

## Water management, the challenge of the future

Water poses two major threats in tomorrow's world. Parts of the globe will suffer from inadequate supplies of clean drinking water whereas other parts suffer an excess of water as a result of climate changes. Therefore effective water management is a key issue at the international scale.

Yet water management also presents challenges at a regional scale. In Western Europe urbanisation is proceeding apace and this is making specific demands on how water is managed. The far more intensive use of the available land and the increase in surface impermeability mean that the space left for water is reducing. Yet this smaller area is having to cope with the increasingly large quantities of rainwater that need to be routed within a short space of time. Although town dwellers greatly appreciate the amenity value of visible water in the urban environment, the inconvenience experienced from sewer overflow, flooded cellars and washed out streets is a clear source of annoyance.

## Integrated approach

The countries around the North Sea frequently face similar problems in managing water in an urban environment. However, the approaches they adopt to tackle these problems often differ considerably. The solutions range from highly to less effective. Therefore an integrated approach to managing water problems in urban areas is clearly needed.

The Urban Water Cycle project aims to tackle urban water problems more efficiently and effectively by developing and exchanging technologies, methods and, in particular, organisational structures:

Ultimately the project aims to answer two crucial questions.

1. how can we improve the efficiency and effectiveness of the urban water cycle;
2. how can we convert the problems of urban water into a positive factor for society and the water system.

To answer these questions, five themes crucial to the development of a sustainable urban water management have been defined. These will form the framework for knowledge exchange. This knowledge will be acquired in concrete projects and experiments, selected for their specific contribution to these five themes.

## European cooperation

Five partners from different regions around the North Sea are each working on partial solutions for their own water problems. These partners are the Dutch water board Regge and Dinkel, the German harbour city of Hamburg, the English city of Bradford, the Danish town of Karlebo and the Dutch province of Fryslân. This project falls within the framework of the Interregg IIIB North Sea Region Programme and is also partially financed by this European programme. Interregg IIIB stimulates an integrated economic growth whilst ensuring that the environment and society as a whole are protected in a sustainable manner. The Urban Water Cycle project aims to improve the living environment in urban (read: built-up) areas by optimising relevant parts of the water cycle. The experiences gained from the different projects in the four countries will not only benefit the individual partners, but also the other partners in the project. Eventually the wider regions and European society as a whole will also benefit from the knowledge that gradually becomes available.

The project proposal which dates from May 2004 will have a total duration of four years. Although the project will be completed in 2007, implementing the results over a wider area will continue for many years.

## Subsidiary projects focus on concrete problems

### Regge and Dinkel: Quality water in an ecologically valuable environment

Regge and Dinkel Water Board in the east of the Netherlands is modernising a wastewater treatment plant (WWTP) and disconnecting the rainwater discharge from the sewerage system in part of the urban area.

A number of measures are being taken in the watershed of the Dinkel River to ensure surface water of a high ecological potential. The inflow of rainwater in the sewerage system is being reduced by either disconnecting the impervious surfaces or by creating rainwater storage ponds. This will lead to a more effective use of the WWTP capacity and make it possible to prevent overflows.

New techniques are being used to improve the water quality of the effluent. Research on membrane technology could be of particular benefit to many other water managers. Thanks to an innovative sand filter an absolute minimum of solid pollutants

end up in the surface water. Finally an ecological filter has been installed in the form of a pond between the WWTP and the stream into which the polished effluent is discharged. This should lead to a considerable improvement in the water quality of the region, by ensuring that the effluent is not only clean but also 'ecologically sound'.

The entire process is being carefully measured and monitored so as to provide a detailed picture about the exact relationships between the measures taken and the subsequent improvements in quality. In particular, the synergistic effects of traditional sludge filters and new techniques must ensure that the effluent discharged from the WWTP into the surface water of this special area has a high ecological potential. It should and must be possible to achieve these same results in highly urbanised areas.

### Hamburg: Storm water treatment in a large city

The German harbour city of Hamburg is looking for measures to limit the negative effects of storm water. In future, local flooding must be minimised. Hamburg has always been a green city renowned for its watersides. However, surface sealing has increased due to the expansion of residential and industrial areas. This has led to excessive peaks of polluted storm water runoff into watercourses that contain little if any flowing water in dry periods.

Three pilot projects have been set up on watercourses into which separated or combined sewerage systems are discharged. Possibilities for mitigating the pollution and peak discharge are being investigated as well as options for ensuring the water flows in dry periods so that it remains clean and rich in oxygen.

The concrete measures taken must reduce flooding and increase the flow of living, oxygen-rich water. However, an injection of knowledge is just as important. Ways of combining source-control measures and end-of-pipe treatments for storm water runoff must lead to the implementation of many larger-scale plans in the future. Although most of the techniques used are known in Hamburg, the synergies obtained from combining various approaches are leading to new opportunities. Yet a lot of input is also expected from the partners in Urban Water Cycle, particularly in the areas of managing high groundwater levels and the use new filter and infiltration techniques. These pilots must set the agenda for a complete strategy that will enable Germany's second largest city to manage the quality and quantity of its storm water in an appropriate manner.

### Bradford: Visible water in a former English textile city

In England, Bradford faces typical large city problems such as peak discharge, pollution due to combined sewerage systems and invisible underground watercourses. The city wants its residents to once again appreciate the aesthetic value of water as opposed to just experiencing its negative aspects. Whereas in the nineteenth century, water was the driving force behind the textile industry, in later years the polluted watercourses were often quite literally buried under the ground.

Bradford is working on a regeneration programme in which water will take pride of place in the city centre. Residents and visitors must once again be able to enjoy good-quality surface water. Returning this water to the surface will require purification and management measures to prevent any negative effects, such as public health problems. Further the steep hills around Bradford mean that during heavy rainfall, storm water is now concentrated in still for water available areas. Therefore flood prevention measures will also be needed.

The pilot projects are focusing on:

- ecological and high-tech purification techniques to improve the quality of surface water;
- developing controls to ensure appropriate rates of discharge during dry and wet weather;
- using source control methods such as direct infiltration to retain water in the hilly catchment areas and balance times of concentration;
- bringing together different stakeholders involved in controlling the quality and quantity of discharges and sharing the costs this entails.

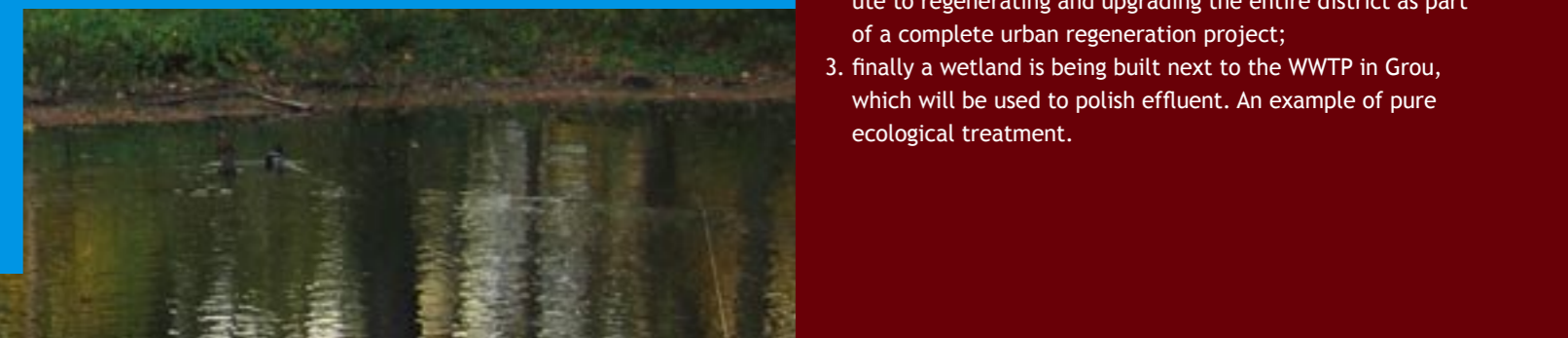


### Karlebo: Interaction between water cycle, groundwater system and social living environment.

In Denmark, the municipality of Karlebo is working on an alternative approach to dealing with storm water in the Kokkedal district. Concrete measures are being taken to reduce flooding and water pollution so as to improve the living conditions in this socially-disadvantaged area.

Karlebo is a municipality with just 20,000 residents and contains a lot of woods, wetlands, and meadows. However, it also has several rapidly-urbanised areas where social problems and criminal activities go hand in hand. In the 1970s many of the local watercourses were vandalised and lost their natural beauty. Efforts are now being made to restore these natural habitats and to increase their amenity value in the eyes of the residents. The Karlebo project has a unique dimension due to its setting in an urban regeneration area and the social impact of the measures adopted. Other partners in the UWC project are also taking these measures.

Although the focus is on restoring old meandering watercourses, alternative methods for draining roads and car parks are also being investigated. A lot of effort is also being put into reducing groundwater usage so as to maintain the groundwater level. The recycling of storm water for public and industrial purposes is another aspect of the project.



### Fryslân: Combining various insights and methods in innovative new projects

Fryslân is the water province of the Netherlands. Water has always played an important role in the regional economy and therefore water management is high on the Frysian political agenda. Improving the water quality, managing the quantity of water and using the surface water for recreational purposes are all everyday issues in Fryslân. Now the focus is on how to combine and integrate various new and existing themes. The province has a directive role in the entire process.

Fryslân is contributing three pilots to the UWC project:

1. de Kameleon island in Terherne. This theme park, aimed at experiencing and discovering nature, attracts 40,000 visitors a year. It can only be reached by boat and has no electricity or drinking water facilities. The challenge is to realise a self-supporting water cycle which functions independently of the mainland. Drinking water needs to be obtained from treated surface water. Wastewater will be treated and discharged into the polder where the soil will act as a filter. The excess water in the polder will have to be pumped into the surrounding lake via a pumping station powered by wind or solar energy;
2. in the socially-disadvantaged Vrijheidswijk district of Leeuwarden, a package of integrated measures will provide an additional 12,000 m<sup>2</sup> of visible, good-quality surface water, which is easily accessible. The amenity value of the water and the recycling of rainwater by the residents must both contribute to regenerating and upgrading the entire district as part of a complete urban regeneration project;
3. finally a wetland is being built next to the WWTP in Grou, which will be used to polish effluent. An example of pure ecological treatment.



## Knowledge exchange in five crucial themes

Simply disseminating the project data will not lead to an increase in usable practical knowledge. Five themes were therefore defined and projects were chosen on the basis of their contribution to these. Knowledge exchange between the different partners in Urban Water Cycle takes place within these themes. The available information is structured accordingly and is therefore quickly and efficiently accessible for both the five partners and for other interested parties. The five themes are:

### Urban water system

Water systems and water cycles influence each other. Therefore a separate approach to them has a particularly negative impact within the urban context. Questions raised in this theme include: 'How does climate change influence the relationship between the water cycle and water system?' and 'How can the water system's resilience be used to optimise the urban water cycle?'

### Society

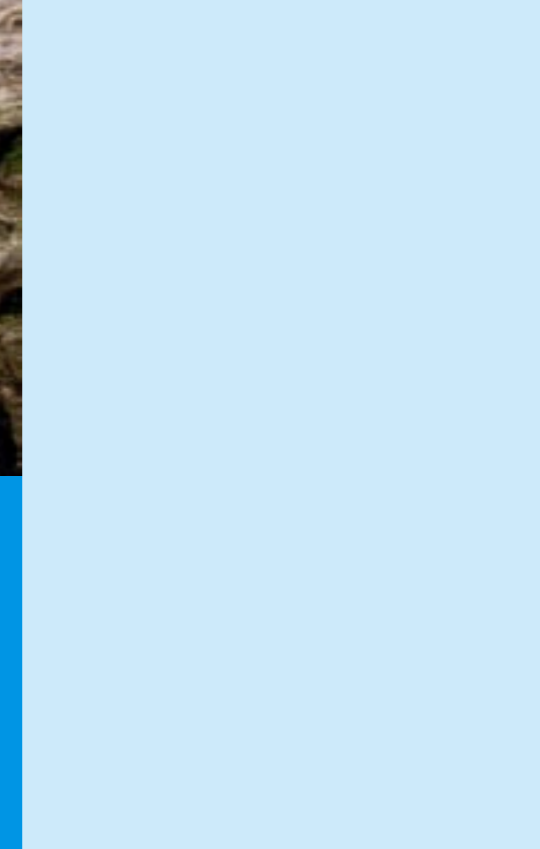
A sustainable urban water cycle cannot be realised without widespread support from the residents of the town or city concerned, or other relevant stakeholders. Moreover water cycle measures have been found to exert a positive effect on traffic problems, spatial development, social segregation and the redevelopment of socially-disadvantaged districts. The aim of this theme is to provide a clear description of these reciprocal effects.

### Flows

Controlling the flow of water is the basis of a sustainable urban water cycle. It involves taking measures to separate the various water flows such as rain-water and sewage water. Yet it also entails preventing leakages from sewer pipes and returning storm water to the surface, so that it is drained and stored in watercourses or storage ponds instead of in underground sewers.

### Urban water cycle management

Organisational, legal and financial frameworks have a major impact on how processes are managed. For example in England, urban water cycles are managed by private water companies. In the Netherlands three different government authorities are responsible for this. Denmark uses a mixture of the English and Dutch systems, whereas in Germany the water industry is in the middle of a privatisation process. The pros and cons of the different approaches on organisational, legal en financial area, adopted by the different countries will be explored in this theme.



### Purification

The purification capacity of water systems is currently underused. Using this more effectively will result in a more resilient and sustainable system. Moreover a lot of effort is being put into developing new high-tech systems for the treatment of wastewater. Water flow management and purification techniques form the basis of urban water cycles.



Further information can be found at:  
[www.urbanwatercycle.org](http://www.urbanwatercycle.org)  
or by sending us an e-mail  
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City of Bradford  
[www.bradford.gov.uk](http://www.bradford.gov.uk)

City of Hamburg  
[www.hamburg.de](http://www.hamburg.de)

Province of Fryslân  
[www.fryslan.nl](http://www.fryslan.nl)

Municipality of Karlebo  
[www.karlebo.dk](http://www.karlebo.dk)

Regge en Dinkel Water Board (lead partner)  
[www.wrd.nl](http://www.wrd.nl)



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Using the urban water cycle to improve the living and working environment

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