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Strategic Planning in Coastal Risk Management COMRISK Subproject 2

PAUL SAYERS, IAN MEADOWCROFT

Summary

Strategic planning describes the planning framework to translate policy aims into practical decisions. The planning framework needs to reflect the policy in each case, so frameworks will differ. But there will also be common principles and common elements. Sub-project 2 in COMRISK aimed to understand the process of strategic planning, to explore how it can support flood risk assessment and management, and to identify common elements of strategic planning – and contrasting approaches – in North Sea coastal countries.

We identified the following elements in a risk-based strategic planning process: problem formulation; flood risk analysis; options generation and decision-making; implementation; and monitoring and review. The objectives for the plan will normally be determined by the policy aims (SP1) and through participative processes (SP3). Flood risk analysis will draw on analysis of the hydraulic boundary conditions (SP5). The 'options selection' and 'monitoring and review' stages will need to take account of the performance of risk management measures (SP4).

Finally, as in SP1, we note the importance of context in determining the best form of strategic planning. We find that the benefits are greatest where there are complex extensive flood plains and flood defence systems, where long term planning is needed, and where the solutions are potentially complex, relying on a suite of complementary risk management measures such as flood defence, warning and land use planning. In these circumstances a structured approach to strategic planning will have significant benefits in terms of flood risk management.

Zusammenfassung

Strategische Planung beschreibt den Rahmen für die Umsetzung der politischen Ziele in praktische Entscheidungen. Dieses Rahmenwerk soll die jeweilige Strategie reflektieren, weshalb sie unterschiedlich ausfallen werden. Andererseits werden gemeinsame Prinzipien und Elemente existieren. COMRISK Teilprojekt 2 zielte darauf ab, den strategischen Planungsprozess zu verstehen, zu untersuchen wie es Flutrisikomanagement unterstützen kann, und gemeinsame Elemente sowie unterschiedliche Ansätze in der strategischen Planung in den Nordsee-Anrainerstaaten zu identifizieren.

Die folgenden Elemente in einem risikobasierten Planungsprozess wurden ermittelt: Problemstellung; Flutrisikoanalyse; Variantenerstellung und Entscheidungsfindung; Umsetzung; Überwachung und Prüfung. Die Ziele eines Planes werden normalerweise bestimmt durch die politischen Ziele (Teilprojekt 1) und durch Beteiligungsverfahren (Teilprojekt 3). Die Elemente „Variantenauswahl" und „Überwachung und Prüfung" müssen die Leistung der Maßnahmen zum Risikomanagement berücksichtigen (Teilprojekt 4).

Letztendlich wird, wie in Teilprojekt 1, die Bedeutung des jeweiligen Kontexts bei der Ermittlung der optimalen strategischen Planung betont. Es wird gefolgert, dass die Vorteile der strategischen Planung dort am Größten sind, wo großräumige und komplexe Küstenniederungen betroffen sind die langfristige Planung benötigen und wo die Lösungen relativ komplex ausfallen werden (bestehend aus einem Mix von komplementäre Lösungen wie Hochwasserschutz, Flutwarnung und Raumplanung). In diesen Fällen wird ein strukturierter Ansatz wie strategische Planung signifikante Vorteile bezüglich eines Flutrisikomanagements aufweisen.

Keywords

Coast, risk management, flood defence, strategic planning

Contents

1. Strategic planning as part of COMRISK

Strategic planning is the process for defining how policy aims are translated into action. Policy is produced with the intention of reducing undesirable outcomes and promoting desirable ones. Often, however, this is not straightforward reflecting the complexity of the flood system and the need to appraise and implement both structural and non-structural options in a logical manner. Particular difficulties arise when:

- problems are of a large-scale and solutions of a long-term nature are involved;
- works need to be implemented, monitored and adapted over a long time scale;
- there are process connections and interactions between different areas and options;
- the relationships between cause and effect is complex involving interconnected benefit areas and environment, social and economic impacts.

The process of strategic planning must therefore facilitate:

- the integration of short and long term actions
- the structured implementation of a combination of actions
- the translation of **Policy** to **practice**.

To develop an optimum ‚mix' of risk management measures and policies requires a good understanding of present and future risks; spatial distribution of flood risk, natural and man-made pressure on flood risk, and appraisal of flood risk management measures within a context of coastal zone and spatial planning policies.

The term 'strategic planning' is therefore used to mean the co-ordinated analysis, planning and decision-making to achieve flood management policy objectives.

2. Aims and outputs of sub-project 2

The subproject has the following specific objectives:

- To provide a non-technical overview of the strategic tools and techniques for planners and risk managers in each partner country.
- To evaluate these approaches in terms of their ability to answer the needs of managers and strategic planners.
- Provide recommendations to improve cross-border dissemination and application of common strategic and spatial planning methods.

A consultation workshop for sub-project 2 was held in Den Hague in the Netherlands at the offices of RIKZ on 17th and 18th of February 2004.

Fig. 1: Workshop attendees – A site visit to a dune system in the Netherlands

The Workshop programme also included a visit to a number of flood defence structures, and areas where flood risk management poses particular challenges in the Netherlands. These provided excellent examples of the challenges and solutions to flood risk problems, and prompted much discussion.

Finally findings from the workshop and next steps were discussed and summarised.

3. An introduction to strategic planning

As outlined in Section 1, strategic planning the co-ordinated process of analysis, planning and decision-making to achieve flood management policy objectives. All of the partner countries, to some extent, have policies regarding the standard and sustainability of flood defences, flood warning systems and evacuation plans for areas with significant flood risk. Once policy has been established there is a range of different methods though which it can be implemented. The emphasis that each partner countries places on a particular option varies according their approach to risk and their perception of risk. Strategic planning is the process by which these various actions are identified, analysed and selected.

Planning relates to a specific spatial unit i.e. to a particular length of coastline and flood cell. It may include some or all of the following stages:

- **Problem formulation:** Establishing the policy aims, identifying the flood defence problem, establishing the spatial / temporal scale for the analysis. Key linkages in COMRISK: SP1 (Policies and Strategies)
- **Flood risk analysis:** Assessing flood risk for the present day, and in the future, generally including hazard identification, assessing probabilities and consequences of flooding, and presentation / communication of risk. Key linkages in COMRISK: SP4 (Performance Indicators), SP5 (Hydraulic Boundary Conditions)

- **Options generation and appraisal, and decision-making:** Identifying options for future risk management, and assessing these options against specific criteria (including policy aims). Key linkages in COMRISK: SP1 (Policies and Strategies), SP3 (Perception and Participation).
- **Implementation (e.g. carrying out the flood management plan):** This may include conducting more detailed analysis, or improving or managing flood defences, developing flood warning and forecasting systems and communication with stakeholders. Key linkages in COMRISK: SP3 (Perception and Participation) and SP5 (Hydraulic Boundary Conditions)
- **Monitoring and review:** Evaluating the outcome in terms of risk reduction (usually using performance indicators). Key linkages in COMRISK: SP4 (Performance Indicators) and SP1 (Policies and Strategies)

This process is cyclic. The results of the monitoring / review feed back to refine and, if necessary, revise the problem formulation stage. The framework is also 'hierarchical'. For example, large scale plans may be made to establish the strategic aims for a length of coast, while more detailed plans for strategies and schemes will be made to realise those aims. Some stages will be more highly developed than others and this will differ between countries.

Once drafted a Strategy Plan provides broader benefit than simple a programme of actions. It also provides an effective framework for wide consultation in relation to the key flood and coastal defence issues for the study area. In turn, this enables the ownership of both problems and opportunities to be shared amongst all stakeholders (with a legitimate interest in these issues) facilitating the emergence of common goals.

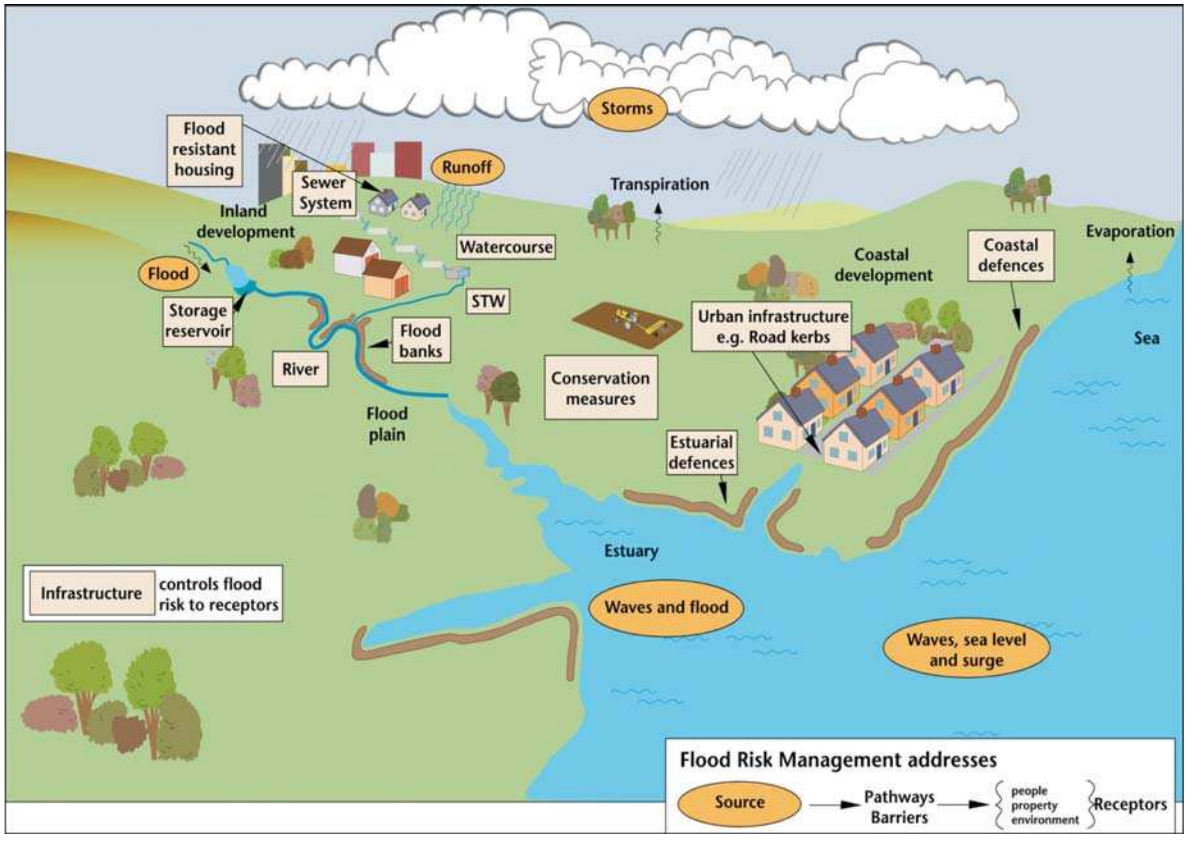

Fig. 2: The flooding system

Strategic planning is about making choices and managing change in a structured way. Good management of flood risk requires many decisions to be made, often based on conflicting aims. For example, across all partner countries the flooding systems are complex and can be characterised as a variety of interacting elements and processes (see Fig. 2 and 3). Satisfying flood management objectives, alongside other social, economic and environmental aims, requires careful planning and Sub-Project 2 has been mainly concerned with the methods for achieving this.

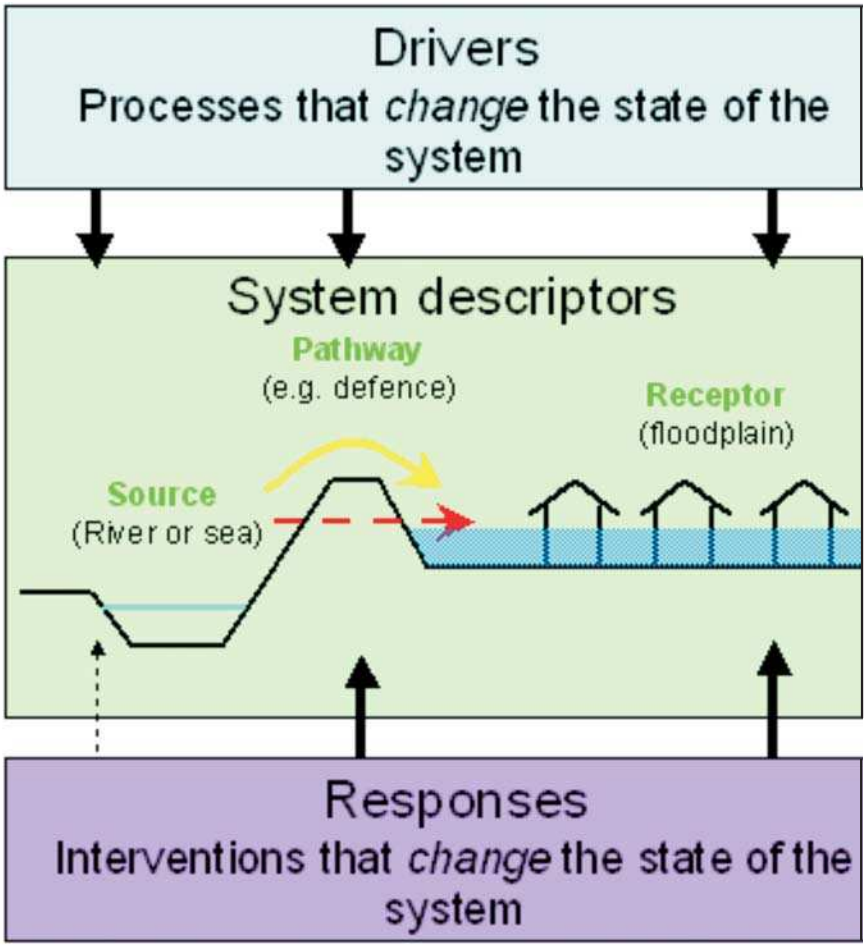

Fig. 3: The flood management system is continually modified by drivers and responses. Strategic planning aims to understand how these affect the flood risk in order to make better decisions to manage the risk

4. Strategic planning in the partner counties

Each partner country has adopted a particular approach to strategic planning for managing coastal flood risks. These different approaches are outlined in the sections below.

Belgium

Belgium has 65 km of coastline. The coastal lowlands of Belgium are focused in Flanders and are interconnected with the Dutch Region of Zeeuws-Vlaanderen. As such the floodplain behaves as a single flood cell, where if a defence breaches in either the Netherlands or Belgium significant inundation can be expected in both countries.

Although sharing a common floodplain the responsibilities for coastal defence are divided between Belgium and the Netherlands at their respective national boundaries. Both countries have slightly different approaches to coastal management and notions of acceptable risks (translated through to a so-called safety standard).

Historically, a *resistance* based approach has been adopted. This has led to a focus on strengthening the flood and coastal defences themselves with direct translation of policy to action with only limited "strategic planning". For example, the main actions have been to:

- Strengthen the existing flood defences through a programme of raising and widening – prioritised according to structural reliability using methods developed in The Netherlands. The target safety standard was fixed at 1:1000 year return period.
- To "fix" the coastline at a pre-defined location and prevent through active intervention retreat – managed through monitoring (including yearly surveys using laser altimetry) and direct local action.

Previous strategic assessments identified many weak links in the defences; with sea dykes being too low in places and being of uncertain condition. Recent assessments found that, although the natural beach/dune systems generally performed well in terms of strength and height problems arose however, where infrastructure had been built directly within the beach/dune system. In terms of position, a comparison of detailed Digital Terrain Models (DTM) over a 20 year time period have been used to identify the extent of dune erosion. This analysis has highlighted significant losses.

Determining action based on these results has been difficult. In particular, there is a complex relationship between the flood defence needs and the broader process of planning via the Master Plan, including a lengthy process of Environmental Impact Assessment, building permits and other licenses. The 'Master Plan' should consider and evaluates not only flooding risks but different perspectives (e.g. ecology and tourism) and involves not only flooding experts but other administrations.

Following a major storm in 1990, a Strategic Investment Plan was developed to improve the defences and improve safety against flooding. The Strategic Investment Plan was designed mainly to guide coastal flood risk managers, prescribing a detailed set of actions both in regard to policies and specific defence schemes. It included a requirement for new schemes to allow for 30cm sea level rise due to climate change.

In the future Master Plans, the provision of new defences is likely to form only part of a broader strategy to manage future flood risk. This is likely to include contingency plans; flood warning systems; insurance systems; spatial planning decisions (relocation of activities, differentiation of safety standard); education and preparation of the public in addition to defence improvements.

The future aim is to continue to address flood risk issues in a more strategic and holistic way. Interestingly the broadening of goals and the move to flood risk management rather than flood defence is led by the civil engineers responsible for flood risk management. Budgetary constraints require a more flexible approach at a time when environmental and biodiversity objectives are coming to the fore in the general move to Integrated Coastal Zone Management (ICZM).

Netherlands – Overview of the present approach

After the severe flooding in 1953, the Delta commission initiated the development of an engineering led approach to flood management with an emphasis on the resistance of engineered defences. The required resistance of the defences was expressed through a 'safety standard' which in turn was enshrined in law. The current standards are shown in Fig. 4.

In addition to setting safety standards, the law requires that the reliability of flood protection structures are reviewed about every 5 years (lower circle in the Figure 5). Recently a first round of assessment of the flood defences was performed. For the flood defences that did not perform adequately, plans are being made to improve them.

When works are carried out, the ability to adapt the defence in face of a climate change is built in. In particular, it is expected and accepted that the defence will need to be increased in height and width in the future and reservation of space for future adoption of the defence is enshrined within the spatial definitions of the defences.

The national budget for coastal defences is reviewed every year. Prioritisation of expenditure is based first on the safety case and then on consideration of the magnitude of possible (not probability of) consequences - represented by the capital value of assets in flood prone areas.

The reassessment of the potential impact of social, economic and technological developments on the flood risk in terms of expected damages or casualties would ideally take place about every 50 years (upper circle in Fig. 5). In response to this requirement, new methodologies are being developed that express safety levels in terms of a 'risk' i.e. taking account of both probability and consequences.

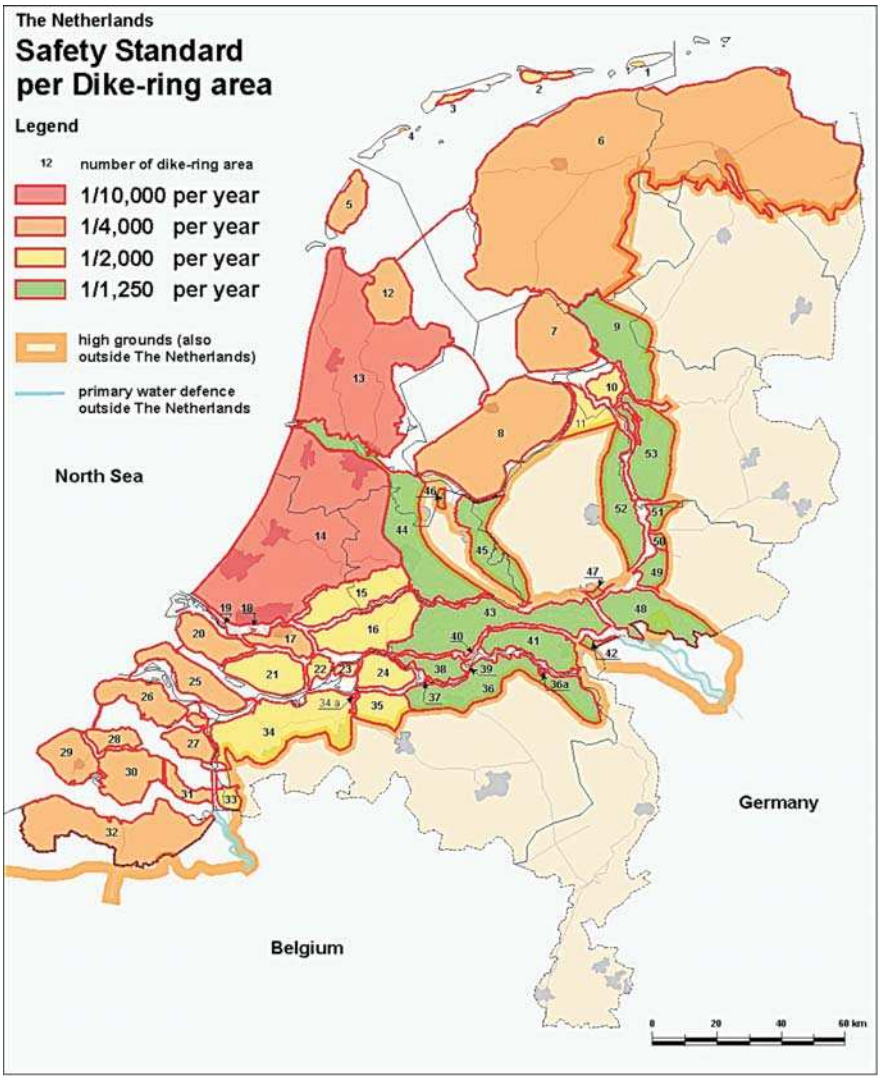

Fig. 4: Current safety standards in the Netherlands

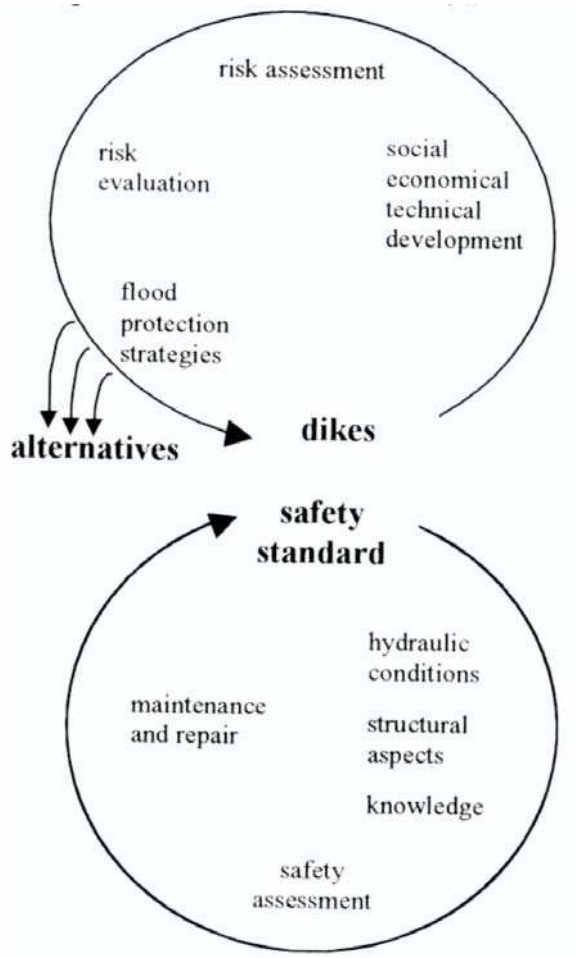

Fig. 5: Strategic planning process in the Netherlands

The new approach is being developed under a project entitled FLORIS commissioned by client the Netherlands Directorate General for water. Rijkswaterstaat is co-ordinating the project in close co-operation with the waterboards and provinces. The project has the following main goals:

- The assessment of the actual flood risk safety situation for the whole of the Netherlands by determining the *probability of flooding* associated with each of the 53 main dike rings which make up the country. Special attention is being paid to structures that have been identified as being weak spots in previous studies.
- The identification of the actual *weak spots* in the flood defence infrastructure.
- The assessment of the *consequences* of flooding and hence the determination of flood risk (probability x consequence), with a clear view on the uncertainties associated with this assessment.

Following the analysis of the flood risks, the FLORIS Project is also tasked with evaluating the physical measures required to improve the identified weak spots and determining the associated revised (reduced) probability of flooding for the relevant dike ring.

England and Wales

Three different scales of studies provide a framework for strategic planning in the UK (Fig. 5). At the broadest scale the UK coastline has been split up into 11 sediment cells and

a series of sub-cells. Within each sediment cell longshore processes are largely considered self-contained.

The development of plans based on sediment cells signalled: a move away from administrative boundaries to process boundaries; a move towards regional management and shared responsibilities, and a recognition of the wider demands on the coastal zone.

The strategic planning process starts with the development of a Shoreline Management Plan (SMP) that are each between 50 and 150 Kilometres long and combine multiple local authorities and interested stakeholders through a series of Coastal Groups. Forty-nine have been completed so far. These studies consider time horizons of 20, 50 and 100 years and develop management policy identifying one of four policies of each Management Unit. The available policies are:

- Do nothing
- Hold the line
- Advance the line
- Retreat the line.

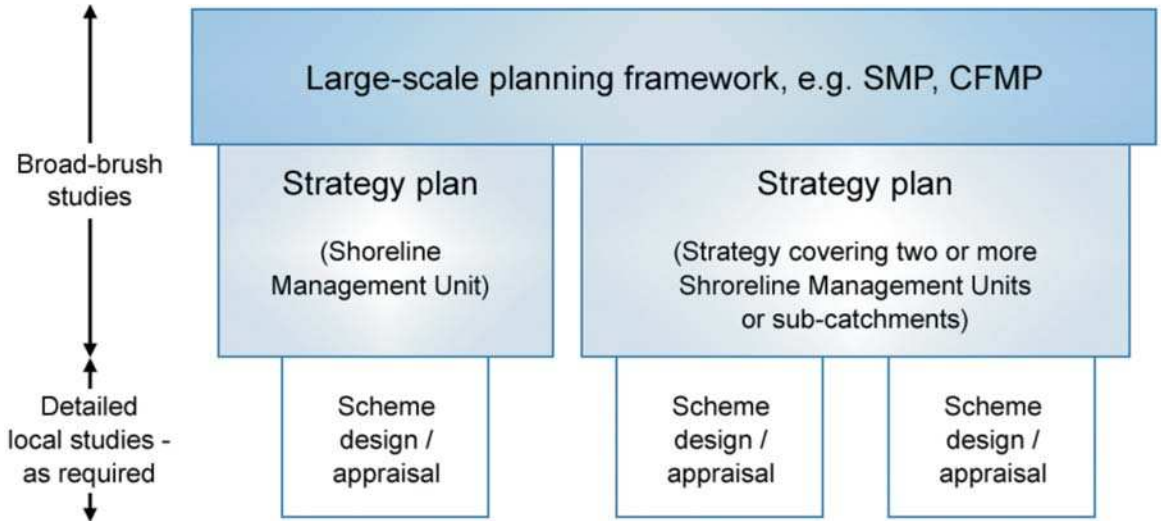

Fig. 6: Hierarchy of management plans in England and Wales

As shown in Fig. 6, Strategy Plans flow from the SMP process. These more detailed include more local analysis of defence performance, flood risk and the preferred programme of intervention options. As necessary local management plans are then developed to implement preferred options identified at higher levels.

The regional Shoreline Management Plans (SMP) and more local Strategy Plans are updated on a rolling five year programme. The results of the SMPs and Strategy studies are supplemented by national reviews of needs through bi-yearly review of budgets and flood risks by Defra as part of the UK Governments Comprehensive Spending Review.

The recently completed Foresight Flood and Coastal Defence study has taken a long-term look into the future in an attempt to inform policy direction and promote sustainable development.

The Foresight project produced a long-term (30–100 year) vision for the future of UK flood and coastal defence which is robust against a range of possible futures and can be used

as a basis to inform policy, and its delivery. This vision is challenging and independent and relies upon an integrated portfolio of measures and actions covering:

- Managing the rural landscape (e.g. run-off)
- Managing the urban fabric (e.g. sewer networks)
- Managing flood events (e.g. emergency responses)
- Managing flood losses (e.g. resilient buildings)
- Engineering and other large scale interventions.

Germany – Overview of Present Approach

In German North Sea coastal regions, significant coastal flood prone areas exist (as illustrated in Fig. 8).

The approach to flood management varies between the regional governments. However all adopt a Master Planning approach covering all coastal flood and defence issues as the primary strategic planning document. In Schleswig-Holstein, for example, within the Master Plan the 10 most important issues are identified and actions discussed. In the case of flood defences, the actions undertaken reinforce the underpinning management paradigm of improving / maintaining the resistance afforded by the defences.

For example, in Lower Saxony the present approach to strategic planning is described in the Lower Saxony Dike Act and within the Master Plans for Coastal Defence for the districts of Weser-Ems from 1997 and Lower Saxony from 1973 (see www.nlwkn.de/ (Home/Wasserwirtschaft/Küstenschutz/ Generalplan Küstenschutz), in Krause (1999) and Thorenz et al. (2004).

As in the Netherlands there is a defined procedure for maintaining and improving dykes. According to the State Water Acts the flood and coastal defences must be inspected at least

Fig. 7: Flood prone coastal lowlands along the North Sea coast of Germany

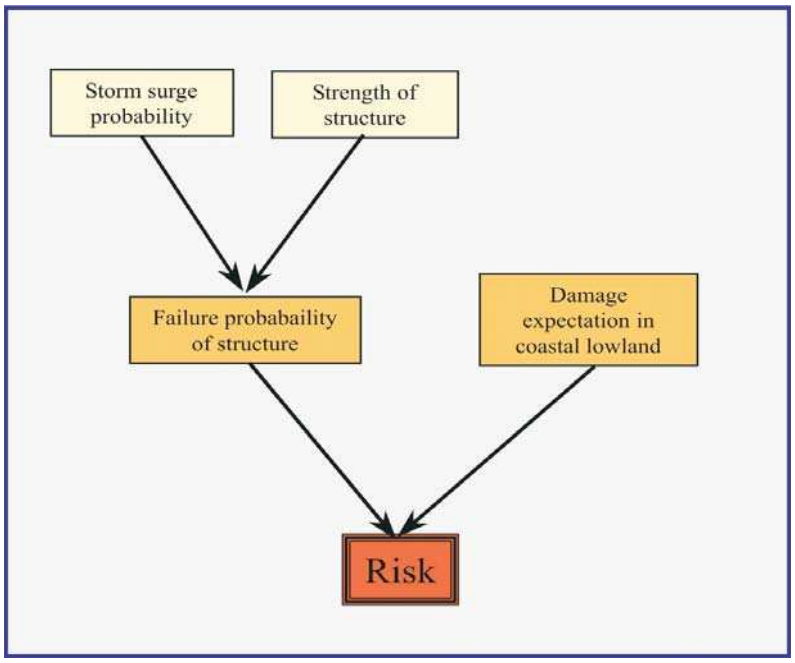

Fig. 8: Possible risk based management approach to flooding

once a year and once in 10 to 20 years detailed safety assessments should be carried out (the actual timing varies between States)

When works are carried out the ability to adapt the defence in face of a climate change is built in. In particular, it is expected and accepted that the defence will need to be increased in height in the future and adequate space is enshrined within the Master Plan to allow the dyke footprint to be expanded. For Lower Saxony, this regulation is laid down in the Lower Saxony Dike Act and a strip of land 50m wide is allocated to future dike widening.

The national budget for coastal defences is reviewed every year. Prioritisation of expenditure is based first on the safety case.

A new approach is under development, incorporating both probability and magnitude of damage (Fig. 8), although at present this is part of ongoing research and development and not implemented.

Denmark – Overview of current practice

Denmark has approx. 7,300km of coastline divided into 4 geomorphologic cells (as shown in fig. 9). The 7 administrative areas do not coincide with these and relate to more traditional governance boundaries. Flood prone areas in Denmark are protected by some 70km of dykes.

The policy background to the process of strategic planning is enshrined within the Coastal Protection Act that allows coastal protection where necessary, but promotes natural processes where possible. In particular:

- coastal/flood protection can be allowed only where significant assets are at stake
- nature preservation is of high priority especially the maintenance of natural coastal dynamics
- if old coastal/flood protection works are refurbished, the work must be minimal and redundant protection removed
- coastal/flood protection works must be technically optimised and fitted into the existing environment in a discreet way.

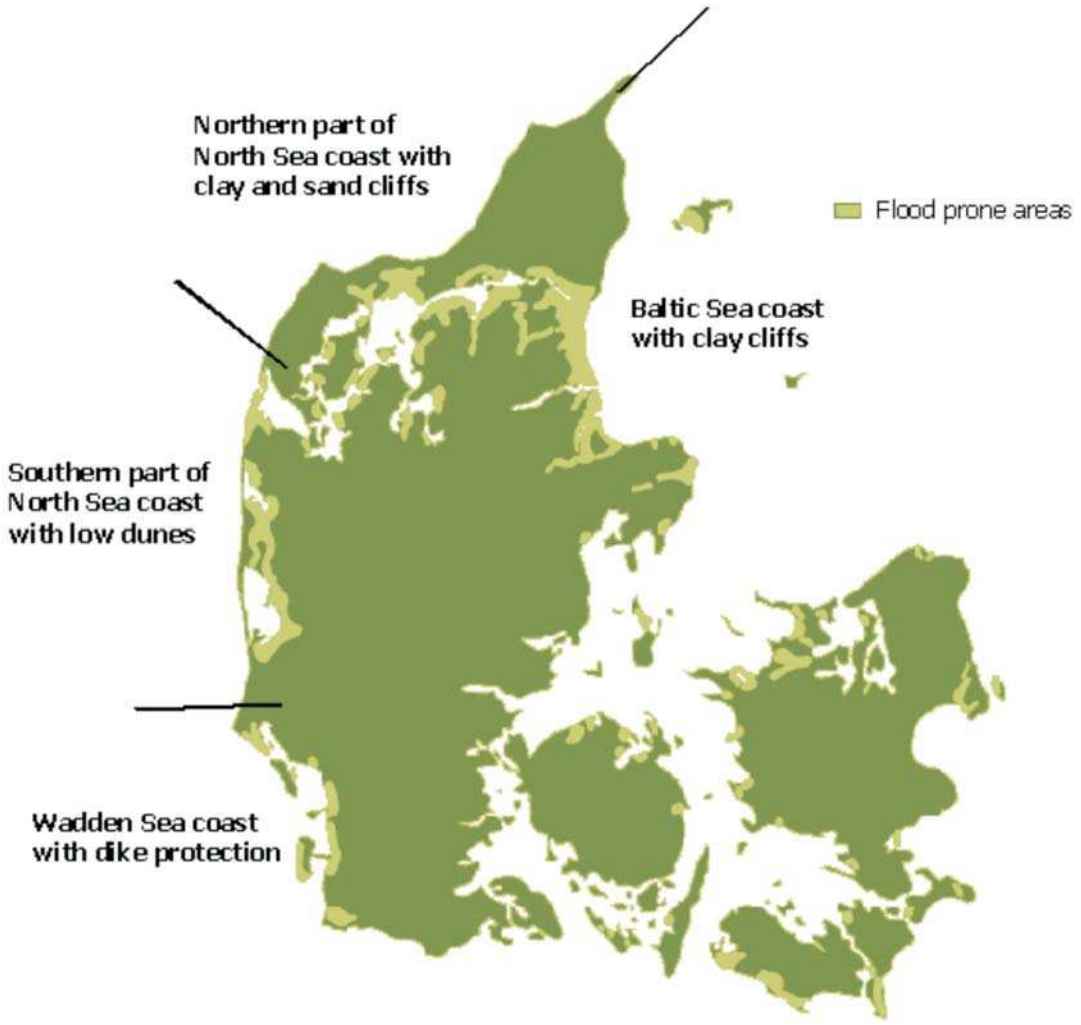

Fig. 9: Map of flood prone areas in Denmark

The main guidelines with respect to maintaining the performance of flood and coastal defences are focussed on finding the optimal technical solution to protect the value of the assets at stake whilst minimising disruption to the natural environment.

Visual inspection of the defences is required two times per year. Assessments of the defence profiles, extreme water levels and wave conditions are performed every five years. Coastal retreat and changes in dune width are monitored once per year and also five yearly evaluations of the hydraulic climate are made.

The approach to the planning of actions follows the basic process outlined below:

- defence inspections (2x per year, embedded in law)
- inspection and monitoring of forelands (by the Danish Veterinary and Food Administration)
- surveying of defence profiles (every 5 years in order to monitor consolidation)
- monitoring and evaluation of water levels (analysis of extreme water levels every 5 year)
- research and development programs. These focus among others on the efficiency of sand nourishment and on the natural variation of beach width, benefit/cost ratio.

This process delivers a prioritised programme of actions for the central part of the Danish North Sea coast based on risk. Two time horizons, 10 and 25 years into the future, are used to develop plans.

5. Conclusions

Sub-Project 2 has reinforced the belief that across Europe there is common understanding of the meaning of strategic planning; as a process undertaken to determine an appropriate programme of measures to implement stated policy aims and objectives. More specially Strategic Planning is defined as follows:

- it a proactive rather than reactive process of analysis
- it considers a board range of options – both structural and non-structural such as:
  - all key consequences associated with action and in-action
  - regulation of urban development
  - structural intervention
  - improved public preparedness
  - better emergency responses
  - insurance / compensation
- it encourages co-operation between stakeholders (including NGOs, Governments and the public)
- it promotes long-term thinking and sustainability
- it provides an opportunity to undertake assessment of risks at the widest possible scale.

The process of Strategic Planning is, however, approached differently and has a different emphasis within each COMRISK partner country. In all Partner countries steps have been made towards this goal and tools are being developed to support (for example the RASP methods in the UK). These differences reflect different risk perceptions, society expectations and tradition. For example, throughout the continental European partners legislative instruments continue to provide the primary management tool, with prescribed safety standards (reflecting land use) and inspection intervals. Within England and Wales a more risk-based approach is adopted based on a more explicit trade-off of benefits and costs of action against the dis-benefits of in-action (with the exception of London where prescribed safety standards are provided by law). These differences are reflected in the way expenditure is prioritised. Within the context of a safety standards led approach prioritisation of expenditure is given little prominence within the strategic planning process and it is difficult (and often politically undesirable) to explicitly prioritise improvement to one defence over an other. The approach adopted in England and Wales, however, has a primary focus on prioritising actions in order of economic efficiency (taking account of both tangible and intangible benefits where possible).

Today across Europe, most countries are moving towards flood risk management based not just on predictions of the probabilities of defence overtopping under given events but also on prediction of the probability of an overall defence failure (e.g. dike breaching), the flooding consequences and their assessment in socio-economic terms. It will take time to establish a fully risk-based approach to strategic planning. This will need to consider a 'whole system' model of flooding including source, pathways and receptors, over the relevant planning timescale. It will also need to include a wide range of flood risk management options. While widely accepted as a key requirement for better flood risk management in the future, it is not yet fully reflected in present day practice.

6. Literature

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