

# ROTTERDAM CLIMATE PROOF

ADAPTATION PROGRAMME 2010



THE ROTTERDAM CHALLENGE ON WATER AND CLIMATE ADAPTATION



ROTTERDAM.**CLIMATE**.INITIATIVE  
Climate Proof  
CONNECTING WATER WITH OPPORTUNITIES



## MAKING THE CITY EVEN MORE ATTRACTIVE AND ECONOMICALLY PROSPEROUS

**Our climate is changing. The consequences of climate change will also be felt in Rotterdam. Rain showers are growing heavier as it is, presenting the city with the challenge of excess water or flooding. In the long run, our low-lying delta city will also be confronted with rising sea levels and fluctuating river discharge. Furthermore, the temperature in the city will rise, and heat stress will affect increasing numbers of people.**

In order to confront the challenge of climate change as an opportunity rather than a threat, the City of Rotterdam has set up the Rotterdam Climate Proof programme. Rotterdam Climate Proof will make Rotterdam climate change resilient by 2025. Permanent protection and accessibility of the Rotterdam region are key elements. The central focus of the programme is to create extra opportunities to make Rotterdam a more attractive city in which to live, work, relax – and invest.

Trendsetting research, innovative knowledge development and decisive implementation of the suggested measures will result in strong economic incentives. Collaborating with prominent partners, Rotterdam will become *the* most important innovative water knowledge city in the world, and an inspiring example to other delta cities.

Rotterdam Climate Proof participates in the Rotterdam Climate Initiative. Thus, Rotterdam addresses the entire climate issue; the causes of climate change (mitigation) as well as the consequences (adaptation).





# 1

## 100% CLIMATE PROOF BY 2025

**Rotterdam Climate Proof will make Rotterdam fully climate proof by 2025. Responding to climate change will enable us to keep the city safe, accessible, and attractive, now as well as in the future. This will benefit both the people who live and work here, and the businesses and corporations established in the area. This substantial ambition will be realized on the basis of three guiding principles:**

- **Rotterdam will develop into and present itself on a national and international level as a leading centre for water knowledge and climate change expertise.**
- **Investments in climate solutions will enhance the attractiveness of the city and port for residents, companies, and knowledge institutes.**
- **Innovations and knowledge are developed, implemented, and marketed as an export product.**

Innovative applications in the area of water management will make the city more attractive. Examples include the construction of water plazas and floating communities. These are appealing projects that will serve to set an example for other delta cities, particularly in view of the fact that Rotterdam is the lowest-lying delta metropolis in Europe and that it has one of the largest ports in the world.

The emphasis is on projects that will strengthen Rotterdam's position as a water city. Collaboration is key in this respect. Knowledge institutes and companies find a testing ground in Rotterdam for the challenging international climate change issues of our time. As the global demand for knowledge and solutions in the area of climate change adaptation is growing, Rotterdam has imperative reasons to highlight its qualities as a water knowledge city on an international level. Accordingly, the city will be represented at the World Expo 2010 in Shanghai by its 'Rotterdam Water City' pavilion and will organize the international 'Deltas in Times of Climate Change' conference.

**PREVENTION AND ADAPTATION**

In addition to adapting to climate change, Rotterdam actively contributes to the prevention of climate change. This subject is addressed by the Rotterdam Climate Initiative (RCI). In cooperation with the City of Rotterdam, the corporate sector and knowledge institutes, Rotterdam is realizing ambitions in the area of energy transition and sustainability. A pivotal objective in this respect is the 50% reduction of harmful CO<sub>2</sub> emissions by 2025.

*Artist's impression of the Wilhelminapier (Rotterdam)*

**• ECONOMIC INTERESTS OF ROTTERDAM CLIMATE PROOF**

On a global scale, all delta cities, like Rotterdam, will be confronted with the consequences of climate change. For this reason, in the next few decades investments will be required in measures to enhance the quality of life in these cities and to protect the economically valuable ports and keep them accessible. The Rotterdam region harbours an unique combination of knowledge institutes, delta technology companies, and architectural firms that are able to contribute new solutions. Rotterdam Climate Proof pools this knowledge and innovative power.

The Rotterdam region is developing into a global testing ground for delta technology, an international knowledge centre for water management and climate change related issues, and a location of choice for companies providing climate change specific international services (specialized engineering consultancies, research agencies that are active in the international arena, and knowledge institutes), and industry (climate change related high-tech industry). Furthermore, this testing ground will help Rotterdam Climate Proof to capture opportunities for the tourism industry, with a specific focus on leisure activities by and on the water. The City has a significant role to play in solving global climate change related issues, which will constitute a new driver of the Rotterdam economy.

**• AN ATTRACTIVE CITY WITH ROTTERDAM CLIMATE PROOF**

In Rotterdam, we combine climate solutions with providing additional impetus for the quality of life in the city. In an urban environment such as Rotterdam, we are compelled to reach beyond conventional solutions such as levee heightening and strengthening. Including innovations like green roofs, water plazas, underground water storage, and cool, green, shaded places in the urban design plans is therefore essential for the further development of the city. Green roofs can be constructed on the instructions of an association of owner-occupiers, or in the form of a neighbourhood project so that people get a sense of ownership of the issue. In this sense, water can be the link that creates a bond between people throughout the city. Climate adaptation will furthermore generate new opportunities for leisure and recreational purposes, including floating parks and the floating pavilion. And finally, the way Rotterdam approaches climate change will open up opportunities to build magnificent new water-based residential areas.

In October of 2007, the International Advisory Board (IAB) advised the Rotterdam administration to position Rotterdam as a leading water knowledge and climate city. Adaptation to the consequences of climate change is essential to Rotterdam, and proper, ambitious water management will offer economic opportunities. The IAB advice on watermanagement was received with enthusiasm by the city administration. On 5 February 2008, the IAB advice was adopted in its entirety, and the administrative decision was taken to have this recommendation elaborated into a programme: Rotterdam Climate Proof. In 2009, the IAB concluded that the implementation is proceeding according to plan, and that the possibilities for an economic spin-off should be explored. Regional cooperation within the framework of Clean Tech Delta will encourage these efforts.





**BUILDING BLOCKS OF THE ROTTERDAM CLIMATE ADAPTATION STRATEGY** The following building blocks are important in climate proofing the city and port.

- **CLIMATE ATLAS:** This involves an outline of the region-specific impact of climate change, scenarios, and the measures that have already been implemented. Region-specific climate change predictions will be laid down in a climate atlas. The final design will be developed in 2010, based on the input of the users of the information.
- **BAROMETER:** The climate barometer is a communication-oriented monitoring tool that will provide insight into the level of climate change resilience of the city of Rotterdam. In 2010, we will focus on translating the concept into a mature instrument.
- **MONITORING:** Physical measures that are taken are monitored, and their effects on the speed and scope of the expected climate change are recorded. In addition, this allows us to assess the positive spin-off for the objectives of Rotterdam Climate Proof, such as enhancing the attractiveness of the city and adding economic value. Subsequently, we will create a comprehensive overview of the progress of the Rotterdam Climate Proof projects and their implementation. To get a good impression of the progress and the correlation between all programme elements, we will assess whether it is useful and possible to develop a dashboard for this purpose. This is also part of the Smart Delta City Concept.

- **ROUTE PLANNER:** Defining the milestones, actions and options for each theme in the course of time, the route planner is the backbone of Rotterdam's adaptation strategy. The road to climate change resilience may vary for each theme, and they may be interdependent. In 2010, this route planner will be elaborated in further detail for all of the themes, including a description of their interdependence.
- **CLIMATE TOOL BOX:** This involves area-specific adaptation options in support of a proper balance in measures to be taken. In 2009, climate adaptation was incorporated in the *Stadshavens* (cityports) case. In 2010, the emphasis will be on the implementation of the methodology in several areas.
- **EMBEDDING:** Climate change resilience will be embedded in spatial planning, area development, implementation and policy guidelines. Existing instruments and methods will be tested for possible alignment (e.g. City Plan, Water Test, EIA, Rotterdam Style). Proper organizational incorporation within City of Rotterdam is crucial in this respect, as is a clear representation of all of the consequences, opportunities, instruments, and expenses involved. Finally, research will be conducted into the question as to whether it would be effective to provide assurance for the climate ambitions and objectives in the form of a policy framework.

The correlation of the Rotterdam Adaptation Strategy (RAS) building blocks is represented in the diagram above.

# 2

## THE ROTTERDAM APPROACH

Characteristic features of the Rotterdam Climate Proof approach are:

- integration of the water management, climate change related, spatial planning and socioeconomic tasks;
- optimum utilization of the opportunities for the city and port;
- set-up of a coherent adaptation strategy that covers the entire region;
- proactive approach with a focus on flexibility and resilience.

**ROTTERDAM'S ADAPTATION STRATEGY (RAS)** Climate change resilience in Rotterdam will first and foremost involve sustainable protection against flooding in the areas inside and outside the levees. In addition to flood management, the city will have to focus on other ways to prepare for the consequences of climate change as well, such as higher incidence rates of heat waves, increased heavy precipitation, groundwater salinization, changing options for transport by water, and an increased variety of groundwater levels. What is essential for an adaptive strategy is that it is implemented proactively and that it can be adjusted to changing circumstances. The Rotterdam Adaptation Strategy (RAS) clearly defines the measures that can be taken to climate proof the area.

The implementation of this proactive strategy requires knowledge and tools. In concrete terms, RAS consists of four clusters:

- **THE TRAJECTORY:** Which specific objectives and milestones can we define on the road to climate change resilience? This involves both a substantive definition and planning. Subprojects: developing a climate atlas and a route planner.
- **THE SPECIFIC ACTIVITIES:** Keeping in mind the trajectory and the milestones to be attained, the question can be answered as to what project managers can do specifically to climate proof their areas. Subproject: developing a climate tool box.
- **THE PROCEDURE:** This involves embedding climate adaptation into current work processes. Eventually, the issue of climate proofing will have to be included in the early phases of all spatial planning, policy-making, implementation and management. Subproject: incorporating climate adaptation.
- **THE STATE OF AFFAIRS:** What is the current state of affairs for the projects of Rotterdam Climate Proof; which interim objectives have been achieved so far? How can we manifest them? Subprojects: monitoring climate adaptation, and developing a barometer.

**THREE PILLARS** Rotterdam Climate Proof nourishes high ambitions. Their realization requires decisiveness, knowledge development, space to test and experiment, and new partnerships and alliances. For this purpose, the City of Rotterdam has decided to adopt a clever way of combining policy and implementation, considerations and execution. Innovative solutions will enhance the safety and the quality

of life in the city, while at the same time offering substantial economic potential for the entire region. Rotterdam thus becomes an inspiring example to other delta cities.

**1. KNOWLEDGE: Rotterdam is developing into a leading national and international water knowledge and climate city.** Trendsetting research in the area of theoretical and applied delta technology enables Rotterdam to create the basis for groundbreaking innovations and international collaboration. Within the national research programme entitled 'Knowledge for Climate', Rotterdam has been named a hotspot in this field. In concrete terms, this means that a fund of over 5 million euros is available for the 50% co-financing of research efforts. Accordingly, most of the knowledge projects are included in this programme.



Knowledge development also takes place through knowledge exchange. For this reason, Rotterdam has set up the international knowledge network called 'Connecting Delta Cities'. In addition, Rotterdam cooperates intensively with Rotterdam University (water management) and Erasmus University Rotterdam (EUR). New educational programmes focused on water management and delta issues are currently being developed, and students are given a chance to work for Rotterdam Climate Proof. Whereas the study programmes in Rotterdam focus mainly on applied knowledge, the cluster with Delft University of Technology predominantly addresses theoretical knowledge. The province of Zeeland serves as a testing ground in this respect where natural elements are used in construction work. A powerful region is thus created, where knowledge development is linked with the application of water





**THE KNOWLEDGE FOR CLIMATE RESEARCH PROJECT**

The Knowledge for Climate research project focuses specifically on the knowledge required – and the way this knowledge is organized – to climate proof the Netherlands. The aim of the project in this respect is to convert the vulnerability of the Netherlands into an opportunity. What we need to capitalize on is the opportunity to make the Netherlands more climate change resilient while at the same time showcasing this fact together with the corresponding knowledge and experience to enhance the country's attractiveness as a business location and strengthen our export position in the field of climate change and delta technology. Rotterdam Climate Proof participates in this research project contributing nine studies in the first tranche. These studies are currently being conducted. For the second tranche, Rotterdam Climate Proof will spend the Knowledge for Climate subsidy grant on the themes of flood management, freshwater supply, the urban environment, infrastructure and networks, and adaptation governance.

Studies in the first tranche:

- Rotterdam's climate atlas: Which primary and secondary effects of climate change are expected to impact the Rotterdam region?
- Accessibility: Which measures will strengthen the long-term reliability of freight transport by water?

- Flood management in the areas outside the levees: What will be the impact of climate change on flood management in the areas outside the levees in the Rotterdam region, and in which manner can flood protection be guaranteed in both the short and the long term?
- Lockable Open Rijnmond region: Would a system of flood defences that can open and close (such as the *Maeslantkering*) be a feasible option to preserve flood protection in the Rijnmond-Drechtsteden region in the long run?
- Adaptive building: What are the criteria and boundary conditions for a successful strategy for floodwater proof construction in areas outside the levees?
- Urban water system: What is the impact of climate change on the performance and maintenance of the urban water system, and which adaptation strategies would be most efficient and acceptable?
- Perception of flood protection: How can risk communication, flood insurance, and government policy favourably influence the perception that citizens and companies have of flood protection?
- Safe and adequately integrated water defences: Which types of flood defence are safe, integrable and robust, and what does that mean for the way we will proceed?
- Heat stress: Which social and economic problems can be expected as a result of climate change, and which physical and social measures are the best options to mitigate these effects?

management and delta technology, allowing the results to be marketed through the knowledge and innovation cluster as part of the Clean Tech Delta.

**2. ACTIONS: Rotterdam is developing into a global testing ground in the field of delta technology and urban water management.** Investing in a climate proof city contributes to the realization of a safe, healthy, and attractive living environment and a strong economy for the residential and business communities. Innovations and knowledge are developed and applied for use in Rotterdam. Especially the *Stadshavens* district will be the recipient of substantial investments, for instance in terms of adaptive building and floating constructions (such as the floating pavilion), and the National Water Centre. This will help *Stadshavens* to become the showcase of Rotterdam for 'urban delta technology'.

**3. POSITIONING: Rotterdam is an inspiring example to delta cities around the world.** Rotterdam positions itself as a delta city with a world port that approaches future climate change in an unassuming, safe and innovative manner. Not only on a local level but also on a national and international level, Rotterdam projects an image of innovation, reliability, and decisiveness. In 2010, Rotterdam will be represented at the World Expo to show the world how this metropolis manages to keep the city and port protected against flooding, despite climate change. Establishing international knowledge agreements and partnerships, Rotterdam takes up a prominent position among the leaders in the field. These leaders in the international field of water management and delta issues will attend the conference entitled 'Deltas in Times of Climate Change', which will take place in Rotterdam between 29 September and 2 October 2010.

**FIVE SUBJECT-RELATED MAIN THEMES** Within the Rotterdam Climate Proof programme, implementation and knowledge-related activities are clustered into five subject-related main themes: flood management, accessibility, adaptive building, the urban water system, and the urban climate. Each theme was assigned a specific objective and a coherent set of products with a focus on knowledge development and

implementation. Some elements naturally coincide with the subject of marketing communication. The state of the art may shift the balance between the three pillars.

**SEVEN STRATEGIC PROJECTS** A number of strategic projects was defined within the programme as well. The focus in these projects is predominantly on image projection, showcasing Rotterdam as a model city and a living example, and the corresponding marketing. Of course, these projects will also contribute to knowledge development. These ambitions are embedded, for instance, in the Rotterdam pavilion at the World Expo in 2010. Other strategic projects include the development of the National Water Centre, Connecting Delta Cities, the floating pavilion in Rotterdam, Smart Delta City, the implementation of the Water and Climate Marketing Plan, and the evolution towards RAS 2.0.

**CONNECTION BETWEEN THE THREE PILLARS, FIVE THEMES, AND SEVEN STRATEGIC PROJECTS** The connection is self-evident: knowledge development and knowledge exchange are necessary for the innovative implementation of measures and the realization of a safe, robust city that demonstrates sufficient resilience. 'Taking action' generates results and practical experience and creates a breeding ground for new, practical demand for expertise. This will allow Rotterdam to develop into a leading knowledge city and testing ground for climate-related issues and delta technology. Additional marketing activities and image projection will accelerate Rotterdam's national and international acknowledgement as a leading player in the water management and climate change arena. This, in turn, will increase the appeal of the city to knowledge institutes, corporations, residents and visitors.

As far as content is concerned, the pillars of knowledge and implementation are mainly aimed at the development of a set of conformal boundary conditions for Rotterdam's Adaptation Strategy (RAS) with its corresponding instruments, and subsequently very specifically at the five subject-related themes. The branding of Rotterdam as an advanced delta city and knowledge city for water and climate change management is embedded in the seven strategic projects.

**ROTTERDAM, KNOWLEDGE CITY FOR CLIMATE AND WATER MANAGEMENT ROTTERDAM AS A MODEL CITY FOR DELTA CITIES ALL OVER THE WORLD**

- Gaining insight into the issues at hand
- Developing innovative solutions
- Embedding them in work processes
- Economic spin-off
- Development of export products
- Attracting expertise and experiments



- ROTTERDAM IS A TESTING GROUND**
- Rotterdam will be climate proof
  - Building knowledge through practical experience (learning by doing)
  - Showcase for marketing communication





# 3

## RESULTS 2008/2009

Rotterdam Climate Proof started out in 2008 and is currently in full progress as part of the Rotterdam Climate Initiative. In the meantime, Rotterdam Climate Proof has achieved the following results.

### 1. KNOWLEDGE

- 5.2 million euros obtained from the national Knowledge for Climate subsidy programme (period between 2009 and 2013).
- Definition study adaptive building completed.
- First Dutch water management curriculum at Rotterdam University started up.
- First elaboration of the Veerman Committee recommendations (Lockable Open Rijnmond) delivered.
- Rotterdam coordinates the knowledge exchange between the C40 delta cities.
- Various publications, symposiums, films, and dissertations.

### 2. ACTIONS

- 20,000 m<sup>2</sup> of green roofs and a subsidy scheme.
- Design of the first water plaza is completed, and the participation programme has been started up.
- A total of 25,000 m<sup>3</sup> of additional water storage space has been realized.
- 5,000 m<sup>3</sup> of additional water storage space in Tjalklaan is currently under construction.
- 10,000 m<sup>3</sup> of additional water storage space in Museumpark is currently under construction.
- Lepelaarsingel has been extended, extra water reservoir has been dug in Hordijkerveld.
- The first terraced levee has been designed (Hilledijk).
- The design for the Blue Connection is finished, the agreement has been signed.
- The construction of the floating pavilion has commenced in September of 2009.

### 3. POSITIONING/MARKETING COMMUNICATIONS

- Contract with World Expo Shanghai, pavilion construction commenced.
- Rotterdam acclaimed as SMART Delta City (Berlin).
- Connecting Delta Cities set up within C40. The delta cities Tokyo, Jakarta, Hong Kong, New York, and London have expressed their commitment, and this commitment has been formalized by now with Ho Chi Minh City and Jakarta.
- Rising turnover is achieved in consultancy services on water management and climate change adaptation in Rotterdam and the surrounding region.
- IBM invests in Rotterdam by means of IT programmes and top talent.
- Rotterdam appointed as Champion City (World Water Forum Istanbul).
- Rotterdam sets an example in the National Water Plan.
- The number of water management and climate-related conferences and delegations in and to Rotterdam has increased explosively.
- Rotterdam now enjoys national and international recognition in this arena.
- Strategic marketing plan called Water and Climate has been delivered.
- 2009 study by Deloitte reveals: water management/ climate is the most promising economic growth sector in Rotterdam.
- Television series entitled 'Mulder & Sno' and 'o10 water' broadcast on local television.
- Rotterdam designated as the location for the new National Water Centre in 2012.

1. Green roof installation at Villa Zebra / 2. Visit of Senator Mary Landrieu (l) and Presidential Advisor Lisa Jackson (r) to Rotterdam / 3. Artist's impression floating pavilion in Rijnhaven / 4. Construction of floating pavilion / 5. Prince of Orange visits the building excavation for the underground water storage of the Museumpark Parking





# 4

## FIVE THEMES

Rotterdam has decided to leverage Rotterdam Climate Proof in a proactive approach to fight the consequences of climate change. The programme consists of five substantive themes which focus on knowledge development and implementation: flood management, accessibility, adaptive building, the urban water system, the urban climate.

### 1. FLOOD MANAGEMENT

Its location by the river Maas and close to the sea makes Rotterdam an outstanding example of a delta city. The city and the region are protected by a network of water defences. The levees, the dunes, and the Maeslantkering are crucial to flood management in Rotterdam and to the safety of the city. Climate change now poses new challenges for the city and the region. Dutch experts project a sea level rise between 65 and 130 cm by the year 2100 for the Dutch coast (compared with the level in 1990). Rotterdam Climate Proof is Rotterdam's response to this challenge, working on optimal protection and permanent, lasting accessibility of the city and the port despite the consequences of climate change.

**INVEST NOW** The Rotterdam region is a delta area where vast numbers of people live and work both inside and outside the levees. Not surprisingly, therefore, the Rijnmond region receives a lot of attention in the National Water Plan and the government's Delta Programme. At present, Rotterdam is a safe region, but in order to guarantee its safety in a changing climate, proactive measures are a necessity. After all, the prosperity of the economy and the attractiveness of the city depend on safety. Sea level rises, changing river flows, increased precipitation, as well as extended periods of drought may increase the risk of levee breach or flooding. It is, therefore, essential to invest in knowledge on water systems, the changes and fluctuations that may occur in these systems, and possible medium-term and long-term protection measures. Investing now will prevent excessive expenses in the long run.

#### REGIONAL DELTA PROGRAMME RIJNMOND-DRECHTSTEDEN

The Veerman Committee issued recommendations on flood management and climate change in 2008. These recommendations of the Veerman Committee will lead to a new Delta Programme for the Netherlands. Rotterdam plays a leading role in the elaboration of the regional Delta Programme Rijnmond-Drechtsteden. In collaboration with the government and a number of regional partners, various scenarios are explored for the future structure of water management.

Rotterdam wholeheartedly embraces the Veerman Committee conclusion that by 2050, the layout of the Rijnmond region should be designed to withstand the impact of storms and extreme river discharges, and considers this a condition for

the further development of the city and port. The proposed alternative of a 'Lockable Open Rijnmond region' seems to offer opportunities for spatial planning along the river and nature development, as well as to strengthen Rotterdam's position as an innovative delta city and world port. For this reason, the City of Rotterdam is collaborating with Delft University of Technology and 'HKV Lijn in Water', conducting research into the possibilities of this lockable alternative. In addition, other alternatives are studied as well, including one that relies even more heavily on levee strengthening.

In two years' time, we will know the outlines of the Delta Programme Rijnmond-Drechtsteden. In preparation of this programme, the government and the regional partners will cooperate in exploring and detailing the first scenarios in 2010. This concerns long-term scenarios. For the near future, the aim continues to be that by 2015, all of the water defences should be sufficiently strong according to current standards. Active participation in the preparations and implementation of the National Water Plan is a logical task. Wherever possible, this plan and the projects within Rotterdam Climate Proof will be aligned.

**RESEARCH IS PIVOTAL** Within the theme of 'flood management', research currently plays a pivotal role. The studies provide insight into the impact of climate change and into the effects of the development of adaptation strategies that will keep the region safe and protected against flooding. Following comprehensive consideration (of aspects including the social, technical, economic, spatial, and planning effects), these studies will serve as guidelines in the selection of the most appropriate, optimal adaptation strategy to ensure sustainable protection of the city and port.

One particular aim is to devise measures that will benefit several themes, and that allow for a combination of functions, for instance. Examples include innovative primary water defences in an urban context; levees that offer both protection and room for residential or recreational purposes. Yet another example concerns the installation of flexible flood defences with a lock-off valve to secure the Rijnmond region in times of heavy storms, while at the same time boosting the economic development of the areas outside the levees.



*In combination with dunes and levees, the Maeslantkering is crucial to flood management in Rotterdam*

Various means of communication will be used to convince the local residents and the corporate sector, on a local as well as an international level, of the adequacy of flood protection in the city and port, and to make them aware of what they, themselves, can do to contribute to the safety of the city and port.

#### ACTIVITIES IN 2010

- In 2009, the Knowledge for Climate programme started up a project to **study the consequences of climate change with respect to flooding risks and projected damage**. Early in 2010, the chart analyses and the corresponding reports will be finalized. At the same time, the flooding and damage model will be delivered. These will be captured in film images on the development of a flood event in areas outside the levees.
- The summer of 2010 will see the delivery of the **feasibility survey of the lockable alternative** with flexible flood defences for the Rijnmond-Drechtsteden region, including an inspiration document entitled Waterfront Rijnmond in the 21<sup>st</sup> century. In parallel and partially consecutively, a Plan of Approach will be developed within the context of the National Water Plan and the Delta Programme of the Delta Commissioner, in which various alternatives will be balanced and considered.
- **Climate-resilient levees** – Rotterdam is currently conducting a **feasibility study** on these multifunctional primary water defences in the city, and the development of a strategy to



realize these defences. The result will consist of a report on typologies, an analysis of alternatives, and indications for appropriate locations. In addition, the concept of the 'terraced levee' will further be elaborated into a final design.

- Starting from 2010, an eighteen months' study will be conducted concerning the **perception of flood protection in Rotterdam**. This will culminate in a report on the correlation between the perception of safety and flood protection and the awareness among citizens and corporate executives of what they can do or need to do in case of an emergency.
- **Flood Control 2015** – Within this research programme, Rotterdam will serve as a case study for the experimental application of real-time flood risk management in an urban environment. The study will furthermore address the selection of ICT elements and sensor networks that would be appropriate for Rotterdam.





## 2. ACCESSIBILITY

Proper accessibility is of vital importance for the economic development of Rotterdam. Proper functioning of freight transport and passenger transport by road, water and rail is crucial to the further development of the port, industry and services sector. But to what extent is the current transport infrastructure of the city and port climate change resilient?

Current climate change projections typically involve high temperatures, extended periods of drought or precipitation, extreme rainfall, storms, and a rising sea level. All of these characteristics may conceivably impact the network and the infrastructure of a city, in the form of subsidence, for instance, or melting asphalt, low water levels, or congested tunnels and bridges during extreme rainfall and storms. Bottlenecks we are already experiencing during heavy downpours are flooded tunnels. Especially when the scarce underground passages under railways in Rotterdam are inaccessible, during rush hours the entire urban road system gets jammed. Moreover, one could wonder what the impact of stronger fluctuations in water levels will be on the navigability of the rivers. What needs to be done to preserve or expand the transport share of inland navigation? Which options do we have further to strengthen passenger transport by water in the region? It is obvious that climate change will have a substantial impact on the layout of the infrastructure in Rotterdam.

**NEW MOBILITY ISSUES** Sustainable solutions for the future in the area of infrastructure in and around the city incorporate climatic effects. This requires research, first of all, as knowledge

on the actual consequences is lacking. Based on the outcome of this research, the measures will be defined that are necessary at least to preserve the existing network. Some measures will be easy to implement, but some consequences will necessitate adjustments. New mobility issues as a result of climate change will also need to be taken into account in this respect. The concept of living on water, for example, will obviously also increase the demand for transport by water.

### ACTIVITIES IN 2010

- In 2009, the Knowledge for Climate programme started up a project to **study the consequences of climate change on inland navigation**. By the end of 2010, a feasibility study will be conducted to test the solution selected earlier that year.
- In 2010, the **study into the consequences of climate change on the infrastructure** will be followed up – and adjusted where necessary – to achieve relevant results for the Rotterdam region, followed by an initial interim report by the end of 2010.
- **Quick scan of the infrastructure** – In addition to the study in the context of Knowledge for Climate, a quick scan will be carried out for the network in the Rotterdam region to acquire an overview of the major bottlenecks that will occur as a result of changing climatic conditions.
- **Implementation of a pilot project** – In a pilot project, we will explore the possibilities of mitigating the nuisance experienced as a result of heavy downpours and subsequent traffic congestions for the location indicated in the quick scan.

## 3. ADAPTIVE BUILDING

The expected sea level rise and the increased river discharge will enhance the risk of future flooding of the areas outside the levees. For Rotterdam, the development of the areas outside the levees is of significant importance. For instance, in *Stadshavens* (city ports), 1600 hectares of space outside the levees will be developed in a sustainable manner. As this involves large investments, these areas will also be used more intensively. Accordingly, the social consequences and the potential damage due to emergencies such as flooding or high tide will increase substantially as well.

The current security strategy for the areas outside levees applied by the government, the water boards, and the municipality is focused predominantly on limiting the consequences of high water levels by strengthening levees and quays, overall heightening, and installing surge barriers and emergency water diversions. As insecurity on the consequences of climate change increases, however, this strategy becomes vulnerable. Confronting this insecurity requires a strategy that aims also to reduce the consequences of high tides. The concept of designing the areas outside the levees in a way that is resistant to high water levels is referred to as adaptive building.

For an optimal approach of adaptive building in the areas outside the levees, the subject is addressed from various angles, including the aspects of urban planning and construction method, access structure, mains services design, the organization of the public space, and legal measures (such as area-specific regulations on the method of construction and use). Key elements in this respect are permanent protection against flooding, and the development of a sustainable and attractive environment. Adaptive building thus offers opportunities for the realization in Rotterdam of new residential and business environments.

**FLOATING BUILDINGS** Rotterdam has ambitious plans to build floating urban districts. The *Stadshavens* (city ports) district offers space for 1600 hectares of sustainable area development. Until 2040, some 13,000 climate change resilient homes will be built here, approximately 1,200 of which will be built on water. In these

floating districts, people will live on the water, get their groceries, work and spend their leisure time, all on the water. The locations of these districts are not yet known. A study will be conducted to determine which (former) harbour basins are most suitable – in the short term, but also in the longer term. The study will also reveal which harbour basins are unsuitable for floating constructions.

### ACTIVITIES IN 2010

- The development of a **high water level resilient strategy** for a sustainable, internationally distinctive and attractive residential and business environment in existing and newly to be developed areas outside the levees in the Rotterdam region. This will be linked to design-driven research into adaptive building in four case study locations.
- Research into the **possibilities for floating constructions** in a number of specific harbour basins in Rotterdam, which will lead to a plan of approach that will be developed by the municipal departments in collaboration with developing (market) parties. This will be used to manage the further development of the floating construction programme.
- In a follow-up to the successful Urban Flood Management (UFM) project in Dordrecht, a strategy will be developed for a number of case study locations outside the levees, starting off with the **Heijlplaat case study**, for a safe and adaptive redevelopment of the areas outside the levees. In subsequent years, this case study will be converted into pilot projects.
- The **translation of the experiences** gained during the realization of the floating pavilion into initiatives to encourage the setup of other pilot projects. One specific example concerns the construction of working platforms developed by PublicDomain Architects in the Heijsehaven and the Innovation Dock of Rotterdam University in the Dokhaven.
- The establishment and setup of a **Floating Buildings Desk** that initiators of a floating project can turn to for information and guidance through the planning and permit procedures of municipal departments, the Port of Rotterdam, the Security Region authorities, and DCMR Environmental Protection Agency Rijnmond.





## 4. URBAN WATER SYSTEM

Climate change already makes its impact felt in Rotterdam. Extreme downpours causing flooded streets and basements are occurring more common, and in the longer term, extended periods of drought can be expected as well. The capacity of the existing drainage systems and pumping stations is obviously insufficient to 'keep our feet dry' during extreme rainfall. Rotterdam has set up the Rotterdam Climate Proof climate adaptation programme in order to limit flooding in times of extreme weather events. The construction of additional water storage facilities and water plazas, and the provision of incentives for green roofs all help to preserve optimal quality of life in the city despite climate change. These initiatives involve innovative alternatives for water storage, solutions for water collection during heavy downpours (emergency storage), and options to delay the discharge of rainwater. Furthermore, also in dry periods, Rotterdam should have sufficient water of sufficient quality.

**INTEGRATED SOLUTIONS** Developing a proper adaptation strategy requires more in-depth insight into the solution avenues available to prevent flooding and water shortages. The task at hand is to devise measures that will solve future bottlenecks while at the same time contributing to the economic strength and attractiveness of the city. For this reason, water storage in Rotterdam is integrated in the urban environment wherever possible. Against this backdrop, Rotterdam Climate Proof and the water boards collectively encourage the installation of green roofs, for example. During heavy rainfall events, these green roofs are a highly valuable solution for temporary water storage. In addition, the City is studying possible locations for the construction of water plazas. These water plazas – a Rotterdam invention – fill up in a controlled manner during heavy rainfall, preventing surrounding streets from flooding. In dry periods, the plazas serve as children's playgrounds. Other storage applications involve multifunctional car parks. The new car park near the Museumpark, for instance, will be equipped with an underground water storage facility. These and other projects are deployed by Rotterdam to increase the storage capacity of the existing sewerage system.

*Water plaza designed by De URBANISTEN*



**WATER QUALITY** Guaranteeing the water quality in times of drought requires appropriate measures. After all, in periods of drought, we may be forced to let in water that is foreign to the area. If, at times like these, saline water or water of poor quality is channelled in, this will reduce the quality of the urban water. That is why large-capacity water connections to the regional water system are currently being installed, so as to safeguard the supply of additional fresh water. One example concerns the Blue Connection in the South of Rotterdam, that will be constructed in 2013. In addition, flexible water-level control in the drainage canals and pools is deployed for additional seasonal storage. And finally, the groundwater level and quality are an important precondition for the buildings and green structures in the city.

### ACTIVITIES IN 2010

- Continuation of the **subsidy programme for green roofs**, aimed at an intensified construction to a total of 50,000 m<sup>2</sup> in 2010, the continued installation of green roofs on municipal objects, and the opening of a demo roof in Rotterdam in the spring of 2010.
- **Identifying and listing promising locations for water plazas** in Rotterdam, leading to a final choice for a pilot plaza. The realization of this pilot plaza will be started up by the end of 2010.
- Setup of an **implementing body for the Blue Connection** and the further elaboration of the draft planning procedure including the boundary conditions with respect to the process.
- Delivery of the **green façade pilot project**.
- Delivery of the **Museumpark underground water storage** (summer of 2010).
- Delivery of the **study concerning the consequences** of climate change on the performance and maintenance of the urban water system (1st tranche Knowledge for Climate). Start-up of the study concerning adaptation strategies (2nd tranche Knowledge for Climate).
- Start of the **model and monitoring survey** into the effect of adaptation measures concerning the urban water system in Rotterdam.
- Start of the **doctoral research** concerning public health risks with respect to the urban water system and climate change.



This will provide insight into what needs to be measured, and where, in order to take effective adaptation measures. - **Research into effective adaptation measures** – Measures will need to be taken in order to realize the required and desired adaptation of the city to climate change. In the 2<sup>nd</sup> tranche of Knowledge for Climate (2010-2013), research will be conducted into the most effective measures. This

## 5. URBAN CLIMATE

The urban climate has an impact on the daily operations in the city. At the same time, the urban layout and design influence the urban climate. Themes that could serve as examples include heat stress during more frequent heat waves, the extra impact of particulate matter on public health in times of aridity, or the increased frequency of occurrence of insect infestations. The need for outflow areas, shaded places and cool areas in the open space increases as summers grow hotter. Public gardens and parks should be climate change resilient and can contribute to heat stress mitigation. These themes will become even more important as building density intensifies.

The theme of the *urban climate* carries a focus on improving the quality of life and the attractiveness of the environment by adjusting the layout of the external public space and the design of the urban areas to climate change. The way we intend to achieve this goal is by expanding the knowledge on the urban climate in Rotterdam and applying this knowledge in practice. In addition, we invest in raising public awareness of the fact that the climate – even in our current situation – influences the personal and professional lives of the people in the city.

### ACTIVITIES IN 2010

- **Heat stress survey** – Review of the effects of climate change, as a result of studies concerning Heat Stress and Regional Climatic Scenarios in the Rotterdam and Haaglanden regions, within the context of the national Knowledge for Climate research programme. The results will be delivered in the third quarter of 2010 and will form the basis for follow-up research into adaptation measures.
- **Monitoring the urban climate** – With the support of the province of South Holland, the number of measuring points will be expanded and additional stations will be set up in municipalities in the region, and trams will be carrying out measurements automatically as they drive around the region on their daily routes. These measurements will, in principle, continue to be taken until the end of the Knowledge for Climate programme.

involves the adjustment of buildings, public spaces, and human behaviour. The study will address, for instance, the question as to which cooling effect and water buffering capacity greenery can provide in and around the city (including green roofs and natural climate buffers).

*Climate monitoring in the city*



- **Review of the Green policy** – Report on the climate change resilience of the municipal greenery in Rotterdam, related to the need for water, possible salinization, available range, and rising temperatures.
- **Use of detailed climate information** – Monitoring the urban climate will yield additional weather information that can be used to prepare more detailed weather reports. The Royal Netherlands Meteorological Institute (KNMI) will provide this service (on an experimental basis) for Rotterdam and the surrounding region. In the course of 2010, the initial version will be available. Together with users who show an interest (including the Port of Rotterdam and the Water Management Department of the City of Rotterdam), we will study which format would be most useful for this weather report, for instance to improve navigation and traffic guidance and to support municipal water management.





# 5

## SEVEN STRATEGIC PROJECTS

A number of projects within Rotterdam Climate Proof are of strategic significance to the image of Rotterdam as a protected port city and a decisive, innovative delta city. Justifying the confidence placed in the safety of the region by investors and citizens is an important factor in this respect.

Rotterdam is well on its way to becoming a global leader in the field of climate adaptation and applied delta technology. The majority of the strategic projects will ensure that Rotterdam will achieve a robust position as a water management and climate city.



**1. CONNECTING DELTA CITIES (CDC)** Recent figures show that today, more than half of the global population lives in urban areas, most of whom in delta cities. Delta cities and the corresponding ports are some of the most vulnerable areas where climate change is concerned, as the risk of economic losses and casualties is high.

These are the considerations that prompted Rotterdam to start up a network of delta cities under the C4o umbrella, by the name of Connecting Delta Cities (CDC). For the time being, the focus is mainly on a core group of seven delta cities: Tokyo, Jakarta, Ho Chi Minh City, Hong Kong, London, New York, and New Orleans. The collaboration with these delta cities has by now been formalized to some extent, or is expected to be formalized in the near future. One of the purposes of the network is to share and exchange knowledge on the subject of comprehensive municipal water management and climate adaptation, and to share 'best practices'. As far as possible, any meetings and workshops will be linked to existing international meetings in order to limit travel movements.

In the meantime, the Netherlands Water Partnership, the Co-operative Programme on Water and Climate, and the Ministry of Transport, Public Works and Water Management have come to consider Connecting Delta Cities a significant network for knowledge exchange among delta cities. Connecting Delta Cities contributes to the municipal element of the government's international policy on water management and climate-related issues. This may well provide a strong impulse for the export and application of Dutch Water Management Knowledge.

### ACTIVITIES IN 2010

- International conference 'Deltas in Times of Climate Change' in Rotterdam (29 September until 2 October 2010).
- Foundation of the 'Front Desk for Climate Proofing Delta Cities'.
- Water conference during the World Expo Shanghai 2010 (10 June 2010).
- Formalization of the collaboration with New Orleans.
- Contributing to the adaptation strategy of Ho Chi Minh City and Jakarta in collaboration with Rotterdam University.
- Concretization of the collaboration with the Ministry of Transport, Public Works and Water Management and the CPWC.
- The development, in collaboration with knowledge institutes, market parties and other government authorities, of a blueprint and corresponding design for the delta city of the future, which will be presented during the 'Deltas in Times of Climate Change' conference.



*Ho Chi Minh City signs the Letter of Intent for Connecting Delta Cities*

### 2. NATIONAL WATER CENTRE AND DDD2012

The Dutch water sector has united in Dutch Delta Design 2012 (DDD2012) for the purpose of promoting the sector on an international level. Thirty large parties from the water sector launched an ambitious plan on 1 July 2009, to reposition the Netherlands as the international platform for water: Dutch Delta Design 2012. These parties have expressed their commitment to ensure that within three years' time, the Netherlands will become the centre of gravity for international agencies, corporations, government authorities, NGOs, and the public to turn to in order to solve water management issues around the





### 3. FLOATING PAVILION

In Rotterdam, port activities are moving more to the west, releasing more and more docks that can subsequently be used for entirely new ways of living, working and spending leisure time on the water. Particularly the *Stadshavens* district offers splendid opportunities for floating constructions. A floating building is a solution that responds well to fluctuating water levels, can be built in a climate-neutral manner, offers more flexibility, and will ultimately work out

more efficiently than land-based developments in a city where land is scarce.

In May 2010, an initial pilot in the area of floating buildings will be completed: the floating pavilion. The floating pavilion will be a prominent landmark for Rotterdam's city centre. It is remarkable not only because of its shape, consisting of three floating half-spheres, but also because of its climate change resilient, innovative, sustainable, and flexible qualities. For the first five years, this futuristic pavilion will be moored in the Rijnhaven, serving as an exhibition and reception centre. For Rotterdam as an innovative climate city, the floating pavilion will be an icon project in which the combined ambitions in the area of mitigation and adaptation will be realized.

#### ACTIVITIES IN 2010

- **Opening** of the floating pavilion in May/June 2010, when the exhibition and reception hall will be completed. The exhibition will be linked to the Rotterdam pavilion in Shanghai.
- Development and implementation of the **operational plan**.



Alderman Karakus gives the go-ahead for the construction of the floating pavilion

**CLEAN TECH DELTA** Clean Tech Delta is a collective effort of companies, knowledge institutes, and government authorities in the Rotterdam-Delft region to fight climate change and promote the environment. The objective is to realize sustainable solutions for the future of the delta by using innovations and clean technology in the area of energy, water, mobility, and commodity consumption. The Rotterdam-Delft region was selected in view of its significant

spatial and economic developments, for instance in the *Stadshavens* district in Rotterdam, where 1600 hectares of land and water are designated to be used for new, sustainable purposes. Clean Tech Delta has an economic (sustainability is a strong business case), environmental (responsible energy and commodity consumption is a must) and a socioeconomic (sustainability can be incorporated by changing people's behaviour and mentality) dimension.

globe. Furthermore, DDD2012 has announced that Rotterdam will be the location where the National Water Centre will be established. This centre will be the showpiece for the Netherlands Water Nation, and has the ambition to develop into an expertise and visitors' centre of international repute in the area of water management and delta technology. It will project the image of a veritable icon, and will be opened in 2012. Rotterdam expects an annual number of 250,000 visitors.

National and regional collaboration within the water sector is of crucial importance to the success of DDD2010. Rotterdam will join forces with Delft, the province of Zeeland, and the city of Dordrecht. The entire region will be presented as a living showcase extending from the Second Maasvlakte to the City Wharfs in Dordrecht.

Early in 2010, the first business case will have to shed light on the viability of this type of centre. The model to be selected will probably be a growth model that is closely connected with the area development of the *Stadshavens* district. Expectations are that the National Water Centre will exert a powerful pull on related industry in the field of water management and delta technology. The realization is in perfect alignment with the Clean Tech Delta ideology. The international element of DDD2012 is reinforced by the Connecting Delta Cities network.

#### ACTIVITIES IN 2010

- Elaboration of the **National Water Centre business case** and further identification of potential investors and users, in collaboration with *Stadshavens*.
- Organization of the **preview DDD2012 in Rotterdam** (in preparation for the international launch during the World Expo 2010).
- Preparation of the large-scale **event in 2012**, the opening and final act of which will take place in Rotterdam.





*In times of extreme precipitation, the sculpture avenue on Westersingel serves as additional water storage*



**4. SMART DELTA CITY** Together with IBM, Rotterdam is developing the groundbreaking concept of the Smart Delta City. A Smart Delta City is a city that uses real, real-time operational information for the management of the (water) infrastructure and the development of control mechanisms for the Rotterdam Adaptation Strategy (RAS). The system pools various data flows on water and climate in the region, creating an accurate, dynamic picture. It enables administrators and operators to respond adequately to threats such as floods, drought, and changes in water conditions that may cause damage. Rotterdam Smart Delta City consists of an elaboration of a number of concrete projects that are subsequently incorporated and integrated into a network for common use with its corresponding 'intelligent' information strategy. Thus, for instance, a dashboard will be developed to monitor climate-related initiatives, new information will be generated and pooled in a sensor network, the Rotterdam elaboration will be specified for Flood Control 2015 (flood risk control), and a serious game has been developed that provides insight into the climate change issue and Rotterdam's approach of the problems.



**ACTIVITIES IN 2010**

- The **development of a demo version** of an integrated data platform, together with a consortium of interested parties. This will provide access and links to a wide variety of data from the Rotterdam region, which will help to lift the daily operations in the city to a higher level of intelligence and to create new information products.
- Joint **presentation of the Rotterdam Smart Delta City concept** with IBM at the World Congress on Information Technology 2010.

**5. WORLD EXPO** On 1 May 2010, the World Expo in Shanghai will open its doors, carrying the theme of 'Better City, Better Life'. Even today, more than half of the world population simply has no other option but to live and work in a city. And this number is still increasing at a rapid pace. The Expo will therefore largely centre on innovation and development of the human environment in the 21<sup>st</sup> century. During this Chinese edition of the world exhibition, 185 countries and 50 cities, including Rotterdam, will share their vision on the future of

life in the city. This offers Rotterdam an excellent opportunity to present its enthusiastic and dynamic approach to climate change to an international audience. The 'Rotterdam Water City' pavilion will be located on the other side of the Huangpu River, in the 'Urban Best Practices Area'. Being one of the selected metropolises, Rotterdam will take this opportunity to demonstrate in its own, unique way how this city develops innovative solutions for urban water management and flood management, and how it is able to identify opportunities in



climate change to enhance living conditions and the business development environment. More than merely an exhibition, the 'Rotterdam Water City' pavilion will mostly offer an inspiring 'experience' of how a delta city like Rotterdam handles flood management now and in the future, despite climate change.

The Rotterdam pavilion also offers organizations, institutes and companies ample opportunities for international exposure, especially in the area of water management and delta technology. There are various opportunities to sponsor the 'Rotterdam Water City' pavilion. Over 1.5 million visitors are expected to experience the Rotterdam approach during the Expo in Shanghai.

#### ACTIVITIES IN 2010

- Opening of the 'Rotterdam Water City' pavilion on 1 May 2010.



## 6. MARKETING AND ECONOMIC POLICY

Energy, water and climate constitute global growth markets. Climate change will require more and more urban areas, and delta cities in particular, to arm themselves against the consequences of extreme rainfall and a rising sea level. This is of particular importance in view of the global trend of increasing population density in cities, most of which are located in low-lying delta areas. And finally, the global trend of ports increasing in scale is expected to continue, with new ports being constructed and old ones transformed. This offers opportunities for sustainable and climate change resilient area development.

The International Advisory Board (IAB) has pointed out the enormous importance for Rotterdam of knowledge on water management and climate change on various occasions. In 2008, the IAB recommended the preparation of a structured marketing plan for knowledge and water management. In 2009, a business plan was developed for the Rotterdam Climate Campus, investing in knowledge development and application in the area of water management and energy. The Climate Campus, or Innovation Cluster, as it is sometimes referred to, will join the RDM Campus and Science Port Holland, presenting themselves on the market collectively as Dutch Clean Tech Delta.

In 2009, Erasmus University Rotterdam investigated the importance of the regional and national players in the field of water management and climate. They concluded that the Rotterdam region has extensive economic opportunities in this area. Also in 2009, Deloitte published its International Market and Sector Analysis, which presented similar conclusions: water management and engineering is a field that offers Rotterdam the opportunity to distinguish itself strongly on the international market, as well as a field of enormous economic potential.



Construction of the 'Rotterdam Water City' pavilion, World Expo Shanghai 2010

Rotterdam-based companies that are strong in water management and engineering (such as Van Oord) or that have large water divisions (such as Arcadis, Haskoning, DHV, and Grontmij) generate a large share of their turnover abroad.

In 2009, various expertise-related questions in the area of water management and climate change were addressed to the City of Rotterdam, coming from cities and countries such as New Orleans, Manila, and Morocco. In this context, Rotterdam has responded by setting up Connecting Delta Cities. Climate proofing delta cities is 'big business' for the future. The Dutch delta will require an estimated 100 billion euros, while Asian delta cities may require the investment of an amount many times higher than this. Rotterdam's comprehensive approach and applied knowledge are expected to serve as an example to other delta cities. This is supplemented by the knowledge gained in 'Smart Delta City', in which IT applications contribute to the realization of a sustainable delta city.

#### ACTIVITIES IN 2010

- Link up with the **Clean Tech Delta marketing programme** that is currently in a start-up phase.
- Exploration of the possibilities of **setting up a market broker or desk function** so that questions related to business establishment and marketing in the area of water management and climate change can be matched with the competences of companies in the region.
- Further policy-making to help shape the role of economic policies in the **Water and Climate cluster**.
- **Report on measurable and objectifiable indicators** to be able to define the **economic added value of the climate programme** (to be prepared by Erasmus University Rotterdam). At the

same time, this research will lead to a strategy to increase the economic added value.

## 7. ROTTERDAM ADAPTATION STRATEGY: RAS 2.0

The development of an adaptation strategy for a delta city is a unique, unprecedented concept in the world. Over the next few years, this adaptation strategy will develop into a more and more detailed document (please also refer to chapter 2). The objective for 2010 is to develop RAS 2.0, incorporating clear milestones and a route planner for each theme. This will be done in national alignment with the development of other regional adaptation strategies, and in this sense, Rotterdam will contribute to the National Adaptation Strategy (NAS). On an international level, RAS may prove to be of significant value to other delta cities. That is why knowledge exchange on the subject is considered one of the most important topics within Connecting Delta Cities. Finally, the development of RAS also has certain market values in view of the worldwide problems and choices delta cities will be confronted with.

#### ACTIVITIES IN 2010

- **Further development of the current Rotterdam Adaptation Strategy** and the coordination of this strategy and its alignment, both within municipal services and with various external parties. In concrete terms, the various instruments from this strategy will be tested at testing stations at Heijplaat and in an area inside the levees, such as the city centre.
- **Heijplaat case** – The elaboration of the strategy with respect to dealing with crucial considerations concerning resistance and resilience. Within the theme of adaptive building, the solution avenue of resilience is further elaborated, while the framework needed to reach a comprehensive balance is provided by RAS.





# 6

## COMMUNICATION

The communication of Rotterdam Climate Proof is predominantly of an informative and marketing communication oriented nature. As far as the City of Rotterdam is concerned, the communication in 2010 will focus mainly on the relevance, urgency and added value of the approach of climate change related issues in Rotterdam. Citizens and the corporate sector will be informed on the solutions that Rotterdam Climate Proof is preparing and implementing even today when it comes to extreme downpours, flooding, and heat stress.

In addition, we will consistently convey that we are elaborating the climate file in a broad approach, and that the solutions we implement will not only contribute to keeping Rotterdam safe in terms of flood management, but will mostly also offer opportunities for the city to benefit from, both when it comes to attractive public space (with more greenery and more water) and where economic opportunities are concerned. The communication efforts take place at three levels: at programme level, theme level, and project level. This will enable us to convey messages to the public in several ways. In view of the progress of the programme, the content of the communication will increasingly focus on concrete results. The ambitions of Rotterdam Climate Proof will constitute the context in this respect.

### ACTIVITIES IN 2010

- (Further) development of **programme-related means** such as the Internet site, monthly newsletters, the programme for the year 2010, gadgets, means for general exposure and a contribution to the interior of the floating pavilion and the Rotterdam pavilion at the World Expo, the DVD 010 water (March 2010), a professional special of Rotterdam Climate Proof on RAS, and the initial results of the Knowledge for Climate research programme (April 2010).
- Generating **continual media exposure** (local, national and international) at programme, theme, and project level.
- At project level, the activities include: a **roadmap** and the Connecting Delta Cities **book**, a **campaign** on the subsidy scheme for green roofs (March/April 2009), the opening and programming of the green demo roof (April 2010), the opening and **promotional campaign** for the floating pavilion (May 2010), communication (in preparation for) the opening of the 'Rotterdam Water City' pavilion at the World Expo (May 2010) in the Netherlands and China, and the promotional campaign for the 'Deltas in Times of Climate Change' conference.



Recordings in New York for the '010 Water' television series / The first heat stress measurement in August 2009 resulted in a lot of attention from the media



Rotterdam green roofs campaign





# 7

## THE FUTURE

In 2010, we will continue to work on climate proofing the city. These campaigns are predominantly aimed at the realization of additional water storage, such as green roofs and water plazas. It is not yet clear exactly what the impact of climate change on Rotterdam will be, which is why we will need to invest in further research. At the same time, as a result of the combination of implementation and research, Rotterdam is successfully branded as an innovative water management and climate city.

In the period between 2011 and 2014, we will proceed along the same line, continuing to emphasize the implementation and realization of innovative projects in the city. In doing so, we will take into account the results of research focused on the themes of flood risks, scenarios for flood management and accessibility of the city and port, optimization of the urban water system, adaptive building, and the urban climate.

In addition, the implementation phase of the so-called strategic files will then be in full swing: RAS 2.0 and the Smart Delta City concept will be elaborated in ever finer detail. This will secure Rotterdam's position as a leading city in the area of intelligent water management and in the direction and coordination of the efforts to climate proof a delta city such as Rotterdam. Also the spatial plans will be climate proof in 2012, if not earlier. And other climate adaptation themes will by then have been adequately embedded and incorporated in standing policy and planning procedures. Even more than before, the emphasis will be on the economic spin-off as a

result of the image Rotterdam has built up as an innovative water management and climate city.

The international collaboration with other delta cities in the next few years will definitely gain momentum. The Rotterdam approach plays an important role in the demand and supply concerning water management and delta technology. This will lead to growth for the regional and national water sector.

An important milestone in 2012 will be the opening of the National Water Centre in Rotterdam, concurrently with the nation-wide Dutch Delta Design event to position the Netherlands even stronger as *the Water Nation* all over the world. Rotterdam will take up a central position in this respect. For this reason, both the start and the conclusion of this Dutch Delta Design Process event will take place in Rotterdam. This way, Rotterdam will demonstrate that climate change offers opportunities for an attractive and economically strong city.



Artist's impression of the Second Maasvlakte



## COLOPHON

**Rotterdam Climate Proof is the adaptation programme of the City of Rotterdam and is part of the Rotterdam Climate Initiative. The Rotterdam Climate Initiative is a partnership between the City of Rotterdam, the Port of Rotterdam, DCMR Environmental Protection Agency Rijnmond, and Deltalinqs, with the objective of reducing CO<sub>2</sub> emissions by 50% and fully climate proofing the city.**

Starting from March 2009, Rotterdam Climate Proof is part of the Climate Office of the City of Rotterdam. The Climate Office addresses the comprehensive climate issue, including both mitigation and adaptation. The office is managed by the Director of Climate Affairs of the City of Rotterdam, Paula Verhoeven. Arnoud Molenaar is the programme manager of Rotterdam Climate Proof.

Implementation of the programme is a joint activity of the following three Rotterdam departments: the Municipal Public Works Department, dS+V (the Municipal Housing and Planning Department), and the Rotterdam Development Corporation. In addition, they collaborate actively with the Municipal Health Service (GGD), the Sports and Recreational Department, the Water Boards, various government bodies, NGOs, the corporate sector, and knowledge institutes. They report to the Municipal Executive. The RCI board are jointly responsible for the coherence, quality, and progress of the programme.

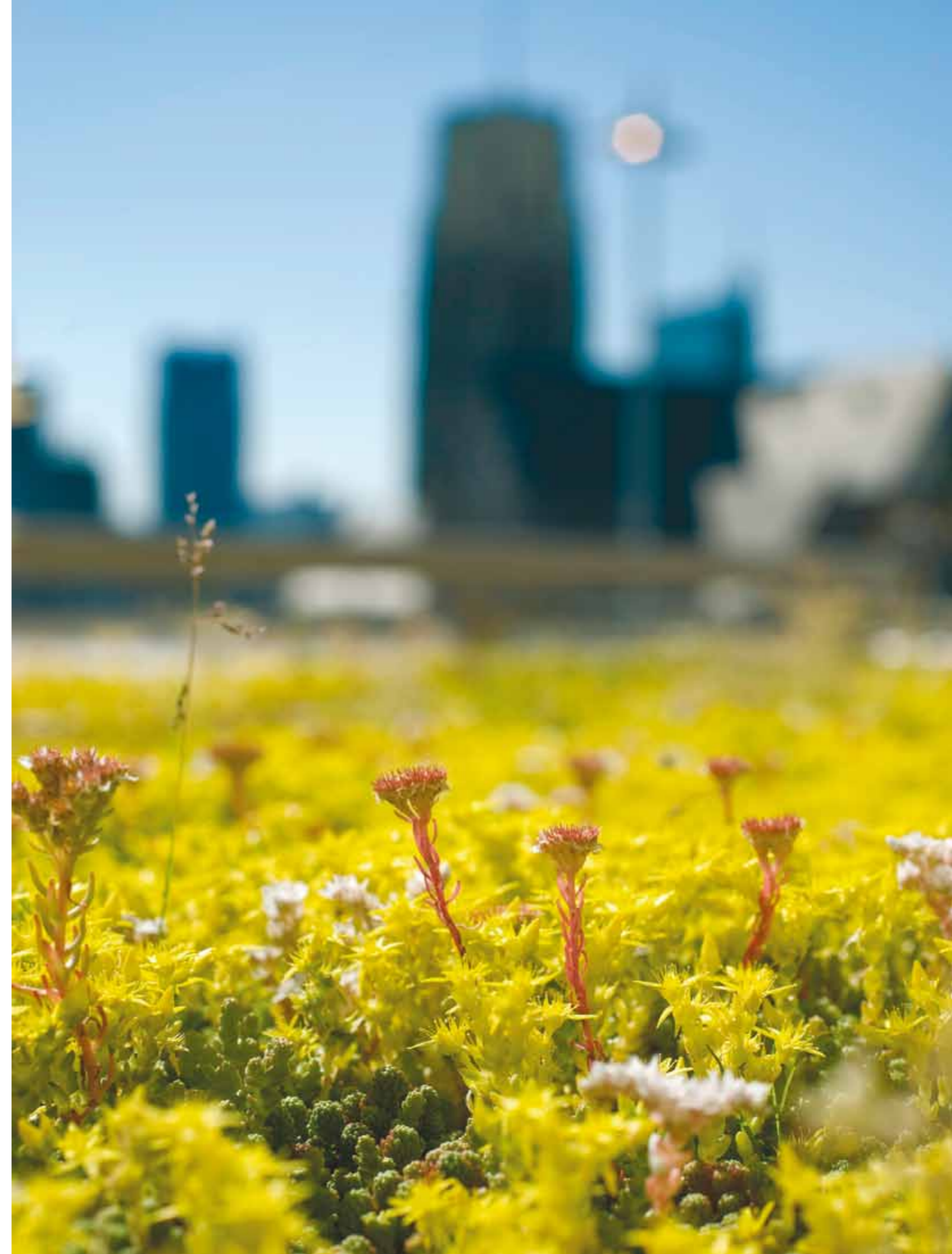
### THE ROTTERDAM CLIMATE PROOF RECOMMENDATIONSCOMMITTEE CONSISTS OF:

Paula Verhoeven (City of Rotterdam, Chairperson), Hans Beekman (*Stadshavens*), Jan Willem Croon (Woonbron), Piet Dircke (Arcadis, HRO), Cees Donker (IBM), Mai Elmar (City of Rotterdam), Jan Geluk (Hollandse Delta Water Board, WSHD), Marlon Huysmans (OVG), Sander de Jongh (Economic Development Board Rotterdam, EDBR), Pavel Kabat (WUR, KvR), Arie Kraaijeveld (Netherlands Water Partnership, NWP), Henk Ovink (Ministry of Housing, Spatial Planning and the Environment, Directorate-General, VROM-DGR), Renske Peters (Ministry of Transport, Public Works and Water Management, DGW), Wiert-Jan de Raaf (RCI), Jan Rotmans (EUR), Marcel Stive (Delft University of Technology, TuD), Pier Vellinga (WUR, KvK), and Chris Zevenbergen (Dura Vermeer, Delft University of Technology, and Unesco-IHE).

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## ROTTERDAM CLIMATE INITIATIVE

Improving the climate for the benefit of people, the environment, and the economy; that is the challenge confronted by the collective initiators: the Port of Rotterdam, the City of Rotterdam, employers' organization Deltalinqs, and DCMR Environmental Protection Agency Rijnmond. The Rotterdam Climate Initiative creates a movement in which government, organizations, companies, knowledge institutes, and citizens collaborate to achieve a 50% reduction of CO<sub>2</sub> emissions, adapt to climate change, and promote the economy in the Rotterdam region. Rotterdam Climate Proof is the climate adaptation programme of the Rotterdam Climate Initiative.

[www.rotterdamclimateinitiative.nl](http://www.rotterdamclimateinitiative.nl)



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Climate Proof  
CONNECTING WATER WITH OPPORTUNITIES