

# CLIMATE PROGRAMME FOR GOTHENBURG

VERSION  
2014-09-04



City of  
Gothenburg





# A STRATEGIC CLIMATE PROGRAMME FOR GOTHENBURG

Gothenburg will become one of the most progressive cities in the world in the rectification of climate-related problems. The City of Gothenburg will be a forerunner and demonstrate that it is possible to live well without contributing to negative climate impact and with associated changes in living conditions for future generations, not only in Gothenburg but also worldwide. The Strategic Climate Programme for Gothenburg, referred to below as the Climate Programme, will bring together

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the climate work that is being conducted in the city and guide us along the path towards Gothenburg maintaining an equitable and sustainable level of greenhouse gas emissions by 2050.

The Climate Programme embodies Gothenburg's long-term climate work, which includes not only the municipal organisation but also industry and the people of the city. The programme is the result of broad-based collaboration between a number of city administrations and companies as well as different bodies and experts from both industry and the research world. It is a policy document that will act as a source of support and security as we address our long-term choice of direction and investment options. The Climate Programme includes objectives and strategies that will help us to realise the ambition of achieving an equitable and sustainable level of

greenhouse gas emissions by 2050. The programme is directed primarily at politicians and public officials in the City of Gothenburg but will also function as a guide for industry, other local stakeholders and the inhabitants of the city.

The Environmental and Climate Committee should provide support, coordination and inspiration when working with environmental strategy issues in the City of Gothenburg. The Committee is the process owner of the prioritised budget objective, Gothenburg will reduce its climate impact in order to become a climate-neutral city. Working in consultation with all parties concerned, the Committee is charged with the task of producing documents that will be used by the City Council as an integral part of the decision-making process. The Climate Programme is one of those documents.



# RELATIONSHIP WITH OTHER DOCUMENTS AND PROCESSES

Gothenburg has a number of policy documents, projects and processes which, either wholly or in part, impact on climate and which affect or will be affected by the Climate Programme. Below is a description of the documents that are of greatest relevance.

The City of Gothenburg Budget, which is adopted by the City Council each year, takes precedence over all other policy documents. It contains prioritised objectives, including climate objectives.

The City Council has adopted 12 local environmental quality objectives with associated intermediate objectives, which will contribute to creating a good living environment and sustainable development for Gothenburg. The objectives highlight the environmental status we are seeking to achieve. One of the objectives is Reduced climate impact, which extends through to 2050. The Climate Programme will demonstrate how we will succeed in achieving this specific objective. The objective has four intermediate objectives, two with 2020 as the time horizon and two that will be fulfilled by 2035.

To ensure that the environmental quality objectives can be achieved, we have produced an Environmental Programme for the City of Gothenburg. As opposed to the Climate Programme, the Environmental Programme includes a concrete action plan that describes the measures the City of Gothenburg needs to implement within the next few years if the objectives are to be achieved.

We carry out an annual follow-up of the environmental status in Gothenburg in order to determine if we are achieving our local environmental quality objec-

tives. The results are included in the Environmental Report published by the Environmental and Climate Committee. The report includes a detailed description of the environment in Gothenburg and the work involved in achieving our environmental objectives.

The City of Gothenburg, through the Environmental and Climate Committee, and with the support of the Swedish Energy Board, has produced an Energy Efficiency Strategy, which has been adopted by the City Council and which will remain in force through to 2020. The Climate Programme expands on the content of the energy efficiency strategy and has an extended timeframe. In Gothenburg there is also a Green Construction Programme, which includes energy efficiency.

The City of Gothenburg has signed the Covenant of Mayors, which means that our ambition is to go beyond what is stipulated in the EU Climate Targets for 2020. We have produced measures which together can reduce carbon dioxide emissions in Gothenburg by 21 percent through to 2020, using 1990 as the base year. These measures are included in the Climate Programme strategies to ensure that they can continue to be developed after 2020.

The Climate Programme strategies are in concordance with the targets and measures included in the Traffic Committee Transport Strategy for a Close-Knit City. The programme covers and develops the climate-related aspects of the Transport Strategy and with a longer time perspective.

Urban planning is a vital tool if Gothenburg is to be developed sustainably. The

Climate Programme is in line with the Gothenburg Comprehensive Plan and thus also with the Development Planning Strategy, which is a concretisation of the Comprehensive Plan and describes where in the city there is densification potential. The Climate Programme has a longer time perspective than the Comprehensive Plan.

The RiverCity Vision is a specific vision for the development of what is termed RiverCity, i.e. the central part of the city covering both sides of the river, the Göta Älv. The Vision provides guidance on how RiverCity can be developed sustainably and thus reinforces Gothenburg and Western Sweden. The Climate Programme and the RiverCity Vision will work together to create a sustainable Gothenburg.

The Low Carbon Gothenburg report provides a basis for the Climate Programme and has been produced as part of the WISE (Well-being In Sustainable cities) project, where the City of Gothenburg is involved through the Environmental Administration. WISE is being run via the Mistra Urban Futures centre. The results are being utilised in the analysis and follow-up of our consumption-based greenhouse gas emissions.

We have supported the Västra Götaland Climate Strategy with the aim of breaking down dependence on fossil energy through to 2030. This is an objective that we comply with in our climate work.

The Climate Programme is also affected by a number of other objectives, documents and processes at local, national and international level. Further information is available in Annex 1 Status Analysis, Gothenburg Climate Impact.

# IMPLEMENTATION AND FOLLOW-UP

The Climate Programme aims to achieve the environmental quality objective Reduced climate impact. The programme comprises nine strategy objectives, which are area orientations and extend through to 2030. The aim is that when the strategy objectives have been achieved, we will be able to see the results of the measures that have been taken in the follow-up of the intermediate objectives related to the environmental quality objective for 2035. If we achieve the intermediate objectives, we have a good and reasonable starting point for the final stage through to 2050.

A great deal of work has already been done within the climate field and this work needs to continue and be developed. The Climate Programme includes strategies that indicate the direction in which new activities need to be implemented. Actions that are produced within the framework of the Climate Programme strategies will be incorporated into the Environmental Programme action plan.

The committees and boards that are responsible should put the strategies in the Climate Programme into action in order to promote its work and incorporate the strategies into its regular budget and planning process. More than one committee or board has been named as being responsible for each of the strategies as they are extensive in terms of content and the involvement of several bodies will contribute to successful implementation.

Collaboration between several bodies is positive if the strategies are to be implemented as efficiently and effectively as possible. The Environmental and Climate Committee is responsible for coordinating work related to the strategies.

As is always the case in municipal decisions, the entire sustainability perspective must be observed when prioritising actions, i.e. the ecological and economic aspects as well as the social aspect where, among other things, it is important to take account of the child's perspective and equality. The consequences of implementation of the Climate Programme are presented in Annex 4 Impact Assessment of the Climate Programme.

The Environmental and Climate Committee is responsible for following up objectives and measures in the Climate Programme. In the annual follow-up of the environmental quality objective, we monitor total greenhouse gas emissions and thus acquire an indication of the trend with regard to emissions. To follow up strategy objectives, a three-year interval is a reasonable time span, partly as the effects of the measures are subject to a certain time lapse and partly due to the fact that the follow-up is extremely resource-intensive. However, we ought to follow up the strategies each year in order to maintain a focus on rectification work and to confirm that we are maintaining sufficient momentum. The follow-up

will also act as a knowledge base for future budget work.

We regard it as self-evident to coordinate the follow-up of the Environmental Programme, Climate Programme and the City of Gothenburg Budget optimally in order to make it easier for all concerned. This work includes the close collaboration that is necessary between the Environmental Administration and the City Executive Board.

As part of the implementation, it will be necessary to make several major investments. Experience from work on green obligations will be valuable as will the development of various investment tools and financial decision-making models, the ultimate aim being to create long-term, sustainable solutions. Even in these processes, it is important to maintain close collaboration between the Environmental and Climate Committee and the City Executive Board.

It could be necessary to revise the Climate Programme based on new knowledge and new conditions. No time span is stated in the programme for revision as it is difficult to predict when and how often it would be justified to revise the programme. The Climate Programme extends over a long time period and the strategy areas will remain relevant for many years to come although obviously the programme needs to be reviewed and adapted to new circumstances.



Photo: Pernilla Rydving



# GUIDANCE FOR THE READER

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The Strategic Climate Programme, referred to below as the Climate Programme, is divided into three main parts and each one has been assigned a colour. In the programme, the word 'we' is used. This refers to all the City of Gothenburg administrations and companies.

The first part of the Climate Programme deals with the local environmental quality objective Reduced climate impact and its intermediate objectives, which form the basis for the entire programme. Based on these, we have formulated a further nine objectives, termed strategy objectives, which are specific to the Climate Programme. These objectives can also be found in the green section. Beside each strategy objective, you can see which strategies have been produced in order to achieve the objective.

Part two comprises the strategies, which are gathered in the orange chapter. The strategies are divided into five areas. Beside each strategy it is stated which of the strategy objectives the strategy is designed to achieve and this is marked clearly in green.

Part three is the Energy Plan, which comprises a description of the current work on ensuring secure, long-term

energy supply and distribution as well as references to the objectives and strategies which will lead to a sustainable energy supply.

In addition to the three main parts, there are also three indexes. The first is an index of the strategies for which each committee or board is responsible. These are gathered in the pink chapter. Which committee or board that is responsible can be seen under each strategy, shown in a grey box. Marked in orange is an index where all the strategies are listed in running order under each area. The blue index contains the sources referred to in the text by means of a raised figure.

At the very end, in the dark blue section, there is a glossary of the terms we use in the Climate Programme and which are not part of everyday language. The first time the word arises in the document, it is marked with an asterisk.

You are naturally free to read the Climate Programme from beginning to end. If, for example, you are a politician sitting on a committee or board, it is suggested that you begin in the pink section, where you can find the strategies for which your committee or board is responsible. If you are interested in how a particular

strategy objective is to be achieved, you can refer to the list of contents to find out which strategies have been produced for this purpose. Alternatively, if you are interested in the strategies as a whole, you can begin in the orange section.

The Climate Programme also includes five annexes (only available in Swedish) where you will find further information about the facts that form the foundation of the Climate Programme as well as presentations of the objectives, an impact assessment and a presentation of the work process. As a basis, we have also used the reports Low Carbon Gothenburg – Technical Potentials and Lifestyle Changes, Mistra Urban Futures Report 2013:5 and Climate Change Gothenburg 2.0 Technological Potentials and Lifestyle Changes, Mistra Urban Futures Report 2014:02.



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## 2 Support citizens to reduce their climate impact

A change in behaviour and awareness in combination with bold political decisions and technical solutions are vital cornerstones in the transition to a society marked by reduced climate impact.

To promote wise investment decisions and to change behavioural patterns, it is important that we support those who wish to readjust and live a more climate-smart life at the same time that we work to disseminate understanding and knowledge of climate issues. Societal norms include guidelines governing behaviour and choice of lifestyle and we must therefore work to bring about a readjustment where taking account of climate factors becomes an obvious element in the day-to-day decisions made by the people of Gothenburg. Acceptance of future climate measures is crucial if our climate work is to have full effect. The strategy is therefore a vital source of support if we are to implement many of the other strategies.

This strategy means that we will make it easier for the people in Gothenburg, based on their life situation and their personal circumstances, to reduce their climate impact. We will contribute with useful tools and clear information to the people of Gothenburg about what they can achieve personally. We will demonstrate climate benefit using measures that the people Gothenburg can carry out personally, such as energy renovation and amended travel patterns, and measures that affect the people of Gothenburg directly, such as the introduction of parking controls.

The strategy can be implemented by extending our impartial energy and climate advice to private individuals, organisations and small and medium-sized enterprises in the metropolitan area. We can also work on an ongoing basis with campaigns, events, discourse and communication with various target groups and contribute with advice and technical assistance. We also need to create different types of incentives and forms of control for the people of Gothenburg to mitigate their climate impact.

This strategy contributes to reduced climate impact through a change in social behaviour and greater awareness. Certain climate measures could also lead to financial savings, both for society in general and for the individual.

This strategy is linked to strategies 1, 4, 5, 7, 8, 9, 12, 14, 15, 16, 17, 20, 22, 23 and 24.

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**Responsible boards and committees:** *The Framtiden Group, Gryaab, Göteborg Energi, Göteborg & Co, the City Executive Board, the Sustainable Water and Waste Management Committee, the City Premises Committee, the Environmental and Climate Committee, the Consumer Policy and Citizen Service Committee, the committee for Allocation of Social Welfare, the City District Committees, the Traffic Committee, the Adult Education committee and Ålvstranden Utveckling.*

### LINKED TO STRATEGY OBJECTIVES:

- 1 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.
- 2 Carbon dioxide emissions from road transport within the Gothenburg geographical area will decrease by at least 80 percent by 2030 compared to 2010.
- 3 The climate impact of citizen's air travel will be reduced by at least 20 percent through to 2030, using 2012 as the base year.
- 4 The volume of household waste per person in Gothenburg will be reduced by at least 30 percent through to 2030, using 2010 as the base year.

### THE STRATEGY IN BRIEF:

- We should act as a source of support and work to ensure that climate consideration becomes a distinct element in the day-to-day decisions made by the people of Gothenburg.
- We will invest in education, information, communication and advice.
- We will demonstrate climate benefit through the climate initiatives that we implement and through the measures taken personally by the people of Gothenburg.

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- 1 Strategy and strategy number
- 2 Responsible boards and committees
- 3 Linked to strategy objectives
- 4 The strategy in brief





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All annexes are available in Swedish only.

### Annex 1:

Status analysis, Gothenburg's climate impact

### Annex 2:

Energy balance for Gothenburg

### Annex 3:

Description of the objectives in the Climate Programme

### Annex 4:

Description of the objectives in the Climate Programme

### Annex 5:

Description of the work process involved in producing the Climate Programme

# IS A CLIMATE PROGRAMME NECESSARY?

The climate is a global issue that affects us all and it is crucial for the quality of life for future generations that climate change is limited. Climate researchers are agreed that it is human activity that generates the greenhouse gas emissions that are causing current climate change.<sup>1</sup> Increased levels of greenhouse gases in the atmosphere lead to the natural greenhouse effect\* being reinforced and with a subsequent rise in the Earth's temperature. This results in effects such as melting glaciers, a rise in sea level, extreme weather conditions and the spread of disease. Local greenhouse gas emissions are contributing to climate change throughout the world and the most serious consequences are affecting places that are already currently being affected. The ecological, economic and in particular social implications are in many areas catastrophic. There is a risk of unexpected and extreme weather events that will increase in number and frequency, even in Gothenburg.

The City of Gothenburg will contribute to globally sustainable development\* and the aim is for Gothenburg to have an equitable and sustainable level of greenhouse gas emissions by 2050. At present, we interpret this as being 1.9 tonnes per person per year. This interpretation is based on what is termed the 'two degree target', which means that the average global temperature should not be more than two degrees above the preindustrial level. In order to achieve this climate target, we are pooling our climate-related strengths and resources to promote the Climate Programme and we are adopting a broad, overall approach extending across five areas: education, social planning, energy, transport and consumption. Our climate work needs to be coordinated and guided towards long-term sustainability if it is to have an optimal effect and where initiatives do not compete but instead offer mutual support and reinforcement.

The Climate Programme includes the Energy Plan for Gothenburg, which presents the form the city's energy supply will take to ensure that it is both sustainable and secure in the long term. All Swedish municipal authorities are obliged by law to have an energy plan. By combining the Climate Programme and the Energy Plan, we are consolidating our work and placing the energy issue in a broader context.

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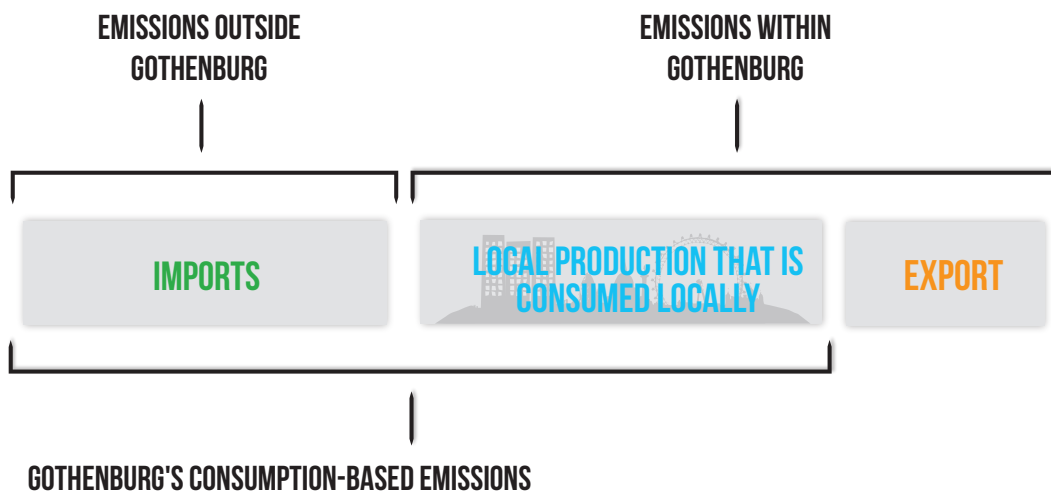
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# RAISING OUR SIGHTS AND SEEING THE TOTALITY

The Climate Programme is basically limited to the Gothenburg geographical area but in order to assume full responsibility we need to raise our sights and view Gothenburg's climate impact from a broader perspective and by doing so include greenhouse gas emissions that take place locally and globally as a result of our consumption. Using both perspectives

is complex and we need to take account of the fact that the City of Gothenburg does not have full control over either production or consumption of energy, goods and services. The programme therefore covers both perspectives and focuses on the areas over which we have control and where we can generate most benefit, regardless of whether the effect is local or global.

This approach has been adopted as the long-term climate objective, which the Climate Programme aims to achieve, covers the emissions generated by our consumption where the effects extend beyond municipal boundaries.



# GOTHENBURG'S CLIMATE IMPACT

Gothenburg is the second-largest city in Sweden with a population of just over 500,000. The metropolitan area has a very dense commercial and industrial base, covering everything from large conglomerates to small local enterprises. The Port of Gothenburg is the largest in Scandinavia and generates a high number of transport movements. In the light of this, we are facing a major challenge but also an opportunity to reduce greenhouse gas emissions generated in Gothenburg and in Sweden.

Greenhouse gases are a collective name covering carbon dioxide, nitrous oxide, methane, fluorinated hydrocarbons, perfluorocarbons and sulphur hexafluoride. The different greenhouse gases have varying degrees of climate impact and to facilitate computations and comparisons between the different gases, emissions are measured in terms of carbon dioxide equivalents\*, i.e. the amount of greenhouse gas expressed as the volume of carbon dioxide that produces the same greenhouse effect. In 2011, just over 2.5

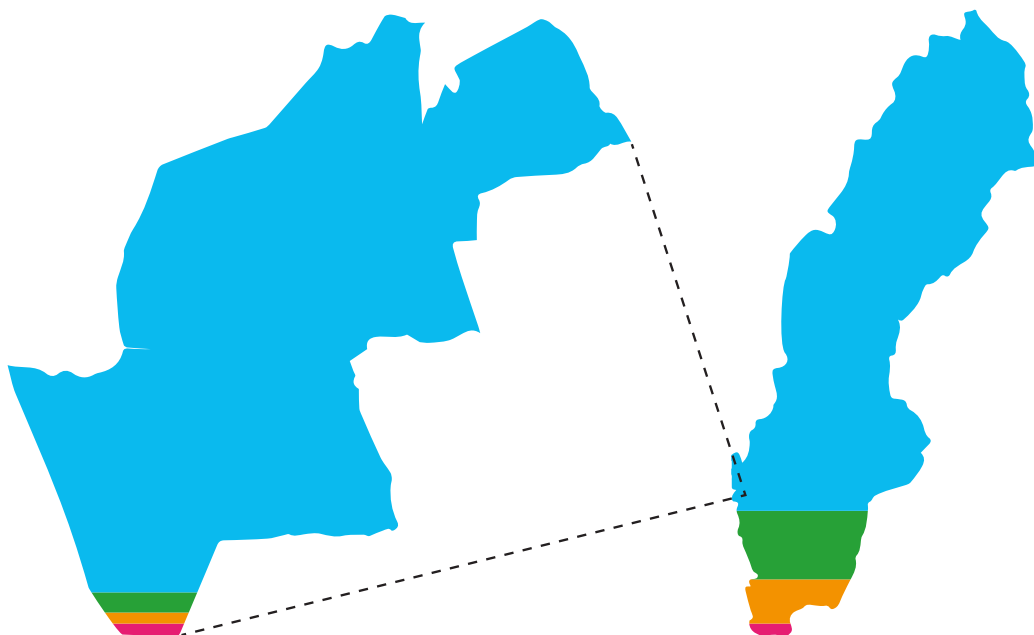
million tonnes of carbon dioxide equivalents of greenhouse gases were emitted in Gothenburg. The emissions comprise 93 percent carbon dioxide, three percent nitrous oxide, two percent methane and two percent fluorinated hydrocarbons, perfluorocarbons and sulphur hexafluoride<sup>2</sup>.

## EMISSIONS GOTHENBURG:

**CARBON DIOXIDE 93%**  
**NITROUS OXIDE 3%**  
**METHANE 2%**  
**OTHERS 2%**

## EMISSIONS SWEDEN

**CARBON DIOXIDE 79%**  
**NITROUS OXIDE 11%**  
**METHANE 8%**  
**OTHERS 2%**



The local fossil\* fuel carbon dioxide emissions derive in the first instance from energy plants, industry and road and sea transport. The primary reason for the low proportion of emissions of nitrous oxide and methane are the limited agricultural areas in the Gothenburg metropolitan area. Important local sources of methane are the handling of waste water, biological waste and leakage in conjunction with the handling of fuels. Local emissions of fluorinated hydrocarbons, perfluorocarbons and sulphur hexafluoride derive primarily from cooling agents and leakages in electrical equipment. There could also be other sources of greenhouse gas emissions for which at present we have no knowledge, measurements or statistics.

If one views the emissions from what we and other public bodies, city inhabitants and industry and commerce in Gothenburg consume, a more complex picture emerges and emissions are higher.

Consumption includes local greenhouse gas emissions from certain areas of transport, industry and power and heat production. Consumption also includes emissions from transport, industry and power production outside the municipal boundaries and occurs as a result of consumption of goods, food and services by the inhabitants, the public sector and industry in Gothenburg. Not included are emissions from goods and services produced in Gothenburg and which are exported and consumed outside the municipal borders.




In Gothenburg we have in our own study calculated greenhouse gas emissions to be approximately eight tonnes per citizen per year<sup>3</sup> whilst national statistics produce a figure of approximately ten tonnes per Swedish citizen per year<sup>4</sup>. The difference between the figures can be attributed to the fact that there are various ways of calculating and that the people of Gothenburg, as city inhabit-

ants, are in a position to emit slightly less than the average Swede due, for example, to access to a well-developed transport system. It is difficult to delimit consumption-based emissions to a metropolitan region's geographical area as many of the statistics at regional and local level are breakdowns of national statistics and do not necessarily present a fair picture of the actual emissions generated by consumption. It is complicated to calculate an emission figure that covers local, national and global emissions but in the Climate Programme the aim is to cover all emissions. By using the Gothenburg-specific emission level as a starting point, we have the opportunity to follow up the trend regarding our actual emissions.

Further facts about how Gothenburg impacts on the climate can be found in Annex 1 Status Analysis, Gothenburg's Climate Impact.

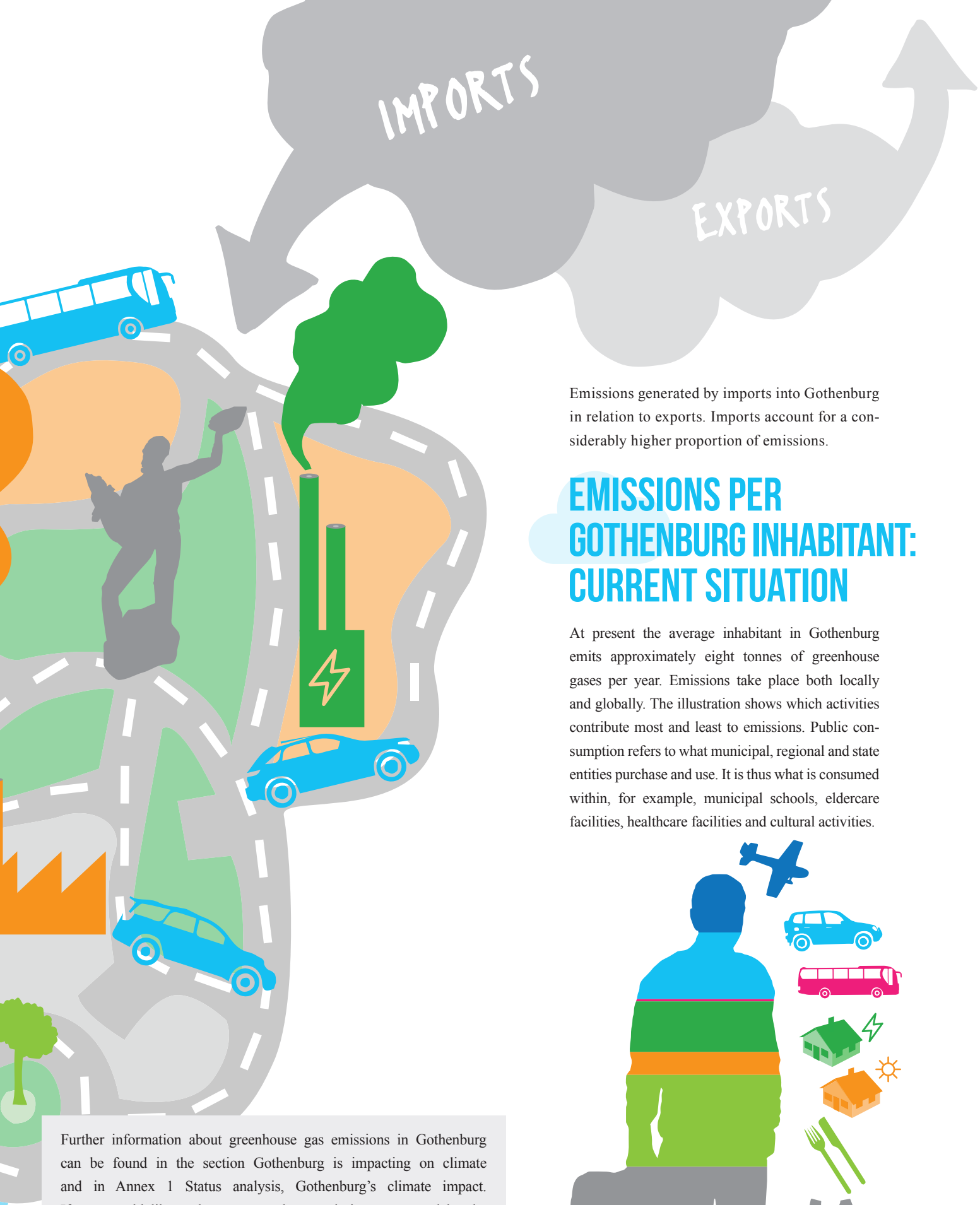
# EMISSIONS IN GOTHENBURG: CURRENT SITUATION

At present, around 2.5 million tonnes of carbon dioxide equivalents of greenhouse gases are emitted each year in Gothenburg. The emission clouds are colour-coded and show Gothenburg's largest emission sources and their relative sizes.

-  **Transport:** Road traffic, shipping and construction machinery
-  **Energy** (fossil proportion of heating and power production): Waste incineration, Rya Combined Power and Heating Plant, heating of single-family dwellings and other forms of energy use
-  **Industry:** Refineries, other industry







Emissions generated by imports into Gothenburg in relation to exports. Imports account for a considerably higher proportion of emissions.

## EMISSIONS PER GOTHENBURG INHABITANT: CURRENT SITUATION

At present the average inhabitant in Gothenburg emits approximately eight tonnes of greenhouse gases per year. Emissions take place both locally and globally. The illustration shows which activities contribute most and least to emissions. Public consumption refers to what municipal, regional and state entities purchase and use. It is thus what is consumed within, for example, municipal schools, eldercare facilities, healthcare facilities and cultural activities.



Further information about greenhouse gas emissions in Gothenburg can be found in the section Gothenburg is impacting on climate and in Annex 1 Status analysis, Gothenburg's climate impact. If you would like to know more about emissions generated by the people of Gothenburg and what is included in the different categories, reference can be made to the background report Low Carbon Gothenburg – Technological Potentials and Lifestyle Changes, Mistra Urban Futures Report 2013:5. Pages 70–71 contain an illustration of an emission scenario for Gothenburg in 2050.

# PREPARING GOTHENBURG FOR CLIMATE CHANGE

As the climate changes, Gothenburg will be affected by the consequences. A rise in sea level will produce effects, such as disruptions in power supply, the water and sewage system and the transport system. The problem of low-lying settlements along the river in the centre of the city will be exacerbated by storms that force seawater up into the estuary. Increased precipitation and thus increased volumes of water will also lead to greater levels of erosion, long-term subsidence and the risk of landslides and rockfalls around the river. However, not only will it be wetter in Gothenburg, it will probably also be warmer during certain periods. In the future, there could be a risk during spring, summer and autumn

of extremely low water levels in our watercourses, which could result in a risk of landslides due to reduced resistance. Tropical nights, i.e. nights where the temperature does not fall below 20°C, will increase in the future, which could lead to more deaths due to heat stress. Heat will also lead to an increase in the use of energy to cool buildings.

To secure the Gothenburg of the future, we need to plan the city in such a way that buildings and the infrastructure can withstand a rise in sea level. Work is already in progress and we are planning ways in which we can, for example, avoid flood damage. A hydrological model forms the basis for simulations and subsequent pri-

oritisation of measures. Since 2003, new local plans and building permits have included adaptation of floor levels and thresholds in buildings to accommodate the estimated rise in sea level. The levels could be revised in the light of the results from the climate reports published by the UN Intergovernmental Panel on Climate Change.

Climate adaptation is not included in the Climate Programme which instead focuses on how we should prevent major climate change and thus reduce the future need for adaptation measures. Climate adaptation is one of the tasks of the Planning and Building Committee.



Photo: Isolde Berner

# WE CAN MAKE A DIFFERENCE

Gothenburg is a city with many strengths and excellent opportunities to meet the challenges of the future and this is something that we are seeking to utilise in our climate work. We are responsible for a wide range of operating areas that are of major significance to the design of the Gothenburg of the future, such as infrastructure, energy supply, exercising of official duties, education and social planning. We have a large public housing sector\*, our own energy company, a well-developed district heating system\*, an efficient waste incineration plant with power and district heating production and our own port.

Climate adjustment will entail major investments, where climate consideration in conjunction with procurement and the adoption of a long-term approach are crucial.

We have good experience of working closely with researchers and industry. Research results provide us with valuable knowledge and we can contribute with information and practical opportunities that can be applied to drive research forward. Collaboration with industry is also of major importance if we are to achieve concrete solutions. Promoting collaboration in development and innovation projects offers the opportunity to make far-reaching progress in our joint climate work.

Our climate work could also have a greater effect if we collaborate and share experience with other cities and regions around the world. We are already involved in a number of networks at local, regional, national and international level, where we can both inspire and be inspired to work intelligently and bold-

ly. Collaboration at all levels offers considerable potential to influence social development.

We also have many important prerequisites and opportunities to be highly successful in our climate work. We are a large metropolitan area and we can therefore affect many people, not only our employees and the people of Gothenburg but also anyone who visits our city. Many excellent initiatives have already been taken and several more are in progress. However, we can and must do more if we are to achieve our ambitious climate objectives.

We can see that major advantages are to be gained by linking climate, culture and quality of life. It is crucial that the human being remains firmly in focus when we create the Gothenburg of the future.

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# OBJECTIVES



# THE CITY OF GOTHENBURG VISION AND OBJECTIVES

The climate issue is a global issue. There are many objectives at international, national and regional level that govern climate work. We comply with the objectives and it is our firm ambition to be at the forefront through our climate work.

The City of Gothenburg has a vision that Gothenburg will be a forerunner in environmental and urban development and be one of the most progressive cities in the world when it comes to rectifying climate and environment problems.

In order to concretise Gothenburg's ambition, the City Council has adopted an overall climate objective, i.e. the local

environmental quality objective Reduced climate impact. Linked to this objective are four intermediate objectives that function as milestones on the path to achieving the final goal. Two objectives are scheduled for fulfilment by 2020 and the other two by 2035. The environmental quality objectives are followed up in the Environmental Report published by the Environmental and Climate Committee.

Apart from the local environmental quality objective and the intermediate objectives, there are the nine strategy objectives in the Climate Programme. The objectives are sector concreti-

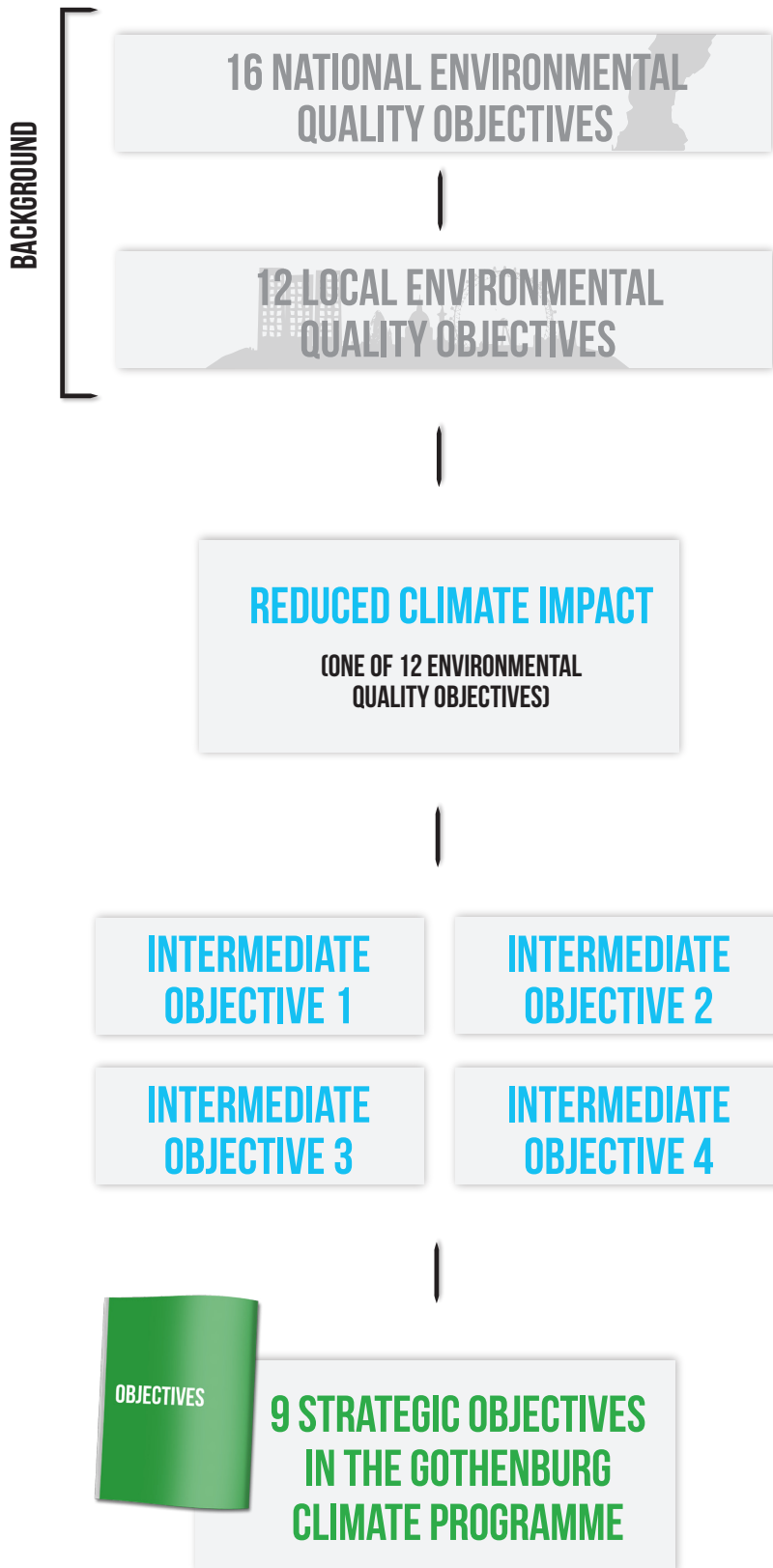
sations that demonstrate how far we should have progressed and indirectly what we should have achieved by 2030 within areas of particular strategic importance. The objectives are scheduled for 2030 to ensure that by 2035 we will have achieved the intermediate objectives and be in a position to measure the overall effect.

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The City of Gothenburg has a vision that Gothenburg will be a forerunner in environmental and urban development and be one of the most progressive cities in the world when it comes to rectifying climate and environmental problems.

**City of Gothenburg, Budget 2014**

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# 1 REDUCED CLIMATE IMPACT

In 2050 Gothenburg has a sustainable and equitable level of greenhouse gas emissions.

The level is currently interpreted as 1.9 tonnes of carbon dioxide equivalents per inhabitant per year.

## INTERMEDIATE OBJECTIVES

### 1 REDUCED CARBON DIOXIDE EMISSIONS

By 2020, the emission of carbon dioxide from the non-trading sector\* in Gothenburg will be reduced by at least 40 percent, using 1990 as the base year.

### 2 ENERGY USE IN HOMES WILL BE REDUCED

Energy use in homes will be reduced by at least 30 percent and electricity use (excluding industry and transport) will be reduced by at least 20 percent by 2020, using 1995 as the base year.

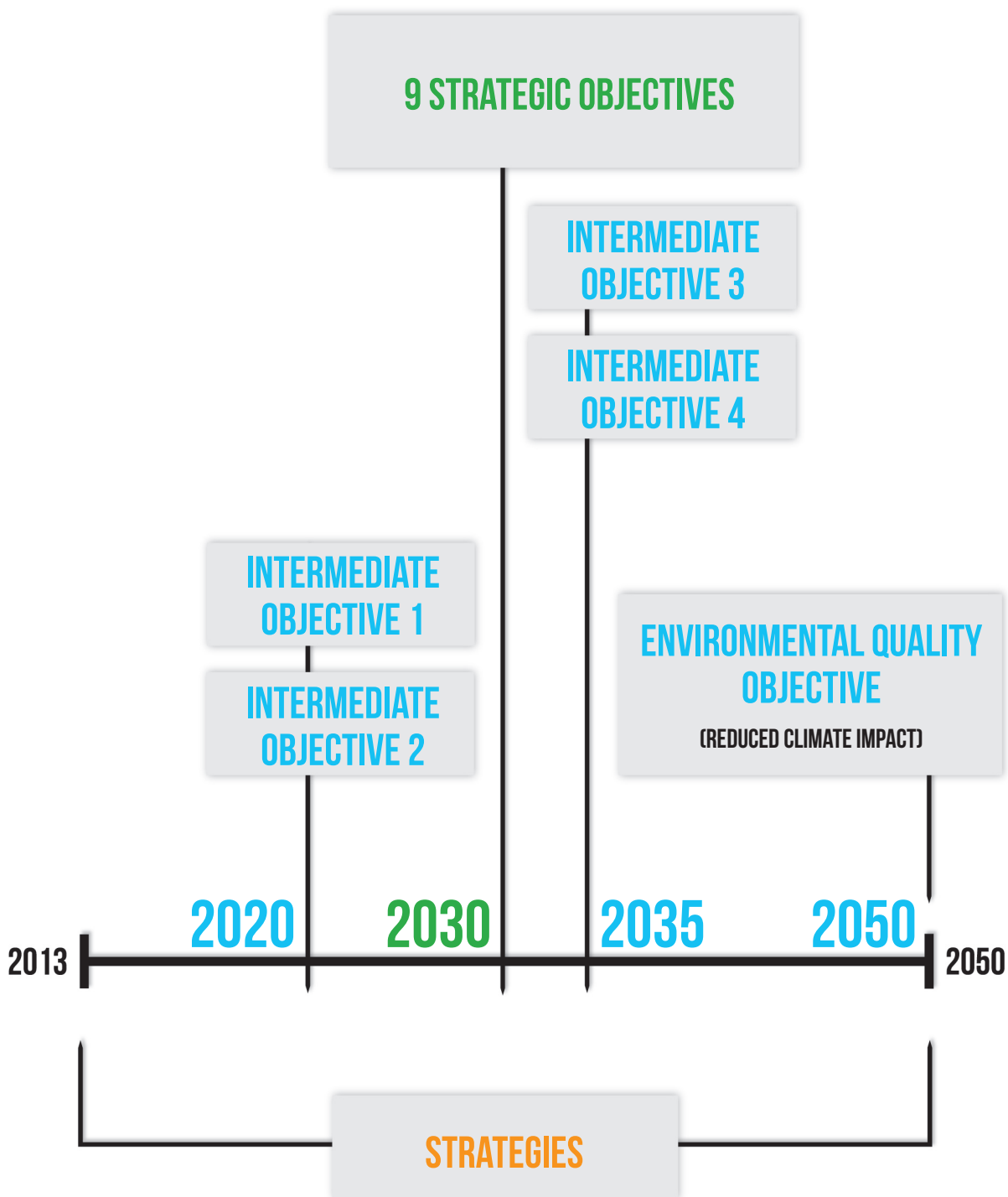
### 3 REDUCED PRODUCTION-BASED EMISSIONS OF GREENHOUSE GASES

By 2035, emissions of greenhouse gases within the Gothenburg geographical area will be a maximum of two tonnes of carbon dioxide equivalents per person.

### 4 REDUCED CONSUMPTION-BASED EMISSIONS OF GREENHOUSE GASES

By 2035, the consumption-based emissions of greenhouse gases by the people of Gothenburg will be a maximum of 3.5 tonnes of carbon dioxide equivalents per person.









# STRATEGIC OBJECTIVES FOR THE CLIMATE PROGRAMME

The strategic objectives in the Climate Programme are a further concretisation of the local environmental quality objective and its intermediate objectives. They are more specific than the intermediate objectives and highlight the sector orientations. The objectives are

based on a backcasting perspective, i.e. reverse calculation based on the desired position of the environmental quality objective although at the same time we have taken into account what it is possible for us to achieve. The City of Gothenburg has direct or indirect control over

whether the objectives can be achieved.

Further information about the background to the objectives can be found in Annex 3 Description of the Objectives in the Climate Programme.

**1 By 2030, all district heating derives from renewable energy sources, waste incineration and residual heat from industry.**

At present district heating is produced using residual heat\* from industrial processes, heat from waste incineration, natural gas-powered heat production and oil-heating. Natural gas and oil make up approximately 20 percent of the district heating mix. By 2030, it is estimated that it will be possible to produce district heating in Gothenburg purely from renewable\* fuels and heat that arises in processes that do not have power or heat production as the primary purpose.

**2 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.**

This target involves a reduction of just over 10 percent compared with 2011. The target refers to the use of electricity and heating in industry, public sector operations, housing and non-residential premises. The target has been formulated in primary energy terms\*, which means that we take into account the whole of the production chain. Reduced use of electricity is a high priority.

**3 By 2030, the City of Gothenburg produces at least 500 GWh of renewable electricity and 1200 GWh of biogas.**

This target refers to production by City of Gothenburg administrations and companies regardless of location. Renova's power production is not included as the company is not wholly owned by the City of Gothenburg. In 2012, the City of Gothenburg administrations and companies produced 86 GWh of wind power, 31 GWh of renewable electricity generated from biopower and 120 GWh of biogas.

**4 Carbon dioxide emissions from road transport within the Gothenburg geographical area will decrease by at least 80 percent by 2030 compared to 2010.**

The target has been adapted to the result from the national inquiry Vehicle Fleet Independent of Fossil Fuels 2030. The Swedish Transport Administration has interpreted this as at least an 80 percent reduction in the use of fossil energy for road transport.<sup>5</sup> To achieve this target, road traffic must decrease and fossil fuels must be replaced by renewable solutions. At present, the local emissions from road traffic are estimated at approximately 700,000 tonnes of carbon dioxide per annum.

**5 Carbon dioxide emissions from shipping in the Gothenburg geographical area will decrease by at least 20 percent by 2030 compared to 2010.**

The shipping covered by this goal includes merchant shipping, cruise ships, public transport vessels and shipping to and from Lake Vänern. In 2010, shipping in Gothenburg emitted approximately 200,000 tonnes of carbon dioxide.

**STRATEGIES**

6

**STRATEGIES**

1 2 3 4 5 6 7 8 9 10 21

**STRATEGIES**

1 4 5 11 12 13

**STRATEGIES**

1 2 3 4 5 14 15 16 17

**STRATEGIES**

1 4 17 19

## 6 The climate impact of citizen's air travel will be reduced by at least 20 percent by 2030 compared to 2012.

In order to achieve this target, it is crucial that the number of kilometres flown per inhabitant does not increase. According to the current trend, there is a doubling of travel by air every 15 years<sup>6</sup> and if this goal is to be achieved, this trend needs to be reversed. Technological development is important although in the short term it will not have a sufficient effect on emission levels to compensate for the increase in travel and reduce total emissions resulting from air travel. The challenge is considerable in the light of the City of Gothenburg's limited potential to affect this trend.

## 7 By 2030 the climate impact of food consumed in the City of Gothenburg will be reduced by 40 percent compared to 2010.

Food that has a major impact on climate includes beef and dairy products. Pork, poultry and fish also have a significant impact on climate.

## 8 The climate impact from our purchase of goods and materials should decrease. A target for 2030 will be set before 2018.

Each year, the City of Gothenburg consumes large volumes of goods and materials, the life cycle of which leads to greenhouse gas emissions, which at present we do not have any opportunity to calculate and follow up. We must therefore produce computation models in order to be able to determine the starting position and target.

## 9 The volume of household waste per person in Gothenburg will be reduced by at least 30 percent by 2030 compared to 2010.

The volume of household waste is used as a measurement of the consumption of materials and goods. The target covers combustible waste, bulky waste, food waste and anything that is handed in for recycling. In 2010, the total annual waste volume per Gothenburg inhabitant was 416 kilos.

Further information about the background to the targets can be found in Annex 3 Description of the Targets in the Climate Programme.

### STRATEGIES

1 2 3 4 23 24

### STRATEGY

1 3 20 22

### STRATEGIES

1 7 18 21 22 24

### STRATEGIES

1 2 3 4 20 21 22 23



# STRATEGIES

# FROM VISION TO ACTION

What is required is that we move rapidly from vision to action in order to reduce our climate impact and achieve a sustainable and equitable level of emissions of greenhouse gases. The Climate Programme contains 24 strategies, divided into five areas.

The aim of the strategies is to provide guidance in the task of achieving a sustainable and equitable level of emissions. The strategies are not specified in the actions but are of an overall character and highlight important strategic

areas where action needs to be taken. This uses the changes that need to be made as a starting point but also takes into account our control over each area. Control is limited in a number of ways and if we succeed in achieving our objectives it will to a large extent be a result of external developments. In order to be able to achieve a major change in society and to achieve the climate objective, commitment and involvement by industry and the people of Gothenburg are also required.

## Strategy areas:

- The climate smart citizen.
- Resource-efficient urban planning.
- Efficient energy use and conversion to renewables.
- Reduced climate stress from travel and transport.
- Climate-conscious consumption.



Photo: Peter Krahl

# THE CLIMATE SMART CITIZEN

To reduce our climate impact, everyone who lives and works in Gothenburg needs to be involved and make a contribution. We should be at the forefront and through knowledge and astute actions inspire others while at the same time we work with controls and technical solutions that facilitate a sustainable lifestyle. We should use a diversity perspective as a starting point in order to utilise, support and encourage the involvement of the people of Gothenburg and our willingness to change our habits towards more climate smart behaviour. It should be simple and self-evident to live well without imposing a load on the environment.

## This area includes the following strategies:

1. Have knowledge and show decisiveness.
2. Support citizens to reduce their climate impact.
3. Educate a new generation of climate smart citizens.





Photo: Peter Krahl

## 1 Have knowledge and show decisiveness

It is of major importance that we – employees and politicians in the City of Gothenburg – remain at the forefront and show the way towards more climate-smart behaviour. The climate issue should be an obvious element in all actions and decisions. There are many of us and collectively we have considerable potential to reduce climate impact through our actions. We should be forerunners and inspire others to change their habits.

This strategy means that we will help to disseminate knowledge and urge each other to have the courage to make difficult decisions and demonstrate the ability to act. We should also show good example and encourage others to take concrete actions that lead to reduced climate impact. A key aspect is that we learn from the actions of others, both in Gothenburg as well as nationally and internationally, and develop our expertise in the climate field. At the same time, we should seek to inspire companies, organisations and private individuals with whom we come into contact in our day-to-day work and through our networks.

The strategy can be implemented by employees and politicians regularly providing education and information about how the City of Gothenburg affects climate and how administrations and companies can contribute to reducing our total climate impact. This knowledge will result in concrete actions to reduce the climate impact of the City of Gothenburg. We will create effective fora to disseminate good examples, both internally and externally. Guiding towards greater consideration for the climate in the City of Gothenburg budget, which all employees must observe, is a way of creating the correct conditions and increasing the power to act. Another way is to impose climate demands in conjunction with procurement and purchasing. We should continue to take part in networks at different levels, both within the City of Gothenburg as well as nationally and internationally, in order to learn from each other and to exert a positive influence on developments.

The strategy contributes to sustainable development by creating conditions for taking action and making decisions that lead to reduced climate impact and in certain cases reduced costs. It is a resource-intensive challenge to induce all employees and politicians to develop an understanding and become involved in reducing climate impact.

This strategy is linked to all the strategies in the Climate Programme.

*Responsible boards and committees: All boards and committees within the City of Gothenburg.*

## LINKED TO STRATEGY OBJECTIVES:

- 1 By 2030, all district heating derives from renewable energy sources, waste incineration and residual heat from industry.
- 2 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.
- 3 By 2030, the City of Gothenburg produces at least 500 GWh of renewable electricity and 1200 GWh of biogas.
- 4 Carbon dioxide emissions from road transport within the Gothenburg geographical area will decrease by at least 80 percent by 2030 compared to 2010.
- 5 Carbon dioxide emissions from shipping within the Gothenburg geographical area will decrease by at least 20 percent by 2030 compared to 2010.
- 6 The climate impact of citizen's air travel will be reduced by at least 20 percent by 2030, compared to 2012.
- 7 By 2030 the climate impact of food consumed in the City of Gothenburg will be reduced by 40 percent compared to 2010.
- 8 The climate impact from our purchase of goods and materials should decrease. A target for 2030 will be set before 2018.
- 9 The volume of household waste per person in Gothenburg will be reduced by at least 30 percent by 2030, compared to 2010.

## THE STRATEGY IN BRIEF:

- We must disseminate knowledge and encourage each other to make difficult decisions and to take concrete action that will lead to reduced climate impact.
- We will work with education initiatives and communicate climate information on an ongoing basis.
- We will become part of national and international networks to promote an exchange of knowledge and the development of know-how and expertise.



## 2 Support citizens to reduce their climate impact

A change in behaviour and awareness in combination with bold political decisions and technical solutions are vital cornerstones in the transition to a society marked by reduced climate impact.

To promote wise investment decisions and to change behavioural patterns, it is important that we support those who wish to readjust and live a more climate-smart life at the same time that we work to disseminate understanding and knowledge of climate issues. Societal norms include guidelines governing behaviour and choice of lifestyle and we must therefore work to bring about a readjustment where taking account of climate factors becomes an obvious element in the day-to-day decisions made by the people of Gothenburg. Acceptance of future climate measures is crucial if our climate work is to have full effect. The strategy is therefore a vital source of support if we are to implement many of the other strategies.

This strategy means that we will make it easier for the people in Gothenburg, based on their life situation and their personal circumstances, to reduce their climate impact. We will contribute with useful tools and clear information to the people of Gothenburg about what they can achieve personally. We will demonstrate climate benefit using measures that the people of Gothenburg can carry out personally, such as energy renovation and amended travel patterns, and measures that affect the people of Gothenburg directly, such as the introduction of parking controls.

The strategy can be implemented by extending our impartial energy and climate advice to private individuals, organisations and small and medium-sized enterprises in the metropolitan area. We can also work on an ongoing basis with campaigns, events, discourse and communication with various target groups and contribute with advice and technical assistance. We also need to create different types of incentives and forms of control for the people of Gothenburg to mitigate their climate impact.

This strategy contributes to reduced climate impact through a change in social behaviour and greater awareness. Certain climate measures could also lead to financial savings, both for society in general and for the individual.

This strategy is linked to strategies 1, 4, 5, 7, 8, 9, 12, 14, 15, 16, 17, 20, 22, 23 and 24.

*Responsible boards and committees: The Framtiden Group, Gryaab, Göteborg Energi, Göteborg & Co, the City Executive Board, the Sustainable Water and Waste Management Committee, the City Premises Committee, the Environmental and Climate Committee, the Consumer Policy and Citizen Service Committee, the committee for Allocation of Social Welfare, the City District Committees, the Traffic Committee, the Adult Education committee and Älvstranden Utveckling.*



We will make it easier for the people of Gothenburg to reduce their climate impact.

### LINKED TO STRATEGY OBJECTIVES:

- 2 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.
- 4 Carbon dioxide emissions from road transport within the Gothenburg geographical area will decrease by at least 80 percent by 2030 compared to 2010.
- 6 The climate impact of citizen's air travel will be reduced by at least 20 percent by 2030, compared to 2012.
- 9 The volume of household waste per person in Gothenburg will be reduced by at least 30 percent by 2030, compared to 2010.

### THE STRATEGY IN BRIEF :

- We should act as a source of support and work to ensure that climate consideration becomes a distinct element in the day-to-day decisions made by the people of Gothenburg.
- We will invest in education, information, communication and advice.
- We will demonstrate climate benefit through the climate initiatives that we implement and through the measures taken personally by the people of Gothenburg.

### 3 Educate a new generation of climate smart citizens

Climate consideration and a sustainable lifestyle will become clearly defined elements in the day-to-day lives of the next generation of Gothenburg inhabitants. It is vital that children and young people acquire knowledge at an early stage about human impact on climate and how they can live in a good, climate-smart way.

This strategy means that we will make it easier to demonstrate involvement and commitment at an early age through discourse, education and practical opportunities to act in a climate-smart way. We will provide the scope and opportunity for knowledge-enhancing activities, both at school and during leisure time. The City of Gothenburg is a large organisation with broad-based knowledge and expertise related to climate and education. By promoting collaboration and various fora for exchanging knowledge, we can utilise the knowledge at our disposal optimally and reach a large number of young people in Gothenburg. Teachers have a vital role to play in this task.

This strategy can be implemented by making it easier for young people in Gothenburg to grow up with due observance of a sustainable lifestyle. We will disseminate information and knowledge about climate issues and we can, for example, arrange events with a clear climate profile. We will provide scope for practical and theoretical teaching in school about sustainable development. Children and young people should also be given greater opportunity to exert an influence and to become involved in decisions and processes that form part of the climate work taking place in Gothenburg.

This strategy will contribute to social sustainability, among other things through exchange and interaction between people, which will produce positive social effects. A common knowledge base will provide the prerequisites for a more equal society. This strategy will also be permeated by a clear 'child perspective'.

This strategy is linked to strategies 1, 7, 14, 20, 22, 23 and 24.

*Responsible boards and committees: Gryaab, the Sports and Associations Committee, the Sustainable Water and Waste Management Committee, the Cultural Affairs Committee, the City Premises Committee, the Environmental and Climate Committee, the Consumer Policy and Citizen Service Committee, Renova, the City District Committees, the Traffic Committee and the Education Committee.*

#### LINKED TO STRATEGY OBJECTIVES:

- 2 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.
- 4 Carbon dioxide emissions from road transport within the Gothenburg geographical area will decrease by at least 80 percent by 2030 compared to 2010.
- 6 The climate impact of citizen's air travel will be reduced by at least 20 percent by 2030, compared to 2012.
- 7 By 2030 the climate impact of food consumed in the City of Gothenburg will be reduced by 40 percent compared to 2010.
- 9 The volume of household waste per person in Gothenburg will be reduced by at least 30 percent by 2030, compared to 2010.

#### THE STRATEGY IN BRIEF:

- We will work to ensure that climate consideration becomes a clearly defined element in the day-to-day lives of the next generation of Gothenburg citizens.
- We will create forms of collaboration and fora for an interchange of knowledge where we can make optimal use of our climate and education know-how.
- We will employ various means to promote involvement and awareness at an early stage, including discourse and education.
- We will provide the scope and opportunity for knowledge-enhancing activities, both during school time and leisure time.



Photo: Peter Krühl

## RESOURCE-EFFICIENT URBAN PLANNING

Gothenburg and the Gothenburg region are growing. If Gothenburg is to develop sustainably and with low greenhouse gas emissions, the overriding principle in the planning process must be resource efficient. We need to utilise the infrastructure effectively and reduce climate impact resulting from traffic. Community planning creates frameworks for an energy- and transport-efficient society that promotes a sustainable lifestyle.

### This area includes the following strategies:

4. Plan for an energy- and transport-efficient society.
5. Contribute to a climate-smart regional expansion.



## 4 Plan for an energy- and transport-efficient society

Urban planning has an important role to play in creating the potential for establishing an energy- and transport-efficient society. Using general strategic planning as the primary tool we can create a resource-efficient social structure. Adopting an overall strategy will lead to a common approach and the interaction required to bring about urban development characterised by optimal resource efficiency.

The strategy means, even more than is the case at present, that we will plan the city in a resource-efficient manner. We will adapt the way we plan the social structure to make it simpler and more obvious to choose climate-smart means of transport, such as walking, cycling and public transport. The planning focus will be a social structure where energy supply is optimised by creating conditions for resource-efficient forms of energy, such as district heating and district cooling, and the promotion of energy-efficient construction. Waste and freight transport also need to be incorporated into social planning at an early stage. It is vital that this work remains in line with the Development Planning Strategy, the Transport Strategy and the Green Strategy.

The strategy can be implemented by planning in such a way that the need for transport is reduced by locating, for example, housing, industrial and commercial areas, workplaces, schools and leisure activities in mixed development\* locations and/or close to public transport. Proximity to good public transport as well as green areas, retail facilities and other service facilities would benefit pedestrians and cyclists. The location of new construction is crucial on many levels and creates conditions for efficient use of the infrastructure, such as roads, water, sewage systems, district heating, fibre-optic networks and electricity grids. It can also reinforce existing structures and contribute to preserving large, valuable green areas. A denser and more compact structure benefits the effective supply of district heating and district cooling although the energy issue needs to be developed to become a clearly identifiable element in the planning process. In urban planning we must also provide scope for reuse and recycling as well as areas for the pursuit of sustainable activities.

This strategy contributes to long-term social and economic sustainability. Apart from contributing to reduced greenhouse gas emissions, the strategy will also lead to reduced emissions of air pollutants and resource-efficient construction processes. One of the primary tasks in the planning process is to strike a balance between public interests and private interests. We will work to achieve a good balance between will-directed planning and planning governed by demand or forecasts. Many parties are involved and many people are affected by the urban planning process, which could result in conflicts and difficulty inducing everyone to work towards the same objective. Denser construction could impede, for example, efficient transport and the preservation of green areas.

This strategy is linked to strategies 1, 5, 6, 7, 8, 9, 10, 11, 14, 16, 17, 18, 22, 23 and 24.

*Responsible boards and committees: The Planning and Building Committee, the Property Management Committee, Göteborg Energi, the Port of Gothenburg, the Sports and Associations Committee, the Sustainable Water and Waste Management Committee, the City Premises Committee, the Parks and Landscape Committee, the Traffic Committee and Älvstranden Utveckling in cooperation with the Gothenburg Region Association of Local Authorities.*

## LINKED TO STRATEGY OBJECTIVES:

- 2 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.
- 3 By 2030, the City of Gothenburg produces at least 500 GWh of renewable electricity and 1200 GWh of biogas.
- 4 Carbon dioxide emissions from road transport within the Gothenburg geographical area will decrease by at least 80 percent by 2030 compared to 2010.
- 5 Carbon dioxide emissions from shipping within the Gothenburg geographical area will decrease by at least 20 percent by 2030 compared to 2010.
- 6 The climate impact of citizen's air travel will be reduced by at least 20 percent by 2030, compared to 2012. The volume of household waste
- 9 per person in Gothenburg will be reduced by at least 30 percent by 2030, compared to 2010.

### THE STRATEGY IN BRIEF:

- We will create a resource-efficient social structure through densification and planning for more people in the same area and with a reduced need for transport.
- The location of new construction and infrastructure should make it easier and more obvious to walk, cycle or use public transport.
- We will optimise energy supply by creating conditions for efficient forms of energy and promoting energy-efficient construction.

## 5 Contribute to a climate-smart regional expansion

There is a strong social trend in Sweden towards growing city regions and this makes it necessary to handle a major influx of people with the high rate of childbirth that results from having a young population in a city region. The Gothenburg region is no exception and within a few years it will have more than one million inhabitants. It is important that we capitalise on the opportunities that future regional expansion will generate and reinforce the features that make the Gothenburg region attractive.

The strategy for climate-smart regional expansion presupposes a common and consistent course of action in all the municipal areas in the region. Regional planning is reflected in particular in the Structural Illustration for the Gothenburg Region, which is an agreement in the Gothenburg region to assume responsibility for ensuring that the regional structure remains sustainable in the long term. This means, among other things, that new houses and workplaces will be concentrated close to public transport in the various parts of the region, both in the regional core – Gothenburg – and along the main routes, with rail links to and from the city. Other areas that could be worked on from a regional perspective are improving the energy efficiency of the current property holdings, waste minimisation, increased recycling of materials and investment in energy sources such as sun, wind and biogas. A sustainable food supply that is secure in the long term is required and business opportunities for service consumption must be encouraged. With its extensive range of alternatives and its role as a hub and driving force, Gothenburg is of major significance to the entire region.

This strategy can be implemented by Gothenburg being reinforced through housing, workplaces and public places and by doing so create mixed and attractive city districts and environments. Based on the visions created for RiverCity, a denser and more attractive regional core can be developed. In the Comprehensive Plan for Gothenburg, the planning process for the intermediate city is focused on supplementing good, convenient public transport, particularly around strategic hubs. Apart from the Comprehensive Plan, the Development Planning Strategy, the Transport Strategy and the Green Strategy clarify how this will take place. Planning is ongoing and the strategy deals with influencing processes that are already in progress and with a climate-conscious orientation. Change needs to commence as soon as possible as the processes are often marked by a long time perspective. The farther into the future we look, the more impact climate-conscious planning could have. It is important that we adopt a regional, national and international perspective when it comes to infrastructure solutions.

The strategy contributes to socially, ecologically and economically sustainable development. The overall view of urban planning is already characterised by sustainability and climate issues. Through a variety of measures, including improved commuting potential, the strategy can generate socially positive effects as well as greater equality and integration. Through the strategy, reduced dependence on cars will also mean reduced greenhouse gas emissions and an improved environment. Obstacles along the way could be a lack of a long-term perspective in political decisions – when there is a conflict of interest for example. There is a risk that competition between city authorities will increase if common regional goals are not observed. This is an issue that must be taken into account, particularly at regional level.

This strategy is linked to strategies 1, 4, 6, 11, 14, 16, 17 and 18.

### LINKED TO STRATEGY OBJECTIVES:

- 2 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.
- 3 By 2030, the City of Gothenburg produces at least 500 GWh of renewable electricity and 1200 GWh of biogas.
- 4 Carbon dioxide emissions from road transport within the Gothenburg geographical area will decrease by at least 80 percent by 2030 compared to 2010.

#### THE STRATEGY IN BRIEF:

- We will assume responsibility for the regional structure becoming sustainable in the long term.
- We will ensure that the climate issue permeates our planning processes.
- We will concentrate homes and workplaces in locations close to public transport.

#### *Responsible boards and committees:*

*Business Region Gothenburg, the Planning and Building Committee, the Property Management Committee, the Sustainable Water and Waste Management Committee, the Parks and Landscape Committee and the Traffic Committee in collaboration with the Gothenburg Region Association of Local Authorities and the Västra Götaland Region.*



Photo: Peter Krühl

# EFFICIENT ENERGY USE AND CONVERSION TO RENEWABLES

As a port and industrial city, Gothenburg faces major energy challenges although we also have strengths, such as a well-developed district heating grid and a large public housing sector, which offers good conditions for readjustment. In order to reduce our climate impact, we must reduce our total energy use and replace fossil energy sources with renewable sources. We must work to bring about a resource-efficient energy system, from primary source through to use.

## WITHIN THIS AREA WE HAVE THE FOLLOWING STRATEGIES:

6. Increase resource efficiency in district heating.
7. Improve energy efficiency in Gothenburg's municipal property holdings.
8. Improve energy efficiency in Gothenburg's private property holdings.
9. Promote energy efficiency in industry.
10. Continue to invest in district cooling.
11. Further develop large-scale production of renewable electricity.
12. Promote and facilitate small-scale production of renewable electricity.
13. Lead biogas development.



## 6 Increase resource efficiency in district heating

Göteborg Energi, the City of Gothenburg energy company, will continue along the present path of utilising local energy flows for heating, including residual heat from industry and heat from power and heating production using waste and renewable fuels. Fossil fuels will be phased out and where further energy sources are required to satisfy capacity requirements, they should be renewable and as resource-efficient as possible. District heating will be an advantageous choice in conjunction with new construction in densely populated areas and a competitive alternative in conjunction with conversion.

The strategy means that the climate impact of district heating will decrease with the phasing out of fossil fuels. However, it does not necessarily need to take place through costly investment in new facilities as measures taken at the customer level are of major significance. Energy efficiency and the investments that are being made to utilise the buildings' thermal inertia in the system could result in a tangible reduction in the need for fossil fuels in peak load\* systems. Large-scale storage of heat across seasonal boundaries also has the potential to create a more emission-efficient system.

This strategy can be implemented in a variety of ways, including the creation of new district heating sources by means of a comprehensive, efficient and regionally optimised district heating system, utilising more surplus heat and adapting the grid to achieve as much residual heat as possible. Moreover, the utilisation and production capacity of desired heat sources ought to be improved and the system ought to be adapted based on energy sources that are prioritised and which are linked to the system. In addition, we need to develop ideas for climate-smart use in the form of, for example, smart grids with output control, and to prioritise research areas related to the storage of electricity, heat and cooling. We can also develop small-scale local heating systems pending the expansion of the district heating grid.

Power production at the Rya Combined Heat and Power Plant is now forcing out marginal electricity production\* with high carbon dioxide emissions. When marginal production no longer has higher emissions than the Rya Combined Heat and Power Plant, natural gas as a base load fuel will be phased out although no later than 2030. Heat generated using gas could possibly be used as a resource to assure electricity and heating supplies in Gothenburg in the event of extreme temperatures or in emergency situations.

The implementation of the strategy will result in a major reduction in our local greenhouse gas emissions. The strategy means large but profitable investments. The Rya power and heat plant has an important role to play in the city's power supply in emergency situations and if the facility is no longer capable of fulfilling its role, alternative solutions must be investigated. When implementing the strategy, we need to take into account the fact that other heat sources that are used, such as waste incineration and residual heat from the refineries, could fall, particularly as a result of other aims and strategies in the Climate Programme.

This strategy is linked to strategies 1, 4, 5, 7, 8, 9 and 10.

*Responsible boards and committees: The Framtiden Group, Gryaab, Göteborg Energi, Higab, the City Premises Committee, the Sustainable Water and Waste Management Committee, Renova and Älvstranden Utveckling.*

### LINKED TO STRATEGY OBJECTIVES:

- 1 By 2030, all district heating derives from renewable energy sources, waste incineration and residual heat from industry.
- 2 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.

### THE STRATEGY IN BRIEF:

- We will phase out fossil fuels in district heating production.
- We will investigate new, climate-neutral solutions, such as residual heat and heat storage.

## 7 Improving the energy efficiency of the Gothenburg municipal property holdings

By reducing the use of electricity, heating and cooling and replacing fossil fuels in our municipal-owned commercial and residential premises, we can reduce our climate impact and contribute to a sustainable energy system. Our properties will become more energy efficient throughout the whole of their life cycle\*, from choice of materials, design, construction and operation through to demolition and recycling. We must utilise the technical potential that exists and lead the way in the development of energy-efficient properties. We must be at the forefront and be among the best in the industry.

This strategy means that for new construction and redevelopment we must prioritise the materials that have low inbuilt climate impact, which offer long-term sustainability and which have good recycling potential. Buildings will be constructed in a way that they will require minimal heating and cooling and the energy sources will have minimal climate impact. Electricity for heating must be avoided. The floor space of the buildings can be used efficiently and by doing so the floor space per inhabitant or per workplace can be reduced. Energy use in existing properties will be improved by means of operational optimisation or renovation. Fossil fuels and electric radiators for heating will be phased out. The energy efficiency measures that are considered to be technically and financially reasonable will be implemented.

To implement this strategy, a large number of technical measures are required of the type that we already have knowledge of and which we have already implemented in a number of projects. We need to make strategic decisions to overcome existing obstacles and by doing so create conditions where we can achieve a high degree of implementation. We need to make strict demands on energy efficiency and choice of materials in conjunction with new construction and renovation. We must produce joint computation conditions\* that enable long-term investment by taking into account the building's life cycle and the project's climate and societal benefit. We will work with common tools that make it possible to easily and uniformly assess the entire greenhouse gas emissions of the building with account taken of building materials. We must take energy use per square metre into consideration and also how efficiently we use the available space. We can meet the challenges of constructing a mixed use city by adapting different requirements to buildings where the floor space can be used for different purposes. We can facilitate the financing of energy efficiency measures by, for example, introducing funds that include climate compensation funding\*, which will be used for energy efficiency measures. We will work to bring about acceptance of long-term profit calculations when making investments and for policy instruments and legislation that act as an incentive.

Energy efficiency and the investments that are being made in utilising the buildings' thermal inertia in the system could reduce the need for fossil fuel to meet peak load requirements. We also need to develop ideas for climate-smart energy use – smart grids with efficiency control for example – and prioritise research related to the storage of heating and cooling.

### LINKED TO STRATEGY OBJECTIVES:

- 1 By 2030, all district heating derives from renewable energy sources, waste incineration and residual heat from industry.
- 2 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.
- 8 The climate impact from our purchase of goods and materials should decrease. A target for 2030 will be set before 2018.

#### THE STRATEGY IN BRIEF:

- In conjunction with new construction, we will build in an energy-efficient way and use more sustainable materials.
- We will work on energy efficiency measures in our existing property holdings.
- We will use residential and commercial floor space efficiently.

This strategy will lead to lower operating costs and lower greenhouse gas emissions. Sustainable material choices safeguard natural resources. Redevelopment and refurbishment often affect social aspects for better or for worse through, for example, better housing conditions or higher rents. It is more difficult to improve energy efficiency in the existing property holdings compared with new construction. However, the technology is available and the obstacles that exist are mainly costs and financial conditions. Overall, major investments are required that will generate profitability in the long term.

This strategy is linked to strategies 1, 2, 3, 4, 6, 10, 12 and 21.

*Responsible boards and committees: The Planning and Building Committee, the Property Management Committee, The Framtiden Group, Göteborg Energi, Higab, the Sports and Associations Committee, the Cultural Affairs Committee, the Environmental and Climate Committee, Parkeringsbolaget, The Procurement Company and Älvstranden Utveckling.*



Photo: Peter Krühl

## 8 Improve the energy efficiency of Gothenburg's privately owned property holdings

To reduce Gothenburg's climate impact and to facilitate the readjustment to sustainable energy systems, both new construction and existing private property holdings must become more energy and resource efficient. The strategy covers private residential and non-residential premises. The building developer's organisation and long-term undertakings affect the construction conditions for achieving long-term sustainability, energy efficiency and quality.

The strategy means that we create incentives for private individuals to build and renovate to achieve long-term sustainability, to ensure low heating and cooling requirements and to reduce the use of fossil fuels and electricity. Properties are part of the energy system in general and efficiency measures on the building level are based on benefit generated throughout the whole system. Energy efficiency enhancement in the investments that are being made to utilise the buildings' thermal inertia in the system could reduce the need to use fossil fuels to meet peak load requirements in electricity and district heating grids. We will work to gain acceptance for long-term profit calculations in conjunction with investment and for policy instruments and legislation that act as an incentive. Last but not least, we will disseminate knowledge about technical and behaviour-changing measures and financing.

The strategy can be implemented by investing in education, advice and information. We need to introduce stricter demands for sustainability in conjunction with new construction and redevelopment of homes and inbuilt energy will be taken into account as part of an overall assessment. We will direct our initiatives aimed at reducing energy use per square metre and reducing non-residential and residential floor space per inhabitant to achieve better utilisation of each residential square metre. Energy and climate advice and dissemination of knowledge in different networks is already taking place and there is the potential to influence development through official supervisory measures. The initiatives could be broadened and made stricter with immediate effect.

This strategy contributes to reduced energy use and greenhouse gas emissions. A sustainable choice of materials and resource management safeguard natural resources. Properties become more sustainable and operating costs are reduced. Many measures have a long payback time and investments entail a risk of rent increases, which in turn could lead to increased segregation. The greatest obstacle is the present-day demand for short-term financial profitability and a lack of incentive to work more sustainably.

This strategy is linked to strategies 1, 2, 4, 6, 9, 10 and 12.

*Responsible boards and committees: Business Region Gothenburg, the Planning and Building Committee, the Property Management Committee, the Consumer Policy and Citizen Service Committee and the Environmental and Climate Committee.*

### LINKED TO STRATEGY OBJECTIVES:

- 1 By 2030, all district heating derives from renewable energy sources, waste incineration and residual heat from industry.
- 2 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.

### THE STRATEGY IN BRIEF:

- We will create incentives to build and renovate in a way that is sustainable in the long term in order to minimise energy requirements and reduce the use of fossil fuels.
- We will disseminate knowledge regarding technical measures and financing.
- We will work to bring about greater acceptance of long-term profit calculations in conjunction with investments.

## 9 Promoting energy efficiency in industry

Industry has an important role to play in developing and producing new technology and new products that mitigate climate impact both locally and globally. At the same time, industry, with its processes, premises and consumption of raw materials, accounts for a large proportion of greenhouse gas emissions. To mitigate negative climate impact, all areas need to be more resource and energy efficient. A number of companies have come some way towards achieving this but for the majority a great deal of work still remains.

This strategy means that we contribute to companies acquiring a good level of knowledge of their energy consumption to ensure that the most effective measures can be identified and implemented. Knowledge of new and available technology in different sectors must also increase as well as knowledge of alternative materials or raw materials that have less climate impact. The measures are directed at large, medium-sized and small industrial enterprises in Gothenburg. Property owners who lease premises to industrial companies are also covered by energy use in the form of heating, lighting and public ventilation, which are included in the rental costs for the premises or which are governed by the property owner's energy agreement.

This strategy can be implemented by offering training programmes and energy surveys as well as measures to improve energy efficiency and generate energy savings. Another measure is that we create platforms for an exchange of knowledge – in the form of sector clusters for example. Communication, information and supervision directed at companies are also important aspects of the strategy, which inspire and drive forward the task of increasing knowledge of energy use and subsequent energy efficiency measures but also how the choice of raw materials affects the climate. We will also work to establish policy instruments and legislation that act as an incentive.

This strategy contributes to reduced energy use in industry and resource-efficient use of raw materials that generate less climate impact. Apart from reducing climate impact, industry is also in a position to reduce the cost of electricity and heating and by doing so assure their operations for the future. During implementation of the strategy, a variety of obstacles could be encountered, such as commercial demands for short repayment periods for energy efficiency measures or fluctuations in the economy that result in planned measures being postponed. Another important aspect is that energy efficiency in industry is not always the same as a reduction in energy use. The financial savings that result from energy efficiency measures could be invested in increased production.

This strategy is linked to strategies 1, 2, 6, 7, 8 and 10.

*Responsible boards and committees: Business Region Göteborg, Göteborg Energi, Higab, miljö- och klimatnämnden, nämnden för konsument- och medborgarservice and Älvstranden Utveckling.*



A number of companies have made some progress but for the majority a great deal still remains.

### LINKED TO STRATEGY OBJECTIVES:

- 1 By 2030, all district heating derives from renewable energy sources, waste incineration and residual heat from industry.
- 2 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.

### THE STRATEGY IN BRIEF:

- We will exercise supervision and disseminate information about energy-saving measures.
- We will create platforms for an exchange of energy efficiency know-how.
- We will support the task of improving the efficiency of operating premises.

## 10 Continue to invest in district cooling

Using district cooling to cool non-residential premises reduces greenhouse gas emissions compared with the use of local, electrically powered cooling units. When expansion of district cooling increases, it is important that we continue to invest in energy-efficient systems and fossil-free energy sources in production and continue to utilise surplus heat from the district heating grid during the summer.

This strategy means that district cooling will become a prioritised choice when the plans for new construction of properties in the central areas of Gothenburg become a reality. It will be advantageous for customers to choose district cooling instead of their own local electrically powered solution.

The strategy can be implemented by the municipal-owned companies in Gothenburg adopting a common view of the advantages of district cooling to ensure that municipal property owners choose district cooling where possible. To reach other property owners, the environmental and financial advantages of district cooling need to be marketed and communicated. District cooling is an established product and a realistic estimate is that the annual use of district cooling will increase by approximately 5GWh. The increased production will be covered mainly by free cooling from the river and absorption cooling of residual heat.

This strategy contributes mainly to ecological sustainability through reduced use of electricity and thus lower greenhouse gas emissions. In addition, social sustainability is affected by the urban environment changing when local cooling units are replaced by district cooling, which will lead to lower noise levels, fewer environmentally hazardous coolants, a more stable indoor climate, roof surfaces that are freed up for construction or cultivation, the utilisation of residual heat that arises during the summer and effective exploitation of local resources. An obstacle to district cooling is competition from in-house produced cooling, which offers low operating costs when electricity prices are low. This strategy means relatively large investments in the district heating system although these will only prove profitable in the long term.

This strategy is linked to strategies 1, 4, 7, 8 and 9.

### LINKED TO STRATEGY OBJECTIVES:

- 2 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.

#### THE STRATEGY IN BRIEF:

- We will establish district cooling through marketing and communication.
- We will prioritise energy-efficient system solutions and reduce the proportion of electricity in the production of district cooling.

#### *Responsible boards and committees:*

*The Property Management Committee, Göteborg Energi, Högab and Älvstranden Utveckling.*



## 11 Further develop large-scale production of renewable electricity

We will contribute to replacing fossil fuels in European electricity production with renewable energy sources. By utilising local conditions in the form of either production locations or knowledge, we can assume responsibility that extends beyond municipal borders.

This strategy means that in the first instance we evaluate the conditions for local production. Where prerequisites for local production exist, we will make use of our knowledge and experience to invest in facilities at locations that offer better conditions.

This strategy can be implemented by creating conditions for large-scale production of renewable electricity from wind, sun, biomass and possibly also from waves and water currents. It involves financing, location, technical expertise and collaboration with other bodies. The location of facilities for large-scale electricity production will become a key land-use and building permit issue in comprehensive plans and detailed plans. At present, it is most attractive to invest in biofuel from forest products and waste and in wind power, both locally and at locations other than in the Gothenburg geographical area. We will continue along the path that has already been set out and invest in and develop large-scale electricity production projects. In the future, other investments could be of interest, such as large solar cell facilities. We will continue to collaborate with researchers in this field in order to learn about new technical production solutions as well as the potential for storing electricity. Meeting this strategy also requires the adoption of a common view within the City of Gothenburg operating areas and with regard to our roles as planners, designers and producers of electricity.

This strategy contributes to sustainable electricity production, which gives society greater independence from fossil fuels. New job opportunities can be created and knowledge and experience can make us a sought-after partner. Because of their varied production, sun and wind as energy sources make particular demands on the electricity grid and with increased production the grid needs to be adapted to prevailing conditions. Electricity production from biomass requires careful consideration as biomass is a sought-after natural resource that can be used for different purposes and with variable climate benefit. Renewable energy sources are not free of environmental impact, which must be taken into account in the planning process. Biofuels\*, for example, give rise to local air pollution and solar cells, wind and wave power affect nature and animal life in the immediate vicinity. This strategy involves relatively large investments that are only profitable in the long term.

This strategy is linked to strategies 1, 4 and 5.

### LINKED TO STRATEGY OBJECTIVES:

- 3 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.

#### THE STRATEGY IN BRIEF:

- We will make use of local potential for solar and wind power production.
- We will investigate installation of wind power at another location in Sweden.
- We will develop and test technical solutions in collaboration with researchers in this field.

*Responsible boards and committees:  
Business Region Gothenburg, the  
Planning and Building Committee,  
the Property Management Committee,  
Göteborg Energi and Renova.*



New job opportunities can be created and knowledge and experience can make us a sought-after partner.

## 12 Promote and facilitate small-scale production of renewable electricity

To readjust society, we need to work broadly and be open to new solutions. Small-scale production facilities can complement large power production plants and contribute to increasing the overall proportion of renewable energy. They are important as test arenas and they also have educational value by inspiring and making the people of Gothenburg more involved in climate adjustment.

This strategy means that we will be forerunners and make small-scale renewable electricity production visible at the same time that we contribute renewable electricity to the energy system. It will become more attractive and simple for private individuals and organisations to install small-scale facilities.

This strategy can be implemented by, for example, large suitable areas on our roofs, facades and bus and bicycle shelters being used for the installation of solar cells. Conditions for small-scale wind power are not as good as for solar cells but there are examples where the technology has proved successful. We will work to disseminate readily available information and good examples between our various operating areas. We can also provide organisations and the people of Gothenburg with information, training and advice about small-scale electricity production. Connection, measurement and payment for electricity produced will be facilitated as far as possible. One way of encouraging and supporting small-scale production of renewable electricity is to take it into account when formulating planning regulations and in conjunction with land allocation procedures.

This strategy will lead to a reduction in greenhouse gas emissions by contributing renewable electricity to the electricity grid. The difficulty behind implementing the strategy is that investment in facilities does not generate short-term profit and the cost depends on policy instruments and technological development. When the proportion of small-scale, renewable electricity production increases noticeably, the electricity grid needs to be adapted to production features, such as a large diurnal and annual variation.

This strategy is linked to strategies 1, 2, 7 and 8.

*Responsible boards and committees: Business Region Gothenburg, the Planning and Building Committee, The Framtiden Group, Göteborg Energi, the City Premises Committee, the Consumer Policy and Citizen Service Committee, Parkeringsbolaget and the Traffic Committee.*

### LINKED TO STRATEGY OBJECTIVES:

- 3 By 2030, the City of Gothenburg produces at least 500 GWh of renewable electricity and 1200 GWh of biogas.

#### THE STRATEGY IN BRIEF:

- We will facilitate connection of small-scale facilities.
- We will disseminate information and knowledge.
- We will lead the way and highlights good examples.





## 13 Lead biogas development

Biogas is a good fuel from a climate point of view. Through increased production of biogas, Gothenburg can lead the way in development and contribute to a reduction in the use of fossil fuels, mainly in the transport sector. The government has set ambitious targets for the creation of a fossil-independent transport sector by 2030. A great deal of the biogas potential can be realised within this timeframe and work in Gothenburg has to some extent already commenced. We were among the first to upgrade biogas and production of liquefied biogas and we have been a driving force in the development of gas-powered vehicles. GoBiGas, the world's first gasification plant for biogas production is now in operation.

This strategy involves intensification of our focus on local and regional biogas production. In Gothenburg, it is a matter of increasing production from waste sludge, food waste, and other residual products and investing in gasification of biofuel and residue from the forestry industry within the framework of the GoBiGas project, which can change the conditions for biogas production radically. A crucial part of this strategy involves stimulating the demand for biogas.

This strategy can be implemented by becoming better at separating surface water from waste water in order to create conditions for Gryaab to increase its biogas production from waste sludge. We will investigate how we can work with other substrata, increase the sorting of food waste, create conditions for dealing with an increased volume of sewage slurry and improve production efficiency. We will create greater security and potential collaboration for producers and users by clearly establishing the direction in which we want to move, clarifying the allocation of roles in processes and reviewing the Ownership Charter and rules as necessary. We will also work to have policy instruments and legislation in place that act as an incentive.

The technical challenges in production are well on the way to being resolved. A major advantage of biogas is that the present natural gas grid can be used for distribution. There is a market for biogas but it could be difficult to bring about financial profitability and policy instruments are required. It is also a challenge to strike a balance between supply and demand. This strategy involves relatively large investments that are only profitable in the long term but which also have considerable potential to contribute to reducing greenhouse gas emissions. To avoid conflicts with other environmental targets, it is important to design the use of forest fuel where account is taken of the ecosystem and biological diversity.

This strategy is linked to strategies 1, 15, 20 and 22.

*Responsible boards and committees: Fastighetsnämnden, Gryaab, Göteborg Energi, kretslopp och vattennämnden and Renova.*

### LINKED TO STRATEGY OBJECTIVES:

- 3 By 2030, the City of Gothenburg produces at least 500 GWh of renewable electricity and 1200 GWh of biogas.

#### THE STRATEGY IN BRIEF:

- We will intensify our investment in local and regional production of biogas.
- We will increase the production of biogas from food waste and waste sludge.
- We will stimulate the demand for biogas.



Photo: Ulrika Naezer

# REDUCED CLIMATE STRESS FROM TRAVEL AND TRANSPORT

Gothenburg is also a transport-intensive metropolitan area and is facing major challenges to reduce greenhouse gas emissions resulting from transport. Gothenburg also has an important role to play as a transport hub and it will be a strong regional centre. The transport of people and freight largely passes through Gothenburg, which gives us considerable potential to influence development positively, not only at local level but also nationally and internationally.

## THE FOLLOWING STRATEGIES CAN BE FOUND WITHIN THIS AREA:

14. Prioritise and invest in the travel modes walking, cycling and public transport.
15. Work towards a more energy-efficient vehicle fleet and promote the use of fuels with low climate impact.
16. Use and develop policy instruments to reduce car traffic.
17. Become a world leader in climate-smart cargo handling.
18. Reduce the climate impact of construction, operation and maintenance of infrastructure.
19. Facilitate and encourage shipping that is energy efficient and fossil free.

## 14 Prioritise and invest in the travel modes walking, cycling and public transport

The transport sector accounts for approximately one-third of carbon dioxide emissions in Gothenburg. Changes in the sector are therefore of major significance to climate. At present there is large-scale technological development of alternative energy sources for vehicles although surveys show that this will not be sufficient. According to the Transport Strategy, a reduction in road traffic of 25 percent, regardless of the increase in population, is required if we are to reach the target of 80 percent lower carbon dioxide emissions resulting from road traffic in Gothenburg.

This strategy means a readjustment of traffic planning, where earlier planning was based on forecasts using historical data and where the car is the basic mode of transport. Instead, city planning will be based on guiding towards sustainability. These changes are laid down in the Gothenburg Transport Strategy.

This strategy can be implemented by providing good alternatives to the car by creating scope for pedestrians, cyclists and public transport. At the same time, features such as attractive streets, parks and squares need to be reinforced. The car will still have a role to play in the city although other modes of transport need to become more competitive for day-to-day travel. If Gothenburg is to retain its attractiveness, it is required that we invest in a well-developed public transport system, a cohesive cycle path network and an attractive environment for pedestrians. New and existing travel services also need to be developed and produced, such as carpools and bicycle pools linked to public transport. Similar to the strategy for an energy- and transport-efficient society, a denser city is required where public transport, cycling and walking at certain locations need to lay claim to land areas currently devoted to road traffic. The Transport Strategy also highlights the need to reduce transport compared with the current situation by establishing proximity to functions that are intrinsic to daily life, such as schools, workplaces, services and leisure activities, instead of rapid access over longer distances.

If we are to succeed in reducing road traffic by 25 percent, regional travel must take place using public transport to a much greater extent than is the case at present. We also need to change the retail structure in such a way that more people can attend to their day-to-day needs without using a car.

This strategy leads to positive social effects as all road users are treated more equally. Reducing car traffic also leads to reduced emissions of air pollutants. Densification and prioritising walking, cycling and public transport are not new but reflect a great deal of the current urban construction ideal. Unfortunately, we do not always build as we preach and the challenge therefore is to comply consistently with the objectives that have been set out in Gothenburg and build the city sustainably from within and outwards and in accordance with our Comprehensive Plan, the Development Planning Strategy, the Transport Strategy and the Green Strategy.

This strategy is linked to strategies 1, 2, 3, 4, 5 and 16.

*Responsible boards and committees: Business Region Gothenburg, the Planning and Building Committee, the Property Management Committee, the Parks and Landscape Committee and the Traffic Committee in collaboration with the Gothenburg Region Association of Local Authorities.*

### LINKED TO STRATEGY OBJECTIVES:

- 4 Carbon dioxide emissions from road transport within the Gothenburg geographical area will decrease by at least 80 percent by 2030 compared to 2010.

#### THE STRATEGY IN BRIEF:

- We will work to ensure that car traffic is reduced by 25 percent irrespective of the increase in population.
- We will build the city sustainably from within and outwards, following the direction set out in our Comprehensive Plan, the Development Planning Strategy and the Transport Strategy.
- We will create space for and prioritise pedestrians, cyclists and public transport.
- We will work to ensure that regional travel takes place using public transport to a much greater extent than is the case at present.

## 15 Work towards a more energy-efficient vehicle fleet and promote the use of fuels with low climate impact

The City of Gothenburg has adopted an aim that states that municipal transport will become more efficient and that the use of renewable energy will increase. This strategy means that as a major purchaser of products and services, we will continue to develop and make environmental demands on suppliers. As part of the Västra Götaland Region, we can also influence the demands that are made on vehicles used in public transport. We are responsible for a large number of transport vehicles operating in Gothenburg, such as waste collection vehicles, travel service vehicles and vehicles used for the distribution of materials and food for various municipal activities. We can influence greenhouse gas emissions generated by traffic by working on the transport in Gothenburg that is specific to our operations.

This strategy can be implemented by opting for emission-efficient and energy-efficient vehicles. We will use modes of transport such as electric bicycles and similar alternatives when possible. At present, the basic requirement is that the vehicles that are purchased or leased should be the more environmentally adapted models on the market. By continuing to tighten demands in conjunction with procurement, we can speed up the development of new, environmentally adapted technology. Demands on fuels are also important and we need to support renewable fuels and energy-efficient hybrid and electrically powered vehicles. Biogas has a particular role to play as a locally produced sustainable fuel with many environmental benefits. We must work to ensure that transport-intensive services and regular delivery of goods are divided into two procurement areas. By separating the transport from the product, it will be easier to impose demands on transport provision. Gothenburg will also continue to function as a test arena for new technology. The city has strong industrial and academic sectors and together with the City of Gothenburg they are working actively to be involved in and initiate projects where the development of transport services, information solutions and automotive development can be tested in practice. Innovative solutions can then be made available to all parties concerned.

The strategy will lead to reduced use of fossil fuels and efficient use of renewable energy. This will mean a reduction in environmental impact from traffic as air pollutants and noise will be reduced. It is important that we analyse the market in order to ensure that suitable demands are made. We must also become better at following up to ensure the best results are achieved in the procurement process. It is important that the test projects we take part in have the potential to generate long-term benefit and we will therefore carefully evaluate the effects of different projects.

This strategy is linked to strategies 1 and 13.

*Responsible boards and committees: Business Region Gothenburg, the Special Transport Committee, Gatubolaget, Göteborg Energi, the Sustainable Water and Waste Management Committee, Renova, the Traffic Committee and The Procurement Company.*

### LINKED TO STRATEGY OBJECTIVES:

- 4 Carbon dioxide emissions from road transport within the Gothenburg geographical area will decrease by at least 80 percent by 2030 compared to 2010.

#### THE STRATEGY IN BRIEF:

- We will continue to make strict demands for energy-efficient, emission-efficient vehicles as part of the procurement process.
- We will promote greater use of fuels with low climate impact.
- We will support innovative solutions and function as a test arena for new technology.

## 16 Use and develop policy instruments to reduce car traffic

The need to own and use a car depends on community planning in general and the competitiveness of other modes of transport. According to the Transport Strategy, a reduction in car traffic of 25 percent is required, irrespective of the increase in population, if we are to achieve the objective of 80 percent lower carbon dioxide emissions from road traffic in Gothenburg. Apart from improved conditions for cycling and public transport, the development of policy instruments is a key issue in the drive to reduce car traffic.

The strategy outcome is that we develop policy instruments that create an economic driving force that will ensure that more people choose not to use the car. We have up to now mainly worked with parking cost and congestion charges\* as policy instruments in order to reduce car traffic and these have had a positive effect.

The strategy can be implemented by gradually raising the cost of street parking in the city centre in order to make it financially feasible to create parking facilities above and below ground. With more cars in a covered car park, street space can be used to create pedestrianised areas and attractive urban spaces. Increasing parking charges could reduce the demand for parking at the workplace and offer a greater incentive to walk, cycle or use public transport. This would apply in particular in areas with access to good public transport. We also need to separate the cost of parking from the cost of housing. At present the parking cost can be included in the price of the purchase cost of a home or in the rent. A person who chooses to forego a car should not need to pay for parking and instead the cost should be reported and paid for separately.

A green travel plan presents how different bodies can work together to make sustainable travel possible. The plan is drawn up in conjunction with new construction or the transformation of areas and compels property owners and other parties in the area to carry out certain measures. We have commenced work on green travel plans although this tool ought to be used to a greater extent to facilitate car-efficient urban planning. A further example of policy instruments that will in time reduce climate impact is lowering speed limits in the city.

Reduced car traffic has positive effects on the environment, human health and social life in the city. However, the above policy instruments result in social injustice as a result of diverse economic conditions. To promote acceptance of economic policy instruments, it is important when introducing different tools that we clearly communicate the purpose. The chosen policy instruments should also be combined with a bonus system.

This strategy is linked to strategies 1, 2, 4 and 14.

*Responsible boards and committees: The Planning and Building Committee, The Framtiden Group, the City Premises Committee, Parkeringsbolaget and the Traffic Committee.*

### LINKED TO STRATEGY OBJECTIVES:

- 4 Carbon dioxide emissions from road transport within the Gothenburg geographical area will decrease by at least 80 percent by 2030 compared to 2010.

#### THE STRATEGY IN BRIEF:

- We will work to ensure that car traffic is reduced by 25 percent regardless of the increase in population.
- We will continue to work with policy instruments for parking.
- We will continue to develop green travel plans.
- We will investigate and develop policy instruments and bonus systems for reduced car traffic.

## 17 Become a world leader in climate-smart cargo handling

The transport sector will reduce its carbon dioxide emissions by 80 percent and the development of technology related to heavy road transport is vital. However, greater use of the best available technology and renewable fuels will not be entirely sufficient. The Swedish Road Administration has calculated that truck traffic must not increase if the national environmental goals are to be met. We must therefore work to bring about tighter means of control and find solutions to improve cargo handling efficiency. Gothenburg is the logistics centre of the Nordic region; it has a port of national importance and a thriving automotive industry. This presents the opportunity, through collaboration, to make demands and to test and invest in smart logistics solutions and technology to create a Gothenburg that is a world leader in climate-smart freight logistics. This ambition and orientation is also highlighted in the Transport Strategy.

This strategy means that a higher proportion of freight is handled through improved efficiency, such as an increased loading factor for vehicles, larger vehicles and a larger volume of freight being switched from road to sea and rail. Freight transport will take place using energy-efficient modes of transport, such as shipping, rail and the use of electrically powered trucks. The Port of Gothenburg has an important function as a logistics hub. The City of Gothenburg has limited control over general logistics structures although we will work to bring about agreements, procurements and transport arrangements that make efficient freight logistics possible.

This strategy can be implemented by offering strategically located terminals in combination with policy instruments that increase the power of industrial sectors and individual companies to demand intermodal transport involving sea, rail and road. Trials with coordinated city deliveries to stores have been conducted using small, electrically powered vehicles. These trials provide crucial experience and ought to be expanded to include deliveries to private individuals. Transport of waste and recyclable material is also a key sector that ought to be coordinated with other distribution solutions. In the next few years, major new construction projects will generate substantial transport volumes, both of materials that need to be brought into the city as well as excavated material that needs to be taken out of the city. From a climate point of view, it is important that transport distances are minimised.

Apart from climate benefits, there are other environmental benefits deriving from more efficient freight transport, including a reduction in air pollutants and reduced noise.

This strategy is linked to strategies 1, 4, 5 and 19.

*Responsible boards and committees: Business Region Gothenburg, the Property Management Committee, Gatubolaget, Göteborg Energi, the Port of Gothenburg, the Sustainable Water and Waste Management Committee, Renova, the Traffic Committee and The Procurement Company.*

### LINKED TO STRATEGY OBJECTIVES:

- 4 Carbon dioxide emissions from road transport within the Gothenburg geographical area will decrease by at least 80 percent by 2030 compared to 2010.
- 5 Carbon dioxide emissions from shipping within the Gothenburg geographical area will decrease by at least 20 percent by 2030, compared to 2012.

### THE STRATEGY IN BRIEF:

- We will make demands and we will test and invest in smart logistics solutions and technology.
- We will reinforce Gothenburg as a logistics hub for energy-efficient freight systems.
- We will work to bring about agreements, procurements and transport arrangements that make efficient freight logistics possible.
- We will coordinate and improve the efficiency of the transport of excavated materials and other materials.



## 18 Reduce the climate impact of construction, operation and maintenance of infrastructure

Apart from reducing energy use and climate impact generated by road transport, we are seeking to reduce the direct and indirect climate impact resulting from the construction, operation and maintenance of the transport system.

This strategy means that we will increase our knowledge of the range of materials available during the construction and operation of the infrastructure and to ultimately make climate demands in conjunction with procurement of materials and construction machinery. We will work actively to reduce transport by, for example, offering interim storage areas for polluted excavated material.

This strategy can be implemented by formulating procurements to promote effective technical solutions and with a distinct focus on climate. This applies to both the planning and construction phases. We ought to cooperate with other regional parties in certain procurement issues in order to have a greater impact. The introduction of a certification system is one of a number of methods that can be adopted when working with increased environmental demands, e.g. in conjunction with road construction. We will investigate and test systems of this nature in selected projects as a means of reducing climate impact.

This strategy will lead to reduced emissions of greenhouse gases and a more resource-efficient choice of materials.

This strategy is linked to strategies 1, 4, 5 and 21.

*Responsible boards and committees: The Sustainable Water and Waste Management Committee, the Traffic Committee and The Procurement Company.*

### LINKED TO STRATEGY OBJECTIVES:

- 8 The climate impact from our purchase of goods and materials should decrease. A target for 2030 will be set before 2018.

#### THE STRATEGY IN BRIEF:

- We will increase our knowledge of materials and operation of the infrastructure.
- We will formulate procurements that promote effective technical solutions and with a distinct focus on climate.
- We will work actively to reduce the transport of excavated material.





Photo: Peter Krahl

## 19 Facilitate and encourage shipping, which is energy efficient and fossil free

Shipping is one of the most energy-efficient modes of transport and Swedish industry is highly dependent on efficient sea transport via the Port of Gothenburg. Shipping is a supporting link in a strong, climate-smart logistics hub in Gothenburg. Today, shipping in the metropolitan area of Gothenburg accounts for almost 8 percent of carbon dioxide emissions. In order to address the climate challenges in society and to reduce the energy emissions resulting from shipping within the Gothenburg geographical area, we need to drive development towards even more energy-efficient shipping, a transition to more climate-smart and in time completely fossil-free fuels and a shipping industry with a higher loading factor.

This strategy means that the Port of Gothenburg consciously uses the five strategy areas identified by the European Sea Ports Organisation (ESPO) in ESPO Green Guide. This means achieving lower emissions and increased use of renewable fuels by showing good example, creating the correct conditions, providing encouragement, collaborating with other parties and being insistent.

This strategy can be implemented through a large number of measures, such as monitoring and analysing emissions, making an offshore power supply available for ships, making liquefied natural gas available as a fuel and highlighting parties that are driving development forward as positive examples. We can take part in international collaboration and an exchange of knowledge in order to learn about and influence others. We also have the opportunity, via our port tariff and concession agreements, to guide towards more climate-adapted shipping, albeit to a limited extent.

The strategy contributes to ecological sustainability but also economic and social sustainability through successful shipping and a successful port that continues to generate job opportunities and efficient transport for Swedish industry. As regards the transition to fossil-free shipping, the challenges are substantial, partly because the life cycle of a ship is long, which means that it will take time before the whole fleet is adapted to fossil-free fuels, and also because the expansion of fossil-free fuels for shipping takes time. As long as there is no demand, few companies will invest in alternative fuels. International agreements and policy instruments are crucial in our work.

This strategy is linked to strategies 1, 4, 13, 17 and 18.

*Responsible boards and committees: The Port of Gothenburg, the Environmental and Climate Committee and the Traffic Committee.*

### LINKED TO STRATEGY OBJECTIVES:

- 5 Carbon dioxide emissions from shipping within the Gothenburg geographical area will decrease by at least 20 percent by 2030, compared to 2012.

#### THE STRATEGY IN BRIEF:

- We will drive development towards even more energy-efficient shipping.
- We will work to bring about a transition to more climate-smart and in time completely fossil-free fuels.
- We will work to ensure that shipping maintains a high loading factor.

# CLIMATE-CONSCIOUS CONSUMPTION

Readjustment and increased climate consideration are required in both public procurement and in private consumption. A high proportion of present-day consumption does not take place to cover basic needs but to create an identity. What is termed symbolic consumption needs to be reduced. More products also need to be replaced by services and material-efficient products that last longer and which can be repaired and reused. Local activities and experiences should become more attractive in comparison to long-distance travel and increased consumption.

## THE FOLLOWING STRATEGIES CAN BE FOUND IN THIS AREA:

20. Reduce the climate impact of food in our organisation.
21. Reduce our purchases of resource-intensive goods.
22. Prevent waste and promote recycling.
23. Promote sustainable activities.
24. Promote alternatives to air travel.



## 20 Reduce the climate impact of food in our organisation

Production of food is resource-intensive. The City of Gothenburg consumes large volumes of food within its schools and care and welfare facilities, in conjunction with events, seminars and conferences and in public cafeterias and restaurants. We should promote a diet that results in lower emissions of greenhouse gases and reduce food waste in order to improve resource management and mitigate climate impact.

This strategy means that we will reduce consumption of food that has a major impact on climate. Beef and dairy products have the highest climate impact although pork, poultry and fish also have a significant impact. These foods are replaced mainly by vegetable products. We should also reduce food waste in our organisation and not throw away food that is still edible. Another important aspect is that we should drink tap water instead of bottled water.

This strategy can be implemented by creating awareness, involvement and collaboration. We must support and encourage fora for collaboration and an exchange of knowledge between catering staff, operational staff, buyers and other parties. It is also important to have an open dialogue between catering staff and other staff and with restaurant guests and their relatives about why food waste and consumption of beef and dairy products needs to be reduced. Catering staff should be trained in vegetarian cooking and we should gradually change the menus to include a reduced proportion of meals based on meat and dairy products. Schools need to be involved more in food issues and work with climate-smart food and reduced food waste as part of the teaching as well as 'pedagogical meals'. Stress in conjunction with lunch leads to greater waste and we therefore need to investigate the introduction of timetabled lunches and create calm, relaxing school dining room environments. Even during our events and meetings we should show good example and choose foods with a low climate impact. The task of reducing the climate impact of food should be long term and be pursued on a continuous basis. We must draw up routines and guidelines and introduce measures aimed at creating an understanding of the work involved and to facilitate its implementation. The work that is currently taking place with 'environmental meals' within the City of Gothenburg is a sign that this strategy is succeeding. An environmental meal is based on environmentally labelled ingredients, is seasonally adapted, consists of a large proportion of vegetables and leguminous plants and takes account of ethical aspects. Just as important as making the correct choice of ingredients is avoiding unnecessary disposal of edible food.

This strategy contributes to ecological sustainability in the fact that climate impact falls if consumption of meat and dairy products and food waste are reduced. Reducing food waste entails cost savings on the operational level and depending on what replaces the meat it could also lead to financial savings. It is positive from a public health point of view to reduce meat consumption to the benefit of increased consumption of fruit and vegetables. Reduced stress in conjunction with school lunch is important from a child's perspective and also contributes to social sustainability. Changing attitudes to food among staff, restaurant and cafeteria guests and relatives is a challenge. A further difficulty is that food is often regarded as an issue that only affects the catering organisation and there is often a lack of time for interaction between different personnel groups.

This strategy is linked to strategies 1, 2, 3, 13 and 22.

### LINKED TO STRATEGY OBJECTIVES:

- 7 By 2030 the climate impact of food consumed in the City of Gothenburg will be reduced by 40 percent compared to 2010.
- 9 The volume of household waste per person in Gothenburg will be reduced by at least 30 percent by 2030, compared to 2010.

### THE STRATEGY IN BRIEF:

- We will create fora and platforms for collaboration and an exchange of knowledge about food issues and the climate impact of food.
- We will change the menus to include a lower proportion of meals based on meat and dairy products.
- We will train catering staff in vegetarian cooking.
- We will create less stressful dining room environments and work in the long term to reduce food waste.
- In conjunction with our events and meetings we should choose food that has a low climate impact.

*Responsible boards and committees:  
All City of Gothenburg boards and committees.*

## 21 Reduce our purchases of resource-intensive goods

We must reduce the City of Gothenburg's purchase of resource-intensive goods and choose resource-efficient alternatives in order to mitigate our climate impact. This involves both goods that are resource-intensive at the production stage, such as products made of plastic and metal, and goods that are resource-intensive at the operational stage, such as ineffective white goods and electronic equipment.

This strategy means that when purchasing, we reject resource-intensive goods in favour of better alternatives. The potential for recycling, shared use and repair should be improved in order to reduce the volume of waste.

This strategy can be implemented by increasing our knowledge of the goods that we purchase. We will investigate which goods have the greatest climate impact from a life cycle perspective and replace them with good alternatives. The range of resource-intensive products in the purchasing system must be reduced and climate-adapted and resource-efficient products should be highlighted, thus making it simpler to choose them. Within goods categories where there is no less resource-intensive alternative, we must minimise use as far as possible. We must review our needs and the volumes we consume to avoid purchasing more products than necessary and we must improve efficiency when using the products that we already have.

This strategy contributes to the ecological, economic and social sustainability perspectives. The ecologically perspective is affected in such a way that the investments that are being made today could generate long-term benefits in the future. By purchasing energy-efficient goods and services, we reduce our energy use and thus also energy costs. When choosing goods that are resource-efficient, savings of net natural resources at local and global level can be made. Reduced use of energy and resources also produces positive health effects due to lower emissions into the immediate environment. One of the greatest difficulties behind implementing the strategy will be to change the mindset and behaviour of orderers to ensure that the most energy- and resource-efficient products and services are chosen when making purchases and that climate demands can be made in conjunction with procurement.

This strategy is linked to strategies 1, 7, 8, 18 and 22.

*Responsible boards and committees: All City of Gothenburg boards and committees.*

### LINKED TO STRATEGY OBJECTIVES:

- 2 By 2030, the total use of primary energy for electricity and heat does not exceed 31 MWh per inhabitant.
- 8 The climate impact from our purchase of goods and materials should decrease. A target for 2030 will be set before 2018.
- 9 The volume of household waste per person in Gothenburg will be reduced by at least 30 percent by 2030, compared to 2010.

#### THE STRATEGY IN BRIEF:

- We must investigate which goods are most resource-intensive and have the greatest impact on climate.
- We must review our needs and the volumes we consume.
- In the purchasing system we must make it easy to find products that have a low climate impact.
- We must improve the potential for shared use, reuse and repair.

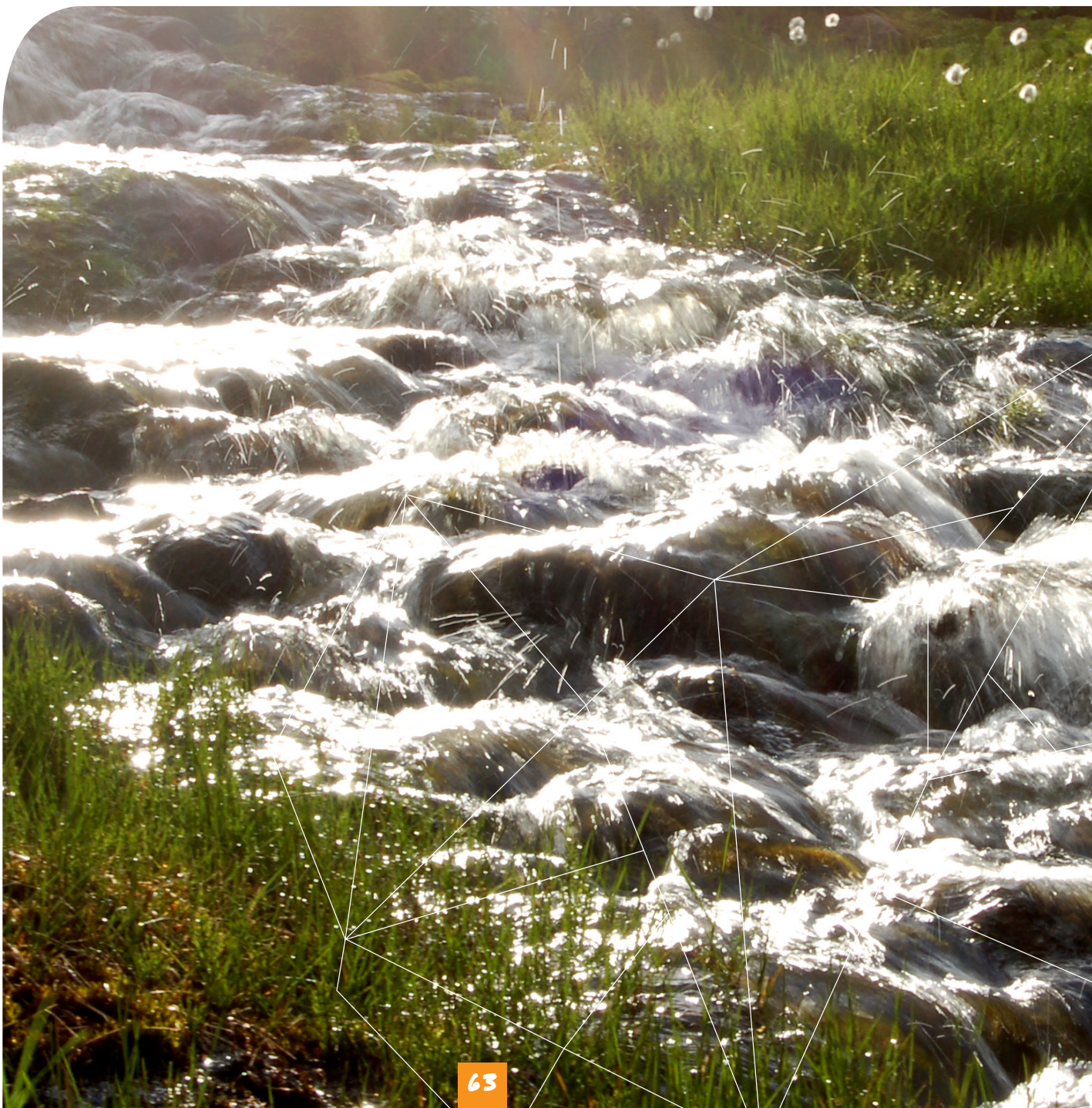


Photo: Peter Krahl

## 22 Prevent waste and promote recycling

The greatest climate impact in a product's life cycle often occurs in the manufacturing phase as a result of energy-intensive extraction of raw materials and production processes. Preventing waste by avoiding consumption of new products therefore generates considerable climate benefits. Reuse of products leads to lower climate impact compared to recycling their constituent materials. In climate terms, recycling of materials is better than incinerating the waste, which is in turn a better climate alternative to sending waste for landfill. This prioritisation, what is termed Lansink's Ladder, will govern our decisions in such a way that we can reduce consumption-related climate impact.

The strategy means that we must work to break the continuous rise in the consumption of new products. This needs to take place by purchasing fewer products and by the products lasting longer, being more material-efficient and being capable of being repaired, recycled or reused. We will work to ensure that consumption is to a greater extent moved from the consumption of goods to services, such as purchasing upgraded IT capacity instead of a new computer. What and how much is purchased is governed ultimately by price and financial resources but is also affected by cultural trends and advertising messages. We should work to bring about policy instruments that reduce excessive consumption of goods and ensure that prices are equivalent to the cost of the goods in climate terms.

This strategy can be implemented by increasing the potential for handing in items for reuse and materials for recycling and by promoting joint ownership and use of products. This requires collection points close to residential buildings, more ecoparks, the opportunity to hand in items for reuse without having to use a car and promoting the second-hand market by making premises available and providing information and support for commercial development. In the urban planning process, we should provide scope for sharing, reuse and recycling. In procurement we should demand material-efficient, sustainable, repairable products and focus more on function. We should develop environmental monitoring so that we can to a greater extent demand that companies prevent waste. Within the City of Gothenburg we will work systematically to prevent waste by, for example, producing new routines and using our website for product reuse. We must cooperate with the retail industry to reduce packaging waste and food waste. We must also promote research and development in the prevention and recycling of waste.

This strategy will contribute to socially sustainable development through the creation of new jobs that involve repairing products, through work at ecoparks and other similar activities. From a financial point of view, it could mean costs are incurred for replacing collection systems, new ecoparks and the provision of information and education. It could entail a fall in revenue from waste incineration but also reduced purchasing and waste management costs. This strategy entails reduced extraction of raw materials from nature, which is positive from an ecological point of view.

This strategy is linked to strategies 1, 2, 3, 13, 20, 21 and 23.

*Responsible boards and committees: All City of Gothenburg boards and committees in collaboration with the Gothenburg Region Association of Local Authorities.*

### LINKED TO STRATEGY OBJECTIVES:

- 7 By 2030 the climate impact of food consumed in the City of Gothenburg will be reduced by 40 percent compared to 2010.
- 8 The climate impact from our purchase of goods and materials should decrease. A target for 2030 will be set before 2018.
- 9 The volume of household waste per person in Gothenburg will be reduced by at least 30 percent by 2030, compared to 2010.

#### THE STRATEGY IN BRIEF:

- We will work to bring about reduced, sustainable consumption of goods.
- We will make it easier to reuse and recycle goods and materials.
- We will work in-house to prevent waste.



## 23 Promote sustainable activities

We must promote alternatives to overconsumption of resource-intensive goods and services in the community. The hope is that we can counteract rising overconsumption by promoting sustainable activities.

This strategy means that we support existing activities and develop new activities that are sustainable and which the people of Gothenburg consider to be meaningful and of interest. These activities include sports, cultural activities and involvement in different associations. Examples are associations that promote the joint use of goods, maintenance and/or creative workshops and urban cultivation. It is important that we cooperate with researchers in order to develop knowledge in this field.

This strategy can be implemented by developing our existing support for associations and projects and directing our efforts at more categories of associations that work with sustainable activities. The school system can continue to develop its role as a bridge between educating, stimulating interest in activities and encouraging students to develop leisure interests. This can take place by the school teaching how to organise associations and associations becoming involved in education. The school can also provide access to premises, equipment and other support during breaks and after school.

The municipal housing companies have the opportunity to expand the influence and involvement of residents in the development of the housing areas, such as urban cultivation projects, the Klimp project Ecological District Majorna and Solhusen in Gårdsten. We should continue to develop and spread job opportunities to more companies. We can also investigate how we can allow the people of Gothenburg to be involved in more activities that support and develop municipal operations. In this context it is important that issues regarding organisation, responsibility, justice and long-term sustainability are investigated fully.

We can develop marketing, coordinate communication initiatives and gather information in a way that it will be easier for the people of Gothenburg to find and discover climate-smart activities. It is important that we work to lower thresholds for participation. We should in different ways encourage the potential for more spontaneous and temporary participation so that the people of Gothenburg have the opportunity to test different activities. In our planning work, we can create structural prerequisites for sustainable activities. It is particularly important to ensure premises are available and that they are accessible to a large number of people.

This strategy contributes to reducing activities that constitute a climate load and promote social sustainability and equality.

This strategy is linked to strategies 1, 2, 3, 22 and 24.

*Responsible boards and committees: The Planning and Building Committee, the Property Management Committee, The Framtiden Group, the Sports and Associations Committee, the Consumer Policy and Citizen Service Committee, the Cultural Affairs Committee, the Parks and Landscape Committee, the Committee for Allocation of Social Welfare, the City District Committees and the Education Committee.*

### LINKED TO STRATEGY OBJECTIVES:

- 6 The climate impact of citizen's air travel will be reduced by at least 20 percent by 2030, compared to 2012.
- 9 The volume of household waste per person in Gothenburg will be reduced by at least 30 percent by 2030, compared to 2010.

#### THE STRATEGY IN BRIEF:

- We will develop and broaden support for sustainable activities.
- We will develop more sustainable activities and projects in which the people of Gothenburg can participate.

## 24 Promote alternatives to air travel

Air transport is currently used primarily for commodity freight, business travel and private travel. The flights, excluding commodity freight, accounts for over ten percent of the total greenhouse gas emissions for the average citizen of Gothenburg and this figure has increased over a long period. We will work to ensure that air transport does not increase, regardless of whether it is in the form of business travel, private trips or air freight.

This strategy means that we will endeavour to reduce the need for air transport, primarily within our own field of operations but also by inducing the people of Gothenburg not to increase the number of trips made by air. Our own air travel can be limited by using alternatives to flying, such as other modes of transport and the use of video-conferences and other technology to reduce the need for travel. Our own work on reducing the number of air trips can also inspire others to change their behaviour and opt for modes of travel other than air. Gothenburg and the surrounding area is also one of the most popular tourist destinations in Sweden and more information to the people of Gothenburg about what their city has to offer could result in more people choosing to holiday at home. To reduce commodity freight it requires increased knowledge about which products are currently transported by air and can be replaced with alternatives.

This strategy can be implemented by continuing to develop and investigate financial means of control, such as climate compensation and differentiated landing charges. All public administrations and companies should already have travel policies and through clear control in conjunction with the follow-up of these policies, air travel within our own operating area can be reduced. To encourage the people of Gothenburg to travel less, we ought to work with information about the possibilities that exist in Gothenburg to relax and experience different things. Gothenburg is a tourist and event city and through marketing we can highlight modes of transport such as rail or bus. We must also work actively to bring about infrastructural investment, such as express trains, to facilitate rapid, sustainable long-distance transport. In our procurement we may identify air-intensive goods, and try to replace them with other products.

At the present time the airlines do not pay an equitable price equivalent to the greenhouse gases they generate. To ensure that the climate objectives are achieved, it is presupposed that air travel is included in the climate policy. In the networks and fora that we are involved in, we must highlight the need for means of control. Together with researchers we must produce material aimed at increasing knowledge about our potential to influence air travel. The climate impact of air travel is considerable and to achieve a sustainable level of emissions, a change in flying habits is needed alongside continued technical development.

This strategy leads to reduced greenhouse gas emissions by decreasing air travel, both within our own field of operations and by the people of Gothenburg. The greatest challenge in the implementation of this strategy is to change present-day travel habits and behaviour.

This strategy is linked to strategies 1, 2 and 23.

*Responsible boards and committees: All City of Gothenburg boards and committees.*

### LINKED TO STRATEGY OBJECTIVES:

- 6 The climate impact of citizen's air travel will be reduced by at least 20 percent by 2030, compared to 2010.
- 8 The climate impact from our purchase of goods and materials should decrease. A target for 2030 will be set before 2018.

#### THE STRATEGY IN BRIEF:

- We will reduce our own level of air travel by making use of alternative means of travel and travel-free meetings.
- We will continue to work with financial means of control, such as climate compensation.
- We will work to bring about infrastructural investment that facilitates rapid, sustainable long-distance transport.
- We will encourage the people of Gothenburg to holiday at home.
- We will act as a driving force behind technical development in the air sector.



Photo: Peter Krahl

# WILL WE ACHIEVE OUR CLIMATE GOAL?

The Climate Programme strategies indicate how we can assume responsibility and the choices we need to make along the road to achieving the intermediate environmental objectives for 2035 and to achieve the final goal by 2050. Based on our strategy objectives and assumptions in the Climate Programme, we estimate that we will come down to a consumption-based emission level of approximately 5.6 tonnes per Gothenburg inhabitant by 2035. This is just over two tonnes above the intermediate objective of 3.5 tonnes, although we have only taken into account emission reductions that we can calculate. Many emission reductions are subject to greater societal change and changes in lifestyle. Strategies related to knowledge, inspiration and information are of major importance but are unfortunately not quantifiable.

In order to achieve our objective, we are dependent on other parties, external events, the development of the economy and national and international legislation and means of control. Society in general needs functioning policy instruments that will effectively lead to measures that will result in us meeting the objectives.

To acquire an understanding of the time aspect, we can look back in time. We have 36 years remaining before 2050 and 36 years ago it was 1978. This was the time when the skateboard became popular in Sweden, there was a worldwide oil crisis, Abba was one of the biggest pop groups in the world and the first PCs came onto the market. Since then we have acquired the Internet, DVD, MP3, smart phones and powerful computers. The Soviet Union has disappeared

and we have seen the reunification of Germany. For some people 1978 was a long time ago whilst others can remember that time very clearly. This is also the case with 2050. It may feel like a long time off and a great deal will happen before then but when we are there many people who will look back on 2014 and think about how quickly the years have passed.

The path that we need to take to achieve our objective will be demanding but necessary. It will require courage, commitment and action by all of us at the City of Gothenburg authority and by organisations, industry and the people of Gothenburg. It is our responsibility to take action and ensure that our legacy to the next generation will be the result of decisions that we can be proud of.

# CHALLENGES ALONG THE WAY

Challenges that emerge as part of climate adjustment are in the majority of cases not of a technical nature but can be found in the way we assess investment costs and benefits. Investment costs for preventive climate measures need to be weighed up against the cost of the consequences of climate change.

A clear political agenda will be required that puts an equitable price on greenhouse gas emissions in order to justify climate-smart actions and decisions, not only for us within the City of Gothenburg

but also for industry and the individual inhabitants of Gothenburg. This is a process that requires political commitment and time is of the essence.

We need to work to bring about the introduction of new financial means of control at national level, to ensure legislation is developed and to pursue climate adjustment.

Gothenburg is the hub in a growth region. An increase in the population will require a new infrastructure, more jobs, more

homes and efficient transport. Combining the city as it is today with new structures and at the same time reducing the city's climate impact is an enormous challenge that we need to address immediately.

The consequences of the implementation of the Climate Programme are set out in Annex 4 Impact Analysis of the Climate Programme.




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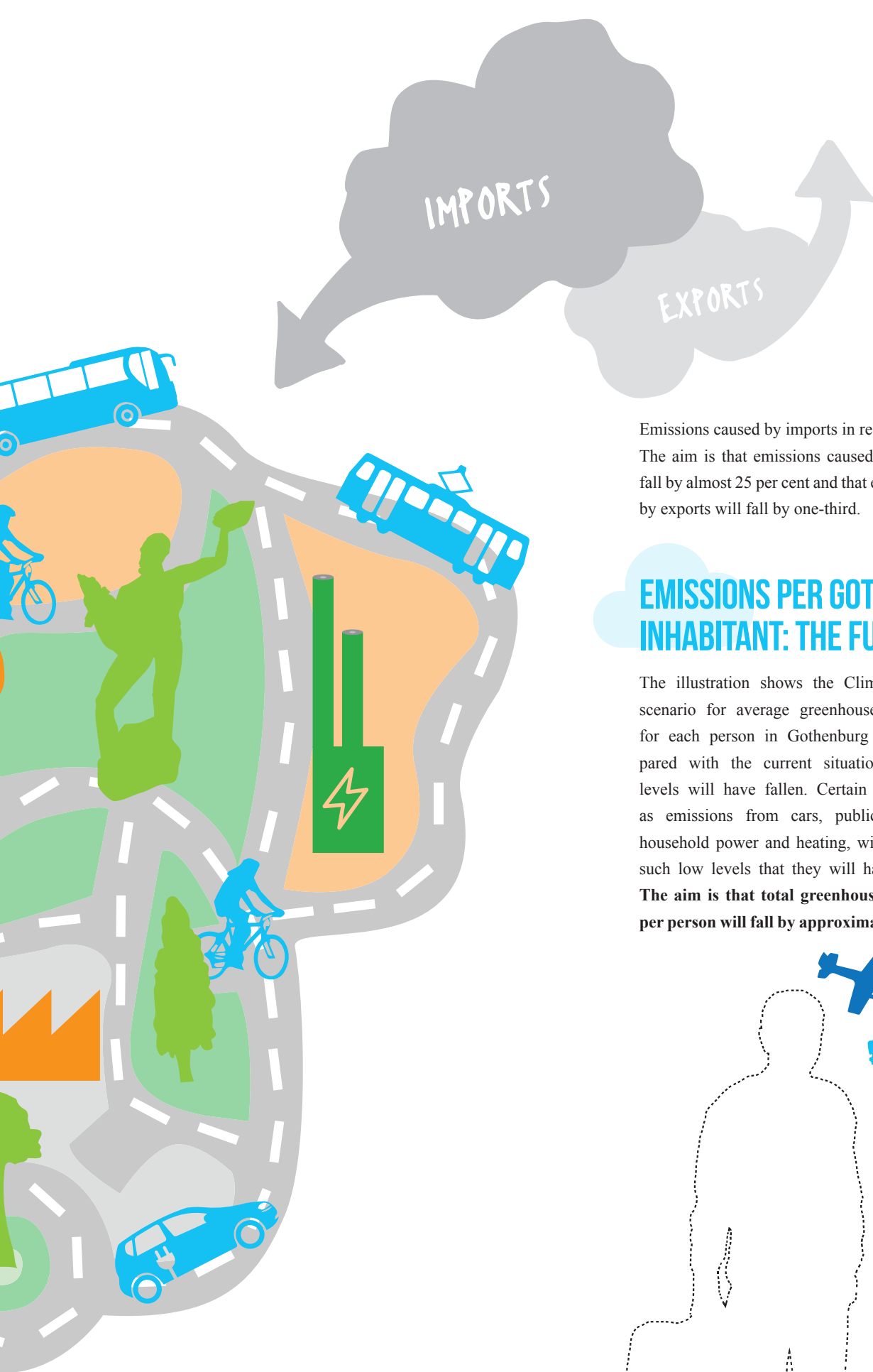
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# EMISSIONS IN GOTHENBURG: THE FUTURE

This is a scenario for the volume of greenhouse gas emissions in Gothenburg in 2050. Emission clouds are colour-coded and show Gothenburg's largest emission sources and their relative sizes.

-  **Transport:** Road traffic, shipping and machinery
-  **Energy** (proportion of fossil fuel in heating and power production): Waste incineration, the Rya Combined Power and Heating Plant, heating of single-family dwellings and other energy use
-  **Industry:** Refineries, other industry

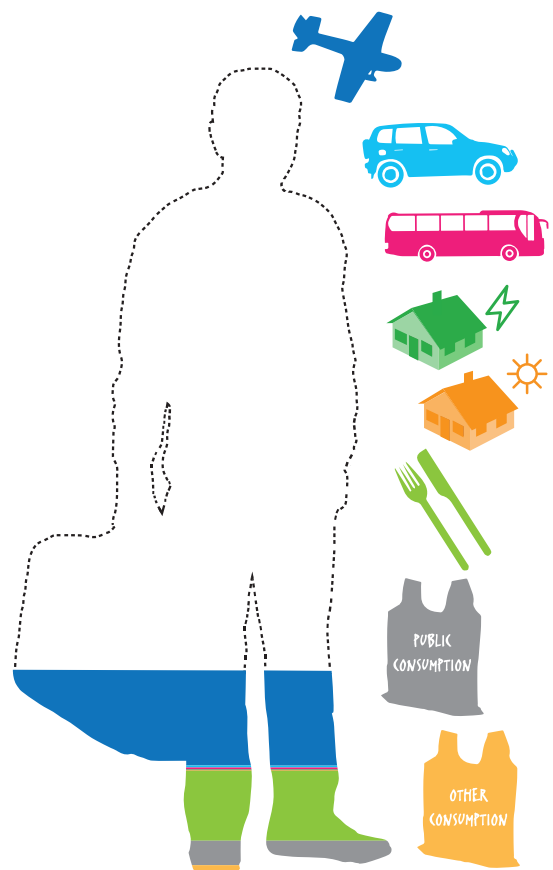




Emissions caused by imports in relation to exports. The aim is that emissions caused by imports will fall by almost 25 per cent and that emissions caused by exports will fall by one-third.

## EMISSIONS PER GOTHENBURG INHABITANT: THE FUTURE

The illustration shows the Climate Programme scenario for average greenhouse gas emissions for each person in Gothenburg in 2050. Compared with the current situation, all emission levels will have fallen. Certain emissions, such as emissions from cars, public transport and household power and heating, will have fallen to such low levels that they will hardly be visible. **The aim is that total greenhouse gas emissions per person will fall by approximately 75 percent.**



If you would like to know more about emissions by the people of Gothenburg and what the different categories cover, you will find this in the background report Low Carbon Gothenburg – Technical Potentials and Lifestyle Changes, Mistra Urban Futures Reports 2013:5. Pages 16–17 contain an illustration of current greenhouse gas emissions in Gothenburg.

# WHAT WILL HAPPEN IF WE FAIL TO ACT?

If we continue as we are doing, we will never achieve our climate objectives. The total greenhouse gas emissions from, for example, cars, ships, aircraft and unsustainable consumption will increase here and in many other parts of the world. We will probably experience conflicts related to access to fossil fuels, drinking water and other natural resources. It is predicted that climate change will lead to

large-scale population movements from places where, for different reasons, it is no longer possible to live. These reasons could include more serious drought conditions in already hot places and a rise in the sea level that will result in certain low-lying land areas being submerged.

In Gothenburg, we are well-positioned to reverse the trend and we have a great

deal to gain from having the courage and conviction to lead the way.

We do not need to worry that climate change will result in a reduction in living standards and quality of life. Research shows that there is no general conflict of objectives between a lifestyle with low emissions and a high level of well-being.



Photo: Klas Eriksson



# ALTERNATIVE APPROACHES

Apart from reducing greenhouse gas emissions, we can also store greenhouse gases in natural and artificial carbon sinks.

A natural carbon sink absorbs and stores carbon dioxide by taking carbon from the atmosphere and using it in conjunction with the build-up of biomass, such as plankton and trees. The main carbon sinks are oceans and growing vegetation. At present it is unclear what natural potential exists in the Gothenburg geographical area and the potential for using local carbon sinks requires further investigation. Natural carbon sinks will in the long term probably function as a complement to the Climate Programme if we are to achieve our emission objectives although at the present time we have chosen not to include them. The actions for arable landscapes and wetlands that are included in the Environmental Programme will also to a certain extent have a positive impact as carbon sinks.

In Gothenburg, around half of the metropolitan area is covered by forest, of which half is owned by the City of Gothenburg. The utilisation trend for municipal-owned forest is to focus on

the forest's environmental values, such as nature and cultural conservation and recreation. This means that deforestation will probably be unusual in municipal-owned forests, which offers potential for increased natural storage of carbon in the ground and trees. The forests in Gothenburg are relatively young with a low proportion of dead wood, which means that the future potential for carbon storage ought to be greater than is the case at present. In Gothenburg there are also planted trees, parks and other green areas, which to a varying degree bind carbon dioxide. Here there is potential to act as a carbon sink through the planting of new trees and the creation of new parks and other green areas.

Artificial carbon sequestration takes different forms. It could, for example, involve separating carbon dioxide from emissions deriving from large-scale production facilities and stored under high pressure – in mines or on the ocean bed for example. Artificial carbon sequestration of this nature is the subject of considerable debate due to the potential risks and the high cost involved. Another type of carbon sink can be created through biochar. In order to grow, plants

take carbon dioxide from the air through photosynthesis. By pyrolysing the plants, they can be converted into char, which is then sequestered in the ground. Biochar, apart from being a carbon sink, is also a soil improvement agent. It is not probable that artificial separation and storage of carbon dioxide will be used in Gothenburg in the near future although we will continue to actively monitor this and follow developments in collaboration with researchers in this field.

The EU has a trading system for emission rights, the aim of which is to reduce the emission of greenhouse gases. A number of operating areas within the City of Gothenburg that generate the highest emissions are part of this trading system.

# IMPACT ASSESSMENT

During the Climate Programme consultation period, a general and qualitative impact assessment was made of the consultation edition of the Climate Programme. The assessment was based on the assumption that the nine strategy objectives would be met by 2030 and it was conducted from a sustainability point of view. The assessment deals with the potential of each objective to contribute positively or negatively to the emission of greenhouse gases and the positive or negative consequences each objective could entail in economic, environmental, social or cultural terms for the City of Gothenburg or for the Gothenburg community in general.

The assessment shows that all objectives contribute positively to reducing Gothenburg's climate impact. Other positive environmental consequences are an improved noise environment and several possible positive consequences outside Gothenburg that can be attributed to stricter procurement

requirements for food, materials and goods and the reduced incidence of waste, as well as energy efficiency and energy savings. The strategies that lead to better air quality, reduced noise and healthier food offer benefits even if the greenhouse gas effect is not decelerated globally.

Investment-intensive objectives require sustainability and long-term thinking when the strategies are implemented. The initial major investments generate more benefit over time, which will result in positive consequences by 2050 and beyond. It is important that we increase our knowledge of the long-term financial consequences of the investments embodied in the Climate Programme in order to be in a better position to justify future investment decisions.

Several strategies will entail readjustments that will result in a large proportion of the people of Gothenburg being affected in their daily lives and their

habits, both at work and privately. Such extensive changes in behaviour have been consistently deemed negative as they are almost always problematic and it takes time for us as people to change our habits. Habits are a source of security and make our lives predictable. Changing them is often perceived as negative, regardless of whether the results following the readjustment period are positive. The negative consequence is only transient, assuming that there is a realistic possibility of changing behaviour and lifestyle. Sustainability and long-term thinking are required in order to bring about changes.

The entire impact assessment can be found in Annex 4 Impact Assessment of the Climate Programme.

# ENERGY PLAN

# ENERGY PLAN

## — A SECURE AND SAFE ENERGY SUPPLY

According to the Municipal Energy Resource Planning Act, every Swedish municipal authority must have a current energy plan covering the supply, distribution and use of energy. It must also include an impact assessment that shows how the environment, health and resource management are affected when the plan is implemented.<sup>7</sup> The Climate Programme includes the Gothenburg Energy Plan.

The Energy Plan comprises the strategies and objectives that lead to a sustainable energy supply and a description of the work that is currently taking place to ensure energy supply and distribution that are secure in the long term.

### Energy management

The City of Gothenburg is a key player in Gothenburg with regard to energy management. We have control over our properties and the potential to exert an influence through the operations, energy and climate advice provision and supervisory duties of Göteborg Energi.

The Climate Programme includes several objectives and strategies that are aimed at energy management. The use of electricity and heating will be reduced and fossil energy sources will be replaced with renewable solutions. By doing so, Gothenburg will assure access to energy and will become independent of fossil fuels and their negative climate impact.

### THE FOLLOWING OBJECTIVES ARE LINKED TO THE ENERGY PLAN:

- 1 By 2030, all district heating derives from renewable energy sources, waste incineration and residual heat from industry.
- 2 By 2030, Gothenburg's total annual use of primary energy for power and heat will be a maximum of 31 MWh, divided per inhabitant.
- 3 By 2030, the City of Gothenburg will produce at least 500 GWh of renewable electricity and 1200 GWh of biogas.
- 9 The volume of household waste per person in Gothenburg will decrease by at least 30 percent by 2030, compared to 2010.



## Collaboration with another municipal authority or key stakeholder

Göteborg Energi is a significant player on the local energy market. The company collaborates with various companies in district heating production and distribution, including Renova with regard to waste incineration, with the refineries, which contribute residual heat, and with Gryaab with regard to biogas production and heat from sewage water. It also collaborates with Ale, Partille, Mölndal and Kungälv municipal authorities, which are connected to the district heating grid.

## Secure, safe energy

We have worked systematically for many years to provide people and companies in Gothenburg with secure, safe access to energy, both in the short term and the long term. Our work takes place mainly through Göteborg Energi, which supplies electricity, district heating, cooling and gas in the municipal area. Security work covers both production and distribution and takes place in close collaboration with key energy bodies, such as Svenska Kraftnät, and larger customers and suppliers. We have invested in large-scale local production of electricity at the Rya Combined Power and Heat Plant. We have also invested in biogas, primarily within the GoBiGas

project, and from the sewage plant. Both investments contribute to a secure, safe energy supply.

Work in the short term is directed at minimising disruptions for customers and ensuring energy supplies at advantageous prices. From a holistic perspective, it is important that Gothenburg adapts to and has contingency plans in place for future changes in energy prices, energy taxes and environmental demands.

The expansion and densification of settlement in Gothenburg and future changes in local energy production will present technical challenges and will require, for example, adaptation of the electricity grid.

The City Executive Board is responsible for ensuring a secure, safe energy supply. Göteborg Energi carries out the majority of the work with support in certain practical areas from other bodies, including the Planning and Building Committee.

The City of Gothenburg has a crisis organisation in place for which the Municipal Executive Board is responsible and where Göteborg Energi is a member. Göteborg Energi also has its own crisis organisation, which is alerted in the event of major disruptions and covers all parts of Göteborg Energi.

## THE FOLLOWING OBJECTIVES ARE INCLUDED IN THE ENERGY PLAN:

- 1 Plan for an energy- and transport-efficient society
- 5 Contribute to climate-smart regional expansion
- 6 Increase resource efficiency and district heating
- 7 Improve energy efficiency in Gothenburg's municipal property holdings
- 8 Improve energy efficiency in Gothenburg's private property holdings
- 9 Promote energy efficiency in industry
- 10 Continue to invest in district cooling
- 11 Further develop large-scale production of renewable electricity
- 12 Promote and facilitate small-scale production of renewable electricity
- 13 Lead biogas development

## Electricity

The municipal area of Gothenburg is now linked to the regional electricity grid through six input points, which offers redundancy\* in the event of one or more of the input points becoming non-operational. The general 10 kV grid has an input loop\*, which means that generally there is an alternative supply, offering further stability. The Göteborg Energi electricity grid is currently made up of more than 20 large transformer stations and approximately 15,000 grid stations. The local electricity grid comprises 6,500 kilometres of power lines. Göteborg Energi owns the electricity distribution system throughout the whole of Gothenburg apart from in the archipelago and in Askim, where the distribution system is owned by Fortum.

Since the 1990s, Göteborg Energi has had a long-term project aimed at halving the time for operating disruptions in the electricity grid. This project is still in progress and the disruption time is now down to approximately 80 minutes per customer, which is among the lowest figures in the country. Historically, the project has mainly meant the laying of electricity cables underground, remote control and the raising the level of electricity stations to meet the City of Gothenburg planning standard for the rise in the water level of 2.8 metres and 3.8 metres for key community facilities. Göteborg Energi has also increased

remote monitoring of electricity grid stations in order to take action more rapidly.

Apart from the development of the electricity grid, the addition of the Rya Combined Power and Heating Plant has offered the opportunity to restart the electricity grid when there has been a disruption and to operate parts of the electricity grid in Gothenburg even if there is a disruption in the regional and/or national grid. By using the Rya plant in condensation operation\* to restart in the event of a possible loss of the entire electricity grid, the Svenska Kraftnät facility on Hisingen can then start, followed by waste incineration. The input can subsequently be controlled on the 10kV level and the functions that are more sensitive for the community are connected. By maintaining control on the 10 kV level it is possible to maintain relatively detailed control, which means that local electricity production is sufficient to serve a large number of key community functions. Electricity grid staff conduct regular exercises together with the district heating staff in order to handle major disruptions in the electricity grid as they affect the distribution of district heating. The training exercises are conducted in the first instance using the Svenska Kraftnät training programme.

The electricity grid is well dimensioned

for connection to wind power and other local forms of power production. This type of production makes greater demands on the grid companies to supply electricity with the right features. Smaller facilities can generally be connected without reinforcement in the electricity grid. Larger facilities, such as the planned wind power system at the estuary in Gothenburg, require reinforcement of the electricity grid.

In the future, Göteborg Energi will work with:

- Continued raising of the level of the electricity grid stations.
- Physical protection of the facilities.
- Preparing for a rise in electricity use and local electricity production.
- Development projects related to smart electricity grids.

## District heating

The distribution grid for district heating in Gothenburg, Partille and Ale is relatively well distributed and extends from Älvängen in the north to Askim in the south and from Torslanda in the west to Jonsered in the east. The grid is also linked to the district heating grids in Kungälv and Mölndal.

The production system comprises the main production facilities – the combined heat and power plants at Rya and Sävenäs, the Renova waste incineration facility and the Rya sewage water heat pumps. In addition, there is residual heat supplied mainly by the refineries and a number of facilities that are used when it is extremely cold outdoors and/or if there are disruptions in one of the main production facilities. By spreading production between a number of facilities, access to the joint production system is very good. The dimensioning criterion for availability is to handle -16°C with redundancy in the production capacity for the largest facility, which at present is approximately 140 MW. In the event of acute disruptions in the distribution grid, important community functions, such as healthcare, require a disruption to last no more than 24 hours. At present, there are provisional boilers that can be delivered to meet this requirement. There is also long-term redundancy in production through flexibility in the choice of fuels if some sort of disruption were to arise in the supply of, for example, biofuel.

To avoid operational disruptions, Göteborg Energi has worked with maintenance prevention measures in both the

distribution grid and at the production facilities. Preventive maintenance has in recent years been coordinated more and more between district heating and district cooling as the systems are integrated with each other.

The relatively large volume of water in the district heating distribution grid and the fact that the buildings are from the beginning heated up means that there is a certain inherent delay before the effects of disruptions reach the customer. In other words, district heating is less sensitive to disruption than electricity, where a disruption often has immediate consequences for customers. However, in the event of a major power cut there would be problems transporting heat to the customers as many pumps in the distribution system would be at a standstill, as would the circulation pumps in the buildings. At best, certain distribution pumps could possibly be used whilst the buildings would need to rely on self-circulation, which could entail an uncertain heating situation. A particularly serious situation for heating would be a simultaneous loss of electricity and gas during the winter as then the Rya plant would need to operate using oil.

Göteborg Energi is working continuously to improve contingency protection to reduce disruptions. In the longer term, both distribution and production must be adapted to the expansion of Gothenburg and a continued high level of delivery assurance and energy efficiency for customers. A technical issue that is currently being analysed is what implica-

tions would areas with low-temperature systems, such as areas with passive buildings, have for distribution.

## District cooling

District cooling is based on the same principle as district heating. A provider supplies the properties in an area with cooling by distributing cold water in an enclosed system.

Cooling in the central grid is produced in three ways:

- Free cooling, which is extracted from cold water in the river, the Göta Älv.
- Absorption cooling, which is produced from surplus heat in the district heating system.
- Electrically produced cooling.

In the same way as district heating, district cooling is less sensitive to disruption than electricity as there are large volumes of cold water in the district cooling distribution grid and in buildings there is a certain inherent delay before possible disruptions affect the customers' buildings. However, in the event of a major power cut there would be problems transporting cooling to the customers as in such a situation several pumps in the distribution system would be at a standstill, as would the circulation pumps in the buildings.

## Natural gas

Gas used in Gothenburg during a normal year is approximately 2.3 TWh and it is dominated by the Rya Combined Power and Heating Plant, which produces electricity and heating. In total, Göteborg Energi uses almost 1.5 TWh. In addition, there is a relatively large supply of gas to industry and the transport sector amounting to 700 GWh. Smaller enterprises use approximately 80 GWh and private use (including gas ovens) accounts for 20 GWh. Supplies for a normal year are relatively stable even if a number of industrial customers have disappeared in recent years. The distribution grid in Gothenburg is owned by Göteborg Energi. It has been renewed in recent years and there are also plans to offer district heating to certain areas with gas heating. The fact that Swedegas, which is the transregional gas grid owner, has

changed its pricing structure could mean reduced profitability, resulting in a slight fall in power and heat production at the Rya plant.

Göteborg Energi, together with the Swedish Energy Authority, has recently introduced a new system for securing natural gas supplies, which was made possible by new legislation initiated by the EU. The system is based on a centralised function, which issues Early warning, Standby and Crisis alerts. With each step, different measures are taken, ranging from information to customers to – in the last step – disconnecting customers from the grid in order of priority. For gas operations, there are national rules, which mean that the gas distributor is also responsible for the customer's facilities, which are inspected at intervals

varying from three to six years. The staff undergo regular training in systematic security work. Overall, gas operations have very few technical disruptions. GobiGas will, with its production of biogas, become a crucial factor in the safe, secure supply of gas. A specific risk with gas supply is that the price can vary considerably, mostly due to political decisions or market events.

## Impact assessment

Annex 4 Impact Assessment of the Climate Programme makes an impact assessment of the Energy Plan. The strategies in the Climate Programme also contain simpler analyses of the consequences for the environment and society.



**INDEX:  
RESPONSIBLE  
BOARDS &  
COMMITTEES**

# INDEX:

## RESPONSIBLE BOARDS AND COMMITTEES

The index shows the strategies for which each committee or board is responsible. The orange section further on in the programme contains a description of the strategies. Each strategy has a number, making it easier to find it in the strategy section.

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# REGISTER: STRATEGIES

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# **GLOSSARY: TERMS\***

# GLOSSARY: CONCEPTS IN THE CLIMATE PROGRAMME

In the glossary you will find certain words and terms that require a detailed explanation.

## Public housing sector

A public housing company is a limited company in which a local authority or several local authorities have a joint controlling influence (Act 2010:879).

A public housing company manages rented properties and promotes the provision of housing in the municipal area/areas that own the company.

## Biofuel

Biofuel includes fuel that is produced from biological material, such as food residue or forest resources. Biogas, bio-oil and ethanol are examples of biofuels.

## Mixed city

A mixed city is an urban environment with a large mix of basic functions (homes, shops, offices, entertainment etc.) and different groups of people (age groups, income groups, socio-cultural groups etc.), which are not geographically separate and exist in the same buildings or on the same block.

## District cooling/district heating

With district cooling or district heating, a property is connected to a supply grid with central, large-scale production facilities, as opposed to local production of heating or cooling. It can be compared with connection to an electricity grid.

## Fossil/fossil-free/fossil-independent

Fossil materials are natural materials that have come into being during earlier periods in the Earth's history. The materials only exist in limited amounts and it

takes an extremely long time for them to form and consequently they are termed non-renewable. Examples of fossil fuels or energy sources are oil, coal and natural gas.

## Renewable (energy, fuel, electricity)

Renewable energy is energy that is being constantly renewed and will therefore not run out within the foreseeable future. The majority of renewable energy sources, such as wind, water and solar energy, originally derive from energy from the sun. Bioenergy can be regarded as stored solar energy. Fossil fuels, such as coal, oil and natural gas, are not classified as renewable as it takes a very long time for these resources to form. Nuclear power is not classified as renewable either as it is based on uranium, which is a finite resource.

## GWh

GWh is the abbreviation of gigawatt hour, which is one billion watt hours. Watt hours is a unit of measurement for energy and can be used to measure the volume of electricity, heat or cooling.

## Sustainable development

Sustainable development is defined as "development that meets our own needs without compromising the ability of future generations to meet their needs" and received international recognition in conjunction with the UN Report Our Common Future (1987). Sustainable development comprises three dimensions – economic, social and ecological sustainability.

## Non-trading sector

The non-trading sector includes operations that are not covered by the EU emission rights trading system, what is known as the EU-ETS (the EU Emissions Trading System). The non-trading sector includes transport, agriculture and real estate.

## Calculation conditions

The term 'calculation conditions' refers to the conditions that are used when calculating profitability and investment. Examples of different conditions are the cost of capital, yield requirement and depreciation period.

## Climate compensation

Climate compensation is a way of reducing emissions of greenhouse gases that you generate by purchasing emission credits. Common climate compensation methods are planting trees to create carbon sinks, purchasing emission rights through EU-ETS or investing in emission reductions, such as wind power.

## Carbon dioxide equivalents

Carbon dioxide equivalents are a joint unit of measurement for emissions of greenhouse gases (CO<sub>2</sub>e). The unit states how large the volume of carbon dioxide the emission of another greenhouse gas is equivalent to.

## Condensation mode

Condensation mode means that a power station produces only electricity and does not supply heating at the same time, e.g. to a district heating system.

## Cogeneration

Cogeneration means that a power station produces both electricity and heating at the same time. The heating that is produced can, for example, be fed into a district heating grid.

## KV

KV is an abbreviation of kilovolt, which is 1,000 volts. A volt is the unit used to measure electric current.

## KWh

KWh is the abbreviation of kilowatt-hour, which is 1,000 watt hours. Watt hours is a unit of measurement of energy and can be used to measure the volume of electricity, heat or cooling.

## Life cycle

A product's life cycle covers all the phases, from production through to use, recycling or end-of-life storage.

## Marginal electricity

Marginal electricity refers to the electric power which from a market economy point of view is at present the most expensive to produce. If electricity use falls, production of this type of electricity ceases first. In the same way, marginal electricity is the first to be replaced if a new, cheaper form of electric power is introduced into the system. In the European electricity system, of which Sweden is a member, it is nowadays mostly electricity from carbon condensation power stations that are at the margin.

## MWh

MWh is an abbreviation of megawatt-hour, which is 1 million watt hours. Watt hours are a unit of measurement of energy and can be used to measure the volume of electricity, heat or cooling.

## Primary energy/primary source

Primary energy is energy that has not been transformed into another form of energy. Primary energy comes from natural resources, such as coal, crude oil, sunlight or uranium. Primary energy can be transformed into other forms of energy, such as electricity, heat or process fuels, which are then termed secondary energy.

## Redundancy

In a system with redundancy, important technical functions occur more than once. An example of inbuilt redundancy is a computer system where the same information is stored on two or more hard drives.

## Loop input

Loop input into the electricity grid means that there is the possibility of feeding electricity into the grid from two directions. In the event of a disruption in the grid or the loss of an input point, the grid can, either wholly or in part, be supplied by energy from the other feed point.

## Peak load

The delivery by an energy system of, for example, electricity or heat can cover customer requirements. Normally, needs are covered by the base load, whilst requirements in exceptional situations are covered by the peak load. Exceptional situations arise in the event of extremely low temperatures during the winter with subsequent high heating requirements as a result.

## Residual heat

Residual heat is surplus energy that cannot be utilised by a company and the alternative is often to release the heat into the atmosphere. The heat can be bound in liquids or gases.

## TWh

TWh is an abbreviation of terawatt hour, which is one billion watt hours. Watt hours is a unit of measurement for energy and can be used to measure the volume of electricity, heat or cooling.

## Congestion charge

A congestion charge is levied on Swedish-registered vehicles that pass through a pay station. The aim of the congestion charge is to improve access, improve the environment in the central areas of the city and to fund investments in public transport, the rail network and the road network.

## Greenhouse effect

The greenhouse effect means that incoming solar radiation passes through the atmosphere and heats up the Earth's surface. The Earth's surface in turn radiates heat back, which is to a large extent impeded by the greenhouse gases in the atmosphere. As the heat is radiated back towards the Earth, the temperature on the Earth's surface is maintained at a higher and more even level compared with a planet without an atmosphere. Increased levels of greenhouse gases in the atmosphere reinforce the natural greenhouse effect and make it warmer on Earth.

## Greenhouse gases

Greenhouse gases arise in the atmosphere and contribute to the greenhouse effect. Greenhouse gases are a collective name for carbon dioxide, nitrous oxide (laughing gas), methane, fluorinated hydrocarbons, perfluorohydrocarbons and sulphur hexafluoride.



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The Environmental and Climate Committee rules stipulate responsibility for managing the city's environmental strategy processes, among other things by producing plans and strategies for the whole of the City of Gothenburg.

At the request of the Environmental and Climate Committee, the Environmental Administration has produced a Strategic Climate Programme.

