A five-year research program in one book
Reading guide

Kothuis, Baukje

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Program	**STW Program 'Integral and sustainable design of multifunctional flood defenses' (MFFD's)** Program Leader: Prof.dr.ir. Matthijs Kok							
Research Lines	**1.** **Disciplinary extension challenges**						**2.** **Trans-disciplinary integration challenges**	
Work Packages	1.1 Risk Assessment of multifunctional flood defenses			1.2 Urban and Rural MFFD design		1.3 Governance & Finance	2.1 Integrated Design	
Projects	1.1.1 Hydraulic impact of overtopping waves on a MFFD	1.1.2 Structural assessment of MFFD's	1.1.3 Safety and reliability assessment of MFFD's	1.2.1 Urban design challenges and opportunities of MFFD's	1.2.2 Contribution of MFFD's to landscape values and spatial quality	1.3.1 Governance and finance of MFFD	2.1.1 Design Support for MFFD	2.1.2 Adaptivity and robustness
University & Research group	TU Delft Civil Engineering & Geosciences	TU Delft Civil Engineering & Geosciences	TU Delft Civil Engineering & Geosciences	TU Delft Civil Architecture & the Built Enviroment	Wageningen UR Water & Climate Centre	University of Twente Engineering Technology	TU Delft Technology, Policy & Management	UNESCO IHE & TU Delft Technology, Policy & Management
Project Leader	Prof.dr. Wim Uijttewaal	Prof.dr.ir. Matthijs Kok	Prof.dr.ir. Matthijs Kok	Prof.dr.ir. Han Meyer	Prof.dr. Rik Leemans	Prof.dr.ir Timo Hartmann	Dr. Pieter Bots	Prof.dr. Chris Zevenbergen
PhD(s) Supervisor(s) Postdoc(s)	PhD: Xuexue Chen (TUD) Supervisors: Wim Uijttewaal & Bas Jonkman	PhD: Mark Voorendt (TUD) Supervisor: Han Vrijling Postdoc: Dr.ir. Paul Hölscher (TUD)	PhD: Kathryn Roscoe (TUD) Supervisors: Han Vrijling & Ton Vrouwenvelder PhD: Juan Pablo Aguilar-López (UT) Supervisors: Suzanne Hulscher & Ralph Schielen & Jord Warmink PhD: Guy Dupuits (TUD) Supervisors: Matthijs Kok & Timo Schweckendiek (Former PhD: Wouter ter Horst)	PhD: Peter van Veelen (TUD) Supervisor: Han Meyer Postdoc: Dr. Nikki Brand (TUD)	PhD: Kevin Raaphorst (WUR) Supervisors: Adri van den Brink, Wim van der Knaap & Ingrid Duchhart (Former PhD: Chris van der Zwet) Postdoc: Dr. Jantsje van Loon (WUR) (Former PhD: Aike van der Nat)	PhD:Julieta Matos Castaño (UT) Supervisors: Geert Dewulf & Timo Hartmann PhD: Daniel Hogendoorn (TUD) Supervisors: Ernst ten Heuvelhof & Bertien Broekhans	PhD: Ellen Tromp (TUD) Supervisors: Wil Thissen, Bartel van de Walle & Pieter Bots Postdoc: Dr. Baukje Kothuis (TUD) Postdoc: Dr. Trudes Heems (TUD)	PhD: Flora Anvarifar (TUD) Supervisors: Chris Zevenbergen & Wil Thissen Postdoc: Dr. Tushith Islam (TUD)

Baukje Kothuis

A FIVE-YEAR RESEARCH PROGRAM IN ONE BOOK

READING GUIDE

Dr. Baukje Kothuis was a Postdoc in the STW-MFFD program at the Faculty of Technology, Policy & Management, TU Delft in the project 'Integrated design'. Currently she works at the Faculty of Civil Engineering & Geosciences as a researcher in the NWO Program 'Integral & sustainable design of ports in Africa' and for TU Delft and Texas-based universities as an independent consultant and co-PI in the NSF-PIRE research and education exchange program 'Coastal Flood Risk Reduction' to develop partnerships for international research and education.

A whole five-year research program in one book? That is no doubt impossible. The true record of our efforts can be found in multitude of papers, reports, journal articles, posters, presentations and, ultimately, twelve dissertations across multiple disciplines. However, to create an overview for various interested parties, to hint at where to start looking for in-depth disciplinary knowledge and, not unimportant, to communicate the efforts and outcomes of integral design, is what we hope to provide for with this book.

In the Table on page 14, the set-up of the STW Perspectief Multifunctional Flood Defenses research program (MFFD) is summarized. Two research lines were envisioned to address the anticipated challenges. The research questions arising from these challenges were ultimately translated into eight research projects:

- Hydraulic impact of overtopping waves on a multifunctional flood defenses;
- Structural assessment of multifunctional flood defenses;
- Safety and reliability assessment of multifunctional flood defenses;
- Urban design challenges and opportunities of multifunctional flood defenses;
- Contributions of multifunctional flood defenses to landscape values and spatial quality;
- Governance and finance of multifunctional flood defenses;
- Design support for multifunctional flood defenses; and
- Adaptive capacity and robustness of multifunctional flood defenses.

The white pages in this book describe disciplinary knowledge developed within these research projects, including methods and approaches. Case studies where this knowledge often derived from - often in collaboration with end-users and other stakeholders - are described in the colored pages in between. In the first three sections of the book we have clustered several research themes to guide interested readers towards information about their specific interest:

- Section 1. Risk assessment;
- Section 2. Design & planning;
- Section 3. Governance & knowledge transfer

Each of these sections starts with the perspective of a so-called 'STW end-user', a field expert from one of the organizations that were involved in one or more projects or case studies. In an interview they explain if and how the collaboration with and outcomes of the MFFD program were useful for them and their organization. Each section ends with two reflections by project leaders. They elaborate on the work done, the current state of affairs considering multifunctional flood defenses and the challenges that still have to be addressed.

The fourth section of the book, named 'Program Cases', is the account of one of the methods to achieve transdisciplinary knowledge development. We choose several extensive cases of (intended) integral multifunctional flood defense design to work on with a team of researchers from different disciplines. Two of those, the Rotterdam Roof Park and the Houston Galveston Bay Region, are presented in the last section of this book. Although we found out that developing integral knowledge within an academic setting is not an easy job, we are convinced the reader will enjoy and can make use of the interesting results of these cases.

Finally, we would like to thank all contributors to the program, to this book, to the case studies, and to all of our other knowledge development efforts. We hope this book will be an inspiration for anyone who is involved in one way or another in the integral design of multifunctional flood defenses.