Water and the life of the city

Historically, the whole existence of the ‘Shipping city of Bergen’ has been based on water. The ‘Rain City’ is our trademark and climate change means that we are facing the challenge of dealing with even more water – both from the sea and from the sky.

WATER is therefore a natural part of all our work, both as an attraction and as an essential component in improving the lives of citizens and visitors alike.

Department of Urban Development, Value Creation and Climate
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Commissioner
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BERGEN – A HISTORIC SHIPPING CITY and an active urban port today.

The historic shipping city Bergen was founded and developed because of its strategic position for trade between Norway and Europe and its good harbour.

The city remains an active urban port and a major cruise ship destination with approximately 250 ship calls a year.

The nationally important, attractive areas around Vågen and Bryggen are worthy of protection and included on the World Heritage List. They represent the heart of the city for its citizens and for the many tourists who visit Bergen each year. Vågen is and shall continue to be the main route of access to the city centre for tourists and people from the regions arriving by sea.

The Market and Fish Market are being developed to become an even better marketplace for fresh food and a showcase for fresh seafood.
BERGEN’S SEAFRONT - undergoing change

For many years, the major changes taking place along the city’s seafront, where industrial properties are being transformed into attractive urban areas with a high proportion of housing, have been and remain a matter for public debate, public planning and related measures.

In the City of the Future, everybody will have access to the seafront. New and better contact between the fjord and the mountains shall provide the Bergen’s citizens with recreational opportunities and improve the quality of their everyday lives, also in the heart of the city.

THE ‘RAIN CITY’ - our trademark and contribution to city life

Bergen’s record-high annual precipitation has made the rain our trademark. Water is a factor that is included in all our planning. The challenge is to focus on the many experiences and great pleasure that the water can provide and on the need to exploit the water to add important qualities to necessary urban densification and the development of new urban districts. The use of elements of water in urban spaces and venues shall contribute new knowledge and diversity to urban life for all age groups.
CLEAN WATER
- the basis for health and wellbeing

In Norway’s major cities, clean drinking water is no longer a matter of course. In Bergen, the Giardia outbreak in 2007 was a wake-up call and, since then, the focus has been on securing clean drinking water for its citizens. Today, Bergen’s drinking water system is among the best in Europe. Modern urban dwellers are increasingly demanding areas for recreation and leisure experiences in close proximity to their homes – also in the heart of the city. Through the Byfjord (city fjord) Project, the sea has become clean enough for swimming, even in central parts of the city. Centrally located swimming areas are increasing in number along with the many outdoor recreational areas that are now being planned along the city’s extensive seashore. The Byfjord Project is continuing its work to remove sediments from what used to be industrial areas along the seafront. The goal is to satisfy the requirements of the European Food Directive and be able to recommend fishing (as well as eating the fish) along the city fjord. The City of Bergen is both challenging and supporting local initiatives in which children and adults participate in the work on water, biological diversity and use of water as an attraction in the development of urban spaces.

MORE WATER
- from the sea and from the sky

In a Norwegian perspective, the challenges facing the Bergen region as a result of climate change are particularly great. Extreme levels of precipitation result in flooding and landslides. Following the landslide disaster at Hatlestad terrasse, the City of Bergen has put a great deal of effort into mapping all areas in which there is a risk of landslides, as a basis for preventing any future recurrence of this type of accident. In Norway, the Bergen region is the area that will be hardest hit by rising sea levels resulting from climate change. An important basis for how our region should deal with this in future plans is now being discussed through participation in MARE (Managing Adaptive Responses to Changing flood risk in the North Sea Region) – an international project based on inter-municipal perspectives and on inter-municipal implementation. MARE is part of the City of Bergen’s efforts in connection with the Cities of the Future programme. An important aspect of the work relating to MARE is the local approach, and a regional climate panel has been established, and all the municipalities in Hordaland county have been invited to participate. We aim to develop a regional climate network to provide information about the work.
Master plan for Wastewater and Water Environments

The Master plan for Wastewater and Water Environments 2005-2015 is the overall plan for wastewater treatment. In addition to upgrading the city’s sewage treatment plants, the plan focuses on surface water and waterways. It includes ambitious plans for how the handling of surface water must be incorporated in city planning at all levels – the city planners, water engineers and landscape gardeners need to put their heads together. The plan stresses that rainwater, of which Bergen normally has an ample supply, is an important resource that should enhance the city rather than harm it, and that not only do open systems enrich the environment, but they are also more robust and reliable.

Guidelines for handling surface water

Bergen was among the first to adopt separate guidelines for the handling of surface water. The applicable requirements state that all developments shall facilitate local handling of surface water with inlet filters, floodwater and storm water control systems and open systems. In those areas of the city where surface water is routed to a combined wastewater system, the separation of sewage from surface water should always be considered in connection with any changes. The City of Bergen is carrying out several separation projects comprising whole areas, either by establishing new waterways such as the Drainpipe Project (Takrenneprosjektet) in the Fjellsiden area in which surface water is collected in mountainside drainpipes above the housing and routed directly to watercourses or the sea, or by disconnecting sewage lines from existing wastewater systems and routing the sewage to treatment plants through new pipe systems. This applies to, for example, Store Damsgårdsbekken stream, where the aim is to reopen the watercourse through the public park at Kirkebukten, which has a central location for that part of the city. Other comprehensive projects such as Haukås, Lille Lungegårdsvann and Nygårdstangen are presented separately in this document.
Management Plan for Bergen’s Watercourses

Wild, wet and beautiful! Bergen has more affinity with water than most other cities. Reflecting water surfaces and murmuring streams, whether natural or man-made, lend character to the city and the quality of urban spaces. The purpose of the Management Plan for Watercourses is to spread knowledge and awareness about Bergen’s watercourse landscape and set out a municipal strategy for the future for sustainable, holistic and coordinated watercourse management. The plan was adopted by the City Council on 26 March 2007.

Schools adopt watercourses

This project came about on the initiative of the City of Bergen’s Agency for Landscape Design and Agriculture in connection with the drawing up of the Management Plan for Watercourses. All schools are invited to adopt their own watercourse area and register how the watercourse is used, littering, bio-diversity and cultural heritage sites. In spring 2004, close contact was established with the ‘School Laboratory’ at the University of Bergen (UiB) and Bergen University College (HiB) with a view to involving primary school children in the planning work. The basis for establishing this contact included a wish for the schools to contribute to the collection of data from local watercourses. The registration tool on the website www.miljolare.no is very suitable for the purpose and, in connection with the planning, UiB/HiB have organised several courses for primary school teachers who wish to make use of the tool to register biodiversity, cultural heritage sites, littering etc. The involvement of the schools has become manifest in that approximately 30 schools have adopted one watercourse each in their local environment.
Securing the ‘blue-green’ resources of the Nesttun watercourse

The Commissioner has decided to protect the blue and green resources of the Nesttun watercourse so that it becomes an accessible and ecological watercourse by 2012. The management and implementation project for the Nesttun watercourse is planned to take four years and a number of measures will be completed to give the watercourse a positive ecological status and make it into an attractive recreation corridor, learning arena and secure ‘blue-green’ urban structure by 2012. The term ‘blue-green’ means that the project is designed to take care of both the blue (water) values and the green (landscape) values. The first two years will be used for planning and surveying, followed by project implementation between 2010 and 2012. Work on important flood control measures in the watercourse will be carried out at the same time. The City of Bergen has recently bought zoning rights to the two largest lakes in the area and are now able to control the water flow so as to reduce the risk of floods. In 2008, the Nesttun watercourse was designated ‘Focus Watercourse of the year’ by the Norwegian Water Resources and Energy Directorate (NVE). The watercourse has its own ‘friends of the watercourse’ association, which has carried out several projects, both on its own initiative and in cooperation with the City of Bergen, to recreate the qualities of previous times along the watercourse.

The Haukås marshlands

The main features of the plan for the 410-decar area northeast of Bergen is to restore the meandering river courses, ponds and pools, and restore landscape zones along the watercourse and at the periphery of the area covered by the plan. The plan aims to safeguard the rich biodiversity and the landscape qualities linked to the Haukås watercourse and adjacent marshlands, and to encourage recreational activities by establishing a local park for that part of the city. Åsane used to have the most extensive marshland complex in the Bergen region. This type of landscape is no longer common, since large bog and marshland areas have disappeared as a result of urban development in the area. Watercourse restoration and revegetation along the watercourse will not only beautify the landscape, but it will also contribute to recreating some of the lost green areas. The Haukås marshland park, combined with modern local handling of surface water, will prevent flooding in the planned development areas at Haukås and be aesthetically pleasing.
WATER AND LIFE QUALITY

The Byfjord Project

The City of Bergen has invested a considerable amount in sewage treatment plants and the major discharge volumes have been rerouted to open fjord areas. However, the five major mechanical plants do not meet the new requirements and, in the years ahead, Bergen will spend considerable resources on upgrading and renewing the treatment plants, pipeline investments and new transport systems. Through the Byfjord Project, the sea has become clean enough for swimming, even in central areas of the city. The map shows centrally located swimming areas. Extensive water quality surveys have shown that the environmental status of the sea along the shores of Bergen is generally good, and that conditions in the inner port areas have been considerably improved. However, in Bergen as in most other Norwegian ports, the sediments on the seabed are polluted. That is why we have carried out an extensive survey to map micropollutants in seabed sediments in the inner port areas of Bergen. The surveys show that large port areas are polluted by organic micropollutants and heavy metals. An action plan has also been prepared, which included various additional surveys. One important factor is to get the flow of micropollutants from sources ashore under control before implementing extensive measures in the sediments. In Bergen, it is necessary to remove sediment from the entire Vågen and Puddefjorden area if we are to limit and stop the spread of micropollutants in Bergen’s harbour basin. A project has therefore been launched, which includes the following activities:

1) Measures to stop any micropollutants from onshore sources.
2) Measures to treat polluted seabeds, a pilot project:
   • Measures to be implemented in Kirkebukten, as well as follow-up and planning of measures assigned priority in the action plan.
   • Marine-archaeological surveys of Vågen.
3) Information strategy, the ‘Sediments and Society’ research project.
4) Planning, follow-up of the Byfjord Project.

The improved condition of the harbour basin is a result of the sum total of these measures. New swimming areas are and will be established in central areas and, and a major long-term objective is the revocation of the recommendation against eating fish and seafood from large areas of the fjords around Bergen.
**Bergen’s annual celebration of World Water Day**

We have a stand at Torgalmeningen town square where we hand out bottles of water labelled with the municipal emblem. This is a very popular initiative. There is a Junior Prize for upper secondary pupils on the topic of water. The people of Bergen are invited to visit the Svartediket and Jordalsvannet water treatments plants, where there will be lectures, guided tours and information will be provided. There is also collaboration with the United Nations Association (UNA) of Norway. This year, too, the Water Association Region West will hold a conference on World Water Day. The ViVite Science Centre is also running activities for grade 5 to grade 7 pupils on water and water treatment. The pupils take part in practical tasks, such as measuring the PH value of water from Svartediket. There will also be films and photo presentations. The activities at the ViVite Science Centre will run on Thursdays and Fridays until week 12 and can accommodate three classes.

**Giardia and new treatment plants**

The principle of having a minimum of two independent, separately functioning safety barriers is recommended in the Drinking Water Regulations. If one of the barriers fails, the other barrier shall prevent this failure from having consequences for customers. During the Giardia epidemic, the barrier in place to protect Svartediket failed. Pollution in the catchment area and the inadequacy of the hygienic barrier in the source itself led to parasites in the untreated water. The second barrier, chlorination, kills bacteria but not parasites. A new water treatment plant for Svartediket was under construction, but the planned UV system that kills parasites had not yet been installed in autumn 2004. The result of the inadequate hygienic safety barriers was that Bergen was the first place in Norway to experience a water-transmitted parasite epidemic.

The scope of water treatment must be based on the principle of adequate, hygienic safety barriers. As a result of the quality of untreated water failing from time to time, extensive water treatment with chemical separation and the installation of UV disinfection were established at Jordalsvannet waterworks. In addition the installation of UV disinfection at Svartediket and Gullfjellet waterworks was pushed forward, so that drinking water also became safe in relation to parasites. Today, all water treatment plants have UV disinfection.

The greatest challenge in terms of safety is the renewal of the pipe network. The work in progress at Damsgård and pipelines in connection with the Bergen Light Rail System, which have just been completed, serve as examples. Renewal of private and public pipelines is being carried out in combination with the separation and handling of wastewater.
Bergen’s seafront is undergoing change

The industrial areas in the proximity of Bergen’s seafront are now being transformed into attractive urban areas with a high proportion of housing. In the City of the Future, Bergen’s seafront shall provide new housing and services near to the city centre, and everyone will have access to the seafront. New and better contact between the fjord and the mountains shall provide the Bergen’s citizens with recreational opportunities and improve the quality of their everyday lives, also in the heart of the city.

New energy around Damsgårdssundet

In this project, the old industrial areas along the seafront are to be transformed into high-quality urban areas. On the east side of the sound, a business and research area is being developed that will include a new Norwegian School of Management (BI) with an initial intake of around 700 students. On the west side of the sound, an urban area is planned with a high proportion of housing units in which Bergen og Omegn Boligbyggelag is the main contractor. The City of Bergen is collaborating with major developers to give the run-down housing area, which has a high proportion of rented council housing furthest up the mountainside, a physical, social and cultural boost in parallel with the new development along the seafront.

Through a quality programme for a new harbour promenade and new guidelines for universal design, a joint private and public collaboration shall give the city a new recreational arena along the entire seafront with meeting places, swimming areas and many attractions en route. A new pedestrian/cycling bridge is scheduled to be finished in autumn 2011, which will link new and old areas in the west of Bergen to the city centre. Among many other measures, the environmental coordinator for the area has developed a new initiative to give ownership to the seafront to the young people from the disadvantaged area, namely, water polo. This is a new sport that many young people are warming to, and which can help establish a new attraction in addition to the other activities on offer along the harbour promenade.
Water between the Lungegård lakes

The southern part of Bergen city centre is built on the landfill sites surrounding the brackish stretches of fjord, now known as Lille and Store Lungegårdsvann. This landfill has been home to the city’s furtive activities and bleak transport areas. The area around Lille Lungegårdsvann has been reconquered by a diversity of urban activities and has become the city’s exclusive representation space with an open events arena and promenades, with high-quality design and landscaping. The lake itself and the bottom of the lake have not yet received the same amount of attention, but are next in line. The problems concerning brackish water have come to an end and the lake is about to be developed into the core of a new urban waterway. Extensive cleaning of the bottom sediments and securing an adequate supply of surface water from the urban area through separation of the sewage system are important elements in a long-term waterway plan that aims to establish a fresh, urban waterway in biological balance.

The reopening of the waterway from Lille Lungegårdsvann to the sea is the next stage of the plan. The remodelling of the rest of the urban area, from a strained heavily trafficked area into an attractive modern city centre area towards Store Lungegårdsvann, will be based on water as the most important element. The establishment of a climate-adapted flood route secured against rising sea levels constitutes the core of the environmental upgrading of the city’s access road and public transport hub. The waterway will be designed as an attractive environmental thread through the new urban spaces to be built along the sea and the swimming complex that is already under construction. Understanding of the climate, modern urban ecology and the diverse qualities of water will form the basis for the design. A strategy programme for the work on water has been adopted, the area zoning plan is ready to be sent for consultation and a watercourse plan will be launched in the course of the year.
Market, cod and tourism

The Fish Market in Bergen is known around the world. With a history dating back to the 13th century, it has fundamental qualities as the city’s quayside marketplace connecting the heart of the city with the sea. Traffic, operating problems and changed consumption patterns have threatened the market’s position, but now the city has given priority to improving the quality of the market. A zoning plan has been adopted for upgrading and for rerouting of traffic in the area around Vågen. Investments in new equipment are being made for the market traders and the quay area is being developed for recreation and the enjoyment of seafood along the shoreline. The market’s natural qualities, historic surroundings and central location make for a unique combination of active, vibrant and cultural history experiences. Ensuring the quality of local seafood and agricultural produce from Western Norway, crafts and proximity to the Tourist Information, will re-establish the Market as an attractive, active hub for the people of Bergen and visitors alike.
**Urban spaces and the commons**

For many years, work has been underway in Bergen on improving the quality of our urban spaces and commons. The city has been awarded the Norwegian State’s Architectural Prize (Statens byggesikkpris) for this work which is now continuing in regional and district centres. Water is linked to play, recreation and noise protection in our urban spaces.

**Transformation**

**Water in the Mindemyren industrial area**

Mindemyren is a 2,000-acre, centrally-located industrial area with a low degree of utilisation, that is situated between Kristianborgvannet lake in the south and Solheimsvannet lake in the north. The area is suitable for a high degree of utilisation and is surrounded by housing areas, local centres, a university college and green areas.

The transformation of Mindemyren will mean that 20,000 people can travel to work by light rail, bus, bike or on foot.

The zoning of the area is part of an overriding plan to clarify the central infrastructure for the area. The full or partial opening of the channel between the two lakes is one of the measures in the plan that, together with the establishment of urban spaces (common areas/ plazas) and green areas and good interconnections, will provide the area with new qualities. The Commissioner has sent the plan programme for consultation. The planning work will be completed by summer 2011.
**Vågen, the wharfs and Bryggen**

With Vågen as the starting point for the city’s formation and based on its thousand-year-long history around a narrow harbour area protected by mountains, the harbour can offer unique experiences. With its World Heritage status, Bryggen has motivated and obliged us to reduce traffic in the area, and thereby opened up new possibilities for people in the area. The qualities of the site serve as the basis for the establishment of new businesses based on recreation and experiences. The development of the harbour area to cater for the public, local boat routes, veteran boats and leisure craft, gives people a new experience of the city’s close relationship with the sea and life at sea. As the noise of traffic is reduced, some of the original atmosphere around the wharf buildings can be restored. The original continuous wharf area at Bryggen has ‘reemerged’ with wooden platforms and space for sales activities, recreational activities and relaxation. The present layout is only temporary, and will be further developed when permanent solutions can be established.
Sandviken – value creation along a seafront with major preservation challenges

The Sandviken Project is Bergen’s contribution to the national value creation programme initiated by the Ministry of the Environment. The aim is that, by 2010, this area’s cultural heritage and cultural environment shall serve as a basis for brand-building, commercial development and a vibrant local community.

The old wharfside buildings etc. constitute a cultural environment of international format, but what is left of the cultural heritage in the area is under threat from increasing traffic and development.

The Agency for Cultural Heritage Management has announced that parts of the area covered by the plan will be protected as a cultural heritage site. The Plus Programme is coordinated by the Department of Urban Development, Value Creation and Climate.

The programme consists of a broad network, in which the Agency for Cultural Heritage Management, industry and public and private institutions focus on Sandviken.

Vågen – marine-archaeological surveys

The survey is a pilot project for new work processes for this type of work. The survey based on video-recordings and photos has attracted much public interest.
MARE – rising sea levels and the risk of flooding

An international project with an inter-municipal perspectives and inter-municipal implementation.

**Background:**
The European Flooding Directive applies to the EU and the EEA areas. This means that there is a need for risk assessments, measures and contingency plans. An essential element is to reduce the risk of flooding and flood damage.
In order to increase our knowledge and be able to meet these challenges, the City of Bergen participates in MARE, an INTERREG IVB project for Managing Adaptive Responses to Changing flood risk in the North Sea Region that focuses on climate change and its consequences. The project looks at climate change, urbanisation and other factors that increase the risk of flooding.
The project will also focus on how the risk of flooding and contingency plans can be communicated to those who are at risk, and how the population and industry should be involved in efforts to deal with these problems.

**Main goals:**
1. To develop a transnational approach to watercourse management including local precautions against the risk of flooding based on the requirements of the European Flooding Directive.
2. To obtain best practice solutions for local flood risk management and to disseminate our experience to other communities that face such problems, in Norway and abroad.

**Sub-goals:**
1. Better safeguards against flooding
2. Better quality of life for those who live in areas at risk of flooding
3. Contribute to cost-efficient environmental policies through effective watercourse management
4. Contribute to cautiousness and increased awareness and build territorial contexts
5. Help produce local municipal approaches that can serve as examples for the whole of EU.

**Status:**
MARE is part of the City of Bergen’s efforts in connection with the Cities of the Future programme. Efforts are made to ensure that projects and work are on schedule.
An important part of the work relating to MARE is to ensure a local approach, and a Regional climate panel has been established in which all the municipalities in Hordaland county will be invited to participate in three meetings in 2010. The aim is to build a regional climate network to provide information about the work being carried out in Bergen, and to obtain knowledge of projects in other parts of the county.
Risk and vulnerability – new planning tools

Bergen had two periods of extreme precipitation in autumn 2005 – in September and November. Following several major landslide accidents during that period, the City of Bergen accelerated the work to survey areas exposed to high amounts of precipitation, flooding, wind and landslides.

The city drew on the expertise of Norwegian Geological Surveys (NGU), Storm Weather Senter AS, Powel ASA and the Norwegian Meteorological Institute.

**Precipitation.** Annual precipitation, maximum precipitation and the number of incidents of extreme precipitation in the period leading up to 2100 were evaluated and forecasts were prepared. Annual precipitation and short periods of maximum precipitation will increase by 20% by 2100. The number of periods with high precipitation levels will double.

**Flooding.** The evaluation looked at the rise in sea levels up to 2010, tide levels and wave heights. Extremely high sea levels in relation to the mean sea level (in the case of wind and waves) will vary between 2.5 and 7.1 metres along the shoreline. With respect to the flooding of watercourses, a map was produced of areas at risk of flooding in 2005 (extreme situation). Further studies on the flooding of watercourses will be followed up by the Agency for Water and Sewage Works.

**Wind.** The wind conditions in Bergen are not expected to change much, but there will be slightly stronger winds on top of the mountains.

**Landslides.** A summary survey was carried out of the whole built-up area, including new areas for development, to show where there is a risk of landslides. All data have been reported and presented on maps showing potential landslide areas that need to be surveyed in greater detail. The results show that rock slides constitute the biggest threat, but that earth slides may also occur.

All data from the natural risks survey is available to the city’s case officers, and will contribute to reducing the risk in connection with new developments and redevelopments. MARE - Managing Adaptive Responses to Changing flood risk in the North Sea Region