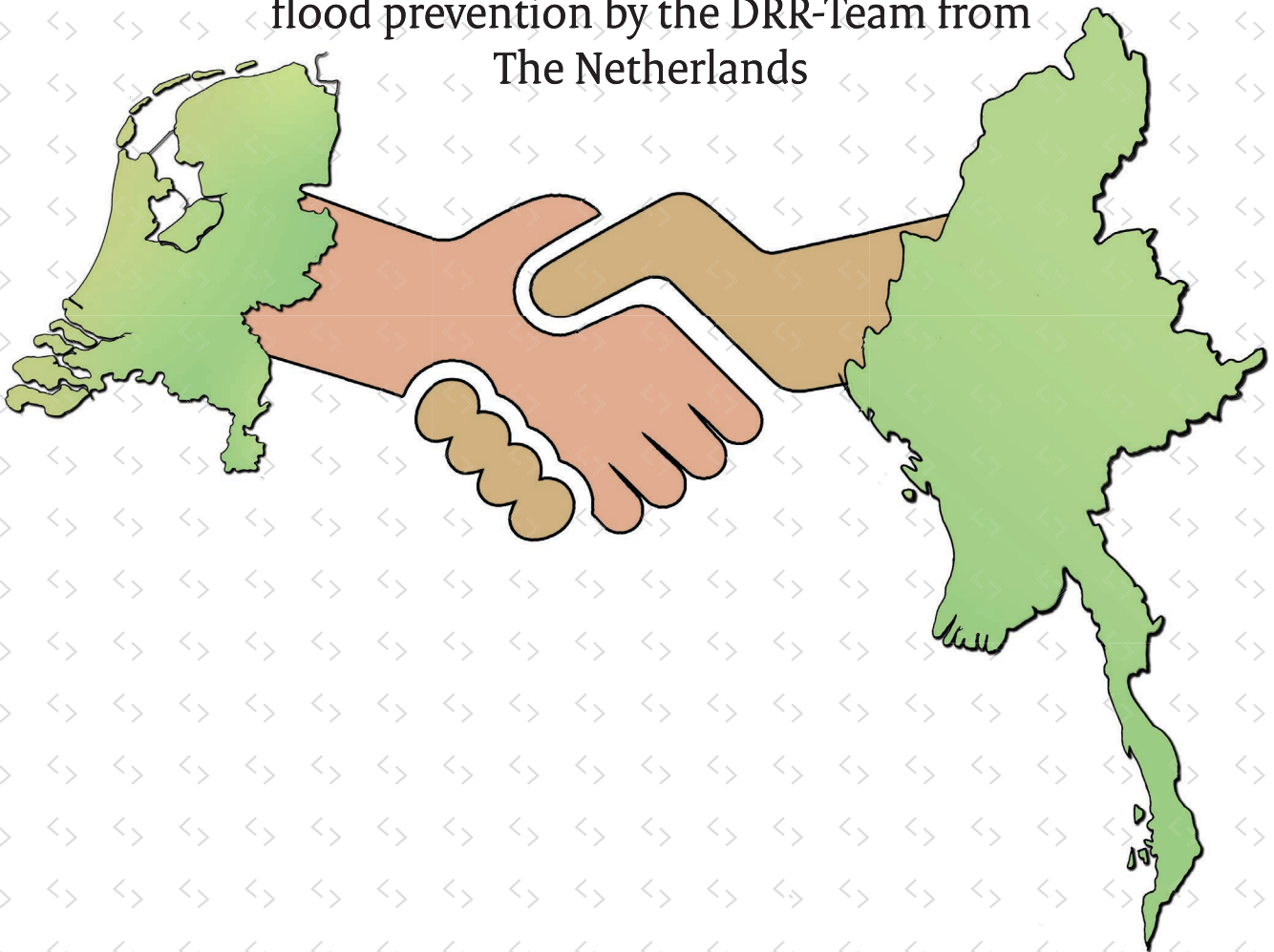


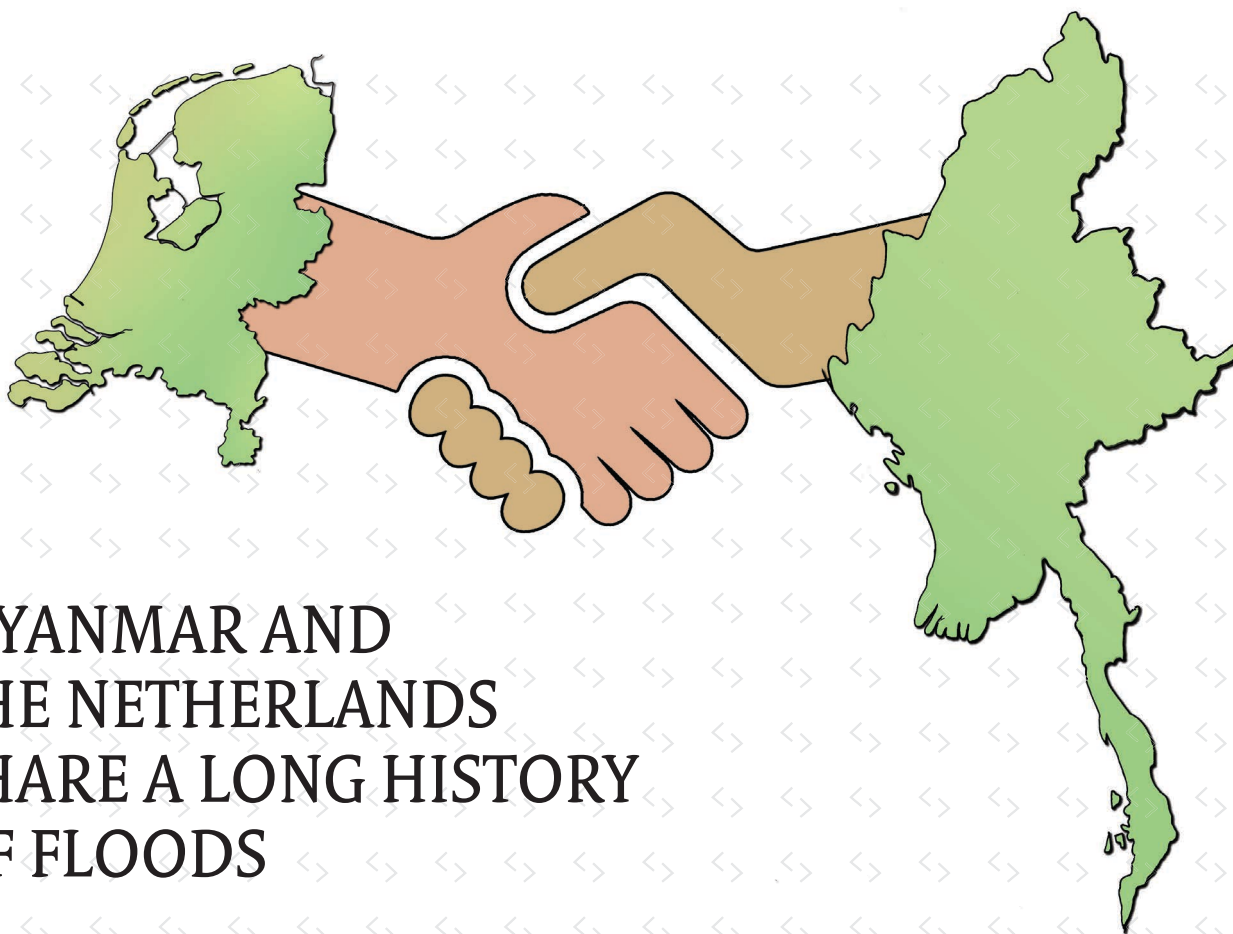


Kingdom of the Netherlands

Dutch Risk Reduction Team (DRR-Team) Reducing the risk of water related disasters

Advice for Myanmar on flood control and
flood prevention by the DRR-Team from
The Netherlands





MYANMAR AND THE NETHERLANDS SHARE A LONG HISTORY OF FLOODS

On 30 July 2015, Cyclone Komen made landfall in Bangladesh, bringing strong winds and heavy rainfall into neighbouring Myanmar. As a result, Myanmar experienced its most severe flooding in decades. Maps displaying the flood affected areas, such as the one prepared by UN-OCHA, showed the enormous scale and severity of the situation. In most dyke-protected areas, the dykes were able to protect the areas behind them, but many leakage and erosion problems occurred. In mountainous areas, flash floods and deep inundations, such as around Kalay, caused significant damage and losses.

Myanmar and The Netherlands share a long history of dealing with floods and managing water resources. In May 2013, both countries signed a Memorandum of Understanding (MoU) to cooperate in the field of Integrated Water Resources Management (IWRM) in Myanmar. In 2014, a strategic study on IWRM was carried out, providing analysis and input for an IWRM Masterplan/Strategy for Myanmar at the national level. In 2016 and 2017 the Netherlands will provide support to Myanmar, using an IWRM approach for the development of a strategy for the Ayeyarwady delta.

In the aftermath of the flood disaster in 2015, the Dutch government provided support when a Dutch Risk Reduction Team (DRR-Team) visited Myanmar. The team focused on analysing the current systems of technical flood protection and how it is managed in terms of operations and governance. This brochure gives an illustrated impression of the teams' findings and recommendations.

The lead recommendation for the proposed follow-up actions is to change the current reactive project-by-project approach to a more up-front and proactive systems-based approach. The second recommendation is to apply more integrated long-term planning based on systems analysis and cost-benefit risk-based approaches. Although the quality of daily flood control operations was evident, such changes as those recommended would make Myanmar's future strong and more resilient to the climate change effects that are already being demonstrated.

More information about DRR-Team can be found on the Website: www.dutchwatersector.com/drr



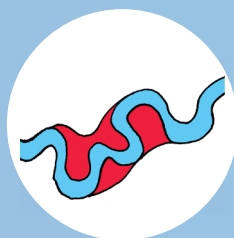
FLOOD FORECAST

rain prediction, data analysis, numerical modelling



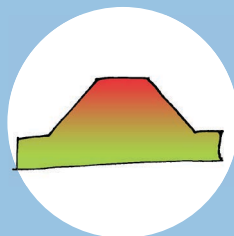
LIVING WITH WATER IN A BATHTUB

public awareness, early warning, evacuation and spatial planning



A DANCING RIVER

improve navigability, space for water, data and modelling to save costs



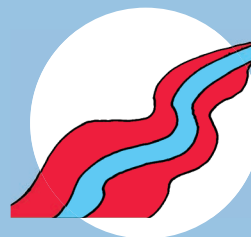
DYKE MANAGEMENT

inspection, data collection, design, usage/people



RISK APPROACH

prioritize dyke improvement, to lower flood risks for built and natural assets and inhabitants

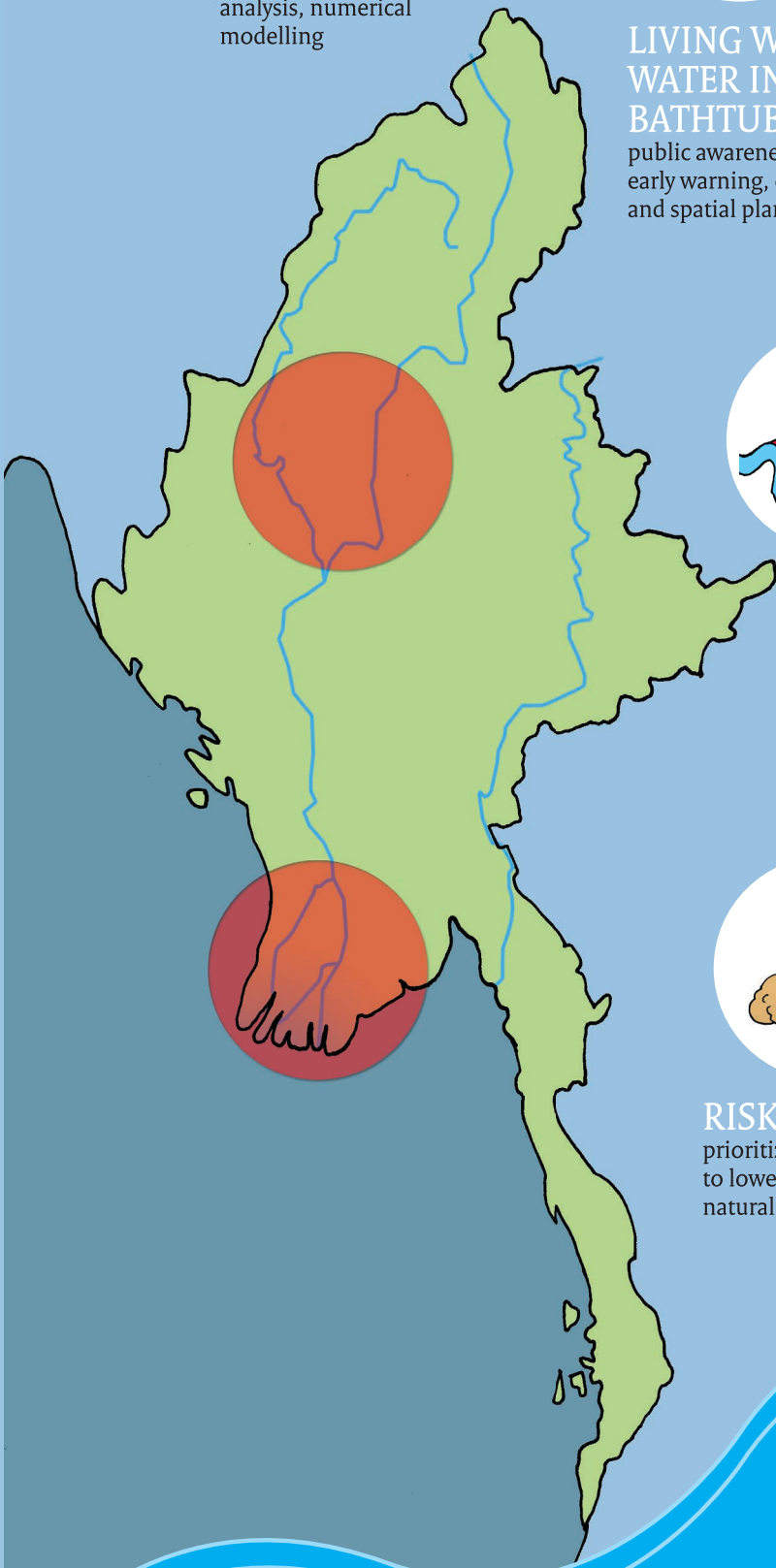


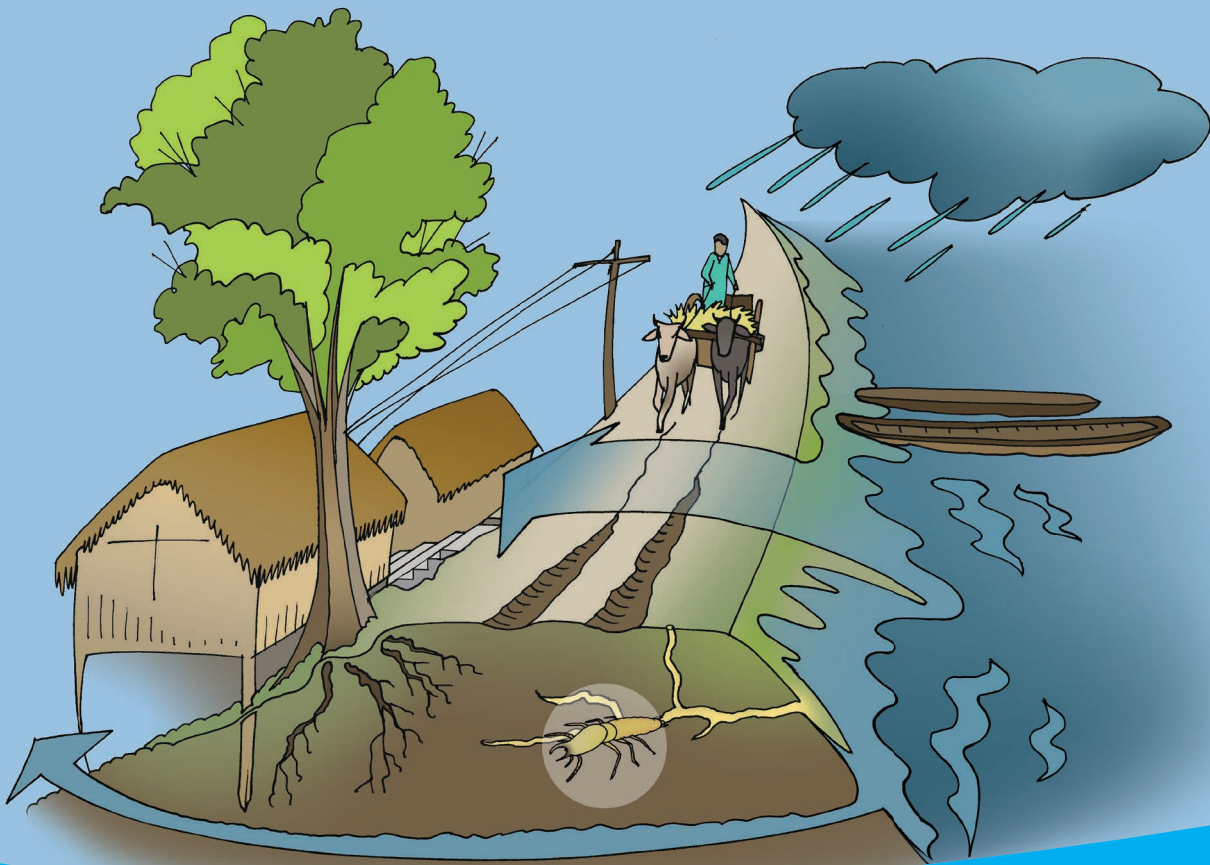
RIVER MANAGEMENT

data and modelling, optimize measures, cost/benefit analysis, systems-approach

THE DRR MISSION

The DRR-Team from The Netherlands visited Myanmar from August 31 to September 6, 2015. The seven-strong team was divided into two regional teams; one with a focus on the Ayeyarwady delta, and another in the Monywa and Kalay areas in Upper Myanmar. The DRR-Team's advice pays attention to the life-cycle approach of dykes, behavior of rivers, flood forecasting, data collection and storage, and capacity building. It is recommended to read the DRR Report (October 2015) for a full understanding of the Dutch recommendations to Myanmar.





DYKE MANAGEMENT

To manage the dykes in the delta, the first step is the collection and storage of data, for example using Prikstok and ground drills. Data, such as water levels, soil information, etc. is relevant for understanding the current status of the dyke and to predict possible future impacts by using numerical modelling software. Any new dyke designs will consider larger areas and not just a single dyke section. Besides the technical aspects of dyke improvements, it is also important to consider dyke usage and the maintenance of safe dykes. Sharing information about the 'do's and don'ts' of the dykes with local people is necessary. For example, planting trees, using the dyke as a path for cattle, building houses on the dyke; these all create large risks for the stability and safety of the dykes.

PROBLEMS

Spatial use is in conflict
with maintaining the dykes
Less space for dyke improvement
Many leakages during rainy season
Field data impressive but scattered



DATA COLLECTION

New instruments such as the Prikstok
Standardized inspection with smartphone app
Central data storage for operational use during
high waters and for design purposes



DESIGN

Upgrade numerical design tools
Specialized data and design centre
Systems-approach when raising or extending dykes

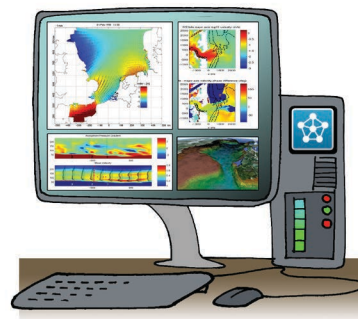


USAGE

Explain "do's and don'ts" (saving costs for maintenance)
Stakeholder involvement (smoother implementation)

RIVER MANAGEMENT

The flow of water changes over time when river channels migrate and change forms: some call this 'river dancing'. It affects the river's navigability, as well as dyke safety, when a flow channel undermines a dyke segment. In many river bends, protective measures have been taken, such as set-back (building a secondary dyke at a safer distance), shore protection, or digging a relief channel at some distance from the threatened dyke. The collection of river data can be streamlined and used in the design of river improvement works. Numerical modelling helps to understand the 'river dance' so that proposed interventions can be most cost-effective.



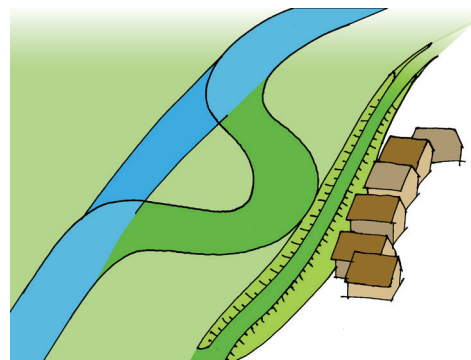
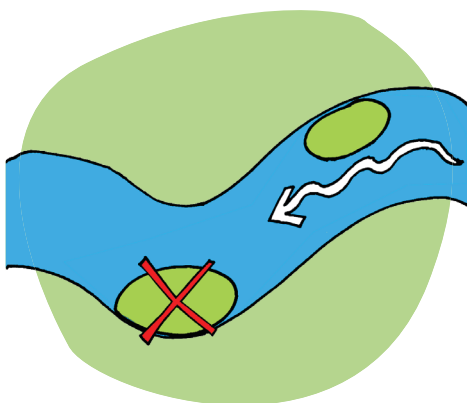
UNDERSTANDING DANCING RIVERS

Data and modelling to predict 'river dance'

Myanmar Hydraulic Center

Modelling with open source software (DELFT3D)

REMOVE BOTTLENECK

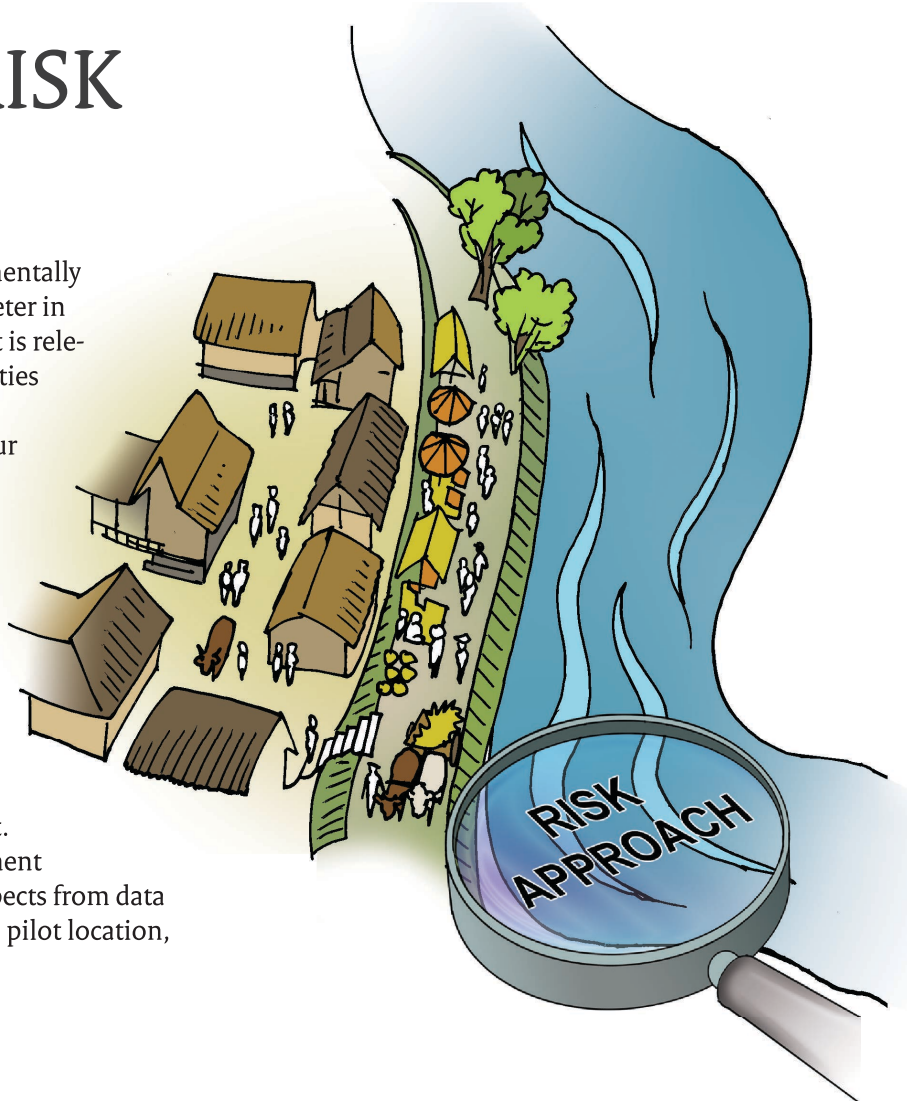


MEANDER CUT-OFF

Influencing the 'river dance' may have serious consequences elsewhere, such as higher water levels, or scouring and deposition at unwanted locations. By taking into account the entire river, the decision-making process for the measures can be improved and those that are financially and socially counterproductive can be avoided. A system-based approach will result in decreased risks in other river areas and reduced costs, for example at the meander cut-off at Zalun.

RATIONAL RISK APPROACH

It is financially, socially and environmentally impossible to protect every square meter in Myanmar from flooding. That's why it is relevant to determine the flood probabilities and consequences (financially and in casualties) of floods and prioritize your measures and investments based on this risk approach. Required steps in this approach are statistical information on frequency of flood occurrences, data analysis and preparation of flood hazard maps. Such flood hazard maps show the vulnerability of an area for flooding and can be used by investors or authorities to decide on sufficiently safe locations for future development. It is suggested to develop and implement the rational risk approach with all aspects from data collection to evacuation methods at a pilot location, e.g. Nyaung Done in the delta.



PROBLEMS

- Properties and people at risk
- Probability of flooding increases over time
- Consequences increase over time
- Pilot: Rational Risk Approach for Nyaung Done



CONTROLLED
DAMAGE

FEWER
CASUALTIES



WHAT IS NEEDED

- Determine frequency of occurrences of floods
- Risk analysis to prioritize measures
- Maximize risk reduction per invested Kyat
- Determine acceptable flood risks
- Risk needs to be managed on both probabilities and consequences



EARLY WARNING SYSTEM

The DRR-Team visited the affected area of Kalay and Monywa region, where floods in the Chindwin River threatened the stability of dykes and structures. The valley of Kalay can be considered a “bath tub” filled by three main rivers and several small tributaries. Water flows out of this bath-tub through one river branch, causing floods in times of heavy rain. Insights into the probability of flooding, assessment of actual current safety levels, flood forecasting systems and the review of current warning and emergency response procedures are required.



WARNINGS

- Forecast floods with already existing models
- Early warning systems (Delft-FEWS)
- Inform people and authorities through various media
- Evacuation and disaster training

SPATIAL PLANNING

- Flood hazard maps to support decisions
- Increase public awareness
- Spatial planning with enough space for water
- Respect for the “dance” of the Mighty Rivers



Many countries around the world face severe water threats. Often these countries are in urgent need of advice on how to prevent a disaster or how to recover from a calamity. To meet these needs with a swift response, the Dutch government has initiated the Dutch Risk Reduction Team (DRR-Team). Because of the unique cooperation between government and the water sector, the best experts can be fielded quickly.

The DRR-Teams consist of high level advisors from The Netherlands, supported by a broad base of technical experts who can provide top-quality and tailor-made expertise to governments confronted by severe and urgent water challenges. The Dutch are experts in adapting to water in a changing world; from

delta management to water technology, from urban planning to governance, public private partnerships and financial engineering. These are all crucial aspects for a safe and climate-resilient country.

Governments that have to deal with an urgent water issue are encouraged to contact the Dutch Embassy in their country. Interventions will only take place on the request of the country concerned, and after a recent calamity or to prevent a potential disaster. The DRR-Team does not focus on emergency relief, but on sustainable solutions for a country. Together with the government and local experts, the situation will be assessed and analyzed, after which the team will establish a set of recommendations.

This brochure was produced by the Ministry of Foreign Affairs of the Netherlands, December 2015, on the basis of the full mission report of the Disaster Risk Reduction Mission. The full Report can be provided digitally on request via: YAN@minbuza.nl

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