RISC-KIT

Resilience-Increasing Strategies for Coasts – Toolkit

www.risckit.eu

Web-based Management Guide

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Publishable Summary

The Resilience-Increasing Strategies for Coasts – Toolkit (RISC-KIT) FP7 EU project (2013-2017) aims to produce a set of innovative and EU-coherent open-source and open- access methods, tools and management approaches (the RISC-KIT) in support of coastal managers, decision-makers and policy makers to reduce risk and increase resilience to low- frequency, high impact hydro-meteorological events.

The RISC-KIT Web-based Management Guide is one of the five RISC KIT tools designed to highlight key principles recommended for the planning of local DRR measures using examples from the case studies and elsewhere to provide practical illustrations. It is intended to give guidance to coastal managers in Europe and those facing similar challenges beyond the region as well as other groups concerned with coastal management (i.e. coastal resource users, technical and scientific experts and policy makers). The guide includes prevention, mitigation, protection and preparedness measures with recommendations for their use in various socio-economic, cultural and environmental settings.

The web-guide can be visited at: **http://coastal-management.eu/**

Executive Summary

The Resilience-Increasing Strategies for Coasts – Toolkit (RISC-KIT) FP7 EU project (2013-2017) aims to produce a set of innovative and EU-coherent open-source and open- access methods, tools and management approaches (the RISC-KIT) in support of coastal managers, decision-makers and policy makers to reduce risk and increase resilience to low- frequency, high impact hydro-meteorological events.

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The web-guide can be visited at: **http://coastal-management.eu/**

1 Introduction

Recent and historic low-frequency, high-impact events such as Xynthia (impacting France in 2010), the 2011 Liguria (Italy) Flash Floods and the 1953 North Sea storm surge which inundated parts of the Netherlands, Belgium and the UK have demonstrated the flood risks faced by exposed coastal areas in Europe. Typhoons in Asia (such as Typhoon Haiyan in the Philippines in November 2013), hurricanes in the Caribbean and Gulf of Mexico, and Superstorm Sandy, impacting the northeastern U.S.A. in October 2012, have demonstrated how even larger flooding events pose a significant risk and can devastate and immobilize large cities and countries.

These coastal zone risks are likely to increase in the future (IPPC, AR5) which requires a re-evaluation of coastal disaster risk reduction (DRR) strategies and a new mix of prevention (e.g. dike protection), mitigation (e.g. limiting construction in flood-prone areas; eco-system based solutions) and preparedness (e.g. Early Warning Systems, EWS) (PMP) measures. Even without a change in risk due to climate or socio-economic changes, a re-evaluation is necessary in the light of a growing appreciation of ecological and natural values which drive ecosystem-based or Nature-based flood defense approaches. In addition, as free space is becoming sparse, coastal DRR plans need to be spatially efficient, allowing for multi-functionality.

1.1 Project objectives

In response to these challenges, the RISC-KIT project aims to deliver a set of open-source and open-access methods, tools and management approaches to reduce risk and increase resilience to low-frequency, high-impact hydro-meteorological events in the coastal zone. These products will enhance forecasting, prediction and early warning capabilities, improve the assessment of long-term coastal risk and optimise the mix of PMP-measures. Specific objectives are:

1. Review and analysis of current-practice coastal risk management plans and lessons-learned of historical large-scale events;
2. Collection of local socio-cultural-economic and physical data at case study sites through end-user and stakeholder consultation to be stored in an impact-oriented coastal risk database;
3. Development of a regional-scale coastal risk assessment framework (CRAF) to assess present and future risk due to multi-hazards (**Figure 1.1**, top panel);
4. Development of an impact-oriented Early Warning and Decision Support System (EWS/DSS) for hot spot areas consisting of: i) a free-ware system to predict hazard intensities using coupled hydro-meteo and morphological models and ii) a Bayesian-based Decision Support System which integrates hazards and socio-economic, cultural and environmental consequences (**Figure 1.1**, centre panel);
5. Development of potential DRR measures and the design of ecosystem-based and cost-effective, (non-)technological DRR plans in close cooperation with end-users for a diverse set of case study sites on all European regional seas and on one tropical coast (**Figure 1.1**; bottom panel);

6. Application of CRAF and EWS/DSS tools at the case study sites to test the DRR plans for a combination of scenarios of climate-related hazard and socio-economic vulnerability change and demonstration of the operational mode;
7. Development of a web-based management guide for developing integrated DRR plans along Europe's coasts and beyond and provide a synthesis of lessons learned in RISC-KIT in the form of policy guidance and recommendations at the national and EU level.

The tools are to be demonstrated on case study sites on a range of EU coasts in the North- and Baltic Sea Region, Atlantic Ocean, Black Sea and Mediterranean Sea, and one site in Bangladesh, see Figure 1.2. These sites constitute diverse geomorphic settings, land use, forcing, hazard types and socio-economic, cultural and environmental characteristics. All selected regions are most frequently affected by storm surges and coastal erosion. A management guide of PMP measures and management approaches will be developed. The toolkit will benefit forecasting and civil protection agencies, coastal managers, local government, community members, NGOs, the general public and scientists.

1.2 Project structure

The project is structured into seven Work Packages (WP) starting with WP1 on 'Data collection, review and historical analysis'.; WP2–4 will create the components of the RISC-toolKIT containing an 'Improved method for regional scale vulnerability and risk assessment' (WP2), 'Enhanced early warning and scenario evaluation capabilities for hot spots' (WP3) as well as 'New management and policy approaches to increase coastal resilience' (WP4). The toolkit will be tested through 'Application at case study sites' (WP5). WP6 will be responsible for 'Dissemination, knowledge transfer and exploitation' and 'Coordination and Management' are handled in WP7.

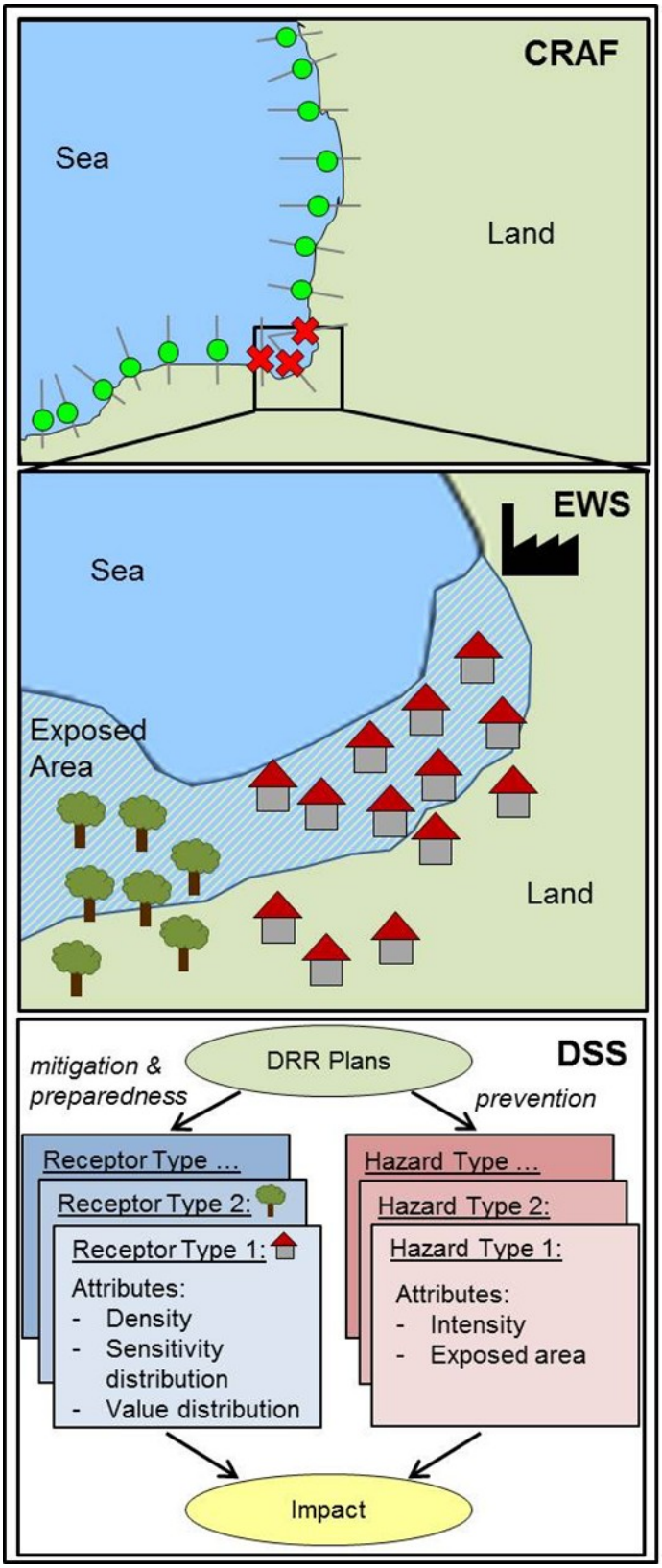

Figure 1.1: Conceptual drawing of the CRAF (top panel), the EWS (middle panel) and the DSS (bottom panel)

Figure 1.2: Case study sites (stars), RISC-KIT case study site partners (blue solid dots) and non-case study site partners (red open circles).

1.3 Deliverable context and objective

The current deliverable 4.3 is part of WP 4. The objective of WP 4 is described in the DOW as follow:

- *Develop potential DRR measures*
- *Design site-specific DRR plans and evaluate their effectiveness and feasibility after their application and scenario testing at case study sites in WP5*
- *Create a web-based management guide for developing integrated risk-reduction plans in other locations*
- *Synthesise findings and provide recommendations for management and policy guidance*

The task 4.3 is described in the DOW with the following description:

> *"Drawing on the outcomes of Tasks 4.1 and 4.2, Task 4.3 will create a web-based management guide (D4.3) to facilitate EU-wide learning and exchange for the development of risk reduction plans. The guide will highlight key principles recommended for the design and implementation of local DRR plans and strategies using examples from the case studies and elsewhere to provide*

practical illustrations. It will give guidance to coastal managers in Europe and those facing similar challenges beyond the region as well as other groups concerned with coastal management (i.e. coastal resource users, technical and scientific experts and policy makers). The guide will include prevention, mitigation and preparedness measures with recommendations for their use in various socio-economic, cultural and environmental settings. It will make recommendations about cost-effectiveness and the value of ecosystem services, distinguish realistic and effective strategies, provide methods for local stakeholder involvement and make recommendations about the development of timelines for decision-making. This web-based management guide will be published in the form of an open-access webpage (as part of the website developed in WP6) and will form the policy and management component of the RISC-toolKIT."

In the project execution, the goals of the DoW were followed. For the layout of the website, additionally to the DoW, a study of existing guides and a survey among RISC-KIT End Users were undertaken (see section 2). Results from Task 4.1 and 4.2 paved the decision to focus strongly on different kind of DRR measures (see section 3.2). These measures address aspects, like the differentiation between prevention, mitigation and preparedness measures. Cost-effectiveness, ecosystem services, or methods for local stakeholder involvement are considered in the description of the measures or examples of implemented measures. During the phase of End-User consultation the structure of the guide was developed and it was decided to build the guide on three pillars: Measures, People & Stories, and Governance. Additionally to the measures, it is important to address the perception of coastal stakeholder (section 3.3) and the different governance settings (from local to international level, see section 3.4). Instead of developing the guide as part of the RISC-KIT website, it was decided (mainly due to technical web-publishing aspects) to develop a stand-alone web-site. The web-site is hosted at the Ecologic Institute and it is secured that the website will be available beyond the time-line of the project.

This deliverable addresses the objective of WP 4 and Project Objective 7 (Development of a web-based management guide for developing integrated DRR plans along Europe's coasts and beyond and provide a synthesis of lessons learned in RISC-KIT in the form of policy guidance and recommendations at the national and EU level.) by launching the web-based guide '**RISC-KIT Coastal Management Guide'** via **http://coastal-management.eu/**.

1.4 Approach

The Web-based Management Guide is part of the RISC-KIT Toolbox. The tools are:

- The Storm Impact Database of present and historic socioeconomic and physical data;
- The Coastal Risk Assessment Framework (CRAF) to identify - at the regional scale (100's km) - present and future hot spot areas of coastal risk:
- The Web-based Management Guide offering innovative, cost-effective, ecosystem-based DRR measures;

- Quantitative, high-resolution Hotspot Tool to evaluate the effectiveness of DRR measures in hot spots (with a scale of 10's km);
- Multi-Criteria Analysis Tool (MCA) to assess alternative DRR measures with stakeholders.

The goal of the guide is therefore the presentation of DRR measures to coastal managers. To achieve this goal; we firstly analyzed existing web-guides with the topic of risk-management. We resembled five different guides that illustrate different strengths and weaknesses of web-guides. These guides were presented and discussed at the RISC-KIT End User Day in Brussels (October 2015) and whishes for a RISC-KIT Web guide were collected.

Based on the outcome of these results, we developed the Web-based Management Guide (**http://coastal-management.eu/**), with three main sections. Risk management planning is the result of the interaction of a measure with the biophysics of the coasts ("COASTAL FEAUTURES"), the human behaviour ("PEOPLE & STORIES") and the institutional arrangements ("GOVERNANCE"). Each coast is characterized by bio-physical and cultural particularities, like coastal morphology, heritage, cultural values, legal and administrative traditions, interpretations of risk and economic situation. Therefore, the utilization of a given measures can only be successful if the particular biophysical, cultural and institutional background that the measure steams from are well understood.

1.5 Outline of the report

This report is structured as follows. In Chapter 2, the methodical approach is described in detail. The section describes the analysis of existing web guides (2.1) and the discussion and results of the RISC-KIT End User' Day in Brussels (2.2). Chapter 3 is structured as the guide itself and describes the measure section (3.2), people & stories (3.3) and the governance section of the web guide (3.3).

2 Methodical approach

2.1 Analysis of existing websites

For the implementation of the guide it was necessary to analyse existing examples to get an overview of the already existing examples and also to get ideas of what to include in a guide. Basically existing guides can be classified in three different ways:

- Module-based
- Interactive
- Map-based

Five examples of existing guides were chosen and presented at the RISC-KIT's End User day on October 14th 2015.

1. AGWA Guide
2. Risk Management Strategies for Coastal Communities
3. Perseus Guide
4. Coastlearn (EUCC)
5. Climate & Disaster Risk Screening Tools - Coastal Flood Protection (WorldBank)

2.2 Discussion of existing guides at RISC-KIT End User Day

At the RISC-KIT's End User day in October 2015, the five existing guides were discussed with the end user and case study owner. Reactions to these guides are listed below.

AGWA-Guide

http://agwaguide.org/EEDS/index.html#welcome

- Too much text & fond too small
- A nice e-book that only provides a one-way direction of knowledge/learning
- The figures included are irrelevant for the text
- Nice background and colors
- The arrows get lost with the background. It takes time to decide what the arrows are for. Not very obvious for the user
- The guide is interactive and entertaining
- Visually friendly
- Not very navigable

Risk Management Strategies for Coastal Communities

http://www.nad.usace.army.mil/CompStudy

- really comprehensive
- Good maps with example
- Who is the target group of the guide?

Perseus Guide

http://www.perseus-net.eu/en/about_the_apf_toolbox/index.html

- Too much text sometimes
- Very good structured
- Clear set up and easy to navigate
- Appealing, but maybe not suiteable for risc-kit?

Coastlearn (EUCC)

http://www.coastlearn.org/

- Not very structured
- Lots of text
- 'old fashioned' – but easy to navigate
- Lots of information

Climate & Disaster Risk Screening Tools - Coastal Flood Protection (World Bank)

https://climatescreeningtools.worldbank.org/cfp/project-information?ref=cfp

- Very wordy
- Good: interactive
- Good: get an pdf at the end with all results
- not many maps and illustrations
- too complex

At a later stage of the End Users days, the participants were asked their needs and whishes for a management guide. There were around 13 End Users answering the questions in average. The results are shown as follows:

Before today, had you ever used a web-based management guide?

- Yes 42%
- No 50%
- Not sure / Can't remember 8%

In case your answer is yes and you have used web-based management guides before: On which issues did you seek guidance?

- Disaster risk reduction 0%
- Other areas of work 100%

What is your main source of information?

- Verbal conversations 8%
- Web based information 62%
- Printed material 31%

Which one of the seen web-based management guides did you like best?

- AGWA Guide 0%

- **US Army Corps of Engineers** 58%
- Perseus Guide 25%
- Coastlearn (EUCC) 0%
- World Bank 17%

Which one did you like least?

- **AGWA Guide** 33%
- US Army Corps of Engineers 0%
- Perseus Guide 8%
- **Coastlearn (EUCC)** 33%
- World Bank 25%

We also asked the stakeholder to choose item that are very important and not so important for a web-based management guide

Very important:

- Case studies
- Step by Step guide
- Open source raw data
- List / description of DRR measures and plans

Not so important:

- Information about funding
- YouTube Videos

In a last question the participants were asked to write their wishes for a guide in short statement, these are the most relevant answers:

- For it to be clear and easy to understand to the coastal practitioner
- Providing the most relevant DRR
- Give a good case study repertory
- Easy access to information of interest
- Oriented on practical life
- Illustrations and maps

These information and personal communications were the basis for the development of the basic concept of the guide. It became clear, that:

- Less (text) is more
- Pictures and illustrations are important
- Maps are an attractive element
- Appealing layout of website is wanted

3 Elements of the Web-based Management Guide

3.1 Structure of the guide

Based on the input by the RISC-KIT end users, the Web-based Management Guide is built on three main elements imbedded in the frame of the RISC-KIT Case Studies (see Figure 3.1). Each coast is characterized by specific bio-physical and social particularities, like coastal morphology, heritage, cultural values, legal and administrative traditions, interpretations of risk and economic situation. To successfully apply coastal risk management and planning, suitable DRR alternatives ("STRATEGIES") have to be analyzed with respect to the biophysics of the coasts ("COASTAL FEATURES"), the human behaviour ("PEOPLE & STORIES") and the institutional arrangements ("GOVERNANCE"). On the introduction slide from the website, the user can choose where they want explore more. In this section, these different elements are described in more detail.

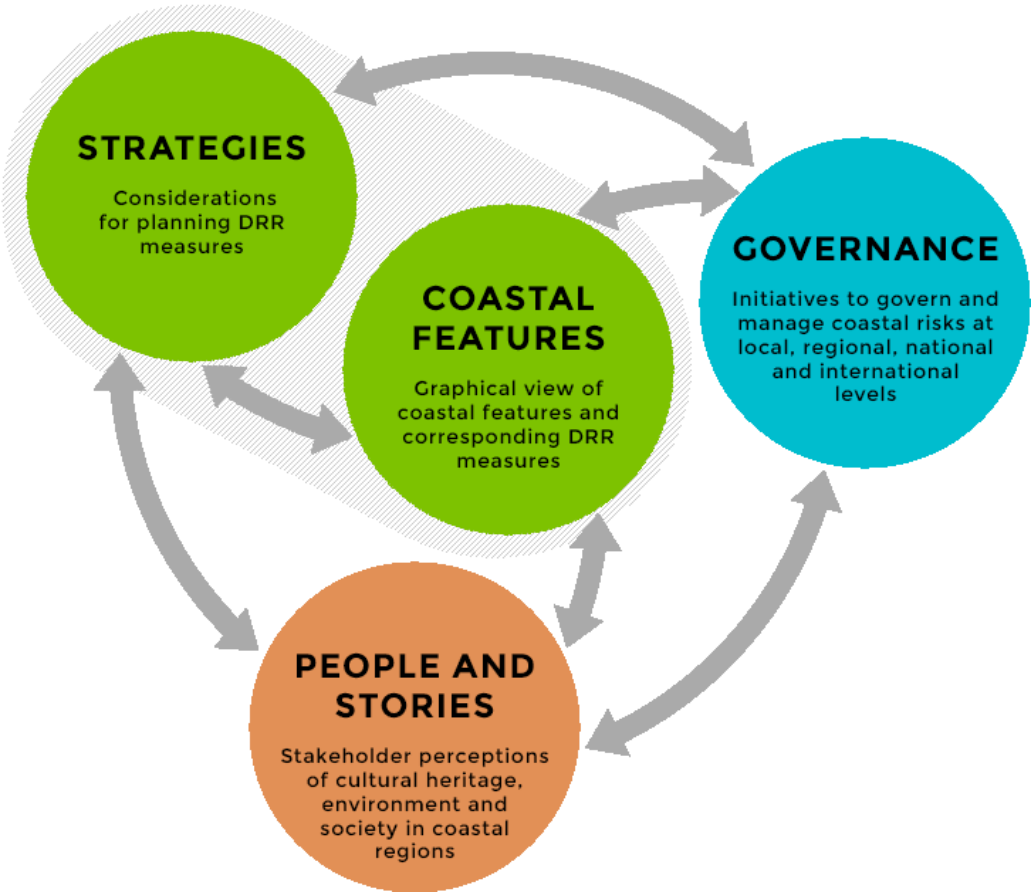

Figure 3.1: Main elements of the guide

The Web-based Management Guide can be viewed via **http://coastal-management.eu/**.

3.2 Coastal Features and Strategies

Recent and historic low-frequency, high-impact events have demonstrated the flood risks faced by exposed coastal areas in Europe. Coastal risks are likely to increase in the future. This projected increase in risk along coasts requires a re-evaluation of coastal DRR strategies and measures that are aimed to reduce damaging impacts on human health, the environment, cultural heritage and economic activity. This guide provides information on available "MEASURES" that can help deal with and prevent damages from such hazards and impacts. But in order to be able to decide on the best possible measure, they have to be carefully evaluated. A Disaster risk management is a key element in successfully implementing DRR measures. Different disaster risk management approaches are displayed in the "STRATEGIES" section. Key Element is the Disaster Risk Reduction Management Cycle. It consists of four phases: Response, Recovery, Prevention and Preparedness. Focus of the RISC-KIT project lays mainly on the pre-disaster phase with tools that address Prevention/Mitigation and Preparedness aspects. Therefore, the presented measures in this guide are classified under prevention, mitigation, and preparedness measures.

Coastal risks will appear on different coastal features that are symbolized in the guide as shown in Figure 3.2. It symbolizes typical features of European coastline, despite the local differences. It distinguishes roughly between natural features ('Dunes & sandy beaches', 'Cliffs & rocky beaches', 'Rivers & estuaries', and 'Wetland') and human usages ('Coastal towns', 'Coastal infrastructure', 'Heritage sites'). These features are accompanied by additional supporting tools. When choosing a feature, a basic description of one feature (with reference to its main usage and risks) and the main list of DRR measures are available. Overall there are more than 60 DRR strategies and measures presented in the guide.

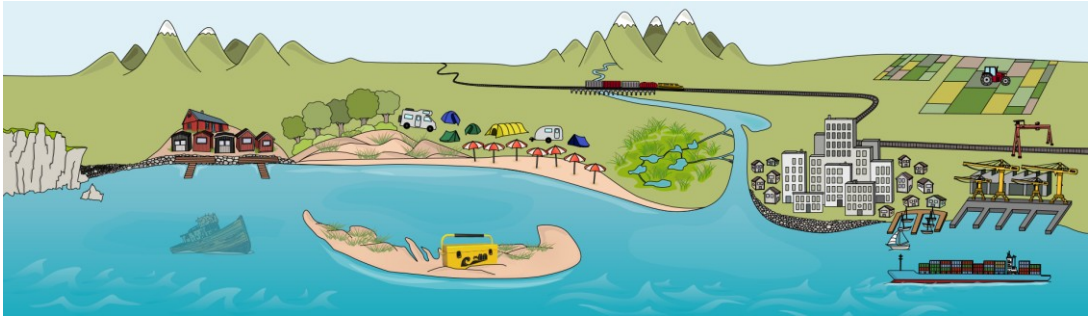

Figure 3.2: View of the different coastal features

We classify the measures along different aspects. For example these measures consist of a mix of prevention (i.e. dike protection), mitigation (i.e. limiting construction in flood-prone areas) and preparedness (i.e Early warning systems, EWS) measures.

Under each of these three categories DRR measures relevant to the specific coastal feature are selectable. Some measures can be found in multiple coastal features (for example a sea wall can protect coastal towns and coastal infrastructure). In general there are around five to fifteen measures per category (prevention, etc.) and coastal feature. By choosing a DRR measure, a separate page will open with the description of the measure.

This description starts with a classification of different aspects. A measure can be classified four different categories:

- Addressed Risk
- 'structural and non-structural measures
- Type of coastal defence strategy
- Type of measure

All DRR measures are designed to address certain risks (**Addressed Risk**). We distinguish between 'Riverine or slow rise floods', 'Flash floods', 'Estuarine floods', 'Coastal floods or storm surges' 'Urban floods', and 'Erosion'. Another way to distinguish between the presented measures is to divide the measure between so-called green and grey measures (**structural and non-structural measures**). While grey measures typically describe engineered measures (like sea-walls), green measures typically address an ecosystem based approach (like creating buffer zones). Additionally there can also be a combination of green and grey measures (e.g. managed realignment) and measures that are not considered neither green nor grey are considered as 'non-structural' measures. For the structural measures, there are five generic strategies for coastal defence (**Type of coastal defence strategy**, see Figure 3.3).

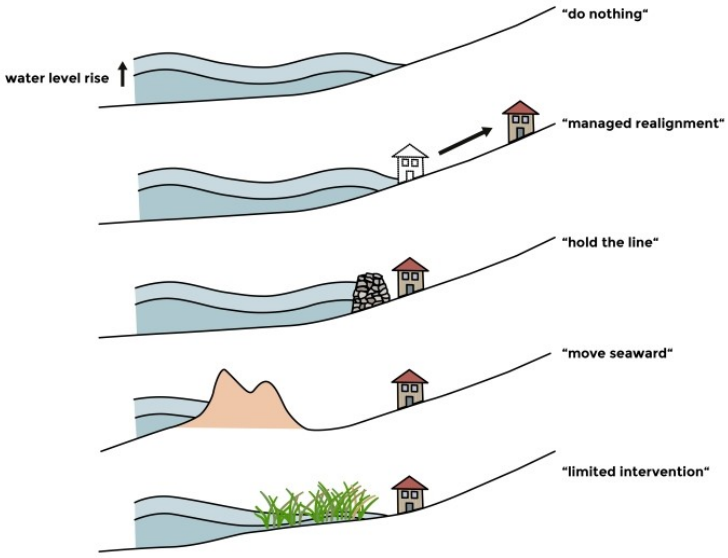

Figure 3.3: Five different strategies for coastal defence in case of sea level rise (based on Dronkers et al. 1990 and Fröhle & Müncheberg 2013)

The European Commission published a guidance document for Reporting under the Floods Directive in 2013. In this document they defined different types of measures for flood risk management. The measures presented in the guide are also classified according to the guidance document (**Type of measure**) and include:

- Avoidance
- Channel, Coastal and Floodplain Works
- Emergency Event and Contingency Planning

- Flood Forecasting and Warning
- Natural flood, runoff, catchment management
- Public Awareness and Preparedness
- Reduction
- Removal or relocation
- Surface Water Management
- Water flow regulation

The presentation of each measure is followed by a short introduction and the main information source the description is based on. Since there is already a lot of very useful information available for the general description of DRR measures, appropriate descriptions were used in the guide. For this an exhaustive literature review was undertaken and a selection of different main sources was considered. The selected sources provide excellent information on DRR measures and the copyright holder of these sources were approached and asked for their collaboration. With the approval, we gathered existing knowledge on DRR measures and complemented this with new research insights and practical illustrations from the RISC-KIT project. All sections stemming from external sources are referenced with a clearly visible web link back to the source. Feedback from the authors were in the most cases very quickly and positive. In particular sources stemming from the UK were easy to use, because we were encouraged to use and re-use information that contains public sector information licensed under the Open Government Licence v3.0. For example, we made used of the Fluvial Design Guide that was developed by the UK Environment Agency (2009). It provides very good description of 'Rivers dredging', Flood embankments and Floodwall', or 'River bank restoration' that we incorporated into the guide.

We also received permission from the Scottish Natural Heritage to reproduce text from their 'guide to managing coastal erosion in beach/dune systems'(Scottish Natural Heritage 2000). The Scottish Environment Protection Agency (SEPA) gave permission to quote their 'Natural Flood Management Handbook' (SEPA 2015). Permission to re-use the Handbook 'Cities and Flooding: A Guide to Integrated Urban Flood Risk Management for the 21st Century" (Abhas et al. 2012) was given by the World Bank. The World Meteorological Organization (WMO) has given permission to re-use their information produced by the Associated Programme on Flood Management (APFM). In particular they produced the Integrated Flood Management Tools Series a handbook about Flood Proofing (APFM 2012) that gave valuable information for the measures like 'Dry Flood proofing' or 'Exposed elements relocation'.

The description of the measures can be supplemented with a photo gallery, a short text about the key lessons learnt, a box with suggestions for further readings, and references used.

For most of the measures presented in this guide, an example of the measure implemented in a real life scenario is provided. Examples from the RISC-KIT case study areas were used when possible. Three criteria were used to guide the selection of the case study examples of implementation. They were: **innovation**, **cost-effectiveness**, and **ecosystem-based** approaches. Case studies that included the implementation of multiple or mutually re-enforcing measures were also selected based on their innovative approach. At least one of these criteria had to be successfully fulfilled in order to be selected as good example for the Web-based

Management Guide. With the focus on these three criteria, some of the examples combine two or more DRR measures, therefore some examples can be found under several DRR measures.

3.3 People & stories

Most coastal nations in Europe look back of a history of thousands of years of living with the risky environment of the sea. This of course formed awareness and shaped actions for prevention and preparedness embedded in European cultural memory: Building defenses, establishing communities on terps[1] or moving away in risky times were some typical DRR measures which have been applied throughout all times of coastal humankind.

For the last centuries however, coastal population alienated from living with the sea. Instead it was thought that sea and land are two different things resulting in predominantly believe of technical superiority over the sea and inexhaustible engineering capacities.

Moreover, coastal systems are spaces which contain embedded stories based on what has happened there in certain circumstances, times and geographical regions. This section is structured into five sub-headings:

- Tourism and recreation
- Economy and conservation
- Historical knowledge
- Sea-based traditions
- Cultural heritage

The section "People and Stories" highlights voices of coastal people in their capacity as professionals, residents, civil society representatives and scientists. These narratives are context specific opinions. They are individual perceptions but do not represent the opinion of an entire group of stakeholders for a region or country. The quotes steam from more than 150 narrative interviews undertaken in several European coastal regions. Some additional interviews took place within another project. They are selected because they show different perspectives of different stakeholders and why they tell the story the way they do.

3.4 Governance

Compared to the attention directed at coastal protection measures, the governance of disaster risk has been relatively unexplored, although it is an area of research that has grown exponentially in recent years. Gall et al. (2014) have identified four ‘clusters’ in disaster governance research: 1) elements of disaster governance; 2) measures of the effectiveness of disaster governance; 3) governance lessons learned from past disasters; and 4) connections to climate adaptation and sustainability governance. However, Gall et al (2014) note that these remain largely conceptual and are driven by theoretical discussions of good governance. The activities of the Risc-Kit project aim to

[1] Terps, also known as warfs, are artificial dwelling mounds typically found plain areas in northern Germany, Netherlands and Denmark.

contribute the empirical knowledge base on current governance of disaster risk in Europe. The project's findings support research by Walker et al. (2014) who highlight the high level of variation in governance and management of natural hazards and risks between EU Member States. A standardisation of approaches for implementing the EU Floods Directive was considered to be far off the target, and at international level, shortcomings in the Hyogo Framework for Action have added confusion to the already complex systems of emergency response at national level (2015). The insights from workshops and over 150 interviews conducted in Risc-Kit case study areas also found considerable variation in the actors involved in DRR governance and the extent of their participation in these processes.

The 'Governance' section of the Risc-Kit webguide brings together research insights on policy frameworks (e.g. laws, regulations, plans, strategies, programmes) and actors (governmental and non-governmental) engaged in DRR and coastal protection for 11 European case study areas. The guide reflects the multi-level governance frameworks in action in these case study areas by summarising the supranational (EU and international), national, regional and local level policy frameworks in play. Nomenclature of territorial units for statistics (NUTS) maps and short facts (e.g. number of coastal administrative districts) enable an initial comparison between the case study countries. Basic information on the policy frameworks is coupled with information on implementation based on stakeholder interviews and expert insights from project partners. This is complemented, as in all other areas of the guide, with illustrative quotes from stakeholder interviews to provide specific context.

This section outlines laws, policies, plans and regulations for coastal protection and disaster risk reduction in Europe. It describes who is responsible for making decisions in relation to coastal risks and who carries out these activities. Evidence from over 150 interviewees across Europe shows how these governmental programmes are implemented and perceived by different groups of people in coastal zones.

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