Die Küste (The Coast)
EDITED BY DR. JACOBUS HOFSTEDE

Archive for Research and Technology on the North Sea and Baltic Coast. Special Edition COMRISK, Common Strategies to Reduce the Risk of Storm Floods in Coastal Lowlands. Vol. 70, 2005. Colour and b/w illus. Softcover. 184 pages. ISSN 0452-7739. ISBN 3-8042-1061-9. In English.

This compendium of state-of-the-art papers on the common strategies to reduce the risk of storm-induced flooding in coastal lowlands in Europe comes at a very appropriate moment. The matter is of particular interest, given the Asian tsunami in 2004 and more recently the storm-induced damages to the Gulf Coast of the United States in the wake of Hurricane Katrina, especially along New Orleans, Louisiana. Much of the disaster planning, education, preparation and mitigation measures that could have been of use in the USA are actually addressed in great detail in this publication. The book is hence a must-have for personnel involved with emergency management and preparedness in coastal areas.

The book, edited by Dr. Jacobus Hofstede, presents a series of papers that address the various topics related to being prepared for coastal flooding. It is estimated that approximately 16 million people live in the 40,000 square kilometer (km^2) expanse of coastal lowlands in the North Sea Region (NSR), which encompass the United Kingdom, Belgium, the Netherlands, Germany and Denmark. Although the various national governments spend several hundreds of thousands of euros each year on coastal defence, the authors establish that much larger amounts are needed in the future, and that a coordinated, well-planned effort is needed to optimise utilisation of these resources.

As part of the efforts of the North Sea Coastal Managers Group (NSCMG) to improve cooperation and coordination between national agencies and governments on coastal risk management issues, the "Common strategies to reduce the risk of storm floods in coastal lowlands – COMRISK" was formed. COMRISK, which lasted from 2002 to 2005 focussed on the following aspects:

"(1) to bring together coastal risk management experts from administration, science and private companies from around the North Sea and beyond,
(2) to exchange experiences and studies of good practice on coastal risk management,
(3) to evaluate and further develop innovative integrated coastal risk management strategies, considering national regulations and responsibilities,
(4) to initiate and support transnational cooperation on integrated coastal risk management (networking), and
(5) to integrate coastal risk management into strategies for sustainable management of the coastal zones in the NSR".

In April 2005, a workshop was held in Kiel, Germany, to address these aspects and to obtain agreement amongst the various coastal managers. This book essentially summarises the workshop discussions and conclusions into a series of chapters:
Chapter 1 provides an overview to the project. Chapters 2-6 address the evaluation of policies and strategies, strategic planning, risk perception and public participation, performance measures, and hydraulic boundary conditions as it applies to coastal risk management. Following this, Chapters 7-10 present four case studies for Flanders and Zeeuws Flanders (Belgium and the Netherlands), Ribe Area (Denmark), Lincolnshire (UK) and Langeoog (Germany). Finally, the book presents strategies for reducing the risk of storm flood in coastal lowlands and associated integrated risk-based decision-making process in Chapters 11-13.

The authors presents risk management as essentially comprising the following basic steps:
(a) identification of the nature and extent of flood risks,
(b) understanding and addressing the relevant public perceptions,
(c) establishing goals and standards with respect to the flood risk,
(d) establishing strategies and policies to achieve these goals, and
(e) minimising the costs of achieving the goals, while ensuring that the risk remains acceptable.

Several challenges were identified in the risk management context – primarily, external challenges (sea level rise, ecological regulation, and development pressure), physical opportunities and threats (large and deep flood prone areas and unprotected natural shorelines), socio-economic challenges (major shoreline cities, designated natural areas, low sense of urgency from citizens), and institutional aspects (limited budget and staff, policy limitations (management as well as planning), and limited integration amongst regions). There were considerable variations in risk management philosophy, approaches and planning

amongst the various NSR countries. For example, the UK places a strong focus on cost-benefit aspects of projects and has permissible legislation (like Denmark), which creates flexibility in funding projects. In Germany, a retreat policy for threatened area may be followed under extreme situations. The concept of flood risk management is well underway in all of the NSR countries, although the specific focus may vary – for example, UK and Denmark stress intervention to mitigate damages, while the Netherlands and Germany focus of flood defence systems.

The authors conclude that, in a global sense, the strategic planning process can be thought to comprise of the following key elements:

(a) problem formulation and management goals (establish appropriate policy aims, identify the flood hazard; consider multi-generational planning, cost-benefit criteria, ecological carrying capacity),
(b) flood risk analysis (assessing present and future trends, identifying hazard, assessing probabilities and consequences of flooding and communication of risk),
(c) alternatives analysis (generation of management options and comparative cost-benefit study),
(d) implementation (i.e., carry out the selected plan – improve or manage the flood defences, develop better warning and forecasting systems, and communications plans), and
(e) monitoring and reviewing (performance monitoring of completed projects, reconsideration of strategies based on lessons learned).

Within the context of alternatives analysis, the authors recommend considering:

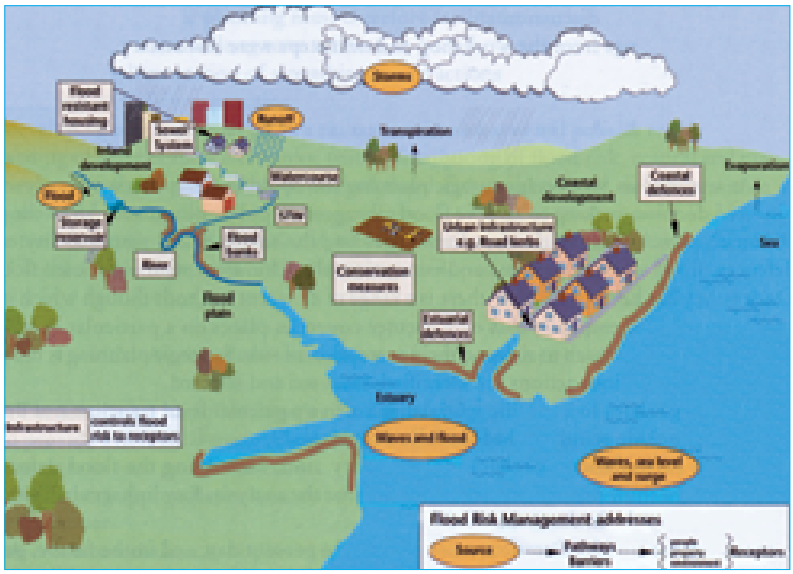
(i) key focus aspects of management measures (alternate methods and strategies, local site-specific methods considered, flexibility),
(ii) management measures to reduce probability of flooding (primary and secondary defense systems and emergency planning),
(iii) measures to reduce consequence of flooding (avoid development in flood prone areas, crisis management through forecasting and warning, and evacuation), and
(iv) recovery systems (restoration of affected areas, funding mechanisms).

Thus, key steps in a performance evaluation would be:

(a) evaluating effectiveness and efficiency of existing flood defence systems using future risk as a performance indicator,
(b) evaluating geographic indicators of shoreline position (where is the defence set? is it stable? should we rebuild or retreat?),
(c) evaluating geometric indicators of defence systems (e.g., setting shape, slope and crest elevation criteria for dikes and gates using hind-cast and forecast data, establishing dune volumes that would resist flood events, development of real-time coastal systems to forewarn of imminent danger, and so on),
(d) structural integrity measures (e.g., geotechnical failure mode analysis – visual loss, slope gradients, piping and failure; field inspection, data collection and predictions), and
(e) development of long-term performance criteria and indicators (data needs, present condition assessment, overtopping potential, failure modes).

The primary failure mechanisms considered in the book include: dune breaching (for natural and beach shorelines) and dike breaching (for engineered shorelines). For dune breaching, the equilibrium beach profile can be compared with the pre-storm profile to draw conclusions regarding vulnerability and probability of failure. The performance of the dune is a function of its geometry, water level, waves and grain size of sediments. For dike breaching, primary aspects of interest are wave overtopping, geometry and stability of the dikes, erosion potential and rate for the core, and predicted breach growth rates during floods. These can be simulated with existing hydrodynamic modelling tools such as Mike21 and Delft3D, amongst others. The authors also point out many of the concerns regarding present use of models and future modelling challenges in this arena.

In terms of technical analysis, geometry, hydraulics and geotechnical characteristics control the results. Geometry varies with the type of structure and its functions, and is site specific to a certain extent. From a hydraulic perspective, all of the NSR countries have fairly extensive networks of water level monitoring and wave gauging stations. The data from these are used for hind-cast and forecast applications of various storm events – but the statistical methods employed vary between the various countries. Also, there are differing criteria amongst countries for the return storm frequency and permissible overtopping assumptions, although 2% run up is still considered as good criteria. For example, while Denmark uses inner structure slope as an explicit criteria for these calculations,



The flooding system as depicted in *Die Küste*.

uncertainty, and the needs of decision-makers. Proper coordination and data sharing between key resource and emergency management agencies is a critical step in disaster planning and response. Finally, since people living in risk-prone areas tend to underestimate potential risks, appropriate education of those citizens are a key to the success of any long-term management programme.

Germany and the Netherlands have dual criteria depending on the quality of the top surface for grass dikes. There can be subtle differences in the wave height and period assumptions as well between countries. The book presents these aspects in much more detail. However, since not all of the technical terms and abbreviations are fully (and readily) described, it can be quite challenging to the non-technical reader.

A probabilistic analysis considering the probability of exceedance of the various storms and resulting economic and human losses is a good planning level tool to determine the desired level of protection against flood events. The analysis would therefore consist of defining damage categories, reviewing data sources, damage analysis and inundation scenarios (through statistical predictions), valuation analysis and selecting optimal scenarios. Finally, the risk susceptibility can be assessed as the product of hazard probability and the system vulnerability.

In summary, the authors recommend that risk, being probability and consequences of flooding, should provide the basis for flood management decisions. To do this effectively, the uncertainties and unknowns must first be understood, communicated and managed. This can be done through identification of the uncertainty, modelling to reduce the uncertainty, and communication of the potential impacts to parties that would be potentially affected. The key aspect here is that the conducted level of risk analysis should be appropriate to the flooding system, the level of

In conclusion, this book presents a wealth of information that is invaluable to emergency planners and managers who work in coastal flood-prone areas. Periodic review of the flood defence systems (identification of weak points in the system and appropriate strengthening measures), evaluation of management strategies (communications plans, evacuation and response plans) and annual review of national emergency response budgets for coastal disasters are vital planning elements. Ultimately, lessons such as the recent New Orleans disaster, can in themselves, be used to develop vital tools for better preparedness in the future – through a failure modes analysis of not only coastal defences, but also the entire policy, planning and response aspects. If such a project were contemplated, this book would be a strongly recommended mandatory first reading assignment.

The authors nicely summarise the intent of the book through their final catch phrase: *"risk of all time – risk is everywhere and always has been"*. It is important that coastal managers and planners recognise and communicate this integral part of the risk management philosophy – *"that the absence of occurrence of risk over long periods of time may reinforce the myth that these extreme events are not probable – however, they are bound to occur sometime in the future"*. The appropriate realisation, communication and reaction to this simple philosophy could have been extremely valuable in New Orleans.

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