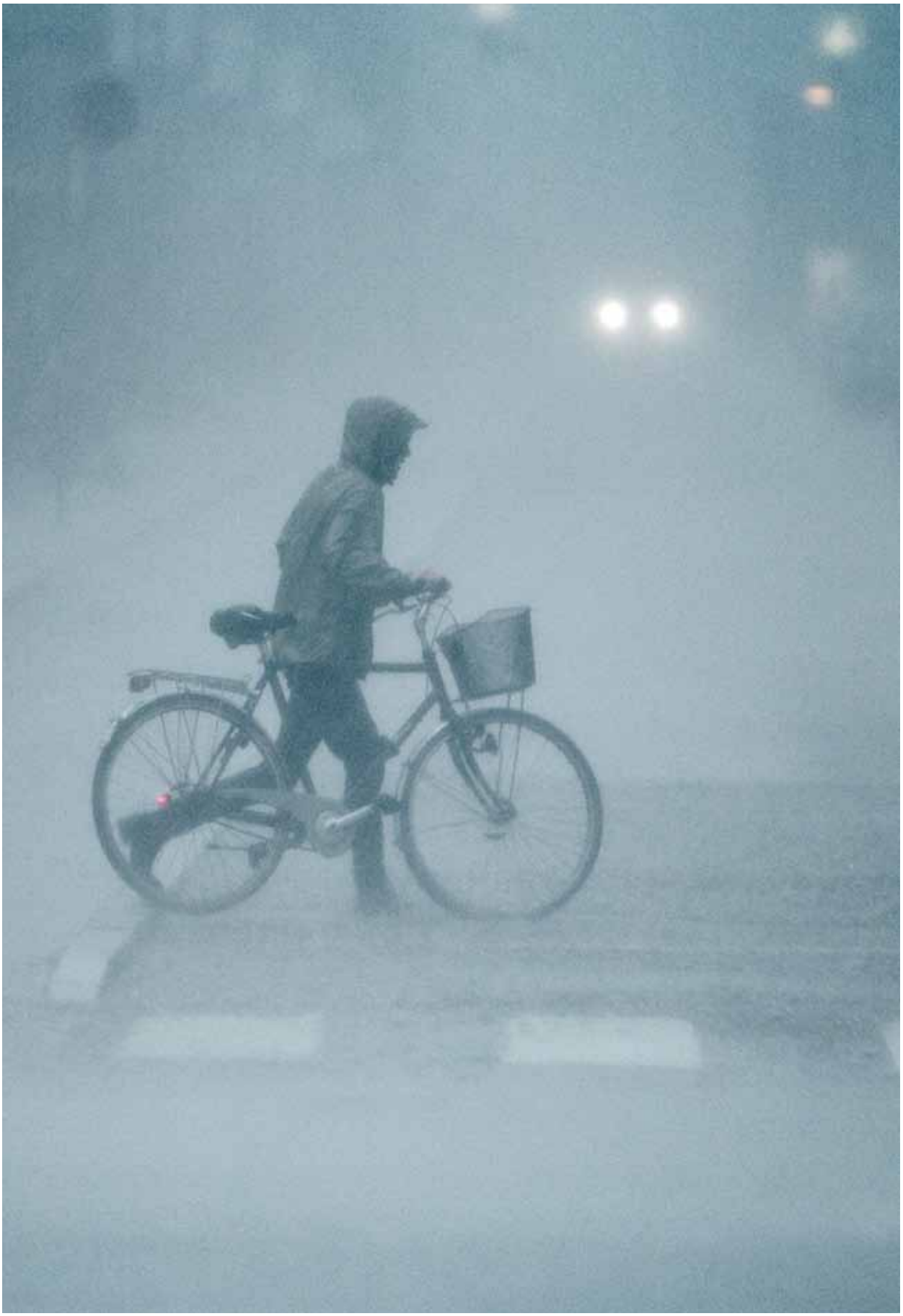
Copenhagen
Carbon Neutral
by 2025

OCTOBER 2011

COPENHAGEN CLIMATE ADAPTATION PLAN

CLIMATE CAPITAL
COPENHAGEN



COPENHAGEN MUST BE EQUIPPED FOR THE WEATHER OF THE FUTURE

We cannot get away from it: the climate is changing, and in the future we will get more rain, higher sea levels and warmer weather. This presents Copenhagen with a number of challenges. If we wait to deal with them, it will become expensive, and coming generations of Copenhageners will have to use a lot of resources in order to avoid seriously damaging our city. With this plan, we are meeting the challenges now. Doing this in good time will help us to keep expenses down as well as offering us a number of exciting possibilities. Climate adaptation can contribute to giving us a greener city as well as more growth and more jobs. In other words, we must exploit the climate challenges positively, by acting in a way which will please both citizens and businesses – not just in 50 years time, but here and now. Amongst other actions we take, we must cope with the larger quantities of rainwater and ensure a pleasant climate by means of green roofs and facades and more trees as well as green and blue areas.

We have already had excellent experiences with using the challenges we face to provide more opportunities for Copenhageners. The popular harbour swimming pools are the result of persistent efforts to deal with rain water, so that it does not contaminate the harbour waters along with the waste water. The cleanliness of the water in the harbour has attracted international attention and by focusing on climate adaptation, we will gain even more experience in the future about how to develop and adapt solutions which will benefit other cities as well as putting Copenhagen on the map.

This plan is our starting point for incorporating the necessary climate adaptation into our thinking in all areas of the city's development in good time. So, climate adaptation and the development of an attractive and green major city will become two sides of the same coin.

Mayor, Technical and Environmental Administration
Ayfer Baykal

COPENHAGEN, READY FOR THE CLIMATE OF THE FUTURE

There is a connection between the increasing temperature on the earth and the increase in the concentration of CO_2 which human activity has caused. Researchers today have no doubt about this. Even though changes take place on a global scale, climate changes will have a number of consequences for Copenhagen, irrespective of how much we succeed in restricting CO_2 emissions. This gives us some concrete challenges which our city must already take a stance about now.

In the Climate Adaptation Plan, we assess which challenges are the greatest and where, as a city, we can derive the greatest benefit by taking action now and in the coming years. At the same time, we are looking at how measures which are necessary to adapt Copenhagen to the future climate, can be of pleasure and benefit to the city here and now. So, climate adaptation in Copenhagen must not be designed to meet only the concrete challenges which the climate brings. Different measures can at the same time contribute to the creation of more recreational opportunities in the city, new jobs and a greener capital.

The comprehensive initiative of adapting the city to the climate will create a demand for new technology. At the same time, measures and technology must be adapted to the situation in Copenhagen. That can create special solutions for Copenhagen which will help boost the development of climate adaptation technology. For these reasons, climate adaptation must be a part of the Green Growth Strategy for Copenhagen. By including a green growth perspective in our thinking, it is our ambition that investments can be made in partnership with external investors. This can contribute to investments being not just an expense for the city but also a way to create growth and employment, as well as attracting new knowledge and new business to the city.

HOW CAN WE BEST ADAPT COPENHAGEN TO CLIMATE CHANGE?

Calculations and forecasts in this plan are based on the best available knowledge of the climate. If however, we attempt to foresee what will happen in 100 years, there is, by the very nature of things, some uncertainty. For this reason, the plan will be revised on an ongoing basis to that initiatives are adapted to technological development and take place step by step, so that the measures we initiate constantly reflect the latest knowledge.

When we adapt Copenhagen to climate changes, we must do it in such a way that best exploits the resources. There is a big difference in the value of the assets which will be lost in for example, a flood. These could be anything from unique cultural buildings to warehouses. This difference must be taken into account in the prioritising of the initiative, so that assets which are of most value to society are given top priority. The guidelines and recommendations which the Climate Adaptation Plan lays down must be incorporated into the Municipal Plan in such a way that climate adaptation becomes a natural part of Copenhagen's development.

THE THREE LEVELS OF CLIMATE ADAPTATION

If the risk of damage resulting from the climate is unacceptably high, it is the strategy of the City of Copenhagen to choose first and foremost those initiatives which prevent the damage. This is climate adaptation level one, where you can find, amongst other actions, the building of dykes, building higher above sea level, the expansion of the sewers' capacity and local management of rainwater.
If it is impossible, for either technical or financial reasons, to prevent the damage, those initiatives which

minimise the extent of the damage will be prioritised. This is level two, where you can find warning systems for rain, establishing waterproof cellars and adapting areas where rainwater can be stored.

Those measures which reduce the city's vulnerability have the lowest level of priority – three. This includes, amongst other measures, equipping cellars so they can cope with flooding and being prepared with pumps.

The strategy for climate adaptation in Copenhagen must ensure:

- timely care
- no inappropriate investments
- that investments are recouped as part of a development in green growth
- largest possible synergy with other planning measures
- flexibility in relation to changes in forecasts of the future climate
- that at the same time, climate adaptation measure in themselves offer quality for the citizens and businesses in the city
- that the adaptation is carried out based on technically high-level analyses
- that a general management of climate adaptation in the city takes place

The goal of the Climate Adaptation Plain is to position us so we can choose the right places to act and the most appropriate measures, so that Copenhagen will be a safe and attractive major city to live in and invest in, in the future as well.

The growth of the city takes place over a long period of time. We replace about 1% of the buildings each year, so it is important that we incorporate climate adaptation now when buildings are replaced to ensure that the city has been adapted one hundred years from now.

MORE AND HEAVIER RAINFALL

Most people have probably noticed that there have been heavier downpours over the last few years. This trend will continue in the future. Meteorologists expect that precipitation will increase by 25-55% during the winter and will decrease by up to 40% in the summer. The heavy downpours typically occur in late summer and are usually accompanied by thunder. Thundery showers will become 30-40% heavier while at the same time there are longer periods of drought between them.

The changes will have considerable significance for Copenhagen. In particular, the heavy summer rain will create more extensive floods if nothing is done. In Copenhagen, we experienced just such a heavy downpour on 14 August, 2010 and on 2. july, 2011. This resulted in many flooded cellars and streets, including Lyngbyvej (a major road into Copenhagen). In the future, rainy weather like this will be more frequent. Even though sewers are large, their capacity is limited. For this reason, floods will also occur in the future. The City Council has decreed that water must only flood in this way once every ten years on average. Today, the sewers meet this requirement to a large degree but they cannot meet a future increase in water of 30-40%.

IF WE DO NOT MAKE CLIMATE ADAPTATIONS – A SNAPSHOT

IT HAS BEEN RAINING HEAVILY IN COPENHAGEN AND A YOUNG COUPLE WHO LIVE IN A FLAT ON THE SECOND FLOOR DISCOVER THAT THEIR CELLAR HAS BEEN FLOODED. FOR FOUR DAYS, THEY HAVE NO ELECTRICITY OR INTERNET CONNECTION SINCE ALL THE MAIN TECHNICAL OPERATIONS FOR THEIR STAIRCASE ARE LOCATED IN THE CELLAR. SEVERAL OF THE NEIGHBOURING BLOCKS ARE IN THE SAME SITUATION, WHICH MEANS THAT THEY HAVE TO WAIT BEFORE THEY CAN GET A TECHNICIAN OUT TO HELP THEM.

AS WELL AS THE COUPLE HAVING A LOT OF THEIR POSSESSIONTS DESTROYED, WHICH THEY HAD STORED IN THE CELLAR, THE WOMAN IS SELF-EMPLOYED AND WORKS FROM HOE, AND SO HAS TO VISIT FRIENDS, FO TO A CAFÉ OR A LIBRARY IN ORDER TO DO HER JOB.

BUT THE IDEA BEHIND THIS CLIMATE ADAPTATION PLAN IS THAT THE YOUNG COUPLE WILL AVOID DAMAGE IN THE FUTURE BECAUSE THEY HAVE TAKEN THE TROUBLE TO SECURE THEIR BLOCK.

THIS IS HOW WE WILL SECURE COPENHAGEN AGAINST RAINY WEATHER IN THE FUTURE

In the future, there will be more frequent and more serious floods, which could have serious financial consequences for Copenhagen if we do not intervene in time.

For this reason, three methods must be used for Copenhagen to adapt to heavier rainfall in the future. In practice, you will need to use a combination of the methods, depending on the local conditions.

METHOD 1: WE MUST HAVE LARGER SEWERS, UNDERGROUND BASINS AND PUMPING STATIONS

Today, the drainage network is full to the brim. New drains must be laid throughout the city in order to create extra capacity. It will cost DKK 10-15bn if they are laid throughout the whole municipality. There will be an additional 3-5bn outlay to separate rain and waste water in the individual dwellings. Finally, there will be so much excavation in the city that traffic and commercial life will be affected over a long period of time. For these reasons, the Climate Adaptation Plan recommends Method 2 in all places where it is feasible.

METHOD 2: WE MUST MANAGE RAINWATER LOCALLY INSTEAD OF GUIDING IT INTO THE SEWERS

In our society, rainwater is considered something we must get rid of. Water is however, also a resource we cannot do without. So, there us much to be gained

Extract of a map showing where flooding can occur when rain which statistically comes once a century hits Copenhagen in 2110.

by using rainwater to make the city a better place to live in. This can be achieved by managing rainwater locally with the help of green, low-tech solutions which can absorb the rainwater or clean in. Such solutions are called SUDS (Sustainable Urban Drainage Systems). By managing rainwater locally, we can minimise the amount of rainwater in the sewers so that it does not become necessary to excavate and lay down large pipes etc. This can be achieved by investing DKK 5bn and is thus much cheaper than Method 1. This method will be adopted throughout the whole municipality, not only where rainwater gives obvious problems.

IF WE DO NOT MAKE CLIMATE ADAPTATIONS – A SNAPSHOT

ONE NIGHT THERE IS A VIOLENT RAINSTORM. A COUPLE WITH TWO SMALL CHILDREN WAKE UP IN THEIR HOUSE TO DISCOVER THEIR CELLAR HAD BEEN FLOODED AND THEIR GARDEN IS NEARLY TOTALLY UNDERWATER. LATER IN THE MORNING IT STARTS RAINING MORE HEAVILY AND THE RAINWATER BEGINS SEEPING INTO THE LIVING ROOM. THE FAMILY DECIDES TO TAKE THEIR VALUABLES AND MOVE OVER TO HER FAMILY.

THE NEXT DAY THEY GO BACK TO LOOK AT THE DAMAGE. THEY BOTH HAVE TO TAKE TIME OFF WORK AS THEY NEED TO GET AN OVERVIEW OF THE DAMAGE. THEY CONTACT THE INSIRANCE COMPANY AND THE REPAIRMEN BUT IT TAKES TIME TO REPAIR THE SUBSTANTIAL DAMAGE WHICH THE RAIN HAS CAUSED. THE COUPLE DOUBT IT THEY WILL EVER BE ABLE TO SELL THEIR HOUSE AS IT IS SITUATED IN AN AREA WHERE THERE IS A RISK OF MORE FLOODS.

BUT THE IDEA BEHIND THIS CLIMATE ADAPTATION PLAN IS THAT THE FAMILY WILL BE ABLE TO SLEEP EASY IN THEIR BEDS WHEN IT RAINS IN THE FUTURE BECAUSE THEY HAVE TAKEN THE TROUBLE TO SECURE THEIR CELLAR.

In such a case, Copenhageners can also help to make a real difference: a back yard or back garden with grass or trees instead of concrete or tiles can, taken together, mean fewer problems with too much rainwater in the city.

METHOD 3: WE MUST ENSURE THAT FLOODING TAKES PLACE ONLY WHERE IT DOES LEAST DAMAGE – SO-CALLED "STORMWATER PLAN"

It will not be an adequate measure, even if a part of the rainwater is kept away from the sewers during heavy rains. Water on the streets, in the squares and so on will be more common in the future as more rain begins to fall. Today, we see that heavy downpours result in traffic grinding to a halt, cellars being flooded and valuable properties being lost. By using simple methods, we must guide the water to those places where it does no damage. This could be to car parks for example, playing fields and parks. This method is only relevant in those areas where the floods start.

With the Climate Adaptation Plan, the basis has been developed on which to decide how rainwater shall be managed in Copenhagen in the future.

THE PLAN FOR COPENHAGEN

Rainwater should be managed locally throughout the whole municipality, so the strain on the sewer system is kept to a minimum. The problem of floods from heavy rain is to be solved by channelling the water into areas where it causes no damage. A number of studies will be conducted in the coming years checking closely each individual neighbourhood to find the best local solutions. These solutions must be incorporated in the City of Copenhagen's Waste Water Plan.

SEAS ARE RISING GLOBALLY

When global temperatures rise, temperatures rise in the world's oceans too. The heated seawater expands, causing the water level to rise. Based on the current estimates, we expect that the sea around Copenhagen will rise by up to one meter over the next hundred years. If this happens the water level during a storm will be even higher than we experience during a storm today.

Storm surges may result in temporary high tides in certain areas of Copenhagen. This means that in the future, we could experience serious damage to the city from floods, if we are not properly prepared.

In the Climate Adaptation Plan, a series of flood calculations has been made showing how various degrees of high water levels affect Copenhagen. The calculations provide a picture of which damage floods can do to the city, and also the cost level which may accompany them. This makes it possible to assess how we can most effectively and economically meet the challenges which flooding from the sea could mean for Copenhagen in the future.

Future storm surges and accompanying floods could create such significant costs for Copenhagen that it could be really worthwhile securing the city against them. If the city is not secured in any way, total damage costs will be DKK 15-20bn over the next 100 years. Calculations of damage costs include factors such as damage to buildings, damage to infrastructure and lost earnings.

Copenhagen can be protected against the risk of future high tides. The price of security is about DKK 4bn over the next 100 years. For these reasons, if the climate changes as we expect, it may be worthwhile to secure the city in preference to doing nothing. The net savings achieved by securing Copenhagen will be in the region of DKK 16bn.

The question as to whether irreparable damage is done to our cultural heritage in situations such as high tides should also be taken into consideration. In this way it is not only the economic damage that is considered when deciding how Copenhagen should be secured against flooding. Expenses and operation of facilities to protect the city against high tides is not only a municipal matter but a cost which should be shared between the affected players, including the state and property owners who are protected against flooding.

IF WE DO NOT ADAPT TO THE CLIMATE – A POSSIBLE FUTURE SCENARIO

THE SEA AROUND COPENHAGEN HAS RISEN ONE METER, WHICH MEANS THAT WHEN THERE IS A HEAVY STORM, THE WATER WASHES IN OVER THE CITY, RUNS ALONG THE QUAY AND OUT INTO THE STREETS WHERE THE LARGE VOLUMES OF WATER CAUSE DAMAGE TO ROADS, HOUSES AND CULTURAL MONUMENTS.

BUT WITH THE CLIMATE ADAPTATION PLAN, WE ARE PROPOSING THAT COPENHAGEN MUST BE PROTECTED AGAINST THE RISING SEA WATER, SO OUR INFRASTRUCTURE WILL CONTINUE TO WORK IN THE FUTURE.

Map of how and where high tides of 226cm over sea level will flood Inner Copenhagen – a high tide which could statistically come every 20 years in 2110.

THIS IS HOW WE WILL SECURE COPENHAGEN AGAINST FLOODING FROM THE SEA

Changes in sea water levels take place slowly. We expect that the risk of serious damage to Copenhagen as a result of rising seas will first begin to change significantly in about 30 years. But by that time, it is likely that flooding from the sea will be expensive for Copenhagen if we are not properly prepared. For this reason, preparations are starting now. It takes time to find the right solutions, and the sooner we start the easier it will be to implement the necessary actions in conjunction with other construction projects, so we can keep costs down.

Climate changes do not take municipal boundaries into consideration, to the problems will not be solved by managing climate changes within one municipality since this would create the risk of the problem simply being displaced somewhere else

THE PLAN FOR COPENHAGEN

Work is going on with a proposal to build a dyke at North Harbour (Nordhavn) and Kalveboderne, while the rest of the coastline out towards the Sound (Øresund) is raised. Dykes need to be built so that they secure the city from storm surges, without at the same time disrupting operation of the port. It is possible to guard against floods in areas outside a dyke by securing buildings and vulnerable installations on a local basis.

Protecting the city can also be achieved by raising the height of the wall along the whole of the inner part of Copenhagen Harbour and along coastal regions. This solution, however, will mean fewer opportunities to develop the port and use it for recreational purposes, and so is not the best solution.

VARMER WEATHER

In the future, we expect a rise in temperature of two to three degrees. This sounds immediately attractive, but more extreme weather with more frequent, longer and more intense heat waves may well come to influence Copenhageners' health and wellbeing.

We can expect more expenses as a result of restricted work, the need to cool buildings and increased health care costs.

THE HEAT ISLAND EFFECT

The population density is higher in cities, there is less vegetation, and there are many hard surfaces such as buildings and squares. This means that some areas in cities hold more heat than the surrounding area, and the surface temperate in cities if therefore higher. This phenomenon is called the heat islands effect and occurs in large cities throughout the world. The rising temperatures which accompany climate changes will offer more challenges in relation to the heat island effect.

The combination of prolonged heat waves and formation of heat islands makes it difficult for people and animals to maintain a comfortable body temperature. This is especially because the heat island effect means that the city cools off more slowly at night. Measurements of surface temperatures in Copenhagen show that in periods of heat waves, surfaces will be much warmer in those neighbourhoods with the largest number of hard surfaces and fewest green spaces. In the future, when we experience more heat waves, this might mean an unpleasant and, in some cases, harmful urban climate.

THIS IS HOW WE WILL ENSURE A PLEASANT URBAN CLIMATE IN THE FUTURE

Today, we do not consider the heat island effect as a major problem because there are very rarely prolonged heat waves in Copenhagen, when the temperature exceeds 25-28 degrees. More frequent and more intense heat waves in the future however, may pose particular challenges, amongst other reasons because of the heat island effect. For this reason, the Climate Adaptation Plan recommends that when the city's physical framework is renewed and developed, we must take precautions against the effect of high temperatures in the future, amongst other options by taking into consideration the use of water, shade, air circulation and considerations about balanced surface temperatures. Long-term, prophylactic efforts can contribute to minimising future damage to health and costs to society.

THE PLAN FOR COPENHAGEN

Trees and green surfaces, together with water can have a cooling effect. If the green and blue, such as trees, green roofs and facades, parks, gardens, lakes and streams have more space in the city, it helps keep the city's surface temperatures at an acceptable level.

In further work on adapting the climate of Copenhagen, it is important to track how the temperature develops as well as the city's surface temperatures. At the same time the 'level of greenness' in Copenhagen must be checked to meet and prevent the challenges that may follow with more frequent, longer and more intense heat waves.

CHANGE IN THE GROUNDWATER LEVEL

Future climate changes will probably also affect our groundwater. Calculations in the Climate Adaptation Plan indicate that there will be increases in groundwater levels in Copenhagen right out by the coast, while there will be a small decrease in groundwater level in the rest of the municipality. The increased water level along the coast and harbour front is due to the rising sea water: This increase will be felt a short distance inland.

Further inland, according to calculations made in the Climate Adaptation Plan, the groundwater level will be unchanged or will fall. The reason is that less groundwater is created when the temperature rises, and when the rain comes in fewer but more intense downpours.

The rising groundwater levels on the coast and along the harbour could eventually cause problems for buildings and constructions. Additionally, the opportunities to extract drinking water may diminish in the longer term, as salt water from the coast creates a pressure, and less fresh water is created further inland.

THIS IS HOW WE WILL MANAGE THE CHANGE IN THE GROUNDWATER LEVELS

On the coasts, where the groundwater level rises, it may be necessary to secure existing buildings against the rising water pressure on their foundations. New buildings and new urban development areas must be geared to future groundwater levels. Sewer pipes and other underground infrastructure must also be secured.

A GREENER COPENHAGEN IS BETTER EQUIPPED FOR THE CLIMATE OF THE FUTURE

The work on climate adaptation gives Copenhagen a unique opportunity to develop the city in such a way that it continues to be of the world's most liveable cities. By choosing solutions that improve the city's physical environment and create attractive urban spaces where you spend time, travel and enjoy various experiences, climate adaptation work can be used to raise the quality of life for Copenhageners.

The recommendation in the Climate Adaptation Plan is that the city's green areas should equip Copenhagen for tomorrow's weather. A long-term, broad and focused commitment to a greener Copenhagen should be a prophylactic investment in a climate safe Copenhagen. A green approach may have a broad and wide multidimensional effect, and can solve several problems of climate adaptation, as well as improving Copenhageners' health and well-being. If this green approach is incorporated now, we are ensuring that the city is prepared in time.

It is a cornerstone of the Climate Adaptation Plan that investment be made in a flexible approach to climate adaptation which can be developed gradually over the next many years. Climate adaptation work must not only focus on minimising the risks in future climate change, but also ensure that all options for developing Copenhagen in a positive direction are exercised. Flexible climate adaptation therefore requires interdisciplinary solutions, where all aspects of climate adaptation and prophylactic initiatives are included. Each time we consider which measures are required to meet a challenge, we must also consider the options for developing the city in a sustainable direction which will benefit Copenhageners.

Copenhagen is a green city, thanks to many years of sound planning and urban renewal. So, it also makes good sense to use and build on the city's green qualities when the city is adapted to the climate. In the city as it is today, it is primarily a question of improving the existing green spaces and blue areas and supplementing these by, among other measures, creating coherent green links between the city's green and blue areas. In those areas where the city is being developed, it is a matter of bearing in mind the green and blue solutions from the start. Climate adaptation in green and blue areas is very much a question of content and quality and of using the areas as one of the tools to prevent storm water flooding, to ensure an ongoing, pleasant, urban climate and diverse, urban natural environment.

Green and blue areas include private gardens, backyards, allotments, public parks, areas of natural interest, green sports fields, lakes, rivers and streams, cemeteries and green transport links. More green and blue initiatives and solutions in Copenhageners' gardens or backyards also contribute in this way to Copenhagen continuing to be a pleasant city to live in.

The city's green spaces and blue areas have many life-giving functions and are important for an ongoing high quality of life in Copenhagen.

The green options

- **reducing and preventing storm water flooding by absorbing and holding rainwater**
- **moderating and balancing temperature**
- **providing shade and air circulation, which helps reduce the city's future energy consumption on cooling buildings**
- **addressing and reducing air and noise pollution**
- **preventing stress and allowing for recreational experiences**
- **providing a home for animals and plants**

THIS IS HOW WE ARE USING THE GREEN AND THE BLUE TO ADAPT COPENHAGEN TO THE CLIMATE

We must start where the city is developing and changing and where the need is greatest. This can be done by focusing on areas where there is increased risk of flooding or other challenges posed by climate change and on public buildings and land eg, kindergartens, schools, homes for the elderly, community centres and parks). In addition, we must prioritise projects and measures which will be a source of new knowledge and inspiration for the city.

Work in the coming years will be about taking into consideration rainwater collection, seepage, biodiversity and prevention of heat islands simultaneously, in the work to establish a greener city.

- WE MUST PRESERVE AND CARE FOR THE CITY'S EXISTING GREEN AREAS
  Copenhagen has many parks of great value, areas of natural interest and private and public green areas and gardens. Changes and improvements must contribute to climate adaptation of the city, highlighting the identity of individual sites and offering interesting and valuable experiences and activities to Copenhageners.

- WE MUST SUPPLEMENT THE CITY WITH MORE GREEN AND BLUE SURFACES
  Trees, green roofs and facades, water gardens and underground basins, gardens etc. can contribute to adapting the city to the climate while revitalising the schools, institutions, backyards, public spaces, streets or neighbourhoods at the same time.

- WE MUST CREATE COHERENT GREEN NETWORKS IN THE CITY
  A coherent, green network can locally for example, consist of trees, green roofs and facades, gardens,

beds and green backyards. For the city as a whole, it is about creating coherence between the city's large green spaces and blue areas. The green networks can contribute to creating attractive links between Copenhageners and their natural surroundings, contributing to the local dissipation of rainwater and improving the urban climate.

THE CLIMATE ADAPTATION OF COPENHAGEN IS AN OPPORTUNITY FOR GREEN GROWTH

Climate adaptation raises a range of new challenges for the city. In particular, challenges caused by rises in sea level and increased rainfall provide an occasion to explore new opportunities and lead the way in the development of new methods of climate-proofing a modern major city. This also means new opportunities for developing Copenhagen. Climate adaptation of the city can promote Copenhagen as a showcase for green growth and help to generate new knowledge and new professions. This could happen, amongst other ways, through the relatively large investments associated with the plan, making Copenhagen an attractive partner and creating an opportunity to position the city internationally.

In the Climate Adaptation Plan, four platforms are defined where the climate adaptation of Copenhagen covers potential for development and growth. The four platforms are: knowledge and skills, networks and partnerships, public regulation and planning, and financing.

KNOWLEDGE AND SKILLS

Through the work on climate adaptation, Copenhagen has been building up knowledge and expertise in climate adaptation, innovation and growth. This is the case partly because climate adaptation creates a need for interdisciplinary knowledge and interdisciplinary collaboration with research and industry on specific initiatives and selected demonstration projects.

NETWORKS AND PARTNERSHIPS

Climate adaptation is an opportunity to benefit from existing networks and partners, creating new relationships between scientific, technical and business networks and increase the dialogue across the administrations in the City of Copenhagen.

PUBLIC REGULATIONS AND PLANNING

Climate adaptation provides the chance to assess the opportunities and obstacles in legislation, in dialogue with municipal and government institutions.

THE ADAPTIVE CAPACITY OF THE CITY OF COPENHAGEN

Knowledge and skills	Networks and partnerships	Public regulation and planning	Financing

FINANCING

Future investments which are linked to the Climate Adaptation Plan mean that we must examine financing options and assess market potentials and strengths. This could for example, be a matter of developing computer models and analyses of business cases. In this way, Copenhagen can gain new knowledge and experience by financing climate adaptation in an appropriate manner.

Overall it makes good sense to think about the activities originating in climate adaptation as a part of the Cit of Copenhagen's Green Growth strategy.

PERSPECTIVES FOR CLIMATE ADAPTATION IN COPENHAGEN

Even if we succeed in reducing the emissions of greenhouse gases, we will experience climate change because of the amount already released. Climate change if happening gradually, and the Climate Adaptation Plan analyses show that during the next 30 years comprehensive measures must be enacted in order to adapt to the climate change in Copenhagen.

In the short term, we must immediately initiate measures to prevent damages resulting from intense rainfall, such as the downpour that hit Copenhagen in August 2010 and 2. july 2011. In the longer term, rising sea levels mean that floods from the sea will be a greater threat to Copenhagen. Even though the threat is not great today, it is crucial to decide how to secure Copenhagen against storm surges and flooding that may accompany them. The initiatives we choose, will be very significant for the city's development and should already now be incorporated into the development plans for the city.

Climate change will also affect temperate in the city in the long term. It is expected that we will experience stronger and longer lasting heat waves, which may affect public health and create a greater need for cooling. A number of other areas such as groundwater, air quality and biodiversity will also be affected. Challenges must, as far as possible, be resolved in a way that benefits the city, such as providing recreational facilities. At the same time, the solutions must be implemented so that they fit together with the city architecture.

Substantial investment and thorough planning are needed to meet the challenges that the changes in climate will face Copenhagen with. But by acting in time, we can minimise the expense of preventing and repairing damage, and climate adaptation can help to create green growth for Copenhagen.

The work is not complete with this plan. There are many uncertainties associated with how climate will develop in the future, and so the plan should be updated continuously so that it always reflects the latest knowledge. This edition of the Copenhagen Climate Adaptation Plain is a starting point to adapt Copenhagen to the climate of the future so that in the future too, Copenhagen will be an attractive major city, adapted to the climate.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