

CLIMATE PLAN 2016-2020













City of Aarhus



CITY OF AARHUS



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FOREWORD

The world faces a major climatic challenge. A challenge that requires global leadership and local action. The urban centres of the world will play a key role, as that's where the majority of the world's population live, meaning that they account for the majority of the world's consumption. Cities are also better able than states to react quickly, to create the changes needed.

Aarhus has the will to create such changes. The Aarhus Goal of CO₂-neutrality by 2030 adopted by the City Council, sets ambitious targets which have already yielded results. We've come far with energy renovation of the city's own buildings, and the first stretch of the new light railway will open in 2017. District heating and electricity production were switched to biomass in 2016, able to deliver green heat and power to city residents and businesses. All these achievements can mean significant positions of strength for Aarhus. They represent huge steps along the way, and are excellent examples of how green transition helps solve the climate problem, and make Aarhus a cleaner, healthier and more attractive city to live and work in.

Yet despite the good results so far, there's still a long way to our goal. The lowest-hanging fruits have been picked, and the next step requires everyone in the city taking part. Most CO₂ emissions are outside the City Council's direct influence. An important part of the task lies therefore in creating common ownership for climate management, in which everyone is able to understand how the city's transformation create opportunities, not limitations.

As we integrate sustainable energy from solar and wind power into our lives over the next few years – in the transport sector for example – more than just technological progress and major investment is going to be needed. Public support and greater mobilisation of know-how and competences will be called for, in a long-term strategic campaign to create the foundations on which we can collectively take the next important steps working towards 2030.

Let's create the green Aarhus of the future together.

Enjoy your read.

Kristian Würtz

*Alderman for Technical Services and Environment,
City of Aarhus.*

THE TRANSFORMATION OF AARHUS



Change in Aarhus is already rapid. The city is expected to grow by a total of 50,000 new inhabitants by 2030. The city will become denser, and we will need to make optimum use of the space and resources we have.

Aarhus is also a city in a world undergoing change at alarming speed - with rising temperatures as a result of CO₂ emissions demanding action now. Consequently, national and regional targets are being set throughout the world to ensure sustainable development and care for the world.

Denmark's own target is to be a low-emission nation by 2050 – and Aarhus is playing an active role with its own target of CO₂-neutrality by 2030. Our society is currently based on the use of fossil fuels for almost everything. That's why nothing less than total transformation is needed to reduce our CO₂ emissions. And that's why we need the green transformation.

Green transformation covers a number of things, including new technologies, better use of resources, more eco-friendly products, new business models and a high degree of social involvement. That takes time. But it's important that we start where it makes most sense for Aarhus. The City Council has been actively working on a number of climate plans since 2008, each of which has brought us closer to our goal. We've focused on quantifying and monitoring CO₂ emissions in the city, building partnerships with the business community and looking at ways we can make an impact through investment in those areas where the City Council has direct influence. Combined, all these initiatives have created a strong network for climate management, and have generated the encouraging results it stands on.

The next step will demand even greater social involvement. Most CO₂ emissions are outside the City Council's direct influence. To reach even further with green transformation over the next few years, common ownership is going to be vital - giving the public and the business community the knowledge and means of taking action that will empower everyone to contribute.

The Climate Plan 2016-2020 has social involvement as a consistent and recurring focus area. There's a lot of work to do engaging members of the community in a manner that enables them to see progress themselves – and to make it plain that green transformation is not just something we're doing because we have to, but that it also offers opportunity and can create a better city. By leading the way over the last few decades, we've created the right conditions for growth and jobs. We have created positions of strength within those areas where the rest of the world still faces massive investment. Green transition has become an important part of the way we earn our living. But we can only maintain that lead by staying one step ahead. Aarhus has created a whole range of successful solutions, projects, technologies and innovative communities, and we need to activate them even more.

That's why Climate Plan 2016-2020 was put together in consultation with the business community, academic institutions and knowledge centres, public sector bodies, grassroots and stakeholder organisations, residents interested in climate change and council employees from just about every department. The plan is also based on a number of projections and technical scenarios developed with the Siemens Global Center of Competence Cities - Urban Development.

Climate Plan 2016-2020 is based on the City Council's climate strategy "On the way to fossil freedom". It brings direction and focus to those areas where special efforts will be made in the years to come to promote transition in the community, and to reduce CO₂ emissions in Aarhus.

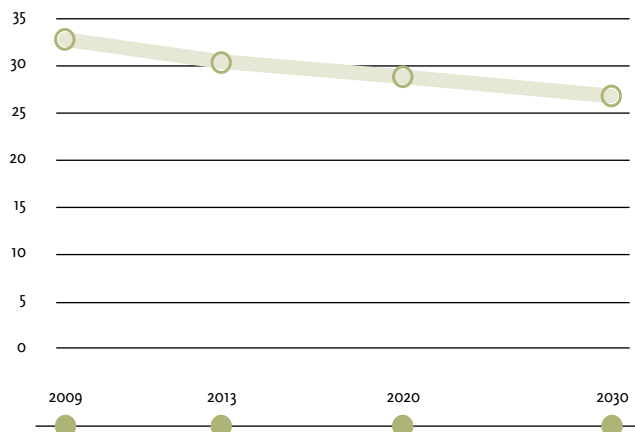
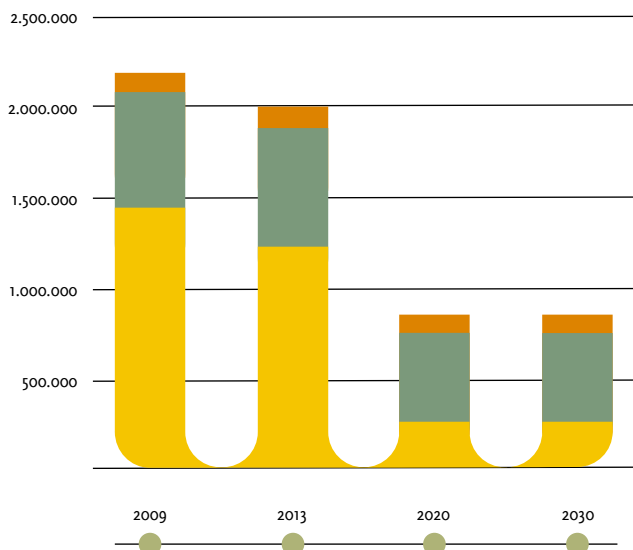


THE TRANSFORMATION OF AARHUS

STATUS

Since the City Council adopted its goal of CO₂-neutrality, total CO₂ emissions have fallen. The figure shows progress from 2009 to 2013 (latest accounting year) and a projection based on forecasts and planned initiatives. The result of climate focus to date is an historically low level of CO₂ emissions. The main contributor is a change in the way energy is generated. Identifying the way to CO₂-neutrality in 2030 cannot be positively identified at this time. Considerable changes will be needed in the transport sector, in energy and eliminating the last fossil fuels used in electricity and heat production (seen as continued emissions in buildings).

As the figure indicates, energy consumption has been steadily falling since 2009. The transition to sustainable energy does of course mean problems, as large amounts of energy are dependent on whether the sun is shining or the wind blowing. The increase in electrification - e.g. within transport - also puts more pressure on energy supplies. If we continue to reduce energy consumption, we can reduce investment in new energy infrastructure and plant, e.g. wind turbines and electricity cables in the city. That will make transition cheaper and easier. That's why work on continuing to reduce energy consumption and create balance in the energy system is a cornerstone of climate management.



Gross energy consumption MWh, per resident.



Buildings

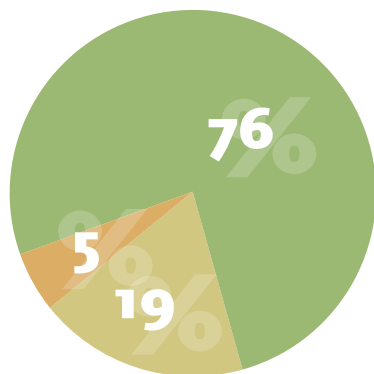


Transport



Industry

The City Council can exercise direct influence on around 24% of total CO₂ emissions in the community through district heating and its own energy consumption. Conversion to biomass for heat and electricity production plus energy renovation of its own buildings have enabled the City to take giant strides within the areas it has direct influence. To reach its targets, focus is necessary on broad social involvement, so that we can also make an impact on areas in which the City does not have direct influence, e.g. homes, the business community and private motoring.



CO₂ emissions and areas where the City Council has influence.



OPTIONS

The focus of earlier climate plans has taken us far in areas where it has been possible to influence CO₂ emissions directly through investment. But there are still a number of levers the City Council can use to support green transition in Aarhus:

- **Greater awareness and competences** in the community to set the scene for residents and businesses to take part in green transition. For example: educating the next generation or running high profile activities such as the REUSE project - a recycling station at which residents can come and take second-hand products for reuse, whilst learning more about recycling and "upcycling". Supporting the movers and shakers in the community who are already engaged and contributing to the creation of public ownership of green transition.

- **Lead from the front** as a good example. The City Council is the biggest employer in Aarhus – with plenty of interfaces in the community – giving us ample opportunity to create awareness. We need to provide the means for our workforce to get involved to do so.

- Continue to **expand our work with strong climate partners**. Doing so will mean that the City Council can create opportunities for businesses and academic institutions to engage in climate management, creating chances for more exports and green workplaces.

- **Setting standards** for climate and eco-friendly solutions through purchasing and procurement by tender and as a major buyer, to drive progress and increase demand for the best products and solutions. One example is the City Council's test of hydrogen-powered cars and its focus on circular processes and total economy via public procurement by tender.

- The incentives created or removed nationally and internationally have a lot of influence on choice of green solutions by the public and businesses. The City Council can therefore promote green transition **by striving for better framework conditions**. These could include national funding schemes, duties, legislation etc.

SETTING BOUNDARIES

The target of CO₂-neutrality set by Aarhus means that we are aiming for a level of CO₂ emissions within the city boundaries that does not affect the global level of CO₂ in the atmosphere. That makes it possible to be CO₂-neutral, even though there are still local CO₂ emissions. In accounting terms, this is balanced out by the absorbance of carbon by planting trees or replacement of 'black' electricity (from fossil-fuelled power stations in other local authorities) through the export of green electricity.

There are many overlapping agendas, such as sustainability and creating a better city for everyone, which the City Council has defined in its 'Aarhusfortællingen' (the story of Aarhus) and Plan Strategy. It's therefore important to define clear boundaries for climate management as a supplement and support for the Council's overall vision for the development of Aarhus.

Climate management focuses primarily on direct CO₂ emissions within the city boundaries, including the import and export of electricity. The illustration on the next page shows that focus in relation to a number of key statements on the way to CO₂-neutrality, fossil-freedom and associated agendas.

MILESTONES FOR 2020

Climate Plan 2016-2020 contains a number of milestones that will help concentrate focus on indicators for green transition in Aarhus. In general terms, the plan has the following milestones for 2020:

- CO₂ emissions per resident 2.3 tons p.a. (7.5 tons p.a. in 2008).
- Energy consumption per resident of 19 MWh (21 MWh in 2008).

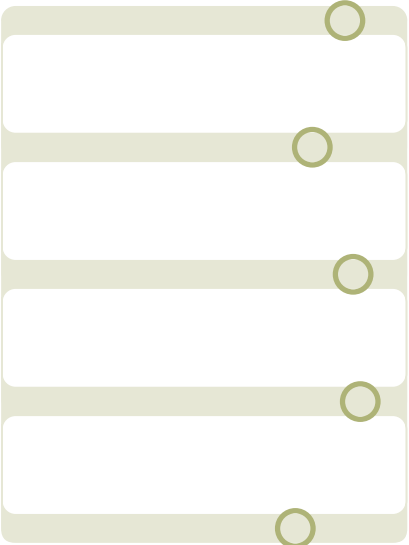
CO₂-neutral 2030
Climate management is about finding balance in technical accounts.

Moderation
By cutting back consumption, we can solve the climate crisis.

Sustainability plan
All aspects of sustainability have to be covered by the Climate Plan.

Symptomatic treatment
We need to adapt to the consequences of global warming with climate adaptation.

Global footprint
We will focus on every source of emissions, including those we are indirectly the cause of outside the city boundaries.



On the way to fossil freedom
Climate management is about change in the community

The light green future
Technology can solve the climate crisis and create a better, sustainable community.

Climate Plan
The Climate Plan focuses in particular on the climate angle, and the way to fossil-freedom.

Combating the causes
We need to combat the cause of global warming by reducing our CO₂ emissions.

Local influence
We will focus on local CO₂ emissions, and on which we have direct influence as residents, businesses or the City Council.

FOUNDATION

Climate Plan 2016-2020 is based on the work within climate management over the last few years. A number of activities are already under way designed to promote transition within the community.

You can read more about them at our portal www.gogreenwithaarhus.dk.

To follow are examples from five major projects making a difference in their own way.



READY

In partnership with the local authorities of Växjö in Sweden and Kaunas in Lithuania and a number of external partners, Aarhus is taking part in a pilot project designed to develop and demonstrate innovative solutions able to support effective green transition. The objective is to test solutions that can help prepare Aarhus for the energy system of the future, based on sustainable energy and build the foundation for growth and progress in the area. Around 500 houses and 400 apartments are involved in Aarhus. The project started in 2014 and is expected to end in 2019.



AA+

Aarhus City Council has launched a major campaign to achieve energy savings in its own buildings by energy-renovating a total of approx. 1.3 million m². The result will be a total reduction of energy consumption of 25% in those buildings by 2019 – costing an estimated investment of approx DKK 300 million. Right from the start, CO₂ reduction has been the primary focus, but since Aarhus is well on the way to becoming self-sufficient within green heat and electricity. It has shifted to energy-efficiency and interfacing with the intelligent energy system that will underpin the energy balance in the city.



FOSSIL-FREE DISTRICT HEATING

The district heating system in Aarhus has an exceptionally high level of energy efficiency, because it covers 90% of the city's housing, and uses surplus heat from electricity production to produce heat. An ambitious plan will reduce CO₂ emissions from here significantly over the next few years, forming a cornerstone towards a CO₂-neutral Aarhus. The first move was to switch production from coal to fossil-free fuels in 2016. That year, Aarhus became one of the first cities able to offer almost all its residents and businesses heat and electricity with very low CO₂ emissions. In fact, emissions were cut by over 1 million tons.



LIGHT RAILWAY IN AARHUS

Denmark's first light railway will be opened in Aarhus in 2017. Existing diesel trains and buses on the route will be replaced by the electric light railway, supporting efforts to bring sustainable energy into the transport sector. Construction of the first phase has a budget of DKK 3.5 billion, split between the City Council, region and state. The first phase can be powered with the electricity produced from a single wind turbine.



BIKE CITY AARHUS

When city residents bike instead of using their cars, they are making a massive impact on CO₂ emissions. That's why it's important to develop infrastructure that encourages and protects cyclists. But providing them with good conditions is not enough on its own. Sometimes, they need to be persuaded to get their bikes out and that's why an important part of the campaign is to motivate and inspire cyclists - including greater awareness and involvement. Bike traffic in the city increased by 29% between 2000 and 2015.

CLIMATE PLAN 2016-2020



CLIMATE PLAN 2016-2020

The Climate Plan contains focus areas and ideas for new activities right up to 2020. Focus areas are where the City Council intends to support change in the community in concert with national and international activities. These are presented on the following pages. More details of all activities and ideas are collected in a special catalogue.

The plan describes existing and new activities. Existing activities are those within other disciplines that support climate management, or that have been carried on from the earlier Climate Plan. New activities are those launched as a result of the current Climate Plan – marked with the word 'New'.

CLIMATE PLAN 2016-2020

FOCUS AREAS LINKED TO THE SIX MAIN ELEMENTS OF THE CLIMATE STRATEGY:

ENERGY



One important element of moving towards fossil freedom is energy supply, which has been the biggest source of CO₂ emissions. We took a major step forward with the switch of district heating production to biomass. 90% of Aarhus residents now have access to green heat with low CO₂ emissions, and the city is almost self-sufficient in green electricity. In the long term, electricity is expected to play a much larger role in the move to a fossil-free community, e.g. as the source of power in the transport sector. That will mean even more demand on sources of energy supply system and the infrastructure. Major decisions will therefore need to be taken with regard to energy supply as we move towards 2030, to be able to maintain energy balance based on sustainable energy. We also need to develop new solutions to take over from biomass and the fossil fuel element in refuse incineration.

TRANSPORT



The switch in energy production makes the transport sector the biggest contributor to CO₂ emissions, and therefore the biggest obstacle on the way to a fossil-free community. Transport demand in Aarhus is rising rapidly in line with the growth of the city. The Council's strategy for city growth focuses heavily on smart solutions. Built-up areas will be denser, distances to public transport will be shorter, as will the distance between work and home. Demand for transport will be reduced accordingly. Focus on the infrastructure is another factor, such as the light railway and bike paths, along with influencing choice of transport from cars to other forms. To achieve targets for transition, a comprehensive change in technology is required. Transport needs to be electrified to bring sustainable energy into use. This is a big job, but will provide many benefits – e.g. a city with less pollution and noise, thereby improving public health and wellbeing.

BUILDINGS



Buildings play a decisive role when seeking balance between producing and consuming sustainable energy. In line with the increase in demand for electricity in the transport sector, demand for the overall amount of sustainable energy rises. If we are to minimise the need for new investment in energy infrastructure and plant, we need to continue to work hard on reducing consumption in buildings. The transition to sustainable energy sources will also entail buildings being flexible and able to cope with fluctuating energy production from the sun and wind. That requires technology able to even out production and consumption. We also need to ensure that new buildings are sustainable in the long term, and built with the lowest CO₂ emissions possible. All the above are part of the overall green transition in buildings that can cut the costs of change in the community with involvement of local resources, whilst becoming a commercial advantage for Aarhus.

INDUSTRY

Industrial processes in Aarhus must be switched to the use of sustainable energy. A large element of process energy currently comes from fossil fuels. There is also huge potential in streamlining industrial processes and reducing resource consumption. By-products and refuse can be good raw materials for other businesses. By supporting developments within circular resource use, we can reduce the impact on the environment of industry, and improve the economics involved. Switching processes to sustainable energy or recycling to a greater degree is a big step for many businesses. The complicated tax structure also makes it difficult for businesses to understand their options. They need advice on what their options are, and support to test new solutions.



LOCAL ENGAGEMENT AND GROWTH

Most CO₂ emissions come from the activities of city residents and businesses. The green transition will therefore require an increase in local ownership to create change. First and foremost, we need to encourage local people and companies already engaged and contributing. Residents, businesses, academic institutions and grassroots organisations can help to support Aarhus in its green transition. But there are also many people who are not motivated by the climate agenda, a situation that will never change. Surveys indicate that greater awareness does increase the motivation to take part and that's why we need to make the green transition relevant and understandable for as many people as possible. We have a special obligation in terms of educating children and adolescents, who will influence change moving towards 2030 through their choices and behaviour. We also need to focus on competence-building for business and industry, where greater awareness can give rise to strategic innovation and commercial success.



OUR WORKPLACE

Even though most CO₂ emissions in Aarhus occur outside the direct sphere of influence of the City Council, we play a leading role in green transition. There are many areas in which we can influence progress through our own initiatives, processes, partnerships and urban development programmes. When working within the specific focus areas, where we expect to achieve the greatest possible effect, visibility and synergy with the community around us in the years to come. In the next Climate Plan period, the most important thing will be that we show the way, leading within key areas such as transport and buildings, setting standards through our purchasing and tender invitations, e.g. for building and construction work. We will do so in a manner which involves our personnel actively, and keeps them informed of new initiatives. Aarhus City Council is the biggest employer in the area, with plenty of interfaces within the community. By involving our employees actively, we create greater awareness, ownership and important ambassadors for climate management.



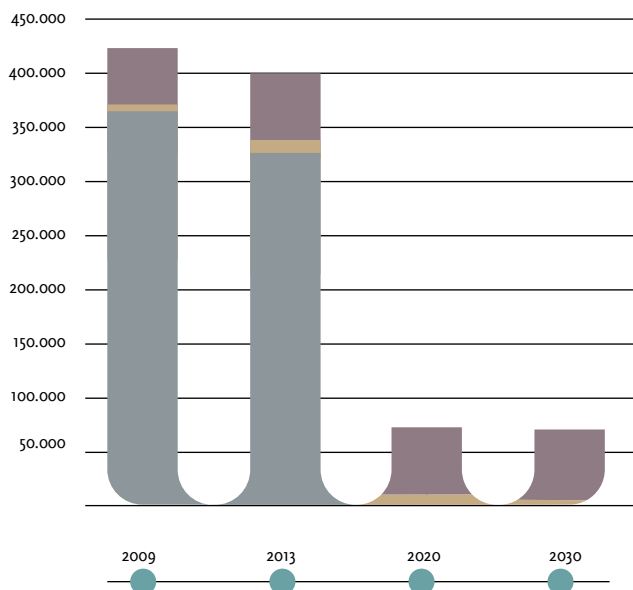
ENERGY





STATUS

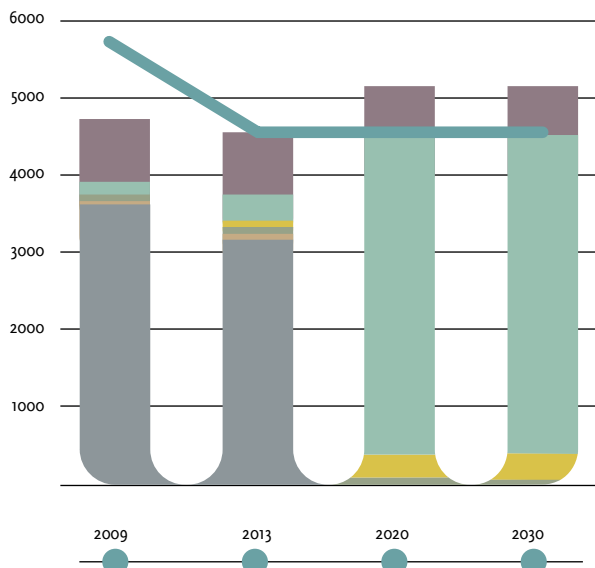
Coal was phased out in 2016, when the majority of district heating and electricity production was switched to biomass. The result was a massive fall in CO₂ emissions from district heating. The figure shows trends from 2009 to 2013 (the latest climate accounting year) and projected trend in emissions based on forecasts for developments in the community and planned initiatives locally and nationally



CO₂ emissions from district heating production (tons).



Electricity consumption



Electricity consumption and production, TJ, Aarhus.

A large proportion of electricity in Aarhus is produced in combination with district heating, which became green in 2016. According to current forecasts, Aarhus will therefore be self-sufficient in green electricity, as increasing demand is expected to be evened out by growing energy-efficiency in the community. In the long term however, a big increase in consumption is expected as a result of the electrification of the transport sector, district heating and industry. This can be expensive in terms of new energy plant and infrastructure, e.g. in the form of new wind turbines and cables in the city. Long-term planning and continued efforts to reduce energy needs will therefore be needed, along with adaptation to an energy system based on sustainable energy.

MILESTONES FOR 2020

- Devise long-term and strategic plans for the energy infrastructure of the future for the City of Aarhus.
- Recycle 4,500 tons of refuse more per year.

GREEN DISTRICT HEATING

Aarhus has one of the world's best district heating grids. 90% of Aarhus residents are connected. District heating is one of the areas in which the City Council can influence the switch to fossil freedom with the greatest effect.

Biomass

The fuel used for district heating within Aarhus was switched from coal to biomass in 2016. The boilers at the Studstrup power station were converted to be able to burn sustainable wood pellets, and the new power station in Lisbjerg will use the same. The result will be a huge fall in total CO₂ emissions from district heating production and from concurrent electricity generation.

Expected effect:

Total CO₂ reduction per year, approx 1.3 million tons.

Activities:

- Biomass at Studstrup and the biomass-fired Kraftvarmeværk A/S in Lisbjerg.

ENERGY SUPPLY OF THE FUTURE

Switching heating to biomass is a huge step along the way to the sustainable energy supply of the future in Aarhus. But full conversion of the energy sector requires much bigger and more extensive changes.

Strategic energy planning

The switch to sustainable energy makes heavy demands of plant and the energy infrastructure in Aarhus. And there are a host of unanswered questions to be answered. Should Studstrup - the supplier of most of the heating and electricity to Aarhus - close in 2030? Is there sufficient electrical infrastructure in the city for the electrical-powered transport of the future? Is there enough biomass, and what's the best way to use it? Where should power plants be sited, and which technology should we put our faith in? To answer such questions and make the right decisions at the right time, requires a comprehensive plan for energy supply.

Expected effect:

Reliable supply and savings from timely decisions and synergy with other investments.

Activities:

- Strategic energy plan for Aarhus (new).



Development of the solutions of the future

The switch to sustainable energy in all parts of the community requires the development of new solutions. The City Council will play a key role in developing and testing them. Not only because we need such solutions, but also because local businesses need somewhere to test and demonstrate their solutions 1:1 in a city such as Aarhus – with a view to exporting products and systems.

Expected effect:

Boost know-how, competences and new technology.

Activities:

- Common data platform for consumer data.
- READY, low temperature district heating and heat pumps.
- Research and development at the Department of Waste and Heating, Aarhus.

REFUSE AS A RESOURCE

An important element in the transition of the community is sustainable use of resources. The vast amount of refuse generated nowadays is an important resource.

Aarhus without refuse

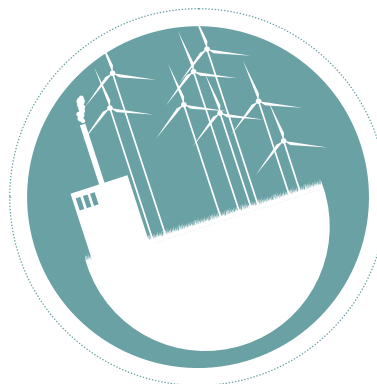
The amount of refuse needs to be reduced. And this can be done by changing the throw-away culture to one of recycling. Recycling refuse is an important key to an Aarhus without refuse. It requires better sorting at home and in the way refuse is processed. Because Aarhus is growing, there are a lot of new buildings going up. Planning urban development in consultation with the developers to enhance easier sorting and disposal of refuse is important. There will also be focus on supporting business and industry with training and practical schemes designed to make it easier to recycle refuse. About one-third of the refuse from business and industry currently incinerated could be recycled - so there is plenty of potential.

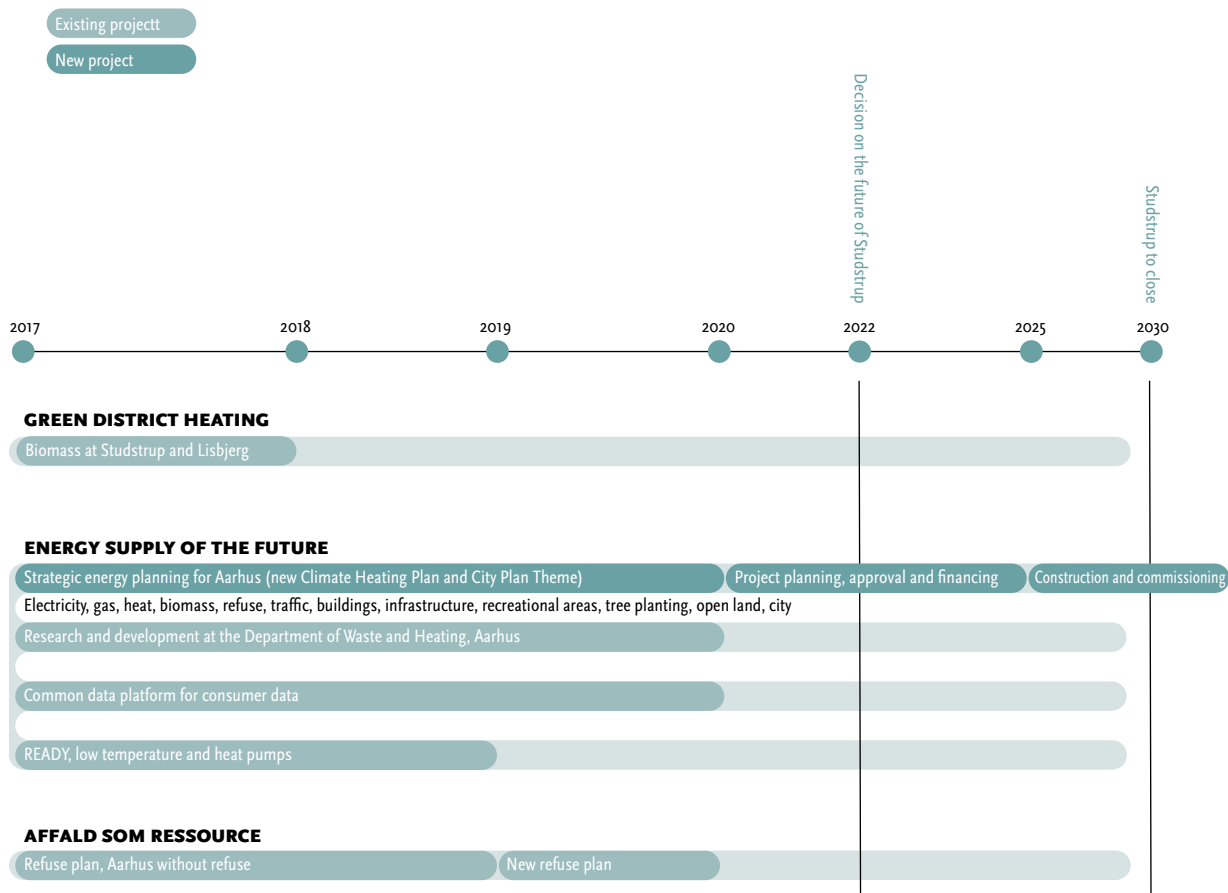
Expected effect:

Reduction of 7,000 tons CO₂ p.a.

Activities:

Refuse plan, Aarhus without refuse.







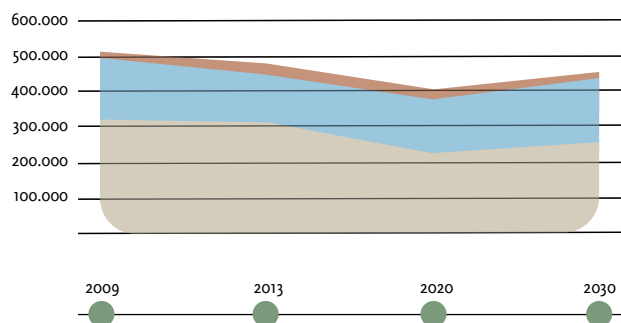
TRANSPORT





STATUS

Moving towards 2030, the transport sector will be the biggest source of CO₂ emissions in Aarhus. The figure shows progress from 2009 to 2013 (latest accounting year) and a projection for emissions. As can be seen from the figure, CO₂ emissions from transport are expected to rise in the long term due to total transport demand expected to rise between 2020 and 2030.



CO₂ emissions from transport (tons).



Cars



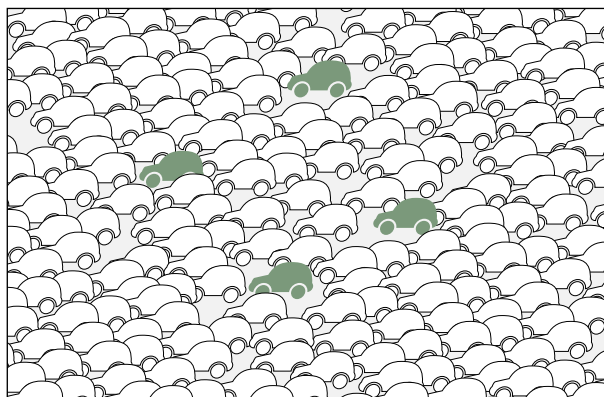
Vans and trucks



Trains and Buses

Cars will generate the biggest share of CO₂ emissions from transport. A breakthrough with more efficient hybrid cars and cheaper electric cars is expected within the next few years. But the switch to new technologies able to utilise green energy in transport has not yet fully occurred in Denmark. For example, only 4 out of 1000 cars in Aarhus are electrically-powered. On a national basis, the figure is only 3 out of 1000.

Out of **1000** cars in Aarhus, only **4** are electric.



MILESTONES FOR 2020

- The number of electric cars is still above the national average.
- Continue to increase the number of city residents who bike, walk or use public transport.

REDUCE TRANSPORT AND ENERGY DEMAND

By reducing and streamlining urban transport, overall energy consumption is reduced along with the cost of converting remaining transport to fossil-free technologies. This is where municipal planning is most important, along with the use of new, efficient technologies and transport concepts in the next few years.

Urban planning

Increasing the urban density of Aarhus is the subject of strategic planning, which can reduce transport demand over time. A denser city can encourage more use of bikes and public transport, providing it is expanded sufficiently to cope.

Expected effect:

Reduction in transport demand.

Rationalisation

The City Council is introducing Intelligent Traffic Management and upgrading streetlights with LED, which will reduce energy consumption related to the transport sector.

Expected effect:

Reduction in energy consumption.

Activities:

- Intelligent Traffic Management.
- Upgrading street lighting to LED.

CHANGE TRANSPORT COMPOSITION

The Council's plans for climate management must support a change in the composition of transport to reduce the use of cars in favour of cycling and public transport.

Habits, behaviour and mobility services

The City Council is working with 'Smart Mobility', which concerns influencing traffic composition to increase mobility within the city. Smart Mobility breaks transport habits and influences behaviour patterns through innovative means, involving the public and businesses using demonstrations. E.g. on car-sharing and combination travel.

A new initiative in Smart Mobility is qualifying the debate on public transport. What is public transport and how can the public help knit the system together to make it a real alternative to private motoring?

Bike City Aarhus is also working to get more people to bike instead of drive.

Expected effect:

More motorists will switch to bikes or public transport.

Activities:

- Activities under Smart Mobility.
- Activities under Bike City Aarhus.



TECHNOLOGY CHANGE

Climate management in Aarhus is intended to work towards a change in technology - from fossil fuels to sustainable energy in the transport sector. Technology change is the field we expect to have the biggest effect on CO₂ emissions as we move towards a fossil-free society.

Electrification

Denmark is investing heavily in wind energy as a sustainable source of energy. That's why electrification of the transport sector is an important part of the cohesive energy and transport system of the future. The City Council intends to support this by increasing electrification of public transport, ensuring the necessary infrastructure and playing an active role in projects and partnerships that will pave the way for new technologies and technology change.

Expected effect:

Local mobilisation of know-how and initiatives within electrification and infrastructure.

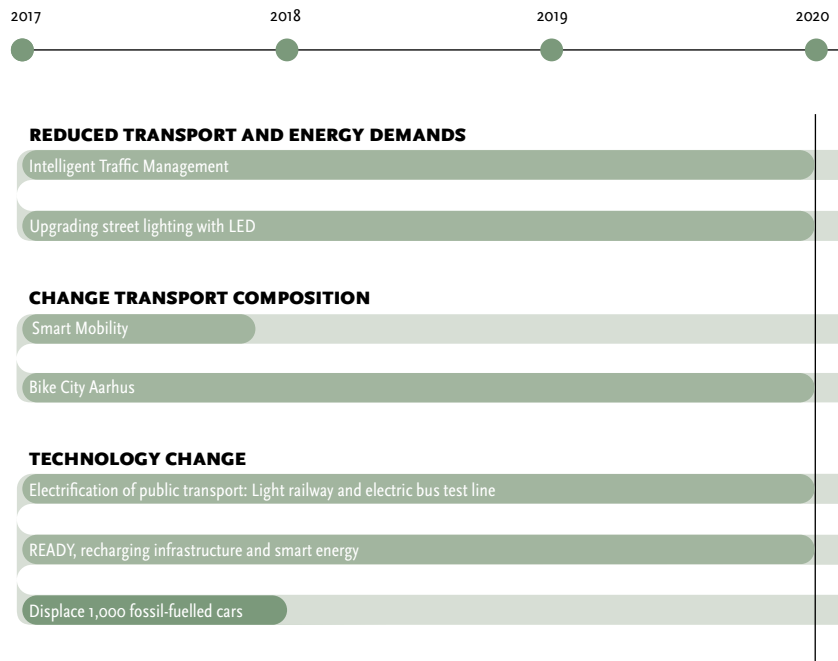
Activities:

- Electrification of public transport: Light railway and electric buses.
- READY, recharge infrastructure and smart energy.
- "Displace 1,000 fossil-fuelled cars" – a car sharing partnership (new).



TRANSPORT

- Existing project
- New project



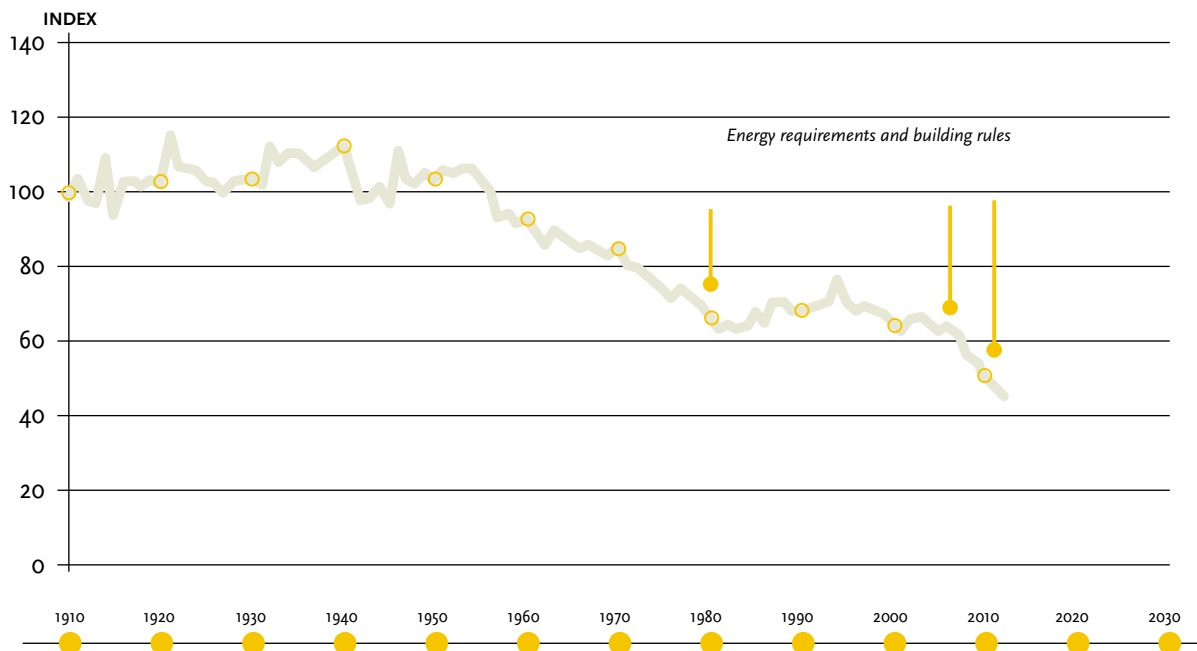


BUILDINGS





STATUS



District heating consumption (ave.) in homes in Aarhus by year built, based on Dept. of Waste and Heating meter data and BBR register.

Energy consumption in buildings is an important factor in creating balance in the energy system of the future, when electric cars will increase our electricity consumption. Lower energy consumption in our buildings means lower investment in sustainable energy sources, such as wind turbines. That makes the job of managing transition cheaper and easier. One of the ways to reduce energy consumption is tougher criteria for renovation and new-build projects. The figure shows the average heating consumption in buildings connected to the district heating grid in Aarhus by build year (house age). As can be seen from the figure, the introduction of tougher energy criteria in building rules has a major impact on energy consumption.

MILESTONES FOR 2020

- Continued reduction in building energy consumption.
- Enhanced collaboration for green building in the local building industry.

RENOVATION AND SMART ENERGY

The City Council will support energy optimisation for buildings to bring overall consumption down. It is important that this is done in partnership with the energy infrastructure of the city. The energy infrastructure is undergoing change, and flexibility, control and storage will become key themes in the years ahead.

Homes

The City Council has joined the pilot project READY, dealing with energy renovation and intelligent coordination with the energy system. The project will create energy optimisation itself in the 900 homes that could potentially be included in it. In addition, the know-how and experience gained will encourage new initiatives for other existing buildings.

Expected effect:

Competence boost and energy optimisation in homes.

Activities:

- READY, energy optimisation in private homes and social housing.

Business and industry

There is massive potential for commercial and industrial buildings, where consumption to a large degree can be programmed in relation to peak loading in the energy system. A pilot project has been started that addresses the relationship between buildings and the district heating system, looking at how intelligent building management and programmed consumption can reduce or eliminate peak demand. This will eliminate peak fossil fuel production and the need for laying new district heating pipes. Lessons learned will be applied in new initiatives aimed at large business customers.

Expected effect:

Reduced peak demand for district heating.

Activities:

- Reducing peak demand by exploiting the relationship between municipal buildings and district heating.
- Smart energy in commercial and industrial buildings (new).





GREEN TRANSITION IN THE CONSTRUCTION INDUSTRY

Green transition will make new demands of the way we build. The relationship with the city's energy infrastructure will be at the forefront, but we also need to ensure that buildings are sustainable long-term, and that they are built with the lowest CO₂ emissions and impact on the environment as possible.

Strategic and physical planning

The City Council works with sustainable urban development using a 360 degree model for planning. How green transition as a theme can become an integrated part of the process, and put on the agenda for the numerous construction projects in the city is closely examined. This includes the City Council's sustainability model for construction, the transport infrastructure in relation to buildings and energy supplies for the future in planning construction and conversion projects.

Expected effect:

To promote green transition through construction.

Activities:

- Green transition through urban planning (new).

Circular processes in construction

Sustainable urban development implies careful selection of materials and an increased degree of recycling. New processes and business areas within the circular economy will be needed.

Expected effect:

Competence enhancement and method-development.

Activities:

- Construction using recycled materials – project with external partners.

COMPETENCE AND KNOW-HOW ENHANCEMENT

Many different companies, authorities and people are involved in the construction process from start to finish. A greater degree of joint competence enhancement and knowledge sharing in Aarhus itself will mean better chances for raising the overall construction standard, driving progress within the industry. It will also mean greater growth and export opportunities for businesses, through new alliances and innovative projects.

Alliances and partnerships

The construction industry in Aarhus is not short of engagement. People interested in taking an active part in the development of their industry. By bringing them together in a local network concentrating on green transition, the construction industry can be further strengthened. The City Council will work to put more focus on further education for the trades, and to build networks around new pilot projects.

Expected effect:

Growth and development within the local construction industry.

Activities:

- Enhanced climate management in social housing (new).
- A strengthened construction industry, through networking, competence enhancement and growth (new).

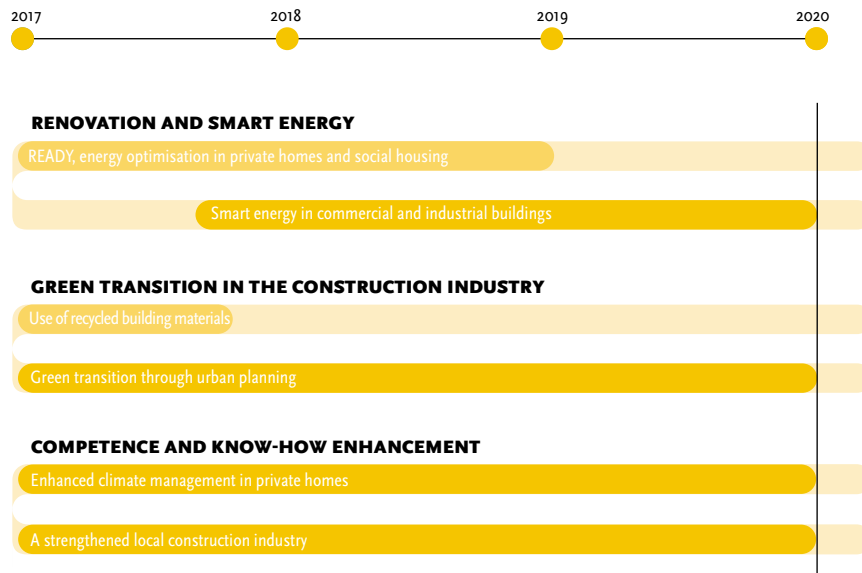
Sharing know-how

A database of 'best practice experiences' is compiled and updated from the City Council's own and external construction projects, as part of the process of enhancing the local construction industry. The database is made available through some of the City Council's central interfaces, including Byggesagsbehandlingen (case management, construction), Planafdelingen (planning department) and Alment Byggeri (social housing).

Expected effect:

Know-how enhancement for individuals within the local construction industry.

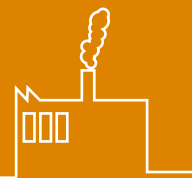
- Existing project
- New project





INDUSTRY



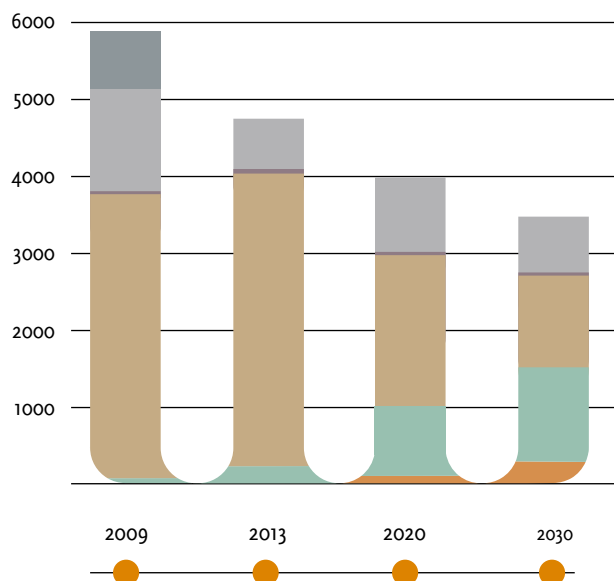


FACTS

Aarhus is the biggest industrial city in Denmark measured by number of industrial employers. Fossil fuels are used for energy in a range of processes. That's why there is potential for reducing energy consumption and the use of fossil fuels. The figure shows progress from 2009 to 2013 (latest accounting year) and a projection based on forecasts and planned initiatives.

MILESTONES FOR 2020

- Reduction in the use of oil in industrial processes.



Energy consumption for industrial processes, MWh.



Coal



Oil



Refuse



Biomass



Natural gas



Electricity

EFFECTIVE, FOSSIL-FREE PROCESSES

The consumption of fossil fuels in industrial processes has to be cut, which is why we need to work at phasing in sustainable energy sources. But phasing in sustainable energy presents industry with a technological challenge. Climate management in Aarhus must support greater collaboration to tackle that problem. It can help boost innovation within industrial production methods, and reduce vulnerability to rising fossil energy prices. A lot of focus will also be placed on conditions and business models.

Collaboration, optimisation and a change of technology in industry.

Maintaining focus on energy-saving measures for industrial companies is important. Energy companies, consultants and government bodies (e.g. the Energy Agency) provide consultancy and funding to continue the process of realising potential savings in industry, and the City Council will support such measures. The city authorities will exploit the already close dialogue with industry from the provision of advice, environmental inspections and permits. Testing and implementation of new technologies for phasing in sustainable energy in industry will continue. Climate management has to support businesses being able to collaborate to a greater degree and to learn from each other's experiences.

Expected effect:

Energy consumption will be reduced, and switched to new energy sources.

Activities:

- Setting up an Industry Task Force - a joint initiative between environmental authorities, energy consultants and industry itself (new).

UTILISING SURPLUS HEAT

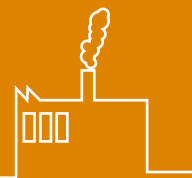
One of the world's most comprehensive district heating grids gives Aarhus the chance to lead and find new methods of utilising surplus heat from industrial processes. The City Council will look at how a district heating infrastructure can be ensured that makes use of surplus heat. It will also be important to encourage the greater use of heat pumps by industry, and to look at opportunities of supplying heat to companies not connected to the existing grid.

Expected effect:

Identifying potential and experience enhancement.

Activities:

- Utilisation of surplus heat at DNU.
- Green district heating for the light railway via mobile heat pumps.



CIRCULAR ECONOMY

The need for cheap raw materials and sustainable production processes is on the rise, creating new opportunities to find symbioses between different industrial bodies. This will also create the opportunity to regard recycled materials, refuse etc. as valuable resources. But we need to encourage opportunities for utilisation of the resources available to a greater degree and more efficiently, whilst developing new circular business models.

Strategic initiatives

Better understanding is still needed for how Aarhus can support circular business models, and symbiosis between businesses.

Expected effect:

Increased recycling within industry.

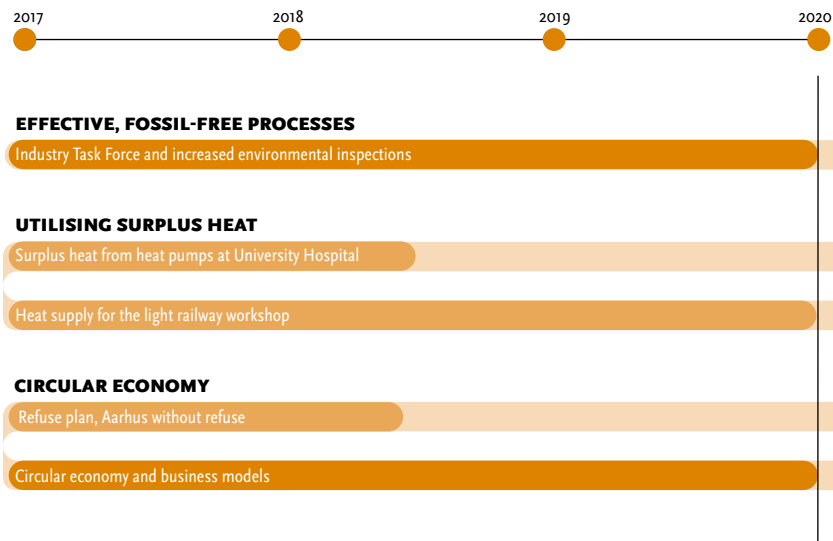
Activities:

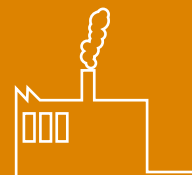
- Refuse plan, Aarhus without refuse
- Circular economy and business models (new).



Existing project

New project





LOCAL ENGAGEMENT AND GROWTH





STATUS

Total employment in Denmark related to **GREEN PRODUCTS AND SERVICES** in 2014 equalled

59,000 JOBS.

Global annual investment requirement up to 2035 to achieve a goal of an increase in temperature of max. 2 degrees is estimated at approx.:

DKK 17,000,000,000,000.

For the sake of comparison, Denmark's export of cleantech in 2014 amounted to

DKK 72,000,000,000.

(Equivalent to 0.4% of the estimated annual global requirement).



60 % of the Danish population perceive green transition wholly or partly as a vital precondition for the creation of growth and welfare in the future.

MILESTONES FOR 2020

- Greater awareness of climate management amongst the population of Aarhus.
- Strong, active climate partnerships.

ENGAGEMENT AND SOCIAL RESPONSIBILITY

In order to create the green transition in Aarhus, the active participation of the public and businesses is vital. Public involvement, making use of the high level of research and education at local academic institutions, support for the city's businesses and profiling the city's wide range of activities within the climate area will place more focus on local cohesion within climate management.

Social responsibility

By involving the public, businesses and academic institutions, the City Council wants to create broad, public ownership of the transition that will take place as Aarhus moves towards a fossil free community. Ensuring a greater degree of openness and involvement in climate management and continuously identifying opportunities for how different target groups can best be involved will be required, to ensure that it becomes natural to contribute and bear responsibility.

Expected effect:

Enhanced ownership of the green transition within the community.

Activities:

- European Capital of Culture 2017: Presentation of climate activities.
- Strategy for public involvement (new).
- The green city residents of the future (new).
- Energy on the school curriculum (new).

SUPPORTING INDUSTRY AND GREEN GROWTH

The Aarhus area is a world leader within the development and sale of innovative cleantech solutions, but the potential is still vast when it comes to creating new businesses, jobs and international sales of green solutions and cleantech products.

The City Council as a green platform

The City Council has a unique role as the focal point of the challenges faced and finding the solutions able to support a sustainable community model. It can set up and facilitate new network groups able to support collaboration, alliances, networking and innovation. It can act as the host, bringing relevant people and businesses together to find new solutions and business opportunities.

Expected effect:

Enhanced commercial collaboration and export support for the cleantech sector.

Activities:

- Climate partnerships: Climate and innovation platform.
- Network support: Membership of CLEAN.
- Export promotion to China.
- International visiting service (new).



VISIBLE GREEN TRANSITION

There is considerable need to explore the technical problems inherent in climate management.

A clear message and professional marketing will ensure that more members of the public and business communities can relate to the programme, and that Aarhus will be perceived by the outside world as an attractive marketplace for green solutions and innovation.

Presentation and promotion of cleantech beacons

The City Council can encourage engagement in the transformation of Aarhus via clear presentation and exploration of the complex issues, making them relevant to every sector of the community. Green transition has to be integrated into the community via visibility - including relevant events able to contribute to profiling Aarhus as the city taking an active role in climate management. Aarhus is the home of well-established businesses with international market share, and of small entrepreneurs and SMEs with the potential to take over the lead in the future. Climate management has to support and help position everyone and everything relevant able to create growth and jobs based on their involvement in green transition.

Expected effect:

Greater awareness of Aarhus as a green city nationally and internationally.

Activities:

- Climate City: CO₂ mapping, DN climate city, WindMade, Covenant of Mayors – reporting and analyses.
- GoGreenWithAarhus: debate and profiling of activities.
- Annual conference and Climate Award (new).



Existing project
New project

2017 2018 2019 2020

ENGAGEMENT AND SOCIAL RESPONSIBILITY

The green citizen of the future

Energy on the school curriculum

Strategy for public involvement

European Capital of Culture 2017

SUPPORTING INDUSTRY AND GREEN GROWTH

Climate partnership and networks (member of CLEAN, VClimate KIC Nordic etc.)

Export promotion to China

International visiting service

VISIBLE GREEN TRANSITION

Web portal (GoGreenWithAarhus: debate and presentation of initiatives)

Climate City

Annual conference and Climate Award



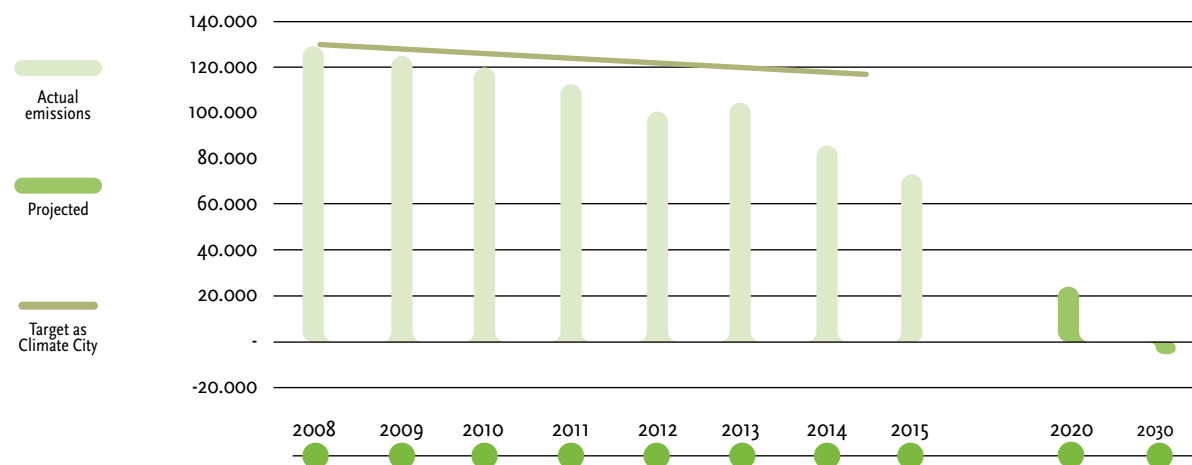
OUR WORKPLACE





STATUS

The City Council has worked hard to reduce its own CO₂ emissions since 2008, and has an agreement with the Danish Society for Nature Conservation on an annual reduction of **2%** per year.



The City of Aarhus as a business CO₂, tons.

The figures shows the city's CO₂ accounts from 2008 to 2015 (latest accounting year) and projected CO₂ emissions. Energy consumption in the form of electricity and heating are expected to drop by 25% by 2020, and that transportation in the city will be fossil free by 2030. Woodlands and wetlands within the city boundaries bind the equivalent of around 14,000 tons of CO₂ per year. If the projections hold, the city as a business will be CO₂-neutral by 2030.

MILESTONES FOR 2020

- The Council's adopted plan for making its own vehicle fleet and contracted transportation services fossil free by 2030.
- 25% reduction in energy consumption in its own buildings (2009 reference).
- Minimum 2% annual reduction in CO₂, equivalent to max. 100,000 tons by 2020 (2008 reference).

FOSSIL FREE TRANSPORT

Transportation will be the biggest obstacle to achieving the city's CO₂ target in the years up to 2030. As a business, the City Council can seek to influence developments through its own initiatives, and define a direction for the necessary conversion of transportation. A strategic programme will be needed of measures to increase transport efficiency and conversion of its own fleet to fossil free alternatives.

Towards fossil free transport by 2030

We are working on a comprehensive plan to convert the fleet by 2030, using rationalisation programmes to cut costs inherent in a change of technology.

Expected effect:

Decision-making facts for implementation of fossil free transportation.

Activities:

- Pilot transport plan at the Centre for Environment and Energy.
- Green transportation plan, Aarhus City Council (new).

Best practice experience-gathering

The City Council has already taken its first steps towards fossil free transportation by investing in new technology, rationalisation programmes and behavioural change via a number of initiatives and projects. Systematic follow-up will support ongoing conversion with practical know-how.

Expected effect:

Know-how enhancement amongst city employees.

Activities:

- Electric cars for Health and Care.
- Use of electric bikes via a leasing concept for Social Affairs and Employment.
- Testing hydrogen-powered cars in Technical Services and Environment.
- Fleet management in Nature and Road Services.
- Best practice, transport: qualification of transportation conversion (new).



ENERGY OPTIMISATION IN BUILDINGS

The City Council will continue its efforts to reduce consumption in buildings, and ensure the correct future energy balance by linking consumption to the needs and production capacity of the energy system.

Energy consumption

The energy renovation program Aa+ will continue to create energy savings in many of the city's own buildings. Coupled with energy management as a separate focus area, overall energy saving potential will be further increased. Energy management is a necessary tool to realise, maintain and increase the energy savings that finance energy renovation programmes.

Expected effect:

Optimisation of energy consumption and financial savings.

Activities:

- Aa+ energy renovation.
- Energy management.

Tools and know-how

The programmes already launched by the City Council within buildings will help create focus and direction when the next planning period looks even further forwards for green transition. Ownership of the know-how achieved must be spread throughout the organisation.

Expected effect:

Competence enhancement across every municipal department.

Activities:

- Sharing experience – Aa+ and energy management.



CITY COUNCIL SETS STANDARDS

By setting standards in purchasing and procurement by tender, the City Council can influence manufacturers and suppliers. This will include putting a value on specific climate initiatives that demonstrate how the best effect and value are achieved in relation to investment, enhanced know-how and experience, by stimulating developments through the way we offer procurement by tender.

Procurement by tender and purchasing

The City Council will reinforce its climate management programme with regard to purchasing and procurement by tender, by setting up a strategic, multi-discipline team, able to work with identifying potential, common competence enhancement and tool development. Its work will be coordinated with existing programmes in the same area, such as participation in the "Partnership for Public Green Procurement" and activities with the national "Flying Squad for Green Procurement".

Expected effect:

Competence enhancement, tool development and market influence.

Activities:

- Participation in the "Partnership for Public Green Procurement".
- Activities with the national "Flying Squad for Green Procurement".
- Multi-disciplinary team for purchasing and procurement by tender (new).

Environment and energy management at Technical Services and Environment

The City Council will phase-out all fossil fuels it uses itself, and apply environmental management systematically. More focus will be put on targets and following them up during the next plan period for phasing-out fossil fuels in Technical Services and Environment.

Expected effect:

The development of environment and energy management at Technical Services and Environment.

Activities:

- Environment and energy management at Technical Services and Environment.

Criteria for the climate targets for city enterprises

Integrating and profiling the results from city-owned companies in our own reporting is important, to create more synergy within our common efforts to achieve our CO₂ targets by 2030.

Expected effect:

Greater collaboration and common strategy with regard to programmes and results.

Activities:

- Following-up on targets for city-owned companies (new).



EMPLOYEE INVOLVEMENT

Greater awareness and profiling of the many climate-related programmes across the municipal departments will increase engagement in climate management amongst our employees. It should be easy to get involved – and there has to be a relationship between core services.

The City Council's own input

The City Council will profile and celebrate initiatives within climate management, making it more comprehensible for our employees. We will do so by looking at the work they do individually.

Expected effect:

Awareness of and pride in their own work.

Activities:

- Easy-to-understand climate management – a programme for presentation (new).

Involvement and education

The process of employee involvement will focus on setting up networks, inter-departmental knowledge sharing and common inspiration – especially within those programmes related to the work and specific ability to act of our employees.

Expected effect:

Greater ownership of the climate agenda amongst employees.

Activities:

- Climate-related support for activities in the City of Aarhus.
- Know-how and competence enhancement in the city – involvement and debate (new).

Existing project

New project

2017

2018

2019

2020

FOSSIL FREE TRANSPORT

Pilot transport plan, CME

Transport plan for the City of Aarhus

Best practice, transport

Existing, ongoing activities, electric and hydrogen cars, electric bikes, fleet management

ENERGY OPTIMISATION IN BUILDINGS

Aa+

Energy management

Sharing experience – Aa+ and energy management

CITY COUNCIL SETS STANDARDS

Multi-disciplinary team for purchasing and procurement by tender

Target follow-up for the council's own companies

Environment and energy management in Technical Services and Environment

EMPLOYEE INVOLVEMENT

Easy-to-understand climate management – a programme for presentation

Know-how and competence enhancement - involvement and debate

Climate-related support for activities within the city



RELATIONSHIPS TO OTHER PLANS AND PROGRAMMES

Climate Plan 2016-2020 relates to a wide range of local, national and international goals and plans. It should therefore be seen in relation to these, and the city's responsibility for their fulfilment.

INTERNATIONAL, EUROPEAN AND NATIONAL PLANS AND GOALS

The global community has adopted 17 'sustainable development goals' as a framework for global efforts over the next 15 years.

COP21 in Paris achieved a global climate agreement – "The Paris Agreement". The agreement gives the world a global, legally-binding action plan for the climate.

At least 30% of actual energy consumption by 2020 shall consist of sustainable energy. This goal is enshrined in the EU's climate and energy pack from December 2008.

AGREEMENTS AND CONTRACTS

Aarhus has entered into several binding agreements on reducing CO₂ emissions.

Climate City agreement

Denmark's local authorities can do a lot to reduce the country's overall CO₂ emissions. They can, for example, save energy, renovate buildings, introduce more electric cars and arrange procurement to encourage energy savings. The City Council has undertaken to cut CO₂ emissions by 2% per year.

Covenant of Mayors

The agreement for cities and local authorities within the EU that undertake to exceed the EU's own goals for CO₂ reductions and implement the Climate Plan and Climate Adjustment Plan.

WindMade local authority

At least 25% of the city's electricity between 2013 and 2016 was to be bought as sustainable energy via certificates, and thus pave the way for Aarhus becoming the first 'WindMade' local authority in the world.

OUR OWN PLANS

Forests and biomass production

The City Council is a major forest owner, with over 1,800 hectares. Our new woodlands bind CO₂. Planting within the authority's boundaries can therefore reduce its overall CO₂ emissions. We can also organise forestry management to increase the volume of CO₂ binding.

Our goal is to reduce CO₂ emissions, and the Climate City agreement with the Society for Nature Preservation includes planting as a precondition. According to the current plan, 320 ha of new woodlands will be planted between 2014-2017. The current forecast indicates however, that less than 1/3rd of this target will be realised. A reduction in the climate effect expected from planting can therefore be expected in the next Climate Plan period.

In addition to storing CO₂, woodlands are also a vital source of biomass. With demand for biomass rising steeply in Denmark in line with the phase-out of fossil fuels, it is therefore important to bear this in mind when planning future strategy. For example: the city's ability to reduce the need to import biomass and thus increased pressure on the world's biomass resources by producing and supplying it for local consumption.

Our own production of biomass and ability to store it will be part of the overall strategic energy plan for Aarhus.

Climate Adaptation

In common with all other cities in the world, Aarhus is experiencing the consequences of climate change as a result of CO₂ emissions. Planning is therefore constant for adapting the city, and allowing for higher rainfall is integrated into plans for new buildings. This process takes place in close consultation between the City Council and Aarhus Water.

Similarly, waste water and separation of sewers are the subject of considerable focus.

Municipal Plan

Planning strategy and the city's Municipal Plan set out the overall parameters of its development. There is a wide range of issues within the strategy and plan that will influence climate management. Examples include greater urban density, principles for buildings close to the station and designating areas for sustainable energy.

OTHER PLANS

Urban and commercial development

- The story of Aarhus and its goals (2015).
- Business plan for Aarhus, 2014-2017 (2013).

Shopping

- Shopping policy for Aarhus, 'Considerate shopping' (2010).

Buildings

- Energy renovation of the city's buildings, Aa+ (2013).

Refuse and energy

- Aarhus City Council refuse plan 2015 - 2018 (2015).
- Aarhus City Council climate heating plan 2010 (2011).
- Central energy strategy (2015).
- Municipal Plan, themed plan for roads (2016).

Traffic

- Overall lighting plan for the City of Aarhus (October 2002).
- Intelligent Transport Systems in Aarhus.
- Biogas perspective plan for the Central Denmark Region (June 2012).
- Cycling Action Plan (2007) Traffic Safety Strategy 2013- 2020.
- Public Transport Plan (2010).
- Interaction 2025, Vision for cohesive and sustainable mobility in Eastern Jutland (2013).
- Recharging station strategy for the City of Aarhus (2015).
- Traffic and mobility plan for Aarhus city centre (expected in 2017).
- Traffic plan for Aarhus city centre (2005).
- Traffic in Aarhus in 2030 (2012).

CLIMATE ADAPTATION AND CO₂ BINDING

Wastewater plan (2011).

CITY OF AARHUS
Technical Services and Environment
Centre for Environment and Energy

