates more in detail the proposed methods and instruments to mainstream adaptation to climate change. It also focuses on the structure that should inform the design of a regional adaptation strategy, and defines its main prerequisites as well as the necessity to consider future climate change scenarios into long-term policies and investments.

The main steps for the strategy development identified in the Guidelines are:

- regional and local climate assessment;
- vulnerabilities and adaptation capacity assessment;
- risks evaluation;
- territorial overview and adaptation objectives elaboration;
- definition of the governance structure;
- identification of specific policy instruments;
- preparation of modification paths for administrative procedures evolution;
- setting of monitoring,
- reporting and evaluation systems.

Operative guidelines on how to integrate Strategic Environmental Evaluation procedure are also explained, alongside a proposal for multilevel governance with differentiated roles and functions. Every step is clear and detailed as it is thought to serve as guiding tool for responsible entities in their specific strategy development process.

1.3. Existing adaptation plan at local level

At present, few adaptation plans are entered into force at local level within the pilot areas. ADRIACLIM partners reported very few examples through the questionnaire.

In Italy, the Municipality of Venice is particularly sensitive to the issue of climate change. A climate action plan is currently under development in the framework of Venice participation to the C40 network. In 2014, the Municipality also developed a document – "Venezia Clima Futuro" – to prepare and guide the development of a local adaptation plan.

In Croatia, no partners reported local adaptation plans, but in some cases integrated plans are in force. It is the case of the "Program for air protection, ozone layer, climate changes mitigation and adaptation". This kind of document focuses mainly on air pollution and CO_2 emissions' mitigation, but it also includes some adaptation measures. For instance, the "Program for air protection, ozone layer, climate change mitigation and adaptation of the City of Split" integrates specific adaptation measures.

In addition, a widespread tool for climate adaptation at local level is the Sustainable Energy and Climate Action Plan (SECAP). It is the main instrument of the Covenant of Mayors initiative: a voluntary commitment to ambitious climate targets (even more ambitious than the national ones). The format of the SECAP includes a section to climate adaptation and municipalities are called to identify specific adaptive actions and to monitor their implementation using a common monitoring system. Italian municipalities responded enthusiastically to Covenant of Mayor's call: 3316 Italian municipalities (representing the 41% of all Italian Municipalities) joined the initiative. The Italian mayors account for the 48% of the total signatories. Croatian municipalities are less active with 62 signatories.

Not all mayors commit to climate adaptation: the majority developed a Sustainable Energy Action Plan (SEAP) focusing only on mitigation. In Italy 18% of signatories chose to commit also for adaptation and to develop a SECAP instead of a SEAP. Nevertheless, despite the database of the Covenant of Mayors reports this commitment for 612 Italian municipalities, the SECAP is often not available. In Croatia 20 municipalities selected the adaptation target, but also in this case SECAP is not always available.

The table below lists the signatories of the Covenant of Mayors included in ADRIACLIM's pilot areas that commit to adaptation targets. For each of them, it is indicated, whether a SECAP is available or not.

Table 1: Municipalities that commit to Covenant of Mayors' adaptation target within ADRIACLIM pilot areas. Source: Covenant of Mayor's website: https://www.covenantofmayors.eu/plans-and-actions/action-plans.html

Country	Pilot area	Covenant of Mayor Signatory (Adaptation target)	SECAP available
Italy	Veneto - Venice Metropolitan City	Caorle	No, only SEAP
		Concordia Sagittaria	No, only SEAP
		Martellago	No, only SEAP
		Noale	No, but the SEAP describes two flood-related adaptation measures (not monitored by the plan).
		Noventa di Piave	No, only SEAP
		Portogruaro	No, only SEAP
		San Donà di Piave	Yes
		San Stino di Livenza	No, only SEAP
		Santa Maria di Sala	No, but the SEAP includes some general considerations about climate adaptation
		Venezia	No, but the SEAP includes the theme of adaptation and it foresees further advancements in a new plan
		Municipalities of eastern Venice metropolitan area (Annone Veneto, Caorle, Cavallino-Treporti, Ceggia, Cinto Caomaggiore, Concordia Sagittaria, Eraclea, Fossalta di Piave, Fossalta di Portogruaro, Gruaro, Jesolo, Meolo, Musile di Piave, Noventa di Piave, Portogruaro, Pramaggiore, Quarto d'Altino, San Donà di Piave, San Stino di Livenza, San Michele al Tagliamento, Teglio Veneto, Torre di Mosto)	Yes, joint SECAP
	Friuli-Venezia Giulia – Coastal Municipalities	Duino-Aurisina	No, only SEAP
		Latisana	Yes
		Trieste	No, only SEAP
	Emilia-Romagna - Coastal Municipalities	Bellaria Igea Marina	No, only SEAP
		Cattolica	Yes
		Cervia	Yes
		Comacchio	No, only SEAP
		Misano Adriatico	No, only SEAP
		Rimini	No, only SEAP
		Ravenna	No, only SEAP
	Marche - Coastal Municipalities	Ancona	No, only SEAP
		Fermo	Yes, developed within LIFE SEC ADAPT project
		Pesaro	Yes, developed within LIFE SEC ADAPT project
		San Benedetto del Tronto	No, only SEAP
		Senigallia	Yes, developed within LIFE SEC ADAPT project
	Puglia - Coastal Municipalities	Alessano	No, only SEAP
		Andrano	No, only SEAP

		Corsano	No, only SEAP
		Gagliano del Capo	No, only SEAP
		Morciano di Leuca	No, only SEAP
		Patù	No, only SEAP
		Salve	No, only SEAP
		Tiggiano	No, only SEAP
Croatia	Zadar County	Zadar	No, only SEAP

The available SECAPs are important documents for adaptation within each pilot area. In fact, they provide a vulnerability assessment, based on a climate analysis. Moreover, they all include a list of adaptation actions and they also have a standardized monitoring system to check the implementation of the measures. The monitoring system in particular can be regarded as a good example to follow: it represents a well-established standard and it allow to align the monitoring of implementation across the different pilot areas, making geographical and temporal data comparison possible.

Takeaway recommendations for ADRIACLIM project

- **Take into account the actions listed in the local adaptation plans**
  The local plans and the SECAPs have already a list of adaptation measures that should be taken into account in order to avoid contradiction or overlapping.

- **Align the monitoring system for the implementation of adaptation actions to the framework of the SECAP**
  The SECAP includes a section for the constant monitoring of the adaptation measures. It is a well-established format that may represent a starting point for ADRIACLIM's adaptation plans and also a core element to make data comparable even outside ADRIACLIM's pilot areas.

2. Relevant sectoral plans within Project‘s Area that integrates the theme of adaptation

Adaptation is necessarily a cross-cutting issue. If climate change mitigation can be initially tackled through specific economic sectors like energy and transportations, adaptation requires that human institutions systematically change the established way of functioning in order to fit with new climate conditions. It not only about disaster risk reduction, but rather on the capacity of thrive under future conditions.

Despite this need for a systemic approach, both private and public organizations tend to have an *additional approach* when dealing with adaptation for the first time. It is often considered an additional item in the jurisdiction and it is addressed with specific pieces of legislation. This additional approach is often challenged by the facts. For instance the identification of the responsible authority may be problematic.

Some of ADRIACLIM pilot areas have already developed adaptation legislation and in some of the cases reported through the questionnaire they identify among the main limitations the lack of coordination within the governance structure. This is not due to the lack of administrative capacity, but rather on the peculiar nature of climate adaptation.

An *integrated approach* can help avoiding the impasse. If adaptation is incorporated in the existing legislation and in the administrative practices or if it is integrated by-design in the new legislation, then the obstacles in the adaptive transition can be minimized.

In order to mainstream adaptation across legislation it is necessary to review the existing plans that might be relevant for adaptation. In some cases they have already a reference to climate change adaptation, in some other cases they have specific measures to adapt to specific climate conditions. For this reason, a review of the existing sectoral plans has been carried out for ADRIACLIM pilot areas.

A questionnaire has been circulated among the partners responsible for each pilot area. Each partner indicated the main sectoral plans that are enforced in specific topics relevant for climate adaptation. The tables below summarize the main findings.

2.1. Croatia

Governance Level	English translation	Year	Pilot area concerned	Sector	Adaptation integration
National	Water management plan for Republic of Croatia 2016-2021	2016	All Croatian pilots	Water	Integration of climate scenarios
National	National programme for the conservation and management of marine environmental and coastal zone	2017	All Croatian pilots	Sea & Coast	Integration of adaptation measures
National	Law on fire protection programme	2010	All Croatian pilots	Fire protection	No direct reference
National	National Energy and Climate Plan (NECP)	2019	All Croatian pilots	Energy	No direct reference
County	Regional program for environmental protection for Dubrovnik Neretva County from 2018-2021	2018	Dubrovnik Neretva	Ecosystem conservation	No direct reference
County	Program for air protection, ozone layer, climate change mitigation and adaptation to climate change for the area of Dubrovnik-Neretva County	2017	Dubrovnik Neretva	Air pollution and climate	Integration of adaptation measures
County	Regional action plan of energy efficiency	2020	Dubrovnik Neretva	Energy	No direct reference
County	Regional irrigation plan for Dubrovnik Neretva County	2006	Dubrovnik Neretva	Agriculture	Reference to climate considerations
County	Spatial plan of Dubrovnik Neretva County	2015	Dubrovnik Neretva	Urban/Territorial planning	Integration of adaptation measures
County	Fire Protection Plan Dubrovnik Neretva County	2016	Dubrovnik Neretva	Fire protection	No direct reference
County	Development strategy of Zara County 2016-2020	2016	Zadar	Local development	No direct reference
County	Program for air protection, ozone layer, climate change mitigation and adaptation to climate change for the area of Zara	2017	Zadar	Air pollution and climate	Integration of adaptation measures
County	Environmental Protection Programme Split-Dalmatia		Split-Dalmatia	Ecosystem conservation	Integration of adaptation measures

County	Spatial plan of Split-Dalmatia county	2002	Split-Dalmatia	Urban/Territorial planning	No direct reference
County	Regional irrigation plan for Split-Dalmatia County	2006	Split-Dalmatia	Agriculture	Reference to climate considerations
County	Regional program for beach nourishment - Split-Dalmatia County	2015	Split-Dalmatia	Sea & Coast	Reference to climate considerations
Local	Environmental analysis of municipal water infrastructure - Slano	2017	Dubrovnik Neretva	Water	Integration of climate scenarios
Local	Local spatial plan for Slano	2018	Dubrovnik Neretva	Urban/Territorial planning	No direct reference
Local	Major accident risk assessment for Dubrovnik Littoral	2018	Dubrovnik Neretva	Risk management	Sectoral plan
Local	Air, ozone layer protection, climate changes mitigation and adjustments program for Split Area 2018.-2021	2108	Split-Dalmatia	Air pollution and climate	Integration of adaptation measures
Local	Air, ozone layer protection, climate changes mitigation and adjustments program for Kastela 2018.-2022	2017	Split-Dalmatia	Air pollution and climate	No direct reference
Local	Spatial plan of the city of Split	2020	Split-Dalmatia	Urban/Territorial planning	No direct reference
Local	Spatial plan of the city of Kastela	2019	Split-Dalmatia	Urban/Territorial planning	Reference to climate consideration
Local	Coastal Zone Management Plan of the City of Kaštela	2014	Split-Dalmatia	Sea & Coast	Integration of adaptation measures

Croatian partners indicated four national sectoral plans that may be relevant for adaptation. Two of them have a clear reference to adaptation: the plan on water management and the marine ecosystem/coastal zone management plan. The latter in particular includes specific measures for an adaptive management of coastal zones that shall be taken into consideration by all ADRIACLIM Croatian partners, especially considering the thematic focus on coastal areas. The other two – Fire protection plan and energy plan – do not make explicit reference to adaptation, but they are still relevant, since, among their measures, they include actions that are typically considered adaptive. For instance, in the context of increasing average temperatures the risk of forest fire may increase as well. Therefore, if this kind of impact is considered within the pilot areas, partners may want to take into account the existing enforced fire protection measures either to strengthen them or to avoid that they overlap with ADRIACLIM's plans.

At county level, partners indicated six sectoral plans for Dubrovnik Neretva County, two for Zadar County and five for Split-Dalmatia County. Among these 13 documents, four include explicit adaptation measures: the two programs for air protection, ozone layer, climate change mitigation and adaptation to climate change for Zara and Dubrovnik Neretva Counties, the Environmental Protection Programme for Split-Dalmatia County and the Spatial plan of Dubrovnik Neretva County. The other plans – spanning from agriculture to fire protection – either take into account basic climate considerations or they do not have a specific reference to adaptation, but they include measures to cope with the hazards and the impacts that are normally associated with climate change. Therefore, ADRIACLIM partners should consider also these kinds of plans when developing the adaptation plan in their own pilot area.

Finally, 8 plans were indicated in the questionnaire for the local level, mainly urban plans and air pollution control plans. Only two of them have explicit adaptation measures and they may be taken into consideration as example of documents mainstreaming the theme of adaptation, also for those territories that do not have explicit reference to climate change issues.

2.2. Italy

The table below summarizes the landscape of existing sectoral plans that may be relevant for adaptation in the Italian pilot areas.

Governance Level	English translation	Year	Pilot area concerned	Sector	Adaptation integration
Regional	Regional Strategy for Sustainable Development	2020	Veneto	Local development	Reference to climate considerations
Regional	Regional Agriculture towards 2030	2018	Veneto	Agriculture	Integration of adaptation measures
Regional	Regional Territorial Coordination Plan - Veneto	2009	Veneto	Urban/Territorial planning	No direct reference
Regional	Water protection plan – Veneto	2009	Veneto	Water	No direct reference
Regional	Rural Development Programme 2014-2020 Veneto	2015	Veneto	Agriculture	Integration of adaptation measures
Regional	Rural Development Programme 2014-2020 Apulia	2015	Puglia	Agriculture	Integration of adaptation measures
Regional	Political agreement 25.11.2010 on interventions for the mitigation of hydrogeological risk	2010	Puglia	Flood	No direct reference
Regional	Regional Coastal Plan - Puglia	2012	Puglia	Sea & Coast	No direct reference
Regional	Strategic Plan for Tourism 2016-2025	2016	Puglia	Tourism	Reference to climate considerations
Regional	Regional plan for forest fire forecast, prevention and mitigation 2017-2019	2017	Marche	Fire protection	No direct reference
Regional	Rural Development Programme 2014-2020 Marche	2014	Marche	Agriculture	Integration of adaptation measures
Regional	Rural Development Programme 2014-2020 Molise	2016	Molise	Agriculture	Integration of adaptation measures
Regional	Regional Forestry Plan - Molise	2017	Molise	Forestry	Reference to climate considerations
Regional	Regional Energy Plan - Molise	2017	Molise	Energy	No direct reference

Regional	Water protection plan - Molise	2016	Molise	Water	Integration of adaptation measures
Hybrid	Flood risk management plan of the River basin district "Eastern Alps"	2015	Veneto and FVG	Flood	Integration of adaptation measures
Hybrid	Water management plan of the River basin district “Easter Alps”	2015	Veneto and FVG	Water	Integration of adaptation measures
Hybrid	Management plan of the River basin district "Po River"	2015	Veneto and E-R	Water & Flood	Integration of adaptation measures
Hybrid	Water management plan of the River basin district Appennino Meridionale	2021	Puglia and Molise	Water	Integration of adaptation measures
Hybrid	Flood risk management plan - River basin district Appennino Meridionale	2016	Puglia and Molise	Flood	No direct reference
Hybrid	"Excerpt" plan: hydrogeological structure plan Apulia - River basin district Appennino Meridionale	2017	Puglia	Water & Flood	No direct reference
Hybrid	"Excerpt" plan: hydrogeological structure plan Molise - River basin district Appennino Meridionale	2019	Molise	Water & Flood	No direct reference
Hybrid	Port Regulatory Plan - Venice		Veneto	Urban/Territorial planning	No direct reference
Hybrid	Flood risk management plan - River basin district Appennino Centrale	2015	Marche	Flood	No direct reference
Local	Forestry reorganization plans	Several	Veneto	Forestry	Reference to climate considerations
Local	Urban Plan - Structural Territorial Plan City of Venice	2014	Veneto	Urban/Territorial planning	No direct reference
Local	Urban Plan - Plan of interventions	2018	Veneto	Urban/Territorial planning	No direct reference
Local	Urban Plan - Particular Plan for Lido Island	2018	Veneto	Urban/Territorial planning	No direct reference
Local	Water management plan City of Venice	2020	Veneto	Water	No direct reference

Local	Building Code - City of Venice	2020	Veneto	Urban/Territorial planning	No direct reference
Local	Civic Protection Plan - City of Venice	2002	Veneto	Risk management	No direct reference
Local	Municipal coastal plans - Puglia	Several	Puglia	Sea & Coast	No direct reference
Local	Natura 2000 network management plans	Several	Puglia	Ecosystem conservation	Reference to climate considerations
Local	Natura 2000 network management plans	Several	Molise	Ecosystem conservation	Reference to climate considerations
Local	Coastal plans of Montenero di Bisaccia, Termoli and Campomarino municipalities	2014	Molise	Sea & Coast	Reference to climate considerations
Local	Coastal plan of Petacciato municipality	2016	Molise	Sea & Coast	No direct reference

The table indicates that many regional plans are potentially relevant for climate change adaptation, in some of the pilot areas. Among 12 regional plans reported, five documents integrate adaptation measures, two include references to climate considerations and five do not have a direct reference but they are potentially relevant for the topic. If we extend the scope to the plans produced by the hybrid authorities (between the National and the Regional levels) three out of seven documents include climate adaptation actions.
This situation may be generalized to all Italian Regions, even if they are not reported through the questionnaire, since all Regions respond to the same institutional structure. In fact, according to the Italian Constitution, Regions share with the central State several competences in the management of environment and natural resources as well as in agriculture and forestry. Moreover, an important source of financial resources for the Regions is coming from the European institutions (for instance the European Structural Investment Funds that co-fund the Regional Operative Programmes). Therefore, the regional initiatives respond also to the European legislation and requirements (for instance EU Regulations) and they share EU law's objectives and priorities, including climate change adaptation. For these reasons, climate change adaptation may potentially cross many Regional sectoral plans and administrative instruments and it is often directly integrated, either as a reference or through specific adaptation measures.
In particular the plans that directly derive from EU legislations usually take into account adaptation actions or scenarios. It is the case of:

- Rural Development Plans (EU Regulations 1303/2013 and 1305/2013)
- Water Protection Plans (Water Framework Directive 2000/60/EC)
- Flood Risk Management Plans (Floods Directive 2007/60/CE) which in Italy are not managed directly by the Regions, but rather by the River Basin District Authorities: a constitutionally hybrid body between the Regional and the State levels.

In addition, other kinds of plans may integrate adaptation at regional level. For instance, the Regional Territorial Coordination Plan (*Piano territoriale di coordinamento regionale*) and/or the Regional landscape plan (*Piano paesistico* or *Piano paesaggistico*) should provide for a harmonic coordination of the local urban plans within the regional domain and therefore they may be open to integrate climate scenarios and adaptation measures.
Finally, all Regions produce a series of strategic documents for the local economic development, that may take into account climate analysis as one of the elements for their strategical assessment. It is the case of the Regional Strategies for Sustainable Development, Veneto's document "Regional Agriculture Towards 2030" or Apulia's "Strategic Plan for Tourism 2016-2025". Even though those strategies do not enforce any specific measure, they may inform the administrative action and the local development patterns.

Concerning the local level, the majority of plans reported in the pilot areas do not include climate change adaptation. Only four out of twelve have some climate consideration, but no direct

measures. Nevertheless, they are obviously crucial for the implementation of specific adaptation actions. For instance, all urban planning instruments adopted by the Municipality of Venice – from the Structural Territorial Plan to the Building Code – may be informed by future climate analysis and may include adaptation measures.
In the specific case of Apulia, there are other sectoral plans that directly derive from a Regional framework: the "Municipal Coastal Plans" and the "Natura 2000 Site Management Plans" may also integrate the topic of adaptation and in some cases they do.

Takeaway recommendations for ADRIACLIM project

- **Use an integrated approach**
  Addressing adaptation through an isolated plan may drive to a impasse in implementation. A more effective and cost-efficient action is to integrate adaptation in the existing sectoral laws, administrative documents and plans.

- **Examine more in depth the sectoral legislation and plans enforced in your own pilot area**
  The current review of sectoral plan is a starting point to shed some light on the potentially relevant fields for adaptation, but it is not exhaustive and it does not cover all pilot areas uniformly. So, we recommend to extend the review of existing sectoral plans from your own pilot area in the following fields:

	Examples from Italy	Example from Croatia
• Urban/Territorial Planning	*- Piano Territoriale di Coordinamento Regionale* *- Piano Regolatore Generale*	*- Prostorni plan uređenja*
• Local development	*- Strategia Regionale per lo Sviluppo Sostenibile*	*- Županijska razvojna strategija*
• Agriculture	*- Programma di Sviluppo Rurale*	*- Plan Navodnjavanja*
• Fire protection	*- Piano regionale delle attività di previsione, prevenzione e lotta attiva contro gli incendi boschivi*	*- Plan Zaštite Od Požara*
• Water	*- Piano di tutela delle acque*	*- Plan Upravljanja Vodnim Područjima*
• Flood	*- Piano di gestione del rischio alluvioni* *- Piano di assetto idrogeologico*	
• Ecosystem conservation	*- Piano di gestione SIC e ZPS*	*- Program Zaštite Okoliša*
• Sea & Coast	*- Piano comunale delle coste* *- Piano di utilizzo del litorale*	*- Plan upravljanja obalnim područjem*
• Risk management/Civil protection	*- Piano di Protezione Civile*	*- Procjena Rizika Od Velikih Nesreća*

- **Take into account the existing legislation/plans that include adaptation measures**
  The plans that already include explicit adaptation actions should be regarded as reference for the adaptation plans of ADRICLIM's pilot areas. It will allow to avoid overlapping and dissipation of resources.

- **Take into account the boundaries set by the sectoral legislation/plans**
  Even if the sectoral legislation and plans do not include an explicit reference to adaptation measures, they are essential for the definition of effective actions in ADRIACLIM's pilot adaptation plans:
    - They set the ground and main boundary conditions for action, especially for hierarchically higher legislations
    - They can be potentially updated and emended by the measures of ADRIACLIM's pilot adaptation plans

- **The regional meso-level is an ideal starting point to enforce new legislation/plans (for Italian partner especially)**
  Regions share competences in several adaptation-relevant fields (e.g. environment, water, agriculture, etc.). They also have a role in setting up regulations, guidelines and evaluation criteria for action at local level (e.g. the Italian Territorial Coordination Plan but Italian Regions are also entitled for local Environmental Impact Assessment and Strategic Environmental Assessment). They represent an ideal pivot to enforce action.

3. Best practices outside the cooperation area

This section comprises several best practices on adaptation planning outside the cooperation area in order to provide project partners, local policy makers and stakeholders with illustrative examples of the all phases of the adaptation planning (based on EEA 2020), which can be useful and to some extent replicable for policy-making in the cooperation area.

3.1 Knowledge supporting adaptation planning

3.1.1 Climate risks and opportunities prioritization: The Urgency Scoring in the United Kingdom "Second Climate Change Risk Assessment" (UK Government, 2017).

The UK Climate Change Risk Assessment is part of the UK Adaptation Planning system, briefly described in Box 3.

BOX 3. The UK's Climate Change Adaptation Framework.

The UK is one of the first countries that adopted a long-term and legally binding framework to address climate change and its impacts. The Climate Change Act 2008 became law in 2008 and foresees as Government's responsibility the publication of a UK-wide Climate Change Risk Assessment (CCRA) and National Adaptation Programme (NAP) on a five-year-cycle. The Committee on Climate Change (CCC) was also established, with the purpose of providing independent advice to the UK Government on issues related to climate change mitigation. The Adaptation Sub-Committee (ASC), was also set up to provide support on issues related to climate change risks, opportunities and adaptation. CCC and the ASC report to the Parliament on the progress made in reducing greenhouse gas emissions and preparing for climate change biennially.

The second CCRA (CCRA2) was published and presented to the Parliament in January 2017. CCRA2 was informed by the ASC's independent 'Evidence Report', which sets out the latest evidence on the risks and opportunities to the UK from climate change and identified six priority areas. The approach for the second UK Climate Change Risk Assessment Evidence Report has been to consider current and future climate-relatedrisks and opportunities to the UK, and the extent to which current or planned policies and proposals will address them. Another important focus of the assessment is the degree to which there are physical, financialor social limits to feasible adaptation. The results of the analysis are summarized in terms of urgency.

In compiling the Evidence Report, the UK Government asked the ASC to answer the following question: "**Based on the latest understanding of current, and future, climate risks/opportunities, vulnerability and adaptation, what should the priorities be for the next UK National Adaptation Programme and adaptation programmes of the devolved administrations?"**. To answer, the ASC has worked with experts to assess nearly sixty individual risks and opportunities in three phases.

- **Phase 1**: Understand present-day vulnerability and assess current climate-related risks, opportunities and levels of adaptation. The purpose of the first step is to provide an overall summary of the impact, urgency, and uncertainty of the present vulnerabilities to the climate and non-climate stressors.
- **Phase 2**: Understand future vulnerability and adaptation, and assess how climate and socio-economic change may alter climate-related risks and opportunities in the 2020s, 2050s and 2080s (where these timescales are relevant).
- **Phase 3**: On the basis of the analysis conducted in Step 1 and 2, prioritize risks and opportunities for which additional action is needed in the next five years to manage the risk or take advantage of the opportunity.

Considering ADRIACLIM scope and the purpose of this report, Phase 3 will be briefly discussed to show the UK CCRA2 urgency scoring approach.

The Evidence Report uses the concept of **urgency** to summarize the findings of the analysis. Each chapter provides the outputs of the urgency scoring approach for each risk and opportunity, and these are summarized together in an appendix to the Synthesis Report. In order to provide greater detail on the kinds of actions that might be needed in the next five years, urgency has been divided into **four categories of action**. The assignment of different risks and opportunities to these categories is based on the expert judgement of the ASC, in consultation with the Evidence Report authors and the CCRA peer reviewers.

It is to be noted that the report identifies specific areas where further action is felt to be needed, based on the available evidence, but no recommendations on what specific actions should be taken have been provided.

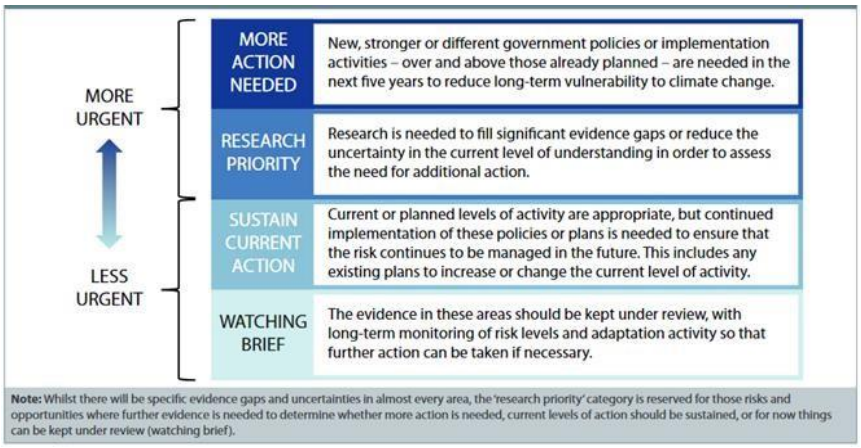

Figure 1: Urgency categories used in the UK CCRA 2017. Source: UK Government 2017

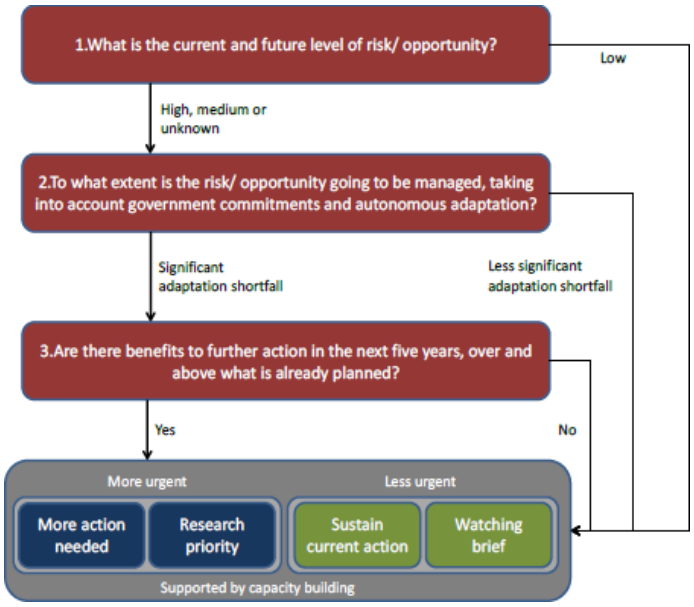

Figure 2: Urgency scoring method used in the UK CCRA 2017. Source: UK Government 2017

According to the approach depicted in the figure above, urgency scoring has been carried out through the following three steps to score urgency:

Step 1: What is the current and future level of risk/ opportunity?

An assessment of the current and future ('2020s': 2010-2019, '2050s': 2040-2069, '2080s': 2070-2099) and of the nature of the risk or opportunity (which would include an assessment of the uncertainty range and magnitude), assuming a 'current level of adaptation' scenario.

Step 2: To what extent is the risk/ opportunity going to be managed, considering Government commitments and autonomous adaptation?

The purpose of this step is to understand to what extent autonomous adaptation can be assumed, according to the commitments Government will take place, and to what extent this will manage the risks or seize the opportunities to a degree described below.

It is judged that there is a **less significant adaptation shortfall** if the following are true for risks:

- The risk is projected to be low magnitude under any future climate scenario, OR
- The risk would be reduced to a low magnitude category by 2100 if these actions take place (see *Table 1.1* below for a description of magnitude), OR
- The available evidence suggests that the key drivers of vulnerability/exposure to the risk are expected to be managed in the future (up to 2100) (with reasons why), OR

- Where there is no evidence, there is widespread agreement between the CCRA authors, ASC and peer reviewers that the key drivers of vulnerability/exposure to the risk would be managed in the future (up to 2100) (with reasons why), AND
- Government commitments and autonomous adaptation in relation to the risk in question, or as a result of dealing with other risks, do not lead to maladaptation.

If the adaptation shortfall is agreed to be less significant, the risk would be given a **'watching brief' or 'sustain current action'** category.

Where any of the criteria above do not apply, or where there is a lack of evidence or agreement, CCRA authors assume that there would be a **significant adaptation shortfall**, and the risk/ opportunity will be taken to **step 3.**

	High Magnitude	Medium Magnitude	Low Magnitude
Quantitative evidence	Major annual damage and disruption or foregone opportunities:7 £hundreds of millions damage or foregone opportunities, and/or Thousands of hectares/km of land lost or irreversibly damaged,8 and/or Millions affected, hundreds of deaths9 or hundreds of people irreversibly harmed Changes to majority of UK's natural assets and their associated goods and services.	Moderate annual damage and disruption or foregone opportunities: £tens of millions damage, and/or Hundreds of hectares/km land lost or irreversibly damaged, and/or Hundreds of thousands affected, tens of deaths, or tens of people irreversibly harmed Changes to around half of UK's natural assets and their associated goods and services.	Minor damage and disruption or foregone opportunities: – Less than £10 million damage, and/or – Tens of hectares/km lost or irreversibly damaged, other reversible/localised damage occurs, and/or – Thousands affected, a few deaths, or a few people irreversibly harmed Changes to a minority of UK's natural assets and their associated goods and services.
Qualitative evidence	Expert judgement and widespread agreement across authors, ASC and peer reviewers suggest there is a possibility of impacts of the magnitude suggested above.	Expert judgement and widespread agreement across authors, ASC and peer reviewers suggest there is a possibility of impacts of the magnitude suggested above.	Expert judgement and widespread agreement across authors, ASC and peer reviewers suggest there is a possibility of impacts of the magnitude suggested above.

Figure 3: Magnitude categories used in the UK CCRA 2017. Source: UK Government 2017

Step 3: Are there benefits of further action – over and above what is planned - in the next five years?

The purpose of this step is to understand, for risks or opportunities, where there is a more significant adaptation shortfall, whether additional actions to address the risk over the next five years would be beneficial, and in what way.

The urgency of decisions in the second CCRA is considered greater where the kind of actions entail the following benefits within the next five years:

- Retain flexibility, avoiding lock-in to a particular pathway over the next few decades, or
- Help to create the right conditions to adapt later (e.g., put in place measures for changes that have long lead times, or create the right institutional conditions to adapt later), or
- Provide the early steps (e.g., capacity building, research, monitoring) that will enable better decisions in the next five years, especially in relation to longer-term major risks, i.e., to build early interventions within an iterative adaptive management framework, or
- Have benefits for managing a wide range of climate and non-climate related risks, or
- Are cost-effective to implement now, or
- Reduce vulnerability now.

If **action is beneficial** over the next five years to manage the risk, the **risk or opportunity** would be identified as **more urgent**, otherwise the risk or opportunity would be assigned a less urgent category.

Confidence scores are outlined in each urgency table to represent the overall quality of the evidence base that has been used to arrive at the decision on urgency. A specific table provides criteria to be used to assign a confidence score to each risk and opportunity assessed, and a specific table classifies the criteria that should be considered in the assessment of the quality of evidence[5].

Phase 3 of the assessment was concluded after the **classification of each climate change risk and opportunity** identified for the UK into the four urgency categories, and the identification of **six priority areas** of inter-related climate change risks for the UK (see the figures below).

[5] The full tables are available in Annex 2.A of the Technical Chapter 2 of UK CCRA 2017 (UK Government 2017): https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Chapter-2-Approach-and-context.pdf .

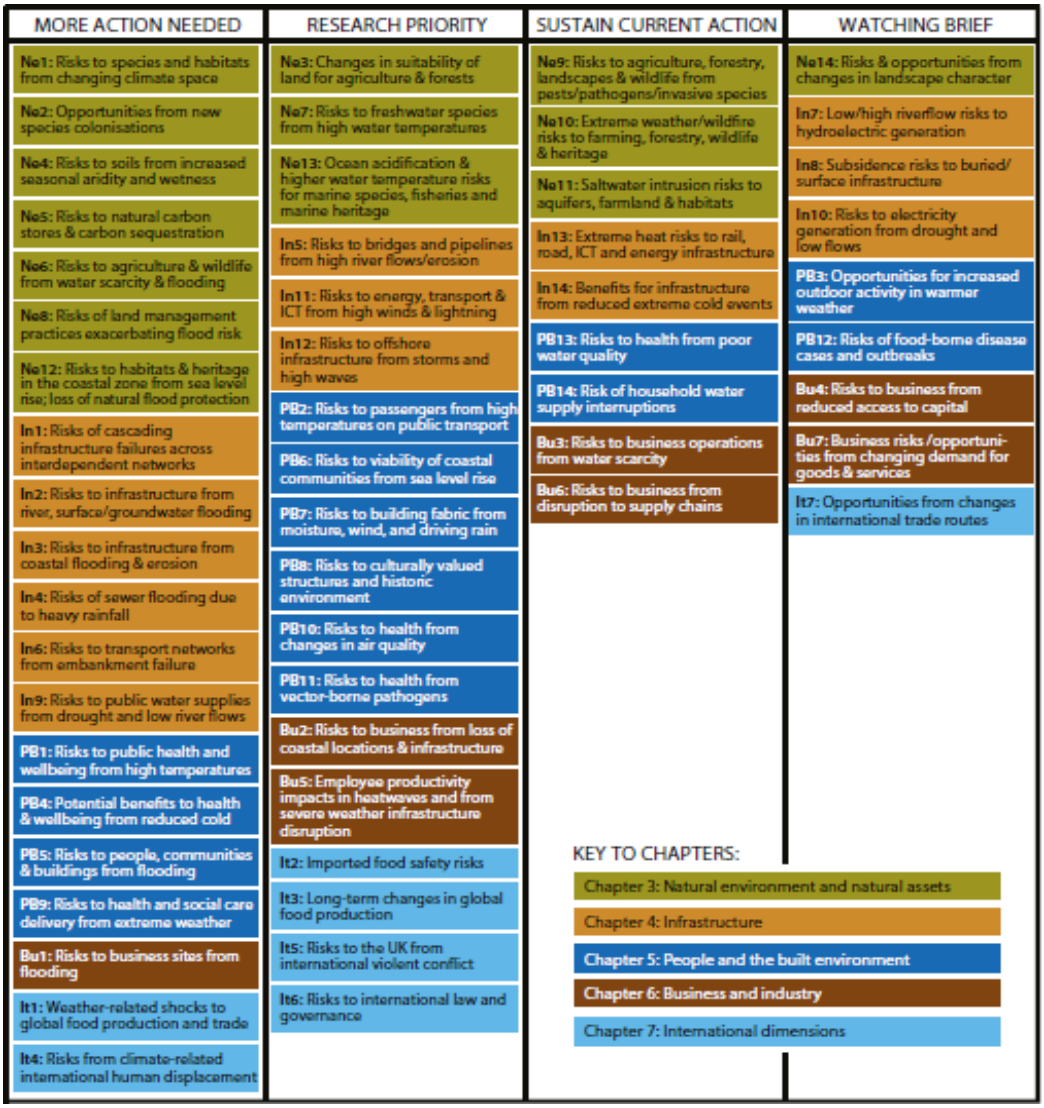

Figure 4: Urgency categories for climate change risks and opportunities for the UK. Source: UK Government (2017).

Figure 5: Top six areas of interrelated climate change risks for the UK. Source: UK Government 2017.

Risks and opportunities highlighted as '**more action needed'** benefit from implementing the one or more of the following actions in the next five years:

- Address the existing adaptation deficit in the UK by implementing '**low-regret' actions** to reduce risks associated with current climate variability.
- **Intervene early** to ensure that adaptation is considered in decisions that have long lifetimes, such as major infrastructure developments, in order to avoid 'lock-in'.
- **Fast-track early adaptation steps** for decisions that have long lead times.

Takeaways for ADRIACLIM project

- **Define a method to score urgency of risks and opportunities.**

The purpose is to manage all risks and opportunities accordingly and to direct the main efforts towards the most urgent ones.

- **Rank all risks and opportunities according to urgency categories.**

Use the urgency categories created to rank all the risks and opportunities of climate change and climate change adaptation identified in the previous steps of the assessment.

- **Proceed through pre-defined and clear steps to assess urgency.**

Use the following three questions (and related steps) to score urgency: 1. "What is the current and future level of risk/ opportunity?"; 2. "To what extent is the risk/ opportunity going to be managed, considering Government commitments and autonomous adaptation?"; 3. "Are there benefits of further action – over and above what is planned - in the next five years?".

- **Categorization of adaptation shortfall as key for step 2.**

Define a system to categorize whether the adaptation shortfall will be significant or less significant in the near future, using different agreed parameters.

- **Set parameters for urgency scoring in step 3.**

Only risks and opportunities with significant adaptation shortfall should reach Step 3. Concerning Step 3, define a set of parameters to categorize urgency of risks and opportunities on the basis of different action's benefits in the near future.

3.2 Implementation

3.2.1 Identification and selection of adaptation options: The New Zealand "Clifton to Tangoio Coastal Hazards Strategy 2120" [6].

Clifton to Tangoio Coastal Hazards Strategy 2120 is being developed to identify and respond to coastal hazards and the impacts of sea level rise out to the year 2120 in Hawke's Bay coastline, particularly its most developed and populated part that stretches from Clifton to Tangoio, where hundreds of people live and businesses, industries, service providers, a seaport and an airport operate. The Strategy was initiated in 2014 with the establishment of a Technical Advisory Group ("TAG") formed by senior Council staff and advisors, and the Clifton to Tangoio Coastal Hazards Strategy Joint Committee ("Joint Committee"). The Strategy aims to:

- Assesses coastal hazards risks between Clifton and Tangoio associated with the processes occurring over the period up to 2120, such as coastal erosion (storm cut, trends, effects of sea level rise); storm surge inundation (wave set-up, run-up, overtopping and sea level rise); and tsunami.
- Develop a model for funding responses to coastal hazards risks.
- Provide a decision-making framework to identify, evaluate, consult on and select practicable adaptation options that respond to the identified coastal hazards risks.
- Implement the selected adaptation option(s) in a coordinated and planned manner that will provide the best overall outcome for the Hawke's Bay community.

To reach its objectives, the Strategy Development Process has been organized in 4 key stages, followed by an ongoing monitoring and review process.

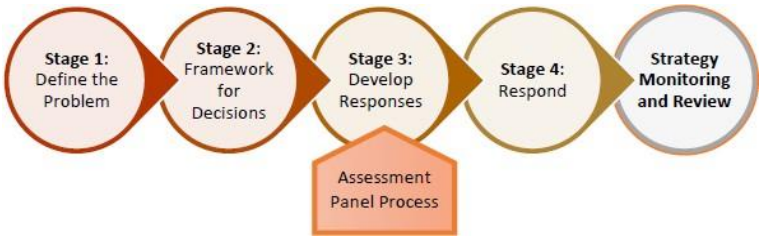

Figure 6: Clifton to Tangoio Coastal Hazard Strategy – Process of Development. Source: Bendall et al. 2018.

[6] Link to the Strategy's website and all related documents is available at: https://www.hbcoast.co.nz/ .

Focus of the present Best Practice analysis is **Stage 3**, in particular the two processes of a) **Identifying Options and Pathways for coastal adaptation** and b) **Option Evaluation**, as carried out by the Northern and Southern Cell Assessment Panels (with inputs from technical advisors) in the framework of the 2120 Strategy.

The recommendations of the Assessment Panels are given based on **coastal 'units'** defined within the Risk Assessment work in Stage 1. The units are based on a combination of ward boundaries, land area units and topography.

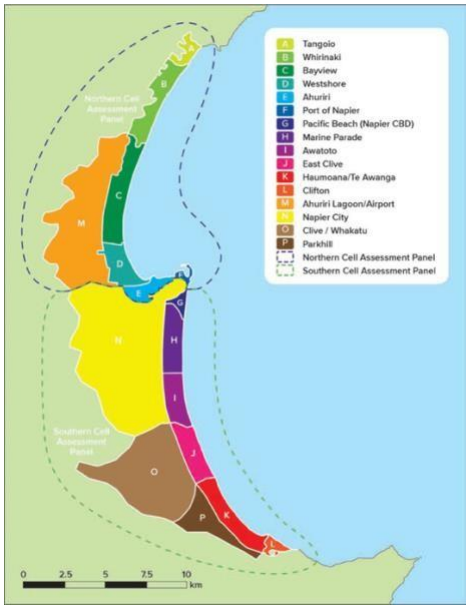

Figure 7: Assessment Panel areas and Coastal Units. Source: Bendall et al. 2018

Utilizing the **decision-making Framework** (developed in **Stage 2**), the specific process followed by the two Assessment Panels to develop their adaptation recommendations was constituted by an **11-workshop programme** completed during 2017, through which coastal units were prioritized, option and pathways developed and agreed upon, and then further evaluated on the basis of economic analysis. The entire 11 workshop programme was conducted separately for the two Assessment Panel Areas and ended with the final recommendations for each unit.

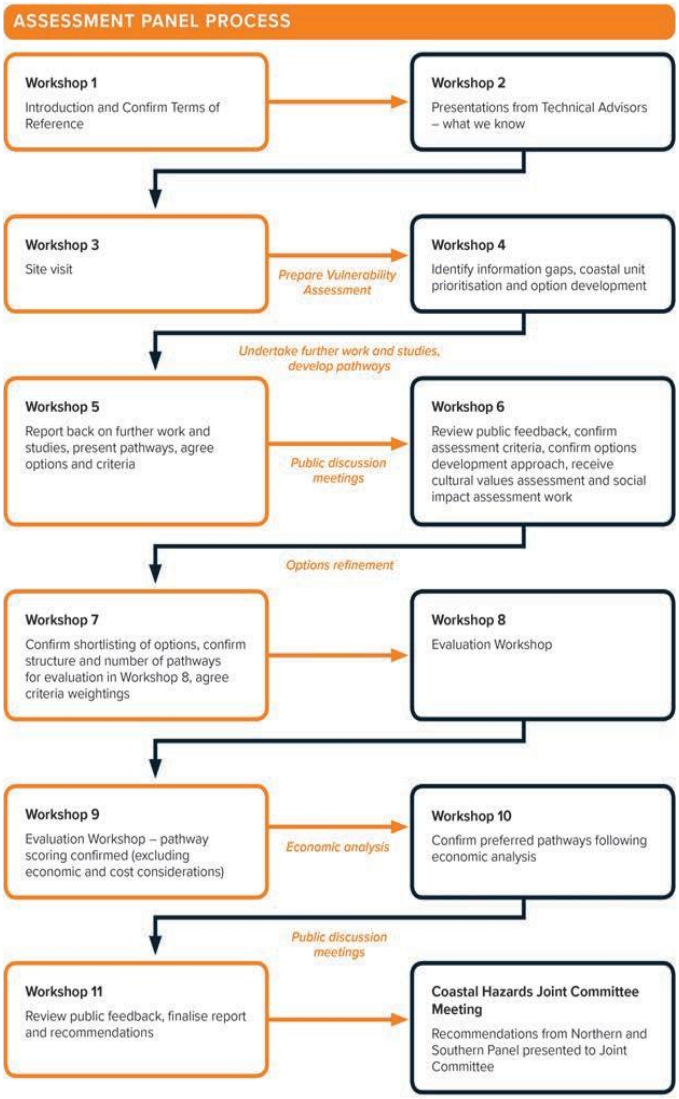

Figure 8: Assessment Panel Workshop Programme. Source: Bendall et al. 2018

A brief overview on the decision-making framework is needed to understand the process of recommendations development. The framework was designed to respond to complex technical information, long timeframes, high levels of uncertainty, and multiple (and sometimes competing) values and interests. It recommended a process of community-led decision making, in summary:

1) Two Assessment Panels are formed to represent the interests of communities and agencies exposed to coastal hazards risks;

2) The Assessment Panels work through a structured decision-making assessment process to develop and evaluate potential options/pathways for responding to identified risks over time in priority units;
3) Preferred options/pathways are confirmed through the application of Multi Criteria Decision Analysis, Dynamic Adaptive Planning Pathways, Real Options Analysis and Benefit Cost Analysis methodologies;
4) Preferred options/pathways are recommended back to each Council for final decision making.

Decision-making framework's key components are explained in details in Box 4.

BOX 4: Decision-making framework's key components of "Clifton to Tangoio Coastal Hazards Strategy 2120" (New Zealand)

Stage 2 of the Strategy Development Process was focused on the development of the decision-making framework to be used for the identification of options and pathways for coastal adaptation and for options evaluation (Stage 3). The key components are described in details below.

1) Multi-Criteria Decision Analysis ("MCDA") is an established technique for assessing multiple and sometimes complex options, involving several steps (1. Defining objectives; 2. Determining options to assess through the development of a long-list of potential options and then refining the options down to a manageable number through specific evaluation parameters; 3. Developing the assessment criteria to assess options; 4. Weighting assessment criteria; 5. Scoring the options on the basis of the assessment criteria; 6. Calculating the weighted scores to order the preference for the options).
2) Dynamic Adaptive Planning Pathways ("DAPP") is a planning tool that focus on flexibility instead of prescribing a single, final solution. Future options are left open for future decision points, and that has been employed by the Assessment Panels to develop adaptive pathways for each priority unit. Pathways are a combination of short term (0-20 years), medium term (20-50 years) and long term (50-100 years) hazard response actions.
3) Coastal Hazard Assessment and Coastal Risk Assessment (developed during Stage 1).
4) A Cultural Values Assessment was conducted and the subsequent report provided an overview of the cultural values in the coastal area from Tangoio to Clifton to guide the decision making.
5) Social Impact Assessment and Valuation. The social impact of coastal hazards (inundation and erosion) on the communities in each priority unit was assessed in three reports, whose main purposes were i) to better understand social issues from coastal hazards, ii) to engage community stakeholders to analyze social outcomes in the case of no human intervention to address coastal hazards, and iii) to measure the estimated monetary value of those outcomes (using Social Return on Investment

methodology). The study was operated through interviews with stakeholders and other background reports. The assessment assumed a status quo scenario ("no change in interventions compared to current status"), which provided a baseline social impact corresponding to the "doing nothing" scenario. Then, projected social outcomes were valued in monetary terms in order to help decision-makers when considering the best adaptation responses.

6) Real Options Analysis ("ROA") was used as the primary means of applying economic analysis to the pathways. It is an expanded version of the "cost-benefit" analysis and it provides a costing assessment that enables flexible decision making on the basis of changes in climate and climate impacts over time. This ensures that decisions taken today do not create further risks which are costly to reverse in the future, and that a range of options have been assessed for their ability to meet community objectives over time. Results were presented in two different reports covering the northern and southern areas each. Moreover, results demonstrate that a flexible investment strategy, enabling a change of course in the future, is more likely to deliver a lower cost outcome than pursuing a single option.

Additional processes include two **community feedback sessions** held during 2017 for each Panel (four sessions in total) as part of the decision-making process, to obtain feedback over priority units identified, hazard response options and draft assessment criteria. Feedback received was used by the Panels to finalize their recommendations.

The **pathway development process** has been characterized by a series of key steps, explained in details in the paragraphs below.

The first step has been the **vulnerability assessment** and **prioritization of units** (Workshop 4). Prioritization decisions were made based on a high-level vulnerability assessment derived from the risk assessment in Stage 1. For each coastal unit, the vulnerability assessment considered the nature on impacts over historic sites as well as ecological areas; potential subsequent economic impacts, whether higher-sensitivity population groups were present; and the timeframe of projected impacts.

Vulnerability assessments outcomes are then grouped into **vulnerability categories** based on assessed future risk, sensitivity and capacity to cope and adapt of each unit. The Assessment Panels adopted a recommendation to focus their efforts on units with **High and Moderate-High Vulnerability** (specifically, units D, K, C, B, E, J and L), while other units would be reviewed at the next Strategy review point (or earlier if triggers are reached earlier).

Secondly, a **long list of options** has been collected. After having identified all possible options on a unit-by-unit basis during Workshop 4, and having sought advice from technical advisors on any other options that may be worth considering, a 'long list' of potential options across all units was compiled and adopted. All 18 options were inserted in a table alongside a short description and a representative image for each of them[7]. In addition, through Workshop 6, the Assessment Panels developed a **short list of options** for each priority unit, by considering each of the 18 options previously identified and determining the practicality of each of them in each priority unity. When an option was not practical for a particular unit, it was discarded[8].

Furthermore, **option refinement** and **pathway development** were carried out. During Workshop 7, **assessment criteria** to be used through the MCDA process were developed. Criteria are split in technical assessment criteria (focusing on efficacy of response) and impact assessment criteria (focusing on the impacts of implementing the option)[9]. Through Workshop 7, the **final pathways** were ultimately adopted **for each priority unit** and summarized in a table[10]. A set of 1-page summary sheets providing further detail on each pathway has been made available for consultation on the Strategy's website[11].

However, the short-listing process still produced a large number of potential option combinations for each priority unit, therefore the Assessment Panels sought technical advice and came up with **6 Final Pathways to be assessed for each Priority Unit** (an extract of the whole Final Pathways Table is provided below).

[7] Table "Long List of Coastal Hazard Response Options" Bendall et al. (2018): pp. 52 - 56.
[8] Discarded options and the rationale for underpinning choices are available in "Table 9. Options Discarded from Long list for each Priority Unit". Bendall et al. (2018): pp. 56 - 59.
[9] Table "Agreed MCDA Assessment Criteria and Scoring Guide" is available in Bendall et al. (2018): p. 48.
[10] "Table 10. Final Pathways to be assessed for each Priority Unit" is available in Bendall et al. (2018): pp. 60 - 63.
[11] Appendix 13 and 14. Available here: Appendix 13 and 14. https://www.hbcoast.co.nz/panels .

Priority Unit	Pathway	Short Term	→	Medium Term	→	Long Term
Unit E1 (Ahuriri)	Pathway 1	Status quo	→	Retreat the Line	→	Managed Retreat
	Pathway 2	Status quo	→	Retreat the Line	→	Sea wall
	Pathway 3	Status quo/ Renourishment	→	Renourishment + Control Structures	→	Managed Retreat
	Pathway 4	Status quo/ Renourishment	→	Renourishment + Control Structures	→	Sea wall
	Pathway 5	Status quo	→	Sea wall	→	Managed Retreat
	Pathway 6	Status quo	→	Sea wall	→	Sea wall

Figure 9: Sample of Final Pathways to be assessed for each Priority Unit. Priority Unit E1. Source: Bendall et al. (2018): pp. 60-63

Workshop 8 and 9 were dedicated to **MCDA scoring**: having a confirmed set of criteria, criteria weightings (to this end, assessment criteria were weighted on a scale from 1 to 3 to determine the relative importance of each criterion to achieve a specific objective), and pathways for assessment, the Assessment Panels developed their **final MCDA scoring for each pathway in each priority unit**[12]. Weighted scores where then calculated, and an **order of preference for pathways in each priority unit** was established.

The economic analysis was carried out in Workshop 10. The Assessment Panels decided to keep the economic criterion separate on the basis that economic considerations would be a critical threshold to the ability to implement a given pathway. To overlay economic considerations with the MCDA outcome, a **Real Options Analysis** was undertaken and presented to the Assessment Panels[13].

In addition to a range of other outputs from the ROA process, the Cost + Loss figure and a Value for Money measure were utilized for each pathway.

Following the economic analysis, as part of Workshop 10, the **identification of preferred pathways** was conducted and **final recommendations** were produced. The information developed through

[12] MCDA Scoring Matrix – Northern and Southern Cell Priority Units are available as Appendix 15 and 16 here: https://www.hbcoast.co.nz/panels/.
[13] To access the full ROA Reports: https://www.hbcoast.co.nz/panels/, Appendix 11 and 12.

the MCDA process and economic analysis was compiled into summary sheets for each Priority Unit (example provided in *Table 2.2*) to support the final recommendations elaboration[14].

Unit E1: Ahuriri										
Pathway	Short term →	Medium term →	Long term	MCDA Score	MCDA Ranking	Cost + Loss[1] ($m)	Cost + Loss[1] Ranking	VFM[2] ($'000/ point)	VFM[2] Ranking	Short Term build costs[3] ($m)
PW 1	Status quo →	Retreat the Line →	Managed Retreat	54	4	15.31	4	211	6	0.29 (0.02 / yr)
PW 2	Status quo →	Retreat the Line →	Sea wall	51	5	10.72	3	111	3	0.29 (0.02 / yr)
PW 3	Status quo/ Renourishment →	Renourishment + Control Structures →	Managed Retreat	58	3=	16.08	6	205	5	1.30 (0.08 / yr)
PW 4	Status quo/ Renourishment →	Renourishment + Control Structures →	Sea wall	58	3=	10.16	2	81	2	1.30 (0.08 / yr)
PW 5	Status quo →	Sea wall →	Managed Retreat	65	1	15.43	5	173	4	0.29 (0.02 / yr)
PW 6	Status quo →	Sea wall →	Sea wall	61	2	8.93	1	57	1	0.29 (0.02 / yr)

[1] Cost + loss is equal to the total cost estimate (operational + capital costs) for the full 100 year pathway + residual losses due to events that exceed a 1 in 100-year chance of occurrence.
[2] Value for Money measure – how much it costs to "purchase" each MCDA point based on the MCDA score and total cost estimate (operational + capital) of each 100 year pathway
[3] Mid-point cost scenario (including operational costs) for the first stage of each pathway (i.e the short term option). Numbers in brackets are the annual rating cost of the short term option over 20 years.

Figure 10: Summary Table for Unit E1: Ahuriri. Source: Bendall et al. (2018): p. 68.

Finally, the **evaluation outcomes** were presented in Workshop 11. The Assessment Panels considered **feedback from the final community discussion sessions** and reviewed a draft of the Report of the Northern and Southern Cell Assessment Panels before confirming their final recommendations for each priority unit (example in *Table 2.3*)[15].

UNIT E1: AHURIRI – PATHWAY 6				
Short term (0 – 20 years)	→	Medium term (20 – 50 years)	→	Long term (50 – 100 years)
Status quo	→	**Sea wall**	→	**Sea wall**

Figure 11: Sample of Final Preferred Pathway for Each Priority Unit, Unit E1: Ahuriri. Pathway 6 selected as preferred pathway. Source: Bendall et al. 2018: p. 77

Takeaway Recommendations for ADRIACLIM Project

- **Establish a clear decision-making framework before engaging in option identification and evaluation.**

[14] For the full list of summary tables (one for each Priority Unit), refer to Simon Bendall, Mitchell Daysh Ltd, 2018. Cliffton to Tangoio Coastal Hazard Strategy 2120. Final Report of the Northern and Southern Cell Assessment Panels. Pages 68 to 76.
[15] For the whole Final Preferred Pathway Table (including each Priority Unit), refer to Simon Bendall, Mitchell Daysh Ltd, 2018. Cliffton to Tangoio Coastal Hazard Strategy 2120. Final Report of the Northern and Southern Cell Assessment Panels. Pages 77-78.

This should be done with the aim of providing a structured path to guide the option development process and to frame the instruments and methods to be used throughout the process.

- **Follow the decision-making framework.**

Follow the progressions established in the decision-making framework and accomplish all the steps required, that may range from vulnerability assessment, to long list of options development and option list refinement.

- **Leave space for adaptability and flexibility when defining the pathways.**

Make use of tools to score the options for each involved area, and consider up to six adaptation pathways for each area after having conducted proper evaluations.

- **Do not omit economic evaluations before coming up with preferred final pathways.**

Economic criteria are of critical importance when determining the feasibility of an option or a pathway.

3.2.2 Governance structure

Finding best practices for what concerns the governance structure of existing adaptation plans has been harder than expected. Few cases do have a governance structure included in their adaptation plan, but it is often not detailed enough to be considered for ADRIACLIM scopes.

Annex 1 of the National Flood and Coastal Erosion Risk Management Strategy for England (Environment Agency 2020) is an example. Although it provides the outline of existing roles and responsibilities in relation to flood and coastal risk management activities, the document is more of a list of related authorities and their role as set by current law, rather than an informed structure assigning specific practical tasks/deliverables pertaining to the Strategy to each relevant authority involved.

A short chapter on Governance Structure is included in the Netherlands' Delta Programme 2019 and 2020 yearly Reports (Ministry of Infrastructure and Water Management et al. 2018, 2019, 2020). However, little is being said about roles and responsibilities for what concerns the Programme implementation structure. Nevertheless, in Box 5 a specific focus has been carried out on the Delta Fund, a funding mechanism for flood risk and water management in Netherlands.

BOX 5. Financing Adaptation: The Delta Fund

The Delta Programme is the Netherlands' national programme to protect the country against flooding, freshwater shortages, and the impact of extreme weather. It sets out the plans to achieve these goals and to make it less vulnerable. In particular, the Delta Programme is aimed at:

- protecting the Netherlands against flooding, now and in the future;
- ensuring sufficient freshwater supplies;
- climate-proofing the country's spatial planning.

The Delta Fund is the part of the Programme specifically dedicated to ensuring the economic feasibility of the Delta measures, whose implementation needs to be financed. It was set up with the Delta Act in 2012 as a budgetary fund to be submitted to the Parliament for its approval on a yearly basis. It has a financial lifecycle through 2028: for this period more than €16 millions are available, which means the annual budget is on average over €1 billion.

The Delta Fund contains the financial resources that the central government has earmarked to fund investments in flood risk management, freshwater supply, and water quality, and the related management and maintenance by the central government itself. The Delta Fund can also provide grants for measures in the same fields implemented by other governments.

In addition, a yearly report has been published to provide an update on the status of the Fund in terms of available funds, investments made and resources from other partners. In fact, although the central government is accountable for the Delta Programme, also other administrative partners (e.g., provinces and municipalities) bear the financial responsibility for the implementation of integrated solutions for flood risk management. In addition, social organizations can also financially contribute to the measures of their interest. For example, Natuurmonumenten (a nature conservation organization) has provided financial resources for the improvement of the Oesterdam in Zeeland, together with the central government and the province of Zeeland.

Just for reference, the 2020 Delta Programme Report shows that a sum of some 17.9 billion is made available in the Delta Fund for the period 2020-2033. This brings the annual budget to an average of nearly 1.3 billion euros. *Figure 1* reflects the itemized development in the budgets for the years up to and including 2033.

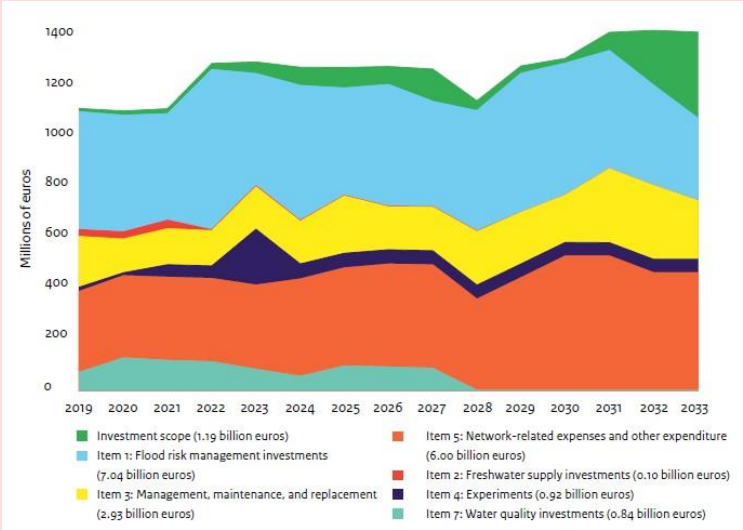

Figure 12: Delta Fund Budget, per item and totals, based on 2020 draft Budget. Source: Delta Programme 2020: p. 74

Takeaways recommendations for ADRIACLIM project.

- Establish a detailed funding system and systematic budget allocation map before starting the plan implementation phase.

The aim is to secure the funding sources before implementing the plan and to set up a clear budget plan to be used as a guide to ensure consistency throughout the following phases and avoid the risk of going out of budget.

- Prioritize.

Resources are limited, therefore selecting a few priority issues to tackle them in the short term can be helpful, within a well-established framework that establishes the longer-term adaptation measures and related resources.

- Adopt an adaptive approach.

Establish a system to periodically review budget allocation and compare each measure's forecast and actual expenditure. Such an approach is helpful to redirect budget allocation on the basis of where it is needed most, as well as to check whether previously allocated funds were consistent with actual expenditure.

3.3 Monitoring and evaluation

3.3.1 Approaches for monitoring systems: the German Adaptation Strategy (DAS) monitoring, reporting and evaluation system.

Germany case study has been chosen because of its relevance concerning adaptation to climate change monitoring, reporting and evaluation (MRE) process, which is well established and institutionalized in the country. Not less importantly, the choice was driven by the pertinent Reports' availability in English language, key feature for making the documents accessible to non-German-speaking users.

Adaptation to climate change is a permanent institutional task with specific methodological framework. Scientific research programmes, participation and consultation processes, on-going reporting systems are key elements of the Strategy. The Inter-ministerial Working Group on Adaptation to Climate Change (IWG Adaptation) brings together nearly all federal ministries, while a standing committee for the adaptation to climate change impacts has been designated to coordinate adaptation activities with the federal states.

In 2008 the **German Adaptation Strategy (DAS)** was adopted. The federal government has identified four areas of activity for the implementation of the DAS[16]:

1. **Implementation of adaption measures, through** the **Adaption Action Plan** (**APA**, revised periodically. Currently implementing APA II), which highlights the objectives and courses of action showcased in the Adaptation Strategy integrating them with specific actions both of the federal government and states, which are continuously implemented. It also includes the funding of adaptation measures.
2. **Dialogue and participation process:** starting at the early stages of the Strategy development, a comprehensive and interdisciplinary dialogue and participation process was set up. After the adoption of the Strategy, this process was continued on a broader base. All key players are involved in the implementation, MRE and revision of the DAS.
3. **Pooling of knowledge:** the federal government supports a large number of research projects in order to expand the existing knowledge base continuously. Collecting and sharing this

[16]Available at: https://www.umweltbundesamt.de/en/topics/climate-energy/climate-change-adaptation/adaptation-at-the-federal-level/german-adaptation-strategy#how-is-the-das-implemented , accessed November 18th, 2020.

knowledge on the online platform KomPass enables to share the information with stakeholders, citizens included.

4. **Monitoring and Evaluation of strategy and measures:** adaptation strategy and the implementation of adaptation measures are to be evaluated every four years on the basis of an established monitoring, reporting and evaluation system.

Monitoring, reporting and evaluation system (Mäkinen et al. 2018).

The DAS and the APA are constantly refined to contribute to a continuous adaptation process. Since 2008, technical experts and political decision makers have been involved in a six-year indicators development process with the purpose of constituting the starting point for the DAC monitoring system.

With reference to the 15 action fields and cross-sectional issues of the DAS strategy, the indicators provide an overview of areas affected by impacts of climate change and of any adaptation processes already initiated in the areas in question.

Continuous revision and upgrade have been established to be the driving principles for the monitoring system, which has already been revised twice. Indeed, periodical reports allow the federal government, relevant stakeholders and citizens to be updated about progress through:

-**Monitoring reports**, published every four years, the first one was published in 2015, the second one and most recent was published in 2019 (Umweltbundesamt 2019). The aim of these reports is to provide the most comprehensive view on the effects of climate change and the current level of adaptation in Germany, on the basis of available data and information collected through the DAS indicator system (see BOX 6 for detailed information on monitoring indicators). Indicators and measured data selected from the 15 action areas by experts were incorporated in the Report in order to demonstrate any climate-related changes in present-day Germany as well as any measures taken to counteract this trend.

Monitoring reports are a necessary step in DAS reporting system as they inform the consecutive Progress Reports, whose scope is to provide an evaluation of DAS and its implementation as well as to update the APA according to the most recent knowledge available.

- **Vulnerability assessment reports,** published every six years. The most recent was published in 2015 (Umweltbundesamt 2015). Existing regional and sectoral evaluations of climate change impacts and vulnerability studies are analyzed to assess climate change-related risks. Furthermore, a methodology for a new cross-sectoral, nation-wide standardized vulnerability assessment was being developed. Using the vulnerability methodology (developed to have a nation-wide standard vulnerability assessment), an interdisciplinary screening procedure identifies regions and systems particularly endangered by climate change.

- **Progress reports**, to be published every five years. The most recent was published by the end of 2015 (Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit 2016). The DAS Initial Progress Report (2015) provides an overview about current knowledge, activities and opportunities for action as well as concrete steps to develop and implement the DAS. The 2015 Monitoring Report and the 2015 German Vulnerability Assessment Report built the foundation for the Progress Report. Developed through a broad stakeholder involvement process (including several federal ministries, the German Laender, local authorities, the scientific community and societal actors), the Progress Report includes an evaluation report describing the implementation of the first Adaptation Action Plan (APA I, 2011) as well as an updated APA, the **"Adaptation Action Plan II"**[17].

The second Adaptation Action Plan (APA II) has been included in the Progress Report in order to redirect the APA I on the basis of emerging needs and gaps. This plan outlines future measures to face climate change and its impacts as well as a concrete time and a financing plan.

[17]Source: https://www.umweltbundesamt.de/en/topics/climate-energy/climate-change-adaptation/adaptation-at-the-federal-level/adaptation-action-plan . Accessed November 17th, 2020.

BOX 6. Monitoring indicators overview.

Originally, the DAS Indicator System comprised 102 indicators, 55 of which describing the impacts of climate change (Impact Indicators) and 42 about adaptation measures or activities and conditions affecting the adaptation process (Response Indicators). Five indicators have been designed as overarching indicators, as they represent overarching activities on behalf of the Federal Government, which are intended to support the process of adapting to climate change.

For the 2019 Monitoring Report, the indicator system dating back to 2015 was reviewed and developed further. The majority of indicators was updated in accordance with the methodology applied in 2015. A total of 21 indicators were reviewed and, where necessary, developed further. In particular, the indicators for the action areas related to Human Health, Water Regime, Water Management, Coastal and Marine Protection, Building Industry as well as Transport and Transport Infrastructure were enhanced and extended by adding essential themes.

Therefore, current DAS Monitoring Indicator System comprises 105 monitoring indicators, 56 of which identified as impact indicators, while 44 as response indicators. The 5 overarching indicators remain unchanged. Five indicators were not featured in the 2019 report as their underlying data were no longer available.

Principally, all monitoring indicators are intended to measure progress across the whole of Germany. Regional differences are illustrated in exceptional cases where no sufficient nationwide data is available to create indicators related to particular thematic aspects. In such instances, case studies have been portrayed to demonstrate through spatially limited data sets what statements might be generated at the nationwide scale given the relevant data.

Impact Indicators and Response Indicators have been grouped according to the Action Area they have been identified with. Action Areas have been divided into 7 “Clusters” according to the issue they cover: Health, Water, Land, Infrastructure, Economy, Spatial Planning and Civil Protection.

Chart dedicated to Cluster “Water” is below reported as an example of the mentioned classification, which is detailed with every Cluster, Action Area and Indicator.

Cluster 'Water'

Impact-Indicators – Effects			Response-Indicators – Adaptations	
Action area Water regime, water management, marine and coastal protection				
WW-I-1	Groundwater level (basically revised in 2019)		WW-R-1	Water use index
WW-I-2	Mean run-off (basically revised in 2019)		WW-R-2	Investments in floodwater protection for inland waterways (new in 2019)
WW-I-3	Floodwater (basically revised in 2019)		WW-R-3	Riparian vegetation on the banks of small and medium-sized watercourses (new in 2019)
WW-I-4	Low water (basically revised in 2019)		WW-R-4	Investment in coastal protection (former WW-R-3)
WW-I-5	Water temperature of standing waters (case study, revised and extended in 2019)			
WW-I-6	Start of the spring algal bloom in standing waters			
WW-I-7	Water temperature in the sea (revised in 2019)			
WW-I-8	Sea levels (revised in 2019)			
WW-I-9	Intensity of storm surges (revised in 2019)			
Action area Fisheries				
FI-I-1	Distribution of thermophilic marine species			
FI-I-2	Occurrence of thermophilic species in inland waters			

Figure 13: Example of Indicators Classification in 2019 Monitoring Report, Cluster "Water". Source: 2019 Monitoring Report on the German Strategy for Adaptation to Climate Change

Even though the particular relevance of "Cluster Water" for what concerns coastal areas adaptation to climate change, the choice of this specific Cluster must not mislead the readers on the importance of the other Clusters with concern for ADRIACLIM purposes, indeed many of them contain precious indicators related both to Impact Monitoring and Response Monitoring.

Citing some of them below, without claiming to be exhaustive.

Cluster "Health", Human Health Action Area: GE-I-1 Heat Exposure (I: Impact Indicator) and GE-R-1 (R: Response Indicator); Cluster "Land", Biodiversity Action Area: BD-I-3 Restoration of natural flood-plains and BD-R-1 Consideration of climate change in landscape programmes and landscape framework plans; Cluster "Infrastructure", Building Industry Action Area: BAU-I-1Heat stress in urban environments and BAU-R-5 Insurance density of extended natural hazard insurance for residential buildings (modified in 2019); Cluster "Spatial Planning and Civil Protection", Action Area Spatial Planning, Regional and Urban Development: RO-R-1 Priority and restricted areas reserved for wildlife and landscape conservation, RO-R -3 Priority and restricted areas for (preventive) flood control, RO-R-6 Settlement use in flood-risk areas.

Takeaways recommendations for ADRIACLIM Project

- **Develop an effective and functional monitoring system.**

Developing a monitoring system requires great efforts but is the pillar of any proper MRE system. A set of indicators able to monitor the broadest range of aspects related to coastal adaptation to climate change is key to track progress and identify gaps, and therefore to progressively improve resilience and adaptive capacity of territories and communities. Even though these can be used as baseline upon which to build a more complex indicator system, it should include at least climate change impacts indicators and adaptation processes indicators.

- **Systemize a framework that enables to step from data collection and monitoring towards progress evaluation.**

It is essential to reflect upon and utilize gathered data to obtain relevant knowledge on what has been done, what has changed since the starting point, what is on track and what needs to be improved, in order to inform next decision-making steps.

- **Establish periodical review and reporting due dates and commit to respecting them.**

Define the reporting cycle for every MRE task, in particular the frequency of publication for monitoring reports, progress reports and vulnerability assessment reports. Establish as well the frequency of review, update and publication of the Action Plan/Implementation Plan as part of the Adaptation Strategy.

Conclusions

Climate change adaptation is a relatively new topic for Italian and Croatian administrations and the present review describes an adaptive action at an early stage. Central States attempted to provide national frameworks for adaptation: both have strategies, both drafted plans. The situation is more articulated and differentiated at regional/county level and also at local level. Here we have concurrent initiatives like the Integrated Coastal Zone Management Protocol or the Covenant of Mayors and in addition the theme of adaptation is also integrated (or it can be potentially incorporated) in different sectoral plan. These approaches change significantly from region to region and from Italy to Croatia. This landscape can be represented as a variable-geometry situation where public administrations are free to select the most suitable administrative tools compatibly with their constitutional competences, without any strong push or incentive to align to a strict standard.

Outside the cooperation area there are many other experiments in adaptation planning, especially in coastal areas. The cases reported in this document are just some best practices in the fields of assessment, implementation and monitoring. A certain degree of uniformity can be reached in the assessment and monitoring phases, by sharing the same methodologies and the same indicators. However, the implementation phase is still highly dependent on peculiar local and contingent variables and it is more difficult to find detailed and replicable procedures. Public administrations should find their own way to implement adaptation measures. At the present stage, implementing adaptation cannot be reduced to a traditional administrative procedure. Adaptation requires adaptation: politics, creativity and expertise are the necessary ingredients to identify a proper way to deliver climate adaptation.

In order to support public administrations within the pilot areas in this complex task, this report also included some recommendations at the end of each paragraph. We can now try to summarize them in fewer and more general indications:

Refer to and align with national and regional plans on adaptation to climate change in Italy and Croatia. All policy documents analysed in Chapter 1 and the Guidelines presented in Box 2 set the scene for local planning processes in the project area, thus providing useful and concrete references on strategic objectives, context analysis and assessments, priority sectors as well as include also a set of general adaptation measures as concrete pieces of advice to be tailored to the local context.

Approach coastal adaptation in an integrated and multi-sectoral manner. Coastal zones are at the intersection of land and sea. The planning process should consider all the biological, ecological, economic and social variables. Box 1 presents a high level of technical and operational guidelines on coastal defence and concretely suggests how to carry out adaptation planning in coastal areas by covering all the required steps, while Annex I focus on the Integrated Coastal Zone Management

(ICZM) Protocol with concrete operational examples in terms of both sectoral approach (in Emilia-Romagna) and concrete measures (in Marche).

Keep a clear and simple governance structure, reducing the burden of administrative procedures through the integration of adaptation across ordinary sectoral planning. Lack of coordination among all the involved actors is one of the main problem reported by project partners when dealing with adaptation. Specific roles and responsibilities are necessary to define an efficient governance for adaptation. The integration of adaptation into the existing sectoral plan is a simple way to avoid duplication of efforts and to streamline the implementation of adaptation actions. Chapter 2 provides an overview of the existing sectoral planning topics in Croatia and Italy as a starting point for mainstreaming adaptation into current legislation.

Engage with citizenship and stakeholders. Adaptation requires political commitment and so it should be part of the local agenda, involving relevant stakeholders and citizens. Therefore, a participatory decision-making process may be a good investment to increase the success of adaptation planning. Best practice in Chapter 3 illustrates some example for the development of the decision-making process for coastal adaptation.

Allocate some resources to the monitoring system, possibly aligning with common standards in order to reduce the efforts and the costs of monitoring. Chapter 3 provides some example of good monitoring systems that are key to track progress in the implementation and identify gaps that prevent the delivery of results.

Annex I – Integrated Coastal Zone Management

Protocol on Integrated Coastal Zone Management in the Mediterranean (UNEP, MAP and PAP 2008)

The Protocol on Integrated Coastal Zone Management (ICZM Protocol) is the seventh Protocol in the framework of the Barcelona Convention and represents a crucial milestone in the history of UNEP's MAP (Mediterranean Action Plan). It complements the existing set of Protocols of the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean. The ICZM Protocol is intended to support the Mediterranean countries to better manage and protect their coastal zones, as well as to deal with the emerging coastal environmental challenges, with particular concern for climate change in coastal areas.

The ICZM Protocol was signed in Madrid in 2008 after six years of efforts by MAP (Mediterranean Action Plan) and especially PAP/RAC (Priority Actions Programme/Regional Activity Centre). It was adopted by the European Council in 2010 and entered into force in 2011 after being ratified by six countries. It is a legally binding regional instrument valid for the contracting parties and represents an innovation in international law, introduced after the international community assessed the need to move from a soft law framework on coastal zones management to a more effective implementation system.

In implementing the Protocol at national and sub-national level, Contracting Parties shall follow the directions included in the ICZM Protocol. As stated in its Article 5, the six objectives of integrated coastal zone management cover sustainable development of coastal zones, sustainable use of natural resources, coastal ecosystems integrity preservation, climate change mitigation and adaptation, and governance consistency (in-between public actors, between public/private actors and national/sub-national actors). Objective number 5 is especially relevant with concern for ADRIACLIM Project purposes: "prevent and/or reduce the effects of natural hazards and in particular of climate change, which can be induced by natural or human activities".

Both Croatia and Italy have signed the ICZM Protocol and are therefore responsible of implementing it. The two Countries are working towards developing a framework for ICZM, even though no National Plans for ICZM have been developed nor implemented so far. Some Plans at sub-national level have nonetheless being designed and made operative, and are worth mentioning for ADRIACLIM purposes.

Common Regional Framework for Integrated Coastal Zone Management[18]

The Common Regional Framework (CRF) for ICZM is the most recent document within the ICZM Framework. It is intended to provide more practical support to the Contracting Parties in the process of implementing ICZM at national and sub-national level.

The CRF is aimed to provide recommendations and measures to strengthen regional cooperation for:

- Processes (accelerating results achievement);
- Indicators (tools to track progress, support for evaluation processes, tools to inform general public and decision makers);
- Methods and Practices (achieving ICZM principles and objectives).

With respect to Marine Spatial Planning (MSP), the CRF considers it as the main tool to implement ICZM in the marine part of the coastal area and to manage human activities according to the Ecosystem Approach. It therefore works towards introducing MSP into ICZM framework and creating a common context for implementing MSP in the Mediterranean Area.

CRF Objectives are specified below the Principle they refer to. For the purpose of the present review and for length reasons, only Objectives referring to Principle b) are reported, given their relevance for what concerns the way to deal (within the ICZM framework) with climate change in coastal areas.

Indeed, ICZM Principles are:

a) Use the ecosystem-based management to ensure sustainable development and integrity of the coastal zone, its ecosystems and related services and landscapes;
b) Address natural hazards and the effects of natural disasters, in particular coastal erosion and climate change;
c) Achieve good governance among actors involved in and/or related to coastal zones.

More into specific objectives of Principle b):

1. take into account the commitments to the Paris agreement on climate change, the 2030 Agenda for Sustainable Development to build climate change resilience and the Strategic Programme of the Convention on Biological Diversity (CBD);
2. prepare timely management plans to prevent, reduce and minimize negative impacts to coastal zones;
3. promote ecosystem approach and nature-based solutions to maintain or restore the natural capacity of the coast to adapt to changes;

[18] The Common Regional Framework for Integrated Coastal Zone Management was adopted by Contracting Parties as Annex to Decision IG.24/5 during the 21st Meeting of Contracting Parties (COP21) held in Split, 8-9 May 2019 (available here: https://wedocs.unep.org/bitstream/handle/20.500.11822/31703/19ig24_22_2405_eng.pdf)

4. assist in mainstreaming coastal adaptation into appropriate institutional and policy frameworks;
5. awareness raising, stakeholder engagement and capacity building for addressing coastal risks;
6. promote the use of best practices and best available data, information and tools.

Tools and instruments are identified among the ones quoted in the ICZM Protocol. The ones considered particularly relevant for the implementation of the CRF are reported in the document by matching 8 specific objectives related to governance and work methodology (e.g. *monitoring of environment and activities*) with a set of suggested measures and tools (e.g. *use, strengthen and create appropriate mechanisms for regular monitoring and observation of the state and evolution of their coastal zones and the resources and activities they encompass).*

A detailed Action Plan (AP) is presented in the form of a Table in the "Implementation of the CRF" section. It is worth to mention since it has been designed to provide concrete support and guidance for joint implementation of the ICZM Protocol through the CRF. Setting 2027 as target year, the AP defines the main outputs to be delivered, associated with related specific activities, estimated costs, key actors and progress indicators (resources are indicative and do not include resources to be provided by CPs themselves but only resources to be provided within the Barcelona Convention System).

The Appendix proposes methodological guidance for reaching Good Environmental Status (GES) through ICZM. The proposed methodological guidance is based on three major phases, as shown in Figure 3.

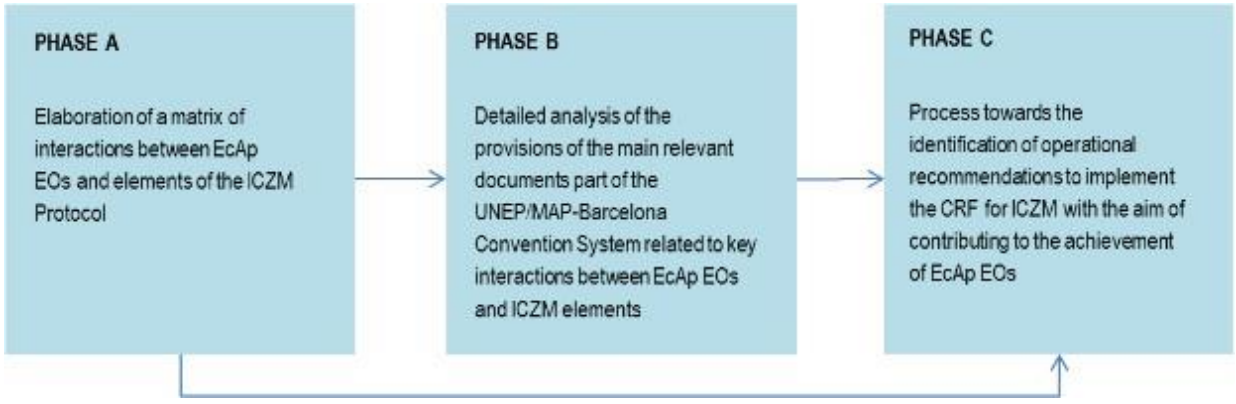

Figure 14: Phases of the methodological guidance (Common Regional Framework for Integrated Coastal Zone Management: "Appendix: Methodological guidance for reaching Good Environmental Status (GES) through ICZM")

Guidelines for Integrated Coastal Zone Management (Regione Emilia-Romagna 2004)

The Guidelines for Integrated Coastal Zone Management (ICZM) in Emilia Romagna Region represent a first document towards the implementation of ICZM in Emilia Romagna, on the basis of ICZM Principles. They have been developed with the purpose of setting the scene for a systemic and concerted management of the regional coasts, which mainly consist in a single long sandy littoral and is characterized by a high degree of anthropic presence. The aim of the work is to provide for a strategy to which every coastal activity should conform in order to have a positive influence on the terrestrial and marine factors impacting the coastal system. The ultimate goal is to promote consistency and pro-activity in coastal interventions as part of coordinated and sound policies able to foresee, link and manage new phenomena like sea level rise and geomorphologic changes in the territory.

Coastal Areas Issues have been outlined in several Sheets by relating biological, ecological, economic and social variables:

- Sheet 1 – Coastal physical system, risk factors and defense strategies.
- Sheet 2 – Pollutants, water resources management, monitoring process.
- Sheet 3 – Harbors, garbage and naval transport risks.
- Sheet 4 – Habitat, biodiversity and landscape preservation and promotion.
- Sheet 5 – Tourism.
- Sheet 6 – Fishing and aquaculture.
- Sheet 7 – Agriculture.
- Sheet 8 – Energy resources.
- Sheet 9 – Settlements, service infrastructures and transport systems.

Even though a big effort for cross-sectoral analysis and connection as well as intervention measures has been conducted and is proposed throughout the whole work, each Sheet represent a short but accurate report on its own. Each one is structured according to: area of interest definition, issue assessments and situation analysis, objectives identification, guidelines for intervention actions, responsible entities and tool to be used.

Acknowledge to interest of every Sheet, of particular relevance for what concerns climate change in coastal areas is Sheet 1, in which the theme of coastal resilience is discussed. Coastal erosion and hazards' impacts over coastal areas can be managed by improving coastal resilience through a series of measures. The Sheet structure, composed of preface, situation assessment, intersectoral analysis and guidelines for interventions, aims at defining: a) Integrated coastal management and knowledge systematization; b) Strategic choices to remove or mitigate coastal erosion drivers (long-term strategy); c) Short-term actions to protect and restore littorals.

The assessment wants to inform the strategic choices both in the short and long run, as well as contribute to the creation of a unitary management system for coastal areas. It is therefore detailed

with a series of key elements, including: monitoring system; studies, researches and prevision scenarios; subsidence process; river sediment transportation; anthropic pressure over coasts; beach nourishment operations; assessment of beaches still free from fixed defense structures and assessment of beaches protected by fixed defense structures. Lastly the issue of coastal adaptability and resilience loss is deepened, with special regard for the beach shrinking and the littoral lowering processes.

Each issue is matched in a table with specific guidelines for action and intervention proposals. In order to contextualize and actualize such proposals, main subjects involved are identified, as well as potential financial resources for the implementation of the proposed measures.

For what concerns ADRIACLIM Project purposes, ICZM Guidelines for Emilia Romagna Region may provide support especially in relation to the work to be carried out within Emilia Romagna borders. A Climate Change Adaptation Plan targeted to coastal areas cannot avoid considering integrated coastal management issues alongside building upon previous climate change adaptation plans or strategies already existing in the region. And recognized the existence of regional ICZM Guidelines, they may help getting closer to have a clearer picture of the priority issues concerning Emilia Romagna coastal areas, climate change, adaptation and resilience.

Takeaway recommendations for ADRIACLIM project

- **(For Emilia-Romagna Region) Take into account the ICZM Guidelines when developing ADRIACLIM adaptation plan**
  The challenge of climate change is included in the Guidelines. Any adaptation plan on Emilia-Romagna coastal areas should take into account the main findings and indications of the guidelines, including ADRIACLIM adaptation plan.

- **(For all partners) Refer to the cross-sectoral approach for the management of coastal areas**
  Considering that coastal system refers to the interface between sea and land, and therefore it depends on and is affected by huge variety of factors, a multi-sectoral assessment has to be carried out, including biological, ecological, economic and social variables. The Guidelines provide a set of nine cross-sectoral entry points that may be used to frame also ADRIACLIM adaptation plans.

- **(For all partners) Develop a unitary management system for coastal areas**
  A crucial issue is to manage the coastal area as a "whole system": therefore, an integrated information system (including monitoring and analysis of current trends) needs to be combined with further research on forecasts and future scenarios, in addition to concrete strategic interventions (e.g. marine ingression risk management and coastal erosion) and short-term actions (e.g. beach regeneration and protection).

Marche Region's Integrated Coastal Zone Management Plan (Regione Marche 2018)

The ICZM Plan for Marche Region 2018 represents the updated version of the 2015 Plan, aimed at making ICZM Protocol (see first section of this Annex) operative for coastal areas within Marche Region. Through the 2018 version, Marche Region aims at dealing with the constant interrelation between coasts and sea environments, by setting up a multi-year Action Program alongside with an operative Financial Plan.

The ICZM Plan is composed of four blocks:

A. General Report, containing an evaluation of the previous Integrated coastal areas management plan (PGIAC) implementation state and a new analysis covering topography and tide gage processes, floods and related risks, monitoring system adopted, sediments management, update utilization of coastal areas, and the updated financial assessment;
B. Technical implementation rules;
C. Interventions program, divided into 11 physiographic coastal units. For each one them an assessment of their state, an imbalances analysis and a cost framework have been provided;
D. Strategic Environmental Evaluation (VAS).

General objectives stated for the Plan have been extrapolated from ICZM Protocol for the Mediterranean Sea (art.5), while practical objectives have been defined on the basis of the previous PGIAC Plan (2005-2015) and the recent European directives on the subject. Among them: restoration of existing defense structures, beach maintenance (nourishment operations), implementation of "protected beach" defense systems, preservation of coastal areas free from defense structures, integrate Floods Directive with Coastal Areas Plans.

Both General Objectives and Specific Objectives are directed towards encouraging the improvement of "coastal resilience", the ability of the coast to react to climate-induced or human-induced changes such as sea level rise, floods and storms and so maintain its long-term functioning system is the core of the entire Plan.

Therefore, this document is quite relevant with respect to ADRIACLIM Project, especially for concerned Project Partners, who may find useful information, data and know-how to target coastal areas and climate change in Marche Region by consulting the mentioned the 2018 version of the ICZM Plan. The development of ADRIACLIM Project in the Region's coastal areas may find it helpful to build upon previous researches, knowledge and interventions on the matter, as well as lean on an intervention program already in place to further develop a Plan for Coastal Areas Adaptation to Climate Change.

Takeaway recommendations for ADRIACLIM project

- **(For Marche Region) Take into account the ICZM Plan when developing ADRIACLIM adaptation plan**
  The ICZM Plan includes many actions for a sustainable management of Marche's coastal areas, therefore any adaptation plan should take into account the measures already planned in order to avoid overlapping, take advantage of the synergies between the two documents

- **(For all partners) Refer to the analysis of costs and the availability of financial resources**
  The plan details the cost for all actions and it also review the main sources of funds, especially at regional level, by identifying suitable financial streams within the regional operative programmes and the regional budget. This approach is very useful to mainstream adaptation in the existing plans and resources and it should be regarded as a best practice.

- **(For all partners) Take into account the possible negative impacts of the actions that you are selecting**
  The ICZM Plan include a Strategic Environmental Assessment (SEA). It is a legal requirement in Italy for this kind of public plans to check whether the initiative may cause negative effects and to identify mitigation actions. Even though it is not necessary/binding for ADRIACLIM adaptation plan to follow a SEA procedure, it is nonetheless useful to assess the negative impacts of "grey" adaptation measures. In fact, infrastructural actions may have significant impacts that should be addressed in the plan.

Integrated Coastal Zone Management – Analysis and monitoring for the definition of interventions for the coastal defense against erosion in Veneto – Guidelines (Regione Veneto, 2016)

In 2016, Veneto Region approved the document "Gestione Integrata della Zona Costiera - Studio e monitoraggio per la definizione degli interventi di difesa dei litorali dall'erosione nella Regione Veneto - Linee guida". The study is the outcome of a research initiative started in 2013. It was acknowledged as a guideline, since it identifies a series of homogenous coastal zones for the framing of future interventions.

The document is not explicitly related with the "Protocol on Integrated Coastal Zone Management in the Mediterranean" but it is still a useful instruments to know the current situation of the coastal area of Veneto and to ground future measures for the adaptation of littoral areas.

In fact, the study describes in details the coast of Veneto through an analysis of wave motion, sediment transportation and topographic surveys. Thanks to this analysis, the document identify 20 homogenous coastal units and the main vulnerabilities in terms of risk of erosion.

Finally, the study includes a guideline for the interventions: it describes the typologies of structural and non-structural measures and it lists a possible type of action and the relative priority for each coastal unit.

Takeaway recommendations for ADRIACLIM project

- **(For Veneto partners) Take into account the analysis of the local coastal area**
  The document include a very detailed analysis of Veneto coastal area. Therefore, ADRIACLIM adaptation plan in the pilot area can rely on this analysis.

- **(For Veneto partners) Refer to the coastal units of the study**
  The experts identified 20 coastal units with similar morphological characteristics. This unit of analysis can be taken into account also for the implementation of specific measures under ADRIACLIM's adaptation plan.

- **(For Veneto partners) Check the priority of action defined in the study**
  The Guidelines include a list of priority for some typologies of measures against coastal erosion. It represents an informative ground for the selection of ADRIACLIM adaptation actions on the coastal area of Veneto.

Guidelines for Integrated Coastal Zone Management of Dubrovnik Neretva County (DUNEA 2011)

In 2011, the development agency of Dubrovnik Neretva County, DUNEA, developed the Guidelines for ICZM of Dubrovnik Neretva County with the technical contribution of the Priority Actions Programme/Regional Activity Centre. The document has been conceived in the framework of COASTANCE project, co-funded under the Interreg Mediterranean Programme.

The guidelines consist of two parts. The first one describes the concept of Integrated Coastal Zone Management, with the details of the principles and the legal and administrative instruments. The second part provides information on Dubrovnik Neretva County's coastal area. The Guidelines also include an analysis of the key administrative documents that are relevant for the coastal area (for instance the County Spatial Plan or the County Development Strategy). Finally, they also propose a series of pilot sites for the implementation of the Integrated Coastal Zone Management approach.

Takeaway recommendations for ADRIACLIM project

- **(For Dubrovnik Neretva County partners) Take into account the analysis of the local coastal area**
  The guidelines carried out an analysis of the local conditions, using an integrated land-sea approach. In order to avoid duplicating the effort, this analysis can be easily assimilated for ADRIACLIM's adaptation plan in this pilot area.
- **(For Dubrovnik Neretva County partners) Check the list of pilot sites**
  The Guidelines include a list of interesting sites for the implementation of ICZM approach. ADRIACLIM partners can check if the list is still relevant and if the indication for each proposed pilot can be integrated in ADRIACLIM adaptation plan for Dubrovnik Neretva County.

Integrated Coastal Zone Management Plan of the Šibenik-Knin County (PAP/RAC 2016)

Acknowledged that Ŝibenik County is not part of the Project Areas, it is nonetheless part of the cooperation area within Italy-Croatia Interreg Programme. The ICZM Plan for Ŝibenik -Knin County is therefore worth to mention for it represents a best practice not only for Croatia but within the whole Mediterranean basin, as it is one of the first systematic attempts to create an Integrated Coastal Zone Management Plan whose purpose is to take into account all the relevant variables and issues concerned with coastal areas, including spatial planning, maritime spatial planning and climate change, impacts and variability. To date, climate change adaptation topic has not been incorporated into Croatian spatial plans yet, and this Plan set the foundations to do so.

The methodology for developing a Coastal Plan consists in three main planning phases, identified for ICZM within the PAP/RAC framework:

1. Introductory activities
2. Analysis and estimate of future developments
3. Plan

The design process has been very participatory, especially through the application of the "Climagine" method, which emphasizes climate change impacts over local communities in order to identify a number of values and measurable indicators for sustainability in a particular area. Results of the mentioned process were combined with results from the Local Vulnerability Assessment, the Assessment of potential effects of sea level rise for Republic of Croatia (DIVA model) and a Socio-economic analysis of Croatia's coastal zone.

After the preparatory phase, prioritization of thematic areas was conducted throughout the scoping phase (three thematic areas were selected: space, climate change and its impacts, water management). A diagnostic analysis was also conducted following earlier reports, to deepen the knowledge aspects previously analyzed with less detail, such as climate change effects.

Consequently, three Coastal Zones Development Scenarios have been assessed ('Risk' Scenario, the 'Through Competition to Cohesion' scenario, the 'Through Protection to Sustainability' scenario) and used as the basis for solutions proposed in the Plan. Follows an accurate assessment of the environmental, social and economic state of Šibenik County, and the analysis of the key problems of the coastal zone, including climate change and variability and its impacts. Also, analysis of governance structure at national and then regional level with concern for ICZM was carried out to understand the social actors involved in the implementation of the Plan, while vulnerability was assessed through the Index of coastal zone vulnerability.

The core of the Coastal Plan starts at Section Three of the document. The four policies are detailed with several more specific sub-policies explained extensively and assigned to responsible actors.

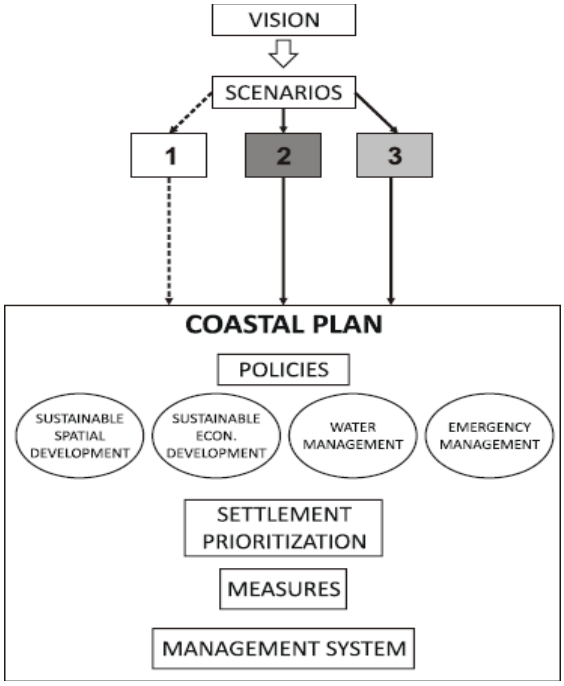

Figure 15: ICZM Plan Structure

The topic of climate change is included in terms of measures to improve coastal and community resilience and adapt to climatic hazards. More in detail, four proposed sub-policies have dedicated tables and are intended to tackle public health and environmental security; to build resilience of coastal towns from extreme events and climate-induced disasters; to adapt the coastal zone to rising sea levels and to build resilience to the wildfires.

Management measures are provided at three levels:

1) Management measures for the County's entire territory are aimed at achieving sustainable development throughout the County and attaining resilience to climate variability and change. Measures are grouped into sectors and detailed in tables;
2) Management measures proposed for each coastal settlement;
3) Measures to establish a management system (proposal of a coastal zone management system).

Takeaway recommendations for ADRIACLIM project

- **Design and combine participatory process' results with scientific assessment and studies**
  ICZM Plan of Šibenik County is a good example for both its participatory process and for the structure of activities and work. Nevertheless, for what concerns climate change adaptation, an operative action plan is still to be developed also in this territory.

- **(For Croatian partners) See how and ICZM plan can be integrated into the Croatian administrative framework**
  Šibenik ICZM plan is a pilot and it represents an unprecedented example of coastal plans that could be included in ordinary spatial plans. Start from the lessons learned within this first experience in order to further refine ADRIACLIM adaptation plans.

Annex II - Sustainable Development Goals and adaptation to climate change

The 2030 Agenda for Sustainable Development is an action programme for people, planet and prosperity signed by 193 UN member States in 2015. The 17 Sustainable Development Goals are the core of the Agenda and set measurable objectives to be reached by 2030. The 17 Goals represent the evolution of the Millennium Development Goals and set specific targets and indicators covering the most compelling development issues, as shown in Figure 1.

Figure 16: Sustainable Development Goals

Moreover, the 2030 Agenda identifies specific Targets for each Goal, and to make them effective it establishes a set of indicators in order to track progress towards the achievement of each objective. Therefore, SDGs indicators represent a useful effort of a monitoring system already available for measures implementation and evaluation purposes.

Coastal Adaptation Plans shall fulfill Sustainable Developments requirements in a broader sense than just tackling climate change. Consistency is key: adaptation options should be developed in order to promote local people well-being and livelihoods, to foster sustainable economic development all while tackling climate change impacts and improving resilience (environmental, social and economic). All Sustainable Development Pillars of the 2030 Agenda should be considered in the design of the Adaptation Plan and in the identification of adaptive measures.

Hence, not only SDG 13 covers the topic of climate change, but many other goals include targets and indicators related to climate change, and specifically to resilience and adaptation.

Identified Indicators are a useful tool to be integrated into Coastal Adaptation Plans' monitoring and evaluation systems that will be developed by Project Partners. Nonetheless, it is crucial to consider and establish a functional monitoring and evaluation framework since the early stages of the adaptation cycle.

Therefore, Sustainable Development Goals relevant for what concerns Coastal Adaptation to Climate Change are reported below. For each SDG, specific targets and Indicators (organized in tables) related to climate resilience and adaptation have been highlighted.

SDG 1: End poverty in all its forms everywhere

Target 1.5 is focused on building resilience of the poor and the vulnerable people, as well as on reducing their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters. The related indicators mainly deal with negative impacts (in terms of deaths and economic losses) and with disaster risk reduction planning at national and local level.

Indicator	Description
1.5.1	Number of deaths, missing persons and persons affected by disaster per 100,000 people
1.5.2	Direct disaster economic loss in relation to global gross domestic product (GDP)
1.5.3	Number of countries with national and local disaster risk reduction strategies
1.5.4	Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies[19]

Table 1: SDG1 relevant indicators for adaptation to climate change

SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

[19] For more information concerning indicators methodology for SDG 1, metadata files are available here: https://unstats.un.org/sdgs/metadata/files/Metadata-01-05-01.pdf.

Target 2.4 promotes resilient agricultural practices that increase productivity and production, and help maintain ecosystems, thus strengthening the capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters. The unique identified indicator focuses on the positive impact of sustainable agriculture on agricultural areas.

Indicator	Description
2.4.1	Proportion of agricultural area under productive and sustainable agriculture (the Indicator is composed by eleven sub-indicators)[20]

Table 2: SDG2 relevant indicators for adaptation to climate change

SDG 6: Ensure availability and sustainable management of water and sanitation for all

As water is a crucial source for adaptation to climate change in coastal area, SDG 6 comprises three relevant targets on this issue. **Target 6.4** enhances multisector water-use efficiency, sustainable withdrawals and supply of freshwater to address water scarcity; **Target 6.5** promotes an integrated water resources management at all levels and **Target 6.6** deals with water-related ecosystems protection and restoration by 2020. The related indicators focus on both negative (in terms of water stress and water-related ecosystems degradation) and positive changes (in terms of water-use efficiency and integrated water resources management) of water sources due to climate change.

Indicator	Description
6.4.1	Change in water-use efficiency over time
6.4.2	Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
6.5.1	Degree of integrated water resources management

[20] For more information concerning indicators methodology for SDG 2, metadata files are available here: https://unstats.un.org/sdgs/metadata/files/Metadata-02-04-01.pdf

6.6.1	Change in the extent of water-related ecosystems over time (the Indicator is composed of 5 sub-indicators)[21]

Table 3: SDG6 relevant indicators for adaptation to climate change

SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Target 8.4 fosters global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation. Identified indicators measure the impact in terms of material footprint and domestic material consumption.

Indicator	Description
8.4.1	Material footprint, material footprint per capita, and material footprint per GDP
8.4.2	Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP[22]

Table 4: SDG8 relevant indicators for adaptation to climate change

SGD 11: Make cities and human settlements inclusive, safe, resilient and sustainable

SDG 11 includes two relevant targets for adaptation to climate change. **Target 11.5** fosters the reduction of the number of deaths and people affected, as well as the decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters; while **Target 11.b** focuses on the adoption and implementation of integrated policies and plans towards mitigation and adaptation to climate change, resilience to disasters by an increasing number of cities and human settlements, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030. The indicators reflect the focus of each target.

Indicator	Description

[21] For more information concerning indicators methodology for SDG 6, metadata files are available here: https://unstats.un.org/sdgs/metadata/.

[22] For more information concerning indicators methodology for SDG 8, metadata files are available here: https://unstats.un.org/sdgs/metadata/

11.5.1	Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population
11.5.2	Direct economic loss in relation to global GDP, damage to critical infrastructure and number of disruptions to basic services, attributed to disasters
11.b.1	Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030
11.b.2	Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies[23]

Table 5: SDG11 relevant indicators for adaptation to climate change

SDG 12: Ensure sustainable consumption and production patterns

Also, SDG 12 comprises two relevant targets. **Target 12.2** fosters the sustainable management and efficient use of natural resources, while **Target 12.b** focuses on the development and implementation of tools to monitor sustainable development impacts for sustainable tourism. As for SDG 8, the identified indicators measure the impact in terms of material footprint and domestic material consumption, but also accounting tools for tourism sustainability are taken into account.

Indicator	Description
12.2.1	Material footprint, material footprint per capita, and material footprint per GDP
12.2.2	Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP
12.b.1	Implementation of standard accounting tools to monitor the economic and environmental aspects of tourism sustainability[24]

Table 6: SDG12 relevant indicators for adaptation to climate change

[23] For more information concerning indicators methodology for SDG 11, metadata files are available here: https://unstats.un.org/sdgs/metadata/.

[24] For more information concerning indicators methodology for SDG 12, metadata files are available here: https://unstats.un.org/sdgs/metadata/.

SDG 13: Take urgent action to combat climate change and its impacts

As the main Goal tackling climate change, all the targets include relevant issues for adaptation to climate change. In fact, **Target 13.1** aims at strengthening resilience and adaptive capacity to climate-related hazards and natural disasters; **Target 13.2** fosters the integration of climate change measures into national policies, strategies and planning and finally **Target 13.3** pretends to improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning. All these targets are monitored through a set of indicators mainly focused on adaptation, mitigation and disaster risk reduction planning at different levels and institutional and citizen capacity building and awareness-raising.

Indicator	Description
13.1.1	Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population
13.1.2	Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015–2030
13.1.3	Proportion of local governments that adopt and implement local disaster risk reduction strategies in line with national disaster risk reduction strategies
13.2.1	Number of countries with nationally determined contributions, long-term strategies, national adaptation plans, strategies as reported in adaptation communications and national communications
13.3.1	Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment
13.3.2	Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions[25]

Table 7: SDG13 relevant indicators for adaptation to climate change

[25] For more information concerning indicators methodology for SDG 13, metadata files are available here: https://unstats.un.org/sdgs/metadata/.

SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development

As SDG 14 mainly deals with marine and coastal ecosystems, the majority of its targets provide useful inputs for coastal adaptation to climate change. **Target 14.2** promotes the sustainable management and protection of marine and coastal ecosystems to avoid significant adverse impacts by 2020, including by strengthening their resilience, and at the same time enhance concrete actions for their restoration. **Target 14.3** aims to minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation, while **Target 14.5** pretends to conserve at least 10 per cent of coastal and marine areas by 2020. The related indicators mainly monitor the progress of the implementation of concrete actions to minimize the adverse impact of climate change on marine and coastal ecosystems.

Indicator	Description
14.2.1	Number of countries using ecosystem-based approaches to managing marine areas
14.3.1	Average marine acidity (pH) measured at agreed suite of representative sampling stations
14.5.1	Coverage of protected areas in relation to marine areas[26]

Table 8: SDG14 relevant indicators for adaptation to climate change

SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

SDG 15 comprises three targets with concrete actions to enhance the climate resilience of terrestrial ecosystems, important natural and economic sources also in coastal areas. **Target 15.1** aim to ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services by 2020, in particular forests, wetlands, mountains and drylands. **Target 15.5** highlights the importance to take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species. Finally, **Target 15.8** pretends by 2020 to introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and

[26] For more information concerning indicators methodology for SDG 14, metadata files are available here: https://unstats.un.org/sdgs/metadata/.

water ecosystems and control or eradicate the priority species. All these actions are monitored by the indicators presented in Table 9.

Indicator	Description
15.1.2	Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type
15.5.1	Red List Index
15.8.1	Proportion of countries adopting relevant national legislation and adequately resourcing the prevention or control of invasive alien species[27]

Table 9: SDG15 relevant indicators for adaptation to climate change

[27] For more information concerning indicators methodology for SDG 15, metadata files are available here: https://unstats.un.org/sdgs/metadata/.

Annex III: Template of the questionnaire on existing national, regional and local climate adaptation plans

Introduction

Dear Partner,

In the framework of the Activity 5.1 "Critical analysis of existing national and regional/local adaptation plans" of WP5, CMCC Foundation is carrying out a review of adaptation policies in ADRIACLIM's pilot areas.

To this end, we prepared a questionnaire that we ask you to fill in order to provide the data for the pilot area of your concern. The questionnaire is structured into five sections.

1. The first section aims at identifying the main climate-related hazards and impacts you are witnessing in your area.
2. The second section is meant to collect information on the current climate adaptation strategies and plans, at different level of government (National, Regional and locally in the pilot area).
3. In the third section, we ask you to provide information on other policy instruments that might be relevant for adaptation such as sectoral plans and specific action to cope with the hazards/impacts identified in Section 1.
4. The fourth section aims at investigating the monitoring capacity in your pilot area.
5. Finally, the fifth and last section is about citizen engagement.

In order to answer all the questions, you will need some time to find and provide the information and all administrative references (name of the plans, URL, etc.).

This work will be preparatory to the adaptation planning process in your pilot area. Therefore, your contribution and your time will not be wasted and, on the contrary, it will be crucial for the subsequent activities.

The deadline to answer the questionnaire is 14/12/2020.

In case of any doubt, please send an email to: giulia.galluccio@cmcc.it, eugenio.sini@cmcc.it or alice.coita@cmcc.it

We thank you in advance for your time and contribution

Best regards,

CMCC Foundation

Please describe shortly ADRIACLIM's pilot area of your concern.

Pilot area:

Please, indicate the administrative units involved in the pilot area (i.e. municipalities and counties):

Main geographical characterization (you can select more than one option):

Coastal area	☐
Lagoon	☐
Urban area	☐
Agricultural area	☐
Mountain area	☐
Other (please, specify)	

Section 1. Current climate-related hazards in your pilot area

In this section, we ask you to indicate the main climate-related hazards that you are witnessing in your pilot area.

1. **What is the grade of relevance of the following climate-related HAZARDS in your pilot area? Please, rate each hazard from 1 (not relevant) to 5 (most relevant)**

	1	2	3	4	5
Sea Level Rise	☐	☐	☐	☐	☐
Floods	☐	☐	☐	☐	☐
Coastal Storms	☐	☐	☐	☐	☐
Hydrological Droughts	☐	☐	☐	☐	☐
Sea water warming	☐	☐	☐	☐	☐
Heatwaves	☐	☐	☐	☐	☐
Sea acidification	☐	☐	☐	☐	☐

2. **Are you witnessing other climate-related HAZARDS not listed above? If yes, please specify:**

3. **What is the grade of relevance of the following climate-related IMPACTS in your pilot area? Please, rate each hazard from 1 (not relevant) to 5 (most relevant)**

	1	2	3	4	5
Coastal erosion	☐	☐	☐	☐	☐
Biodiversity loss	☐	☐	☐	☐	☐
Alien species' colonization	☐	☐	☐	☐	☐

Soil and freshwater bodies salinization	☐	☐	☐	☐	☐
Forest fires	☐	☐	☐	☐	☐

4. **Are you witnessing other climate-related IMPACTS not listed above? If yes, please specify:**

5. **What are the economic sectors mainly exposed to climate-related IMPACTS?**

Fisheries	☐
Tourism	☐
Agriculture	☐
Industries	☐

6. **Are there other economic sectors exposed to climate-related IMPACTS? If yes, please specify:**

Section 2. Current adaptation strategies and plans

In this section, we would like to collect information on specific adaptation policies, namely adaptation strategies and adaptation plans.

7. Are there ADAPTATION STRATEGIES in your pilot area?

National Strategy	☐
Regional Strategy	☐
Local Strategy	☐

8. Please indicate references below (name or legislative/administrative act and URL to the document):

9. Are there ADAPTATION PLANS in your pilot area?

National Plan	☐
Regional Plan	☐
Local Plan	☐

10. Please indicate references below (name or legislative/administrative act and URL to the document):

11. Concerning the adaptation plans, what is the status of their implementation?

	The plan was approved but no measure was yet implemented	Only some measures were implemented or are in an advanced state of completion	The majority of measures were implemented or are in an advanced state of completion
National Plan	☐	☐	☐
Regional Plan	☐	☐	☐
Local Plan	☐	☐	☐

12. If the implementation of adaptation plans is late in relation to its time schedule, what are in your opinion the main reasons for the delay?

Low legal enforcement	☐
Insufficient financial resources allocated	☐
Unclear responsibilities within the governance structure	☐
Lack of coordination within the governance structure	☐
Inability of the responsible public administrations	☐
Excessive bureaucratic burden	☐
Poor participation of the final implementers/users	☐
Errors in the vulnerability assessment	☐
Errors in the technical design of the adopted measures	☐

Other (specify):

13. Would you consider the implementation of the adaptation plans successful in terms of efficacy and capacity to deliver tangible results?

	Not successful at all	Partially successful	Fully successful	It is too early to evaluate; results are expected in the long-term
National Plan	☐	☐	☐	☐
Regional Plan	☐	☐	☐	☐
Local Plan	☐	☐	☐	☐

14. Please indicate the magnitude of the financial resources envisaged for the implementation of the plan

	No financial resources allocated	From € 0 to € 1.000.000	From € 1.000.000 to € 5.000.000	From € 5.000.000 to € 25.000.000	More than € 25.000.000
National Plan	☐	☐	☐	☐	☐
Regional Plan	☐	☐	☐	☐	☐
Local Plan	☐	☐	☐	☐	☐

15. How would you consider the amount of financial resources?

	Insufficient	Partially sufficient	Sufficient	More than sufficient

National Plan	☐	☐	☐	☐
Regional Plan	☐	☐	☐	☐
Local Plan	☐	☐	☐	☐

Section 3. Other policy instruments and initiatives taken to cope with climate-related hazards

In addition to the previous specific adaptation policies, there might be other policy instruments enforced in your pilot area that might cope with the climate-related hazards and impacts that you identify in Section 1. In this section we ask you to indicate some of them.

16. Are there policy instruments or sectoral plans implemented in your pilot area that take into account adaptation scenarios and measures (more than one answer can be selected)?

	National Level	Regional Level	Local Level	None
Urban plan with relevance for the coastal area	☐	☐	☐	☐
Water management plan	☐	☐	☐	☐
Coastal/littoral plan	☐	☐	☐	☐
Maritime Spatial Plan	☐	☐	☐	☐
Environmental preservation and conservation plan	☐	☐	☐	☐
Energy plan	☐	☐	☐	☐
Agriculture and/or Forestry plan	☐	☐	☐	☐

Hydrogeological instability management plan	☐	☐	☐	☐
Tourism management	☐	☐	☐	☐
Heat health action plan	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐
Other (please specify)	☐	☐	☐	☐

17. For each plan, please indicate references below (name or legislative/administrative act and URL to the document):

18. Are there Integrated Coastal Zone Management Plans (UNEP/MAP/PAP's ICZM Protocol) and Maritime Spatial Plans (Directive 2014/89/EU) being implemented in your Pilot Area? And if so, do they take into account adaptation scenarios and measures? Please indicate references below (name or legislative/administrative act and URL to the document)

Please indicate what type of specific measures have been taken to cope with the climate-related hazards and impacts you identified in Section 1. If you are reporting an action/initiative, please, indicate also if it is carried out in coherence with the objective of your National Adaptation Plan, by flagging the corresponding box in the last column.

Sea Level Rise

19. Have any actions or initiatives been carried out to tackle sea level rise in your pilot area?

		Coherent with your National Adaptation Plan?
Buffer zones creation	☐	☐
Buffer zones extension	☐	☐
Incentives for the abandonment of concerned areas	☐	☐
Non-buildable areas creation	☐	☐
Others (specify):		

20. If any action/initiative has been taken, please indicate reference below (name or legislative/administrative act and URL to the document):

Floods and Coastal Storms

21. Have any actions or initiatives been carried out to tackle floods and sea storms in your pilot area

		Coherent with your National Adaptation Plan?
Dams, dikes, channels, storm surge defences construction	☐	☐

Sustainable land management	☐	☐
Incentives for the abandonment and retreat from flood-prone areas	☐	☐
Requalification of floodplains and wetlands	☐	☐

Others (specify):

22. If any action/initiative has been taken, please indicate reference below (name or legislative/administrative act and URL to the document):

Hydrological Droughts

23. Have any actions or initiatives been carried out to tackle droughts and decreased rainfalls in your pilot area

		Coherent with your National Adaptation Plan?
Rehabilitation and restoration of rivers and coastal wetlands	☐	☐
Sustainable land management	☐	☐
Adaptation of groundwater management	☐	☐
Adaptation of drought and water conservation plans	☐	☐

Others (specify):

24. If any action/initiative has been taken, please indicate reference below (name or legislative/administrative act and URL to the document):

Sea Water Warming

25. Have any actions or initiatives been carried out to sea water warming in your pilot area?

		Coherent with your National Adaptation Plan?
Precautionary catch limits to prevent overfishing	☐	☐
Aquaculture changes (in crops and methods)	☐	☐
Others (specify):		

26. If any action/initiative has been taken, please indicate reference below (name or legislative/administrative act and URL to the document):

Heatwaves

27. Have any actions or initiatives been carried out to tackle heatwaves in your pilot area?

		Coherent with your National Adaptation Plan?
Heath-health watch system	☐	☐
Green spaces and corridors in urban areas	☐	☐
Standardised meteorological heat wave warnings	☐	☐
Climate proofing of buildings against excessive heat	☐	☐
Restoration and management of coastal wetlands	☐	☐
Enhanced care for vulnerable groups	☐	☐
Others (specify):		

28. If any action/initiative has been taken, please indicate reference below (name or legislative/administrative act and URL to the document):

Sea acidification

29. Have any actions or initiatives been carried out to tackle sea acidification in your pilot area?

		Coherent with your National Adaptation Plan?
Coral reef restoration operations	☐	☐
Others (specify):		

30. If any action/initiative has been taken, please indicate reference below (name or legislative/administrative act and URL to the document):

Please indicate what type of specific measures have been taken to cope with the climate-related impacts you identified in Section 1.

Coastal Erosion

31. Have any actions or initiatives been carried out to tackle coastal erosion in your pilot area?

		Coherent with your National Adaptation Plan?
Dyke cleaning or other actions to facilitate sediments flow towards coasts	☐	☐
Beach nourishment operations	☐	☐
Barriers construction and/or reinforcement	☐	☐
Artificial dunes building or strengthening	☐	☐
Coastline elevation operations	☐	☐
Others (specify):		

32. If any action/initiative has been taken, please indicate reference below (name or legislative/administrative act and URL to the document):

Biodiversity, ecosystems and alien species

33. Have any actions or initiatives been carried out to tackle biodiversity and ecosystem loss, and alien species invasion in your pilot area?

		Coherent with your National Adaptation Plan?
Re-naturalization initiatives to address human-induced coastal degradation	☐	☐

Creation of retreat zones	☐	☐
Preservation of coastal biodiversity and areas of ecological interest (e.g., Nature2000)	☐	☐
Identification of favorable areas for habitat expansion	☐	☐
Eutrophication control	☐	☐

Others (specify):

34. If any action/initiative has been taken, please indicate reference below (name or legislative/administrative act and URL to the document):

Soil and freshwater salinization

35. Have any actions or initiatives been carried out to tackle soil and freshwater salinization in your pilot area?

		Coherent with your National Adaptation Plan?
Structures to halt salt trespass	☐	☐
Selection of salt-tolerant crops	☐	☐
Desalinization techniques	☐	☐

Others (specify):

36. If any action/initiative has been taken, please indicate reference below (name or legislative/administrative act and URL to the document):

Forest Fires

37. Have any actions or initiatives been carried out to tackle forest fires in your pilot area?

		Coherent with your National Adaptation Plan?
Improvements in active fire suppression	☐	☐
Fire break areas creation to restrict the potential spread of fires (e.g., agricultural fields as fire breaks)	☐	☐
Fuel removal by prescribed burnings	☐	☐

Others (specify):

38. If any action/initiative has been taken, please indicate reference below (name or legislative/administrative act and URL to the document):

Section 4. Monitoring and tracking tools.

In this section, we ask you to provide basic information about the monitoring systems implemented in your pilot area.

	YES	NO
39. Do you have an early warning/alert system already active in your pilot area?	☐	☐
40. Do you have an active environmental monitoring system in your pilot area?	☐	☐

41. If so, which sectors does it monitor:

Sea level rise	☐
Flood impacts	☐
Drought impacts	☐
Heatwaves impacts	☐
Coastal erosion	☐
Sea water warming	☐
Ecosystem service provision	☐
Biodiversity status and loss rates	☐
Alien species invasion	☐
Soil salinity	☐
Sea acidification	☐
Public health	☐

42. If an adaptation plan is implemented in your pilot area, does it have an active monitoring system to evaluate the measures?

No	☐
Yes, but only to monitor the progress in the implementation of each measure	☐
Yes, it monitors both the progress and the efficacy in the implementation of each measure	☐

Section 5. Citizens' engagement.

In this section, we would like to know your opinion about the citizens' awareness on the issue of climate change in your country and in your pilot area.

43. In your opinion, how is the situation in terms of communication and awareness related to climate change hazards and adaptation measures for coastal areas?

	Not satisfactory	Partially satisfactory	Fairly effective	Effective	Very effective
At national level	☐	☐	☐	☐	☐
At regional level	☐	☐	☐	☐	☐
Within your pilot area's local community	☐	☐	☐	☐	☐

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