|  |
| --- |
|  |
| **Task 3.1a Asset Management: Template Questionnaire** |
| **WP3 Investment Planning and Asset Management** |
|  |
| **Paul Sayers, ……all other authors….** |
| **May 2016** |

# Report information

**Interreg Programme:** Flood infrastructure Asset management & Investment in Renovation, adaptation, optimization and maintenance

**Report Title:** Task 3.1 Asset management tools and approaches within the North Sea Region

**Date:** May 2016

**Contributing science partners:** Sayers and Partners, UK,

Contributing asset owners: list….

**Document revision history:**

|  |  |  |  |
| --- | --- | --- | --- |
| Version | Date | Author(s) | Description |
| 1.0 | 23 May 2016 | Paul Sayers | Outline only for discussion to WP3 partners |
| 1.1 | 27May2016 | Paul Sayers | Based on skype call ST – 27May2015 |
| 1.2 | 11July2016 | Paul Sayers | Taking on board the discussion with Remco Schrijver, Wouter jan Klerk, Frank den Heijer and Owen Tarrant |

# Summary

FAIR (Flood infrastructure: Asset management and Investment in Resilience, adaptation and maintenance), is funded by the EU INTERREG North Sea Region (NSR) Programme and led by the Rijkswaterstaat, FAIR focuses on providing improved, more resilient, more multi-functional and adaptive approaches to providing flood infrastructure. Asset owners and academic colleagues from the Netherlands, Sweden, Germany, Belgium, UK and Denmark will be comparing approaches to asset management and investment planning to share good practice and support new developments.

This report is provided under Work Package 3 (WP3 Investment Planning and Asset Management) and sets out a questionnaire to be completed by the asset owners and science partners within the FAIR consortium. The aim of the template is to guide the Asset Owners in identifying the challenges, barriers and gaps they face in developing more adaptive Asset Management. The science team will then summarise the findings and incorporate elements in international practice and tools.

**Glossary of terms**

|  |  |
| --- | --- |
| Asset | Item, thing or entity that has potential or actual value to an *organization*[[1]](#footnote-2)*.* In the context of flood management this is generally a physical asset (e.g. a gate), but it can also be the data that is used to manage the gate (i.e. if the data is gone, the performance will drop). |
| Asset function | Function related to an organizational objective that the asset fulfills, an asset can fulfill multiple functions. E.g. a sluice will contribute to shipping (a function), but also to flood risk reduction (a different function). |
| Asset management | Enables an organization to realize value from assets in the achievement of its  organizational objectives1. Asset management can be done on different levels, strategic, tactical and operational are the generally distinguished levels. An example of strategic asset management is that safety standards of flood defences are changed due to new societal developments (e.g. economic growth), an example of asset management on a tactical level is the planning of reinforcement of dikes over a longer period of time, an example of a decision on an operational level is how often a dike should be inspected in order to ensure its reliability meets the standard. |
| Asset performance | Measurable result1 Measure for the extent to which the asset performs, to be compared with the required performance. E.g. the reliability of a dike or the availability of a sluice. |
| Availability | Ability of a system to be kept in a functioning state[[2]](#footnote-3). E.g. the percentage of time that a pump is functioning. |
| Consequence | Represents an impact such as economic, social or environmental damage or improvement, and may be expressed quantitatively (e.g. monetary value), by category (e.g. High, Medium, Low) or descriptively.[[3]](#footnote-4) For instance the casualties and damage in a flood. |
| Cost | **Capital**: Initial investment required to provide a significant change to the performance of an asset or provide a new asset (e.g. reinforcement costs, cost of building a sluice)  **Revenue**: On-going investment needed to maintain the performance of asset / asset system  **Operating**: costs for keeping an asset (e.g. the sluice) operational (i.e. satisfying the performance criterion). For instance, cost for energy, maintenance, painting the doors.  Whole life: see life-cycle cost |
| Life-cycle cost (LCC) | Or: Whole Life-cycle Cost or: Total Cost of Ownership (TCO). The total of all costs and revenues over the life cycle. Enables comparison of e.g. construction, maintenance and removal costs. Generally expressed as Present Value, where all future investments are expressed in current day value using discounting. |
| Probability | Measure of our strength of belief that an event will occur. 2 For more details on different interpretations and views on the concept of probability see2. |
| Reliability | Ability to perform a certain defined task, often expressed as probability of failure. E.g. the reliability of a flood defence is its ability to prevent a flood. Generally expressed in terms of probability |
| Resilience | Ability of a system to react and recover from a damaging hazard2 |
| Risk | Function of hazard, exposure and vulnerability2  For a flood that would be:  Hazard: the probability that a flood occurs (to given depth, velocity, duration) at a given location.  Exposure: the people, businesses, infrastructure, habitats etc that may experience harm if a given flood occurs.  Vulnerability: the degree of harm (loss of well-being) suffered by those exposed to a given flood.  Please note: This definition supports the more general definition of risk as a function of probability and consequences; where consequences are described by exposure and vulnerability. |
| Risk attribution | Decomposition of risk to individual assets/objects |
| Safety | The requirement not to harm people, the environment, or any other assets during a system's life cycle[[4]](#footnote-5) |
| Scenario | A plausible description of a situation, based on a coherent and internally consistent set of  assumptions.2 For instance a description of the development of climate or economic growth in the next decades. |
| Standard | Of protection:  Performance    Safety  Ultimate limit state  Serviceability limit state |
| (Investment) strategy | A strategy is a combination of long-term goals, aims, specific targets, technical measures, policy instruments, and process which are continuously aligned with the societal context. 2 |
| Performance criteria | Required: Levels that performance indicators need to meet. E.g. safety standards defined by law.  Desired: Levels of performance indicators that might be met, if benefits for organizational objectives (broadly) outweigh costs. E.g. if an organization has as objective to generate more economic activity on and around a dike, they can make it multifunctional, if it is not too expensive. |

# Contents

[Report information 1](#_Toc456188089)

[Summary 2](#_Toc456188090)

[Contents 7](#_Toc456188091)

[1 Introduction 9](#_Toc456188092)

[2. Part A National context - Netherlands 10](#_Toc456188093)

[Question 2.1: Context within which asset management takes place 10](#_Toc456188094)

[2.1a – Roles and responsibilities 10](#_Toc456188095)

[2.1b - Relevant policy, plans and codes 11](#_Toc456188096)

[2.1c Planning timescales of interest 12](#_Toc456188097)

[2.1e Governance and other aspects 13](#_Toc456188098)

[Question 2.2: Challenges and barriers to be overcome 14](#_Toc456188099)

[2.2a Barriers in the understanding of the current system 14](#_Toc456188100)

[2.2b Future change 14](#_Toc456188101)

[2.2c Funding barriers 15](#_Toc456188102)

[2.2d How successful is asset management 16](#_Toc456188103)

[Question 2.3: Overview of tools and data used (where this is known) 16](#_Toc456188104)

[2.3a Reliability 16](#_Toc456188105)

[2.3b Deterioration 17](#_Toc456188106)

[Question 2.4: Decision process 17](#_Toc456188107)

[2.4a Investment planning and prioritisation 17](#_Toc456188108)

[2.4b Social justice 17](#_Toc456188109)

[2.4c Robustness under conditions of future change 18](#_Toc456188110)

[3. Part B Case study – Flood protection gates 19](#_Toc456188111)

[Question 3.1: Setting the scene of the case study 19](#_Toc456188112)

[Question 3.2: Specific challenges and barriers to be overcome 21](#_Toc456188113)

[3.2a What is the asset management challenge 21](#_Toc456188114)

[3.2bUnderstanding of the current system 21](#_Toc456188115)

[*Socio-economic understanding* 23](#_Toc456188116)

[3.2b Future change 24](#_Toc456188117)

[3.2b Governance and other aspects - move to be consistent with Part A 25](#_Toc456188118)

[Question 3.3: Overview of tools and data to be used (where this is known) 25](#_Toc456188119)

[3.3a Reliability 25](#_Toc456188120)

[2.3b Deterioration 26](#_Toc456188121)

[For Marken the specifis challenges are peat (settlement), stability, height and maximum acceptable overtopping volume, LCC and communication with stakeholders. 26](#_Toc456188122)

[Question 3.4: Decision process 26](#_Toc456188123)

[3.4a Social justice 26](#_Toc456188124)

[3.4c Investment planning 26](#_Toc456188125)

[Question 3.5: The relationship of AM to board planning issues 27](#_Toc456188126)

# 1 Introduction

This template sets outs the questions to be reviewed and completed by the Asset Owners. The responses will then form the basis of a comparison of methods across the North Sea Region and, importantly, common challenges identified and best practice shared. The results from the questionnaire will be taken forward in WP3 and WP5.

The questionnaire is structured in two main parts. This first part of the questionnaire explores the context within which asset management policy is made, strategies development and plans delivered. The aim is to provide a rich understanding of the approaches in each partner country that forms the background to the case studies. The second part of the questionnaire focuses on the specific challenges and approaches at the case study site. By including these two strands an in-depth understanding of the reasons why different approaches are used will be developed and, in doing so, enable best practice to be shared in the most meaningful way.

**Note:** The responses to the questionnaire should be provided as a standalone report and set out using the question headings given here.

# 2. Part A National context - Germany/LSBG

## Question 2.1: Context within which asset management takes place

### 2.1a – Roles and responsibilities

We would like to understand the organizations with an interest in AM, their role and responsibilities for delivering AM (funding, programming and permitting etc). This includes both private and public sector organizations, as well as the role of communities and NGOs. We would also like to explore how third party assets treated/managed.

|  |  |  |  |
| --- | --- | --- | --- |
| **Organization** | **Interest** | **Role** | **Responsibility** |
| **National government** |  |  |  |
| Federal Ministry for Environment, Nature Conservation, Building and Nuclear Safety (FRG) | Maintain an appropriate level of national safety against flooding.  laws pertaining to water and waterways | Global framework legislation  Promotion and support by the federal states | Costs promotion (up to 70%) by the federal ministry for actions of flood protection  Coordination of the activities of the federal states in collective meetings |
| **Regional government** |  |  |  |
| Regional water authorities (not in Hamburg, but in other federal states : water boards) | Protection of residents towards flooding according to set safety levels | *Operational flood management:* accomplishing the prescribed safety by constructing and managing flood protection structures.  Setting the standard: provide the required funds, pass detailed flood protection laws and decrees | Funding the structures, maintenance and defence of the flood protection in excess of the nation promotion  Maintain flood defences to the statutory safety level (laid down in legislation) |
|  |  | Permitting in Hamburg |  |
| **Local government** |  |  |  |
| Regional water authorities (in other federal states municipalities | Local integrated development | Permitting | Responsible for spatial planning on local scale |
| **Operating authorities** |  |  |  |
| LSBG | Protection of residents towards flooding according to set safety levels  Local integrated development | *Operational flood management:* accomplishing the prescribed safety by constructing and managing flood protection structures.  Setting the standard: provide the required funds, pass detailed flood protection laws and decrees  Permitting in Hamburg | Funding the structures, maintenance and defence of the flood protection in excess of the nation promotion  Maintain flood defences to the statutory safety level (laid down in legislation)  Responsible for spatial planning on local scale |
| **Private owners** |  |  |  |
| N/A | N/A | N/A | N/A |
| **NGOs** |  |  |  |
| N/A | N/A | N/A | N/A |

N/A: Not applicable for asset management in the national context from the LSBG point of view

### 2.1b - Relevant policy, plans and codes

Discuss the policies, plans and codes that specifically influence the delivery of asset management. These should include both flood related and non-flood related (for example, broader development plans). This should be provided as a table as below with supporting text below.

|  |  |  |  |
| --- | --- | --- | --- |
| **Policy or plan** | **Level (international;/European/National)** | **Description** | **Influence on asset management** |
| **Policies** |  |  |  |
| Floods Directive | European |  | The requirement for a national understanding of areas at significant risk and develop Flood Risk Management Plans for those areas |
| Masterplans of federal states or printed matter  In Hamburg | National (and federal state) | The masterplans or printed matters describe the measures that must be taken to keep the German federal states safe and habitable for current and future generations and to make the most of the opportunities that water has to offer. | It is the framework for flood protection issues, like the new safety standard. |
| **Plans** |  |  |  |
| N/A | N/A | N/A | N/A |
| **Codes** |  |  |  |
| Eurocodes | European | Technical annexes: e.g. geotechnical codes, reliability analysis; EC machinery directive | Some of the technical Eurocodes are incorporated in German codes. |
| German Codes | National | The DIN-Standards describe the measures that must be taken to keep the German federal states safe and habitable for current and future generations and to make the most of the opportunities that water has to offer. | Each federal state developed codes for measurement for its own use. |
| **Guides** |  |  |  |
| Hydraulic boundary conditions | National (and federal state) | Hydraulic loads used for the safety assessment and design of flood protection infrastructure | The results of the safety assessment determine the fabrication and maintenance of the flood protection structures Each federal state developed codes for measurement for its own use. |
| Assessment method and rules | National (and federal state) | Description of the assessment procedures and assessment rules for each asset type and failure mechanism | The results of the safety assessment determine the fabrication and maintenance of the flood protection structures Each federal state developed codes for measurement for its own use. |
| Design guide / standard assembly | National (and federal state) | Description of design procedures and rules for each asset type and failure mechanism | The results of the safety assessment determine the fabrication and maintenance of the flood protection structures Each federal state developed codes for measurement for its own use. |

*Please feel free to expand below….*

### 2.1c Planning timescales of interest

Discuss the timescale over which asset management activities are assessed and planned and how each influences AM decisions. Consider the multiple timescales within which assessments takes place (national policy cycles, regional planning cycles, maintenance cycles, others).

|  |  |  |  |
| --- | --- | --- | --- |
| **Time scale** | **Associated time horizon (in years)** | **What AM decisions take place over this timescale?** | **Who leads these decisions?** |
| **Long term planning** |  |  |  |
| Design Flood | ≥ 2050 | Regular consideration of the design flood in matters of climate change and other factors | Regional parliament |
| **Medium term planning** |  |  |  |
| National safety standards | Considers the situation in 2050 (taking account of socio-economic and climate change). This is repeated about every 50 years. | Regular consideration of the design flood in matters of climate change and other factors | Current probability of occurrence: about 1:450,  new design flood about 1:7.000 |
| **Short term plans** |  |  |  |
| N/A | N/A | N/A | N/A |

*Please feel free to expand below….*

**2.1d - Requirements of performance**

Discuss what kind of performance requirements have to be met, who defines these and how these are determined.

* **Required criteria (i.e.** What criteria must be met regardless of cost)

In Germany the responsible institutions plan the construction and the maintenance of the flood protection structures. After consulting the neighboring federal states, each federal state determine the design flood, which is regularly reviewed.

The construction of the structures is based on international and national engineer standards and on in Germany valid codes, which are for example: EAK (recommendations for coastal protection structures) and other specific determinations like standard assemblies, laws and decrees

Important is an unification of standards of the FRG to improve the approaches of each federal state for the flood protection.

**Desired criteria?** What criteria might be met? If (broad) benefits outweigh (broad) costs

Tourism and city planning make increasing demands on flood protection structures. A co-financing by the city planning would be helpful for the maintenance

### 2.1e Governance and other aspects

#### Funding

* Who pays, the asset management plan to be developed, for maintenance, capital investment and how secure is this funding stream into the future?

Bearing the expenses in Germany is often variable. In Hamburg for example, the cost-bearer and the institution for maintenance and flood defence is the federals state of Hamburg with financial support by the federal government.

In other federal states the maintenance and flood defence is organized by water and dyke unions / water boards, which expenses are paid by contributions for the water boards and with financial support for investments by the federal government

## Question 2.2: Challenges and barriers to be overcome

Questions 2.2a to 2.2d seek to tease out the issues in our understanding of asset performance over time and the availability of supporting data.

### 2.2a Barriers in the understanding of the current system

#### Physical understanding

*Sources*

* Extreme storms and river discharges (what are of return period storms do you consider, how do you include joint probability issues)

The regional government determines the expected maximum storm flood data and publishes these.

*Pathways*

* Accuracy of the floodplain topography data (what level of accuracy is typical and is this good enough?)

A detailed digital elevation map is available.

* Accuracy of information on asset location, geometry and construction (what is known and where are the key gaps in knowledge)

In the archives of the asset owner contain data of the actual-condition and further information of: planning, permissions, exhibitions and damages. Plans for the flood defence are available.

### 2.2b Future change

Socio-economic understanding

*Receptors*

* Accuracy of information on floodplain usage (residential properties, people, businesses etc)

There is no separation of risks in order to provide a high constant level of protection.

We would like to understand how future change is accounted for. In particular:

#### In climate

What guidance is provided on climate change, including: (change to a table)

* Sea level rise allowances – what estimates of SLR are used for 2025,2050,2080

Hamburg (LSBG) has a monitoring program in which data for SLR and storm surge development are collected. The uncertainties are considered.

The estimated SLR is:

* 2025: ≤ 10 cm
* 2050: 20 cm
* 2100: ≥ 80 cm
* River flows – what estimate of change in peak flows are assumed for 2025,2050 and 2080 – if not peak flows how is climate change accounted?

For 2050 the estimated design flood (storm surge in river Elbe) for Hamburg is 8.10 m NHN (gauge St. Pauli). The flood protection hight is going to be raised by around 1 meter in the next 25 years

* Rainfall – what change in the estimate of rainfall (30 and 100 year return period hourly, daily, monthly) are assumed for 2025, 2050, 2080s? – if not quantified how is rainfall change accounted for?

N/A

Is any consideration given to the influence of the following climate change related issues on asset management decisions:

* Temperature – Yes/no – if yes how? No, only as a trigger for SLR
* Storm sequencing – Yes/no – if yes how? No, the frequency is not relevant
* Spatial coherence – Yes/no – if yes how? No

#### In socio-economics

* Population growth – Yes/no – If yes, what assumptions are made about population growth (% increase, by 2025, 2050, 2080)

Yes, the % increase is independent, because of territorial protection.

* Economic development – Yes/no – If yes, what assumptions are made about growth (% increase, in GDP by 2025, 2050, 2080)

Yes, the % increase is independent, because of territorial protection.

#### In land levels

Localised settlement of the levees – If yes, what assumptions are made

Yes, depends on location. In many cases there is increasing influence of city planning and tourism.

Regional soil subsidence (i.e groundwater management related consolidation) – If yes, what assumptions are made

No

Isostatic rebound – If yes, what assumptions are made

No

### 2.2c Funding barriers

Everyone has a finite pot of money – but is the structure of funding or payment a barrier to optimal / best asset management (compensation for example).

Generally the funding follows the requirements. Low funding rates mean longer construction sites and for the maintenance less work. The safety has to be provided and always is. There is a priority list to ensure that the funding is spent optimally

### 2.2d How successful is asset management

Is it known whether the asset management is being delivered successfully?

Consider issues of delivering:

* The required process – assets been managed through the process set out
* The performance criteria (see Question 2.1d) – have required and desired performance been met.
* The efficiency of achieving these – minimizing whole life costs for the outcomes achieved

If so, how is it measured? (e.g. required and desired performance requirement (if present) is met?

The results of a new construction are documented. The same applies to the maintenance in the form of logs and inspections. A priority list ensures that the most vulnerable part will be improved first. The safety standard is not reconsidered in dependence on individual measures

## Question 2.3: Overview of tools and data used (where this is known)

### 2.3a Reliability

#### Overview

* What approaches do you typically use to support policy analysis and design?

Hamburg uses a multi-method concept. That means empirical calculation, modelling and statistics. International standards are considered.

The safety standard is not risk based. But in the course of improving the dike-line in the next 30 years risks are considered. This means to improve the weakly parts first.

* Do you have data to support these methods? If so, who collects it, who collates it and can access it and is it t openly available, if so where? Is uncertainty in the data considered?

Hamburg has a monitoring program in which data for SLR and storm surge development is collected. The uncertainties are considered.

#### Specific challenges and gaps in understanding

What are you particularly grappling with

The main challenge is a sufficient funding of maintenance, monitoring systems and the archiving of data and information in different places.

### 2.3b Deterioration

With and without management….

The deterioration of assets is not exactly known, but it is visible at some points. It is managed by inspection (visual and technical monitoring).

## Question 2.4: Decision process

The following question explore the aspects that shape the choices made.

### 2.4a Investment planning and prioritisation

*Expenditure type*

* Total expenditure (whole life cycle costs) – or just capital or revenue?

The LLC is rarely considered. The planning is based on the design flood and state of the art standards.

*Prioritisations*

* First in the queue – early bird gets the worm – constraints on permitting for example
* Given the nature of expenditure, do you seek to identify least cost or max BCR, or other
* Individual asset versus asset portfolio planning: How is investment optimised across the portfolio of assets that exist?

Like in the Netherlands the flood protection construction is primarily determined by safety laws. Further points are available plots of land, acceptance by the citizens and the funding. The planning and the construction are based on the design flood, the state-of-the-art technologies and given engineer standards and decrees.

Maintenance experiences are integrated in the planning. Possible future expansions are also considered in the planning of flood walls. Reinforcements by priority list and need for action

*Opportunities for enhancing the return on investment*

* Payment for non-FM benefits/functions? i.e broader benefits – is this possible and do they change the investment ranking? No
* Private contributions – does this change the ranking? No
* Opportunities of material reuse and other infrastructure investment synergies – i.e tunneling programme has generated potential source of materials? Yes

For the flood protection the “return of investment” is not or hardly presentable. Although there is nation wide data by *Munich Re* (a German Reinsurance) for protected value by the flood protection. The ultimate ambition is the safety of the citizen and the protection of the city and the goods. The planning and construction should be maintenance-friendly and include realistic depreciations. LCC as a base for improvement is reasonable.

### 2.4b Social justice

How are the three principles of justice considered:

* Equality – Are all citizens treated equally in the FRM process? If no, why not? If so, how is this ensured? Yes, the same level of safety for all parts and citizens of Hamburg is provided
* Are the most vulnerable members of society prioritized? If no, why not? If so, how is this ensured?

No, the same level of safety for all parts and citizens of Hamburg is.

* Utility – Is it a required to ensure the best return for each euro spent? If no, why not? If so, how is this ensured?

Yes, keeping up a high level of safety while optimizing the costs (LCC)

# 3. Part B Case study – Flood protection gates

The following questions focus on the specific approaches taken at the case study sites. The responses here follow on from those in Part A and will help provide an understanding of how the approaches nationally influence and are taken up locally.

## Question 3.1: Setting the scene of the case study

Please describe (in no more the two pages including figures) the context of your case study. This should include:

#### Name of the case study and a map

Flood protection gates: “Große Elbstraße”, “Landungsbrücken Brücke 6”, “Brooksbrücke”

|  |  |
| --- | --- |
|  |  |
| “Große Elbstraße” | “Landungsbrücken Brücke 6” |
|  |  |
| “Brooksbrücke” |  |
| Rights of the pictures: LSBG Rights of the map: FHH | |

#### Focus/objective of the case

*Decision focus:*

The approach for decision is mix of strategic and tactical. There is a strategic plan for our pilots but they are already in use and therefore sometimes issues will be fixed after priorities.

* tactical 🡪 check of legal conformity regarding the operation
* check strategy if necessary

*Objective:*

The objective for the flood protection gates are:

* optimizing the maintenance costs without loss of quality
* optimizing the reliability
* increasing the buildings life cycle
* identifying and adapting suitable material / components
* Adaptability to new requirements
* better conformity with norms, rights and regulations

#### The physical setting

*Nature and topography*

The three flood protection gates are located in the inner city of Hamburg. The average ground level is about 5,6m above sea level (m NHN)

*Sources of flooding*

The source of flooding is storm surges in the river “Elbe”.

*Existing flood defence infrastructure:*

The existing flood defence infrastructure in Hamburg consists of 40 flood protection gates, about 25 km flood protection walls, 78 Km of main dykes and 39km of dykes in the second defence line. The pilot gates are the:

* flap gate „Landungsbrücken Brücke 6“
  + cill: 5,25m
  + width: 7,91m
  + hight of protection: 7,6m (m NHN)
* sliding gate „Große Elbstraße“
  + cill: 5,15m
  + width: 19,20m
  + hight of protection: 8,3m (m NHN)
* sliding gate „Brooksbrücke“
  + cill: 6,40m
  + width: 17,83m
  + hight of protection: 7,6m (m NHN)

#### The socio-economic setting

State if rural, semi-urban, dense urban

What is the nature of the communities to be protected, residential and non-residential activities, important infrastructure services (hospitals, transport hubs etc) that may be in the floodplain and how these might be impacted by a flood.

The inner city of Hamburg is a dense urban setting. There is a mix of residential and commercial activities. There is no separation of risks in order to provide a high constant level of protection.

#### Have there been past floods in the area? If so, how was it caused and what impact did it have?

The last flood was in December 2013 with a height of about 6,09m NHN in St. Pauli.

Almost all flood protection infrastructures had worked as expected. The flood protection gate St. Pauli “Landungsbrücken Brücke 6” couldn’t get closed because of human maloperation. But the notch was closed with stop logs. There were no damages on civil infrastructure and no one got hurt.

## Question 3.2: Specific challenges and barriers to be overcome

### 3.2a What is the asset management challenge

what is the driver for the case study and what makes AM difficult:

* limited budget
* lack of understanding by:
  + politics
  + citizen
  + residents
* reserved attitude towards changes
* Ongoing improvement in the consulting of planning, construction and maintenance
* Identifying the maintenance rate of the asset components. (analyzing the components and setting individual maintenance rates despite the recommendations of the producer, because of a lack of experience with the components)
* Deterioration
* Decreasing knowledge because of outsourcing
* Not consistent and partially incomplete documentation

### 3.2b Understanding of the current system

#### Physical understanding

* **Vertical accuracy and source of the floodplain topography data**

The vertical accuracy of the topography is: - / -

The horizontal resolution of the topography is: : - / -

* **What flood defence assets are important to the case study**

A basic typology of the flood and coastal erosion risk management infrastructure is provided in the table below (Sayers et al, 2015). Which asset types exist in the pilot study area and what role do they play?

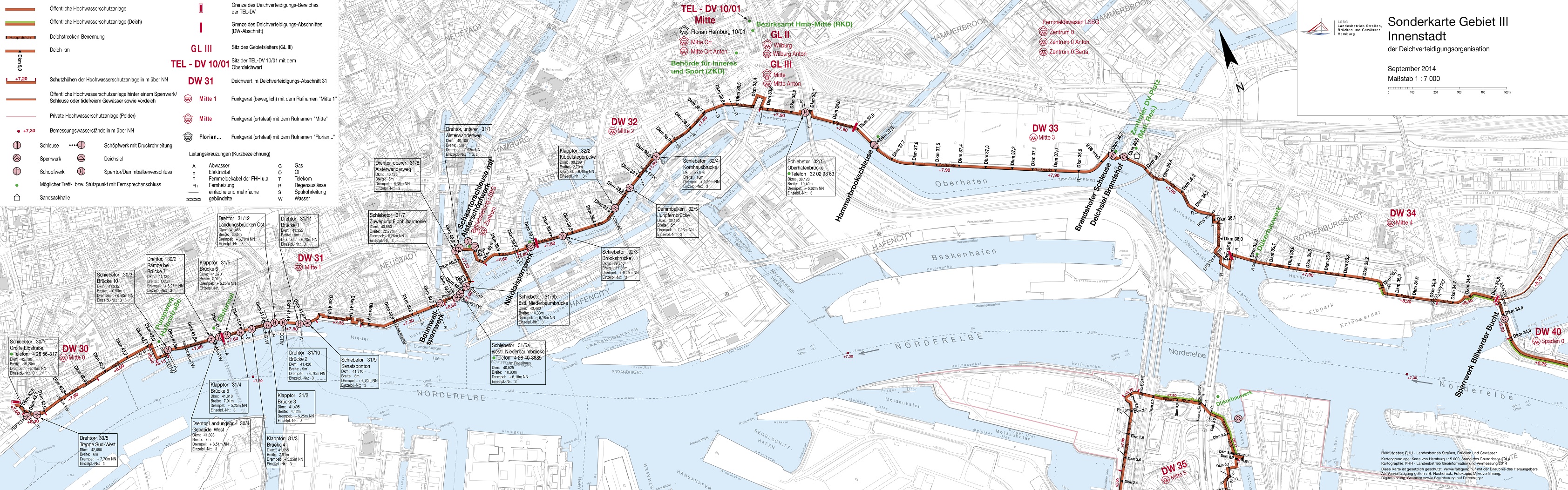
*Asset types to be considered in the pilot (asset typology after Sayers et al, 2015)*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of asset** | | **Example activities** | **Considered in pilot (yes/no)** | **Why?** |
| **Local scale infrastructure** | | |  |  |
| **Private homes and businesses** | Avoidance | Raising properties above flood levels (actively, floating homes, or passively, raised thresholds) or some other way to avoid flooding. | No |  |
| Resistance | The use of flood products and construction detailing to prevent water entering a property. | No |  |
| Recovery | Use of building materials and practice that such that although flood water may enter the building no permanent damage is caused, structural integrity is maintained and drying, cleaning and minor repairs are facilitated. | No |  |
| **Critical service nodes** | Avoidance | Raising critical functions / building above flood levels. Deployment of property scale ‘ring dykes’. | No |  |
| Resistance | The use of flood products and construction detailing to prevent water entering a property. | No |  |
| Recovery | The use of function specific building designs and network redundancy to avoid loss of function if flooded (i.e. continued power or communication distribution). | No |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **System scale infrastructure** | | |  |  |
| ***Hard path infrastructure – Planning, design and management of built infrastructure*** | | |  |  |
| **Linear and network assets** | Active | Barriers that can be deployed as temporary and demountable defences. | No |  |
| Passive - Above ground | Raised defences and shore parallel structures (i.e. embankments, levee or dyke, breakwaters) through to storm water storage ponds. | No |  |
| Passive - Below ground | Individual pipes, CSO’s and the drainage network they compose. | No |  |
| **Point assets** | Active | Pumps, floodgates and sluices. | Yes |  |
| Passive | Fixed trash screen, groynes as well as interface assets (that link above and below ground linear systems) such as manholes and gullies. | No |  |
| ***Soft path infrastructure – Utilizing natural infrastructure systems*** | | |  |  |
| **Watercourse** | Channel | The management of vegetation (e.g. weed cutting) and sediment (e.g. shoal removal and dredging). | No |  |
| Floodplain | The management of floodplain roughness and debris recruitment. | Yes |  |
| **Coast** | Foreshore and backshore | The management of dunes and beaches through active (e.g. recycling and profiling) and passive (e.g. sand fencing, marram grass planting) management as well as natural wetlands and soft cliffs. | No |  |
| **Urban landscape** | Urban land use | The engineering of urban green space, managing surface permeability (e.g. through SuDs) and debris recruitment. | No |  |
| **Rural catchment** | Rural land use | The management of rural run-off, sediment yields as and debris recruitment. | No |  |

*Note: FCERMi includes any feature that is actively managed to reduce the chance of flooding or erosion (Sayers et al., 2010). Dams and associated ancillary structures are excluded from this paper*

* **Accuracy and source of information on asset geometry and their performance**



### Socio-economic understanding

* Accuracy and source of information on floodplain usage (receptor etc)

#### Existing plans and policies

How do existing plans and policy influence the approach to asset management in the case study site

|  |  |  |
| --- | --- | --- |
| **Policy or plan** | **Description** | **Influences on asset management at case study location**  **<Impact?>** |
| **European policy** |  |  |
|  |  |  |
| **Eurocode** | Some of the eurocode are incorporated in national code | Less influence |
| **National policy** |  |  |
| Deltaprogramme – National level | Sets the requiremensts on the longer term on national scale | Less influence |
|  |  |  |
| **Regional strategies** |  |  |
| Design flood |  |  |
| Printed matter for construction range |  |  |
| Zoning and land-use regulations / area development | Sets the requirements regarding regional spatial planning | Upgrading methods for flood defence must meet regional regulations |
| **Local plans** |  |  |
| Design flood |  |  |

### 

### 3.2b Future change

We would like to understand how future change is accounted for. In particular:

#### In climate – repeat by the Part A questions here but answer for the specifics of the case study

What guidance is provided on climate change, including:

* Sea level rise allowances
* River flows
* Temperature?
* Storm sequencing?
* Spatial coherence?

Climatic influences are generally considered in the calculation of the design flood

#### In socio-economics

Socio-economic aspects (population growth and development) are incorporated in the legal safety standard.

### 3.2b Governance and other aspects - move to be consistent with Part A

#### Funding

* Who pays, the asset management plan to be developed, for maintenance, capital investment and how secure is this funding stream into the future?

The maintenance of the public flood protection gates is financed by the federal state. The funding for the construction range is also secured.

* Are there other funding or payment barriers (compensation for example)

The maintenance account is permanently set to a minimum. Therefore often only the functional issues get resolved. Cosmetic repairs will be performed if enough money is available

#### How successful is asset management – review Part A question

* Is it known whether the asset management is being delivered successfully? If so, how is it measured? (e.g. required and desired performance requirement (if present) is met?)

The results of a new construction are documented. The same applies to the maintenance in the form of logs and inspections.

## Question 3.3: Overview of tools and data to be used (where this is known)

### 3.3a Reliability

#### Overview

* What approaches are you planning to apply?
  + Exchange of identified low reliable components, e.g. proximity switches
  + Identifying components that should be exchanged before they get broken
  + To develop a specific maintenance plan for each flood protection gate
* What are minimum data requirements for this approach(es)?

For these approaches a long-term experience of the asset and its components is necessary / required.

* Will the analysis be undertaken by a specialist engineer? If yes, is this in-house or external?

The analysis is performed by internal and external specialists. It depends on the department and also the components. The goal is to keep as much as possible knowledge in house.

#### Specific challenges and gaps in understanding

What are you particularly issues are you grappling with

* Gaps in physical process knowledge: Not known, so far.
* Gaps in analysis capability: Not known, so far.

### 2.3b Deterioration

Why is deterioration of assets important at the pilot? Are the deterioration rates known, if so, what is the evidence that is used? Is deterioration managed, and how is value for money of the associated expenditure evaluated?

Deterioration rate is not known. Because of less money in maintenance deterioration occurs and LCC rises respectively live span would be reduced.

#### Specific challenges and gaps in understanding

What are you particularly grappling with – transitions, piping, on-demand M+E, peat, exceedance?

* Lack of information
* Lack of maintenance structures

## Question 3.4: Decision process

### 3.4a Social justice

How are the three principles of justice considered:

* Equality
* The most vulnerable are prioritized
* Utility (best return)

See answers 2.4b

3.4b Robustness under conditions of future change

What are the specific values of future change that have been considered in the pilot site:

* How is climate change factored in?

The design flood for Hamburg is adjusted or rather calculated on a regular base.

* How is development in the floodplain factored in?

It is based on the regulation concerning dykes.

* How is uncertainty over future funding factored in?

Uncertainty is not factored in. The funding is secured by the federal sate.

3.4c Investment planning

What funding constraints exist at the pilot site?

The limited annual budget for the maintenance of the flood protection buildings is provided by the federal state.

How is long term funding secured?

Stately task; funding is secured by state

Is additional funding for multi-benefits being sought - if so, where from and is this likely to be successful?

No

## Question 3.5: The relationship of AM to board planning issues

Within the pilot location, do flood defence activities and funding link with broader planning policies and plans, if so how?

As a minimum consider the relationship of the flood defence approach to:

* Spatial planning
* Environmental regulation (such as the Water Framework Directive)
* Promotion of redevelopment or tourism
* Evacuation planning?

The available budget is used for upgrading the flood defence to the legal safety level. Other initiatives can be incorporated only when additional budget is available. City planning aspects are incorporated in every planning. Laws for environmental compatibility and nature conservation law have to be considered as well.

1. ISO55000 [↑](#footnote-ref-2)
2. http://www.ntnu.edu/c/document\_library/get\_file?uuid=ae1f2570-1191-4d7c-b4c3-9686aaeccaf8&groupId=151572 [↑](#footnote-ref-3)
3. FLOODsite: The Language of Risk [↑](#footnote-ref-4)
4. http://www.ntnu.edu/c/document\_library/get\_file?uuid=ae1f2570-1191-4d7c-b4c3-9686aaeccaf8&groupId=151572 [↑](#footnote-ref-5)