



Copenhagen
Carbon Neutral
by 2025

CPH 2025 CLIMATE PLAN

A GREEN, SMART AND
CARBON NEUTRAL CITY



CPH 2025





CPH 2025

PREFACE BY THE LORD MAYOR OF COPENHAGEN AND

THE MAYOR OF TECHNICAL AND ENVIRONMENTAL ADMINISTRATION



Copenhagen wants to be the world's first carbon neutral capital in 2025. This is an ambitious plan requiring long-term action, but it is realistic. We are already well underway. In 2011, Copenhagen had reduced CO2 emissions by 21% compared to 2005.

This plan shows how: we need to construct wind turbines and convert the energy supply, all Copenhageners must use their bikes more, we will purchase buses that operate on electricity and biogas, buildings in Copenhagen must be energy retrofitted, we will invest in solar energy – plus numerous other initiatives.

Several solutions are based on known technology just waiting to be implemented. In other areas, we will focus on the need for developing new technology. A cornerstone in the climate plan is, therefore, initiatives for collaboration with the business community, the Government, organisations and research institutions.



The plan requires investments. But the climate plan documents that they will pay for themselves both with regard to the climate, the environment and the health of Copenhageners as well as the economy. Several of the investments will result in savings on the power and heating bills while others will form the basis for the jobs of the future. The new solutions being developed and tested in Copenhagen present a unique export potential to cities all over the world which also require solutions to reducing energy consumption and CO2 emissions and improving the environment.

MOST IMPORTANT OF ALL IS THE COPENHAGENERS' SUPPORT OF THE PLAN AND THE WORK LEADING TO ITS IMPLEMENTATION. WITHOUT THE ENGAGEMENT AND UNDERSTANDING OF THE PEOPLE OF COPENHAGEN, WE WILL NOT BE ABLE TO REALISE THE NUMEROUS AMBITIONS. A CARBON NEUTRAL CITY REQUIRES EVERYONE TO TAKE A LONG LOOK AT THEIR HABITS. WHEN WE MOVE ABOUT THE CITY, A BIKE AND PUBLIC TRANSPORT MUST BE OUR PREFERRED MEANS OF TRANSPORT. INCREASED WASTE SEPARATION WILL MEAN NEW WAYS OF ARRANGING OUR KITCHENS AND BACKYARDS. WE MUST BE WILLING TO INVEST IN HAVING OUR HOMES ENERGY RETROFITTED. LAST BUT NOT LEAST, WE MUST ACCEPT THAT OUR CITY, FROM TIME TO TIME, WILL RESEMBLE A BUILDING SITE WHEN WE WILL BE INSTALLING PIPES FOR REMOTE COOLING SYSTEMS, EXTENDING METRO LINES OR CONSTRUCTING NEW CYCLE LANES.

Copenhageners will have so much to gain from the implementation of the Climate Plan. With the Climate Plan, we invest in growth and quality of life: clean air, less noise and a green city will improve everyday life for Copenhageners. The investments will secure jobs here and now – and the new solutions will create the foundation for a strong, green sector.

The switch to a greener Copenhagen starts with this Climate Plan. The work requires a long, hard haul together with the people of Copenhagen, the green organizations, universities and other education establishments, private businesses and the Government.

We look forward to working together for 2025.

A handwritten signature in black ink, appearing to read 'Frank Jensen'.

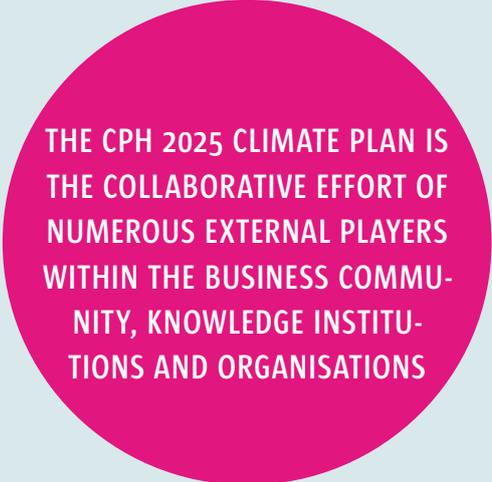
Frank Jensen

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Ayfer Baykal

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THE CPH 2025 CLIMATE PLAN IS
THE COLLABORATIVE EFFORT OF
NUMEROUS EXTERNAL PLAYERS
WITHIN THE BUSINESS COMMU-
NITY, KNOWLEDGE INSTITU-
TIONS AND ORGANISATIONS

HOW TO READ THE CPH 2025 CLIMATE PLAN

In 2009, the City Council unanimously adopted the Climate Plan for Copenhagen, setting down goals for achieving a 20% reduction in CO₂ emissions by 2015. In addition, a vision for a carbon neutral Copenhagen in 2025 was formulated.

In the budget agreement for 2011, it was decided to draw up a new climate plan before the end of 2012 setting down guidelines for achieving carbon neutrality in Copenhagen by 2025.

This plan, the CPH 2025 Climate Plan, is the City of Copenhagen's plan for achieving carbon neutrality by 2025. In addition to transferring relevant initiatives from the 2009 Climate Plan into CPH 2025, the CPH 2025 Climate Plan contains those objectives, main efforts and initiatives adopted by the City Council which must be implemented in order to achieve the goal of carbon neutrality.

Chapter 1 is the political framework for the Climate Plan. This consists primarily of Copenhagen City Council's main goal detailing a carbon neutral Copenhagen by 2025. Also, the chapter outlines a number of the main challenges and opportunities the road to carbon neutrality will present for the City of Copenhagen. Additionally, chapter 1 contains details of the necessary CO₂ reductions and the economic framework for the CPH 2025 Climate Plan.

The chapter concludes with an overview of goals and initiatives for the climate actions distributed on four main areas of action: energy consumption, energy production, mobility and City Administration initiatives.

The subsequent chapters outline the four main areas of action in more detail, in this way forming the background to Chapter 1. In each chapter, the City of Copenhagen sets out concrete goals and initiatives which, taken together, should help reach the goal of carbon neutrality – while also providing Copenhagen with a sound local government economy and the most favourable conditions for green growth. Chapter 7 contains an extended section on the economic framework and investments up to 2025.

The CPH 2025 Climate Plan is the result of the collaborative effort of the City of Copenhagen and numerous external players, the business community, organisations etc. who have all played a part in framing the Plan.

We hope you will enjoy reading the Plan.

1



IN 2025, COPENHAGEN WILL BE THE WORLD'S FIRST CARBON NEUTRAL CAPITAL AND THE CITY'S BUSINESSES AND UNIVERSITIES WILL BE SPEARHEADING THE DEVELOPMENT OF GREEN SOLUTIONS GENERATING EMPLOYMENT AND GREEN GROWTH.

1

COPENHAGEN – A GREEN AND SMART CITY

Copenhagen wants to be carbon neutral by 2025. It is a political ambition that Copenhagen as a Metropolis and capital must assume responsibility for the climate and show that it is possible to generate growth and progress while also reducing CO₂ emissions.

Climate actions are in full swing in Copenhagen. In 2009, Copenhagen City Council unanimously adopted a climate plan for Copenhagen up to 2015. The initiatives contained in the plan have contributed to significant CO₂ reductions, thus reducing emissions by 21% during the period 2005 to 2011. This leaves no doubt that the goal to reduce the city's CO₂ emissions by 20% before 2015, as compared to 2005, will be reached.

The CPH 2025 Climate Plan is the implementation plan for the City of Copenhagen up to 2025 with special emphasis on initiatives between now and 2017. It will also set a precedent for the years beyond 2025. The initiatives in the Plan will be funded and initiated within the scope defined by budget agreements or alternative decisions on funding.

But the CPH 2025 Climate Plan is more than a plan for climate activities. It also indicates ways in which authorities, universities and businesses have to collaborate. It is a plan detailing how Copenhageners can contribute to and engage themselves in climate tasks. It is a plan outlining how the energy companies of the future will be promoting a resource-efficient metropolis. It is a plan laying down the practices of the municipality in its role as one of the country's largest employers. Finally, it is a plan for exploiting the ambitions about carbon neutrality as leverage for innovation, new jobs and investments.

To realise these ambitions, Copenhagen must act smarter and greener – and be open to new opportunities.

1.1

THE ROAD TO CARBON NEUTRALITY IN 2025

In 2011, CO₂ emissions in Copenhagen were approximately 1.9 m tons. This is expected to drop significantly in the period up to 2025, partly as a result of the planned switch from coal to biomass in the combined heat and power plants in the Capital Region, more renewable energy in the Danish electricity grid, the obligation of energy companies to save energy, together with stricter EU regulations on fuel efficiency. Without further initiatives, CO₂ emissions in Copenhagen will amount to 1.2 m tons CO₂ in 2025.

FOCUS ON ENERGY AND TRANSPORT

To achieve carbon neutrality in 2025, Copenhagen must use less energy than it does today and also switch to green energy production. To counteract continuing emissions from e.g. transport,

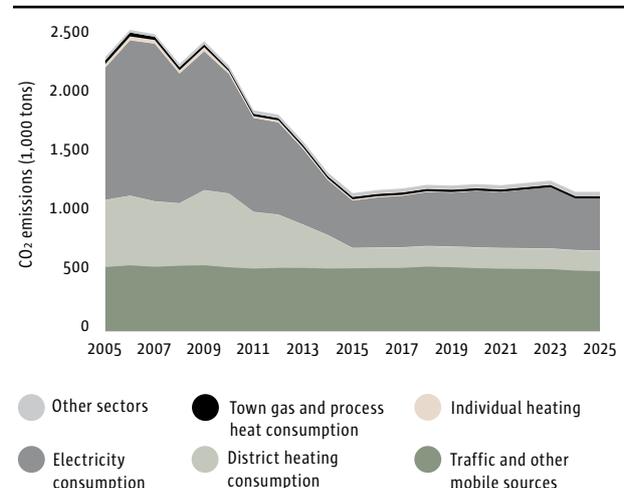


FIGURE 1 // Development of CO₂ emissions up to 2025 provided that no further initiatives or policies are initiated.

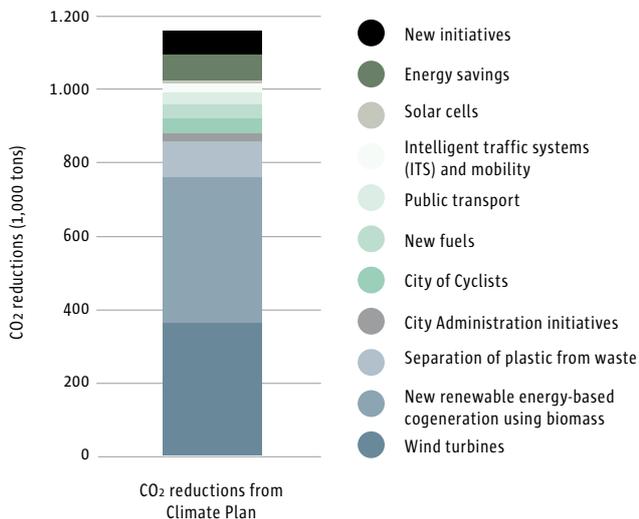


FIGURE 2 // CO2 reductions resulting from initiatives in the CPH 2025 Climate Plan.

Copenhagen must produce a surplus of green energy corresponding to these emissions. The initiatives are categorised into four themes: energy consumption, energy production, green mobility and City Administration initiatives.

Energy savings account for nearly 7% of CO2 reductions. Additionally, energy savings play an important role in relation to reducing the economic costs of the Climate Plan. The reason is that every time Copenhageners save energy, Copenhagen avoids having to invest in production capacity in new power plants. Initiatives include energy retrofitting of existing buildings, implementing low-energy new build, promotion of solar cells together with an improved framework for the construction sector.

Energy production initiatives account for 74% of the total CO2 reduction in Copenhagen. These include installing land and offshore wind turbines, establishing a new biomass-fired combined heat and power plant, establishing a geothermal plant and the phasing out of fossil fuels for peak load production. Furthermore, Copenhagen is able to reduce CO2 emissions from district heating production by separating and reusing plastic from the waste stream.

A broad range of initiatives in the transport area account for just over 11% of CO2 reductions. The main transport initiatives include activities to promote cycling, biogas and hybrid buses and the introduction of electrical and hydrogen-powered cars.

In addition to this, new fuels for the heavy traffic in Copenhagen as well as initiatives focusing on efficiency and climate behaviour all play an important role. The City of Copenhagen wants to lead the way and reduce its CO2 emissions considerably. To effectuate

this, the City Administration will set activities in motion focusing on energy consumption, mobility, operations and management together with climate-friendly conduct among its employees.

COPENHAGEN ATTAINS ITS GOAL

THE INITIATIVES IN THE CPH 2025 CLIMATE PLAN ARE CRUCIAL IF COPENHAGEN IS TO ATTAIN ITS GOAL OF CARBON NEUTRALITY IN 2025. THE PLAN HAS A REDUCTION DEFICIT OF 70,000 TONS CO2 FOR COPENHAGEN TO ACHIEVE CARBON NEUTRALITY. THE MAIN REASON FOR THIS IS THAT THE PLAN INCLUDED CALCULATIONS ON CO2 REDUCTIONS FROM A CONGESTION ZONE STILL AT THE PLANNING STAGE. THIS DEFICIT CAN BE CORRECTED BY, FOR EXAMPLE, EXTENDING WIND ENERGY AS WELL AS NEW INITIATIVES IN THE CONSTRUCTION AND TRANSPORT SECTORS. THIS WILL BE CLARIFIED OVER THE NEXT COUPLE OF YEARS DEPENDING ON THE RESULT OF THE GOVERNMENT'S ENERGY AGREEMENT AND CONGESTION STRATEGY TOGETHER WITH CONCRETE INITIATIVES FROM THE EUROPEAN COMMISSION. THIS WILL BE INCLUDED IN THE EVALUATION AND UPDATING OF THE CPH 2025 CLIMATE PLAN SCHEDULED FOR 2016. THE CITY OF COPENHAGEN WILL STRIVE TO INFLUENCE THE FRAMEWORK ON BOTH A NATIONAL AND EUROPEAN LEVEL PAVING THE WAY FOR NEW INITIATIVES TO ENSURE THAT WE ATTAIN OUR GOAL.

1.2

A GREENER AND SMARTER CITY WITHIN VIEW

With the Copenhagen Climate Plan 2009, activities were initiated to significantly reduce CO2 emissions. These activities will be continued with the CPH 2025 Climate Plan.

Copenhageners want to help make a difference in favour of the climate. They choose their bikes – not just in sunny weather – they separate their household waste, they energy retrofit their homes and adopt an energy-efficient lifestyle.

Copenhagen is unique. Copenhagen is a metropolis large enough for its climate solutions to be interesting in an international context, but also small and manageable enough to test out new, smart solutions. The city is growing and consequently there are large urban development areas where trials and demonstrations of new solutions and new thinking can take place on a large scale.

THE DEMAND FOR ENERGY IS GROWING

Climate changes are real and are already taking place. At the same time, the global economy is facing fundamental challenges. In 2030, there will be an additional 3 bn middle class consumers globally and,

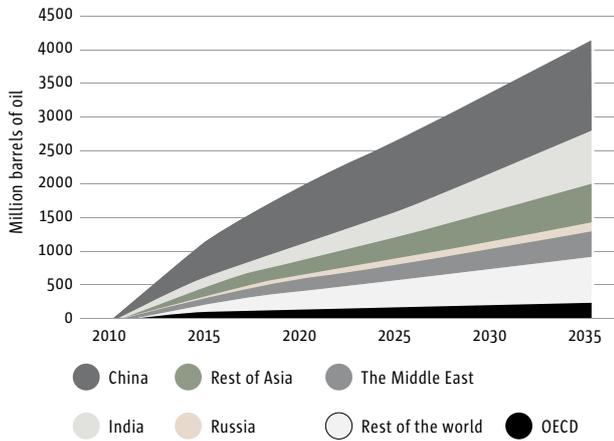


FIGURE 3 // Growth in developing countries will lead to a 33 % rise in energy consumption up to 2035 – even if the present national climate goals are implemented. *Source: IEA, World Energy Outlook 2012.*

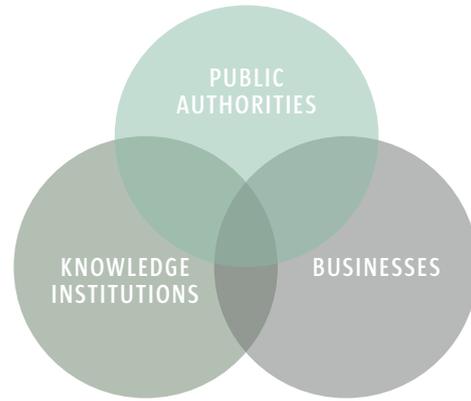


FIGURE 4 // Interdisciplinary collaboration of public authorities, businesses and knowledge institutions must result in solutions that are future-oriented.

if developments continue at their present levels, there will be a world-wide demand for an additional 33% of energy as we approach 2025.

The demand for resources and raw materials such as metals and nutrients is therefore likely to rise. So much so that that demand will increase in relation to supply and this will also lead to price increases. At the same time, a global switch to a greener economy will generate a demand for technology, know-how and efficient solutions. Copenhagen is ready to meet the challenges and to make the city available as a green lab.

In the period up to 2025, the population of Copenhagen is expected to increase by nearly 110,000 and some 20,000 new jobs will be created. This means that 6.8 m sqm of new city will need to be built. As the city changes and develops, there will be scope for developing and implementing green solutions. This is true of dwellings where energy retrofitting may lead to energy savings and also of green solutions in specific urban development areas such as Nordhavn, Nørre Campus, Carlsberg, Ørestad, Amager, Enghave Brygge and Kalvebod Brygge.

AN INTERDISCIPLINARY APPROACH

The CPH 2025 Climate Plan is a collection of concrete goals and initiatives which Copenhagen must implement in order to become the world’s first carbon neutral capital. However, the Plan also takes into account a constantly changing world, allowing for the introduction of new solutions and technologies in the years to come. Businesses, citizens and scientists will be offering new suggestions and solutions. Copenhagen is ready to listen and collaborate.

Collaborating closely with businesses and knowledge institutions constitutes a central part of the plan to develop new green solutions. The green businesses – those already here, newcomers and

those about to emerge – all require growth in order to mature and, in time, find their way into the export markets.

To secure the best possible conditions for growth, Copenhagen must continue to establish an attractive knowledge environment capable of attracting and retaining research and businesses.

1.3

A BETTER CITY FOR COPENHAGENERS

In 2025, the preconditions for enhancing the quality of life will be present in Copenhagen even more so than today. There will be less noise, cleaner air, better dwellings and green mobility.

Work done to become the world’s first carbon neutral metropolis is not only a gain for the climate and the environment. The initiatives will also have positive spin-offs for the everyday lives of the people of Copenhagen. This is because they will be part and parcel of developing Copenhagen into a greener and smarter city experiencing growth.

When Copenhageners renovate their homes, they are not only reducing energy consumption and cutting their electricity and heating bills. They are getting healthier homes with a better indoor climate including more daylight. At the same time, they will be safeguarding their homes against rising energy prices in the future. By making green roofs that absorb rainwater, Copenhageners are helping to increase the sum total of green oases in the city.

Mobility has become greener and the public transport system is smarter making city travel easier, faster and greener. This is done by coordinating the entire traffic system so that users get the most benefit from the different means of transport in various combinations.

QUALITY OF LIFE

Copenhagen is internationally recognised and singled out as one of the world's best cities to live in. It is safe, inspiring and multifarious with a mix of old and new buildings, green oases and people actively using the urban spaces.

Copenhagen is characterised as a city giving high priority to the quality of life thanks to the numerous green solutions which provide a sound environment as well as a city that works. A long-term environmental effort has given Copenhagengers access to new harbour baths and urban planning has created better facilities for cyclists and easier access to the city's breathing spaces.

GREEN GROWTH

Copenhagen sees an opportunity to become carbon neutral while at the same time generating green growth. Since 1990, CO₂ emissions have been reduced by more than 40% and during the same period, there has been a real volume growth of around 50%.

Reductions in CO₂ emissions are, to a large extent, due to expansions of the district heating grid which now covers 98% of the demand for heating in Copenhagen. By cogenerating heat and power, the energy use is almost twice as efficient as compared to separate production. This means that district heating has not only provided significant environmental benefits, but has also secured Copenhagengers cash benefits such as cheap heating. District heating in Copenhagen, for example, is half as expensive as oil or gas-fired central heating. Part of the funds freed from the purchase of fossil fuels is used in Copenhagen thereby generating local business and employment.

At the same time, substantial environmental improvements have given Copenhagengers a better urban environment and improved quality of life. A good example being the clean water in the harbour which has facilitated the harbour baths at Islands Brygge. This, together with the tradition for cycling in Copenhagen, has been mentioned in numerous international lifestyle magazines thus profiling Copenhagen as an attractive travel destination.

With its initiatives up to 2025, the City of Copenhagen is actively contributing to green growth. The investments in retrofitting, urban renewal and an improved public transport system and cycle lanes create new jobs and opportunities for innovation in Copenhagen.

Today, the City of Copenhagen and the Capital Region are front-runners in the green Danish economy. This position will be accelerated and extended in the years to come. A carbon neutral Copenhagen will

provide Danish businesses with a common platform and a showcase for demonstrating green Danish technology. Not just as small-scale embryonic projects and demonstration facilities, but in a full-scale metropolis where technologies and solutions form a symbiotic relationship, simultaneously showing their strengths individually and collectively, aptly illustrated by the development of remote cooling.

Internationally, Copenhagen is very conspicuous. Copenhagen is known worldwide as a green and ambitious city with ideas for future green solutions. The green sector in Copenhagen is growing. In 2009, the green sector employed 11,000 people and turnover rose to

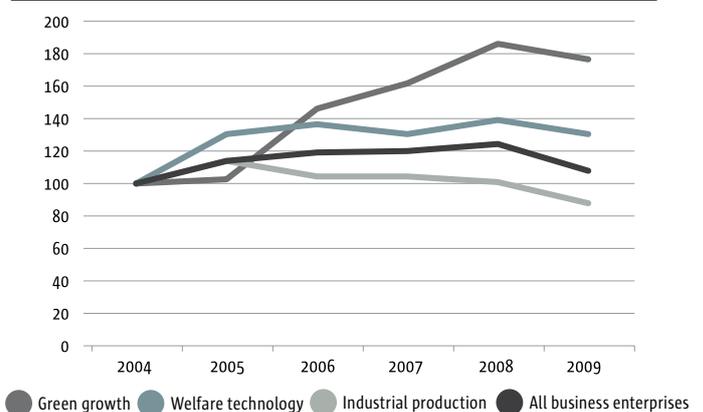


FIGURE 5 // Growth in exports from key sectors compared to total growth in The Capital Region. Source: Damvad 2011

DKK 24 bn. Green sector exports also rose significantly in the same period reaching DKK 10.5 bn. In 2010, the economic growth rate of the Capital Region was 3% compared with the national rate of 1.3%. This supports the role of the region as a growth locomotive and its potential to attract new business activities.

HOW CO₂ EMISSION IS CALCULATED

THE CITY OF COPENHAGEN CALCULATES THE EMISSION OF GREENHOUSE GASES FROM THE CITY BY USING THE CARBON CALCULATOR. IN 2008, THIS WAS DEVELOPED JOINTLY BY KOMMUNERNES LANDSFORENING (LOCAL GOVERNMENT DENMARK) AND THE MINISTRY FOR CLIMATE AND ENERGY AND IS BASED ON THE METHODS APPLIED BY THE NATIONS SUBSCRIBING TO THE UN FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC).

THE MUNICIPAL CARBON CALCULATOR CAN DEDUCT POWER GENERATION BASED ON RENEWABLES (RE) FROM CONSUMPTION IN COPENHAGEN. THIS MEANS THAT POWER CONSUMPTION IN COPENHAGEN IS CARBON NEUTRAL WHEN THE PRODUCTION OF RENEWABLE ENERGY POWER EQUALS THE QUANTITY USED BY THE CITY. IN THE EVENT OF RENEWABLE ENERGY POWER PRODUCTION EXCEEDING THE DEMANDS OF COPENHAGEN, THE AMOUNT WILL DISPLACE COAL-BASED POWER PRODUCTION ELSEWHERE AND MAY BE OFF-SET AGAINST CO₂ EMISSIONS FROM TRAFFIC, FOR EXAMPLE.

1.4

FRAMEWORK FOR THE CPH 2025 CLIMATE PLAN

The CPH 2025 Climate Plan is an integral part of the development of Copenhagen. The plan is therefore closely connected to the City of Copenhagen's other plans and strategies.

The Municipal Master Plan 2011 'Green Growth and Quality of Life' sets out the strategic framework for planning in Copenhagen for the next few years. Furthermore, the City of Copenhagen Climate Adaptation Plan was adopted by the City Council in 2011. The Climate Adaptation Plan outlines the physical climate mitigation planning necessary to prevent damage from excessive downpours and rising sea levels during the next 100 years. The Climate Adaptation Plan addresses the second part of the climate challenges: the physical changes resulting from worldwide CO₂ emissions. It is not within the scope of this Plan to treat of climate adaptation at decision-making level. This has already been done by Climate Adaptation Plan.

In addition, the CPH 2025 Climate Plan is linked to local master plans, the Agenda 21 plan, the Action Plan for Green Mobility, the City of Copenhagen Resources and Waste Plan, Cycling Strategy 2025 and the visionary plan, the Eco- Metropolis 2015.

'A GREENER AND BETTER EVERYDAY LIFE'

LOCAL AGENDA 21 PLAN FOR COPENHAGEN 2012-2015

THE CORE OF THE CITY OF COPENHAGEN'S LOCAL AGENDA 21 PLAN A GREENER AND BETTER EVERYDAY LIFE IS A SERIES OF ACTIVITIES WHICH, TAKEN TOGETHER, CREATE NEW OPPORTUNITIES FOR CITY DWELLERS, USERS AND BUSINESSES WHERE ENVIRONMENTAL AND CLIMATE CONSIDERATIONS ARE PART OF EVERYDAY LIFE IN A NATURAL WAY. ACTIVITIES ARE GROUPED INTO FIVE THEMES: AT HOME, RESOURCES, URBAN SPACES, TRANSPORT AND AN INTERDISCIPLINARY THEME INCLUDING INNOVATION AND EDUCATION.

Source: Draft Consultation Document, May 2012

ECONOMIC FRAMEWORK

To achieve the goal about carbon neutrality would require an estimated need for municipal investments of approximately DKK 2.7 bn up to 2025. This is on a par with municipal investments allocated during recent years.

Of these, investments to cover energy retrofitting of municipal properties and replacement of street lighting total DKK 1.4 bn up to 2025. This results in current savings on energy consumption which, in turn, will have repaid the major part the investment by 2025.

Also, it is crucial that the transition to a carbon neutral city will not increase the overall expenses for the Copenhagen city dweller. The Climate Plan will only have limited impact on the private economy of Copenhageners. A couple with one child living in a flat and owning one car will be saving approximately DKK 6,500 per year if they invest in energy saving measures and use their bikes more.

Today, Copenhagen receives the major part of its energy from fossil fuels. The price of fossil fuels like coal, oil and gas is high at present, but it is expected to rise even further in the future. For this reason, a commitment to energy saving measures and green energy production is a good investment.

POLITICAL FRAMEWORK

The overall political framework plays a part in supporting the initiatives and investments in Copenhagen in the years to come. Both Denmark and the EU have set ambitious goals for reducing the emission of greenhouse gases. In the EU, the common goal is a 20% reduction by 2020 and a number of countries have chosen to go even further. England, Germany, Sweden and Denmark have decided to aim for 40%. Furthermore, Denmark has set the goal that power and heat production must be independent of fossil fuels by 2035.

In March 2012, a broad majority in the Folketing (the Danish Parliament) adopted Denmark's most long-range and extensive Energy Agreement, so far, showing the way to the country's green transition in the years up to 2020.

LEGISLATIVE FRAMEWORK

A large part of the legislative framework for the green transition takes place at national level with no possibility for the City of Copenhagen to exert direct influence. But Copenhagen can, due to its size and position as a capital, share knowledge and try to influence the framework at national as well as international levels, be it conditions governing CO₂ reduction, energy production, energy consumption, retrofitting and new build, green transport, urban development, green growth and job creation, framework for the capital's business community or common, regional initiatives.

The City of Copenhagen is up front on issues of climate and green growth. The idea is to accelerate the initiatives around the world and the development of methods and technology to support the Copenhagen initiatives in the years up to 2025 and beyond. For this reason, the City of Copenhagen will strive to influence and collaborate with decision-makers on both national and international levels.

COLLABORATION WITH OTHER PLAYERS

During the years up to 2025, Copenhagen expects to implement substantial investments in the City Administration's own properties, switch to new fuels in the car fleet and replace existing street lighting in order to contribute as much as possible to the effort.

Copenhagen will also be exploiting the strengths inherent in the Øresund Region and Malmø. The Øresund Region is one of Europe's most dynamic regions. Northern Europe's largest concentration of highly educated people is found here and the region is responsible for a fourth of Sweden's and Denmark's total GDP. In the same way, collaboration with Hamburg will be extended to further strengthen the northern European axis.

The central partners who will contribute actively to the initiatives are:

- The people of Copenhagen
- The business community, investors and knowledge institutions
- Companies owned, wholly or in part, by the City of Copenhagen
- The Government

The People of Copenhagen

The climate initiatives actively include Copenhagengers through co-ownership and involvement. The installation of solar panels on buildings, energy retrofitting, urban renewal and new means of transport are just some areas which will involve Copenhagengers. For example, Copenhagengers may achieve direct ownership by purchasing wind turbine shares. The City of Copenhagen will actively enter into dialogue with Copenhagengers to motivate them to opt for green solutions in development of urban properties and spaces, transport, consumption and education.

Business Community, Investors and Knowledge Institutions

In Copenhagen, businesses will find a city able to provide a good framework, curious scientists, perfect competencies together with courage and a will to succeed. Knowledge institutions can get ahead on intelligent traffic systems, they can explore the possibilities for storing wind energy or developing solar cells integrated into buildings. Copenhagen will offer opportunities able to attract investment and generate green growth. Copenhagen will back those businesses willing to take part all the way to achieving carbon neutrality for Copenhagen in 2025 and beyond.

Companies (jointly) owned by the City of Copenhagen

Energy savings, carbon neutral energy production and green mobility are central challenges up to 2025. As part-owner of a number of companies, the City of Copenhagen must ensure that their ambitious objectives are attuned to the Copenhagen climate initiatives.

Copenhagen Energy can, within its mandate, contribute by switching to renewables and energy saving measures, and the waste incineration plant at Amager can demonstrate future solutions within resource and waste treatment. The Copenhagen Metro can energy retrofit the capital's Metro system while Movia can head experiments with new fuels for buses and intelligent transport systems. All these will be core tasks up to 2025. Apart from this, the companies will also be collaboration partners for businesses and knowledge institutions.

The Government

An expedient framework for new, green solutions must be made in conjunction with the Government who lays down the framework for a number of the initiatives which will be set in motion by Copenhagen, businesses and knowledge institutions to draw the attention of Copenhagengers. The City of Copenhagen's goals are in line with many of the Government's intentions currently being developed within the areas of energy consumption, energy production and transport.

The City of Copenhagen will, therefore, be striving to influence conditions securing a long-term charging structure rewarding green development, tighten regulations for environmental zones, create improved conditions for the production and distribution of biofuels and, finally, to solve the congestion problems in the city.

1.5

GOALS AND INITIATIVES

By 2025, Copenhagen will be carbon neutral. The City of Copenhagen also wants to help create a greener city with a substantial rate of green growth. The result of the Climate Plan will be CO₂ reductions totalling 1.2 m tons. To help make the goal tangible, this Plan contains specific goals within the four themes of energy consumption, energy production, green mobility and City Administration initiatives.

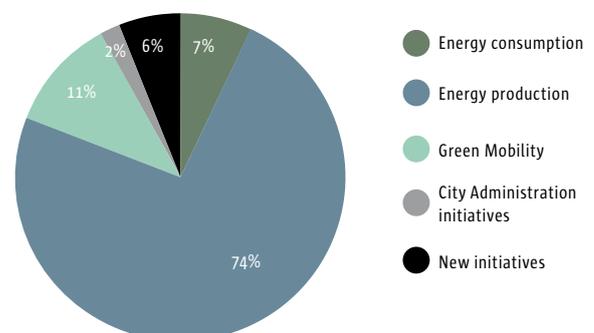


FIGURE 6 // Distribution of total CO₂ reductions in 2025 resulting from initiatives contained in the four themes.

MAIN AREAS OF ACTION

Investments in all areas are necessary to attain the goal. There is no room for opting out. Hence a measure of CO₂ reduction in all the four main areas of energy consumption, energy production green mobility and City Administration initiatives is crucial to attain the goal of carbon neutrality.

Energy Consumption

By 2025, energy consumption in the Copenhagen building stock will be significantly reduced. This is true of existing buildings which, as far as possible, will be energy retrofitted while undergoing general refurbishment. In this connection, aspects of cost-effectiveness and architecture will be observed.

New build must be constructed for low energy use. This will ensure low consumption when the buildings subsequently become operational. There will be special focus on energy consumption in commercial and service companies where there is great potential for energy savings.

Solar cells will be installed on all municipal properties and new, innovative energy technology and methodology will be demonstrated and developed further through lighthouse projects.

Energy Production

By 2025, power and heat generation in Copenhagen will primarily be based on wind, biomass, geothermal energy and waste. The goal is to make district heating carbon neutral by 2025 and for Copenhagen to help secure the generation of renewable surplus power. Copenhagen will be a net exporter of green energy, thus reducing coal-based power generation outside the City of Copenhagen area.

The initiatives will primarily be carried out by the energy companies and will require substantial infrastructural changes. Consequently, the implementation will be gradual in consideration of stability of supply and environmental and financial aspects.

Green Mobility

Up to 2025, a series of initiatives will be launched to strengthen green mobility in Copenhagen. Particularly in connection with the further development of City of Cyclists, using new fuels in the transport sector, developing public transport and implementing Intelligent Traffic Systems and traffic information. A variety of initiatives are needed to reduce CO₂ emissions and to develop Copenhagen as a metropolis. Green mobility contributes to creating a smarter city making it fast and easy to get about for Copenhageners and other users alike. This will result in relatively less congestion, substantial health gains and a dynamic city which will contribute to the growth potential of Copenhagen.

City Administration Initiatives

The City of Copenhagen has the opportunity to set an example. This means reducing energy consumption in the City's own properties up to 2025, halving the energy used for street lighting and gradually introducing greener forms of transport and new fuels to the municipal vehicle fleet. The City of Copenhagen innovates and develops programmes for the transport sector in conjunction with collaboration partners. In addition, the City will continue to develop its green procurement policy

and City employees will be involved especially with regard to the use, operations and maintenance of City properties and installations.

New Initiatives

The initiatives in CPH 2025 ensure that the goal of carbon neutrality will be attained by 2025. Equally important for attaining the goal by 2025 is the realisation of a series of new initiatives on a national level together with additional initiatives in Copenhagen. These might be the extension of wind power and new initiatives in the construction and transport sectors. Certain clarification is required in the transport area. The Government's transport strategy and the Congestion Mitigation Commission will provide the answers to a number of questions. The European Commission is also expected to present draft directives in support of their long-term transport strategy. Furthermore, in Copenhagen a number of pilot projects will be initiated in the transport area in 2013 and 2014.

The various initiatives and projects will be evaluated towards the end of 2015. Based on experience and the evaluations, a revision of initiatives will be carried out in the period up to 2025 and the City of Copenhagen will actively contribute to the work with the Government's congestion strategy and is prepared to participate in demonstration projects in the area of construction.

CO₂ Reductions

Even without the initiatives contained in the CPH 2025 Climate Plan, CO₂ emissions in Copenhagen will fall considerably over the years to come. This is due to the fact that the existing combined heat and power plants are expected to switch from coal to biomass as a result of the national energy policy agreement and the fact that Danish power generation will be greener over the next few years. Based on a projection prepared by the consultancy group, COWI, for the City of Copenhagen, CO₂ emissions are expected would have been reduced from 1.9 m tons in 2011 to approximately 1.2 m tons in 2025. It is this emission the Climate Plan aims to reduce to zero.

However, in 2025 there is likely to be some CO₂ emission in Copenhagen, notably from traffic.

The CPH 2025 Climate Plan's road to carbon neutrality rests on the assumption that Copenhagen will be able to compensate for these emissions by having, on an annual basis, net exports of power based on renewables displacing coal-based power generation elsewhere in the energy system. However, this will only be possible so long as Danish power generation, to some extent, is based on coal. It would be realistic to assume that to be the case in 2025. But on the basis of the Government's goal that Danish power and heat generation must be independent of fossil fuels by 2035, the situation is likely to change after 2025. This means that carbon neutrality will become a 'moving target' for Copenhagen, an issue the city only will be able to maintain if work to reduce emissions, including those from traffic, will continue beyond 2025.

ROADMAP 2025

On pp. 16-19, there is an aggregate roadmap of goals for 2025 main initiatives and which initiatives have been planned for the period 2013-2016. All initiatives have been further detailed in chapters 3-6 of this Plan. The initiatives within the four main areas have been prioritised in such a way that they will be launched and implemented at the most expedient moment with the best preconditions for the climate, the economy and city development. Implementation of the individual initiatives will meet with certain challenges. Some initiatives are already being implemented by the City of Copenhagen such as the development of City of Cyclists Copenhagen project and the energy retrofitting of buildings. Other initiatives will be implemented when the technologies which the solutions will be replacing are worn-out. Finally, some require further development and innovation, before the solutions can be implemented.

The roadmap on the following pages sets out the individual initiatives according to three different characteristics as described below.

1. Analysis

During the first period which includes 2016 there is great emphasis on pre-analysis and strategy development. There is a need to define the framework for future initiatives. Various solution models are analysed and evaluated, strategies and methodologies are drafted and attempts will be made at influencing national legislation.

2. Demonstration

A number of the initiatives will be accompanied by demonstration projects, which, on a small scale will provide Copenhagen with knowledge and experience relating to the strengths and challenges of each individual solution model. The City of Copenhagen will use the demonstration projects to accumulate knowledge in each specific area and to initiate joint ventures and provide a wider world with a glimpse of the initiatives and solutions which form part of green cities of the future.

3. Implementation

The individual initiatives will be implemented on a current basis and will be prioritised for optimal coherence between climate, economy and the city development. Some initiatives will be implemented in one go such as the establishment of a new incineration plant, yet others will be implemented in the course of several years such as street lighting. The roadmap covers the next four pages, listing goals, actions and initiatives for each of the four themes.

ROADMAP >

MAIN AREAS	GOALS FOR 2025	MAIN INITIATIVES UP TO 2025
ENERGY CONSUMPTION	<ul style="list-style-type: none"> • 20% REDUCTION IN HEAT CONSUMPTION COMPARED TO 2010 • 20% REDUCTION IN ELECTRICITY CONSUMPTION OF COMMERCIAL AND SERVICE COMPANIES COMPARED TO 2010 • 10% REDUCTION IN ELECTRICITY CONSUMPTION HOUSEHOLDS COMPARED TO 2010 • INSTALLATION OF SOLAR CELLS CORRESPONDING TO 1% OF TOTAL CONSUMPTION 	Framework improvements for construction sector
		Energy efficient buildings in copenhagen
		Proliferation of solar cells
		Innovation and profiling
		The smart city
ENERGY PRODUCTION	<ul style="list-style-type: none"> • DISTRICT HEATING IN CPH IS CARBON NEUTRAL • POWER GENERATION BASED ON WIND AND BIOMASS AND EXCEEDS TOTAL CPH REQUIREMENTS • SEPARATION OF PLASTIC - DOMESTIC AND COMMERCIAL • BIOGASIFICATION OF ORGANIC WASTE 	Land wind turbines -within city of copenhagen
		Wind turbines - other municipalities
		Offshore wind turbines
		Bidding partnership for state wind turbine projects
		Biomass in combined heat and power plants
		New heat generation units in copenhagen
		Conversion of peak production to carbon neutral fuels
		New waste treatment centre
		Treatment of organic waste
		Separation of plastic from waste

ANALYSE DEMONSTRATION IMPLEMENTING

INITIATIVES UP TO AND INCL. 2016	2013-2016
Develop strategy for energy consumption in construction sector	
Develop and test funding model for realisation of energy savings	
Work to change legislation to facilitate more energy efficiency	
Establish method and guidelines and target funds for increasing climate retrofitting	
Establish method and framework to ensure coherence between projected and actual energy consumption	
Promote development of technology and solutions to secure low-energy new build	
Adequate regulation of heat and domestic water supplies	
Develop, test and implement model for realising energy savings in commercial and service companies	
Motivate and support proliferation of solar cells	
Knowledge building and experience sharing	
Establish partnerships for setting up private lighthouse projects	
Establish digital infrastructure for public data	
Support an increased flexible energy consumption	
Disseminate concept of smart house solutions	
Local hydrogen production	
Improve framework for use of onshore electricity on cruise liners	
Identification of 4 sites in Copenhagen with room for 14 wind turbines	
Planning process for a total of 7 wind turbines expected to be concluded in 2013	
Negotiations with land owners on possible sites	
Encourage the Government to lay down favourable settlement model for offshore wind turbines	
Installation of offshore wind turbines on 2 predetermined sites	
Examine possibilities for establishing tendering partnerships in relation to offshore wind turbine projects	
Draft decision-making basis regarding the establishment of wood-fired combined heat and power plant	
Negotiations on the conversion to biomass on Amager and Avedøre combined heat and power plants	
Draft decision-making basis regarding the establishment of geothermal plant	
Draft decision-making and time line for the establishment of renewable heat production units incl. heat pump, heat storage and solar heating	
Analyse possibilities for converting peak load production	
Draft decision-making basis regarding the establishment of new waste incineration plant	
Assessment of REnescience plant and other treatment technologies for biogasification of organic waste	
Examination of various methods of organic waste collection	
Set up arrangement for collecting for hard plastic	
Clarify methods for prevention, separation and reuse of plastic	

> ROADMAP

THEME	GOALS FOR 2025	MAIN INITIATIVES UP TO 2025
GREEN MOBILITY	<ul style="list-style-type: none"> • 75% OF JOURNEYS IN COPENHAGEN ARE DONE ON FOOT, BY BIKE OR BY PUBLIC TRANSPORT • 50% OF ALL JOURNEYS TO WORK OR EDUCATION IN COPENHAGEN ARE DONE BY BIKE • 20% MORE PASSENGERS USING PUBLIC TRANSPORT COMPARED TO 2009 • PUBLIC TRANSPORT IS CARBON NEUTRAL • 20-30% OF ALL LIGHT VEHICLES USE NEW FUELS • 30-40% OF ALL HEAVY VEHICLES USE NEW FUELS 	City of Cyclists
		New fuels in transport sector (power, hydrogen, biofuels)
		Public transport
		Intelligent Traffic Systems
		Mobility planning
CITY ADMINISTRATION INITIATIVES	<ul style="list-style-type: none"> • REDUCE ENERGY CONSUMPTION IN CITY ADMINISTRATION BUILDINGS BY 40% COMPARED TO 2010 • MUNICIPAL NEW BUILD UP TO 2015 TO MEET REQUIREMENTS OF 2015 CLASSIFICATION AND NEW BUILD UP TO 2020 TO MEET REQUIREMENTS OF 2020 CLASSIFICATION • ALL CITY ADMINISTRATION VEHICLES RUN ON ELECTRICITY, HYDROGEN OR BIOFUELS • ENERGY CONSUMPTION FOR STREET LIGHTING IN COPENHAGEN IS HALVED COMPARED TO 2010 • A TOTAL OF 60,000 SQM OF SOLAR CELL PANELS ON EXISTING MUNICIPAL BUILDINGS AND NEW BUILD HAVE BEEN INSTALLED 	Systematic consumption mapping and energy management
		Energy efficient buildings
		Solar cells installed on City of Copenhagen properties
		Switching of car fleet to new fuels
		Procurement
		Behaviour and training
Energy-efficient street lighting		

ANALYSIS DEMONSTRATION IMPLEMENTATION

INITIATIVES UP TO AND INCL. 2016	2013-2016
Develop cycle connections to and from Copenhagen	
Develop partnerships and green growth for cycling	
Establish partnerships with 300 - 600 companies about using electric cycles	
Develop concept of improved conditions for cycling with the aim of promoting cycling in 600 - 1,000 private companies	
Develop and start demonstration projects using new fuels for light and heavy transport	
Establish infrastructure for vehicles using new fuels	
Initiate collaboration and joint ventures with relevant players	
Work to ensure that the Government secures a long-term charging structure favouring cars using new fuels	
Develop and start demonstration projects using new fuels for busses	
Improve public infrastructure by implementing CityNet 2018	
Energy efficient operation of Metro and S-train	
Establish a plan for monitoring traffic management leading to improved traffic flow	
Establish a system for joint traffic management leading to improved traffic information	
Optimisation of signalling installations to facilitate better traffic flow and improved passability for buses	
Increase of ecodriving by offering courses	
Establish mobility programme to alter transport conduct	
Long-term 'attitude training'	
Establish remote meter reading and systems to register energy consumption	
Establish organisation to assess development of consumption	
Secure energy management and energy efficient operations as a permanent and integrated part of operations	
Continue the Municipal Energy Savings Fund	
Implement all energy saving initiatives with a short payback time	
Climate retrofitting of all City of Copenhagen properties	
New buildings to be constructed with climate adaptations and low energy use	
Secure energy efficiency in private rented accommodation and other non-municipal properties by consumption regulations	
Create lighthouse projects within climate retrofitting and climate-adapted new build	
Establish solar cells on City of Copenhagen properties	
Develop and implement a transition plan	
Implement management system	
Establish infrastructure for electric charging stations	
Establish pilot and demonstration projects for fuel technologies for heavy vehicles	
Determine regulations for the use of new fuels for external driving	
Implement procurement strategies with focus on transport, energy consuming products and the construction sector	
Secure climate-friendly conduct by City employees in the areas of consumption, transport and purchasing by means of courses and info meetings	
Replace street lighting	

1.6

PERSPECTIVES AND DEVELOPMENTS BEYOND 2025

The climate effort will continue beyond 2025. Carbon neutrality and green growth need further consolidation and development concurrently with the emergence of new solutions and technologies – not forgetting the gradual changes of the city. The ongoing upgrading of green solutions within energy use, power generation and mobility will, therefore, continue. With the large number of initiatives being implemented during the years up to 2025, Copenhagen will have an optimal basis for continuing to develop the city beyond 2025 – and remain carbon neutral until 2035 which is the expected deadline for Denmark being independent of fossil fuels.

Energy Consumption

Energy consumption will continue to be in focus beyond 2025 to ensure that energy retrofitting will be carried out at the same time as the general renovation of Copenhagen's building stock. This is to facilitate further reductions in energy use and hence a reduced demand for production capacity concurrently with existing capacity being phased out. Without this reduction in energy consumption, the transition will be too costly from an economic aspect as well as for the people of Copenhagen.

New technological solutions will continue to be tested and knowledge sharing, new organisation and funding models will need to be designed and tested along with the general development of society.

Energy Production

Energy production in Copenhagen and the Capital Region will undergo substantial changes beyond 2025 going on 2050.

This is the transition which the CPH 2025 Climate Plan is seeking to prepare. There will be a much larger share of wind power in the Danish energy system. Part of the present biomass-based heat supply will be phased out and presumably be replaced by geothermal energy and heat pumps.

Beyond 2025, geothermal power and biomass supported by heat pumps and waste incineration will constitute the foundation of Copenhagen's heat supply. Depending on technological advances and economic considerations, the heat supply will be supplemented by solar heating and the use of heat storage to secure maximum flexibility in the overall energy system.

In the immediate future, it will be increasingly crucial to gain more knowledge about developments during the period 2025 – 2050 to be able to develop and test necessary technologies for the period beyond 2025. By optimising the solutions for Copenhagen, great efficiency gains will be achieved together with excellent opportunities for trading them on a global scale. There will be continued focus on collaboration between relevant players to achieve a successful transition.

Green Mobility

In the transport area, kick-starting developments prior to 2025 is high on the agenda, while also designing overall mobility solutions providing Copenhagen with advantages in relation to a green transition in other cities. Beyond 2025, Copenhagen will continue to pursue the goal of supporting cycling, walking and public transport and to switch automobile traffic to new fuels and secure an efficient flow of traffic generally. It is difficult to project how mobility will develop during the period up to 2050, but new solutions are likely in this area. These will be monitored closely during the years up to 2025 and actions adjusted accordingly.

Between now and 2025 and beyond, numerous development projects are expected to take place in conjunction with private companies and research units. Consequently, Copenhagen will have the potential of becoming a pioneering example of mobility transition.

Green Growth

Beyond 2025, Copenhagen will continue to be a collective international showcase for green technologies and solutions incorporated into a coherent whole in the world's first carbon neutral city. Copenhagen will not only offer the visitor isolated green solutions which per se will be worth a visit. There will be coherent, integrated solutions of the future city as a whole, combining optimisation of the present city with the construction of new dwellings, neighbourhoods and urban areas. The visitor will sense a well-established city where, albeit the major part of the building stock is rather old, has succeeded in achieving carbon neutrality by cross-sectoral collaboration and integral solutions and, in one fell swoop, managing to reduce CO₂ emissions and ensuring health, quality of life and mobility in the metropolis.

1.7

WHAT HAPPENS NEXT? – EVALUATION AND FOLLOW-UP

The City of Copenhagen evaluate actions in all of the City's planning on a current basis, each year preparing the so-called Green Accounts which takes stock of the City's many environmental goals. The Green Accounts will also keep track of selected goals in the CPH 2025 Climate Plan. The evaluation of the Plan is done partly as an annual reporting and partly as a comprehensive evaluation carried out three times during the period.

The CPH 2025 Climate Plan shows the feasibility of Copenhagen being carbon neutral in 2025 and it shows the way to achieve it. Secondly, it specifies actions during the period 2013 – 2016 in order to secure optimal ongoing developments of the initiatives set out in the previous 2009 Copenhagen Climate Plan.

In the CPH 2025 Climate Plan, planning and development take place side by side while efforts are constantly undergoing assessment and evaluation in order to stay on track. This process happens in close collaboration with businesses, research units, Copenhageners and the various city administrations. Without collaborating with relevant players about coordinating actions and implementing them, we will not achieve our goal.

To further support this process, an annual report will be prepared intended to take stock of developments and also to relay a common story about the various projects. The Climate Plan will result in huge amounts of information and will be accumulating knowledge in numerous fields. It is of vital importance for the implementation that experience and knowledge is shared with relevant internal and external players as far as possible on national and international levels. The various stakeholders will meet annually in Copenhagen for a specific dialogue on experience and future opportunities. There could be an international element in the conference to facilitate the sharing of knowledge on an international level. Such a dialogue may further support the position of Copenhagen as the world's leading environment eco-metropolis.

In the period up to 2025, there will be three general evaluations of the CPH 2025 Climate Plan where the two first are intended to provide input for new initiatives and adjustments of the Plan in the subsequent period. The first one will take place in 2015-2016 as a conclusion of the first implementation period 2013-2016. The period 2017-2020 will be evaluated in 2019-2020. During the period 2025-2026, the final evaluation will be done with an assessment of the goal-achieving rate.

1. PERIOD
2013-2016

2. PERIOD
2017-2020

3. PERIOD
2021-2025

SUBANALYSES IN THE PERIOD UP TO 2017

CROSS-SECTORAL	
Copenhagen 2050 Long-term Plan	An overall 2050 Long-term Plan for Copenhagen within the climate area will be prepared. The long-term plan will assess the 2025 initiatives from a 2050 perspective. This plan will be prepared before 2014.
ENERGY CONSUMPTION	
Holistic strategy for energy use in construction sector	The strategy will ensure that the initiatives to reduce energy consumption in the existing building stock as well as in new build will be carried out as a coherent and coordinated effort. To coincide with this, the Government will lay down an overall strategy for the construction sector in Denmark. The City of Copenhagen will be collaborating with the Government as far as possible on this, so that the efforts in Copenhagen will be consolidated. The strategy will be presented in 2014.
Funding model	The City of Copenhagen will analyse various methods and develop a funding model reducing the financial barriers for increased energy efficiency in the individual sectors. The funding model will be ready before the end of 2013.
Energy saving model in commercial and service companies	The City of Copenhagen will, in conjunction with other players, develop a model to increase incentive and drive for commercial and service companies to achieve energy savings. The finished model for businesses will be ready for implementation some time in 2014.
ENERGY PRODUCTION	
Decision-making basis for future heat production	Analysis and planning of future heat generation based on renewables. The result will form an overall decision-making basis for heat generation in the future, and will be presented no later than 2015.
Geothermal energy beyond 2025	Strategy for extending geothermal energy sources in the period up to 2040 will be presented no later than 2020.
Heat pumps and solar heating	Decision-making strategy and strategy for extending the use of heat pumps and solar heating will be presented no later than 2015.
Sustainable biomass	Analysis and assessment of sustainable biomass in energy production. The basis document will be ready towards the end of 2015.
Peak load and reserve load	Decision-making basis for future plans to switch to carbon neutral peak and reserve load production will be presented towards the end of 2015.
Biogasification of organic waste	Analysis and assessment of REnescience plant and other treatment technologies as well as collection methods for treatment of bio-waste. The analysis is expected to be completed in 2013.
GREEN MOBILITY	
The Government's transport strategy	There are a number of uncertainties in the transport area. The Government's transport strategy will provide the answers to some of the questions, likewise, the European Commission is expected to deliver draft directives in support of their long-term transport strategy. This will have a bearing on the initiatives in Copenhagen up to 2025 and beyond.
Revision of initiatives in the transport area	Copenhagen will see a series of pilot projects in the transport area during 2013 and 2014. These initiatives and projects will be evaluated towards the end of 2015. On the basis of the evaluation, the initiatives up to 2025 will be revised.
The Congestion Mitigation Commission	The Government's congestion strategy is expected to appear in the second half of 2013. The City of Copenhagen will participate actively in the work with this strategy and is prepared to enter into demonstration projects.
Biogas for transport purposes	An analysis on the scope for exploiting biogas from the waste water treatment plants Lynetten and Damhusengen for transport purposes will be prepared before the end of 2014.
CITY ADMINISTRATION INITIATIVES	
New fuels for vehicles above 3,500kg	Pilot and demonstration phase in which various fuel technologies for a number of different needs up to 2016 will be assessed. The results will form the basis for phasing in new fuels for the municipal fleet of large vehicles.

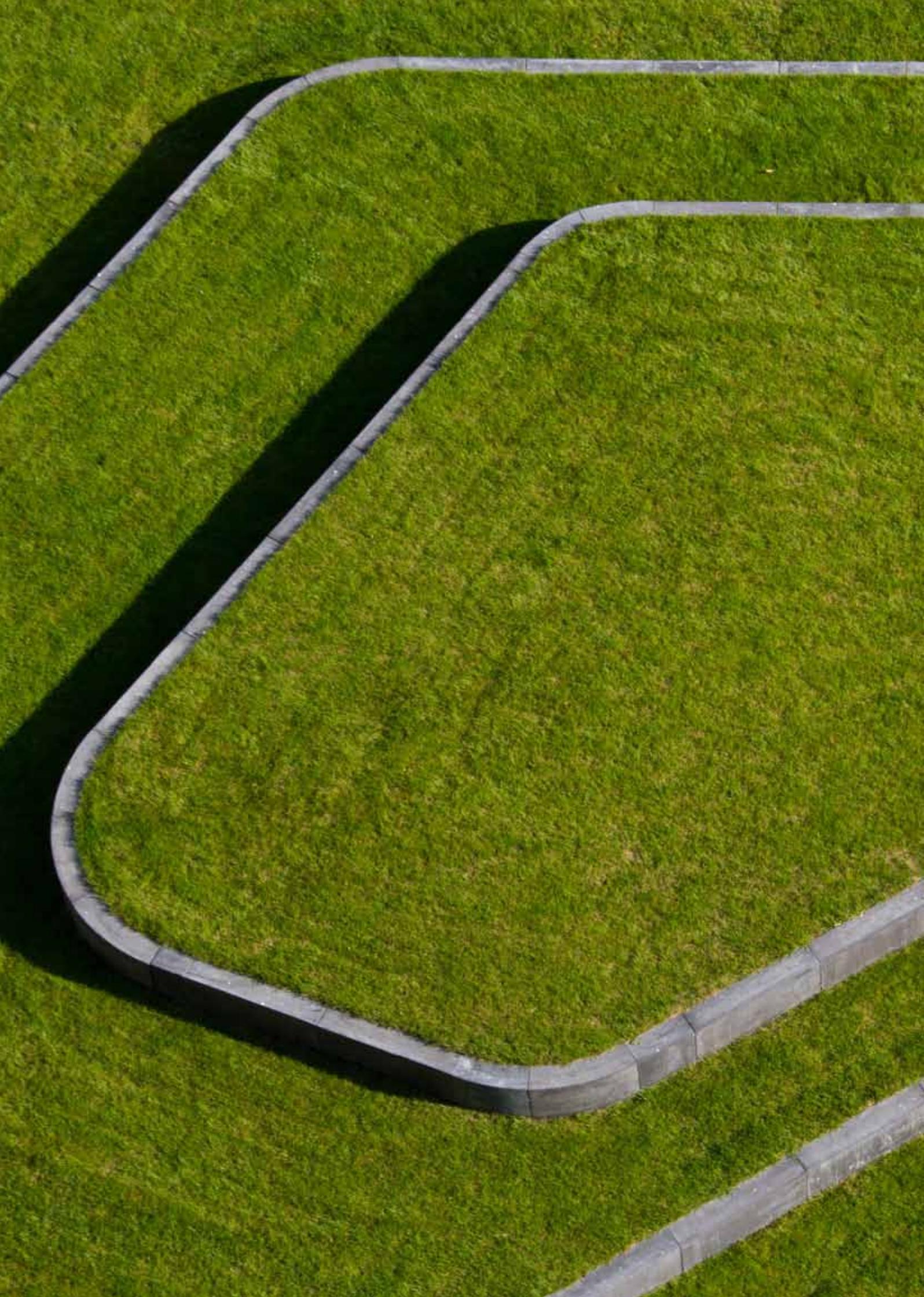
1.8

ENVIRONMENTAL ASSESSMENT

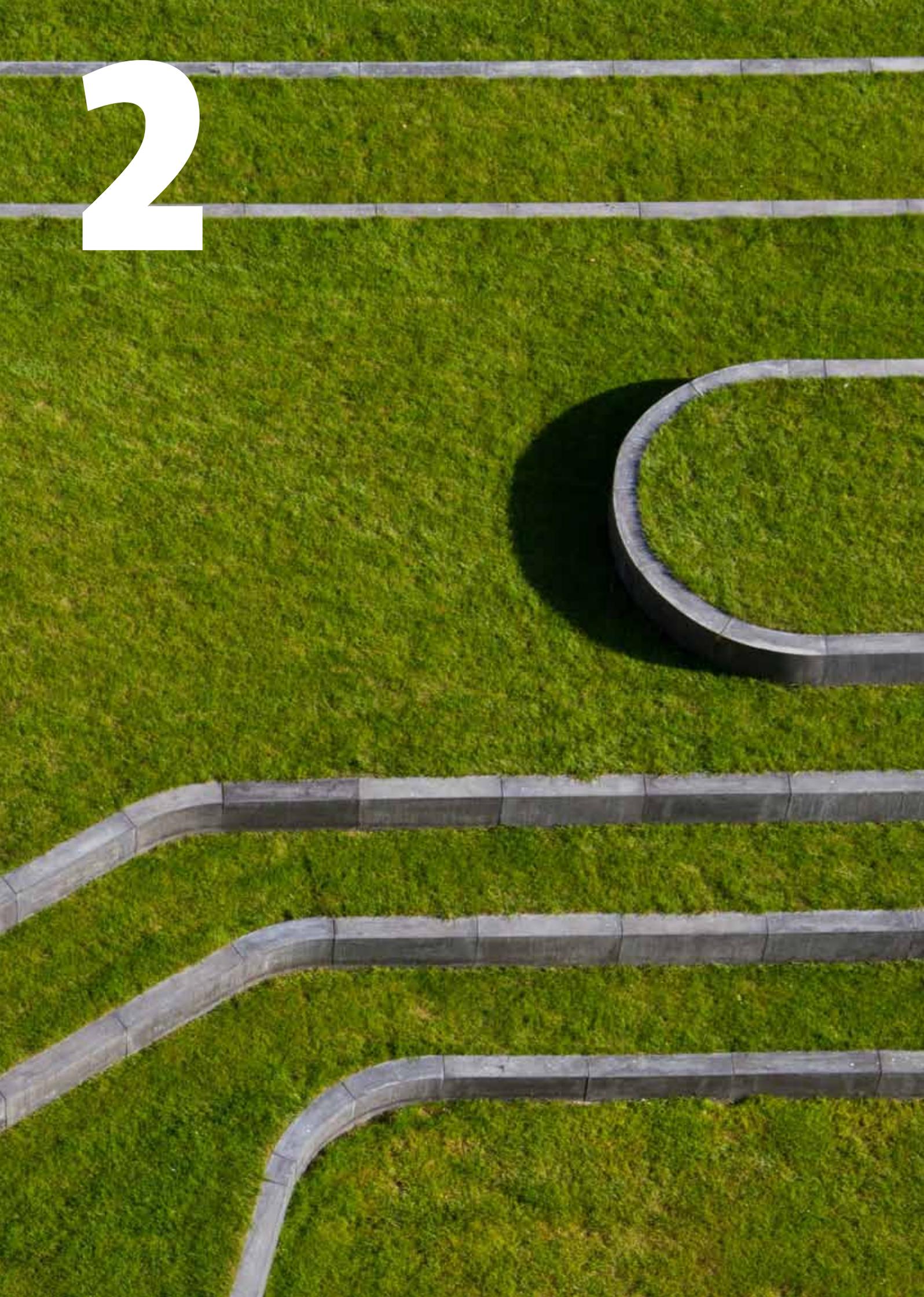
An assessment has been made as to whether the CPH 2025 Climate Plan should undergo environmental assessment according to the Ministry of the Environment's Executive Order on environmental assessments of plans and programmes.

As the CPH 2025 Climate Plan does not lay down a framework for future construction permissions, the consensus is that the Plan need not undergo environmental assessment according to current legislation.

THE CPH 2025 CLIMATE
PLAN SHOWS THE FEASIBILITY
OF COPENHAGEN BEING CARBON
NEUTRAL IN 2025 AND IT
SHOWS THE WAY TO
ACHIEVE IT



2



2

THE ROAD TO 2025

In the period leading up to 2017, the City of Copenhagen will initiate a series of initiatives to secure CO2 reductions and create a framework for green growth. Also, the Climate Plan forms part of the preparations and the process which will result in future action in the years up to 2025.

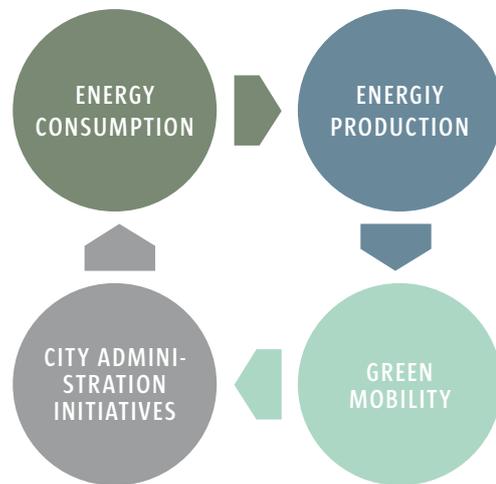
The main initiatives prior to 2025 will take place within four key areas:

- Energy consumption
- Energy production
- Mobility
- City Administration initiatives

Initiatives within these areas will ensure that Copenhagen will become a city where the potential in the large urban development projects in Nordhavnen, Carlsberg, Nørre Campus and the completion of Ørestad is exploited to create smart solutions. The same applies to retrofitting of the existing building stock – both with regard to user-friendly aspects as well as to reducing the use of resources.

The CPH 2025 Climate Plan is a holistic plan in which efforts to reduce energy consumption is inextricably linked to the transition in energy production. Also, there must be a higher degree of integration between the energy sector and the transport area. A holistic approach like this will achieve a positive economy – on both national and user level. City Administration investments will bring about a favourable return in the shape of the value added to the city by green, smart and healthy initiatives corresponding to the needs and wishes of Copenhageners for a buzzing, creative and interesting city.

The transition is one of the key elements to creating increased economic growth in Copenhagen. The city must attract more foreign businesses within the green sector and must establish an innovation and entrepreneurial environment able to support the development of new solutions.



3



3

ENERGY CONSUMPTION

MAJOR GOALS FOR 2025 COMPARED TO 2010

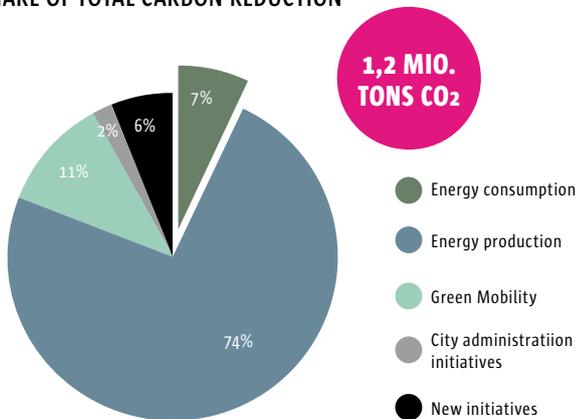
// 20% REDUCTION IN HEAT CONSUMPTION

// 20% REDUCTION IN POWER CONSUMPTION IN COMMERCIAL AND SERVICE COMPANIES

// 10% REDUCTION IN POWER CONSUMPTION IN HOUSEHOLDS

// INSTALLATION OF SOLAR CELLS CORRESPONDING TO 1% OF ELECTRICITY CONSUMPTION

SHARE OF TOTAL CARBON REDUCTION



ALLOCATION OF REDUCTIONS FROM ENERGY CONSUMPTION INITIATIVES

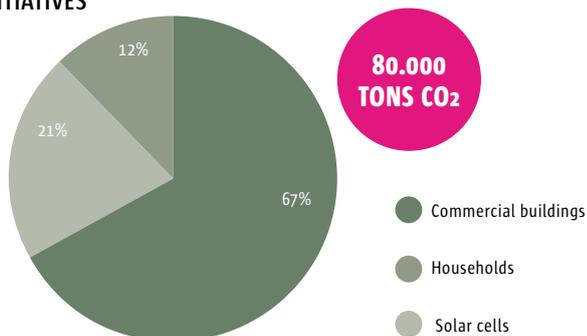


FIGURE 7 // Reduction of CO₂ emissions from energy consumption as part of total reductions broken down into initiatives

In 2010, the actual heat and electricity consumption in Copenhagen amounted to 5,000 GWh and 2,500 GWh, respectively. This corresponds to 75% of total CO₂ emissions in Copenhagen, of which the City of Copenhagen's own buildings accounted for nearly 5%. A reduction in CO₂ emissions can be effectuated by increasingly switching energy production to renewables or by reducing energy consumption. The initiatives outlined below relate to improved efficiency in energy consumption.

If the City of Copenhagen does not implement further initiatives, total energy consumption in the buildings of Copenhagen in 2025 will remain at roughly the same level as in 2010. In the projection, allowances are made for savings in electricity and heat but also for a substantial population growth. In return, CO₂ emissions related to energy consumption are reduced by around 50%. This is achieved by switching the district heating production to biomass and by plans to convert 50% of the Danish electricity supply to wind power by 2020. The CPH 2025 Climate Plan points to substantial reductions in total energy consumption. The initiative is comprehensive and covers all sectors in Copenhagen with particular focus on electricity consumption in commercial and service companies where consumption is expected to rise in the years up to 2025.

The initiative is designed to ensure that existing buildings as well as new build in Copenhagen will meet future requirements. It is targeted at all buildings in the City of Copenhagen except the City's own properties which come under the City Administration initiatives.

Phasing out coal in favour of biomass in the future district heating production in Copenhagen will result in a more expensive supply seen from an economic perspective. So, major economic benefits can be gained by reducing energy consumption in buildings. This also means that Copenhagen will be able to minimise the need for investing in new energy production.

There is often a discrepancy between projected and actual energy consumption both when new buildings become operational and in the case of substantial retrofitting. It is important, therefore, to focus on continuously maintaining operational energy consumption in energy retrofitted buildings as well as new build at the expected low level. The building and the commissioning process and the behavioural patterns of Copenhageners, for example, have great impact on actual energy consumption.

The City of Copenhagen Local Agenda 21 Plan focuses on the energy consumption of Copenhageners. The activity, 'Saving Energy in the Home', for example, is about saving energy by changing habits in the home by e.g. using the heating system in the most expedient way. Another example is 'Energy retrofitting the homes' which provides support and guidance to owner-occupiers and tenants as well as associations about energy retrofitting their homes.

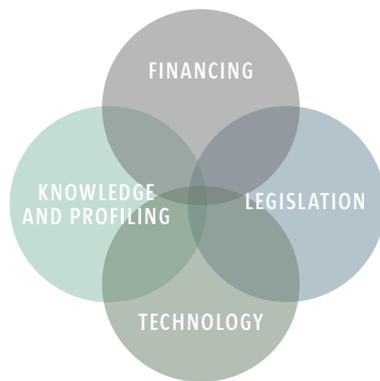


FIGURE 8 // New technology is constantly being developed to reduce energy requirements in the construction sector. A number of barriers to using the new technology means that consumption is not reduced as much as expected. Barriers include the lack of knowledge among relevant decision-makers/players, legislation and financing. Selected initiatives in the CPH 2025 Climate Plan focus on reducing these barriers.

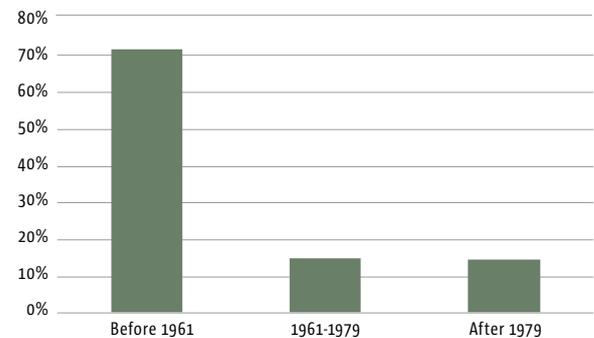


FIGURE 9 // A large part of the building stock in Copenhagen was erected before 1961 – and prior to the adoption of the first Building Regulations. This means that there is a large potential for energy retrofitting in existing buildings in Copenhagen.

Source: *The Copenhagen Climate Plan, 2009*

3.1

MAIN CHALLENGES

The Plan's goal to achieve significant energy savings must happen through a strategic effort with strict priorities. The challenges are mainly the energy consumption in existing buildings, energy-efficient new build and the need for smarter solutions able to strengthen the balance between energy production and energy consumption.

THE GROWING CITY

The building stock is responsible for the major part of the city's energy consumption. This challenge will increase over the years. Copenhagen is expected to grow by nearly 110,000 inhabitants over the period from now until 2025 and a total of 20,000 new jobs will be created. This will require the construction of 6.8 million sqm of new city. The City of Copenhagen will need to ensure that the expanding city and its users use resources efficiently.

At present, there are strict requirements to low energy use in new build and these must be incorporated into the construction process. When new buildings are constructed, they must be able to meet future requirements in the shape of gradual optimisation and eventual compliance with new rigorous requirements in the future. This will help secure a lasting and low energy consumption and high operational quality of the building.

Also, it is essential that new construction and energy retrofitting will take place without substantially adding to the costs.

UPGRADING CITY BUILDINGS

The City of Copenhagen needs to play an active role in ensuring that the building stock in Copenhagen is able to meet future requirements, both in relation to energy consumption and indoor climate. Energy consumption requirements for new build have been regularly tightened in the Building Regulations. The major part of the building stock in Copenhagen was built prior to the introduction of the first Building Regulations, so in the older buildings alone, there are substantial cost-effective savings to be made. Unfortunately, several of these are not realised due to a variety of barriers. By way of example, the so-called 'owner-tenant paradox' meaning that neither owners nor tenants have any incentive to energy retrofit their homes. Also, companies and homes often change owners and tenants in Copenhagen. This means that the economic benefits of energy retrofitting are significantly lower or disappear altogether, as the temporary owners/tenants will not be present to see the benefits before the investment has been repaid. The various players also lack knowledge about concrete solutions and available financing.

The City of Copenhagen are often in contact with Copenhageners, companies and national public authorities and wants to exploit this contact to exert influence on the players to make decisions leading to an even higher level of energy efficiency.

FLEXIBLE ENERGY CONSUMPTION

National policies stipulate that 50% of electricity demand be covered by wind power by 2020 and, in the long term, even more. A larger share of renewable energy in the energy system leads to an increasing demand for flexibility – also on the consumer side. This means a growing demand for intelligent systems able to balance electricity production from e.g. wind turbines with customer demand. An example of flexible consumption is the recharging of the family's electric car when there is a surplus of renewable energy in the system or at certain times during a 24-hour period when consumption is generally low.

3.2

GOALS AND INITIATIVES IN COPENHAGEN UP TO 2025

CO₂

WHEN THE GOALS FOR EXISTING BUILDINGS HAVE BEEN MET, HEAT CONSUMPTION WOULD HAVE BEEN REDUCED BY NEARLY 1,000 GWH AND ELECTRICITY CONSUMPTION BY 250 GWH COMPARED TO 2010.

ENERGY SAVINGS AND THE INSTALLATION OF SOLAR CELLS WILL PROVIDE A TOTAL CO₂ REDUCTION OF 80,000 TONS.

During the period up to 2025, the City of Copenhagen will initiate and implement numerous initiatives to reduce the energy consumption in buildings. Below, there is an outline of the main initiatives together with those initiatives being put into action in the short term in order to secure a framework and solutions models to achieve energy savings during this period.

ECONOMY

The total expenditure of the City of Copenhagen to implement initiatives leading to a reduction of energy consumption in the building stock in Copenhagen is expected to amount to nearly DKK 170 m until 2025. This includes, for example, concept and model design together with funds for demonstration projects within new and existing buildings.

Having reduced heat consumption by 20% in 2025 and electricity consumption by 20% in commercial and service companies and 10% in households, the overall economic savings will be approximately DKK 1.6 bn. A couple living in a flat will, on average, be saving approximately DKK 4,000 annually on their energy consumption by 2025 if the goals are met.

Total investments in new build and retrofitting of existing buildings will require investments totalling DKK 180 bn in the period up to 2025. Total investments in solar cells in the private sector are estimated to be DKK 425 m in the period up to 2025.

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016
20% reduction in heat consumption compared to 2010	Improvement of framework for construction sector	Develop strategy for energy consumption in construction sector
20% reduction of electricity consumption in commercial and service companies compared to 2010		Develop and test funding model for realisation of energy savings
10% reduction of electricity consumption in households compared to 2010	Energy-efficient buildings in Copenhagen	Work to change legislation towards an increased level of energy efficiency
Installation of solar cells corresponding to 1% of electricity consumption		Establish methods and guidelines and target funds to increased energy retrofitting
		Establish methods and framework to narrow the gap between projected and actual consumption
	Increased use of solar cells	Promote development of technology and solutions to construct new build with low-level energy consumption
	Innovation and profiling	Secure regulation of heat and domestic water supplies
	The smart city	Develop, test and implement model for realising energy savings in commercial and service companies
		Motivate and support the increased use of solar cells
		Knowledge accumulation and sharing
		Establish partnerships to construct private light-house projects
		Establish digital infrastructure for public data
		Support increased scope for flexible consumption
		Dissemination of concept regarding the smart building
		Local hydrogen production
		Improvement of framework for using onshore electricity for cruise liners

FRAMEWORK AND CONDITIONS

In the short term until 2017, the City of Copenhagen will strive to improve the framework for new build and energy retrofitting in existing buildings.

Strategy for a Reduction of Energy Consumption in the Construction Sector

The City of Copenhagen will work out an overall strategy for reducing energy consumption in the construction sector. The strategy will include both existing and new build in Copenhagen. Ambitious goals have been set for energy-efficient construction in Copenhagen, leading to a number of initiatives being launched to provide solutions to the challenges of energy-efficient construction from different perspectives. The strategy will act as a guideline for both the City Administration and the construction sector to manage the future planning of energy retrofitting in the city. The strategy will also create a breeding ground for the development of technology and investment in new solutions in the field of energy retrofitting.

Knowledge will be accumulated on financing, technological solutions, construction processes and organisation through various construction projects in Copenhagen. So, the strategy on the reduction of energy consumption in the construction sector must ensure that the effort to achieve energy-efficient buildings in Copenhagen will be done by knowledge sharing with all relevant parties inside and outside the City Administration. The numerous initiatives being launched in the immediate future must be coordinated across the various City Administrations. A follow-up procedure will ensure that the City Administration is on the right track with regard to attaining the set goals. This includes registering completed energy retrofitting and low-energy construction projects in Copenhagen resulting in the accumulation of experience and follow-up on energy consumption in the finished projects.

Work to reduce energy consumption will, therefore, be organised at cross-sectoral level within the City Administration and in close collaboration with external parties.

Incentives to increase Energy Efficiency

Several cost-effective energy saving measures are not implemented due to the apparent lack of incentive for the individual Copenhagen-er. This could be due to a lack of funding or to the fact that the investor will not necessarily see any return on his investments in energy saving measures. The City of Copenhagen wants to set up initiatives to increase the number of energy saving measures being carried out.

The City Administration will reduce financial and organisational barriers to energy saving measures both when retrofitting existing buildings and in new build. This work will be done in conjunction with relevant players and together with these, the City of Copenhagen wants to:

- Help to develop and implement a funding model simplifying funding and achieving energy savings in existing buildings and energy-efficient new build. The model will take various ownership models into consideration and use the ideas behind the ESCO concept, green funding and the 'One Stop Shop' idea as its starting point.
- Surmount the so-called 'owner-tenant paradox', which means that neither owner nor tenant have economic incentives to invest in energy saving measures. This is a challenge to both the housing sector as well as the commercial sector.
- Strive to make the Government change the Building Regulations so that buildings worthy of preservation are not automatically exempt from those energy resolutions which do not reduce their preservation value.
- Businesses and housing in Copenhagen often change ownership which reduces incentives to carry out energy saving measures, as owners will not necessarily enjoy the benefits of these with even a short repayment period. The City of Copenhagen will strive to ensure that the Government establish an energy savings scheme in the individual buildings as part of its future strategy for the building stock.
- Disseminate information regarding new funding, organisation and partnership models providing a scope for reducing costs when constructing low-energy buildings.

ENERGY-EFFICIENT BUILDINGS IN COPENHAGEN

The City of Copenhagen has already commenced various initiatives to reduce energy consumption in the existing building mass as well as new build. The initiatives will continue until 2025 and beyond.

Climate Retrofitting of Existing Buildings

With existing buildings, it is essential to incorporate the energy saving measures at the same time as the general retrofitting of the building is being done. Two parameters, therefore, are particularly important for the volume of energy savings taking place up to 2025: partly the size of the housing stock being retrofitted and partly how comprehensive these will be. The City of Copenhagen seek to increase the rate of retrofitting by 0.5 percentage point per annum. This means that 33% of the housing stock and 46% of commercial properties will be retrofitted in the period up to 2025.

The City of Copenhagen wants to secure proactive casework including specialist knowledge in the field of energy retrofitting. In this light, the City Administration will provide consulting services on the added value inherent in better quality housing with an improved indoor climate and more daylight, for example.

The City will work to increase the rate of retrofitting in the social housing sector which constitutes almost one fifth of the housing sector in Copenhagen.

In addition, the City Administration wants to utilise the scope presented by urban renewal to increase the rate of retrofitting together with the energy efficiency ratio of existing buildings. The City of Copenhagen wants to offer grants to long-term energy efficiency while the most cost-effective projects will be self-financed.

Consistency between Estimated and Actual Consumption

At present, there are no requirements that actual energy consumption for heating a new low-energy building is consistent with the consumption calculated for the building prior to construction.

Measurements of energy consumption in low-energy buildings indicate that energy consumption is bigger than expected. The City of Copenhagen wants to develop a method and work to establish a framework for correlating the estimated and the actual consumption.

In conjunction with local committees and green organisations, the City of Copenhagen must create a sense of ownership to the agenda about a carbon neutral Copenhagen. Collaboration with these groups is intended to minimise energy consumption in households. The follow-up on energy consumption in both existing and new buildings will be combined with this initiative.

New Build with low Energy Consumption

New urban development areas in the Municipal Master Plan 2011 have been construed so that construction must comply with the requirements of Energy Class 2015 and already from that date the construction sector must comply with the requirements of Building Class 2020. New construction projects will then be at the forefront of requirements of green construction.

This provides Copenhagen with a huge potential for becoming the driving force behind developing increasingly energy-efficient new build, thereby starting the innovation process to enhance energy-efficient technologies – also in the operational phase. The City of Copenhagen will set initiatives in motion which promote the development of these solutions by inviting businesses to develop and test new technologies and solutions. The initiatives include close collaboration with construction sector players about sustainable and energy-efficient urban development as well as analyses of the optimal method to supply new urban areas with energy in the future.

Efficient Heat and Domestic Water Supplies

The City of Copenhagen will, together with Copenhagen Energy and others, create incentives for totally upgrading heat and domestic water supplies in Copenhagen before 2025.

Expectations are that the total heat consumption in Copenhagen can be reduced by 10% if heat and domestic water supplies in Copenhagen are increasingly regulated and adjusted to demand. Remote meter reading of heat consumption can be used to identify plants with unusually high consumption. Through field work, inefficient plants will be regulated and optimised, so that temperatures can be adjusted for maximum efficiency.

Energy Savings in Commercial and Service Companies

The City of Copenhagen will strive to redeem the huge potential for energy savings in companies. At present, the City Administration provides help and inspiration to companies on how to reduce their CO2 emissions in the Green Business network. This provides easily accessible tools for climate action and energy consultancy tailor-made to each business.

The City of Copenhagen also wants to offer a package solution aiming to increase incentive and drive for commercial and service companies to achieve energy savings. The package will provide information on how to identify, finance and implement cost-effective energy savings.

The City of Copenhagen will include relevant players in the initiatives targeted at companies such as skilled workers and energy companies to provide consultancy and implementation.

SOLAR CELLS

Market trends for solar cells with an worldwide annual growth rate of 40%, increased efficiency and a substantial drop in price cause great optimism with regard to solar cell technology. By collaborating closely with the people of Copenhagen and businesses, the City of Copenhagen will be able to promote the growth of solar energy even further.

The City of Copenhagen, therefore, wants to play a proactive role in relation to case handling, for example, in order to motivate and support the installation of solar cells by Copenhageners through its various enterprises. The City Administration will design architectural guidelines for solar cells on city roofs and, in various contexts, provide information about the scope for installing solar cells. Also, the City Administration will be making use of urban renewal funding to develop solar cell solutions which will fit into the city's architecture and be energy cost-effective. Furthermore, Copenhagen Energy will be able to develop a business concept supporting the installation of solar cells on city buildings provided the concept is commercially viable.

INNOVATION AND PROFILING

For several years now, there has been strong focus on energy consumption in the construction sector implying that energy requirements both in existing buildings as well as in new build have been reduced. However, there is still a considerable, unexploited potential and there is a continuous need for knowledge sharing and development within the field of low-energy construction and retrofitting of existing buildings. There is a need for holistic planning solutions for the entire building.

Accumulation of Knowledge and Knowledge Sharing

The City of Copenhagen will be establishing new partnerships with relevant organisations for the purpose of accumulating and disseminating knowledge and examples of good solutions within the field of new build and retrofitting.

Collaborating with knowledge institutions and relevant players from the construction sector, the City Administration will initiate the compilation of a catalogue of good solutions that achieve energy savings and economic benefits resulting from energy retrofitting, taking into consideration the age and condition of the buildings.

The City of Copenhagen has compiled a catalogue of inspiration for developers about energy supply of new urban areas and low-energy construction, and The City of Copenhagen will strive to enter into agreements with developers to ensure that as many as possible will follow its recommendations.

Lighthouse Projects

The City of Copenhagen will carry out lighthouse projects to show the way to constructing energy-efficient buildings and to retrofitting existing ones. Their design and construction will be optimal with regard to energy consumption, indoor climate, user satisfaction and economy. Also, focus will be on building process and collaboration between sector parties.

The City of Copenhagen will establish a green growth partnership with developers and contractors concerning lighthouse projects to gain more sample construction projects within the private sector, which will add to the development of energy-efficient new build and retrofitting.

Concurrently with the new urban development areas, the City of Copenhagen wants to test ways in which urban design may provide good energy solutions. Authorities, architects, engineers, investors and others must collaborate on designing and implementing low-energy buildings able to comply with strict energy requirements while also securing optimal solutions in energy supply.

THE SMART CITY

Turning Copenhagen into a smart city means user-friendly development while also reducing consumption of resources. The starting point for the smart city is the unified whole. That is to say, limitations in capacity, renewable energy production, consumer patterns and consumer needs will be integrated into the solutions which are finally implemented.

With the smart city, The City of Copenhagen wants to select the most energy-efficient solutions such as giving high priority to electricity largely produced by renewables and to ensure that the potential for flexible energy consumption is utilised. The City Administration will use its own vehicles and buildings to test and implement new technology.

Digital Infrastructure

In the smart city, we will be monitoring energy consumption – amongst other things by controlling the energy consumption in buildings – and learn from it. Access to public energy consumption data creates a scope for new services and new information for the benefit of both Copenhagengers and businesses. The City of Copenhagen will be collaborating with relevant partners to ensure an open digital infrastructure so that Copenhagen will have an open platform for new and innovative solutions.

In practice, Nordhavn Energy Partners will be used as a pilot project for the publication of energy consumption data in buildings. In the future, energy and water consumption in City of Copenhagen buildings will be monitored by remote meter reading and illustrated so that the City Administration, in conjunction with relevant players, can optimise and innovate the city's digital infrastructure.

Flexible Consumption and Smart Grid

In the future, the Danish energy supply will consist of increased amounts of renewable energy. This requires an increasingly flexible consumption and a Smart Grid which, together, can accommodate more renewable energy into the system. A Smart Grid must be the link between energy production and user.

The City of Copenhagen will, together with external players, strive to examine the possibilities of implementing a scheme whereby Copenhagengers, businesses and authorities will have more opportunities to select and use electricity when the share of renewable energy in the overall energy production is high.

The City of Copenhagen will also launch several initiatives to ensure intelligent recharging of the City Administration's own electric cars. To minimise the production of district heating in plants producing heat only - which happens during very cold periods - the City Administration will, in collaboration with Copenhagen Energy, examine whether the heating system could be made more flexible.

The Smart Building

The smart building is a general concept involving a number of elements within the field of energy efficiency, flexibility and energy management. The concept will be tested in two of the City Administration's properties before it will spread to various sectors in Copenhagen.

Smart CPH2

In a demonstration project at a site in Copenhagen, hydrogen will be produced from excess wind energy. The hydrogen could be used for transport which would provide an obvious link between renewables and mobility in Copenhagen.

Onshore electricity for Cruise Liners in Copenhagen

Copenhagen is a popular venue for cruise liners which dock in Copenhagen harbours. At present, the liners are supplied with electricity generated by their own engines during their time in the dock which means noise, air pollution and high oil consumption and hence CO2 emission.

Nordhavn Energy Partners are focusing on the problem and they are making attempts at finding a solution whereby the liners are supplied with onshore electricity. The City of Copenhagen will strive to improve the framework for supplying the cruise liners with onshore electricity which would generate a positive effect on the local environment by reducing air pollution and the global CO2 emissions.

**BY 2025, COPENHAGEN WILL
BE A SMART CITY FOCUSING ON
USER-FRIENDLINESS WHILE ALSO
REDUCING THE CONSUMPTION
OF RESOURCES**

4



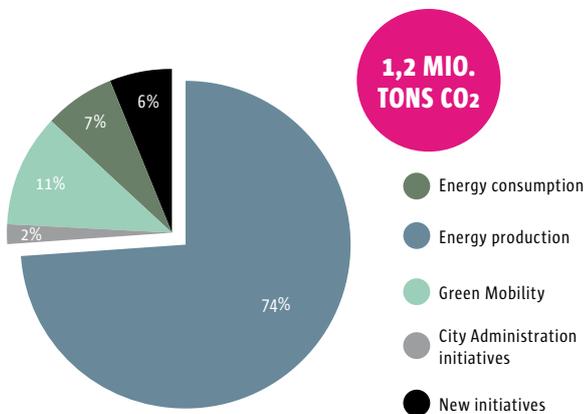
4

ENERGY PRODUCTION

MAJOR GOALS FOR 2025

- // DISTRICT HEATING IN COPENHAGEN IS CARBON NEUTRAL.
- // ELECTRICITY PRODUCTION IS BASED ON WIND AND BIOMASS AND WILL, IN TOTAL, EXCEED THE CITY'S ELECTRICITY CONSUMPTION.
- // SEPARATION OF PLASTIC FROM HOUSEHOLDS AND BUSINESSES.
- // BIOGASIFICATION OF ORGANIC WASTE.

SHARE OF TOTAL CARBON REDUCTION



ALLOCATION OF REDUCTION FROM ENERGY PRODUCTION INITIATIVES

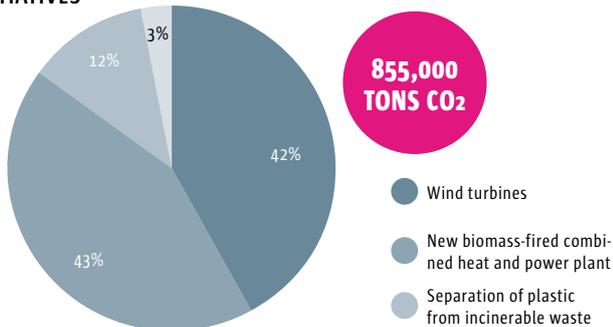


FIGURE 10 // Reduction of CO₂ emissions from energy production compared to total reductions broken down into initiatives.

In 2025, the production of electricity, heating and cooling in Copenhagen will primarily be based on wind, biomass, geothermal energy and waste. The goal is carbon neutral district heating by 2025 with Copenhagen contributing to establishing a renewable electricity production which, in total, exceeds the city's electricity consumption. This is likely to place Copenhagen in a unique position both nationally and internationally. Clearly, this has a number of inherent and obvious advantages.

Firstly, energy production will be based on several different renewable energy sources ensuring a flexible energy system. The energy needs of the people and businesses of Copenhagen vary over a 24-hour period and over the course of a year. Flexible energy production provides an opportunity to meet varying demands for energy in ways which exploit the energy resources optimally. This will also reduce the reliance on individual energy sources.

Secondly, the conversion will provide green job opportunities: partly in the process of converting to already developed energy technologies and partly in relation to development and demonstration of green energy solutions of the future in the world's major cities.

4.1

MAIN CHALLENGES

Today and in the immediate future, Copenhagen faces a number of big challenges in the area of green energy production. These include a lack of base load facilities, the deregulation of the waste sector and the need for a flexible energy supply together with a need for strategic energy planning across the municipalities in the Greater Copenhagen Area. Furthermore, expectations point to economic growth as well as a considerable population increase in Copenhagen.

Carbon neutral district heating requires the conversion of peak load supply to carbon neutral fuels and a separation of plastic from the incinerable waste. Electricity needed for heat pumps in e.g. geothermal facilities will continue to emit CO₂ until the production of electricity has been converted into renewables which, according to the Government, should be implemented by 2035.

FUTURE CHANGES IN ENERGY PRODUCTION

In 2014, the combined heat and power unit at Svanemølle is expected to be discontinued and the two heat and power units at the H.C. Ørsted combined heat and power plant will be discontinued at the end of 2015 and 2023, respectively. These two stations will continue as peak and reserve-load stations.

Furthermore, the heat production resulting from waste incineration is expected to decrease due to more efficient separation and the use of alternative treatment technologies. This will result in a lack of base-load capacity already in 2015. The need for a new base-load facility must therefore be assessed and subsequently constructed in partnership with the heating companies. A likely site for the new facility is Amager.

Amager combined heat and power plant Unit 3 and Avedøre combined heat and power plant Unit 1 could, provided their lifespans are extended, be operational until 2027-2030 when the facilities will be approximately 35 years of age. The lifespans of Avedøre combined heat and power plant Unit 2 and Amager combined heat and power plant Unit 1 can be extended and, in the event of this taking place, they are expected to be operational until approximately 2040. Hence, the City of Copenhagen will reserve a power station site on Amager. The site may be used for either a combined heat or power unit in the short term, in the event that no available space can be found in the old power stations, or if the conversion to biomass in the old stations turns out to be disproportionately costly. Alternatively, the site will remain reserved in the long term as it is the only power station site left to supply Copenhagen.

FLEXIBLE ENERGYSYSTEM

A growing quantity of wind in the energy supply creates the need for more flexibility in the rest of the energy production and also with users. It is necessary to opt for several technologies such as storage, heat pumps and biomass-based combined heat and power which can be adapted to actual consumption.

It is estimated in Heat Plan Greater Copenhagen 2 that the corporate and economic conditions for any large-scale use of heat pumps in the Greater Copenhagen Area are unlikely to be present in the years up to 2025. The district heating system of the Greater Copenhagen Area is likely to be better suited to a flexible energy system by increasing dynamics in the power stations and by increasingly establishing heat storage facilities whereby heat can be stored and used when the need arises. The City of Copenhagen will examine the basis for using large heat pumps in the district heating grid on a large scale to balance the overall energy system.

WASTE DEREGULATION

In December 2010, the market for importing and exporting commercial waste was deregulated. If the same thing happens with household waste, the consequences for waste treatment will be significant.

In 2012, the Government presents a new resource strategy and has already hinted that, in the future, Denmark must treat waste as a resource and that reusable waste must be made useful in some way. So at present, waste is a somewhat uncertain entity – both with regard to the quantity of waste for energy production and to CO₂ emissions from waste incineration.

In the years up to 2015, development and pilot projects will be carried out to examine the increased separation of plastic from the waste stream and the exploitation of organic residues in waste. The City of Copenhagen Local Agenda 21 Plan for 2012-2015 'A Greener and Better Everyday Life' stages an activity relating to waste which is about increased reuse through better waste solutions developed and tested together with citizens.

DEVELOPMENTS IN PRICES AND CHARGES

The charges structure is a central tool for supporting green growth both in an economic sense and for consumers. For the Government to maintain its revenues when the proceeds from charges on fossil fuels decrease, a so-called supply security charge will be introduced on fuels for heating, including biomass.

The price of biomass is expected to rise due to a rise in demand and a drop in supply. In addition to the demand for biomass for energy production, the transport sector is expected to increase their demand for biomass resources concurrently with the phasing out of fossil fuels.

A growing demand also means that focus on the sustainability of the biomass must be sharpened and that alternatives to biomass must be found. In Copenhagen, the scope for using geothermal energy will be examined further.

STRATEGIC ENERGY PLANNING

The district heating grid in Copenhagen is linked to the grid in the neighbouring municipalities in the Capital Region and the power grid forms part of the European grid. The goal of carbon neutrality requires that the City of Copenhagen and the neighbouring municipalities in the Greater Copenhagen Area have a united vision for converting the energy supply. For this reason, Copenhagen is collaborating with a number of players on strategic energy planning for the Greater Copenhagen Area. Only through collaborating across municipal borders, will Copenhagen achieve a carbon neutral energy production by 2025.

4.2

GOALS AND INITIATIVES IN COPENHAGEN UP TO 2025

In respect of both electricity and heat production, the City of Copenhagen have, in recent years, taken the first steps towards carbon neutrality by converting and developing energy production to wind, biomass, waste and, on a smaller scale, geothermal energy and remote cooling.

The transition to become a carbon neutral capital happens gradually through central infrastructural priorities and investments in energy production. That is why Copenhagen, in conjunction with central players, will initiate a series of main initiatives within energy production in the period up to 2017 to reduce CO₂ emissions.

WIND TURBINES

CO₂

WITH A REALISTIC EXPANSION RATE FOR WIND TURBINES, COPENHAGEN WILL ACHIEVE AN ANNUAL CO₂ DISPLACEMENT OF 360,000 TONS BY 2025.

Copenhagen has initiated an ambitious wind turbine project, the goal being that more than 100 new wind turbines must be installed by 2025. The work includes installation of wind turbines both inside and outside municipal borders – land-based as well as offshore. Copenhagen Energy is the client and Copenhagen City Council has decided to provide guarantee for loans to finance cost-effective wind turbine projects within a framework of DKK 5.5 bn.

The City Administration also attaches great importance to anchoring activities in the local community as well as involving the citizens. The City of Copenhagen and Copenhagen Energy will, therefore, give Copenhageners the opportunity of purchasing wind turbine shares – initially for turbines in Copenhagen. There will also be an investigation into ways in which city businesses could actively contribute to the expansion of renewable energy.

Economy

Capital expenditure for Copenhagen Energy for 360 MW of wind turbines is estimated at DKK 5.5 bn. Copenhagen City Council's collateral security for Copenhagen Energy's borrowing for cost-effective wind turbine projects will be utilised at the same rate as the individual projects mature.

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016	INITIATIVES UP TO 2025
Establishment of guilds for wind turbine shares sold to citizens and businesses in Copenhagen. Offshore and land-based wind turbines for 360 MW (100 turbines) have been installed	Land-based wind turbines within municipal border	Four suitable locations have been selected and the planning process for a total of seven wind turbines at Prøvestenen and Kalvebod Syd is expected to be finalised in 2012/13	Work continues with actual projects at the four localities
	Wind turbines in other municipalities	Copenhagen Energy initiates negotiations with land owners about localities and the respective municipalities are encouraged to start planning process	Continue efforts to decide on sites, municipal planning processes, development and maturing of projects etc.
	Coastal off-shore wind turbines	Suitable sites have been found in Øresund and Energy Agreement 2012- 2020 includes a total of 500 MW coastal offshore wind turbines. Settlement terms have not yet been finalised	Work continues
	Partnerships to tender for Government offshore wind turbine projects	Copenhagen City Council has mandated Copenhagen Energy to participate in e.g. joint ventures to tender for public contracts of offshore wind turbines	Energy Agreement 2012-2020 stipulates that an expansion of 1,000 MW of wind power will be carried out in the years up to 2020; call for tenders planned for 2013 -2015, expected to be operational in 2017-2020

HEAT SUPPLY AND BIOMASS

CO₂

TOTAL CO₂ EMISSIONS FROM INITIATIVES IN HEAT SUPPLY AND BIOMASS IS ESTIMATED AT 395,000 TONS PER ANNUM IN 2025. ELECTRICITY PRODUCTION FROM A NEW WOOD-FIRED COMBINED HEAT AND POWER PLANT CAN REDUCE THE ANNUAL CO₂ EMISSIONS BY UP TO 365,000 TONS. CONVERSION OF PEAK AND RESERVE POWER TO PRODUCTION FROM CARBON NEUTRAL FUELS WILL REDUCE CO₂ EMISSIONS BY APPROXIMATELY 30,000 TONS PER ANNUM. CONVERSION OF THE EXISTING COMBINED HEAT AND POWER PLANTS TO BIOMASS FORMS PART OF THE CITY OF COPENHAGEN CLIMATE PLAN 2009 AND IS THEREFORE TREATED AS AN ASSUMPTION IN THE CO₂ PROJECTION.

In continuation of the first climate plan dating from 2009, Copenhagen has, via the heating companies, worked to convert combined heat and power to biomass. Part of the Amager Power Station was converted in 2010 to biomass only and the heating companies are negotiating the conversion of the second part of Amager Power Station and Avedøre Power Station.

With the Energy Agreement 2012-2020, the decision was made to amend the Act on heat supply enabling heat producers and heat consumers to enter into voluntary agreements regarding the distribution of the indirect tax benefits when converting to biomass. In this context, it is important to also consider the consumers.

Today, the biomass for electricity and heat production in the capital mainly consists of wood pellets. The City of Copenhagen wants that international requirements for sustainability of biomass for energy production be adopted concurrently with rising demands. Biomass will play a significant role in the energy production in the capital for many years to come, but the City of Copenhagen expects demand to fall parallel with the phasing out of the large combined heat and power plants. Alternative energy sources such as wind power and geothermal energy are, to a large extent, expected to take over.

The City of Copenhagen attaches great importance to utilising the biomass efficiently and in the plants best able to exploit them.

At present, there is a geothermal demonstration facility at Amager Power Station. The facility has been in operation since 2005 and during this period, a great deal of operational knowledge has been gained, which can be drawn upon when establishing new plants. Within the next few years, a final decision will be made on the role of geothermal energy in the overall energy production in Copenhagen, including the position of Copenhagen Energy in any future production.

The City of Copenhagen sees as its goal for 2025 a 20% reduction in heat consumption, a 20% reduction in electricity consumption for commercial and service companies and a 10% reduction for households compared to 2010 figures. This reduces the need for energy and should be allowed for in the future planning of production capacity.

In 2025, Copenhagen will have a carbon neutral district heating supply primarily based on biomass, waste and geothermal energy. The combined heat and power plants at Amager and Avedøre will be converted to biomass and an additional biomass-fired combined heat and power facility will be established in Copenhagen. The new combined heat and power facility will remedy the lack of base-load capacity in Copenhagen in the years up to 2025. In addition to a new combined heat and power facility, interesting possibilities include especially geothermal energy but also large heat pumps and heat storage facilities.

The City of Copenhagen wants an energy system to be established with several energy sources to supplement one another, thereby giving the city a flexible electricity and heat supply. This means, for example, that biomass-fired combined heat and power plants increasingly need to adjust their energy production at times when wind turbines generate less energy due to little or no wind. Investigations will be made to decide whether there is a scope for reducing the need for peak-load production and for converting the rest to carbon neutral fuels.

Remote Cooling

Copenhagen Energy has established remote cooling systems for businesses on Kgs. Nytorv and Rådhuspladsen and plans to establish remote cooling at the University of Copenhagen, Rigshospitalet and the Panum Institute.

Remote cooling is more energy-efficient when replacing individual compressor cooling systems in commercial buildings. During the winter months, the facility provides cooling by using sea water and in the summer months the cooling is derived from steam from the power plants and by using electricity-powered refrigeration compressors. The City of Copenhagen will currently assess the energy efficiency, the economy and the environmental benefits of remote cooling.

Economy

Investments in electricity and heat production are partly financed by the energy companies and partly by the district heating charges. However, the City of Copenhagen may opt to provide collateral security for:

- A wood-fired combined heat and power plant of 115-350 MW corresponding to an investment of DKK 1.5-4 bn.
- A geothermal facility (65 MW) corresponding to an investment of approximately DKK 1 bn.
- A heat storage facility (capacity 200 MW) corresponding to an investment of DKK 0.2 bn.

**IN 2025, ENERGY
PRODUCTION IN COPENHAGEN
WILL BE BASED ON WIND,
SUN,
BIOMASS, GEOTHERMAL ENERGY
AND WASTE**

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016	INITIATIVES UP TO 2025
Combined heat and power production in Copenhagen is converted to biomass A new wood-fired combined heat and power plant has been established A geothermal facility of at least 50 MW has been established together with an additional one before 2030 Peak-load production has been converted to carbon neutral fuels	Biomass introduced at combined heat and power plants	Negotiations on converting to biomass at the power plants at Amager and Avedøre	Implementation
		Technical and economic assessment, planning and projecting of new wood-fired combined heat and power plant	Establishing wood-fired combined heat and power plant
		Decision-making basis regarding establishing a geothermal facility to be drafted	Implementation
	New heat production units in Copenhagen	Overall decision-making and time line to be drafted on establishing heat-producing renewable energy-facility in Copenhagen, including heat pumps and possibly solar heat	Implementation
		Conversion of peak and reserve-load production to carbon neutrals fuels	Conversion plan to be drafted

to build a new incineration plant using other technologies to supplement incineration in order to increase the recycling of plastic and the production of biogas. If new technologies and solutions were adopted for the purpose of waste disposal, it would provide a more flexibility energy system.

When plastic contained in waste is incinerated, it contributes to the energy supply but it also emits CO₂, because plastic is an oil-based product. If plastic content in waste remains unchanged, CO₂ emissions from waste incineration are expected to reach 100,000 tons by 2025. Furthermore, it requires a lot of energy to produce plastic. Copenhagen must increasingly prevent, separate and recycle plastic from households and businesses – a process already begun by the City of Copenhagen in 2011.

Economy

Initiatives on waste are financed by charges. It is estimated that a REnescience facility with a capacity of 80,000 tons of waste per year will cost DKK 0.8 bn in capital expenditure while a biogas facility with a capacity of 50,000 tons of waste per year is estimated to cost DKK 120-150 m in capital expenditure.

WASTE AND ENERGY SUPPLY

CO₂

TOTAL CO₂-REDUCTIONS ARE ESTIMATED AT 100,000 TONS IN 2025 DUE TO THE SEPARATION OF PLASTIC FROM WASTE STREAM.

Waste incineration will continue to be part of heat production in the capital. The imminent plans for resources and waste due from both the Government and the City of Copenhagen will set out the framework for increased recycling and are likely to result in reduced quantities of waste for incineration.

There is a close link between initiatives within the field of waste incineration and the district heating supply in the Greater Copenhagen Area. This is true with regard to incineration capacity and also to separation and recycling as well as new treatment methods in waste handling. The Amager Incineration Plant is about to be run-down and work is in progress

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016	INITIATIVES UP TO 2025	
Gasification of organic waste A full-scale REnescience or biogas facility has been established Plastic from households and businesses are separated from the waste stream	New waste treatment centre	Decision-making basis for establishing a new waste treatment centre to be drafted	Implementation	
		Treatment of organic waste	Assessment of REnescience facility and other treatment technologies for biogasification of organic waste	Establishing either a REnescience or other treatment technology so that resources in organic waste can be exploited
	Prevention, separation and recycling of plastic in waste	Investigation of various aspects regarding the collection of organic waste in Copenhagen		Exploitation of organic waste in the event of a positive result
			Establishing three new collection schemes for hard plastic, metal and small electronic appliances from multi-storey housing in the city	Work continues
		Clarify methods for prevention, separation and recycling of plastic by participating in the LIFE project, Plastic Zero – the project on climate-friendly waste		Implementation

5



5

GREEN MOBILITY

MAJOR GOALS FOR 2025

- // 75% OF ALL JOURNEYS IN COPENHAGEN ARE ON FOOT, BY BICYCLE OR BY PUBLIC TRANSPORT.
- // 50% OF ALL JOURNEYS TO PLACE OF WORK OR STUDY ARE BY BICYCLE.
- // 20 % MORE PASSENGERS USING PUBLIC TRANSPORT COMPARED TO 2009.
- // PUBLIC TRANSPORT IS CARBON NEUTRAL.
- // 20-30% OF ALL LIGHT VEHICLES USE NEW FUELS LIKE ELECTRICITY, HYDROGEN, BIOGAS OR BIOETHANOL.
- // 30-40% OF ALL HEAVY VEHICLES USE NEW FUELS.

The City of Copenhagen is focused on making cycling, walking or using public transport the most attractive means of transport for Copenhageners to get around in the city. If Copenhageners use their cars, the goal is that the large majority of them use electrical, hydrogen or hybrid-powered cars or new fuels like biofuels. Transport in Copenhagen must contribute to making a greener, smarter and healthier city in 2025 where more people use their bicycles, walk or use public transport. New fuels and car club schemes will also be increasingly prevalent.

The City of Copenhagen Local Agenda 21 Plan 'A Greener and Better Everyday Life' contains three transport activities which all seek to influence Copenhageners towards greening their conduct with respect to mobility. Amongst other things, Copenhageners will receive information on and an opportunity to try other methods of transport such as electric cars and car club schemes. Another activity focuses on making life easier for cyclists and getting more people on their bikes.

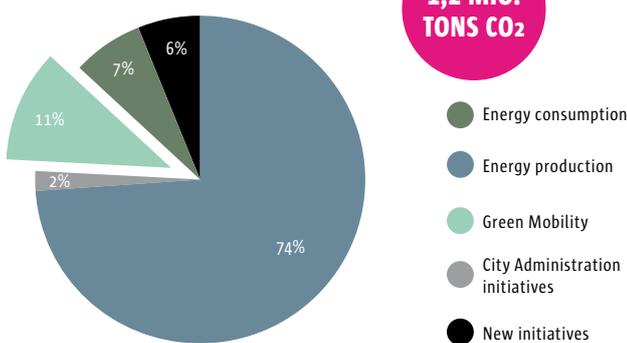
Expanding Initiatives

Municipal Master Plan 2011 contains the vision that traffic in Copenhagen must be broken down so that at least one third of journeys must be by bicycle, at least one third by public transport and no more than one third by car. The City Administration is improving conditions for cyclists on an ongoing basis, expansion of the Metro and optimisation of the bus network have improved public transport. Still, huge challenges remain if the goals are to be attained by 2025. This requires investments in everything from infrastructure to bicycles, electric and hybrid cars and biofuels for the public transport sector, traffic nodal points and intelligent transport systems (ITS).

Several different initiatives support developments to achieve greener transport as described in 'Action Plan for Green Mobility', which was adopted by the City of Copenhagen in 2012. This includes extending the Metro supplemented by light railways and priority bus routes, expanding the overall coherence of the cycle lane network, the PLUSnet and super cycle lanes connecting Copenhagen with neighbouring municipalities, IT-regulated signalling systems, extensive refurbishment of stations and, finally, a better interaction between the various modes of transport. Besides, road users must stop thinking about themselves as motorists, cyclists or people using public transport – everyone is all of these things but at different times. For this reason, the City of Copenhagen will offer road users the best possible information enabling them to select the best mode of transport at any time.

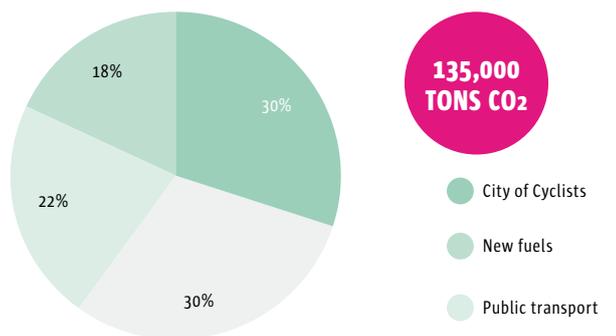
There is focus on electric cars in Copenhagen. The City of Copenhagen has as its goal that 85% of the Administration's own passenger cars must be powered by electricity or hydrogen by 2015. This means that the City of Copenhagen must purchase more than 500 electric cars. To upgrade the infrastructure for electric cars in the city, more than 200 parking spaces for electric cars will be established before the end of 2012 and a further 500 to be completed by 2015. Possibly still another 500 -1000 if the demand is there. These initiatives will help to sustain a market for the use of new fuels in the transport sector.

SHARE OF TOTAL CARBON REDUCTIONS



1,2 MIO. TONS CO₂

ALLOCATION OF REDUCTIONS FROM MOBILITY INITIATIVES



135,000 TONS CO₂

FIGURE 11 // Reduction of CO₂ emissions from mobility compared to total reductions broken down into initiatives.

Furthermore, the City of Copenhagen is striving to promote the use of electric and hydrogen-powered cars including promotion activities, information and dialogue-based activities for Copenhageners, businesses and other authorities. Also, collaborative efforts are in progress in the Øresund region in relation to the climate strategy for the Capital Region.

There are a number of uncertainties in the area of transport. The Government's transport strategy will provide the answers to a number of questions and the European Commission is expected to present draft directives in support of their long-term transport strategy.

A number of development projects will be initiated in Copenhagen on transport during 2013 and 2014 and the Government's Congestion Mitigation Commission will be presenting their proposal for a major strategy in August 2013. The various measures and projects will be evaluated towards the end of 2015. In the light of experience gained and the evaluation, the initiatives in the transport sector will be duly revised up to 2025. The City of Copenhagen will actively participate in the work towards a governmental congestion strategy and is prepared to enter into demonstration projects.

5.1

MAIN CHALLENGES

CO₂ EMISSIONS FROM TRANSPORT

Transport causes a large part of the total CO₂ emissions in Denmark as well as in Europe. In 2010, 544,000 tons CO₂ was emitted by the transport sector in Copenhagen corresponding to 22% of the city's total CO₂ emissions. Road traffic alone was responsible for 70% of transport emissions.

This percentage share is likely to rise over the next years as the emissions from other sectors will be falling. At the same time, the demand for transport is rising. Copenhagen is expecting an increase of 110,000 inhabitants between now and 2025 and 20,000 new jobs will be created. More people mean more congestion, more CO₂ emissions and more noise. Furthermore, it is crucial for the life and growth of the city that mobility will continue to be high and that all valuable space in the urban setting is used optimally. In other words, the CO₂ challenges in the transport area are considerable at the present time. They are likely to be even bigger for many years to come.

TRANSPORT NEEDS AND FUELS

Improved public transport, better conditions for cyclists, more car club activities, better coherence between modes of transport and targeted information will ensure optimal mobility for the vast majority. But in the future, too, there will be a need for cars and heavy vehicles. Since vehicles in 2025 will continue to be largely powered by petrol and diesel, transport will continue to be the cause of substantial CO₂ emissions and local air pollution. For this reason, it will be necessary to switch from petrol and diesel to greener fuels like electricity, hydrogen and biofuels as far as possible.

The price of fossil fuels is expected to rise while it is likely to drop for green fuels and the new, promising technologies which make use of them. In this way, investing in green fuels might prove to be a long-term benefit – as cheaper fuels for transport and the development of new technologies.

The need for road traffic also imposes demands for developing and testing new traffic solutions which will improve traffic control, create more coherence between modes of transport and contribute to new green growth.

In other words, the transport sector constitutes a huge challenge if Copenhagen is to attain its goal of carbon neutrality by 2025. It will require new, substantial initiatives able to create a more flexible mobility, less congestion, less pollution and better health while also contributing to green growth, so that Copenhagen will gain from taking on responsibility for the climate - from the point of view of the climate as well as the economy.

CO₂ EMISSIONS WITHOUT NEW INITIATIVES

MEASURED I 1,000 TONS CO ₂	2010	2025
Passenger cars	254	229
Vans	67	56
Lorries	25	27
Buses	29	22
Motorbikes	2	1
Road in total	377	335
Diesel trains	3	5
Electric trains	41	49
Railways in total	44	54
Shipping	42	42
Aviation in total, domestic	15	18
Non-road industry	63	51
Non-road house/garden	3	3
Other in total	123	114
IN TOTAL	544	503

Table 1 // CO₂ emissions from the transport sector in Copenhagen in 2010 and 2025 projections without new initiatives. Source: COWI, 2012.

GRAMME CO2 PER PASSENGER-KILOMETRE (PKM)

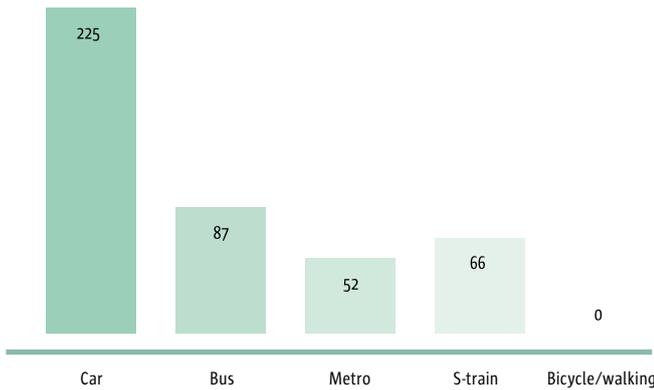


FIGURE 12 // Actual CO2 emissions by various means of transport measured in grammes CO2 per passenger-kilometre. Source: Metroselskabets Miljørapport, 2010.

ALL PASSENGER JOURNEYS DISTRIBUTED ON MEANS OF TRANSPORT

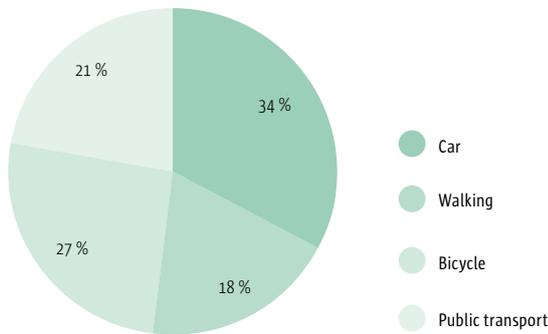


FIGURE 13 // Passenger journeys in Copenhagen broken down into means of transport in 2010. The goal for 2025 is that car journeys account for only 25%. Source: Copenhagen Green Accounts 2011.

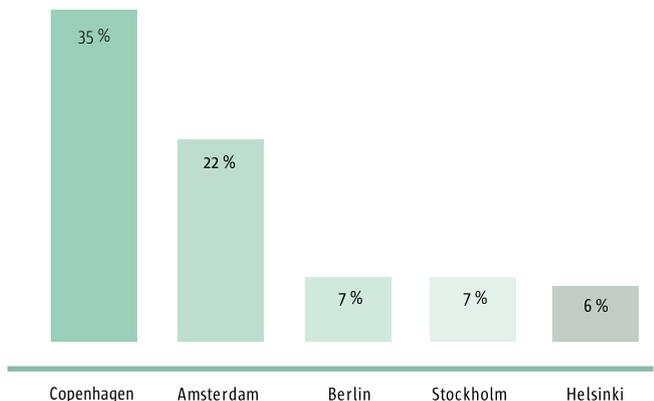


FIGURE 14 // Share of journeys to work using bicycles in various cities. Source: Copenhagen Solutions.

5.2

GOALS AND INITIATIVES IN COPENHAGEN UP TO 2025

To strengthen mobility in Copenhagen, a number of initiatives will be set in motion in the years up to 2025.

Especially in connection with continuing developments of City of Cyclists, using new fuels in the transport sector, developing public transport, implementing intelligent traffic systems and traffic information and carrying out mobility planning.

CITY OF CYCLISTS

CO₂

THE MANY CYCLISTS IN COPENHAGEN ARE A MAJOR REASON THAT THE CITY'S CO₂ EMISSIONS ARE RELATIVELY LOW COMPARED WITH OTHER CITIES. TODAY, 35% OF ALL JOURNEYS TO PLACE OF WORK OR STUDY ARE BY BICYCLE. IF HALF OF ALL JOURNEYS TO PLACE OF WORK OR STUDY ARE DONE BY BICYCLE IN 2025, IT WILL MEAN A REDUCTION IN CO₂ EMISSIONS OF 40,000 TONS CO₂ PER YEAR COMPARED WITH 2010.

Copenhagen is already a city of cyclists. Cycling is widespread and recent years' initiatives with special cycle routes and wider cycle lanes have encouraged Copenhageners to jump on their bikes. There is a greater potential, however, and new initiatives are necessary to encourage even more to use their bikes.

The congestion on the cycle lanes escalates at the same rate as the increase in the number of inhabitants and the expansion of workplaces. There is a need, therefore, to improve conditions for cycling – in and to the city – if Copenhagen is to remain the City of Cyclists.

The City of Copenhagen wants to set initiatives in motion to develop bicycle connections and promote the proliferation of ordinary bicycles as well as electric ones in the business community.

Economy

The City of Copenhagen expects the cost of realising initiatives for the City of Cyclists in the CPH 2025 Climate Plan to reach approximately DKK 560 bn in the years up to 2025. Of this, DKK 520 m are expenses for the PLUSnet.

In addition to the measures connected to the CPH 2025 Climate Plan, the City of Copenhagen will incur expenses of approximately DKK 1 bn to further develop the City of Cyclists.

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016
<p>At least 50% of all journeys to the place of work or study must be by bicycle</p> <p>At least 75% of all journeys are done on foot, by bicycle or public transport</p>	Developing bicycle connections in and to Copenhagen	Establishing the PLUSnet connecting the overall cycle lane network with parts of the super bicycle lanes and the Green Bicycle routes. 80% of the PLUSnet must have three lanes
	Developing partnerships and green growth for cycling	Establishing a network for businesses and institutions active within the field of cycling. Establishing internal (and external) structures supporting innovation related to cycling.
	Increased use of electric bicycles for long journeys in the Copenhagen area	Analysis of the need for infrastructure for electric bicycles. Collaborate with 300-600 businesses in Copenhagen on pilot loan scheme for electric bicycles, promoting them and informing about their use as a means of transport
	Developing a concept of improved conditions for cycling with the aim of promoting cycling at workplaces.	Developing and implementing a concept making it easy for businesses to make an effort to encourage staff to increasingly use their bikes to work and also using it as a means of transport during working hours, including contact and collaboration with 600 – 1,000 businesses.

NEW FUELS IN THE TRANSPORT SECTOR

CO₂

TAKEN AS A WHOLE, NEW FUELS IN THE TRANSPORT SECTOR CONTRIBUTE TO A CO₂ REDUCTION OF 30,000 TONS.

20-30% OF ALL LIGHT VEHICLES USING NEW FUELS WILL RESULT IN CO₂ REDUCTIONS OF AROUND 20,000 TONNENS

30-40% OF ALL HEAVY VEHICLES USING NEW FUELS WILL RESULT IN CO₂ REDUCTIONS OF AROUND 10,000 TONS.

The City of Copenhagen will strive to increase the use of electric cars, hydrogen-electric cars and cars powered by biofuels. Copenhagen must be known as a green lab for new technologies and products in the field of transport hosting large-scale testing of the newest solutions and products.

The main initiatives are development projects, infrastructure, collaboration and framework. The work will be three-fold:

Electric cars: By 2025, electric cars will be relevant for short-distance vehicles. 96% of all car journeys in Denmark are less than 50km, so there is a basis for a large electric car market. A national and differentiated infrastructure will enable electric cars to cover the relatively rare need for longer car journeys.

Hydrogen-Electric Cars: These are expected to develop over the next years eventually being available on market terms. Copenhagen wants to participate in developing and demonstrating the technology, for example, by ensuring adequate infrastructure, but also by hydrogen technology tests in relation to the total energy system.

Biofuels: Biofuels like biogas and bioethanol are well suited for heavy vehicles such as vans, lorries and buses, as these are difficult to convert to electricity from both a technical and economic perspective while, today, bioethanol could be part of the existing infrastructure of petrol stations as it can be mixed with up to 20% of ordinary petrol.

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016
<p>20-30% of light vehicles (less than 3,5 tons) are powered by electricity, biogas, bioethanol or hydrogen by 2025</p> <p>500 -1,000 charging stations with public access have been installed together with 5,000 charging stations for electric and hybrid cars with restricted public access</p> <p>5-10 tank stations for hydrogen-electric cars have been installed reflecting market development</p> <p>30-40% of heavy vehicles in Copenhagen are powered by biofuels</p> <p>At least 10% of driving by private companies in vans and heavy vehicles will be covered by new fuels by 2025</p>	Development projects	<p>Help to improve framework for electric and hydrogen-electric cars through urban planning and new urban development areas</p> <p>Initiate three to five demonstration projects with focus on the use of biogas and bioethanol</p> <p>Establish collaboration with businesses and research institutions to stimulate the market for biofuels through development projects, for example, with focus on converting sizeable car fleets in companies</p>
	Infrastructure	<p>Work to have more charging stands and hydrogen filling stations installed. In the light of the Energy Agreement, to collaborate with the Government on a national action plan for rolling out an intelligent infrastructure</p> <p>Establish a secure supply and infrastructure for biofuels by e.g. creating a production and distribution system in collaboration with relevant players</p> <p>Collaborate with energy companies about using the natural gas grid for distributing biogas</p> <p>Work to establish a certification system for green gas</p>
	Collaboration	<p>Strengthen collaboration with the business community and other public authorities including trying to set up incentives to encourage business community to purchase electric cars – making Copenhagen known as the city with the greenest taxis and car club schemes.</p> <p>Tests and campaigns allowing Copenhageners and businesses to try out electric cars, car club schemes and hydrogen-electric cars. The measures should be launched in collaboration with producers and sub-suppliers of vehicles, components and fuels</p>
	Framework	<p>Strive to ensure that the national framework sets out a long-term tax structure favouring green cars and also a tightening of the regulations governing environmental zones.</p> <p>Work to establish special conditions for the parking of cars using new fuels</p>

Economy

Electric cars, hydrogen-electric cars and biofuels are expected to become significantly cheaper over the next decades. At a time when fossil fuel prices are expected to rise, the total costs of using new fuels instead of petrol and diesel are expected to be substantially lower. Some of the new fuels might even turn out to be cheaper than the conventional ones.

In the spring of 2012, the Danish Energy Agency updated their analysis of alternative fuels. According to the new report, the cost of electric cars and cars powered by biogas will be on a par with petrol and diesel driven cars already by 2020 – even without the present grants and tax exemptions. By 2030, expectations are that electric cars and cars powered by biogas will be cheaper than conventional cars in relation to both purchase and running costs.

With regard to costs, on the other hand, hydrogen-electric cars are unlikely to be as competitive as some of the other new fuels in the years up to 2030. They do have a number of advantages such as longer driving distance and quicker refilling. Furthermore, the development of the fuel cells used in hydrogen-electric cars might be important to other areas of the transport sector as well as to the energy supply.

PUBLIC TRANSPORT

CO₂

IN THE CASE OF BUSES, THE MEASURES MUST SECURE A CO₂ REDUCTION OF 30,000 TONS BY 2025.

WITHOUT ANY NEW MEASURES, CO₂ EMISSIONS FROM S-TRAINS AND THE METRO WILL – ACCORDING TO PROJECTIONS – BE 49,000 TONS BY 2025. CO₂ EMISSIONS WILL DROP TOWARDS ZERO BEYOND 2030 AS RENEWABLE ENERGY GAINS A Foothold IN THE ENERGY SUPPLY.

Public transport is very conspicuous in the streets of Copenhagen and roughly 750,000 people use the bus, Metro or S-trains on a daily basis. The City of Copenhagen, therefore, wants to improve the coherence of public transport by extending the bus network and by initiating new construction projects thereby making it an even more attractive option. The bus network must be adjusted to the ongoing development of both the Metro and S-train systems, and passability projects and improvement of traffic nodal points will ensure that buses are able to traverse the city easily and quickly. The goal is to get even more people to use public transport and to make public transport by bus carbon neutral by 2025. Such a transition will also help reduce noise and

improve air quality. Experience from Sweden, Norway and Germany, for example, shows that it is technologically possible and economically manageable to convert public transport to biogas and biofuels and electric and hybrid buses. By imposing environmental requirements and through trials, the City of Copenhagen wants to show how a green conversion might be implemented in public transport. The Metro and S-trains are already running on electricity. This means that they will gradually become carbon neutral as the whole energy supply is converted to renewable energy. The City of Copenhagen will engage in an ongoing dialogue with DSB S-trains and the Metro Company to ensure that S-trains and the Metro will become increasingly resource-efficient and contribute to reducing the overall electricity consumption.

Economy

Annual expenditure for bus operations in and through the City of Copenhagen amounts to DKK 930 m. Of this, the City of Copenhagen pays DKK 400 m. According to estimates, the City Administration should earmark approximately DKK 290 m for items such as the implementation of demonstration projects and improvement of infrastructure so that public transport can achieve carbon neutrality by 2025.

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016
Public transport is carbon neutral 20% more passengers using public transport compared to 2009	Fuels	Carry out trials with large buses powered by electricity Increase the use of biofuels in buses through operational trials in conjunction with Movia
	Infrastructure	Continue the improvement of the public transport system by the implementation of CityNet 2018 Efforts continue up to 2025 and will also improve conditions at traffic nodal points as well as include measures to improve passability, adjustments of bus timetables and traffic information
	The Metro and S-trains	Efficient use of energy in the Metro and S-trains

INTELLIGENT TRAFFIC CONTROL

CO₂

THE OPTIMISATION OF SIGNALLING FACILITIES, THE TRAFFIC MANAGEMENT CENTRE AND ECODRIVING WILL, TOGETHER, CONTRIBUTE TO A REDUCTION OF AROUND 25,000 TONS CO₂.

The present times witness a rocketing in technological advancement creating a wider scope for traffic planning and traffic management. The City of Copenhagen will attempt to lay the foundations for increased traffic control. The initiative will be realised by, for example, planning and implementing a supplier’s agreement about the city’s traffic signalling systems. The agreement will ensure reliable operations, maintenance and further development of city traffic signalling systems from January 2012 and 8-10 years ahead.

The City of Copenhagen will initiate various measures to improve traffic flow and to reduce CO₂ emissions. This includes a traffic management plan intended to pinpoint the areas in the city where we are likely to achieve the highest reductions in CO₂ emissions by optimising traffic flow for bicycles, buses and cars.

The City Administration will monitor data on travel times and establish an actual traffic management system able to prevent foreseen disruptions of traffic such as roadworks and to redirect in the event of disruptions such as accidents etc.

In addition, the City of Copenhagen will support ecodriving, which is already widespread among bus companies using so-called eco-monitoring. The City of Copenhagen will also attempt to support and develop various pilot projects outside City Administration auspices.

Economy

The City of Copenhagen’s total investments in intelligent traffic control and traffic management is estimated at approximately DKK 300 m for the period 2013-2025. This does not include the establishment of a traffic management system.

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016
<p>All users (buses, trains, cars, bicycles, pedestrians) have access to real-time information about their journey</p> <p>Bus travel times have been reduced by 10% and regularity has been improved by 20% compared to 2011</p> <p>Fuel consumption of lorries have been reduced by 10% due to fewer stops and accelerations compared to 2011</p>	Plan for traffic management	Review scope for CO2 reductions by traffic optimisation
	Monitoring traffic management	Secure reliable data for traffic by means of e.g. blue-tooth units which are available in approximately 20% of all motor vehicles today
	Optimising signalling systems	Coordinate signalling to improve passability for buses, adjust signals according to the traffic for a regular flow (adaptive management) and aim for a regular flow of heavy traffic
	Establishing a system for shared traffic management and traffic information	Draft a concept for strategic traffic management in Copenhagen. Relevant players such as the Danish Road Directorate will be invited to participate
	Ecodriving	<p>Arrange courses to inform drivers of how correct driving will save up to 10% of fuel consumption</p> <p>Automatic speed adjustments – for example electronic signposting</p>

MOBILITY PLANNING

Investments in public transport, cycle lanes and technologies for new vehicles will render carbon neutral means of transport more attractive. It will, however, be necessary to increase and sustain the use of these through information, campaigns and by directly influencing road users. Mobility planning will ensure a targeted and cross-sectoral influence of transport habits across the other initiatives in the transport area. In addition, mobility planning will sustain the proliferation of alternative mobility such as car clubs and car sharing.

Mobility planning is all about influencing the demand for green transport and about getting the target groups to opt for green means of transport. As a starting point, businesses and local areas will be targeted, and target groups such as new residents will be defined.

Economy

Total investments needed for mobility programme and long-term ‘attitude training’ is estimated at DKK 50 m in the period up to 2025.

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016
<p>10% of employees in businesses with a transport plan have changed their transport habits compared to before implementation of the transport plan</p> <p>10% of those who move inside the City border will change their conduct</p> <p>75% of new residents to Copenhagen opt for green means of transport</p> <p>Not more than 15% of schoolchildren are driven to school by car</p> <p>25% of coach companies driving in Copenhagen use route optimisation, no idle running, ecodriving etc.</p> <p>The usual attitude to transport in the city has changed so that green means of transport are seen as a natural choice</p>	<p>Establishing a mobility programme. The programme will outline the green transport facilities to various target groups and contribute to altering their transport habit</p> <p>Long-term ‘attitude training’ resulting in making green transport facilities the natural choice. The City of Copenhagen will implement the initiative in conjunction with scientists and other authorities</p>	<p>Establish business network and help businesses to draft transport plans</p> <p>Collaborate with local capacities about direct offers and information to citizens about transport opportunities</p> <p>Direct attempts at swaying target groups such as new residents, tourists, families with children starting school etc.</p>

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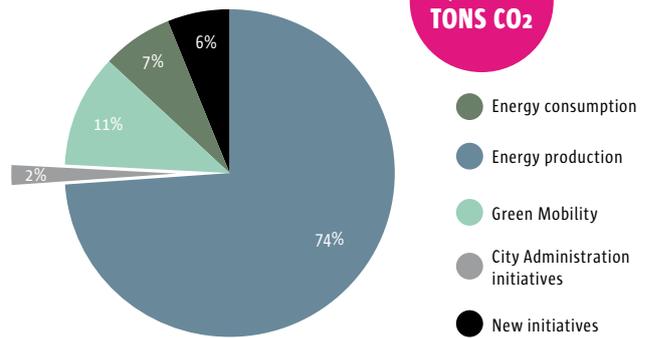
6

CITY ADMINISTRATION INITIATIVES

MAJOR GOALS FOR 2025

- // REDUCE ENERGY CONSUMPTION IN CITY ADMINISTRATION BUILDINGS BY 40% COMPARED TO 2010.
- // MUNICIPAL NEW BUILD UP TO 2015 TO MEET REQUIREMENTS OF 2015 CLASSIFICATION AND NEW BUILD UP TO 2020 TO MEET REQUIREMENTS OF 2020 CLASSIFICATION.
- // ALL CITY ADMINISTRATION VEHICLES RUN ON ELECTRICITY, HYDROGEN OR BIOFUELS.
- // ENERGY CONSUMPTION FOR STREET LIGHTING IN COPENHAGEN IS HALVED COMPARED TO 2010.
- // A TOTAL OF 60,000 SQM OF SOLAR CELL PANELS ON EXISTING MUNICIPAL BUILDINGS AND NEW BUILD HAVE BEEN INSTALLED.

SHARE OF TOTAL REDUCTION



ALLOCATION OF REDUCTION FROM THE CITY ADMINISTRATION INITIATIVES

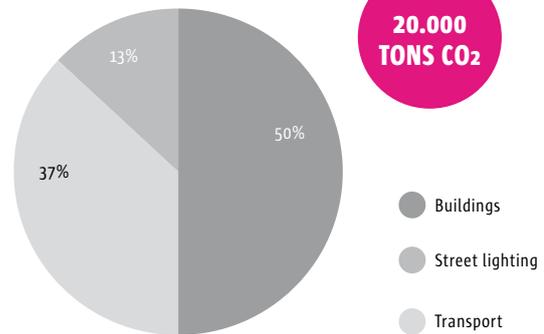


FIGURE 15 // Reduction of CO₂ emission from the City Administration initiatives compared to total reductions broken down into initiatives.

The City of Copenhagen is up front on climate issues and there are substantial benefits to be gained from reducing energy consumption and developing City Administration initiatives. With these initiatives, the City of Copenhagen wants to demonstrate how to push the limits for CO₂ reductions and energy optimisation even further.

In 2025, the energy used by the City of Copenhagen to run buildings and operate street lighting will be reduced significantly. All municipal vehicles are powered by either electricity, hydrogen or other types of new fuel.

The City Administration will set ambitious environmental and climate requirements for its own operations and those of suppliers. The City will, by virtue of its large procurement volume, actively seek to move the market in a climate friendly direction. The City Administration will, in its capacity of both developer and property owner, gather knowledge about building processes, climate retrofitting solutions, climate adapted new build and user conduct.

Additionally, the City of Copenhagen wants to collaborate with knowledge institutions and public/private players about the creation and dissemination of new knowledge. The collaborative effort will secure green growth through the development of new technology, services and competencies on aspects of climate and the environment. Through communication, education and behavioural campaigns, the City Administration seeks to inspire its 45,000 employees to climate-friendly conduct.

FACTS ABOUT CITY ADMINISTRATION INITIATIVES

- **IN 2010, THE CITY OF COPENHAGEN CAUSED THE EMISSIONS OF 110,000 TONS CO₂.**
- **IN 2010, RUNNING THE CITY OF COPENHAGEN CAUSED THE EMISSION OF 4% OF TOTAL EMISSIONS IN COPENHAGEN.**
- **THE CITY OF COPENHAGEN OWNS APPROXIMATELY 6% OF THE TOTAL FLOORAGE IN COPENHAGEN AMOUNTING TO APPROXIMATELY 2.2 M SQM.**

6.1

GOALS AND INITIATIVES IN COPENHAGEN UP TO 2025

ENERGY CONSUMPTION IN MUNICIPAL BUILDINGS

Running the City Administration buildings is responsible for the major part of energy consumed and hence the CO₂ emissions from the City Administration initiatives. It is an extremely ambitious goal to reduce energy use in buildings by 40% up to 2025 and a focused effort will be required to upgrade the building stock and the ways in which it is used.

Consumption Mapping and Energy Management

It is necessary to have a general idea of the energy consumption in individual buildings in order to target efforts and in order to rate the subsequent effect. There is a need, therefore, for valid and updated information about consumption with regard to volume, composition and development.

The City of Copenhagen's energy consumption has already been mapped. The next few years will witness an improvement of master data which will be based on data obtained by remote meter reading equipment installed in municipal buildings. The improved master data will make it easier to optimise operations. Furthermore, the City Administration plans to establish systems to gather information on energy use on all sites and plants used and operated by the City Administration.

Energy consumption management and energy-efficient operations contain a huge energy saving potential and are prerequisites for obtaining the full benefit of the investments which the City Administration plan to make in energy retrofitting and low-energy buildings. Energy management and energy-efficient operations, therefore, must be an integral part of running the municipal building. The existing municipal Energy Savings Fund supporting proposals submitted by users and operational staff will also be continued.

The work to implement energy management entails the accumulation of expertise. Therefore, an organisation must be established to assess trends in energy consumption and to make the necessary adjustments and improvements based on the available data.

Energy-efficient Buildings

The City of Copenhagen's existing buildings and new build contain a huge potential for reducing energy consumption. All energy saving measures with a repayment period of less than 10 years from the energy labelling of municipal buildings are now being implemented. The previous initiatives to implement all cost-effective energy savings will continue.

Due to the population growth in Copenhagen, much new build will be constructed in the years to come. Municipal new build will be climate adaptable and low-energy at the forefront of developments in the Building Regulations – that is low-energy classification 2015 at present and classification 2020 starting from 2015. This initiative can promote the general spread of low-energy construction.

It is essential to make long-term investments in climate retrofitting which, in conjunction with other types of retrofitting, will ensure the necessary energy savings and prepare the buildings for future climate changes. This will minimise the overall expenditure and enable improvements in other areas such as indoor climate etc. to be made. Similarly, energy-reducing initiatives will be implemented in the numerous private leases used by the City Administration.

The City of Copenhagen will only be able to realise the full potential of energy savings by 2025 if the major part of municipal buildings are retrofitted during this period.

Solar Cells on Municipal Properties

Solar cells will also be contributing to the general conversion. The City of Copenhagen wants to promote growth within this field which is experiencing rapid expansion at the present time due to a substantial drop in prices. So, the City Administration wants to be up front and will be installing 30,000 sqm of solar cells on new build and existing buildings, respectively – amounting to 60,000 sqm in total.

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016
<p>Energy consumption in municipal buildings reduced by 40% compared to 2010</p> <p>Municipal new build prior to 2015 meets the requirements of the 2015 classification and until 2020 new build meets the requirements of the 2020 classification</p> <p>30,000 sqm of solar cells installed on existing municipal buildings and new build, respectively</p>	<p>Systematic consumption mapping, registering of energy consumption together with energy management and climate-conscious operations</p>	<p>Establish remote energy meter reading and systems for gathering information on energy consumption and energy management</p>
		<p>Establish an organisation to assess trends in consumption</p> <p>Report on energy consumption with recommendations on major investments and strategic priorities to the Management</p>
	<p>Energy-efficient construction</p>	<p>Implement all energy savings with short repayment period</p> <p>Long-term energy savings and climate adaptations to be an integral part of all major renovation projects and conversions</p> <p>The City Administration to construct low-energy and climate adaptable buildings</p> <p>Energy requirements of private leases and other non-municipal properties used for City Administration purposes</p> <p>Revision of City Administration guidelines on environmental considerations in the construction sector</p> <p>Continue the municipal Energy Savings Fund</p>
		<p>Lighthouse projects</p>
<p>Solar cells on municipal properties</p>	<p>Map potential for solar cells</p> <p>Establish solar cells systems</p>	

TRANSPORT

In 2009, the City of Copenhagen decided that all newly purchased passenger cars should be powered by electricity or hydrogen from 2011. Also, the City Administration set a goal that 85% of its car fleet should be powered by electricity or hydrogen in 2015. These goals are still valid but have been extended so that all passenger cars will run on electricity or hydrogen by 2025.

If the City Administration is to attain these goals thereby minimising CO₂ emissions from transport, it will be necessary to make a conversion plan for passenger cars. This conversion plan will ensure that the lifespan of the vehicles will remain proportional to running and maintenance costs.

To ensure optimal operation of the car fleet, the City of Copenhagen wants to establish a fleet management solution and to install navigation systems in all municipal vehicles. This is expected to lead to a reduction in the car fleet of approximately one quarter due to a higher utilisation rate. Also, the navigation system data will form the basis for establishing an infrastructure for charging stations for municipal vehicles. An infrastructure for City Administration vehicles will be necessary, since the Administration plans to convert to electric and hydrogen-powered cars before the infrastructure for charging stations has been fully implemented throughout the city.

In the short term, the City of Copenhagen will have to establish an infrastructure for charging stations for municipal vehicles. The charging stands must be placed strategically and be optimised for intelligent charging.

The City Administration investigates the options for using new fuels for vehicles exceeding 3,500kg. This will be done in the pilot and demonstration phases which are designed to obtain information on using different fuel technologies according to type of vehicle and transportation need. The information will form the basis for the conversion to new fuels by the entire fleet of large vehicles. The City Administration will require the use of green fuels in all new transport contracts.

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016
All City of Copenhagen vehicles to run on new fuels such as electricity, hydrogen or biofuels All external transport contracts for the City Administration to preclude the use of fossil fuels	Conversion of car fleet to electricity and hydrogen	Develop and implementing conversion plan Implement management system Establish infrastructure of charging stations for municipal vehicles
	New fuels for vehicles exceeding 3,500kg	Establish pilot and demonstration projects for fuel technologies for heavy vehicles
	External suppliers will be required to use electricity, hydrogen or biofuels when driving for the City of Copenhagen	Formulate requirements in connection with tendering

PROCUREMENT

The City of Copenhagen will impose environmental requirements on joint purchasing agreements. The procurement strategy for 2011-2014 defines a framework for actively promoting the issues of green growth and climate through procurement.

Green growth will, in the future, be a primary consideration in the City Administration procurement policies - with regard to quality, the environment and the economy. The City Administration's procurement policies will increasingly focus on initiatives which will lead to CO2 reductions and green growth being a direct consequence of these policies. Initiatives will concentrate on transport, energy consuming products and the construction sector.

Also, the City Administration will be working to develop new methods for the tendering process such as total costs and functional tenders. Finally, there will be focus on the implementation and follow-up of the agreements already entered into as well as future ones.

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016
Climate and environmental requirements within procurement extended to more areas than at present (2012)	Implementing of Implementation of procurement strategies	Focus on transport, energy consuming products and the construction sector
		New methods for the tendering process
		Focus on the implementation and follow-up on agreements

BEHAVIOUR AND TRAINING

Employees of the City of Copenhagen play an important role in creating a culture where the climate and the environment are in focus on a daily basis.

For this reason, the City Administration wants to stimulate the climate conduct of its employees and to train operations personnel in procurement, transport and energy-efficient operation and consumption.

Designing training courses will be done in close collaboration with the various administrations and their employees. Present as well as newly employed staff will be trained in appropriate 'climate conduct' thereby anchoring the initiatives over a broad spectrum in the City of Copenhagen.



GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016
<p>Medarbejdere er i Employees have been trained where relevant in climate-friendly conduct and task solution as well as energy-efficient operating methods</p> <p>All new employees have been introduced to the City Administration's CO2 goals and have received instruction in climate friendly habits and work routines</p>	Behavioural campaigns and training	<p>Courses in climate-friendly conduct and task solution as well as energy-efficient operating methods from 2012 and up to 2025</p> <p>New employees will be introduced to the City Administration's CO2 goals and climate habits from 2013 and up to 2025</p>

GOALS FOR 2025	MAIN INITIATIVES UP TO 2025	INITIATIVES UP TO AND INCLUDING 2016
The electricity consumption for street lighting is halved compared to 2010	Replacement of street lighting	<p>During the period 2011-2014, the City Administration will implement the statutory replacement of approximately 11,000 mercury fittings</p> <p>From 2013 or 2014, the City Administration will carry out replacement of the remaining approximately 20,000 fluorescent lamps and sodium fittings. The replacement work is expected to last 3-4 years</p>

STREET LIGHTING

Part of the City of Copenhagen's CO2 emissions come from street lighting. The City of Copenhagen has presented a plan for replacement of existing street lighting. The plan was started in 2011 and its objective is a reduction in electricity used for street lighting.

THE CITY LAB

The City of Copenhagen will enter into permanent collaboration with knowledge institutions in the Metropolitan area on research, development and training within climate issues and green growth. Part of the collaboration will attempt to link PhDs from the commercial sector to the activities in central areas.

In a collaborative effort with external players, the City Administration will initiate large, overall construction projects designed as spear-heading projects and working as a lab and a showcase for future solutions. The solutions will be developed in conjunction with external players within narrowly defined areas with a particular potential and need for progress such as new solutions within energy retrofitting, low-energy construction and climate adaptation.

ECONOMY

Total capital expenditure for the City Administration initiatives will amount to approximately DKK 1 bn up to 2025 after deducting energy savings and other reduced costs.

The two most important items are climate retrofitting and climate adaptation of municipal properties and the replacement of street lighting. Total expenses for climate retrofitting and adaptations will amount to approximately DKK 1.4 bn in the period up to 2025 resulting in a saving on operations of approximately DKK 0.6 bn during the same period. Beyond 2025, the initiatives in relation to municipal buildings is expected to generate annual savings of approximately DKK 125 m. Changing to LED street lighting will incur total costs of approximately DKK 270 m and will cut the electricity bill with a total of approximately DKK 140 m.

BEYOND 2025, INITIATIVES IN RELATION TO MUNICIPAL BUILDINGS ARE EXPECTED TO RESULT IN ANNUAL SAVINGS ON OPERATIONS OF APPROXIMATELY DKK 125 M.

7



7

ECONOMY AND INVESTMENTS

ECONOMIC CONSEQUENCES IN 2025

// THE CPH 2025 CLIMATE PLAN PROVIDES A POSITIVE ECONOMY, BECAUSE THE BENEFITS OF ENERGY SAVINGS COMPENSATE FOR THE INCREASED COSTS OF ENERGY PRODUCTION AND TRANSPORT.

// THE CPH 2025 CLIMATE PLAN HAS A POSITIVE EFFECT ON THE PRIVATE ECONOMY OF COPENHAGENERS AND BUSINESSES ALIKE. A COUPLE WITH ONE CHILD AND ONE CAR LIVING IN A FLAT COULD BE SAVING APPROXIMATELY DKK 6,500 PER YEAR.

// THE OVERALL INVESTMENTS OF THE CITY ADMINISTRATION UP TO 2025 ARE APPROXIMATELY DKK 2.7 BN.

7.1

ECONOMIC CONSEQUENCES OF THE CLIMATE PLAN

The CPH 2025 Climate Plan provides an overall positive economic picture and will lead to economic benefits for Copenhageners.

The Plan is expected to require the City of Copenhagen to invest in the region of DKK 2.7 bn in the period up to 2025. These investments will also lead to energy savings which will improve the City Administration economy for several decades into the future.

It may seem surprising that a positive economy picture will be the result of making Copenhagen carbon neutral and that the consequences for the municipal investment are relatively minor. There are several reasons for this.

It is primarily due to the fact that prices for conventional energy sources such as coal, oil and gas are expected to rise in the years to come. This makes the green switch a good investment seen in the light of alternative costs if Copenhagen were to continuously supply most of its energy needs from fossil fuels. Additionally, reductions in the emission of greenhouse gases have generated a healthier economy in a city like Copenhagen than in the country as a whole. This is because several climate initiatives also contribute to improving the health and quality of life for Copenhageners by reducing congestion, noise and particle pollution. These benefits are far greater in a city like Copenhagen where the measures affect many more people than is the case in other conurbations in the country.

Furthermore, costs have been kept down by applying the following principles in the drafting of the CPH 2025 Climate Plan:

- The conversion happens gradually over considerable time. This means that existing vehicles and facilities will not be replaced before time and that the buildings will not be renovated before it is necessary. Conversely, it is of prime importance that the conversion is initiated immediately, because a number of the plants supplying energy to Copenhagen are run-down and need to be replaced by new capacity in the imminent future.
- Initiatives with a sound economy will be set in motion without delay including energy saving measures and investments in wind turbines.
- The switch to green transport, which is relatively costly, will in most cases be introduced as development projects. Subsequently, the new technologies will be gradually phased in.
- Initiatives are multipurpose to the widest extent possible and not limited to CO₂-reduction.

There are considerable uncertainties connected with a number of the preconditions for the economic calculations – including among others the price development of fossil fuels and the progress within new transport technologies. For this reason, it is difficult to ascertain how risky rising and increasingly fluctuating energy prices will turn out to be for the people of Copenhagen and the City Administration. On the other hand, there can be no doubt that the CPH 2025 Climate Plan will reduce these risks considerably.

7.2

BUDGETARY CONSEQUENCES

Implementing the CPH 2025 Climate Plan implies City Administration expenditure of approximately DKK 2.7 bn over the period 2013-25.

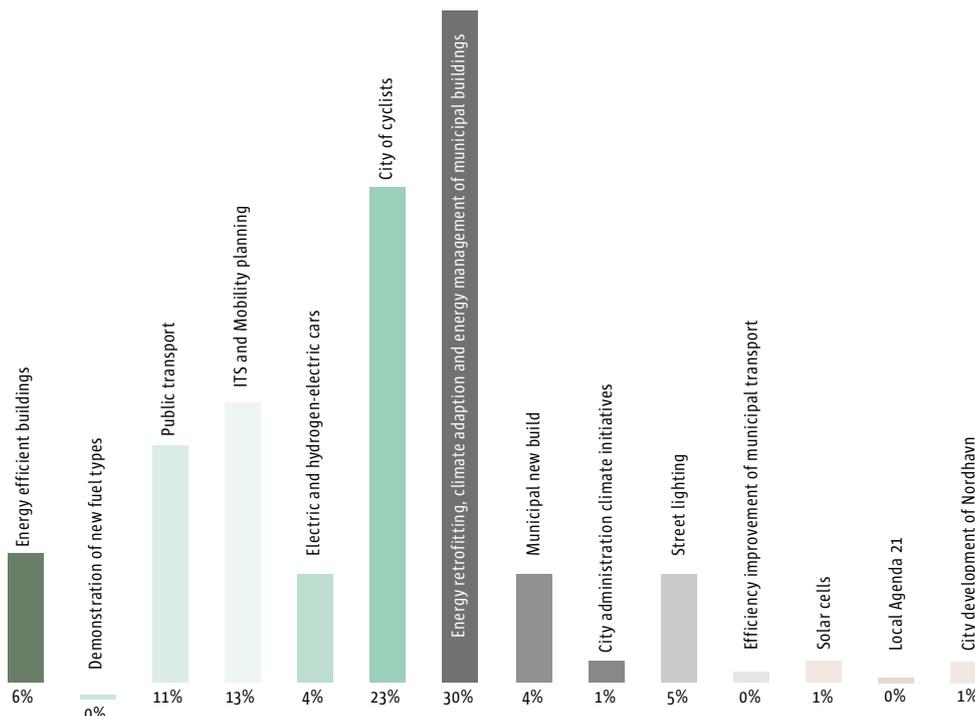
Financing the energy production will not come out of City Administration budgets. For that reason, City Administration expenditure in connection with the CPH 2025 Climate Plan is primarily found in transport and energy consumption.

Private sector expenditure related to climate adaptation is not included.

The adoption of this Plan does not mean that funds have been earmarked in the budget. Initiatives will be set in motion and financed within the scope defined by budget agreements or alternative decisions on funding. Whether the goal about carbon neutrality will be attained will depend on annual investments and their mutual correlations.

Expenditure and income are distributed unevenly throughout the period, because energy savings in the City Administration's own buildings will reduce annual expenditure significantly as the implementation of the savings are carried out. Investments in energy retrofitting of the City Administration's own buildings have a relatively short repayment time, but as it takes time to implement the projects, energy savings will only be realised to a limited extent over the period 2013-2016. Investments for energy retrofitting of own buildings together with climate adaptations will amount to approximately DKK 1.4 bn and is by far the biggest item of expenditure while the replacement of street lighting at a cost of approximately DKK 270 m also constitutes a significant item of budgetary expenditure.

Where mobility is concerned, cycling is by far the largest single item with investments of approximately DKK 600 m while improvement of public transport amounts to approximately DKK 290 m.



Figur 16 // Combined municipal investments 2013-2025.

7.3

ECONOMIC CONSEQUENCES OF ENERGY SAVINGS AND THE CONVERSING OF ENERGY PRODUCTION

The City of Copenhagen has made calculations on the economic aspects of energy savings and of the conversion of energy production in order to throw light on the economic consequences.

Overall, the conversion of energy production, which is part of the CPH 2025 Climate Plan, constitutes an economic gain of approximately DKK 1.5 bn. The economic aspects of each initiative are shown in the table below.

ECONOMIC GAIN/COST FROM ENERGY INITIATIVES IN DKK MILLION (NET PRESENT VALUE)

Conversion to biomass	-725
Peak-load production from biomass	-80
Geothermal energy (preliminary calculation from KE)*	-500
Heat savings	1.015
Electricity savings	600
Wind turbines	1.425
IN TOTAL (DKK M)	1.735

Table 2 // Source: Data from Heat Plan Greater Copenhagen 2 and calculations by COWI. *KE (Copenhagen Energy) is presently making a detailed analysis of the economic aspects connected with establishing a geothermal facility approximately six times the size of the present research establishment at Margretheholm on Amager. The analysis is expected to be completed in 2012.

The potential economic gains of energy savings are included in the calculations to illustrate what happens to the overall expenditure in the energy sector. In order to get a complete picture, the costs of converting the city's combined heat and power plants from coal to biomass have also been included in the calculations. This has been done even though the costs are part of the baseline projection and, as such, not part of the CPH 2025 Climate Plan. Calculations on energy production are based on Heat Plan Greater Copenhagen 2. The total costs have been adjusted in relation to the latest developments and scaled to Copenhagen.

As seen in the table, the conversion to carbon neutral combined heat and power production entails substantial costs. This is due to the fact that wood pellets and wood chips are considerably more expensive than coal. Initially, district heating customers will not notice the added costs since biomass enjoys the benefit of an indirect tax exemption compensating heat producers for rising fuel costs.

From an economic perspective, the increased fuel costs mean that there are large gains to be had in energy savings. In actual fact, the energy savings planned in the Climate Plan will more than compensate for the costs caused by the conversion to biomass.

Finally, it should be mentioned that the City Administration's planned investments in wind turbines – based on the Danish Energy Agency's projection of electricity prices – will be an extremely good deal for society.

7.4

ECONOMIC CONSEQUENCES OF TRAFFIC INITIATIVES

Traffic initiatives have a number of economic consequences which do not appear in the budgetary expenditure. These include, among others, lower health costs and shorter transit times. That is why a calculation of the economic consequences of the various initiatives has been made.

Economically speaking, the initiatives in the transport sector provide a gain of DKK 70 m when the economic health benefits are included into the calculations. The economic aspects of the individual initiatives are shown in the table below.

ECONOMIC GAIN/COST FROM TRAFFIC INITIATIVES IN DKK MILLION (NET PRESENT VALUE)

Electric cars	45
Hydrogen cars	-35
New fuels in municipal vehicles	-5
New fuels in buses	10
More cycling	55
IN TOTAL (DKK M)	70

Table 3 // Source: calculations by COWI.

As shown in the table, substantial economic benefits will be derived from electric cars, new fuels in city buses (primarily biogas) and more cycling. On the other hand, hydrogen cars and biofuel powered cars are associated with economic costs since these technologies are substantially more expensive than the available alternatives. Benefits resulting from technological progress in hydrogen-electric cars are not included. Beyond 2025, the costs associated with hydrogen are expected to come into line with a number of the alternative fuels. When the economy related to new fuels in the City Administration's vehicles shows a negative picture, it is due to the fact that a large number of heavy vehicles are expected to run on biodiesel.

7.5

CONSEQUENCES FOR THE PRIVATE ECONOMY OF COPENHAGENERS

Energy prices for consumers are expected to rise over the period up to 2025. That is due to increased price pressure on fossil fuels and climate policy measures on national and international levels.

The energy-saving measures expected to be set in motion as a result of the CPH 2025 Climate Plan are likely to substantially limit the consequences for Copenhageners.

Furthermore, improvements in public transport and cycle lanes will make it attractive for a growing number of Copenhageners to use their bikes or get the bus or the Metro. Those who opt for one of these means of transport rather than using their cars will experience an economic gain as a result of these improvements.

For a couple with one child and one car living in a flat, increased cycling and investments in energy savings are expected to provide annual net savings of approximately DKK 6,500 per year with energy savings totalling approximately DKK 4,000 of these.

**THE CPH 2025 CLIMATE
PLAN PROVIDES AN OVERALL
POSITIVE ECONOMIC PICTURE AND
WILL LEAD TO GAINS IN THE
PRIVATE ECONOMY OF
COPENHAGENERS**

7.6

PRIVATE INVESTMENTS

In the period up to 2025, a number of investments will be made, independent of the City of Copenhagen, in the areas covered by the CPH 2025 Climate Plan. New buildings will be constructed, existing ones retrofitted, investments made in new energy plants, cars will be purchased etc. Within the areas of energy consumption, energy production and mobility, investments of approximately DKK 200-250 bn are expected to be made in the period up to 2025. The initiatives in the Climate Plan will encourage further investments of about DKK 20-25 bn. These amounts should be seen in the light of municipal investments expected to reach DKK 2.7 bn in the period up to 2025.

New build

Up to 2025, 6.8 m new sqm are expected to be constructed in Copenhagen which will mean total investments of approximately DKK 130 bn. When new build is constructed to meet the highest Building Regulations requirements, costs may rise by approximately 5% corresponding to an added expenditure of up to DKK 6 bn. Expenditure in connection with low-energy construction is, however, expected to quickly adjust to present levels.

Retrofitting

At the present rate of retrofitting, 26% of the housing stock corresponding to 11.3 m sqm will be retrofitted in the period up to 2025. This will mean investments of approximately DKK 40 bn. Increasing the retrofitting rate by half a percentage point, which is the goal of the Climate Plan, will mean a total of 13.7 m sqm being retrofitted. This will lead to extra investments of approximately DKK 8 bn. Of these, investments in extra energy retrofitting will amount to DKK 3.6 bn.

Energy Production

Up to about DKK 10-15 bn will have to be invested in energy production plants up to 2025.

There are planned investments of DKK 5.5 bn in wind projects, DKK 1.5-4.0 bn in a wood chip-fired combined heat and power plant, roughly DKK 1 bn in geothermal energy as well as conversion of peak and reserve-load to biomass, extension of heat storage etc. These investments will be carried out by the energy companies.

In addition, there will be investments in the conversion to biomass in the existing combined heat and power plants and investments in a new waste treatment centre on Amager. Finally, private investments in solar cells are expected to amount to approximately DKK 0.5 bn up to 2025.

Transport

In the period up to 2025, approximately DKK 24 bn will be invested in new passenger cars in Copenhagen. Also investments in bus operations, lorries and vans. The increased use of new fuels inherent in the CPH 2025 Climate Plan is not expected to significantly alter the amounts invested. This is because the cost of running on new fuels up to 2025 is expected to drop to the level of conventional fuels. Electric cars and cars running on biogas are expected to become cheaper than conventional cars both with regard to purchase price and running costs.

7.7

EFFECT ON EMPLOYMENT

With the initiatives covering the period up to 2025, the City of Copenhagen sustains both directly and indirectly, massive investments in green growth. These investments will have considerable bearings on employment within the green sector and provide scope for numerous innovation projects in Copenhagen during this period.

The extent to which investments will create new jobs will depend on general economic developments and should be assessed for the individual projects over a shorter time frame.

Based on investment sums, the City of Copenhagen can prepare a qualified assessment of the employment effect of the initiatives in a long-term perspective up to 2025. The employment effect of the City of Copenhagen's green investments is calculated on the basis of the investment sums for each initiative.

EMPLOYMENT EFFECT OF THE CPH 2025 CLIMATE PLAN

GREEN INVESTMENTS	DKK MILLION	JOBS PER DKK MILLION INVESTED	EMPLOYMENT EFFECT (FULL-TIME EQUIVALENTS, FTE)
Municipal investments	2.700	1,3	3.000
New build: Added investments (private sector)	6.000	1,3	8.000
Retrofitting: New investments in energy retrofitting	3.500	1,3	4.500
Energy production	10.000-15.000	1,3	13.000-19.500
IN TOTAL (DKK M)	22.000-27.000		28.500-35.000

Table 4 // Source: AE and 3F: cf. 'Miljø, energi og beskæftigelse - Hovedrapport', 3F and Det Økologiske Råd, 2005.

CPH 2025





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