Managing Adaptive REsponses to changing flood risk

MARE Policy Development
Activities and impact on policy of the
4 Learning and Action Alliances

Overview report

Co funded by the European Union through the European Regional Development Fund

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Glossary of terms

ATP	Adaptation Tipping Point
Adaptation Tipping Point	Points where the magnitude of climate change (or any driver) is such that the system can no longer meet its performance objectives (Kwadijk et al, in press)
Climate-proofing (broad definition)	To use hard infrastructure to reduce risks to a quantified level, accepted by the society or economy. This risk can be further combated by 'softer' measures, such as insurance schemes or, as a last resort, evacuation plans . Such climate proofing should be driven by opportunities for technological, institutional and societal innovations (Kabat et al, 2005)
Climate-proofing (narrow definition)	To take account of and act upon changes in climate (Jeuken et al, 2008)
CPT	Climate-proofing toolbox and guidance
Exceedance event	An event which exceeds the threshold (the protection level) of the flood system. The volume of water is larger than the drainage system (including e.g. exceedance pathways) can handle, resulting in water flowing where it was not intended or planned to flow
Flood	Temporary covering by water of land not normally covered by water (Flood Directive, 2007)
Flood impact	Economic, social or environmental damage that may result from a flood. May be expressed quantitatively (e.g. monetary value), by category (e.g. high, medium, low) or descriptively. (Samuels and Gouldby, 2009)
Flood intensity	The flood intensity is a measure of the magnitude of the flood, e.g. expressed as the rainfall duration or flood discharge
Flood protection (measure)	Measure to protect a certain area from inundation (Samuels and Gouldby, 2009)
Flood risk	The combination of the probability of a flood event and of the potential adverse consequences for human health, the environment, cultural heritage and economic activity associated with a flood event. (Flood Directive, 2007)
FRMP	Flood Risk Management Plan
Learning and Action Alliance	Platform of professional stakeholders to enable collaborative learning and to provide a base mechanism for action; the platform has a shared interest in innovation and the scaling-up of innovation
Net Present	The sum of the discounted benefits of an alternative less the sum of its discounted costs, all discounted to

Value	the same base date.
Non-structural measures	Designed policies and procedures; supporting institutional framework, including land use planning economic incentives and human capacity building (EC, 2009)
Impact	See Flood impact
Preparedness	Informing the population about flood risks and what to do in the event of a flood
Prevention	Preventing damage caused by floods by avoiding construction of houses and industries in present and future flood-prone areas; by adapting future developments to the risk of flooding; and by promoting appropriate land-use, agricultural and forestry practices
Protection	Taking measures, both structural and non-structural, to reduce the likelihood of floods and/or the impact of floods in a specific location
Protection level	Threshold level up to which a drainage system is designed to protect against flooding
Risk	See Flood risk
Reaction curve	Relationship between the change in impact of the system in relation to increasing flood intensity
Resilience	The ability of a system or subsystem to maintain its identity in the face of external pressures (Cumming et al, 2005)
Structural measures	Physical, structural interventions and construction measures to make buildings and infrastructure more robust (EC, 2009)
Uncertainty	A concept that reflects a lack of confidence about something. Decision-makers may have more or less certain knowledge of a risk.
Unpredictability	Uncertainty which cannot be removed through more scientific research
Vulnerability	Characteristic of a system that describes its potential to be harmed

Executive summary

This is a document describes by means of brief case studies the impact of the MARE project and in particular the four MARE Learning and Action Alliances on Flood Risk Management policy.

In each of the LAAs, impact has been created on various levels of governance. In Dordrecht, the Netherlands, the project has lead to new design methodologies for all urban developments, and the project started a national-level discussion on norms for decision-making in investments in the dike system. In Bergen, Norway, new design standards for urban developments have been established and a permanent regional Climate Council has been create. In Sheffield and Rotherham, England, the project contributed to the delivery of the River Don Catchment Flood Management Plan, an innovative instrument for developing public-private partnerships is being used for the first time to finance flood protection infrastructure. In Hannover, Germany, the MARE learning and action alliance become an inherent part of the cities strategy working group on climate adaptation, challenged the cities development strategy "Hannover 2020" by addressing the topic of flooding, altered the Federal States practical implementation of the Flood Directive and – is by now – ready to bring an Flood Risk Management Plan into action.The MARE project will therefore have a lasting impact on adaptation to flood risk in participating cities, at regional level in to some extent national levels as well. The MARE project recommends further analysis of the success factors of policy innovation in order to achieve an even higher impact in future projects.

Contents

1 Introduction

MARE stands for Managing Adaptive REsponses to changing flood risk in the North Sea region. The MARE project was created develop and demonstrate methodologies adaptation to flood from a bottom-up perspective, ie at city level, and support uptake of these methodologies by participating cities but as well by policy makers at regional and possibly national levels.

In the project, Flood Risk Management tools have been developed; the ´Climate Proofing Toolbox´, which has been applied by development of Flood Risk Management plans in 4 cities across the NSR that face different types of flood risk. These cities are Dordrecht (The Netherlands), Sheffield (United Kingdom), Hannover (Germany) and Bergen (Norway). Both the development of the method and it application have been supported by a local ´Learning and Action Alliance´ of key stakeholders, and an international team of academic experts.

1.1 Context: the need to do things differently

Recent flooding events in the North Sea region and beyond have demonstrated the vulnerability of cities through huge economic and social disruption and even loss of life. It is firmly predicted that these events will become more frequent and severe. The viability of urban areas and their capacity to attract and retain investment is threatened.

Adaptive planning at local scale is widely recognised to have a large potential in mitigation of flood risk. Local solutions could provide equitable, resilient and reversible options for Flood Risk Management (FRM). However, supporting policies and guidelines need to be put in place. The European Directive on Flood risks provides a general framework. Many questions however remain regarding implementation at local level, and integration of Flood Risk measures with other policies and objectives into coherent, effective, (cost)-efficient policies and projects. MARE aims to be a project to develop and demonstrate possible approaches for such integrated policies.

1.2 Aims and objectives

A central aim of MARE is to support policy development on different scale levels in order to ensure lasting impact of the project's lessons learned. Projects results should feed into local to national Flood Risk Management processes and regulations. These objectives are part of Work Package 4 Process and Policy Implementation.

This report on MARE Work Package 4 describes results and impacts achieved by the learning and action alliances in development of policies that enable or promote local flood risk adaptation policies. The report consists of a number of case studies per Learning and Action Alliance describing the Output of the project in term of policy change. Where needed, it provides details on the Throughput process, this process analysis is not part of the document.

2 Method

2.1 Rationale

This report serves to show the contributions made to FRM policy processes through the activities carried out in MARE. Examples from each participating LAA (Dordrecht, Hannover, Sheffield and Bergen) are being described following the common framework described below to illustrate the (potential) impact of their activities. Existing reports and semi-structured interviews have been the method of use to collate all the information needed for the description of the case studies presented in this report.

2.2 Framework for Policy Development in the MARE project

The framework for Policy Development in the MARE project is based on Collaboration for policy change in water management; impact, organisation and perspectives on a Learning & Action Alliance (van Herk et al., 2011).

In brief, the model consists of 3 elements; Input, Throughput (Learning and Action Alliance activities) and Output. The Input is the driver of the system: the development of new knowledge or models, new local (infrastructural) needs or new policy objectives start a process in which stakeholders work together to jointly analyse the system, design options and select optimal outcomes. This leads to Output in terms of: local infrastructural solutions in demonstration projects, new knowledge or insights and policy changes.

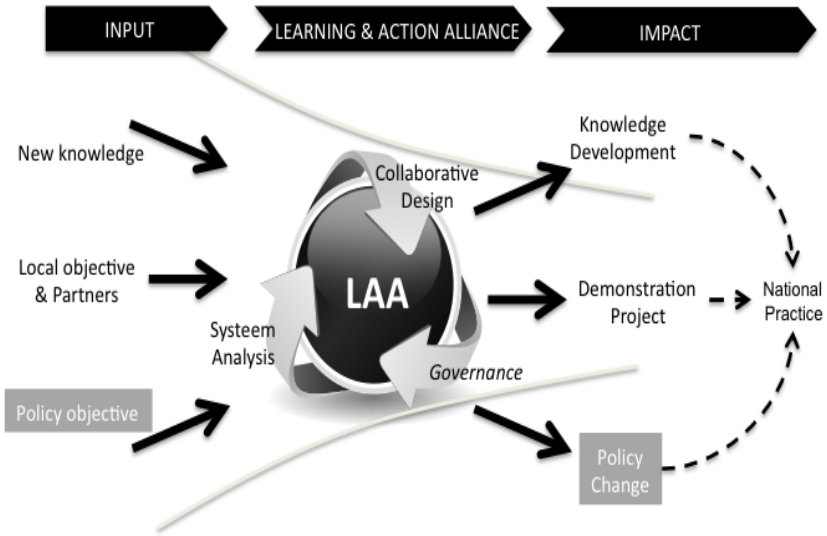


Figure 1: Policy change through LAA approach: based on local cases and new knowledge[1]

2.2.1 Case structure and interview questionnaire

For each Learning and Action Alliance a selected case studies are presented to demonstrate the impact of the MARE project. Each case study description in this report is structured according to the framework above. As a starting point the input is reviewed, as it is important to understand what has been the initial driver of the case example we are looking at, and how the different elements relate to one another and to associated policy trajectories. We distinguish among three factors that

[1] For a detailed description of the organization of LAA's please refer to MARE WP1 reports

alone or together constitute the driver of change; a policy objective, local challenge and newly emerged knowledge amongst LAA partners.

Continuing the three activities of the interactive LAA process is briefly described. Key questions in this respect are for instance; how have the partners together dealt with the matter at hand and how is it developed further. Here we would also like to describe which method of analysis has been used, which stakeholders have been involved and which alternative measures have been identified that can help solve the problem.

Finally, we describe where and how this process has fed into policy. It is further described what changes are still expected to occur and what is or will be the subsequent impact on national practice. With each case study a reference to (a preferably external) document is included to demonstrate the impact achieved by MARE and the wider uptake beyond the direct partnership.

2.3 Data and data sources

The case studies are based on existing reports and semi-structured interviews with Learning and Action Alliance coordinators and other key people in the MARE project.

MARE Partner	Organisation	Interviewee
LAA Dordrecht	Gemeente Dordrecht	Ellen Kelder
LAA River Don	Rotherham Metropolitan Borough Council	Andy Newton
	Sheffield City Council	Roger Nowell
	University of Sheffield, Pennine Water Group	Richard Ashley, John Blanksby
LAA Hannover	Landeshauptstadt Hannover	Paul Burkhard Schneider
LAA Bergen	Bergen Kommune	Eva Britt Isager, Per Vikse,

3 Case studies

3.1 Overview

In each of the Learning and Action Alliances, a long list of policies haven been initiated, contributed or otherwise supported. In sections describing impact these overviews are included. Per LAA this report also describes particular case studies to demonstrate the link between MARE methodologies (LAA, CPT), the demonstration in pilot projects and the resulting impact on policy. These case studies are:

	Local	Regional	National
Dordrecht	Wielwijk Climate Proof (WWKB)		Dike reinforcement Kop van het Land (KvhL) MultiLevelSafety (MLS)
Hannover	climate adaptation strategy and Hannover 2020 (H2020)	Flood Directive regional implementation (FD)	Flood Directive regional implementation (FD)
River Don	Rotherham Flood Alleviation Scheme (RFVAS)	River Don Catchment FRM plan (RD)	Business Improvement District for FRM financing (BID)
Bergen	Bergen FRM design standard (FRM)	Regional Climate Council (FCC)	

3.2 Dordrecht, the Netherlands

3.2.1 Background and approach

Water is an intrinsic part in the city of Dordrecht. The historic development of the city has been determined by the economically convenient location of the city at important waterways and by a continuous struggle against the water. Dordrecht lies on an island surrounded by rivers and under direct influence of the sea. In future development of the city water plays an important role. Dordrecht is working to exploit opportunities to develop and implement water (safety) policies by interweaving it with its urban developments. An important barrier though is distribution of financial resources, decision making power, knowledge and competencies. Therefore started collaboration with public partners, companies and knowledge institutions in the LAA Dordrecht in 2006.

3.2.2 Overview of contributions to policy

The LAA Dordrecht, through the activities carried out in MARE now formally contributes to a wide range of policies related to flood risk management and urban development on local, regional and national levels:

Local	Regional	National
Waterplan Dordrecht	MultiLevelSafety Island of Dordrecht	Delta subprogramme Safety
Renewed Masterplan Dordrecht 2020	Delta subprogramme Rijnmond-Drechtsteden	Delta subprogramme New Building and Restructuring
Wielwijk Klimaatbestendig	Provincial guidelines building unembarked areas	Discussion norm systems dike reinforcements
Kop van het Land dike reinforcement		Expert group ´alternative approaches to water management´
		Knowledge network Adaptive Deltamanagement

This reports describes 3 cases that reflect the approach and results of the LAA Dordrecht activities.

3.2.3 Case 1: MultiLevelSafety

The Dutch government launched MultLevelSafety (MLS) as a policy concept in 2008. The existing flood management approach in the Netherlands focuses primarily on protection against flooding as regulated through the Water Act (2009). The proposed MLS approach is a three-tier approach that goes beyond flood protection that is its first safety layer. The two other layers are aimed at reducing the consequences of flooding by adapting the spatial layout and enhancing emergency response, respectively. The MARE LAA proposed to pilot a Flood Risk Management plan using the MLS approach and was commissioned a policy pilot by Rijkswaterstaat.

The MARE Dordrecht Learning and Action Alliance could offer an active, vertically integrated project team that included the key authorities involved in FRM planning such as Rijkswaterstaat, the province of South-Holland, the Safety Region South-Holland South and the Water Board, and a municipal authority that offered resources to apply the MLS concept to urban planning.

The MARE pilot was the first of its kind in the Netherlands. It contributed to map synergies combining individual organisations' means into integrated solutions. Ideas were furthered in an integrated FRM plan for the Island of Dordrecht. The plan comprised of several measures and an investment strategy over time that, in turn, started various policy debates.

These include; potential shifts of responsibilities and budgets to fund and operate dry canals, rather then dyke heightening. A political discussion document has been produced and policy makers are discussing the consequences for regulation and funding. However it is yet to be discussed by elected politicians. Another is the dyke reinforcement project Kop van het Land, see case number 2.

The MARE pilot influenced policy making roughly in two ways. Through the demonstration project, partners could use a clearly defined practical case to conceptualise new governance systems. This sped up collaboration, but also caused practical issues to surface that otherwise would not have become clear until a later stage. On a more strategic level, the current regulation and funding schemes are re-thought top-down as they now do not incentivize the incorporation of measures from the second and third flood safety layers. This lead to a policy-regulatory discussion started within the national DeltaProgramme and at the Ministry of Infrastructure and the Environment. As one partner put it: ¨At national level the three safety layers are decoupled in 3 ministries. At present you can still easily work on [flood] safety from your own policy domain without coordinating with the others.¨ In summary, the collaborative process as organized in the case study led to an IFRM plan, whereas previously no collaboration had been organized and no integrated plan had been developed.

3.2.4 Case 2: Dike reinforcement at Kop van het Land

The city of Dordrecht aimed to develop an integral 'Multi Level Safety' strategy, where the Climate Proofing Toolbox is used to optimise investments in measures between protection (dikes), infrastructure and emergency services. Cornerstone in that strategy was the upgrade to a 'Delta dike' of the most risky segment of the dike that surrounds the city of Dordrecht; a 5-km stretch at 'Kop van het Land', due for reinforcement in 2015. The Water Board was preparing an upgrade of the section to national norms of 1:2.000 flood protection. However, using a cost-benefit method, MARE demonstrated that a slightly different dike design at 3M euro additional investment could significantly increase protection levels of the dike, therefore reducing risk valued at 8M euro. MARE proposed this investment beyond the current norms in order to achieve a better protection level at optimal cost-benefit.

In order to obtain approval – and additional funding for the Delta dike - MARE approached the responsible national authority, the Deltaprogramme, part of the Ministry of Infrastructure's executive division Rijkswaterstaat. In a series of meetings at functionary level

between the municipality, water board and ministry, the methodology of the cost-benefit system, and the relation to dike design, were demonstrated and modified to match definitions used by the ministry. The resulting cost-optimal decision was presented by the staff of the ministry to director level for request of funding. After all these meetings, which eventually included directors of the municipality and the water board, the ministry concluded that due to lacking political decisions on investments beyond the current norms, no additional funding could be assigned and the project was cancelled.

The Kop van het Land case however continued to be discussed at senior level. The main conclusions drawn by two Directors of the Deltaprogramme, Rijkswaterstaat, the Ministry of I&M and the Province of South-Holland was that the MARE design was based on an alternative norms system. It should therefore not have been presented via the regular channels; if it would have been presented as an innovative project which uses a novel methodology to get optimal solutions for the novel Multi Level Safety strategy, it could have been escalated to director-level earlier, where various entities would have been willing to contribute.

The relevant branches of the Deltaprogramme have indicated to seek evaluation of the MARE cost-benefit method, including a review of potential impact countrywide if such system were to be applied and seek possibilities for application in another pilot case.

Related Annexes

- Letter of Mayor Aboutaleb of city of Rotterdam, chair of the steering committee for Deltaprogramme Rotterdam-Drechtsteden to Secretary of State for Infrastructure and Environment, mr. J.J. Atsma

3.2.5 Case 3: Wielwijk Climate Proof

Starting point is the task of restructuring the district Wielwijk, including improvement the drainage system, the spatial planning and real estate of the area. The additional ambition is to make the district water-enriched and greener, while reducing flooding at limited additional cost. Flood risk management was therefore not the driver, and had to be economic and integrated into the main redevelopment plan. For this the LAA applied the new method from the Climate proofing toolbox: the tipping point approach (see WP2).

Analysis based on climate change models shows the capacity of the existing systems over time and where nuisances occur. In parallel, experts from UNESCO-IHE, VROM, Alterra, STOWA and RIONed are involved to identify sustainable and water storage solutions. Together with urban planners it is identified where and when in the redevelopment process these measures can be applied. On the basis of these initial drafts, three possible spatial solution packages have been designed in a joint workshop focusing on green space and additional sewage capacity as ´green´ and most cost-effective solutions. After assessment on impact on reducing flood risk and nuisance and cost-efficiency, a combined design with the best solutions was made.

The FRM solutions found minimise additional cost by coupling to externally funded renovation plans, while climate proofing the neighbourhood over time. If FRM were treated as a stand-alone topic, funding would not have been available and realisation would have been unlikely.

The lesson learned for water managers and policy makers is that mainstreaming the ideas of MARE in existing development programmes involve additional costs on a short term, but are cost-effective on a long term.

The process and toolbox for integration of water storage and restructuring is being used in Dordrecht, by the Deltaprogramme in the national pilot 'Nieuwbouw en Herstructurering' (new building and restructuring´), and by STOWA and RIONed as national best practices.

Related annexes

WP3 report Wielwijk Climate Proof

3.3 Hannover, Germany

3.3.1 Background and approach

With 520,000 inhabitants and an area of 204 km^2, Hannover is the capital and largest city of the Federal State of Lower Saxony in Germany. A major venue for international trade fairs, Hannover status is an important industrial, service and retail centre.

The surrounding rivers and flood plains influence the state capital of Hannover and its residential development significantly. The city lies at the confluence of the rivers Ihme and Leine, which have a catchment area of about 6,000 km2. The two rivers have extensive flood plains and the city has had a long history of flooding since its foundation. Consequently the city council, region and state administrations, the university and several engineering firms have come together to address flood risk and water management. An initial result of this collaboration was the establishment of Hannover Water eV, a centre of expertise for sustainable water management, which is internationally recognised. The regional alliance in MARE is a further development of this collaboration which is contributing to the cities investment in flood mitigation from a 100 years flood of a total budget of € 30 million between 2008 and 2013.

3.3.2 Overview of contributions to policy

The LAA Hannover, through the activities carried out in MARE now formally contributes to a wide range of policies related to flood risk management and urban development on local, regional/national levels:

Local policy trajectories	Regional policy trajectories	National policy trajectories
Climate adaptation strategy	legal display of flood plain	FRM-planning approach of Federals State
Downtown urban development master plan Hannover 2020 implementation of risk study and flood mitigation measures	mapping of 200years flood	

We will now describe cases that reflect the approach and results of the LAA Hannover activities.

3.3.3 Case 1: Cities Climate Adaptation Strategy

The LAA Hannover took (over) lead in one of three fields within the cities commission with the task to draft a citywide strategy to comply with climate change. The MARE-LAA was responsible for all water related questions especially flood risk and rainfall casualties. The approaches of MARE and the LAA that fed into the strategy paper were accepted

unanimously by the other working groups in September 2011. One reason for this might be that the working group consisted of intern and extern specialists, which is natural for the MARE LAA, but not common for working groups of city administrations in general and the two other working groups for the strategy in particular. The MARE LAA was kind of heart or core group which invited more intern expertise from several departments to join the working group. Thus the results and ideas deriving from MARE not only fed into the strategy but as well reached out to more people within the cities administration attached to the all over topic. The final draft of that strategy was presented in March 2012 and at April 24th, 2012 handed over to the City Council. With that the findings from MARE become – as far as implemented – part of the cities climate change adaptation strategy that had been discussed within the city council and, thus, is directly linked to policy that has a broad and long lasting validity.

3.3.4 Case 2: Hannover 2020

The MARE LAA showed to have impact on the cities policy as with regard to the cities strategy 2020 one succeeded to make mitigation of flood risk a topic, not so from the beginning, within the design competition by architects. This is – last but not least – due to the incorporation of one of the facilitators (Prof. Machleidt) of that process as part of the beneficiary University of Hannover and with that a full member of the LAA.

3.3.5 Case 3: Collaboration with Federal State - soft factors

In the field of flood protection the City of Hannover aimed - as part of the MARE project - to involve the Federal State, their agencies and authorities into its daily work. Therefore the city strived after continuous exchange of ideas and knowledge with civil servants from the federal state about how to implement the flood directive, especially about how to mitigate flood risk within urban areas. This was welcomed by these authorities not only because of Hannover position among the cities in the Federal State but also because of the valued expertise and extra-knowhow Hannover as partner within MARE was able to share with them and kind of uncertainness how to deal with the implementation of the EU flood directive.

Thus, the City of Hannover was asked to present their findings from MARE at the joined conference of the five Federal States in northern Germany and the Federal Ministry for the Environment about regional climate adaptation in November 2012.

From that derives that experts from the City of Hannover was chosen as the municipal example on occasion of the exchange of experts between the federal state of Lower Saxony and its partner-province in Poland about flood related issues. Insofar the MARE project may as well have some impacts on the implementation of the Flood Directive in Poland.

Last but not least, the LAA Hannover / City of Hannover stimulated the interest of the Federal States responsible civil servants for FD implementation to exchange their ideas with the respective colleagues in the Netherlands and the UK which resulted into a study visit to the Netherlands and explicitly to our MARE partners of the LAA in Dordrecht.

All of this might have influenced the policy of the relevant bodies.

3.3.6 Case 4: Collaboration with Federal State - practical implementation of EU flood directive

The Federal State administration's work on flood risk management plans has resulted in the publications of flood risk maps at a scale of 1:25,000,

which lacks the precision needed to meet the requirements of municipalities. Furthermore, the approach adopted by the state administration currently takes no account of the impacts of climate change when drawing up FRM plans, and will not be doing so until the statutorily required routine review of the plans takes place in 2020.

In Hannover, the Federal State administration only became fully involved when it became clear that the City of Hannover had the data, technical competencies and local understanding which changed the state's understanding of flood risks and its initial findings.

(a) The review of the flood extent maps produced by the State of Lower Saxony for the Preliminary Flood Risk Assessment revealed that the scale at which they were produced was not sufficient for the purposes of developing detailed flood risk and hazard maps and for the development of a prioritised flood risk management plan.

There is a need to increase the horizontal and vertical resolution of the mapping to identify where the flooding takes place and the depth of flooding.

As a result of the willingness of the City to share its data (1:5,000) and knowledge with the state, the limits of the new flood zone (HQ100) were more accurately identified and in places the maps which had already been created were revised.

(b) As a result of the work carried out by the MARE team in Hannover, the state's checklist towards risk areas has been enhanced by adding key elements of the Climate Proofing Toolbox (CPT) including:

- hydraulic data for describing the problem areas,
- the stakeholder analysis,
- references to other projects in the search area so as to develop synergies and to help identify alternative measures.

This has been discussed with the state authorities and met with a positive response. However, it remains to be seen whether the aforementioned additions will be taken on board and therefore automatically offered to other municipalities.

3.4 River Don (Sheffield and Rotherham), United Kingdom

3.4.1 Background and approach

The UK Don catchment partnership comprises multi-disciplinary membership from two municipalities being Rotherham Metropolitan Borough Council and Sheffield City Council. The partners identified that the common issues between Sheffield and Rotherham, and the reason why they had joined together in the MARE project, are the need for town centre regeneration with change pressures in the urban areas on the same river catchment watershed with each pressure being an influence on the catchment.

Although the municipalities share a common economy and travel to work patterns with significant cross flow of people working cross border, they have separate political and administrative arrangements and working together tends to occur only on a project or specific programme basis not as a natural pattern of activity.

One of the major comparable issues is how the respective partners regenerate their urban centres with a focus on their riverside corridors for desired investment and development in these areas of high flood risk.

Since the setting up of the DCLAA further partners in the same rivers catchment have been brought in and the alliance is an open forum. Initially Demonstration Project based (i.e. city regeneration in a flood zone) from exchange between the three main partners however the forum seeks also to keep Members fully apprised of the changes and responsibilities being introduced in the field of water management so as to achieve greater and wider understanding. This includes transnational and national policy responses in terms of flood and water management and associated structures being conceived. It is considered that no other catchment partnership is operating on the same basis.

In terms of National Policy direction the forum has achieved engagement with main Government Agency (The Environment Agency) on policy direction for the catchment and river delivery. In this regard the partnership is urging the Environment Agency to lead on strategic direction in a more integrated and expansive way in order to ensure wider understanding and partnership.

3.4.2 Overview of contributions to policy

The LAA Don Catchment, through the activities carried out in MARE now formally contributes to:

Local policy trajectories	Regional policy trajectories	National policy trajectories
Rotherham Town Centre Flood Risk Tool Kit	Rover Don Catchment Flood Risk Management Plan	Business Improvement District approach for co-funding investments
Sheffield Flood Risk Assessment approach	Regional Learning & Action Alliance (Yorkshire & Humber)	

We will now describe three cases that reflect the approach and results of the LAA Don Catchment activities.

3.4.3 Case 1: Rotherham Flood Alleviation Scheme

Rotherham Metropolitan Borough Council is seeking to implement a 25-year, £2 billion town centre renovation, the Rotherham Renaissance Programme. The Town Centre area lies in the flood plain of the Rivers Don & Rother and was extensively flooded in June 2007. In order to facilitate the Rotherham Renaissance project and reduce the risk of flooding, a Flood Risk Tool Kit has been produced, in association with Jacobs of Leeds, an engineering concern who had previously assisted in Phase I of the Flood Alleviation Scheme.

The Rotherham LAA used the Flood Risk Tool Kit to map different risk zones and identify design solutions for any development therein. These risk zones are consistent with the requirements of the UK Planning Policy Statement 25 (PPS25) and are based on a 1 in 100 year (or 1% annual exceedence rate); plus less frequent occurring flood events, to produce a 'High', 'Medium' and 'Low' risk programme.

Design solutions comprise a step-by-step guide, which influences the location, character and design of proposed new development in order to reduce the risk of flooding and the Tool Kit has been adopted by the Councils 'Local Plans' Section (this team determines future land use needs and policies); and the 'Development Control' Section (which determines planning applications). The Tool Kit has also been adopted by the Councils

Drainage and Emergency Planning Sections, in order to better inform these teams as to the potential future threats arising from both river and surface water flooding.

The new FRM approach has lead to changes in recent new developments such as the new Council offices and football club stadium, which occupy a site which has been 'lifted' in its entirety, above the 1 in 100 year flood event scenario. An intended centrepiece of the Renaissance Scheme, the potential re-development of the Forge Island site, is also being influenced by the Tool Kit. The flood-risk analysis also helped trigger additional investments of almost £0.8M (jointly funded by Rotherham MBC and the Environment Agency) to construct a flood defence wall on the right bank of the River Don.

On a larger scale, the detailed analysis of flood risk lead to a more accurate estimate of the investment needed to protect against flooding to 1 in 100 year standards. This has lead, particularly in the current economic climate, to a change in the strategy of the Alleviation scheme, from a comprehensive to a more piece-meal upgrade of infrastructure and systems, probably led by sites where there is an opportunity for private investment. The Council will nevertheless continue to focus on both facilitating private sector re-developments and supporting any opportunities for public sector led schemes, in an effort to produce an integrated approach to flood alleviation.

3.4.4 Case 2: Delivering the River Don Catchment Flood Management Plan

The 2007 floods in the UK were a catalyst to change in flood risk management. The National Department of Environment (DEFRA) on recommendation gave greater responsibilities for flood risk to municipalities in England. Locally the flooding in Sheffield in 2007 had caused enormous disruption. The combination of regeneration needs, protecting employment and vulnerable communities, and new responsibilities for Sheffield City Council resulted in high political priority to deliver a local flood alleviation scheme and long term management plan.

The River Don Catchment Flood Management Plan had been instigated prior to 2007 by the Environment Agency, but the floods gave greater emphasis to pursuing delivery of its aims. Short-term priorities were to realise infrastructural investments to alleviate flood risk along the river Don, which runs through the city centre and key industrial zones. Solutions are focused on floodwalls and raising ground level for new developments in the regeneration programme.

The MARE project supported development of a LAA, which included both knowledge partners, representatives of downstream authorities and stakeholders such as Yorkshire Water. The involvement of partners helped to improve modelling to include climate change, which is leading to new estimates for required investments to maintain desired 1:100 safety levels.

The involvement of a wider stakeholder group has lead to the exploration of other aspects of the catchment flood management plan, a key one being the identification of river flow compensation reservoirs operated by Yorkshire Water as potential locations for temporary water storage in case of heightened flood risk. This could potentially deliver the capacity needed for desired alleviation associated with climate change.

Sheffield City Council now works together with Yorkshire Water in a cost-benefit analysis and risk assessment to include reservoirs in the flood alleviation scheme. If positive, the partnership will request an approval of Parliament to change the status of the reservoir from ecologic area and drinking water storage to flood reservoir. This would be a highly cost-effective, non-intrusive solution, and open up possibilities for other local flood authorities to follow a similar route.

Further reading

Report of the Environment Agency indicating collaboration with entities around Sheffield, highlighting the approach to develop collaborations between relevant organisations and communities. http://www.environment-agency.gov.uk/homeandleisure/floods/133669.aspx

3.4.5 Case 3: Using the Local Business Improvement District approach for Flood Risk Management

The 2007 floods affected 400 businesses in an 8km stretch along the River Don. The Flood Alleviation scheme prioritised development in this area. At the same time, changes in the national funding models for Flood Risk Management meant that DEFRA moved away from a model in which 100% grants were provided to a model in which local stakeholders are expected to contribute. Sheffield pioneers the use of the 'Local Business Improvement District' (LBID) instrument as a tool to raise funds to realise the alleviation scheme. The MARE LAA and technical expertise contributed to development of the solution.

The original design for infrastructural investments along the River Don amounted to 30M GBP. Reduced national funding and tighter costs benefit analysis meant a gap of several millions GBP. As a result Sheffield had to reduce the scheme to one delivering flood protection to 1 in 100 without allowance for Climate change. This meant a more achievable financial mix could be secured totalling £11million. As part of the remaining funding gap Sheffield turned to LBID as a source of funding. An LBID is an instrument which allows authorities or business groupings to temporarily levy taxes on an entire business cluster in order to realise special projects, but only if 50% of companies, representing at least 50% of turnover agree. LBIDs are often used for marketing and promotion and improved higher standards of management. Sheffield will be the first to apply the LBID to realise a FRM scheme. Based on a cost-benefit analysis, the proposed LBID would place a levy on local business rates of 1-2% and contribute 1,5M GBP to the overall scheme. As part of the process, Sheffield will approach over 300 companies in preparation of a ballot to be held end of 2012. If results are positive, the secretary of state would need to approve the LBID, after which full establishment could be realised in March 2013.

Successful application of the LBID would be a highly promising new instrument to finance local flood risk management schemes. While potential replication in Sheffield is limited as the scheme covers most of riverside areas, its potential at a regional and national level are very high.

Further reading

http://waterbriefing.org/index.php/home/flooding/item/6158-%C2%A311m-flood-defence-scheme-in-sheffield-under-development?tmpl=component&print=1

3.5 Bergen, Norway

3.5.1 Background and approach

Historically, the whole existence of the 'Shipping city of Bergen' has been based on water. The 'Rain City' is its trademark, and climate change means that the city is facing the challenge of dealing with even more water - both from the sea and from the sky. Water is therefore a natural part of all the work, both as an attraction and as an essential component in improving the lives of citizens and visitors alike.

From the wider Norwegian perspective, the challenges facing the Bergen region as a result of climate change are particularly great. Extreme levels of precipitation result in flooding and landslides. Following the landslide disaster at Hatlestad Terrasse, the City of Bergen has put a great deal of effort into mapping all areas in which there is a risk of landslides, as a basis for preventing any future recurrence of this type of accident.

In Norway, the Bergen region is the area that will be hardest hit by rising sea levels resulting from climate change. The way in which the region should deal with this in future plans is being developed through participation in MARE.

MARE is part of the City of Bergen's contribution to the Norwegian Cities of the Future programme. The work associated with MARE is contributing to the development of local scale approaches.

3.5.2 Overview of contributions to policy

The LAA Bergen, through the activities carried out in MARE now formally contributes to:

Local policy trajectories	Regional policy trajectories	National policy trajectories
Bergen design standard for flood risk for new urban developments	Regional Climate Council	NORADAPT
Bergen guidelines for surface water management	Regional Climate Plan	Cities of the future
Bergen (public-private) Climate Forum		
Dimensioning guidelines for sewerage in process of updating		

We will now describe 2 cases that reflect the approach and results of the LAA Bergen activities.

3.5.3 Case 1: Region Climate Council

Bergen set adaptation to climate change as a political priority in 2000. It has since worked on developing integrated citywide climate adaptation plans connecting urban development with climate, environment and energy. MARE's Learning and Action Alliances and the Climate Proofing toolbox have been used in scoping the issue and determining the appropriate stakeholders to be involved. This has contributed to extension and formalisation of a regional climate council.

Bergen set up a climate department in 2008, which is responsible for coordinating work on climate, environment and energy, directed by the city commissioner responsible for Urban Development. When analysing impact of climate change in WP2, the strong interconnectedness of Bergen with direct surroundings become clear; most of the risk of flash flooding originates from rivers and streams in the wider area. Outlining solutions strategies therefore required engagement with entities responsible those areas; optimal solutions for Bergen may lie in

adaptation of infrastructure outside its municipal borders. To realise this, Bergen went on to support the creation of regional Climate Panel. The aim of this body, in which the mayors of 14 municipalities in the Hordaland region participate, was to create a joint understanding of climate change and adaptation options.

After 2 years of collaboration focusing on developing a shared vision on climate adaptation, it was decided in 2011 to formalise the Panel. It was renamed the Climate Council and obtain a formal role in the regional planning process; some of the municipal capacities on Planning and Building are transferred to this regional council. This will ensure optimal solutions for Flood Risk management across administrative borders.

The Norwegian Climate Change Adaptation programme has mentioned the approach as best practice and will be promoted at national level.

Related annexes

Presentation of Gudrun Mathisen, Head of climate and natural resources as Hordaland Fylkeskommune introducing the Climate Council of Hordaland, the Climate Action Plan and link to MARE.

www.bergen.kommune.no/bk/multimedia/archive/00094/Water_and_life_of_th_94885a.pdf

3.5.4 Case 2: Flood risk protection standards for urban developments

Bergen's transport hub is located in the city centre, in an area between the large and small Lungegard lakes. Redevelopment of the site prompted revision of the area's flood risk and water storage and drainage capacity. Applying the climate proofing toolbox, the demonstration project 'Water between Lungegard lakes' focused on possibilities for creating a watercourse between the lakes as a design element and outlet for water to increase local flood resilience. The process led to revision of the city's norms for flood risk.

Located in the bottom of a fjord, the area functions like a reservoir prone to flash floods as urbanisation caused a disconnection between the two lakes and the possibility to drain water to sea. This contributed to flooding in 2009. Collaboration with the Bjerknes Centre for climate research in the Learning and Action Alliance resulted in highly detailed modelling of expected precipitation under different climate change scenarios: This showed a potential 30% increase of rainfall in an area which already has Europe's highest levels of precipitation.

While the city's urban planning took flood risk into account, there were no specific norms for safety levels. Due to modelling and impact analysis of the Bjerknes Centre, the city council was convinced of the need for such standards, in particular to include climate change. The council formally adapted a design standard of 1:100 years under moderate climate change scenarios.

In setting norms for flood safety, the Bergen city council in effect created a standard quality requirement for all future developments within the city's borders. Due to the collaboration in the county climate council, the norms and methodology is set to be used in 14 municipalities of the Hordaland region.

Related annexes

Water and Life of the city, booklet by Department of Urban Development, Value creation and Climate.

https://www.bergen.kommune.no/bk/multimedia/archive/00094/Water_and_life_of_th_94885a.pdf

4 Conclusions and recommendations

It has been the aim of the MARE project to develop policy initiatives from an urban development point of view. Understanding administrative context and creating tools and processes for urban FRM plans is key to transnational implementation of policy strategies in different regions. In this final section we evaluate what has been done in this respect by drawing conclusions from the undertaken activities described in this report and discussing the observations made. An attempt is made to establish what the barriers and learning points are and recommendations will be given for fields of improvement.

4.1 Conclusions

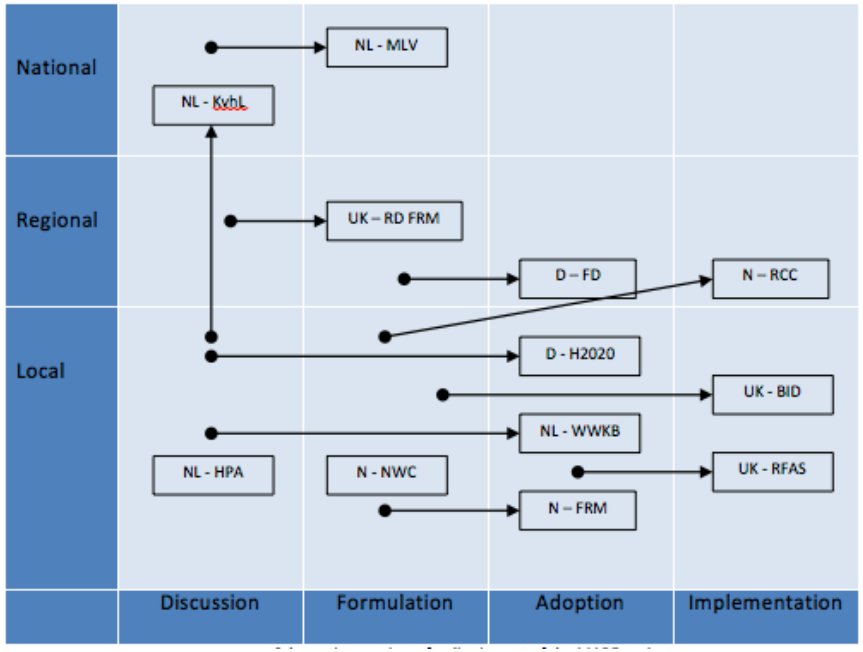
In this report several case studies have been described which show that the MARE project have impact on policy processes at local, regional and international levels. In all four MARE cities FRM plans and policies have been set up or implementation has been supported using method developed in the MARE project.

Broadly speaking, the impacts can be categorised along development phases of policy; Discussion, Formulation, Adoption and Implementation.

On a local level, some of the most striking examples are adoption of new standards for urban development such as the 1:100 design standards taken up in Bergen and Sheffield/Rotherham. These norms will influence all future developments in these cities. In Dordrecht, use of long-term impact of climate change in the design of sewerage systems is now standard practice. Application of more detailed flood risk analysis methodologies in Hannover has allowed better fitting reclassification of flood plains and safe areas. The application of the Local Business Innovation District in Sheffield is creating a precedent for cities nationwide in England. In all cases, departments with expertise on flood risk have anchored their expertise into formal decision-making processes.

On a regional level, the most impactful activities are related to the improved collaboration of organisation in developing and implementing flood risk management approaches. In Dordrecht, the Learning and Action Alliance continues operation in the Rijnmond-Drechtsteden Deltaprogramme platform. Bergen has formalised a regional Climate Council, and formalised its role in decision-making on urban development to this body. The River Don Learning and Action Alliance has allowed Sheffield and Rotherham to explore flood storage options that could be more (cost)effective in alleviation risk in city centers. In Hannover, the impact at regional level was more of technical nature; collaboration with the state's body responsible for Flood Directive implementation has lead to new standards in regional-local communication and requirements of the local FRM plans.

On the national level, it again is the MARE methodology on Flood Risk Management that contributes to policy making. In the Netherlands the discussion on MultiLevelSafety strategy has been supported by MARE case studies to allow policy formulation, now coordinated by the national Deltaprogramme. Particular tools from the Climate Proofing Toolbox like the tipping point analysis´ are disseminated as best practices.



Schematic overview of policy impact of the MARE project

4.2 Discussion & Learning points

It can be firmly concluded that through the activities carried out in the MARE project impact is achieved on Flood Risk Management policies. This has been achieved on different scale levels and in different ways. From the different activities carried out by

or policies are needed. When the case study and the locally desired solutions become more challenging, boundaries of existing policies may need to be pushed. A clear example is the case Kop van het Land. In some cases, such as the River Don Catchment Flood Risk plan, solutions did not require policy change but rather involvement or consent of higher-level entities.

Along the same lines, type of participants in the LAA determine the appropriate scale level of influencing policy. For instance, there are no EU representatives in the LAAs. Also, in Hannover (Germany) there has been no involvement of the Bundesland or Federal Government; hence the extent of impact on a national level is limited. Or, alternatively; the LAAs focus on issues most important to those involved; absence of certain stakeholders means their interests are not taken into account.

Following from the interviews and further case study analysis, awareness of and focus on creating impact on policies seems to be a critical factor as to how much impact is achieved. In Sheffield and Rotherham for example, the primary aim upon participating in the project was to support implementation of a flood alleviation scheme. On the other hand, in Dordrecht there has been a clear aim to influence policy. Significant capacity was dedicated to this goal. It might thus be concluded that if there is a more explicit focus on bringing about impact from the onset, that the impact may be even higher as well.

To extend the impact, also dissemination of lessons to create a critical mass for more influence on policy development can play an important role. As an example, when the LAA of Dordrecht involves organisations like STOWA, Rioned, NIROV (professional associations), as well as other cities such as Rotterdam and Amsterdam, lessons learned can be shared and validated. This in turn increases the probability of useful policy contributions.

Lastly, active involvement of scientists will reinforce impact further, since they are the messengers of knowledge instead of providers of knowledge. It will ensure more innovation, more credibility and further dissemination through their networks and existing collaborations with other cities. In turn it becomes more appealing for policy makers and better to justify policies.

4.3 Recommendations

Further analysis could go more in-depth and show what are the critical factors of LAA activities that shape the impact on FRM policies. This will aid in the development of strategies for policy development in future projects.

Through the activities in the MARE project we can conclude on some valuable lessons learned, which can be taken into account for future activities undertaken to improve FRM policies. Some of the initial recommendations that we can draw from this report are listed below:

- Impact on policy as objective: Impact might be higher if there is a more explicit focus at organisational level (versus project level) on bringing about such impact from the onset. Such target should be integrated into work plans in terms of capacity and people/entities that should be involved

- Seek innovative demonstration project: When case studies become more innovative, more barriers and opportunities will be encountered. Therefore, change is more likely to occur and impact on policy will be greater.

5 Appendices

Appendix A: Case Study Template & Questionnaire

Case study template

Each case study will be described using the common framework, in 15-20 lines each.

The structure of the case examples is

title
- driver of change
- short description of demonstration project
- process folllowed in the LAA
- new solutions proposed
- use of solution in local to national policies
- impact of the solution

Questionnaire for development of case studies

1. Through the activities carried out in MARE, to which local / regional / national policy trajectories have you contributed? Which policy changes have occured?
2. What are the 3 most relevant examples (best / worst practice)
3. Per case study
    a. What was the starting point? (policy objective, local challenge and/or new knowledge amongst partners)
    b. How are the key drivers related to the other 2 elements?
    c. If policy development was not the key driver; (how) did you connect to relevant policy trajectories?
    d. In the LAA process, how have these drivers lead to activities or new solutions:
        i. System analysis
        ii. Collaborative design
        iii. Governance: How did you organise this part of the process? How did you ensure uptake?
    e. What is the impact of this process on policy? What changes have or are expected to occur and what is the impact on national practice?

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