Gemeente Rotterdam

Office for Sustainability and Climate Change

Kennis voor Klimaat

Appendix 1 Midterm Review Report Hotspot Rotterdam Region

Factsheets second tranche projects and cases

September 2012

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1. Introduction

Knowledge for Climate (KfC) is a research programme that aims to develop applied knowledge in order to bring long-term decisions in line with consequences of climate change in a timely manner by means of cooperation between the Dutch government, trade and industry and scientists. The mission of the programme is defined as: 'developing scientific and applied knowledge for a climate proof planning of the Netherlands and the creation of a durable knowledge infrastructure for dealing with climate change.'

KfC develops scientific and applied knowledge in three tranches. The first tranche is designed to address the initial urgent knowledge questions and exploratory studies from the hotspots. The second tranche concerns more in-depth and long-term research into a number of themes which are important for climate adaptation. The third tranche is about regional adaptation strategies.

KfC concentrates on a number of areas, the so-called hotspots. The Rotterdam region is one of the Hotspots, also referred to as the Hotspot Rotterdam Region (HSRR). This fact sheet goes into more detail on research themes which HSRR has committed itself to in this second tranche.

2. Second tranche research themes - Hotspot Rotterdam Region

After a brief descriptive summary, this chapter will go into more detail on research themes which HSRR has committed itself to in the second tranche. Per theme, a summary will be given of the study and the research questions will be explored in further detail, along with related case studies, the intermediary products, the final products with associated schedules and the financial contribution from HSRR.

2.1 Situation outline

HSRR has committed to the following research themes in the second tranche of KfC:

- Theme 1 - Flood risk management
- Theme 2 - Fresh Water Supply
- Theme 4 - Climate Proof Cities
- Theme 5 - Infrastructure and Networks
- Theme 7 - Governance of adaptation

HSRR is obliged to use 50% of the KfC subsidy budget in the second tranche, namely €2,600,000.00. In addition to this, HSRR has a best effort obligation to generate 50% of co-financing over a period of 4 years. This amounts to a sum of €1,300,000.00.

2.2 Theme 1 – Flood risk management

Content of study

Theme 1 consists of the following work packages:

1. Controlling flood levels: flexible flood barrier systems;
2. Reducing the impact of wave attack: dunes as natural buffers;
3. Robust multifunctional embankments;
4. Reduction of exposure to floods and reduction of flood consequences;
5. International comparative analysis of adaptation policies;
6. Cross-cutting approaches: uncertainty, robustness and designing for spatial quality.

Research questions Rotterdam with related case studies

Research question per work package:

1. Controlling flood levels: flexible flood barrier systems; is a system of flexible flood barriers sufficiently reliable?
2. Not relevant.
3. Robust multifunctional embankments; what instruments can be used for the decision-making regarding multifunctional dykes in different circumstances (local level).
4. Reduction of exposure to floods and reduction of flood consequences: how can flood consequences be limited. More specifically: what are the options for risk reduction by means of zoning and building requirements in case of an open Rijnmond, and what are the options in general, investigated by means of damage modelling.

5. International comparative analysis of adaptation policies; how have other delta cities realised their adaptation strategy?
6. Cross-cutting approaches: among other things, how do you assess planning quality (to then be able to utilise it when considering different water safety measures)?

Intermediary products (date: July 2012) and end products with associated planning

- WP1: report open/closed water barriers in the Rijnmond: ready.
- WP3: 3.1: report multifunctional dykes. It is currently under review whether HSRR will become a case study. To be decided in consultation with sub-programme Rijnmond-Drechtsteden.
- WP 3: 3.2: report flexibility investment plans for dykes. Planning: in start-up phase.
- WP 4: two reports delivered: 1) flooding damage Port of Rotterdam in relation to various scenarios, 2) buildings decree/building regulations. Follow-up study planned in further detail.
- WP 5: research group in Germany focuses on the effectiveness of individual flooding measures at domestic level. This could potentially offer added value to Rotterdam. Planning: delivery of end product unknown. Also delivery of international comparison of insurances. Planning: ready by late 2012.
- WP 6: ready: report Assessment method of planning quality.

2.3 Theme 2 - Fresh water supply

Introduction

The KfC theme fresh water supply carries out research into measures that help render the fresh water supply climate proof. An investigation is carried out into measures that can be taken by the regional water management board, the water user (agriculture, industry, drinking water, nature, greenhouse farming), the regional government and Central Government. The study is predominantly aimed at the regional scale and is therefore in addition to the national Delta Programme, where an investigation is carried out into the distribution of fresh water in the future at a national scale.

Research questions Rotterdam

In the Rotterdam region, the following issues are studied by the research team:

- The Water demand of the greenhouse farming sector in Haaglanden.
- Brine problem, underground storage of water, reverse osmosis
- The Water Management in the Schieland Polder, chloride standards, dealing with the salt tongue on the Nieuwe Waterweg
- Chloride cycle in the Rotte
- Chloride, climate change, the Water Framework Directive, aquatic ecology

Water management Schieland and salinisation

Alterra in partnership with water board Schieland & Krimpenerwaard launched a water system analysis of the Schieland bosom in different climate scenarios with a model provided by the water control board. Various options for the inlet at pumping station mr. U. G. Schilthuis (Nieuwe Maas) and the Snelle Sluis (Hollandse IJssel), the use of the Small Scale Water Supply procedure and

the widening of the chloride standards are explored in this study. It has become clear, among other things, that the Small-scale Water Supply procedure is no longer necessary if the chlorine standards are widened to 600 mg/l, also in a situation of climate change. In this study, expertise and measuring data from the water board are combined with model calculations of the national hydrological set of instruments with regard to seepage and chloride concentrations at the inlet points (Deltares). Literature has been collected on salt tolerances of an aquatic nature, where the (target) species (flora and fauna) present in Schieland formed the starting point (with the help of the limno database of STOWA). Contact: Jeroen.veraart@wur.nl

Products

- Comprehensive Work Plan (June 2011)
- Glossy Report Kick Off Workshop (April 2011)
- PowerPoint with first results (October 2011)
- Internship Report Water Management Schieland (Wageningen University)
- Improved SOBEK for Schieland storage basin, which can be linked to Delta Instrumentarium and KNMI scenarios
- ***In preparation:*** *Final report Salinisation, Climate Change and case study Schieland. (for review, late December 2011)*
- Preparation Pilot Underground Water Storage Westland.
- ***In preparation:*** *Final report Salinisation, Climate Change and case study Schieland. (for review, late December 2011)*

Underground water storage
A practical pilot (25 ha) is currently being prepared to test underground water storage in the Westland under the guidance of KWR. Among other things, this practical pilot forms part of the PhD research of Koen Zuurbier (VU University Amsterdam) and Pieter Pauw (Wageningen University). Irrigation water is added to the 1st aquifer, after which it can then be removed from the aquifer again when needed. Response from the region has been enthusiastic and parties are willing to make an active contribution (Horticulture Marketing Board, Prominten Society). However, additional financing is still required to finance the pilot. Contact: Marcel.Paalman@kwrwater.nl

Water demand of the Westland
TNO and partners are mapping out the water demand of the greenhouse farming sector in the Westland which will be completed at the end of this year with a final report. TNO and partners estimate that the water demand from the greenhouse farming sector in the Westland currently stands at 28 million cubic metres per year. Contact: wilfred.appelman@tno.nl

Delta Programme
The KfC Consortium contributes to the bottleneck analysis 2.0 Fresh Water Supply which are currently being carried out for the sub-programme Rijnmond-Drechtsteden and the sub-programme South-West Netherlands Delta. Contact: jeroen.veraart@wur.nl (Sub-Programme South-West Netherlands Delta), ad.jeuken@deltares.nl (Sub-Programme Rijnmond-Drechtsteden)

2.4 Theme 4 - Climate Proof Cities

Study summary

The study has to deliver the fundamental knowledge which is currently missing; this knowledge is required to develop an adaptation strategy for the urban areas in the Netherlands. In 5 work packages work is being carried out towards this purpose, whereby the question is approached from the perspective of various scales. The work packages are, respectively:

1. Measuring and modelling (led by the WUR/Alterra)
2. Sensitivity and vulnerability (led by Eindhoven University of Technology)
3. Measures (led by Delft University of Technology)
4. Governance (led by UU)
5. Integration (led by TNO)

KWR and Deltares are also part of the research consortium. Approximately 20 doctoral research studies are going to provide the majority of this result, with a running time of 4 years. Although the CPC-study started mid 2010, most researchers started late 2010, early 2011. In 2014, the Climate Proof Cities programme will be completed, and the final products will be delivered.

Research questions Rotterdam with associated case studies

The central research question for the Rotterdam case studies is: *operationalise the term climate resilience for urban areas, so interventions and measures can be assessed and considered with regard to their effect in terms of climate resilience.* The working method is that a methodology and associated set of instruments are developed, tested and demonstrated on the basis of a practical application.

The spatial scale level of building, street and neighbourhood are central because at that scale there is the highest possibility to influence the situation. Water, wind and heat are the most important climate aspects, and how the circumstances are experienced is also considered. The water system is considered in its interaction with the built environment. With regard to water, an extension proposal has been accepted to make the distribution of CPC focus on water, heat and wind more evenly balanced.

Products

The case study concerns an application of the developed methodology and the associated (model) set of instruments in the area in Rotterdam district 'Noord' (Bergpolder Zuid). At the initiative of a housing corporation, a Masterplan was developed for this, on which the (model) set of instruments for the quantification of the level of 'climate resilience' is applied[1]. The existing situation will be characterised and clarified with one or more vulnerability maps of buildings and outdoor spaces. For the planned interventions, quantification is then carried out on what their effect is on 'climate resilience'. Finally, a 'most climate-proof variant of the plan' is developed. As

[1] For the urban water system, a wider demarcation of the area is needed because the processes involved can only be usefully analysed by regarding them as a single hydrological entity. The Water Plan for district North and municipal Water Plan Rotterdam 2 form the framework. Drought problems have been shifted to the third tranche of KfC.

part of the work packages governance and integration, the measures (feasibility and level of support, cost effectiveness and mutual influencing) are weighed up. The final product is a coherent and tested methodology to map out 'climate resilience' of (parts of) the city and to make a well-substantiated consideration between varieties of interventions, both for maintenance and development and restructuring.

Intermediary products:

- Preliminary results on climate resilience of Bergpolder Zuid in its current situation (3rd quarter 2012)
- 1st results of the effects of individual adaptation measures on urban climate in Bergpolder Zuid (3rd quarter 2012)
- Examples of different ways to communicate results (3rd quarter 2012)
- Results of the effects of combined adaptation measures (2013)

The researchers involved in the case study Masterplan Bergpolder Zuid:

- Cor Jacobs, WUR, "Meteorology and climatology of the city"
- Wiebke Klemm, WUR, "Green infrastructure for climate-proof cities"
- Laura Kleerekooper, TU, "Climate design at neighbourhood level"
- Patrick Schrijvers, TU, "Simulations of the urban heat island"
- Mike van der Heijden, TU, "Impact of climate change on indoor climate and energy consumption of buildings in the Netherlands"
- Twan van Hoof en Mike van der Heijden, TU, "Effects of various passive climate adaptation measures on perceived air temperature in a typical Dutch home"
- Hamid Montazeri, TU, "Direct and indirect evaporative cooling"
- Martin Roders, "Adaptation in social housing"
- Toine Vergroesen, Deltares, "Weighing instrument for measures in the event of extreme precipitation in urban areas"
- Eddy Moors and Annemarie Groot, WUR, "Assessment of effectiveness of adaptation measures"

Schedule

Late 2011 a start was made by means of a start meeting of the researchers involved in the case study Masterplan Bergpolder Zuid. Mid-April 2012 there was a follow-up meeting where the current state of affairs was presented to the stakeholders. The first intermediary results are expected mid-October 2012. The corporation has requested the identification of any 'quick win' measures as soon as possible, so they might be included in the realisation phase (even with the possibility of measuring the assumed effect). The preliminary results of 'climate resilience' of the Bergpolder Zuid in the current situation and the 1st results of partial effects of individual adaptation measures on urban climate in Bergpolder Zuid are expected mid-October. The final results are expected late 2013.

2.5 Theme 5 - Infrastructure and Networks

Summary of study

Theme 5 of the 2nd phase of Knowledge for Climate includes the INCAH project: Infrastructure, Networks and Climate Adaptation for Hotspots. The research goals are:

- To determine what the influence of climate change is on the infrastructure with the focus on the physical effects on the behaviour of the subsoil and infrastructural components such as roads, tunnels, water supplies and current conductors;
- To build models to simulate the effects on the functioning of the infrastructure: reliability, availability, capacity and socio-economic productivity.

The INCAH project consists of 4 work packages. There are 3 work packages that investigate – from 3 perspectives – which effects occur as a consequence of climate change, i.e. physical effects, organisational effects and economic effects. A 4th work package with an integrating character connects these three work packages and ensures there is interaction with the stakeholders.

Theme 5 consists of the following work packages:

1. Adaptation strategy for infrastructure and networks
    a. integration of the knowledge from work packages 2 - 4
    b. platform for researchers and stakeholders
2. 'Climate resilience' of the physical infrastructure.
   This work package is set out in 4 sub-projects:
    a. sub-project 1: Design of the climate-proof physical infrastructure (integrating)
    b. sub-project 2: Quantified effects of climate change on railways, roads and tunnels
    c. sub-project 3: Effects of climate change on underground pipes
    d. sub-project 4: Effects of climate change on the subsoil
3. Robustness and adaptation of infrastructural networks. Work package 3 consists of 4 sub-projects:
    a. sub-project 1: Design of the climate-proof networks (integrating)
    b. sub-project 2: Modelling of failing for the assessment of climate risks
    c. sub-project 3: Agent-Based Modelling for transport and energy networks
    d. sub-project 4: Asset Management for climate adaptation
4. Socioeconomic effects of climate change. In work package 4 work is carried out on three sections:
    a. sub-project 1: Economic effects of adaptation for transport systems
    b. sub-project 2: Economic effects of adaptation for electricity networks
    c. sub-project 3: Economic effects of flexible adaptation approaches
    d. sub-project 4: Costs and benefits for adaptation (integrating)

Information from INCAH for RAS

(planned in accordance with the angles of approach of the RAS barometer)

RAS	Approach	INCAH	Information
1	Climate effects (deadline June 2012)	WP 2.2 – WP 2.3 – WP 2.4	Insight into the sensitivity to climate change / extreme weather influences of sections of the networks (embankments, civil constructions, drinking water pipes)
		WP 2.1	Insight into the relationship between climate change and the consequences for the physical infrastructure and insight into failing mechanisms.
		WP 3.3	Insight into which parts of the traffic network are vulnerable to climate change and how this influences the functioning of the traffic network.
		WP 4.1	Insight into the influence of weather on bicycle traffic and road traffic.
		WP1	Insight on the basis of an example of how effects on different infrastructures can reinforce each other (cascading)
2	Ambitions		-
3	Task		Is a derivative of 1) and 2). INCAH and Rotterdam can set out this task together on the basis of ambitions determined by Rotterdam, and on the basis of input from INCAH on climate effects. Proposal to do this on the basis of a joint workshop, proceeding from the workshop in mid-February 2012. Plan for the summer?
4	Potential measures (deadline June 2012?)		INCAH provides long-list of measures. This list will not be exhaustive, but will be more specifically aimed at:
		WP 2.1	Overview of potential preventive and curative measures for the physical infrastructure, compiled on the basis of the nature of the consequences of climate change.
		WP 3.3	Overview of potential measures for increasing the robustness of the traffic network
		WP 4.3	Overview of flexible adaptation strategies and associated economic assessment tools
5	Selection of measures	WP 4.3	Economic underpinning of flexible adaptation strategies [2] (?)
6	Route-planner and assurance		The insight into flexible adaptation strategies provides information which may be useful when planning investments.
7	Level of support (incl. financing)		Information is gathered from the work packages regarding level of support and financing. This section does not receive any particular attention within INCAH.
8	Implemen-tation		-

[2] Checking with project leaders WP4 whether we can provide the actual underpinning, or whether we can help draw up a selection method.

2.6 Theme 7 - Governance of adaptation

Study content

Theme 7 consists of the following work packages:

1. Collaborative action research for science hotspot relations
2. Organising connectivity
3. (Re)Allocating responsibilities and risks
4. Dealing with controversies
5. Normative principles for adaptation
6. Comparative analysis of the governance of adaptation

The work packages 2 and 3 are the most relevant ones for Rotterdam. A brief summary is given of both work packages below.

Work package 2: Organising connectivity
In work package 2 an investigation is carried out into how creative and innovative measures can be realised within a fragmented government, and how players, issues, sectors and scale levels can be brought together. This type of research requires knowledge of design processes, the organising forms of cooperation, relating interrelated policy problems to each other, multi-level governance and the development of leadership strategies. The study aims to contribute to the current gaps in knowledge.

Work package 3: (Re)Allocating responsibilities and risks
In work package 3 research is carried out into the reallocation of risks and responsibilities between a multitude of players in order to enable climate adaptation. The research generates knowledge in the area of responsibilities, costs and benefits distribution and the design of new systems with economic incentives.

Research questions Rotterdam with associated case studies

Casuistry HSRR	**Research project of KfC Governance of Adaptation**	**Researchers involved**
Case 1: Heijplaat 'from Old Tuindorp to a climate proof neighbourhood in 15 years'. The core question concerns the governance of Heijplaat. Sub-questions: How do you create a climate-neutral and/or climate-proof neighbourhood in 15 years? How do you integrate different policy lines for this area? How do you organise this process? What governance arrangements ("which management model") are possible? How do you work	3.1 – Public/private responsibilities concerning the safety of building behind dykes. Development of an analysis framework on the basis of which various considerations which may play a role in the distribution of responsibility between public and private parties can systematically be analysed. This provides an insight into the various legal, administrative, economic and political aspects.	Research trainee: Heleen Mees (Utrecht University) Supervisor: Prof. dr. Peter Driessen (Utrecht University) Start: 2011

towards a common goal, taking different decision models in different organisations into consideration? Who is legally and administratively responsible for the safety of buildings in unembanked areas? How do you deal with safety in unembanked areas in the light of future developments, for example the Delta Commission? Should there be a guideline for example, and who should take the initiative to create it? What about the legal aspects of the plans within the existing legal frameworks?	5.1 - Legal aspects of the RO plans for the Heijplaat within existing legal frameworks. For Nick Barneveld (Rotterdam Climate Proof), dr. Andrea Keessen (Utrecht University) scanned the legal analysis of the provincial authorities for flaws. This scan is used to instigate legally focused research on the Heijplaat.	Senior input: Dr. Andrea Keessen (Utrecht University) Start: December 2010
Case 2: Spatial Planning & Water Policy Rotterdam and environs Policy is pursued at different levels with regard to space for water. Regional programmes must realise internal support and must relate to supra-regional and subregional dynamics. Water supply must compete with other interests. Focus on link between RO Rotterdam Region and Delta Programme Rijnmond & Drechtsteden (initial conversations between Harry van Huut and Nick van Barneveld have already taken place) In cooperation with Sandra Langezaal (RWS) on the basis of in-kind financing from RWS.	2.4 – Co-evolution and multi-level governance Further analysis of the interaction between search processes at various levels: the discussions surrounding open/closed Rijnmond, construction behind the dykes (in combination with consideration framework of the provincial authorities) and surrounding the delta programme as a whole and the questions of how to achieve a sense of coherence. It concerns a comparative study regarding the following cases: 1) Rijnmond-Drechtsteden; 2) South-West Netherlands Delta; 3) Major Rivers. Coordination is currently taking place with the appropriate Delta sub-programmes with regard to all cases.	Research trainee: Jitske Verkerk, Erasmus University Supervisor: Dr. Arwin van Buuren (EUR) Start: late 2011
Case 3: Green roofs	3.1 – Public/private responsibilities in the context of green roofs. Development of an analysis framework on the basis of which various considerations which may play a role in the distribution of responsibility between public and private party can systematically be analysed. This provides an insight into the various legal, administrative, economic and political aspects.	Research trainee: Heleen Mees (Utrecht University) Supervisor: Prof. dr. Peter Driessen (Utrecht University) Start: February 2011

Intermediary products and final products with associated planning

Casuistry HSRR	Research project of KfC Governance of Adaptation	Intermediary products
Case 1: Heijplaat	3.1 – Public/private responsibilities concerning the safety of buildings in unembanked areas	Intermediary product 1 • Creating and applying an analysis framework with considerations which may form the foundation for the allocation of responsibility between public and private parties • Delivery: Q2 2012 Intermediary product 2 • Interactive session with the most important stakeholders on responsibility allocation • Delivery: Q3 2012 Sub-product 3: • Report on possible governance arrangements for Heijplaat case • Delivery: Q4 2012-Q1 2013
	5.1 - Legal effect of the plans within existing legal frameworks	Deliverable 5.1.2 • Report on legal obstructions and possibilities for climate-proof RO Heijplaat • Sub-product: Dutch summary of 5.1.2 which is aimed at a wider audience • Delivery: Q1 2011 Deliverable 5.1.6 • Workshop to provide further information on the (theoretical framework and the applications of the) legal investigation and to work out in further detail with the help of parties from the cases (in this case the Heijplaat) • Sub-product: Dutch summary of workshop which is aimed at a wider audience • Delivery: Q1 2012
Case 2: Spatial Planning & Water Policy Rotterdam and environs	2.4 – Co-evolution and multi-level governance	Deliverable 2.4.1 • Analysis report + recommendations for the multi-level governance of RO Rotterdam and environs • Sub-product: Dutch summary of 2.4.1 which is aimed at a wider audience • Delivery: Q1 2012 Deliverable 2.4.4 • Report with a comparative analysis between 3 cases

		(Rotterdam, South-West Netherlands Delta and Major Rivers) with insights on arrangements / instruments and approaches which are more or less helpful in organising coherence in multi-level contexts • Sub-product: Dutch summary of 2.4.4 which is aimed at a wider audience • Delivery: Q3 2013 Deliverable 2.4.10 • Evaluation workshop in Rotterdam with senior staff and involved parties • Sub-product: Dutch summary of workshop which is aimed at a wider audience • Delivery: Q14 2011
Case 3: Green roofs	3.1 – Public/private responsibilities in the context of green roofs	Sub-product 1 • Creating and applying an analysis framework with considerations which may form the foundation for the allocation of responsibility between public and private parties • Delivery: Q2 2011 Sub-product 2 • Interactive session with the most important stakeholders on responsibility allocation • Delivery: Q3 2011 Sub-product 3 • Report on possible governance arrangements for green roofs • Delivery: Q3 2011 Sub-product 4 • International comparison with interesting international cases • Delivery: Q3 2011