

ROTTERDAM

THE ROTTERDAM CHALLENGE ON WATER AND CLIMATE ADAPTATION

CLIMATE PROOF



Rotterdam will remain protected, even now that the climate is changing. The city is exploiting the economic opportunities of water and climate adaptation. Water is an important means by which the quality of Rotterdam as an attractive city in which to live is enhanced. Together with various partners, Rotterdam is strengthening its position as a city with knowledge of water, at both a national and international level. Being in the vanguard of climate adaptation and innovative developments, Rotterdam serves as an example to and source of inspiration for other cities located on or near deltas.

CONTENTS

FOREWORD

blz. 3

1.

ROTTERDAM CLIMATE PROOF

blz. 5

2.

WHAT CAN ROTTERDAM EXPECT?

blz. 7

3.

AMBITIONS

blz. 9

4.

THREE MAINSTAYS

blz. 11

5.

PLANNING AND ACTIVITIES

blz. 15

FOREWORD

This adaptation programme, Rotterdam Climate Proof, paints an outline of how Rotterdam intends to anticipate climate change. It is not just a matter of surviving. Through dynamic action and knowledge development, the city is taking a huge leap forwards to the market of the future. Rotterdam is seeking to secure a firm position on the international stage in the field of climate adaptation, water knowledge and urban delta technology. In short, Rotterdam Climate Proof is helping build a city and port that is protected attractive and competitive!

The programme sets out Rotterdam's plans for climate adaptation and its exploitation of water knowledge as an asset to our city as a major port city. The Rotterdam Climate Proof programme also serves as an invitation to public and private parties to come up with innovative and effective contributions that can help realise these goals. As the process of implementation, knowledge development and profiling progresses, strategic alliances will be formed with knowledge institutes, building contractors, design firms and government bodies.



New Orleans The floods that affected New Orleans marked the start of a new era. Because of the worldwide climate change and the rise in sea levels, disasters of this kind are likely to occur more frequently. Deltas are being used more and more intensively in the western world and elsewhere. The question is, how can we ensure that people can live comfortably and securely in a river delta in spite of all the changes taking place?

The answer to this question can be found in the Netherlands – in Rotterdam, for example. We are a showcase. A consequence of “New Orleans” is that the Americans have placed orders with a number of Dutch companies to the value of 200 million dollars. The threats also represent new opportunities. Sustaining the Randstad region is of crucial economic importance and that means fully committing ourselves to innovation. This will enable us to achieve three things: we can continue to live securely in our delta, we can become more competitive and we can maintain and enhance our image!

Rotterdam is in a position to play a pioneering role here. Rotterdam, as a delta city with the largest port in Europe, situated on a river close to the sea, will invest in climate adaptation and the development and transfer of knowledge. Stadshavens is an important example of this. Rotterdam can emerge as a centre of knowledge for climate and water by pooling its strengths with TU Delft, Rotterdam University, and Erasmus University Rotterdam.

(summary from “Stadshavens, zes beelden van de toekomst” (2008) by Piet Dircke)

1. ROTTERDAM CLIMATE PROOF

ROTTERDAM CITY VISION: A STRONG ECONOMY AND AN ATTRACTIVE CITY TO LIVE IN

During the next few years, the region of Rotterdam will have to pull out all the stops in order to remain competitive on the international stage. The leading position of Rotterdam Mainport cannot be taken for granted. In order to maintain and indeed strengthen this position, Rotterdam will have to work at developing a strong economy and making itself an attractive city to live in. Rotterdam is seeking to become the most important port city in Europe in the field of knowledge and innovation and to become an enjoyable place to live – for young and old, students, people setting up home for the first time and especially families. This is the essence of the recent Rotterdam City Vision. The most important preconditions are a healthy climate, the quality of the living environment and anticipating climate change. The combination of tackling environmental problems and dealing with spatial developments for the benefit of the two chief objectives therefore forms one of the ten core decisions of the City Vision.

ROTTERDAM CLIMATE INITIATIVE The Rotterdam Climate Initiative (RCI) was launched in 2007. The RCI focuses on the basic measures designed for tackling climate problems (*mitigation*). The Rotterdam City Council, the Port of Rotterdam, DCMR and Deltalinqs have set themselves a joint target of a 50% reduction in carbon dioxide (CO₂) emissions by 2025, compared with 1990 levels. This is the percentage needed, if the Netherlands as a whole is to be able to comply with the European proposal for a 30% cut in emissions by 2025. Rotterdam is actively looking at sustainable ways of meeting the increasing demand for energy: simply working on measures at tackling climate change is not enough.

THE CLIMATE IS CHANGING ANYHOW Because the effects of climate take time to manifest themselves, any reductions in emissions will inevitably be unable to prevent the climate from undergoing considerable changes. For a country like the Netherlands, densely populated and vulnerable to the effects of climate change, it is therefore doubly important to allow plenty of time to adapt to such effects. There are four reasons why early investments in adaptation measures are important for the Netherlands:

- To be able to continue safeguarding health and security of the population;
- To prevent damage caused by climate change from being unmanageable;
- To increase the return on investments in the use of public spaces and infrastructure;
- The importance to society of innovative and attractive solutions.

INTERNATIONAL ADVISORY BOARD RECOMMENDATION In October 2007, the International Advisory Board (IAB) gave the local authority of Rotterdam the following advice: “Rotterdam should become the CLIMATE ADAPTATION leader and a city of WATER KNOWLEDGE.”

Adapting to the consequences of climate change is essential for Rotterdam, while sound and ambitious water management

offers economic opportunities. Developing knowledge, conducting research and working together with various regional institutes is of great importance for improving this ‘intrinsic value’ of the city. Rotterdam should make every effort at profiling itself in the field of water management, nationally and internationally. The adaptation strategy should complement the RCI programme that is aimed at mitigation measures.

The IAB has stated that an ambitious adaptation programme will provide Rotterdam with the means to get down to business quickly. The basis has been laid for this through the Water Plan 2 and the city’s participation in the national Knowledge for Climate programme, which is already underway.

The following developments should in any case be actively and cohesively continued:

- Rotterdam as an *innovative city* with innovations in the field of urban water storage facilities, such as WATER PLAZAS.
- Rotterdam as a *green, climate-conscious city* by being in the forefront of the development of GREEN ROOFS.

ROTTERDAM CLIMATE PROOF (RCP) Adaptation to climate change is a process for reducing vulnerability to climate change and for making use of the opportunities that it presents. This means the RCP is complementary to the Rotterdam Climate Initiative (RCI), which concentrates on the mitigation aspects of the climate issue. With the RCP and RCI, the city of Rotterdam is tackling the full range of climate-related challenges. There may be occasions when an adaptation measure is simultaneously a mitigation measure. This type of synergy between the RCP and the RCI will be specifically pursued and maintained. It is also essential that joint efforts are made at marketing and branding to ensure the success of the knowledge-to-implementation strategy and that the economic opportunities (best possible business climate and attractive for investors and knowledge institutes) are properly exploited. Rotterdam takes climate issues seriously. As well as dealing with the causes, the city is arming itself against the consequences of climate change.

THE OUTLINE AIMS OF THE ROTTERDAM CLIMATE PROOF ARE SUMMARISED AS FOLLOWS: Rotterdam will remain protected, even now that the climate is changing. The city is exploiting the economic opportunities of water and climate adaptation. Water is an important means by which the quality of Rotterdam as an attractive city to live in is enhanced. Together with various partners, Rotterdam is strengthening its position as a city with knowledge of water, at both a national and international level. Being in the vanguard of climate adaptation and innovative developments, Rotterdam serves as an example to and source of inspiration for other cities located on or near deltas.

The strength of the RCP programme can be found in the already existing knowledge and expertise in the field of water and climate adaptation in the Rotterdam area. We would like to pool this knowledge and link it with international know-how in order to further encourage our innovative capacity. Rotterdam therefore needs to profile itself as an experimental centre of delta technology. Efforts aimed at the development and application of innovation will need to be made, as will heavy investments in the development and exchange of knowledge: meanwhile, there should be a strong push at profiling Rotterdam as a city of knowledge as far as climate adaptation and water are concerned.

THE ADDED VALUE OF RCP:

- The international port city of Rotterdam is profiling itself structurally, nationally and internationally, resulting in extra economic opportunities for the city. In concrete terms, this involves attracting new investors, primarily from the water and climate

industries. In addition, Rotterdam is proving that it is an attractive residential and employment location for professional people and those with good qualifications, one that is firmly focused on the future;

- The development, exchange and clustering (alliances) of knowledge in relation to climate adaptation, water knowledge and delta technology are being tackled, encouraged and facilitated on a structural basis. It is hoped that this will lead to the binding of relevant organisations (knowledge institutes and creative and innovative companies from these sectors) to Rotterdam;
- The implementation and development of innovative concepts will be accelerated. This will enable Rotterdam to profile itself more prominently, attract knowledge and enhance the economic significance of this sector;
- New challenges will be opened up and addressed so that Rotterdam is better prepared for the future;
- Every activity in the field of climate adaptation will be interlinked and coordinated within one single programme. This will create synergy, encouraging the development of innovative solutions and concepts;
- RCP will ensure that the city and the port will actually benefit from the development of knowledge and innovation. Practical experience itself generates new knowledge-based challenges. Learning by doing. This contributes to Rotterdam's image as a city of knowledge and as a centre of experimentation;
- RCP plays an active and catalytic role in the creation of new alliances, both in the development and application of knowledge. RCP is also intended as a means of clearing obstacles that only serve to delay or prevent the exploitation of useful opportunities.

Superhub – Study project concerning the redevelopment of Waalhaven-Zuid as trans-shipment and distribution center with floating warehouses and green roof buildings © 2007 Harm Timmermans, Shift Architecture & Jacques Vink, VHP



2. WHAT CAN ROTTERDAM EXPECT?

WATER CHALLENGES

Partly as a result of its location on a North Sea river delta, Rotterdam is susceptible to the effects of climate change. It is clear that the challenges posed by water in particular play a role in the fortunes of the city, which is faced by water from every direction – the river, the sea, the sky, and the soil (groundwater). The increase in sudden downpours is already noticeable, resulting in frequent flooding and overflowing of basements and cellars. The quaysides on Noordereiland are occasionally completely flooded and the problem of groundwater level rise is becoming more and more frequent. There are large parts of Rotterdam where the ground level is gradually subsiding. There is little flexibility in the water system left and things are only getting worse. Temperatures will continue to increase, resulting in more heavy rain and longer periods of drought in summer. The sea level is rising, the river discharge is changing and the pressure on groundwater is increasing.

The climate is changing all the time and it is clear which way things are going. All we are uncertain about is the exact rate and the extent of the changes. For that reason, the process of making a region “climate-proof” is not aimed at a fixed final outcome. The aim is to create a system that is sufficiently robust and that can adapt in good time to changes as they occur – a system that is able to RESIST extreme conditions and so continue to function. For example, there should be enough facilities for storing water when there is heavy rainfall and adequate stocks of cooling water for electric power stations in hot, dry summers. Another requirement is RESILIENCE, so that the system can bounce back, if ever it should unexpectedly fail. This could be in the form of buildings that can withstand the effects of flooding, for example or an emergency plan for the supply of electricity.

The uncertainty about the extent and the rate of climate change therefore calls for the ABILITY TO ADAPT. Resistance and resilience can be strengthened by reserving space for future changes to dykes or other water barriers.

EXTRA WATER CHALLENGES The adaptation strategy consists, to a large degree, of the challenges posed by water. Although policies relating to the QUANTITIES OF WATER (risk of flooding) have always been aimed at making modifications in anticipation of climate change, extra measures will be required in order to be able to cope with the latest scenarios and greater extremes that are expected.

Excess water is not the only problem – there may also be shortages. DROUGHTS will also occur from time to time. Supplies of sufficient quantities of good-quality water may come under pressure, while a lower groundwater level could affect the health of the city's trees.

WATER QUALITY is also an area that should not be overlooked. Freshwater supplies are threatened by being made brackish or salty and the quality of surface water by increased temperatures, drought and overflows from wastewater and sewage systems. Water treatment plants may be overloaded as a result of changing patterns of rainfall.

OTHER ADAPTATION CHALLENGES The RCP programme lays the emphasis on the subject of water and particularly water safety. However, climate adaptation goes further than anticipating the challenges posed by water. Non-water related themes will also feature in the RCP programme.

For example, there is the problem of HEAT STRESS. This refers to the phenomenon whereby the temperature in urban areas can be up to 6°C higher than that of the surrounding areas. As a result, the rate of mortality increases in particular among vulnerable groups of the population, productivity is adversely affected, people look for outdoor locations where they can cool off and there is an increase in levels of aggression. In the extremely hot summer of 2003, there were between 1,000 and 1,400 more deaths than usual. The summer conditions of 2003 are expected to be the standard by the year 2050.

The presence of GREENERY can serve to moderate heat stress in cities, as well as provide shade in outdoor areas. It can also make a contribution in terms of water storage during heavy bursts of rain. The need for greenery in and around the city will increase, but at the same time, the greenery will have to learn to live with the hotter and drier periods which are expected. In short, there will have to be a reassessment of the policies relating to the city's greenery.

Climate change will cause climate zones to shift northwards. Various plant and animal species will – if they can – move accordingly. This kind of ‘INVASIVE EXOTIC’ could create problems in urban areas. Some well-known examples include the water pennywort, which causes waterways to become overgrown and the oak processionary caterpillar, plagues of which have become a regular summer feature. Combating this problem may require expensive counter measures.

GENERAL QUESTIONS Given the uncertainty of future climate scenarios, the question is: what is the best way of ensuring that the right number of measures is taken (not too many, not too few) and that those measures are effective? What is the best way to develop a FRAMEWORK FOR CONSIDERING adaptation measures so that spatial planning, policies and implementation can be made entirely “climate-proof” and that the RIGHT INVESTMENTS are made?

3. AMBITIONS

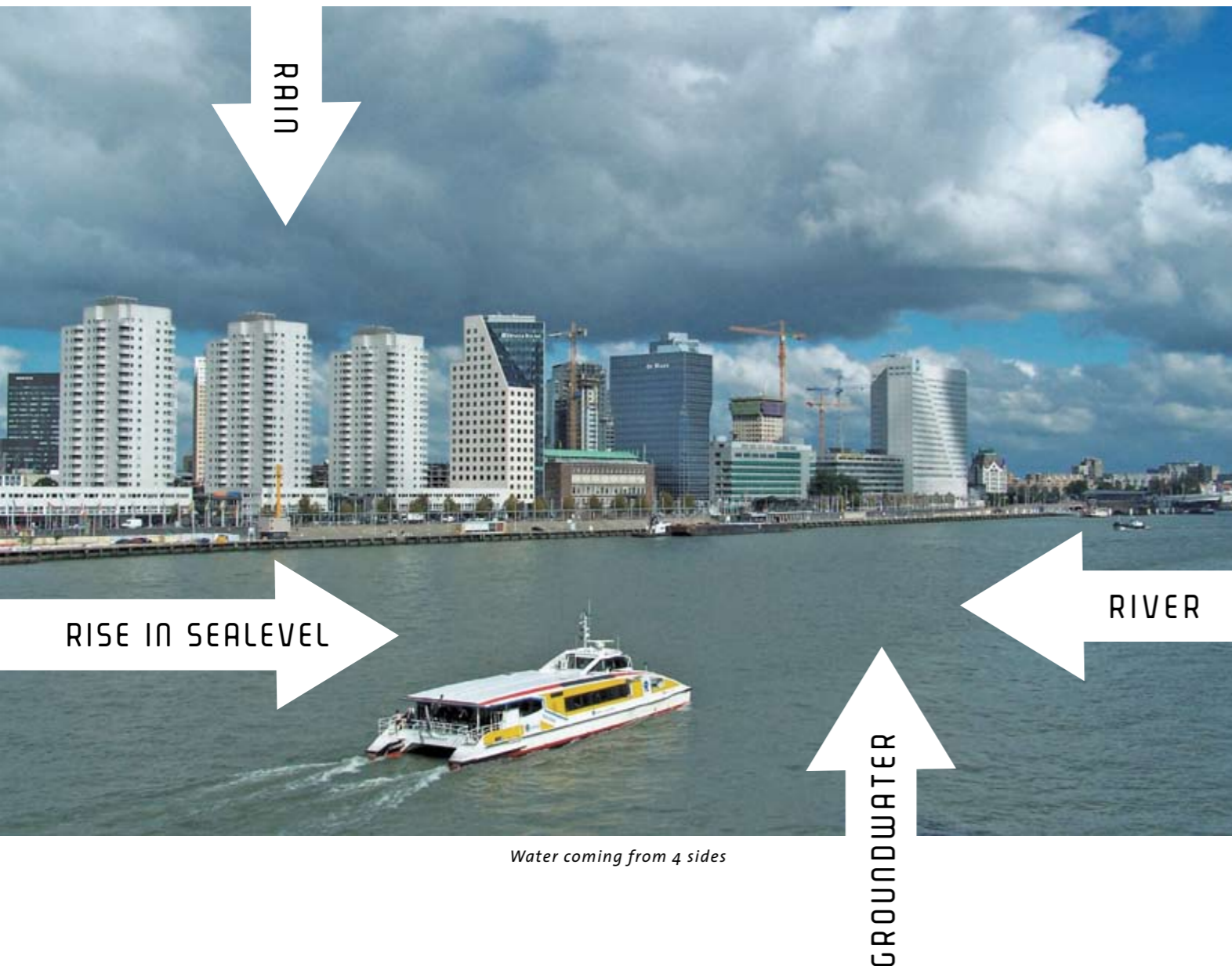
ADAPTATION FOR A PROTECTED ROTTERDAM (FLOOD CONTROL)

The consequences of climate change for the city

According to Kwadijk et al (2006), the following climate changes will take place:

- larger number of heatwaves (very probable)
- decrease in air quality during heatwaves (very probable)
- larger consumption of electricity in the summer (very probable)
- increase in the frequency of cold-water restrictions (very probable)
- higher levels of river discharge in winter and therefore greater likelihood of floods (very probable)
- more frequent occurrence of flooding in urban areas (probable)
- increase in wind speeds during gales (fifty-fifty)

Climate scenarios show an increase in wind speeds, but the increase will be small and falls easily within the current variation of wind speeds from year to year. Kwadijk et al. (2006), conclude that the climate in the Netherlands in 2050 will resemble the current climate in Bordeaux (in spring, summer and autumn) and that of the Po Valley (in winter).



The Rotterdam Climate Proof programme has three ambitions: adaptation to make Rotterdam protected, adaptation to make Rotterdam strong economically and adaptation to make Rotterdam attractive. Rotterdam is one of the safest port cities in the world and in order to keep it that way we have to take decisive action. It is against this background that the city has been chosen as a so-called Hotspot to spearhead the national Knowledge for Climate research programme.

Rotterdam has to be sustainably protected from flooding, from areas both inside and outside the dykes. This means that all quaysides and dykes that are not yet high enough will have to be strengthened. The future security of the city is also an area for attention. Sufficient space will of course have to be set aside for the fortification of water barriers, although this does not mean that the dykes will in future form huge barriers between the inner city and the areas under development outside the dykes.

The key theme in the question of security is that of the adaptive strategy – a strategy in which the city adapts to changing circumstances. It is important to start now setting aside the space that we will need in the future for water storage, and to prepare the projects that will be required in due course for the purpose of increasing the city's security. It is also important to encourage innovations from which we will be able to benefit in the future. Wherever there are opportunities, Rotterdam has to take measures, even if their effect will only become apparent in the long term.

But more needs to be done than keeping the city and the port secure. The feeling of security that citizens and businesses have is largely based on their own perception of the facts. It is very important to properly highlight that our area will continue to be secure and attractive in order to retain the confidence of investors. It takes only relatively little effort to influence their perceptions. Rotterdam should be known as the city with the most modern, the cleanest and most secure port in the world.

ADAPTATION FOR ECONOMIC REASONS Rotterdam (and the surrounding area), has for a long time been well-known as one of the economic power houses of Europe and, as far as its port activities are concerned, it is among the world leaders. However, this position is under threat from attempts by other world cities to gain attention and recognition and from spatial and environmental factors. In order to uphold and indeed safeguard its leading status, the economy of Rotterdam has to be internationally competitive, innovative and sustainable. This involves some important aspects, such as greater mobility of goods, people, knowledge and capital and a need for identity and distinction. The increasing scarcity of natural resources like space and energy, and technological progress are also of significance.

Rotterdam can serve as an example for other delta cities, as the place where sustainable economic activity goes hand in hand with life around and on the water – all in a densely populated area that is several metres below sea level. Indeed, as far as water is concerned, there is a unique combination of knowledge and economic activity at the disposal of the city and its surrounding areas. The recent establishment of two knowledge institutes, Deltares and EcoShape, is firm evidence that a great deal is being invested in and around Rotterdam in innovation and the development of knowledge as regards delta technology. As a result Rotterdam is in the global forefront of delta technology, while becoming an international knowledge centre for water and climate-related issues. It is also becoming increasingly popular as the location for the head offices of businesses involved in international climate-specific services (specialist consultancy and engineering firms, international research agencies and knowledge institutes) and industries (climate-related high-tech industry). The combination of water management knowledge and the presence of so many firms of architects only serves to strengthen the concentration of knowledge and expertise in and around Rotterdam and offers great potential.

The focus must remain on providing a friendly business climate, on keeping qualified people and those on middle and higher incomes. The local potential in the field of energy, other favourable conditions, and the city's identity as a centre for architecture and water must be reinforced. This is no small task, but it is one for which the opportunities and challenges that climate change brings can be exploited. Other port cities have to cope with the issue of climate adaptation. If Rotterdam takes the lead, its port will become even more competitive.

ADAPTATION FOR AN ATTRACTIVE CITY TO LIVE IN How can the city be made more attractive as a place to live, work, study and relax? Is it possible to address these questions and to attempt to anticipate the problems of climate change at the same time? Conventional solutions will not do here. For example, it is no longer possible to deal with the problems of water storage facilities in the densely populated city centre and older districts by extracting water from the ground. The costs are exorbitant and existing buildings cannot be just simply demolished. Innovations like green roofs, water plazas, alternative forms of water storage and so on are therefore essential for the further development of the city (see boxes).

The answer to the challenges associated with water storage is characterised by the slogan, “New water where possible and innovation where necessary”.

The city must be made more pleasant for its inhabitants during hot summers. Limiting heat stress through clever urban planning and the presence of greenery and water is an important challenge here.

Climate adaptation offers not just economic opportunities. Water disarms and binds people. Water projects provide a

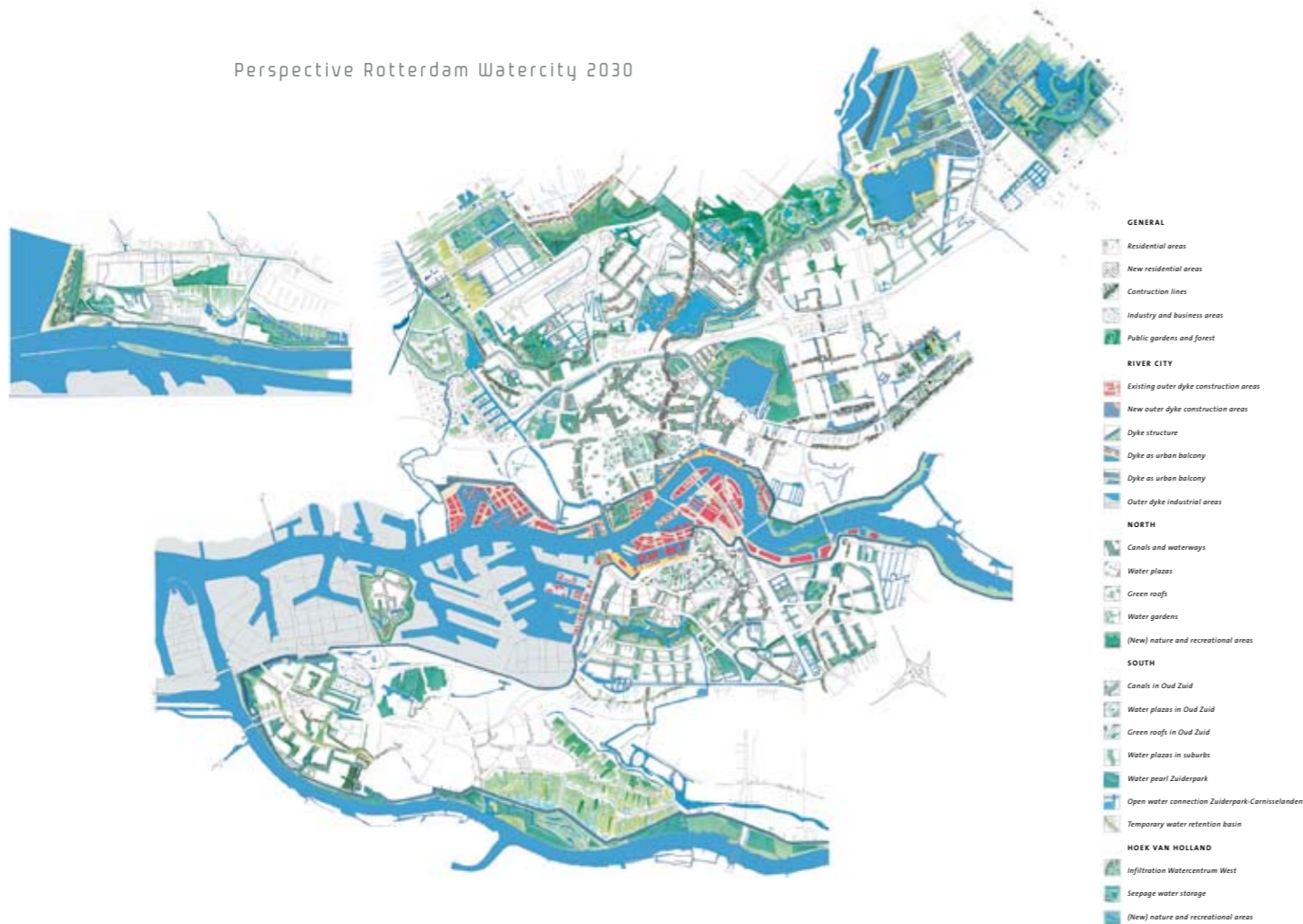
chance for people and cultures to meet, and this can enhance social ties and people’s feeling of safety. The construction of green roofs can be set up as part of a local neighbourhood project. Water also generates new leisure possibilities in urban areas, as well as offering exciting yet safe opportunities for varied living environments (waterfronts and floating buildings). It is not without good reason that the City Vision refers to public space and the water-based challenges as the key to achieving these residential environments. In short, climate adaptation strengthens the physical, economic and social pillars of the city.

4. THREE MAINSTAYS

ROTTERDAM KNOWLEDGE CITY, LIVING LAB AND SHOWCASE

Rotterdam’s ambition for climate adaptation is described in the previous chapter. To summarise: Rotterdam Climate Proof will help to create a safe, attractive and competitive city and port! To achieve this, the following three themes are important. Firstly, to share, develop and combine all the knowledge present in the Rotterdam area. Secondly, to realise high-profile adaptive measures and innovative concepts with Rotterdam as the testing ground. And thirdly, to put Rotterdam on the map nationally and internationally as a showcase for water and climate adaptation. RCP therefore focuses on three mainstays: Knowledge, Action and Marketing.

Perspective Rotterdam Watercity 2030



Perspective of Water Plan 2 Rotterdam The Water Plan 2 Rotterdam was agreed in 2007. It was drawn up jointly by the Rotterdam City Council (Public Works, dS+V and the Rotterdam Development Corporation), the Schieland en de Krimpenerwaard District Water Board, the Hollandse Delta Water Board and the Delfland Water Board. Water management and spatial developments are inextricably linked to each other in the plan. The perspective contained in the water plan is based on the question of how water can be used to make Rotterdam an attractive city in which to live, while the city itself continues to build a strong economy. This can be done on the one hand by strengthening existing qualities and on the other, by responding smartly to new developments. By creating or expanding existing water features wherever possible and by applying innovative solutions wherever necessary, the Water Plan 2 Rotterdam Perspective offers very realistic prospects indeed.

All three mainstays are interrelated. Knowledge development and knowledge exchange are needed to implement innovative measures and create a safe, robust city with good defences and a high level of resilience. ‘Action’ will generate practical experience and create a breeding ground for new, practically-oriented knowledge questions. In this way, Rotterdam can grow into a trend-setting knowledge centre and function as a testing ground for climate-related issues and delta technology. Supplementary marketing activities will soon put the Rotterdam area on the map, both nationally and internationally. Marketing the theme of water will increase Rotterdam’s visibility and high profile as a model city with an comprehensive knowledge of water. This will increase the city’s appeal for knowledge institutes, businesses and residents.

KNOWLEDGE: ROTTERDAM AS A KNOWLEDGE CENTRE FOR CLIMATE AND WATER By focusing on and stimulating the development of water-related knowledge and particularly by realising genuinely new concepts, new opportunities will be generated for strengthening the economy of the Rotterdam area. Utilising the potential of water will increase the city’s quality and appeal.. Moreover, it will be in keeping with the city’s desire to attract innovative and creative businesses and students. And it is also ‘down to earth’: adapting to the physical consequences of climate change is a must, if the city is to continue providing physical security to businesses and keep the economy strong in the future.

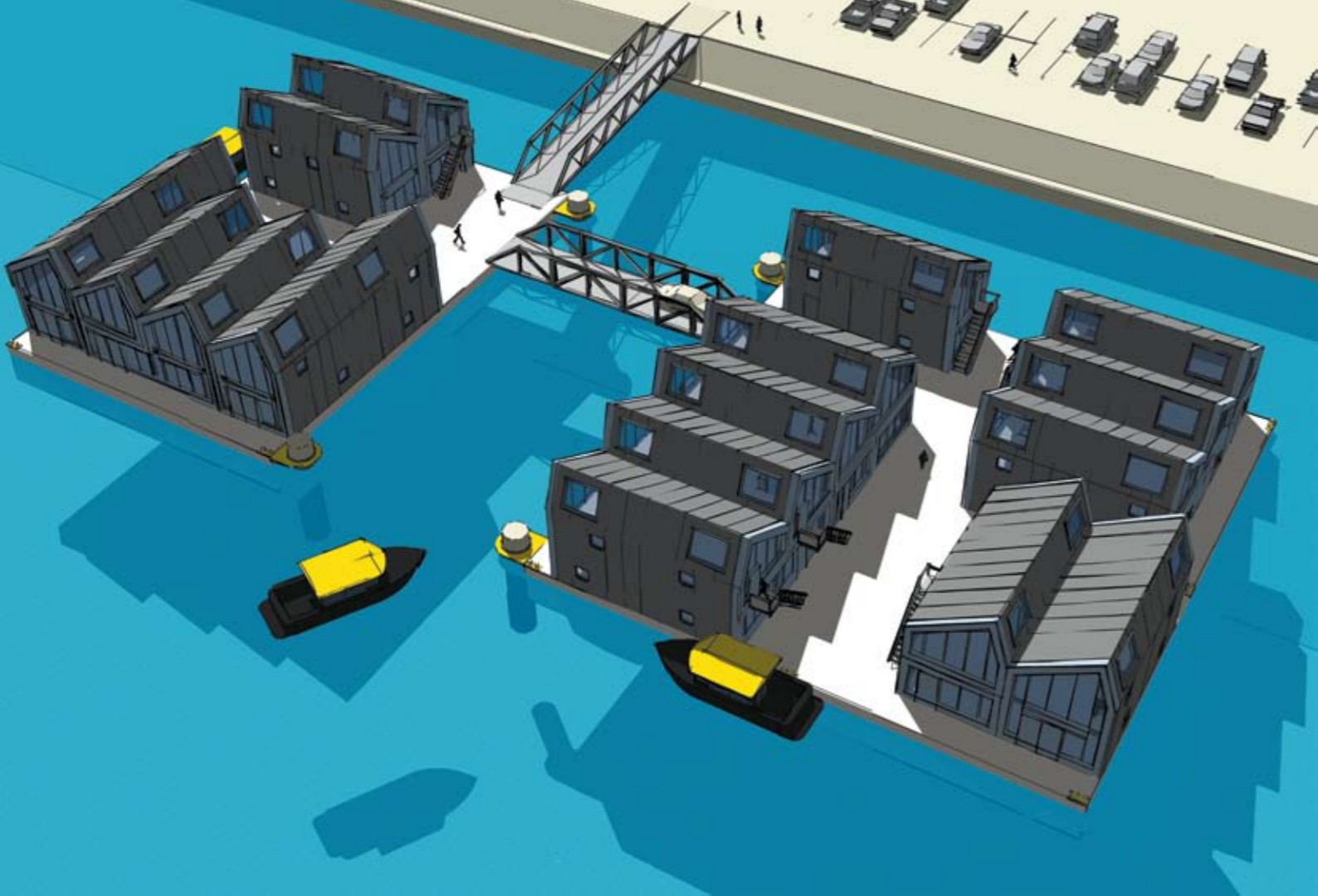
Innovation, knowledge development, research, cooperation with a range of institutes in the region and combining knowledge are vitally important for the realisation of a Climateproof and Waterproof Rotterdam. Climate adaptation will strengthen Rotterdam’s position as a knowledge centre for innovative urban water management and delta technology. In doing so, the Stadshavens district will serve as an important model. With RCP, Rotterdam will focus not only on knowledge development, but also on knowledge exchange and knowledge export. And besides urban water management, an adaptation strategy and delta technology, themes will also include the drinking-water supply and sanitation.

WITH THIS KNOWLEDGE TRACK, ROTTERDAM IS FOCUSING PRIMARILY ON THE FOLLOWING MAIN ACTIVITIES:

- the Knowledge for Climate Rotterdam programme (see box)
- the development of an adaptation strategy for building outside the dykes in cooperation with relevant parties, such as water and hydraulic engineering institutes, universities, businesses, water boards, housing corporations and developers
- research into the scale of heat stress in Rotterdam and into sustainable options for preventing and limiting its effects
- cooperation with the regional knowledge institutes, including the Delft University of Technology (TU Delft), Hogeschool Rotterdam (HRO) [Rotterdam Institute] and the Erasmus University of Rotterdam (EUR)
- knowledge exchange, nationally and internationally, with other port cities
- in conjunction with the Rotterdam Climate Initiative, establish and implement a ‘Climate & Water innovation laboratory’. Specialisation: Urban Delta Technology.

ACTION: ROTTERDAM AS A TESTING GROUND Investing in water safety and a climate-proof city will help create to a safe, attractive living environment and will bind people together. There is no doubt about the need to continue guaranteeing physical security. Creative solutions are now already required to resolve the current urban water requirements. In addition, an innovative approach to water storage and water drainage in the outside space will increase the attractiveness of the living environment.

This RCP track is aimed at implementation. It does not mean that all dykes have to be raised immediately, but it does mean that investments will be made to realise extra water storage in the city. By excavating for extra water where possible and by applying innovative solutions where necessary. So that the attractiveness of the city it increased at the same time. Investments will also be made to implement the adaptation strategy developed for building outside the dykes (flood-proof building). Innovative and climate-adaptive building types will be developed and their use will be stimulated where possible.



Work islands © Public Domain Architects – sept. 2007

Knowledge for Climate Hotspot Rotterdam The Knowledge for Climate national programme acts as a solid basis for the knowledge track. Rotterdam is one of the national Hotspots. In concrete terms, this means that more than 8.5 million euros will be available for research into climate adaptation in the Rotterdam area over the next 5 years. The regional parties and stakeholders have pledged to contribute a similar amount, resulting in a budget of more than 17 million euros.

The mission of Rotterdam's Knowledge for Climate programme is to: Generate scientifically-underpinned and practically-oriented knowledge related to themes such as water and spatial development, transport over water and water safety so that Rotterdam and businesses can jointly arrive at well-considered investment decisions in the context of climate change.

Knowledge for Climate Rotterdam is therefore one of the main sub-programmes of the RCP. The theme of 2008 will be to define the knowledge questions and research proposals. In order to do so, alliances will be formed between knowledge institutes and knowledge users, such as between Rotterdam and the Port of Rotterdam Authority. The latter is the main instigator of this sub-programme. Important groups of stakeholders include universities, businesses, housing corporations, water boards, consultancy firms and developers.

Stadshavens is also the ideal location for this building method. Stadshavens can develop into the centrepiece of the Rotterdam showcase for "urban delta technology".

The relationship between the implementation procedures is embedded in Rotterdam's Water Plan 2. The RCP implementation track is therefore primarily aimed at:

- implementing the adaptation strategy in the Rotterdam Water Plan and its further elaboration for building outside the dykes
- constructing Green Roofs
- constructing Water Plazas
- easing heat stress in the city (for example, by providing shade and cooling) and limiting its effects in a sustainable way
- applying new innovative concepts for adaptive methods of construction, water storage and water safety generated by the innovation laboratory (see the Knowledge mainstay)
- realising model projects that attract worldwide attention for the showcase city of Rotterdam.

PROFILE: ROTTERDAM AS A MODEL FOR DELTA CITIES ALL OVER THE WORLD Rotterdam wants to create a high profile as a city that is tackling the climate changes of the future in a sensible, safe and innovative way. This should be plain to see for all residents and businesses in the Rotterdam region. Internationally, too, Rotterdam wants to send out the message: Here it is safe, here we have the knowledge and here we are using that knowledge to find creative solutions.

Since the floods in New Orleans, the world is focusing on the Netherlands - and particularly Rotterdam - with great interest. This has already led to a number of projects for the business sector, including many consultancy firms in

Rotterdam. Hogeschool Rotterdam has reacted to these developments by setting up a Water Lectureship and a Water Management degree course. The cooperative relationship with the Delft University of Technology in the field of water and climate adaptation is increasing. There are more and more delegations from home and abroad travelling to Rotterdam to experience the Water Plan Perspective and practical models for themselves. This process can be amplified by investing in high-profile innovative solutions and hydraulic engineering icons. As mentioned above, Stadshavens is the ideal location for practical models and eye-catchers.

The marketing of Rotterdam as a model city for water and climate adaptation should be carried out in a structured and professional way. In order to do so, the Rotterdam Climate Initiative, Rotterdam Marketing and the Chief Marketing Officer, among others, will work closely together. Specifically, a promotion and communication bureau will be employed for this purpose, and close cooperation with the communication departments of the public services, the Rotterdam Climate Initiative and Stadshavens will be essential.

THE RCP PROFILE WILL MAINLY BE AIMED AT THE FOLLOWING:

- communication and marketing
- high-profile and attractive water and climate solutions
- the initiation of water and hydraulic engineering icons in the city
- the realisation of trend-setting water events
- research into and the possible setting up of a climate and water institute, in close cooperation with the Rotterdam Climate Initiative and Stadshavens
- the propagation of Rotterdam as a model city and testing ground, nationally and internationally.



Stadshavens, the showcase for urban delta technology

Rotterdam is the collective name for a large number of docks on both sides of the New Meuse River. Stadshavens Rotterdam consists of the following four sub-areas: Merwehave / Vierhavens / Rijnhaven / Maashaven / Waalhaven/ Eemhaven The RDM shipyard

These four sub-areas together cover an enormous area of approximately 1,600 hectares located outside the dykes in an intensively urbanised region. Rotterdam City Council and Port of Rotterdam Authority have agreed to jointly develop an ambitious programme for this area in the next 20 to 40 years, resulting in a strong port and a unique part of the city with innovative and modern living and working conditions. Stadshavens Rotterdam is part of the Perspective for Rotterdam (Stadsvisie Rotterdam), which is the spatial development strategy for the city between now and 2030. It is one of Rotterdam's 5 strategic top priorities for the coming 25 years.

In Stadshavens, front runners in the field of energy and water management can find the perfect conditions for the development and experimental use of knowledge. At the same time, Stadshavens has plenty of space for the urban economy: shopping, leisure and educational facilities make optimum use of the space that Stadshavens has to offer. The area can already boast countless creative breeding grounds for art, architecture, graphic design, design and music. Those creative pioneers are in turn attracting new initiatives, which are turning Stadshavens into a unique and self-contained part of the city.

In Stadshavens, the objectives of climate adaptation – as well as climate mitigation by means of the Rotterdam Climate Initiative – can be realised to the optimum. Stadshavens is also the search area for the first water and hydraulic engineering icons and can be used as an ideal testing ground for climate adaptation and delta technology.



5. PLANNING AND ACTIVITIES

KNOWLEDGE, ACTION AND MARKETING

This Rotterdam Climate Proof programme is an invitation to public and private parties to make an innovative and decisive contribution to help achieve Rotterdam's ambitions. Based on these ambitions, strategic alliances will be developed with knowledge institutes, construction companies, design bureaux and government bodies to elaborate on the process of implementation, knowledge development and the creation of a high profile.

The main features of the RCP programme will be developed in detail during the implementation process. In the AUTUMN OF 2008, a comprehensive programme will be publicised in which the organisational structure, the cooperative relationships with other parties, the long-term planning schedule and associated budgets are worked out in detail. At the same time, where applicable, measurable targets will be formulated. This might include water storage (cubic metres), green roofs and floating buildings (square metres) and the number of water plazas. The time horizon for this first plan of action will be 2012.

Below, for each mainstay we indicate the activities that are already in progress and the activities we can in any case initiate in the SHORT TERM (2008/2009). These will function as building blocks for the plan of action next autumn. We also include a perspective of the long-term follow-up activities.

KNOWLEDGE

- The development of knowledge and innovative ideas in the Knowledge for Climate programme (Hotspot Rotterdam), focusing on the three themes: 1. water safety, 2. transport over water and 3. water and spatial development (started in April 2008).
- The development of an adaptation strategy for building outside the dykes in cooperation with the provincial programme for water safety (runs until 2009), amongst others.
- The consolidation of existing cooperative relationships with the regional knowledge institutes, which include: Delft University of Technology, Hogeschool Rotterdam and the Erasmus University of Rotterdam. The exploration of new alliances aimed at water, climate adaptation and delta technology (started in April 2008).

- National and international cooperation and knowledge exchange with other delta or port cities. Water management and climate adaptation are on the agendas for existing and recently initiated exchange programmes with Shanghai, Jakarta and New Orleans (2008 and onward).
- Studies in the framework of Rotterdam Water Plan 2 are being conducted (2008 and onward).
- In close cooperation with the Rotterdam Climate Initiative and Stadshavens, a 'Climate & Water innovation laboratory' will be established and implemented. Specialisation: Urban Delta Technology (second half of 2008). This laboratory is the collective name for all activities required to develop innovative ideas and knowledge, to exchange and combine those ideas and knowledge and to build up the networks.
- Rotterdam and particularly Stadshavens can function as a pilot for determining an assessment framework, where the focus in the short term will be on defining indicators for climate adaptation (autumn 2008).
- Compilation of the Rotterdam Climate Atlas (linked to the climate atlas for South Holland). The aim is to gain an insight into the main climatic consequences and the current vulnerability of the city (second half of 2008).
- Research into the larger cooling issue: amongst other things, into the feasibility and effectiveness of a sustainable cooling supply (second half of 2008).
- A quick scan into the extent and scale of heat stress in Rotterdam and the creation of a micro-climate model for one or more neighbourhoods revealed by the scan to be the most vulnerable. In this way, Rotterdam can become a front runner in this field in the Netherlands (second half of 2008).



ACTION

- A speedy follow-up to the implementation of the adaptation strategy in Rotterdam Water Plan 2, such as constructing extra open water, designing and realising the first water plazas and other innovative water storages methods (speeded up in 2008).
- Accelerated implementation of the Rotterdam Green Roofs Programme: the construction of pilot roofs, the creation of a subsidy scheme, associated social costs-benefits analysis and regulations (started autumn 2007).
- The application of new innovative concepts for adaptive forms of construction, water storage and water safety generated by the innovation laboratory (from 2009 onward).
- Reduction in the demand for cooling in homes in new construction projects to a testing criterion when granting the construction permit and incorporating this as a design criterion in the urban planning design, in close cooperation with the Rotterdam Climate Initiative. The forceful promotion of cold/heat storage as a marketable option for sustainable cooling. The City Council will develop a policy framework with incentives to achieve this (2009).
- The definition of the easing of heat stress in the urban planning layout as a design criterion (2009).
- The use of the Rotterdam Climate Proof assessment framework in all spatial plans, sector development, implementation and management. Water and climate adaptation will play a leading role in this (2009 and onward).

MARKETING

- In terms of communication and creating a distinctive profile for Rotterdam, there is a huge amount to be gained. Partly in cooperation with the Rotterdam Climate Initiative (RCI), and largely by effectively marketing Rotterdam as an adaptive water city. The investment climate is particularly susceptible to the opportunities and threats of climate change. This involves much more than just objective facts. The perception of citizens and businesses is of overriding importance here. A sophisticated communication strategy in combination with physical measures can be used to increase confidence (start 2008).
- Acquiring and developing a prominent location in the existing network with relevant local, regional and national stakeholders and knowledge sources. Such as The Port of Rotterdam Authority, the water boards, Stadshavens, the Provincial Government of South Holland, City Councils (such as Delft and Dordrecht), the Ministry of Housing, Regional Development and the Environment and the Ministry of Transport and Public Works, housing corporations, project developers and firms of consulting engineers, Delft University of Technology, Hogeschool Rotterdam, Erasmus University Rotterdam, Unesco-IHE, Deltares, Living with Water [Leven met Water], the Netherlands Water Partnership and other knowledge institutes (started in the first quarter of 2008).
- Internationally, too, a significant effort is required. Rotterdam wants to create a distinct profile for itself as a positive example of a climate-adaptive city in a delta, focusing on a knowledge of water and urban water management. In order to achieve this, relations should be established and/or maintained with comparable cities worldwide (ongoing, intensified in 2008).

- Model projects for floating construction: in addition to extra attention for the promotion of ongoing activities (water plan, green roofs), it is vitally important that Rotterdam manages to quickly realise high-profile model projects. One interesting option is to build a floating pavilion, a global novelty. Stadshavens is the ideal location for this. Such an icon would be ideal for visiting delegations. Rotterdam can become a showcase for water and climate-related innovation (explorations started in the first quarter of 2008).
- Events: the realisation of trend-setting water-based events. A water-based and climate-based event calendar will be drawn up (ready in 2008). A major international 'event', a World Water Expo, would provide a perfect promotion and marketing opportunity. As soon as a date for this can be found on the international calendar, an event like this will also act as a focus point for the RCP. We know that in other cities such events continue to attract worldwide attention for a long time, with positive consequences for residents (attractive city, new infrastructure) and the economy (businesses, tourism). The Rotterdam entry for the Water Plan Perspective at the World Expo in Shanghai (2010) has been accepted. Options for a first water conference in the autumn of 2008 are being explored together with Hogeschool Rotterdam.
- Participation in the World Water Forum in 2009 in Istanbul, which is Rotterdam's twin city. A recently held presentation on Rotterdam's approach will probably already lead to the "Delta Cities" being included as a theme on the WWF agenda. This can become an important platform for Rotterdam. The options will be explored further in 2008.
- Research into and the establishment of a climate and water institute, in close cooperation with the Rotterdam Climate Initiative and Stadshavens (2008).

MEDIUM-TERM PERSPECTIVE (UP TO 2020)

Many of the results of the studies and surveys can be translated into implementable projects. In addition, the economic added value of these results will also have to be highlighted - for example, by attracting businesses.

Besides the switch from research to implementation, there will be an increase in the importance of the network that has been built up. Implemented projects and realised icons provide enormous opportunities for creating an even higher profile as well as marketing opportunities. Rotterdam must become an eye-catching example for other cities in the Netherlands and elsewhere in the world.

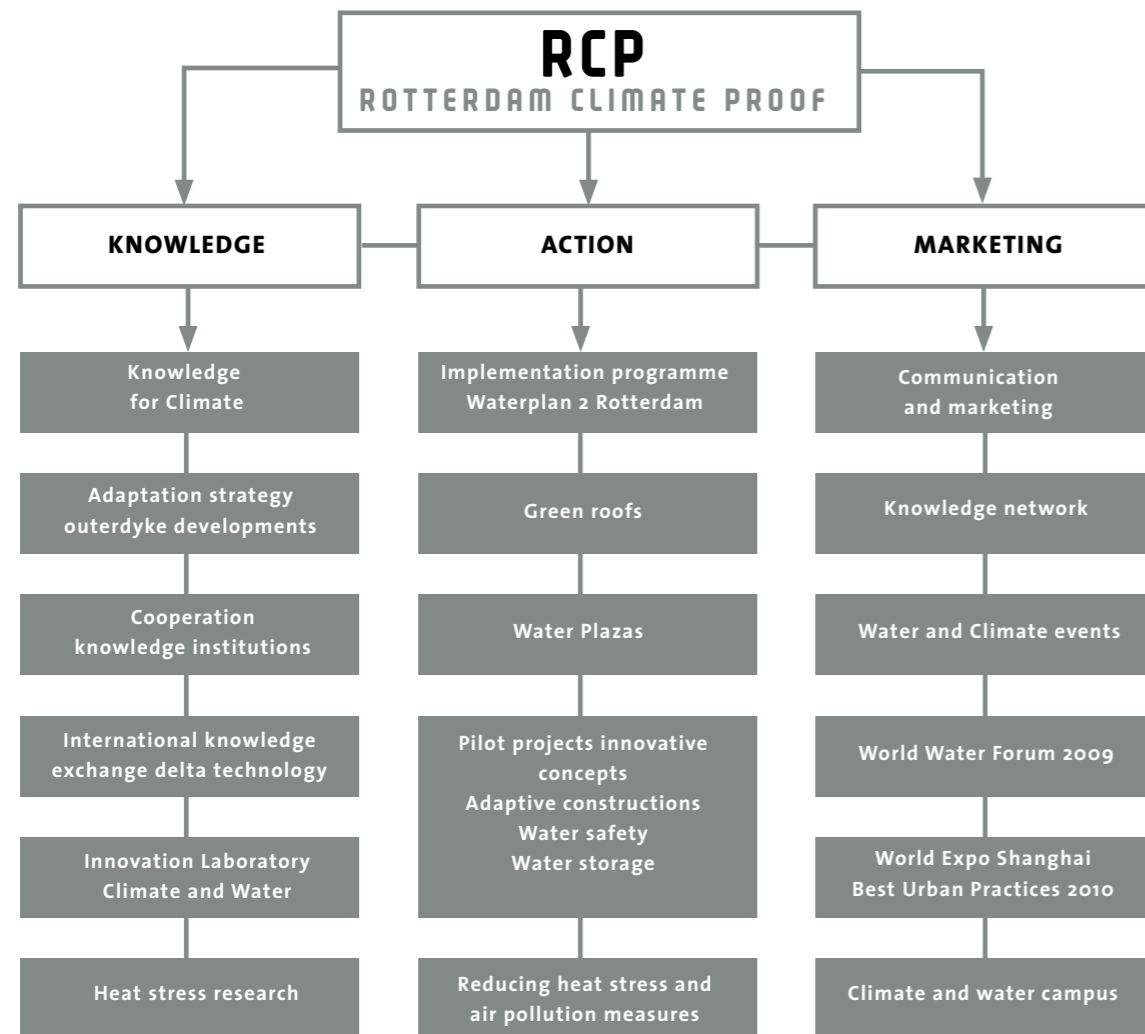
LONG-TERM PERSPECTIVE (AFTER 2020)

After 2020, the programme will be fully integrated. Depending on new developments based on the extent of climate change, the focus will particularly be on keeping the city climate-proof. The abovementioned measures and programmes will have to be rolled out in the city on a large scale.

Rotterdam is offering a solid basis for the future, a city in which people can live, work and pursue leisure activities pleasurably and safely thanks to sustainable, attractive and effective measures taken in the field of water, construction and infrastructure.

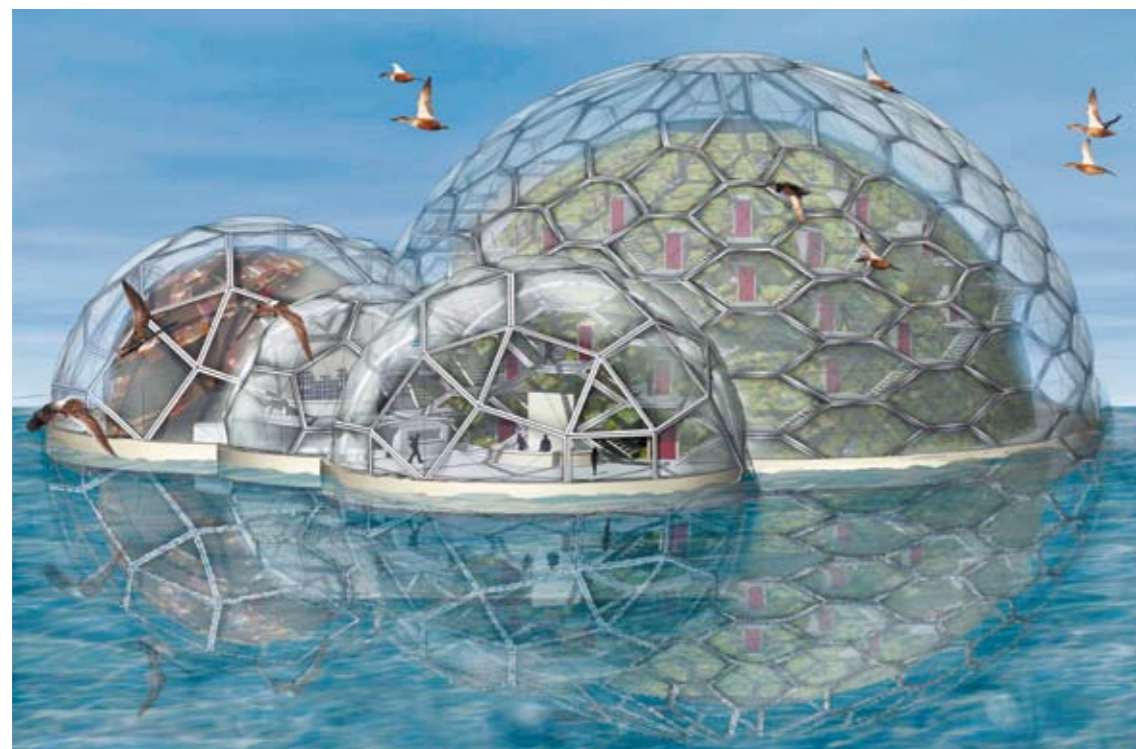
The Rotterdam Climate Proof programme has three ambitions: to adapt to create a safe Rotterdam, to adapt to create an economically strong Rotterdam and to adapt to create an attractive Rotterdam.

Rotterdam is one of the safest port cities in the world. We all have to work hard to keep it that way. In this context, the Rotterdam area has been chosen as a spearhead area (called a 'Hotspot') in the national Knowledge for Climate programme.



The Rotterdam Climate Proof programme has three ambitions: to adapt to create a safe Rotterdam, to adapt to create an economically strong Rotterdam and to adapt to create an attractive Rotterdam.

Rotterdam is one of the safest port cities in the world. We all have to work hard to keep it that way. In this context, the Rotterdam area has been chosen as a spearhead area (called a 'Hotspot') in the national Knowledge for Climate programme.



Bron: deltasync, Delft



Gemeente Rotterdam