Althoff, H., Emschergenossenschaft

Future Cities

urban networks to face climate change

MAKING CITY REGIONS FIT TO COPE WITH THE PREDICTED CLIMATE CHANGE IMPACTS

A European cooperation project

This project has received European Regional Development Funding through INTERREG IV B.

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INTERREG IVB

CONTENT

THE FUTURE CITIES STRATEGY

Climate change is not a topic to be discussed in the far future – it is more and more on the agenda of actual scientific, political and public discussions. Heat island effects in summer or wetter winters with increased flash flooding are actual phenomena which have great impacts on the urban living conditions. Rising temperatures and weather extremes like floods and storms derogate the quality of life in our towns and cities. We have to face these challenges. Our urban city regions must react on the effects of climate change.

In April 2009, the European Commission published the White Paper “Adapting to climate change: Towards a European framework for action”. Herein, the Commission states: “Climate change increases land and sea temperatures and alters precipitation quantity and patterns, resulting in the increase of global average sea level, risks of coastal erosion and an expected increase in the severity of weather-related natural disasters. Changing water levels, temperatures and flow will in turn affect food supply, health, industry, and transport and ecosystem integrity”.

City structures and the urban living environment are especially vulnerable to these consequences. The heat island effect or increased flash-flooding can create high damages in the urban environment. At the same time well functioning city regions are one of the most important pre-requisites for sustainable economic development. A mere reaction on the impacts of climate change will lead to a cost escalation for adaptive measures. Viable and cost-effective adaptation measures are only scarcely at hand.

Therefore, anticipatory strategies are needed for adapting the urban structures in a way that the impacts of a changing climate will not endanger the urban living environment.

The Future Cities Partnership develops concepts and implementation strategies which:

- are innovative – not yet implemented on the practical level
- save from greater financial loss – by operating proactively
- provide for synergy effects and cost effectiveness – by applying combined measures.

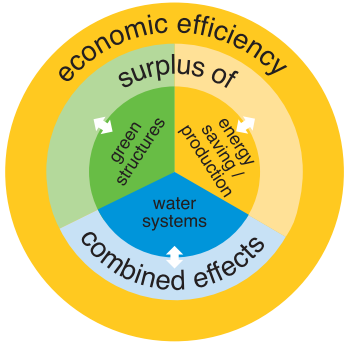
THE FUTURE CITIES AIM

On the European level as well as on the national level, urban networks exist to promote strategies to mitigate greenhouse gas emission. Mitigation is important, but not sufficient. It will be impossible to reduce the effects quickly enough to avoid dangerous or negative effects on people's life, economy and ecology. It is obvious that beside mitigation, especially adaptation is necessary. There is consensus here in theory but it is difficult to realise in practice. This calls for a coordinated action and for transnational cooperation.

The Lippeverband has joined forces with eight partners from five European countries to create a project entitled “Future Cities – urban networks to face climate change”.

The project aims at making city regions in North-West Europe fit to cope with the predicted climate change impacts.

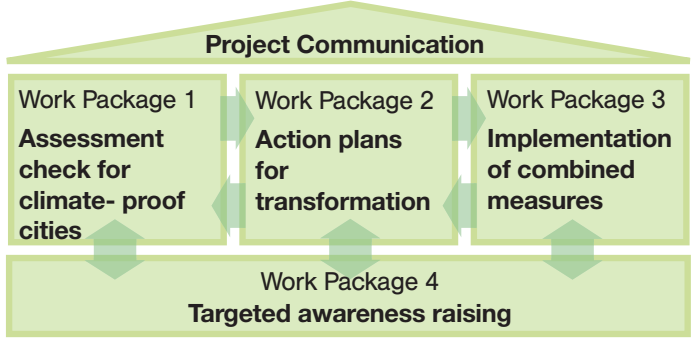
The project partners have developed a strategy which combines selected strategic urban key components – green structures, water systems and energy efficiency – for a pro-active transformation of urban structures.



From 2008 to 2012, two water boards, six municipalities, two regional planning associations and two project development agencies are cooperating to implement this strategy.

The work comprises:

- Common evaluation methods for climate-adapted towns and cities – leading to an assessment check for climate-proof cities
- Action plans for current structures to enable the participating regions to adapt their strategies in a concrete manner
- Implementation of combined measures: Selected construction solutions in eight pilot projects
- Awareness raising of decision-makers and multiplicators for pro-active ways of tackling adaptation to climate change impacts.



The partnership works out joint results in 4 working packages.

Felden, R.

WORKING IN EUROPEAN COOPERATION

Acting locally is essential to face directly the challenges of extreme weather situations. But it is not enough because the impacts of climate change do not stop at national borders or city limits. Through international partnership, sectoral and individual know-how can be assembled and several actors can join forces for local and regional improvements.

At the Launch Conference in Rouen, 19th March 2009, this joint approach was presented by political representatives and professional experts from the involved countries. 120 participants from the European partnership as well as French representatives of the local, regional and national authorities discussed the Future Cities strategy. One session was dedicated to the national adaptation strategies in France and Belgium. What came out clearly in the discussion was the importance of communication and cooperation within the European project partnership.

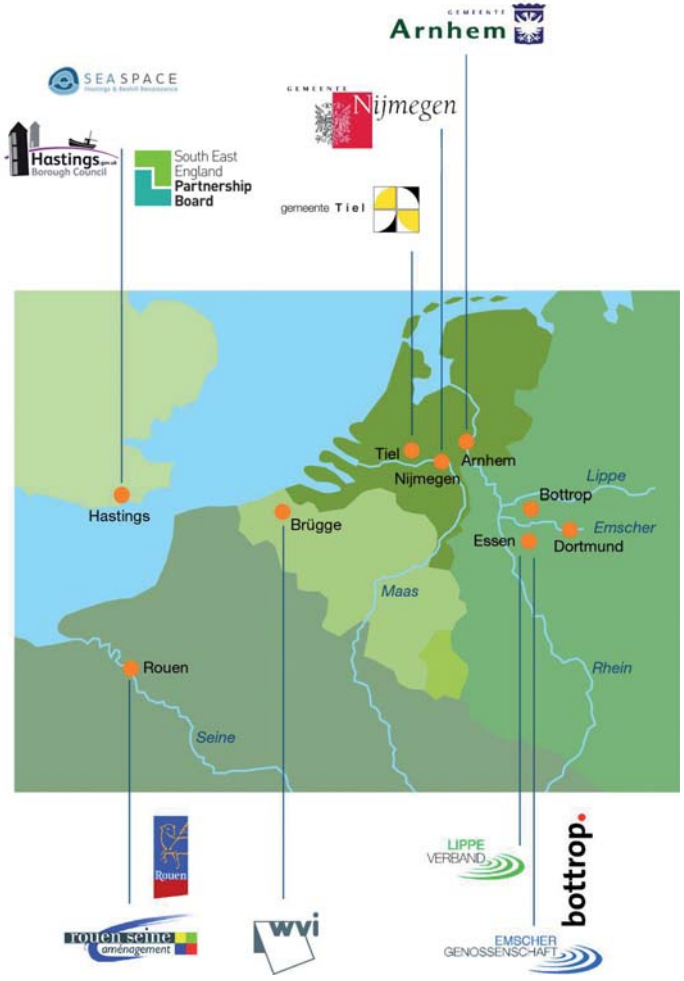
The Future Cities project partnership

THE INTERNATIONAL PROJECT PARTNERSHIP

The Future Cities partnership includes water boards, urban administrations, planning companies and project developers in North-West Europe.

The geographical scope of the partnership covers densely populated areas in river catchments or directly at the coast: Northern Ruhr area with the catchments of the rivers Lippe and Emscher as tributaries of the Rhine, the province of Gelderland in the catchment of the rivers Nederrijn and Waal, the region Haute-Normandy in the catchment of the River Seine, West Flanders with the river catchment of the Lys and finally South-East England on the southern coastline of Great Britain.

Each partner of the Future Cities project has special expertise in a field of necessary action: E.g. the expertise of water boards about the urban water system is combined with the expertise of the municipalities with regard to the effects of green structures. The involvement of regional planning authorities secures the expertise in planning guidelines as well as development agencies provide for know-how in planning with investors.



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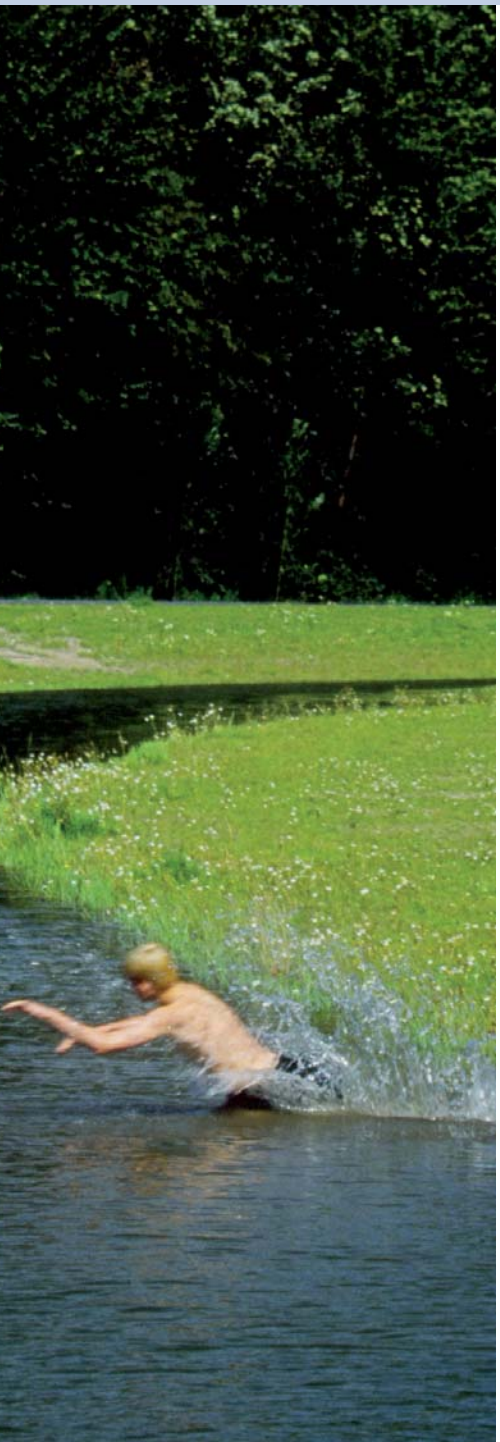


BRINGING PEOPLE AND IDEAS TOGETHER

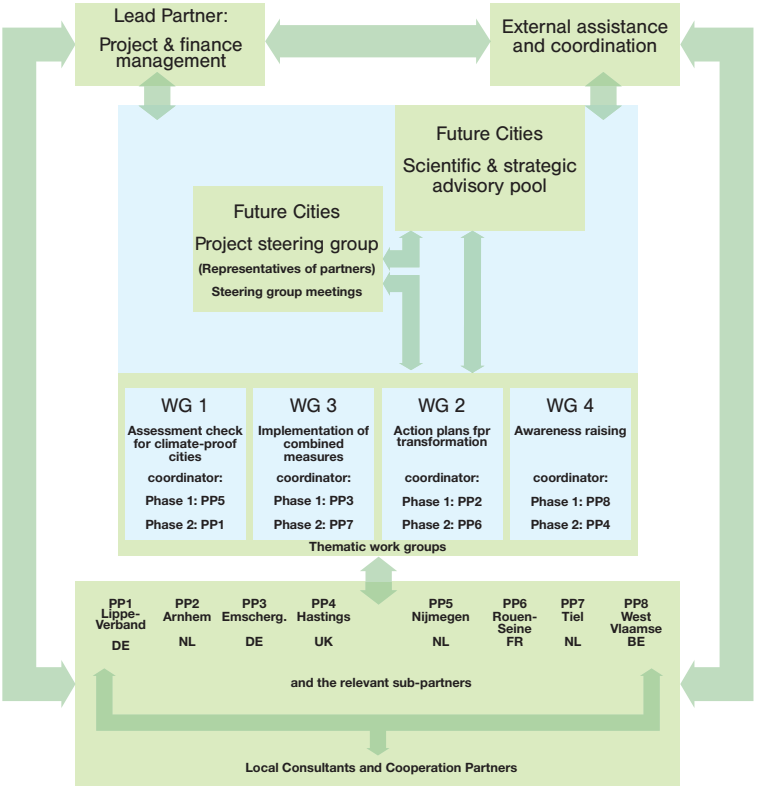
The successful work within the Future Cities partnership is based on close cooperation and exchange of know-how in all modules of the project:

Four international **working groups** bring together the know-how of water management, project development, urban and regional planning on the local and regional levels. This expertise from the project partners is important to implement strategies to face climate change on the local level.

The Future Cities project has implemented a **scientific and strategic advisory pool** to use the available knowledge from actual research as well as the potential for follow-up activities in the involved regions which political stakeholders bring in.

A special feature of Future Cities intensifies the exchange of ideas: the **twinning**. An exchange of staff between the partners is foreseen. Concrete topics such as green-blue-networks or building techniques are discussed using the examples of pilot projects. Therefore, partners who are developing climate-compatible business sites or those partners who are using the same regenerative energy sources join up as “twins” to discuss their plans and further develop the measures that are implemented within Future Cities.

The project's findings are widely propagated in international **conferences**. The Launch Conference took place in March 2009 in Rouen, France. In 2010, the Mid-term Conference will take place in the Emscher region to present the interim results of the assessment check for climate-proof cities. The Final Conference in 2012 will be held in South-East England to present and disseminate the project's findings.



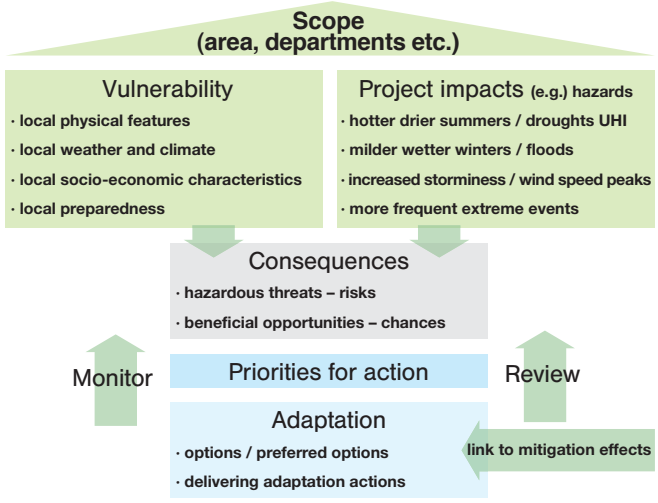
WORK PACKAGES

The activities of Future Cities are split into four working packages. Each of these is guided by an own working group in which the partners work out joint results regarding the activities.

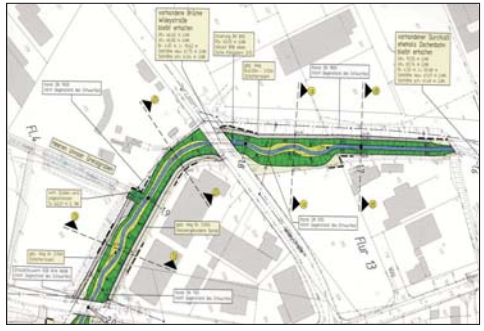
WP 1: Assessment check for climate-proof cities

The Future Cities partnership will develop a joint “Assessment check for climate-proof cities”. The assessment check is based on the three key components of Future Cities – green structures, water systems and energy efficiency – plus the combination of these. The assessment focuses on adaptation measures. Existing checklists and guidelines on mitigation of greenhouse gas emission can be included as an information source.

The methodology developed will support decisions on how to make the urban infrastructures climate-proof with cost-effective measures. The assessment check itself is targeted at planners at cities and water boards, the results have to be used by those responsible for implementing measures. More general results will be generated for politicians and decision makers. The first draft of the assessment check is ready to be tested by the Future Cities partners in autumn 2009. This will lead to the improved final version by 2012.



The partners develop a joint assessment method for climate-proof city regions.



The project approach is applied in on-site action plans.

WP 2: Action plans for transformation

The project partners will develop action plans for measures which combine green structures and water systems, or energy efficiency and water systems as well as all three key components green structures, water systems and energy efficiency. The theoretical assessment check is applied on concrete pilot projects.

The action plans are systematically assessed. The feasibility of the assessment check is tested and evaluated leading to an improved method which has undergone a “reality check” and can be transferred to other regions. In October 2010, interim results will be presented. By the end of 2011, the action plans evaluation will be completed and the results of the twinnings will be available. This will feed into the final project report in 2012.

The project implements eight concrete pilot sites.

The kick-off meeting in November 2008 brought together relevant stakeholders of the partnership.

WP 3: Implementation of combined measures

Exemplary measures are realised by the partners in different combinations of the key components green structures, water systems and energy efficiency.

Several best-practice pilot projects will be built on three levels: on the building level, on the district level as well as on the city level. These investments are described in detail in the following chapter “Project sites”.

The pilot projects are discussed between the partners during the twinnings. The effectiveness of the measures is monitored and evaluated for further development of the assessment check for climate-proof cities.

WP 4: Targeted awareness raising

Addressing strategic stakeholders and disseminators is important for triggering a more pro-active approach on a wide scale.

The aim is to raise the awareness for the necessity and the chances of adaptation to climate change. In order to enhance efficiency, the potential of the target group “disseminators” is exploited. Disseminators are strategic stakeholders who can substantially promote further spreading of the Future Cities tools, e.g. administrations at local and regional levels. Also, important multiplicators are people and organisations in charge of implementing measures, e.g. architects, project developers, urban planners.

The working group explores and monitors the communication and participation activities and instruments applied by the project partners. Conclusions on best-practice activities allow recommendations on transferable approaches.
The results of the Future Cities activities will be spread broadly to create "real impact" of the innovative tools and adaptation measures developed.

Wischniewski, D., Lippeverband

PROJECT SITES IN DETAIL

The Future Cities project implements selected pilot projects to test the jointly developed assessment check and action plans and to investigate different combinations of the key components – green structures, water systems and energy efficiency. The measures are evaluated and their effects are monitored for improvement of the assessment check.

Transformed walls, roofs and public court yards will increase the public green in the Dutch city of Nijmegen. Implemented parts of an adapted master plan provide an exemplary project that can be visited by other regions, cities, schools in the Belgian municipality of Ieper. Transformed roofs will make the city climate-compatible in an industrial site of Tiel-East in the Netherlands. Multifunctional water infrastructure will be adapted to climate change impacts for 5,000 m^2 of a dense urban development in the French city of Rouen. A green-blue corridor will improve the city micro-climate over a length of 2 km in Kamen, Germany. Transformed parts of a waste water treatment plant will provide for more energy efficiency in the Emscher catchment in Germany. The sustainable development of an industrial area will improve the city climate in the German municipality of Bottrop. An innovation exchange centre will be built as a platform for the dissemination of knowledge and best practice in terms of adaptation to climate change in Hastings in the South-East of England.

The projects will be implemented on three levels: on the city scale, on the district level and on specific buildings.

New York Central Parc is a famous example for green in the city.

Lippeverband

GREEN-BLUE CLIMATE CORRIDOR IN THE CATCHMENT OF THE RIVER LIPPE

Challenges of climate change in river catchments

One major challenge of climate change is the uncertainty: An exact forecast of the local impacts due to climate change is not possible. Waiting and doing nothing cannot be the answer. Therefore, the Lippeverband is taking on its responsibility for its region, the Lippe catchment with 3,280 km^2 and 1.4 Mio. inhabitants. In planning strategies and concrete measures, the Lippeverband reviews where adaptation to climate change is necessary and where mitigation of greenhouse gas emissions is possible.

No regret strategy

Because future rainfall and temperature are not exactly known, measures must be developed which are cost-effective, flexible in the long-run and also serve other objectives in sustainable urban development – the so called “no regret measures”. The ecological transformation of the River Lippe and its tributaries is combined with the disconnection of storm water. This creates a green-blue corridor with positive impacts on the local city climate:

- In case of heavy rainfalls, floods of the River Lippe and its tributaries can be reduced.
- With rising temperature in summer, the water bodies tend to dry out more. The use of rain water for the open water body contributes towards a sound water cycle. Evaporation creates a better micro-climate.
- The ecological functions of the water system are strengthened. Combining water management measures with green corridors in inner cities, the climate in the urban surroundings is enhanced.

The ecological transformation of the Heerener Mühlbach

The water body of the Heerener Mühlbach in the city of Kamen will be ecologically improved over a length of 2.14 km. About 80 houses with a paved area of 1.1 hectares will be disconnected and the storm water will be drained into the new, nature-like water body. A green corridor will be built through the city of Kamen contributing to making the city climate-proof. The citizens will be made aware of what they can personally do to face climate change – such as disconnecting their private property.

In a series of conferences, adaptation to climate change will be discussed with the municipalities and representatives of industry to develop joint solutions.

The water body will be transformed into a green-blue corridor to improve the micro-climate.

ADAPTING THE CITY REGION ARNHEM/NIJMEGEN TO FACE CLIMATE CHANGE

The urban heat island effect

The Dutch city of Arnhem will set up a practical method to adapt urban areas to prevent them from overheating. As one possible impact of climate change, prolonged periods of draught and heat waves will be more frequent and more extreme. Cities will be affected more noticeably because of the so-called urban heat island effect: The average temperature in a city is higher than in the surrounding area. Three to five degrees is no exception. The main causes are thermal radiation and lack of vegetation. Temperatures are not homogenously distributed across a city. In districts with many parks the effect is lowest. Local wind patterns, location and the design of the city also play significant roles.

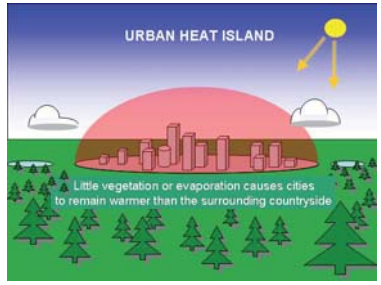
A practical method to combat overheating

For the city region Arnhem Nijmegen, a method will be set up to adapt built-up areas to the warmer summers. The method can judge the climate compatibility on the regional, city and district levels. It will offer necessary planning and design recommendations based on four components:

- Green structures like green roofs, green walls and parks
- Water structures like rivers and ponds; having a positive effect on the water and humidity balance
- Heat and energy balance: What means of energy supply are used and how do they contribute to heating up of the city?
- City morphology: The structure of buildings and public space influence both the heating up and the cooling down of a city. The location of Arnhem, at the foot of the Veluwe-hills between two rivers, seems to offer possibilities to cool the city in summer.

Energy strategy for the city of Arnhem

For the city of Arnhem, the available sustainable energy sources, like rest heat and cold and heat storage will be investigated. The aim is to reduce the emission of greenhouse gases and to minimise the heating up of the city. The results will be linked to the component “Heat and energy balance”.



Urban heat islands affect the living quality in cities.

The MapTable is an interesting tool for assessing the consequences of e.g. green and blue measures on the city climate.

Felden, R.

CLIMATE-SENSITIVE DEVELOPMENT IN THE EMSCHER CATCHMENT

Regional guideline on climate change provides the framework

The catchment area of the Emscher is one of the most densely populated regions throughout Europe. The water board Emschergenossenschaft establishes a “Guideline Climate Change” for its own actions. The coherences of climate change, water cycle and the water board's activities are explained in an easy way. Furthermore, the following questions have to be answered: What are the main effects of climate change for a water board? Which of the present activities of a water board help to adapt to the local effects of climate change and which other activities could decrease the consequences on the water cycle?

Joint forces for water management and urban development

Emschergenossenschaft and the municipality of Bottrop are cooperating to restructure the industrial park “Scharnhölzstraße” to become climate-proof. On the site with mostly impermeable surfaces, like roofs and roads, floods after heavy rainfall often occur. This situation is exacerbated by the impending climate change. Options are the discharge of rainwater into a nearby water body, infiltration into the soil, retention on green roofs or in subsurface tanks and the usage of rainwater as process water. Also rising costs for cooling the buildings in hot summers and air pollution by traffic represent problems which will intensify in the future. Combining green roofs with photovoltaic systems is a promising option. The photovoltaic systems can produce power for cooling and the green roofs reduce the need of cooling by a better isolation of the roof. To reduce the pollution, the city of Bottrop will increase the green structures in the public space. A feasibility study will determine preferred measures.

The industrial park at the Scharnhölzstraße

Adaptation and mitigation in water management: Shredder fibres for sludge de-watering

At the moment the sludge of three large waste water treatment plants is de-watered for incineration by adding fine black coals. At the pilot site in Bottrop, the fossil coal is substituted by shredder fibres, a product from car recycling. This also provides good de-watering results and reduces the greenhouse gas emissions.

Waste water treatment plant of Emschergenossenschaft in Bottrop

The Emscher catchment

TACKLING ADAPTATION AND ECONOMIC DEVELOPMENT IN HASTINGS

Challenges and opportunities

Hastings is a vibrant, coastal town in the South East of England with a rich history. It aims to be creative and innovative in its approach in dealing with change. It also has areas of economic and social deprivation with a large historic building stock.

The South East of England is forecast to experience major climatic change over the coming century including more frequent extreme high temperatures and winter precipitation, net sea level rise and increase in sea storm surge height. Hastings will take opportunities for business growth and jobs that adapting to the impacts of climate change will present, in order to create a better adapted place in which to live, work, play and visit.

Understanding them better

The South East regions' vulnerability to climate change will be assessed considering how climate change could affect public health, natural resource management, the built environment, infrastructure and economic development. A particularly innovative aspect will be to investigate geographical variations of vulnerabilities in the region. On this basis the scale, nature and location of potential adaptation measures will be identified.

Starting from the regional and town wide vulnerability study and the experience of the exemplary projects Hastings will develop a climate adaptation plan. This will provide the framework for facing the challenges of climate change. All learnings over the timeframe of the project will be published and shared across the region.

Taking adaptation action

The “Eco-retrofit Project“ in Cambridge Gardens will act as an exemplary project for adapting existing buildings for the future. It will provide training opportunities for schools, colleges and local business people. In this way Hastings aims to educate people in the problems that need to be solved, and develop the skills to solve them.

The “Enviro21 Exchange building“ is part of a series of business parks evolving over the next decade. The Exchange will be a business to business focal point in which to network and collaborate. The centre will have exhibition and meeting space and a sustainable restaurant. It will act as a platform for dissemination of knowledge and best practice in adaptation to climate change.

The Enviro21 Exchange will be an exemplary building for climate-proof development.

THE GREEN TRANSFORMATION OF THE CITY OF NIJMEGEN

A new climate policy

In the Dutch city of Nijmegen a climate action plan has been established by the council. However, it is not known which impacts of climate change are threatening to such an extent that measures must be taken. Therefore, Nijmegen will make local climate maps and vulnerability assessments. For example, it is investigating whether the city can handle violent downpours.

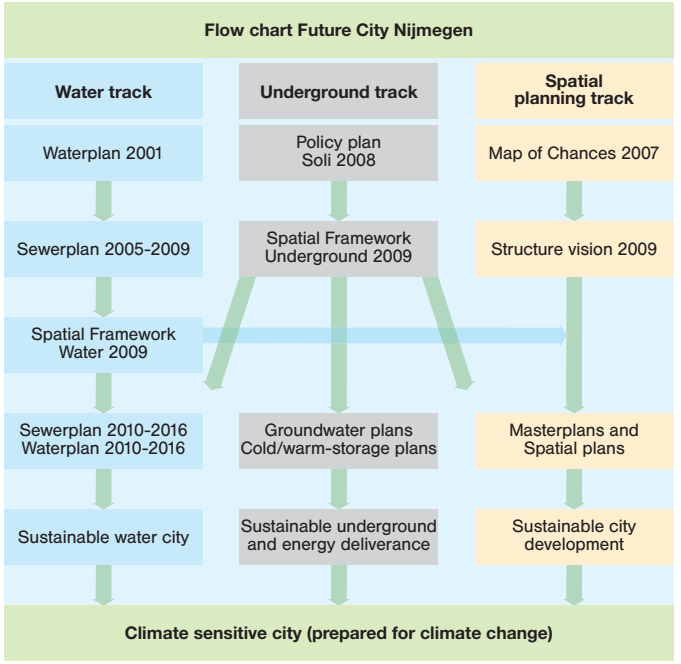
Nijmegen is setting up a structure plan. Components of this structure plan are the spatial frameworks Water Vision and Underground Vision. These spatial frameworks are the starting point for a new climate policy. Water Vision is aiming at improving water quality and quantity in relation to spatial development. In Underground Vision the current and future situation of the underground – soil and groundwater – is visualised. Possibilities and impossibilities for energy and warmth or cold deliverance and spatial consequences for urban development are considered.

From ideas to realisation

The idea book “Green Allure Inner City” presents examples of how the centre of Nijmegen can become greener with green roofs, walls and squares. Research will show which locations in the city can be made more sustainable. Feasibility studies will give definite answers concerning financial and technical possibilities. Together with stakeholders, projects are then implemented and monitored. A beautiful example from the idea book is the transformation of stony squares into green parks. Public water art works can visualise water. Solar panels are placed on roofs and for wind energy research runs. Scans provide information on the loss of energy through roofs. The outcomes are of special interest for businesses.

The climate campaign “Our Green Heart”

The message of the campaign “Our Green Heart” is that climate awareness must have a place in your heart and not only in your head. Several campaigns for solar-energy and energy saving are conducted as part of the climate campaign. There are also plans to establish an information counter in the inner city. Possibly this will be in the form of a climate information shop, where also products for energy saving can be bought.



The diagram shows that the spatial frameworks are the basis for an achievement ladder, which leads to a sustainable, climate-sensitive city.

THE SUSTAINABLE URBAN SITE LUCILINE IN ROUEN

Reconstruction sites offer opportunities

In the French city of Rouen, the public developing agency Rouen Seine Aménagement, together with the municipality, is converting 800 hectares of former industrial and port sites. Changing the purpose of these sectors gives an exceptional opportunity to create a compact new mixed residential and commercial centre of attraction linked to the river. Environmental objectives such as energy efficiency and the natural management of rain water can be realised.

Project site and activities

The development of the sustainable urban site "Luciline" is part of the restructuring process. The aim is to adapt the Luciline district to the increase of temperatures. For this purpose, issues of energy, water management and ecosystems are combined on the site:

- A heat network is installed which is supplied by the geothermal sources located nearby: Ground water, water from the River Seine, spring waters, rain water, and wastewater will be used.
- A natural rainwater management system will serve as zones for the development of ecosystems, and as storage areas for the infiltration of rainwater.
- A network of green corridors will allow for development of urban biodiversity.
- The combination of the water structure and the green corridors will refresh and improve the built environment.

Rouen Seine Aménagement undertakes research for the limitation of the ecological footprint of the district's development. An important aspect here is the use of the geothermal potential for the heating and the cooling of all buildings built on the site.

The project site Luciline

International cooperation provides improvements

The development of the sustainable urban site "Luciline" by Rouen Seine Aménagement and the City of Rouen is a project within the global environmental initiative of the city. Future Cities permits not only this project but the whole process to learn and profit from the experiments and best-practice methods of the other European partners.

DRY FEET FOR TIEL EAST

Water related problems

The eastern part of the Dutch city of Tiel consists of residential areas, new development sites, flood plains and the industrial area of “Latenstein”. Latenstein is currently being revitalised.

Tiel East has to deal with several problems related to water which will be aggravated by the impacts of climate change: Water from the River Waal and Amsterdam-Rhine canal infiltrates and the groundwater levels fluctuate freely with the water level of the Waal. Due to high groundwater levels in wintertime, surface water from heavy rainfall does not drain off.

Tiel wants to build 1,100 new houses in Tiel East. Since new development in Tiel East cannot take place without causing problems elsewhere, an integral approach towards climate compatible and waterproof building has to lead to an integral water scenario for the whole area of Tiel East.

Integrated approach for climate-sensitive development

The overall aim is to develop sustainable, climate and waterproof building in Tiel East by combining water management, climate-resilient building and renewable energy.

In order to achieve this aim, the following actions will be taken:

- Study on low energy building and renewable energy for Tiel East
- Developing an integral scenario for water to solve groundwater and seepage water problems in Tiel East
- Study on the effects of green roofs in Latenstein on air quality, reduction of volume and peak rates of stormwater, new technologies, etc.
- Action plan “water adapted development in Tiel East” including energy aspects
- Realisation of green roofs in the industrial area of Latenstein
- Raise awareness of the inhabitants by a water game.

First results

A team of experts of several organisations has studied possible solutions for the water problems in Tiel East. This has resulted in an integral scenario for water in Tiel East, a combination of innovative design principles and technical measures.

First results show that interesting opportunities exist to combine cold and heat storage with lowering groundwater levels locally.

Tiel develops a vision for a sustainable development in 2015.

THE CLIMATE-PROOF TOWN OF IEPER

Sustainable development: A strategy to face climate change

Sustainable development means addressing social, environmental and economic issues in an integrated way. This is becoming even more important with the threats of climate change. Having this in mind, the West Vlaamse Intercommunale is developing a sustainable new district, the Oostsector in the Belgian city of Ieper.

From the planning phase until the phase of actual living, sustainability is implemented in all aspects: Energy, water, viability, use of space, materials, etc. In the Future Cities project, the focus lies on networks which combine the needs of water management and urban greening. Green-Blue corridors shall connect the district with an adjacent housing area and the main roads. The use of collective renewable energy systems for the whole district will be examined.

The partners are the city of Ieper, a private and a social housing company, and the province of West Flanders. Experts from all fields share their expertise in a larger working group.

From guideline to implementation

West Vlaamse Intercommunale started by developing a sustainability guideline for the project site. This guideline will be extended to a regional guideline that can be used for other city district developments. In the next step, a master plan for the site will be developed based on the guideline. The master plan is the vital basis for all future plans such as the allotment plan, infrastructure plan, and landscape plan. In a third stage, the site will be developed combining the three key components of Future Cities: Water, nature and energy.

Raising awareness for wide implementation

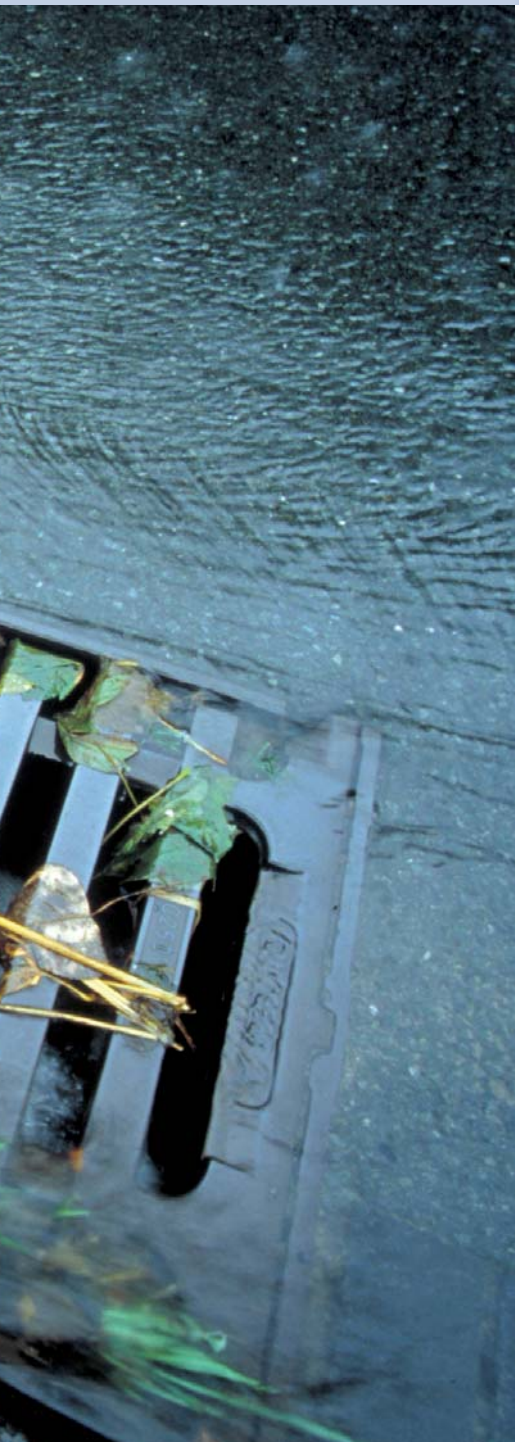
Broad awareness raising is important in all stages of the process. The communication and participation actions are addressed to political representatives, administrations, key actors and opinion leaders such as architects, housing companies, schools, and many more. The communication actions shall show the positive aspects of sustainable development:

- Pro-active actions are less expensive than reactive actions.
- The introduction of sustainability does not always have to be more expensive than using standard techniques.
- Sustainability improves the quality of life.

Project area Ieper East

Energy efficiency for buildings

Sustainable Masterplan for Ieper East



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