



How to manage cloudburst and rain water

Action plan for a climate-proof Denmark



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Rain gardens and green roofs in Kalvebod Brygge, Copenhagen
(Photo: Lone Verwers Jansson)

Foreword

Climate change is now a reality

A responsible climate policy must more than just work towards limiting climate change in the long term. It must also ensure the action necessary right now to adapt our society to a climate that is already changing.

Heavy rainfall is one of the climate challenges that Denmark could face. The unusually heavy cloudburst that struck Copenhagen in the summer of 2011 is an example of how extreme weather events can have severe consequences for our infrastructure and homes. Total insurance payments for cloudbursts in all of Denmark totalled DKK 6 billion in 2011.

From its very first day in office, this government has set clear objectives for climate change adaptation, and placed the issue high on the political agenda. The government will proceed from knowledge to positive action in order to make Denmark resilient to climate change. With this national action plan, important steps are taken on the road towards a climate-proof Denmark.

It is important that all parts of society contribute to climate change adaptation in Denmark. Dealing with the climate challenge requires collaboration between authorities, organisations, private enterprise and individuals; regardless of whether the project is maintenance of existing roads, coastal protection, construction, or investments in new infrastructure.

Central to climate change adaptation efforts is a strong interaction between state and municipalities. The government and the municipalities have agreed that the municipalities will increase investments in climate change adaptation of wastewater treatment by DKK 2.5 billion in 2013. This assessment also entails that all municipalities carry out a risk assessment and prepare municipal climate change adaptation plans. An improved framework will be created simultaneously, enabling municipalities to treat surface water more effectively in urban areas – including combined solutions so that surface water can become a resource instead of a problem. This means that climate change adaptation can contribute to solving several problems simultaneously.

Climate change adaptation efforts are already well under way, and there are many good examples of green, innovative solutions. Climate change adaptation efforts can contribute to the development of new solutions, not least in relation to water, where Denmark has a strong position. Several companies have already prepared solutions which have attracted international demand.

With the *Action plan for a climate-proof Denmark* the government leads the way with a series of initiatives to establish sustainable, green and innovative climate change adaptation efforts throughout Denmark.

The government December 2012

Background

This Action plan for a climate-proof Denmark provides an overview of the initiatives that the government has either planned, or already set in motion, to ensure that Denmark will become more resilient to climate change.

In its government programme A United Denmark (*Et Danmark, der står sammen*), the government has identified the following tasks:

- Establish a task force which is to prepare an action plan for climate change adaptation and ensure rapid implementation of the EU Floods Directive.
- Ensure that all municipalities prepare action plans for climate change adaptation within two years.
- Modernise the legislation on watercourses and water supply.
- Examine whether water utility companies have adequate opportunities to finance climate change adaptation, and whether the need for adaptation, other than initiatives aimed at sewerage, makes it appropriate to adjust the division of responsibilities between the municipalities, water utility companies and other authorities.

The government has already launched a series of significant initiatives and made amendments to the regulatory foundation. The action plan highlights several initiatives which contribute to a better framework for climate change adaptation efforts by central and local government, private enterprises and individuals.

The document *Mapping climate change – barriers and opportunities for action* (was prepared prior to this action plan). It describes the consequences of climate change and possible initiatives.

Focus areas

Climate change adaptation has significance for many areas, and requires initiatives with broad, cross-sector objectives. This action plan focuses on five general areas of initiative:

- *An improved framework for climate change adaptation.* The state must ensure the best possible framework for, as an example, the municipal climate change adaptation efforts, in order to ensure the most appropriate solutions. The action plan suggests, for example, changing and modernising relevant legislation and regulations.
- *More consultancy and a new knowledge base.* There is a need for a common knowledge base and ongoing consultancy about the implications of climate change and how to adapt to climate change. The action plan describes which initiatives the government will launch in order to strengthen the knowledge base and ensure knowledge sharing.
- *Strengthened collaboration and coordination.* Climate change adaptation efforts must be coordinated across authorities, the business community and individuals. Initiatives are indicated, which are able to promote and ensure the necessary dialogue and cooperation amongst the primary stakeholders in the area.
- *Green transition.* Climate change adaptation efforts create the opportunity for green transition through development and use of new, innovative solutions. The action plan focuses on the potential for growth in this respect.
- *International climate change adaptation.* Climate change is also a challenge for our neighbouring countries. Denmark is working internationally to reduce the effects of climate change, and for an ambitious EU-climate change adaptation that will support the Danish climate change adaptation efforts.

The climate challenge and shared responsibility

The Danish climate is changing gradually. This will provide many challenges up to 2050 and in the longer term.

Primary climate changes

Denmark can expect increased precipitation, especially during the winter. The temperature will rise. We can expect milder winters, and the summers will be warmer. In the long term, the sea level will rise, and in many areas, a rise in groundwater levels can be expected. One of the first challenges is that, as a result of climate change, an increased frequency, intensity and duration of extreme weather events is anticipated. Denmark will experience more frequent and longer lasting warm spells and heatwaves. Precipitation patterns will change, with summers characterised by longer dry spells and heavier cloudbursts.

Uncertainties and a strengthened knowledge base

The magnitude of climate change in the long term is associated with great uncertainty, as is the magnitude of the impacts of climate change for Denmark. There may also be differences in the regional and local effects of climate change in Denmark.

Climate models, and our understanding of the uncertainties linked to them, are improving all the time. Despite the strengthened knowledge base, decisions regarding climate change adaptation initiatives will still be subject to uncertainty, and that in itself will be a challenge when prioritising the efforts.

Consequently, adaptation initiatives risk being either over- or under-dimensioned relative to what is optimal for society. It is therefore important that climate change adaptation initiatives allow for later adjustments and that the knowledge base is improved on a regular basis.

Allocation of responsibilities

Climate change adaptation is first and foremost locally based – at the municipal authorities, companies or individuals. The individual stakeholders know the local conditions best, and are consequently in the best position to make decisions on adaptation.

Central government itself has a responsibility as owner of infrastructure, buildings and land. However, the principle role for central government is to establish an appropriate framework for local climate change adaptation by, for example, adapting laws and regulations, but also by ensuring coordination and providing information. A solid framework for the efforts must support the specific parties involved, so that they can address the challenge in a socio-economically appropriate manner at the proper time.

A solid framework also means that the municipal authorities can incorporate climate change adaptation in the long term plans, and that individuals and the business community are able to prevent damage to buildings, avoid health risks and exploit the opportunities that climate change offers to Denmark.



Rain garden in Kalvebod Brygge, Copenhagen
(Photo: Ursula Bach)

Initiatives in progress

An improved framework for climate change adaptation

The central government is in the process of providing a solid framework for climate change adaptation through laws and regulations, making it possible to address climate change appropriately.

Municipalities, individuals, and enterprises are, to a large extent, making decisions about climate change adaptation based on local conditions, but central government has the specific task of ensuring a framework that makes an economically viable, timely and coherent effort possible.

A series of initiatives and changes in relevant regulations have already been implemented. The government will continue to work actively to improve the framework, wherever the need arises.

Mapping and identification of risk areas

The government has ensured the basis for prioritising and selecting focus areas in an agreement on municipal budgets for 2013 with Local Government Denmark. Towards the end of 2013, the municipalities will draw up climate change adaptation plans which will map the risk of flooding, specify priorities and give an overview of the efforts.

The government has prioritised a rapid implementation of the EU Floods Directive. The first phase has been completed, which means all of Denmark has been mapped and ten risk areas have been identified. The risk of flooding from watercourses, lakes, the sea and fjords is assessed to be considerable in these areas.

A good framework for the municipalities

Areal planning has a central role in enabling us to tackle extreme weather conditions in the future. The Ministry of the Environment has therefore amended the Planning Act, to make it possible for the municipalities to include climate change adaptation directly in the local development plans from 1 June 2012. This amendment will be followed up with guidance to the municipalities.

The possibility for wastewater companies to invest in climate change adaptation has been clarified with an amendment in the Water Sector Act, in spring 2012.

In an agreement from June on municipal budgets for 2013, the government and Local Government Denmark have taken common responsibility, and have worked together to prepare Denmark for the climate of the future. This entails, that investments in climate change adaptation in the wastewater area will be increased by DKK 2.5 billion in 2013.

Building and construction

New buildings must be able to withstand future climate challenges. The Ministry of Climate, Energy and Building will continue to customise the building regulations, so that these regulations work towards a modern and climate-proof building stock. The Danish Building and Property Agency will also consider climate change adaptation when planning new construction projects.

Consideration for climate change adaptation will also play an important role in connection with the ongoing maintenance and management of the Danish Building and Property Agency's buildings.

As a follow up to the ministry's climate change adaptation strategy the Ministry of Transport has included performance requirements concerning climate change adaptation in the performance contracts for 2012 and 2013 for the Danish Coastal Authority, Rail Net Denmark and the Danish Road Directorate.

Nature and Agriculture Commission

At the start of 2012, the government established a broadly composed Nature and Agriculture Commission. This commission will, for example, examine the possibilities and challenges that climate change creates for the relationship between agriculture and nature.

Initiatives planned

An improved framework for climate change adaptation

The government intends to improve the framework for climate change adaptation efforts. Primarily, this involves mainstreaming the regulatory foundation, and providing the appropriate tools to convert political commitment into real investments.

In order to achieve this, the government will launch a series of initiatives:

Increased precipitation

- Through legislative amendment, the Ministry of the Environment will ensure that wastewater utilities have the possibility to co-finance projects, carried out by municipalities or private enterprises, which involve roads, watercourses and recreational areas and which assist the wastewater utilities in their efforts to manage surface water in relation to climate change adaptation.
- The Ministry of Economic Affairs and the Interior will change the Statutory Order on loans (lånebekendtgørelsen) with a view to extending the municipalities' loan guarantees for wastewater utilities investments, from 25 to 40 years, for new loans. The intention is to ensure a better agreement between the repayment of loans by wastewater utilities and the charges imposed on users.
- The municipal climate change adaptation plans must be the focal point for the municipalities' climate change adaptation efforts – and the government will ensure that the plans are prepared on this basis. The Minister for the Environment will therefore submit a bill concerning the wastewater utilities' assessment of the risk of flooding as a result of capacity problems in sewage systems. To follow up, the Minister for the Environment will issue a statutory order and guidance which will, for example, stipulate that the wastewater utilities must use the so-called A1B climate scenario (an average scenario), from the Intergovernmental Panel on Climate Change (IPCC), when preparing flooding maps.

Planning

- The Ministry of the Environment will ensure that the proposal for the National Planning Report 2012 includes a chapter on climate change adaptation and green energy, which examines subjects such as climate change adaptation, climate change, and renewable energy in the form of wind turbines and biogas.
- In the draft Finger Plan 2012, the Ministry of the Environment allows for the use of the green wedges of Greater Copenhagen in climate change adaptation, by establishing retention basins and canals, which also have recreational value. A temporary storage of rainwater in the green wedges could act as a temporary infiltration plant, and thereby contribute to climate-proof future ground water resources.

Building and construction

- The Ministry of Climate, Energy and Building will monitor changes in wind patterns and determine whether existing dimensioning rules for buildings should be amended.
- When revising the Public Roads Act, the Ministry of Transport will consider how climate change adaptation can be addressed in the act, in order to achieve improved treatment of issues related to climate change adaptation.
- The railway network must continuously adapt to climate change. In the coming years the Ministry of Transport will launch and carry out any necessary revisions of relevant railway standards.
- Within the Ministry of Transport, climate change adaptation plans will be prepared by the Danish Coastal Authority, the Danish Road Directorate and Rail Net Denmark. These authorities will specify how installations and maintenance of the infrastructure will be adapted to climate change.



Combined skate park and retention basin in Rabalder Park, Roskilde
(Photo: Roskilde municipality)

- Recycling of resources is a high priority for the government, and also necessary in relation to climate change adaptation. By legislative amendment regarding the use of lightly contaminated soil, the Ministry of the Environment will ensure the use of excavated soil for dikes and dams in connection with climate change adaptation.

Nature and the environment

- The Ministry of the Environment will investigate options in relation to handling of seabed material due to an increased need for excavation of sediment at Danish harbours, as a consequence of climate change.
- The Ministry of the Environment will present a nature plan for Denmark. This plan will be based on EU and UN decisions and legislation regarding the marine environment, the aquatic environment, nature conservation and biodiversity. The nature plan will make Denmark's nature more resilient to climate change.
- The government will continue the implementation of the EU Floods Directive. The Ministry of Transport and the Ministry of the Environment will therefore prepare a more detailed map of the flooding risk for the ten designated risk areas, before the end of 2013.
- The Ministry of the Environment will ensure that the consequences of climate change are included, as part of the basis for the determination of the future efforts on the Natura 2000 sites, when working on the next generation of Natura 2000 plans.

- The Ministry of the Environment will ensure that the second generation of water plans are resilient to the impacts of climate change. In order to strengthen the dialogue with stakeholders, the Ministry of the Environment will establish a watercourse forum which will examine the interaction between climate change adaptation and water plans in relation to the risk of flooding.

Enterprises and agriculture

- The risk of pollution and accidents involving hazardous substances during storm surges or extreme rain events must be reduced. To this end, the Ministry of the Environment will work together with other relevant authorities, to assess whether there is a need to impose specific requirements on establishments involved in potentially hazardous activities. This will be carried out in connection with the implementation of the Seveso III Directive.
- The Ministry of Food, Agriculture and Fisheries of Denmark will amend regulations for catch crops, to limit the run-off of nitrogen as a consequence of increased precipitation.

Evaluation

- The government will continuously take stock of the progress of the initiatives in the action plan. Furthermore, the municipal climate change adaptation plans will be evaluated in 2015.



Water and recreational park in Selsmosen, Høje-Taastrup
(Photo: Tegnestuen Jens V Nielsen)

Initiatives in progress

More consultancy and a new knowledge base

The government has already undertaken a series of initiatives that strengthen the common knowledge base and consultancy of municipalities.

Task Force on Climate Change Adaptation

The Minister for the Environment has established a task force on climate change adaptation. The objective of this task force is to ensure up-to-date data and relevant knowledge on the Danish Portal for Climate Change Adaptation www.klimatilpasning.dk. This portal presents knowledge about climate change and climate change adaptation within relevant sectors.

The portal also contains news, concrete cases of climate change adaptation and many interactive tools. A number of tools, aimed at municipalities, enterprises and individuals, were made available in 2012. These tools can be used to assess risk from rising sea levels and to climate-proof buildings.

Strengthened consultancy

In February 2012, a mobile team was established as part of the task force. This team offers guidance and facilitates collaboration between municipal authorities and other stakeholders in the field, for example with regard to preparing municipal climate change adaptation plans.

The mobile team gives guidance on the municipalities' analyses and presents initiatives put forward by central government in the climate change adaptation area. With the mobile team, the municipalities have a sparring partner in relation to specific climate change adaptation efforts.

The Ministry of Transport will also visit municipalities that contain areas which the EU Floods Directive designate as being prone to flooding. It is important that municipalities have a basis for preparing risk management plans that draw on the Danish Coastal Authority's mapping of flood risks. On 2 July 2012 the Ministry of Defence published a report about the dramatic cloudburst in the Greater Copenhagen

area on 2 July 2011. The purpose of the report was to describe the course of events and response hereto, as well as the various follow-up initiatives undertaken or planned since the cloudburst. In addition, the report contains ten general lessons about emergency management aimed at anyone who might be involved before, during or after a major cloudburst.

Forecasting the weather, and especially extreme weather events, is associated with uncertainty. In the light of the cloudbursts seen in recent years, the Danish Meteorological Institute now issues a new type of risk forecast about hazardous weather. Individuals have an improved opportunity to take appropriate precautions with these earlier warning systems.

Research

Research must ensure that we have a more accurate foundation for decisions on climate change adaptation. Furthermore, research contributes to the development of solutions to tackle challenges.

The Ministry of Science, Innovation and Higher Education has carried out a dialogue process (FORSK2020) on the prioritisation of strategic research funds. One of the 14 research themes identified is "Future climate and climate change adaptation" (Fremtidens klima og klimatilpasning), which is to support Denmark's climate change adaptation through research.

A series of projects was launched in 2012 under the Coordination Unit for Research in Climate Change Adaptation. These projects support the knowledge base and development of tools for the Danish Portal for Climate Change Adaptation.

The Ministry of Transport is working with research projects about drainage techniques in order to investigate the consequences of climate change for the lifespan of roads and future road construction.



Elevated coastal dike on Vestamager, Copenhagen
(Photo: Martin Rivero)

The Ministry of Transport will continue to develop warning systems that can be used to warn road users about dangers and obstacles due to, for example, extreme precipitation.

In connection with preparation of the new pesticides strategy, the Ministry of the Environment has assessed the consequences of climate change. One research project shows that pesticide use is not expected to change significantly in terms of quantity, but the changing climatic conditions could lead to an increased risk of run-off into groundwater. These results will be included in future work.

The government is seeking solutions that can manage several challenges simultaneously. Too much water in one place can be exploited as a resource in another place.

In collaboration with Copenhagen Energy and other partners, the Ministry of the Environment is investigating the possibilities for increased use of surface water or purified wastewater. Moreover the aim of this collaboration is also to harvest experience from the existing regulations for surface water usage.

Resilient forests

Danish state-owned forests are managed using close-to-nature principles. Through its operational plans, breeding programmes, seed production and plant supplies, the Ministry of the Environment aims to ensure large genetic diversity. This will lead to a smooth transition to tree species that are resilient to climate change.

Health

The Ministry of Health regularly adapts its consultancy on prevention of the health risks connected with climate change, and guidance on health emergency response as a consequence of changing climatic conditions and new knowledge about health risks. Furthermore, changes in pollen patterns that are due to climate change are regularly registered.

The Ministry of Health also undertakes ongoing monitoring of the influences of climate change on the spread of infectious diseases and the occurrence of new micro-organisms. Moreover, the ministry also ensures timely communication of new knowledge to the people and authorities who are responsible for treatment, prevention and control.

In 2012, the Ministry of Health issues a prevention package about health risks from the sun to all Danish municipalities. The aim of this initiative is to support local government efforts to curb the increase in skin cancer due to UV radiation from the sun.

Similarly, the Ministry of Food, Agriculture and Fisheries has increased monitoring of livestock diseases, especially new, dangerous diseases, in order to maintain an effective veterinary emergency response. Efforts involving communication of information to, for example, animal owners, vets and doctors, have also been increased.



Linear drainage along the Kliplev-Sønderborg motorway
(Photo: the Danish Road Directorate)

Initiatives planned

More consultancy and a new knowledge base

It is essential that climate change adaptation takes place on a solid, shared knowledge and planning basis. The government will work to spread the necessary knowledge and ensure its ambition that municipalities have prepared climate change adaptation plans within a two-year period.

To this end, the government will step up its communication and guidance for municipalities, individuals and enterprises by, for example:

Increased precipitation and higher sea levels

- The Ministry of the Environment will prepare guidelines to the municipalities for use when preparing climate change adaptation plans. This guidance will give concrete directions and sound advice on how the municipalities can climate-proof in their area. Moreover, this guidance will also advise municipalities on how to prepare local development plans incorporating climate change. An amendment of the Planning Act from 1 July 2012 has enabled these climate change local development plans.
- As a basis for the detailed risk assessment by the municipalities, the Ministry of the Environment will provide a uniform, nationwide mapping for the municipalities, including blue-spot maps. These will act as part of the basis for the municipalities' preparation of their climate change adaptation plans. The mapping will indicate the likelihood of flooding as well as assets that may be at risk.
- The Ministry of Defence will, as necessary, adjust data registration and reporting systems on emergency response efforts in connection with climate-related events. The overall Danish emergency response will thus continue to have an updated knowledge base. Adaptation of the systems will take place in close consultation with, for example, the municipal emergency services.
- With an ongoing audit of the environmental monitoring programme, the Ministry of the Environment will examine how the monitoring programme can highlight climate changes, including whether there is a need to incorporate additional indicators.

Planning

- In 2012, the Ministry of Transport will publish a handbook for climate change adaptation in coastal areas. This handbook will guide the municipalities in the preparation of the municipal climate change adaptation plans.
- The Ministry of Transport is developing a screening tool for coastal erosion, which will be available in 2013.

Building and construction

- For usage in property management etc., the Ministry of Housing, Urban and Rural Affairs will create an online tool, which will enable property owners and municipalities to map vulnerability to climate change of local areas and buildings.
- From 2012 to 2014, the Ministry of Transport will map the state-owned road and rail network using GIS screening, with a view to identifying locations at risk of flooding.
- The Ministry of Transport will, together with the police and other relevant authorities, identify a strategic road network to ensure that road users can reach their destination. This strategic road network consists of the roads that have the greatest socio-economic significance, and where the cost for society is high should traffic break down. Fixed diversion routes using existing roads will be identified, for example, to be used when redirecting traffic in the event of flooding.



Coastal protection of the Port of Aarhus Pier 4
(Photo: Aarhus municipality)

Nature and the environment

- The Ministry of the Environment will, in the future, ensure that climate changes are included in updates of the technical basis in the pesticides strategy for risk assessment of pesticides. In the future, efforts to develop models and methods for pests monitoring and warning will also be included in assessments of the consequences of climate change.
- The Ministry of the Environment will, in collaboration with the relevant authorities, identify issues and possible initiatives linked to climate change adaptation in Danish coastal areas. Primary focus is on nature, biodiversity and the aquatic environment.
- The Ministry of the Environment will launch a project that will, for example, collect experiences with green climate change adaptation solutions, and identify possible actions which simultaneously encourage biodiversity and climate change adaptation in urban areas.

Enterprises

- The government wishes to support companies in their efforts to prevent large and costly damages. The Ministry of the Environment will continuously develop new tools for www.klimatilpasning.dk, the Danish Portal for Climate Change Adaptation. In 2012, additional interactive tools will be developed that can be used to advise farmers and companies about prevention of the negative impacts of climate change in relation to property.



Urban renewal project involving climate change protection, Skt. Kjelds Kvarter, Copenhagen
(Visualization: Tredje Natur)

Initiatives in progress

Strengthened collaboration and coordination

The government coordinates the climate change adaptation efforts across sectors, authorities, the business community and individuals in order to achieve the best solutions.

Increased stakeholder involvement

Initiatives in the climate change adaptation area are based on an open and inclusive decision-making process that ensures forward-looking input and ownership of the common climate change adaptation efforts.

As an example, the Ministry of the Environment has carried out a pilot project in the climate change adaptation area under the slogan Dialogue on the environment – open ministry (Aktiv miljødialog – åbent ministerium). This broad, network-based stakeholder involvement has provided input for new legislation and helped create synergy between sectors.

Additionally, in 2012 the Minister for the Environment established and headed a national dialogue forum for climate change adaptation consisting of the main players from the business community, research institutions and municipalities. This forum advises the Minister for the Environment on the need for action and suggests practical solutions.

Cooperation forums

The Ministry of Transport works together with, amongst others, the municipalities in the Greater Copenhagen area, to tackle the traffic-related challenges in the area, in particular flooding of major approach roads. Similarly, an emergency response plan has been drawn up for the area around Ryparken Station in Copenhagen.

Under the auspices of the Road Regulation Council, the Ministry of Transport cooperates with municipalities, consultants, contractors etc. when, for example, preparing proposals for regulations and recommendations on how to solve climate change related problems.

In 2012, the Ministry of Transport and the asphalt industry established a working group to investigate the environmental consequences of using special types of asphalt, including those relating to climate change adaptation.

The Ministry of Transport also works together with coastal municipalities and other relevant authorities to ensure coordination and development of climate change adaptation efforts.

The Ministry of the Environment has launched a screening of state-owned land. The purpose is to identify areas which can be used to retain water and thereby contribute to reducing the risk of flooding in urban areas. The municipalities and relevant authorities at central-government level will have to work together on these efforts.

New funding for climate change adaptation

To strengthen the cooperation on climate change adaptation, in June 2012 the Ministry of the Environment granted a total of DKK 2.7 million to eight projects in which local collaboration partners create solutions for climate change adaptation. The municipalities and several other players are involved in these projects.

The Ministry of Housing, Urban and Rural Affairs has announced climate change adaptation as the theme for the allocation of pool funds for 2012, according to the preliminary provisions in the Social Housing Act and Urban Renewal Act. Which projects that will be granted funding will be announced at the end of the year. Projects on knowledge base and consultancy as well as green transition will also be considered.

Compilation of experience

Following the severe cloudbursts in Copenhagen on 2 July 2011, the Ministry of Defence has increased the pump capacity of the Danish Emergency Management Agency by approximately 20%.

Based on experiences from the cloudburst in Copenhagen on 2 July 2011, the Ministry of Health has intensified and enhanced dedicated consultancy concerning precautions aimed at reducing the health risks from flooding with sewage. The current revision of the reporting system for infectious diseases will include considerations concerning diseases that could be climate-related.

Initiatives planned

Strengthened collaboration and coordination

Efficient climate change adaptation demands a coherent climate change adaptation effort. Therefore the government encourages collaboration and knowledge sharing. Open communication and appropriate examples play an important role. The government will lead the way with a series of collaborative projects and encourage other parties to participate.

Stakeholder and collaborative projects

- In 2013, the Ministry of the Environment will hold a conference where the results from a series of collaborative projects that have contributed to strengthening cooperation and increasing knowledge sharing between municipalities and other parties will be presented.
- The Ministry of the Environment will launch specific collaborative projects with a number of municipalities that aim at retaining water in urban areas. These include a project in the forest Store Hareskov that protects against flooding in the adjacent residential area, government afforestation near the city of Slagelse and water retention from Gudenå river at Haslund Enge.
- In order to promote identification of new projects, the Minister for the Environment will contact mayors and encourage municipalities to participate in collaborative projects on state-owned land that the municipalities may use in their climate change adaptation efforts.
- The Ministry of Housing, Urban and Rural Affairs will provide grants to a small number of development projects in the climate change adaptation field which are linked to public and private housing in accordance with the preliminary provisions of the Social Housing Act and the Urban Renewal Act.
- In collaboration with the trade organisation Danish Insurance Association, the Ministry of Business and Growth and the Ministry of the Environment will set up a working group with the purpose of examining possible solutions for properties that are particularly vulnerable to flooding from extreme rain events.

- The Ministry of Housing, Urban and Rural Affairs hopes to inspire municipalities and other urban renewal parties to local actions that address climate and resource-related challenges in urban areas in the future. The Ministry will launch a communication project that includes a number of good examples of holistic, local solutions.
- The Ministry of the Environment will initiate a stakeholder project that is to identify the need for data and digital solutions. These solutions can be used by municipalities when preparing contingency plans in connection with climate-related emergency situations. The project is also to identify initiatives that can prevent emergency situations.

Campaigns for Climate Change Adaptation

- Based on recommendations from the national dialogue forum for climate change adaptation, the Ministry of the Environment has just launched a national campaign on climate change adaptation. This campaign will provide citizens with knowledge and advice on action to protect their homes against flooding in the event of, for example, heavy rain.
- In order to ensure increased emphasis on climate change adaptation in the collaboration between municipalities and social housing organisations, the Ministry of Housing, Urban and Rural Affairs will initiate a climate change adaptation campaign targeted at municipalities and housing organisations. The campaign encourages a review of challenges and initiatives for climate change adaptation in social housing.

Initiatives in progress

Green transition – growth and employment

The government will convert Denmark to a green economy. This will be achieved by promoting green growth enterprises when dealing with key challenges. This also applies to climate change adaptation.

Global opportunities

Climate change is one of the greatest challenges facing the world today. It affects, for better or for worse, all the populations of the world, who must adapt to a rapidly changing climate.

Denmark has a strong position in a number of areas that can make a significant contribution to climate change adaptation. In these, and new areas with a large export potential, the government will create the basis for continued technological and knowledge development, so that Denmark will have a strong position on the global market for climate change adaptation.

Innovation on the domestic market

The government has undertaken a series of climate change adaptation initiatives which contribute to green transition. An example is the agreement with Local Government Denmark on the municipal budgets for 2013. This agreement provides an increase in investments in climate change adaptation in the wastewater area of DKK 2.5 billion.

This will create more jobs now and at the same time will lead to a demand on the domestic market, which in turn supports the innovation and effectiveness of enterprises.

Public – private collaboration

The government wishes to promote the usage of public-private collaborations. The inclusion of competences from knowledge institutions and private enterprises can contribute to innovation of new climate change adaptation solutions.

In this way partnerships can play a part in increasing growth opportunities and the export potential of future investments in climate change adaptation. These investments could, for example, be a result of the agreement on the municipal budgets for 2013.

Through urban renewal projects under the Urban Renewal Act, the public sector leads the way with investments to initiate economic development in an urban area. To obtain state funding the municipalities have to cooperate with the private sector. In some areas, climate change adaptation is a collaborative theme. For example, in the urban area Skt. Kjelds Kvarter in Copenhagen, focus is on how surface water management involving private companies can create green growth and make for a better urban environment.

Existing initiatives

With the 'State of Green' initiative, Denmark aims at leading the way in the transition to a green economy. Central government collaborates with leading Danish companies and business organisations to sell Danish green solutions. Water and climate change adaptation is one of the focus areas where, for example, Danish technology for handling of flooding can be promoted.

The government's growth team for water, bio and environmental solutions, which includes representatives from the top of the Danish business community, has recently handed over its recommendations on improving the conditions for growth, to the government. These contain recommendations for promoting technological development within climate change adaptation. Similarly, the Danish Regions have established growth teams that contribute with regional experiences and recommendations to the government's growth teams.

The Environmental Technology Development and Demonstration programme (MUDP) has DKK 60 million to be allocated to projects in 2012, where climate change adaptation and water is one of five main themes. The aim is to assist Danish companies with regard to developing and demonstrating new environmental solutions.

In 2012, a climate change adaptation partnership with selected municipalities and wastewater utilities was established. These parties face great challenges, and will have to invest heavily in surface and wastewater management. The Innovation Foundation has earmarked a total of DKK 30 million for development and market preparation of new generic climate change adaptation solutions that can create increased growth and export in Danish companies.



Drainage grating at Fortunstræde, Copenhagen
(Photo: Mia Holmbo Lind)



Wetland area in the forest of Store Hareskov in northern Zealand
(Photo: Tobias Markussen)

Initiatives planned

Green transition – growth and employment

The government will ensure that climate change adaptation efforts contribute to transition to a green economy and thus create jobs now and in the future. This will be through collaboration with the business community, export drives and support schemes for development and promotion of new Danish technologies.

- The government has earmarked DKK 122.6 million for green technology in 2013. This funding will go towards development, test and demonstration of technical solutions with a significant market potential, including those within climate change adaptation.
- In the Finance Act for 2013, a further DKK 35 million have been earmarked for improved resource efficiency within waste and water, of which a portion can be allocated to promote Danish climate change adaptation solutions. The funding is part of a proactive effort to claim a share in the growing global markets for green solutions, and will be implemented as a follow up to the Ministerial committee for new business-and-growth policy.
- The government seeks to promote the use of public-private collaboration, and the Ministry of the Environment will therefore investigate whether there are appropriate opportunities to apply public-private collaboration in relation to wastewater treatment in the climate change adaptation area in Denmark.
- The government has earmarked DKK 8.3 million in 2012 to establish test facilities for water technology and climate change adaptation. The government has also earmarked a similar sum in the Finance Act for 2013.
- As a part of a green package in the Finance Act for 2013, a total of DKK 40 million has been allocated to a green transition fund. Some of these funds may be used to support innovative solutions for climate change adaptation in surface and wastewater management.
- Under the Environmental Technology Development and Demonstration Programme (MUDP) for 2012, the government will launch 34 projects within water and climate change adaptation totalling an overall investment of approx. DKK 34 million.
- The government will look at the possibilities to exploit commercially in international business projects the significant knowledge on climate change adaptation and water purification achieved in Denmark in connection with climate change adaptation efforts.
- The European Union has appointed Denmark to lead the China Europe Water Platform, which also includes climate change adaptation. The government's intention is that this cooperation can become a good platform for European enterprises aiming at the Asian market.
- The Ministry of the Environment is working towards creating international awareness of Danish solutions for climate change adaptation through the English version of the Danish Portal for Climate Change Adaptation. This will be achieved through articles on research, specific examples, tools, an English newsletter and via input to the European climate change adaptation portal 'Climate Adapt'.
- In collaboration with the Danish National Association for Building, the Confederation of Danish Industries and the Green Building Council Denmark, the Ministry of the Environment is testing, a certification scheme for sustainable land development, (DGNB), in a number of Danish construction projects. The criteria for sustainability include focus on climate change adaptation and, in the future, will contribute to clarifying the principles for water management in Danish urban areas.
- The Ministry of the Environment and the Ministry of Housing, Urban and Rural Affairs will, together with other relevant parties, launch a project to investigate the possibility of innovative climate change adaptation initiatives that could simultaneously create new opportunities for play and movement in urban areas.
- The European Union's environmental support programme LIFE+ includes the possibility to support innovative climate change adaptation and prevention projects. The Ministry of the Environment, together with the Ministry of Climate, Energy and Building, is working to give climate change adaptation a significant role in the Regulation for LIFE for 2014-20.
- The government will prepare a growth plan on innovative climate change adaptation solutions, amongst other things following a recommendation from the growth team for water, bio and environmental solutions.

Initiatives in progress

International climate change adaptation

Danish climate change adaptation efforts cannot stand alone. The challenges created by the changing climate also have consequences for our neighbouring countries.

Denmark is therefore working towards an ambitious climate policy in the European Union, United Nations and bilaterally, both in relation to adaptation to climate change, and also for limiting emissions of the greenhouse gases that cause climate change.

Worldwide

There are ongoing negotiations with the United Nations on the framework for effective climate change adaptation efforts that focus on how the industrialised countries can support the least developed and most vulnerable of the developing countries to adapt to climate change.

For many years, Denmark has been aware of the need for climate change adaptation, and has sought to climate-proof programmes and projects in bilateral development collaborations against climate change. Additionally, Denmark is giving extensive support to climate change adaptation bilaterally and multilaterally through international organisations.

Water is central to the climate challenge. At the Rio+20 Summit in June 2012, the government helped ensure that an agreement was reached that water management should promote sustainable development. This agreement will be central for continued global collaboration on management of water resources.

The European Union

The European Union has initiated work to prepare regional, climate change adaptation strategies, such as in the Baltic region, and to prepare a European Union climate adaptation strategy. In March 2013, the European Commission will present thoughts concerning the contents of the EU strategy. The strategy is expected to address the challenges to the European Union's neighbouring countries in relation to cli-

mate change, and the challenges across the European Union. The strategy will also provide an opportunity to adapt the European Union's external and internal policies in a number of areas so that they take into account the consequences of a changed climate.

The European Union's climate adaptation strategy is expected to focus on approaches to the impending climate challenges that result in innovation of new green technologies. In this way, the need for adaptation to the changed climate will contribute to the creation of new green jobs in Denmark and Europe.

During the Danish Presidency of the European Union, Denmark commenced negotiations concerning a new legal framework for the European Union for strengthened collaboration in the emergency preparedness area. The purpose of the Act is to strengthen cooperation, so that the European Member States can contribute when a specific country is unable to deal with the consequences of anthropogenic or natural disasters. Denmark has worked for a simple and resilient system. It is expected that the new Act will enter into force from 2014.

The European Union has for some time focused on the challenges linked with water. As part of future efforts, the European Union has plans to establish a European innovation partnership for water, including initiatives such as the creation of innovation centres with demonstration facilities.

To understand and meet climate challenges requires coordination of individual countries' research and innovation efforts at European level. The JPI (Joint Programming Initiative) is a European initiative concerning coordination of Member States' research funding. Denmark participates in JPI Climate, and the government is striving for a research agenda in JPI Climate that supports the most significant Danish and European knowledge requirements.



Canals in Ørestaden, Copenhagen
(Photo: Mia Holmbo Lind)

Work is also in progress to shape the European Union's research and innovation strategy up to 2020 (Horizon 2020), and climate and climate change adaptation are amongst the challenges that the research programme will support.

Denmark is taking part in a number of European Union collaborative projects, in such fields as transport and coastal protection.

The Ministry of Transport has participated in a European project in which a tool for the identification of stretches of road vulnerable to heavy precipitation has been developed. This tool will now be used in Denmark for a nationwide mapping of vulnerable areas in the national road network.

In the health sector, WHO Europe is preparing information and knowledge about health and climate change adaptation. The Ministry of Health is using this knowledge in Danish consultancy on health aspects of climate change adaptation.

Bilateral initiatives

With the BRIC strategy (Brazil, Russia, India and China), the government has launched a process that is to result in a survey before the end of 2013 of the competences and techno-

logies of Danish companies in relation to water. In extension of this survey, it will be possible to enter into bilateral agreements on establishing water projects.

For several years, Danish development collaboration has affected sectors of key significance for tackling climate change in developing countries. Over a number of years, Denmark has implemented climate protection of bilateral development activities, and the government will continue to assist the least developed and most vulnerable developing countries in their efforts to prepare for climate change.

The Ministry of the Environment is taking part in collaboration with Germany and the Netherlands on climate change adaptation of the Wadden Sea, where the unique nature and low-lying towns are under pressure as a result of climate change.

Through the Nordic Council of Ministers, Denmark has contributed to Nordic collaboration and knowledge-building in Nordic networks within research into climate change adaptation, through the top-level research initiative – Impact studies and adaptation to climate change ("Effektstudier og tilpasning til klimaændringer").



Green infrastructure in Ørestaden, Copenhagen
(Photo: Mia Holmbo Lind)

Initiatives in progress

International climate change adaptation

The government will encourage intensive international work in relation to climate change adaptation. This applies in the European Union and United Nations as well as in Denmark's bilateral collaborations.

The government will therefore take a series of initiatives, at international and European level, which can also contribute to strengthening Danish climate change adaptation efforts.

Global initiatives

- In extension to RIO+20, the government will work to ensure that specific, global objectives are set for the water area, which contribute to environmentally, socially and economically sustainable use of water resources.
- The government will support Danish exports to the BRIC countries by entering into bilateral agreements on at least two large water projects in the BRIC countries before the end of 2015.
- The government will set up a climate investment fund (KIF), which will utilise investment and consultancy to promote climate investment with Danish technology in developing countries. These investments may include both climate change adaptation and reduction of CO₂ emissions. The climate investment fund will be administered by the Investment Fund for Developing Countries.

European Union initiatives

- The government will work to ensure that the European Union's climate change adaptation strategy complements and supports national initiatives, including through funds from the future European Union budget, as well as agendas that can contribute to promoting focus on climate change adaptation in Denmark and Europe.
- In extension of the European Commission's proposal for future strategy, the government will work to ensure that existing partnerships with third countries and regions are adjusted so that they take climate change into account.

- The Ministry of the Environment will work to influence development by the European Commission of the European water strategy (Blueprint to Safeguard Europe's Waters), and to create consistency between the water strategy and the European climate change adaptation strategy.
- Linked to the European water strategy, the European Commission has taken initiative to establish a European water partnership (European Innovation Partnership on Water), in which the Ministry of the Environment is actively involved.
- The government will work to adjust the European Union's internal policies, so that they take into consideration changes in conditions as a result of climate change. This applies to such areas as the common fisheries policy, agricultural policy and the cohesion policy.
- The government will work to ensure that a future European Union strategy promotes green innovation and opportunities. This could, for example, be through funding research and development or demonstration projects for climate solutions.
- The government will work to ensure that the European Union locates at least one innovation centre in Denmark, as part of the European Union's plans to establish a European innovation partnership for water.
- The government will work for broader and more flexible funding opportunities, so that, for example, the Rural Development Programme can support Danish efforts for nature, the environment and climate. The government will work to ensure that the Rural Development Programme is able to support Danish implementation of requirements under the Water Framework Directive, the Natura 2000 directives and forthcoming obligations within the climate and environmental area.

How to manage cloudburst and rain water

Action plan for a climate-proof Denmark

2012/2013 : 13

Queries about this publication

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Electronic publication

978-87-7279-593-5

Design

e-Types & India

Front-page photo

Polfoto

Printing

Rosendahl Schultz Grafisk A/S

Web

The publication can be downloaded from
nst.dk
klimatilpasning.dk



