SWEDISH CLIMATE POLICY COUNCIL

Klimat politiska rådet

2019

Report of the Swedish Climate Policy Council

Foreword

The Swedish Climate Policy Council was formed on 1 January 2018 as part of Sweden's climate policy framework, which had been adopted the previous year by an overwhelming majority in the Riksdag (the Swedish Parliament).

The council was tasked with evaluating how well the Government's comprehensive policy is aligned with the climate goals established by the Parliament and the Government. The findings are to be reported annually.

This first report includes an analysis of the overall design of policies related to the climate goals. It also contains our comments on the Government's first climate report in the 2019 Budget Bill. Based on this, we present a wide range of observations and recommendations. In addition, in this report the Council has chosen to further deepen its evaluation of the impact of policy on the climate goal for domestic transport.

The Climate Policy Council has been tasked with a broad, complex remit. There are no established methods to evaluate the Government's entire set of policies towards a long-term goal. The first year's work has partly focused on developing analytical approaches and methodologies and on creating dialogue with other agencies and stakeholders. We aim to present a review that is grounded in scientific methods and has practical application for the Government and the Parliament. Building on the experience gained from the first year, the Council's work and reports will continue to evolve.

We would like to express our thanks to all the organisations, researchers, experts and practitioners who have contributed to this report by submitting written documentation and participating in seminars and dialogues.

In addition to providing recommendations to the Government and the Parliament, we hope that the report will contribute to a forward-thinking discussion between all stakeholders who are affected by Sweden's climate goals, and who are needed to achieve them.

Stockholm, March 2019

Ingrid Bonde, Chair

Johan Kuylenstierna, Vice Chair

Karin Bäckstrand

Katarina Eckerberg

Tomas Kåberger

Åsa Löfgren

Markku Rummukainen

Sverker Sörlin

2019 Report of the Swedish Climate Policy Council
Report Nr 2
ISBN 978-91-984671-2-3

Contents

theme:

Summary

Sweden's overarching climate target is to reach net-zero emissions of greenhouse gases by 2045, followed by negative emissions. This long-term target is complemented by several interim targets.

Those climate targets, the planning and monitoring system regulated under the Swedish Climate Act (2017:720), and the Swedish Climate Policy Council together form Sweden's climate policy framework. The Climate Act took effect on 1 January 2018 after being adopted by a broad majority of the Riksdag (the Swedish Parliament).

The mission of the Swedish Climate Policy Council is to determine if the government's overall design of policies is compatible with the climate targets adopted by the Parliament and the Government. The Council uses a broad approach to evaluate the comprehensive policy, aiming to assess the effect of different policies on greenhouse gas emission trends. From this broad perspective, we examine the comprehensive policy in two dimensions: **leadership and governance**, and **policy instruments**.

We define leadership and governance as policy targets, organisation and work procedures. Policy instruments include all the decisions and actions that directly affect citizens, companies and other stakeholders, including taxes, fees, regulations, public-sector consumption and investments.

PROGRESS IS TOO SLOW

Since 1990, Sweden's greenhouse gas emissions have decreased by 26%. This reduction mainly took place between 2003 and 2014. Thereafter the rate of reduction slowed, and 2017 was the third consecutive year in which emissions decreased by less than 1%. This rate is far too slow to achieve the climate targets, except for the upcoming 2020 target. The rate of reduction would need to accelerate to between 5% and 8% each year to meet future targets.

SWEDEN'S CLIMATE GOALS

The rate of emissions reduction has slowed when it needs to accelerate. Neither the overall target of net-zero emissions or the intermediate targets will be achievable without further political action.

The Swedish Climate Act states that within the framework of the budget bill, each year the Government must report climate policy decisions and actions taken during the previous year. The first climate assessment was presented to the Parliament together with the 2019 Budget Bill. It lacks assessments of how the reported climate policy decisions and actions might affect emissions. The Government recognised that additional actions are needed in several sectors, but did not state when and how decisions on these actions will be taken. The transitional government at the time said this was due to its limited mandate. This raises the stakes for the four-year Climate Action Plan that the Climate Act requires the Government to present in 2019.

CLIMATE REPORTING

The Climate Policy Council considers that the Governments's climate report only partially meets the requirements of §4 of the Climate Act

THE TRANSPORT SECTOR AND EMISSIONS TRADING SYSTEM ARE OF VITAL IMPORTANCE

To achieve the long-term target, Sweden must reach the interim targets for 2030 and 2040, which include emissions that are not a part of the EU's Emissions Trading System (EU ETS). All sectors matter, but reaching the 2030 goal depends heavily on progress in the transport sector, because domestic transport accounts for half of Sweden's current emissions. In light of this, the Climate Policy Council has chosen to more closely examine policies that affect domestic transport emissions in a thematic section in this year's report.

The sectors included in the EU ETS – large-scale industry, civil aviation and power generation – account for almost 40% of Sweden's greenhouse gas emissions. These sectors are included in the overarching target of net-zero emissions but not in the national interim targets, since the trading system is regulated at the EU level. There is currently no mechanism in place at the EU level to bring emissions covered by the trading system to net-zero in all Member States. Progress on these emissions is not in line with what is required for Sweden to reach its target of net-zero emissions.

OVERALL RECOMMENDATIONS

Transitioning society to net-zero emissions by 2045 requires fundamental, systemic changes and rapid progress throughout Swedish society. By international standards, the greenhouse gas emissions in Sweden have decreased by a relatively large amount. However, the Climate Policy Council concludes that today's policies are not sufficient to achieve the set targets.

The Climate Policy Council has made several overarching observations regarding the comprehensive policy. Based on these, we highlight six policy recommendations to the Government for achieving the climate targets.

Three concern government leadership and governance:

rec:

RECOMMENDATIONS — GOVERNMENT LEADERSHIP AND GOVERNANCE

Clarify that net-zero emissions imply zero emissions in most sectors.

Include the effects on the climate goals in all impact assessments in public inquiries and in Government bills and proposals. In addition, prior to implementing new policy instruments, monitoring and evaluation plans should be created to ensure high levels of climate benefit and cost efficiency.

Promote broad engagement and increase coordination among different initiatives. All stakeholders are needed in the transition —the business sector, labour unions, municipalities and regions, academia, government authorities and civil society.

The other three overarching recommendations involve general and cross-sectoral policy instruments. These lay the foundation for fruitful, cost-effective policies that enable stakeholders to develop the best low-emission solutions. General policy instruments sometimes need to be supplemented with more specific policy instruments, which we illustrate in the report's thematic section on domestic transport.

In terms of cross-sectoral policy instruments, the Climate Policy Council makes three recommendations to the Government:

rec:

RECOMMENDATIONS — CROSS-SECTORAL POLICY INSTRUMENTS

Phase out remaining exceptions to the carbon tax for industries outside the EU Emissions Trading System.

Work proactively within the EU to improve the trading system and simultaneously introduce cost-effective national policy instruments to reduce emissions from Swedish facilities within the system.

Introduce and adopt legislation that gives the Government the right to review the establishment of operations and businesses that may run counter to achieving the national climate targets.

TEN RECOMMENDATIONS FOR A FOSSIL-FREE TRANSPORT SECTOR

Domestic transport accounts for about one third of Sweden's total greenhouse gas emissions. Road transport represents more than 90% of the transport sector's emissions. From 2010 to 2017, emissions decreased by nearly 20%, but the rate of reduction is too slow to meet the targets. Moreover, preliminary figures from the Swedish Transport Administration indicate that emissions from domestic transport increased in 2018.

Such is the importance of the transport sector in Sweden's climate transition that it is the only area with a specific sector target. Emissions from domestic transport must decrease by at least 70% by 2030 compared with 2010 levels. However, on current trends and under existing policies, emissions are only expected to decline from today's 16 million tonnes CO_2 equivalent to 12–13 million tonnes by 2030, or about 35% compared with 2010. Achieving the 2030 target requires bringing emissions below 6 million tonnes. In order to achieve Sweden's overarching climate target, the transport sector needs to be fully fossil-free by 2045.

THE TRANSPORT SECTOR'S CLIMATE GOALS

On current trends and under existing polices, the transport sector will only achieve half the reductions needed to meet the target of at least a 70% reduction from 2010 levels by 2030. Closing that gap demands strong political actions by the current government during this mandate.

Even as the transport sector needs to sharply reduce greenhouse gas emissions in a relatively short time, it will need to address major global trends: electrification, automation, and new services and sharing solutions. These have great potential for enabling an efficient, fossil-free transport sector, but they also pose risks. For example, if they cause transport costs to decline, there could be a rebound effect, resulting in increased demand for transport services.

From a technical and an economic perspective, the 2030 target of a 70% reduction in emissions from domestic transport is achievable. It requires comprehensive actions within three areas: a more transport-efficient society, accelerated electrification, and a higher share of biofuels in more efficient vehicles. In particular, policies need to be strengthened for a more transport-efficient society and faster electrification. A higher share of biofuels will also continue to play a major role going forward.

LEADERSHIP AND GOVERNANCE FOR ACHIEVING THE CLIMATE TARGETS FOR THE TRANSPORT SECTOR

The Council finds that existing transport policy goals and their implementation conflict with the climate targets. The plans for achieving the transport sector's climate targets are unclear, both within the Government and at the agency level, and so is the division of responsibilities.

Sweden's infrastructure is being planned not around the goal of achieving the climate targets, but on forecasts of increased road traffic that are not in line with the 2030 climate target. The order of priorities for infrastructure investments – the so-called four-step principle – is not used in practice. The potential of cities to obtain more efficient transport through increased use of public transport, biking and walking is not being fully leveraged.

It is doubtful whether the transport policy goals and the Government's processes in terms of infrastructure planning comply with the requirements of §3 of the Climate Act, which state that the Government's work should be based on the long-term emissions reduction targets set by Parliament.

The Climate Policy Council presents four recommendations to the Government regarding leadership and governance within the transport sector:

rec:

RECOMMENDATIONS — DOMESTIC TRANSPORT

- Determine a scheduled action plan to achieve a fossil-free transport sector beyond the 2030 target.
- Make the transport policy targets compatible with the climate targets.
- Strengthen regulations and processes for community planning that decrease car dependence.
- Take into account diverse conditions and offset negative distributional effects, for example between urban and rural areas.

STRICTER POLICY INSTRUMENTS FOR A FOSSIL-FREE TRANSPORT SECTOR

The Council concludes that current policy instruments in the transport sector have only been partly effective. Governance towards a transport-efficient society is too weak. Private car ownership and driving are often subsidised in ways that work against the climate targets. The national policy instruments for vehicles are aimed at new car sales, with too little impact on the entire fleet. The ambitions for electrification are vague, and the policy instruments insufficient. There are effective policy instruments for the increased use of biofuels, but not enough for domestic production. In addition, there are policy instruments with other purposes that undermine the climate targets.

The Climate Policy Council presents six recommendations to the Government in regards to policy instruments within the transport sector:

rec:

RECOMMENDATIONS — DOMESTIC TRANSPORT

- Prepare a reform of road traffic taxes that takes into account increased electrification and the use of autonomous vehicles, while ensuring just treatment of all regions in Sweden.
- Stop subsidising car ownership, driving and parking.
- Strengthen the municipalities' mandates and tools to encourage fossil-free transport.
- Accelerate the electrification of road transport throughout Sweden.
- Set a date when fossil fuel sales will end in Sweden.
- Increase policy incentives to adopt more climate-efficient vehicles.

1. The global commitment

Under the Paris Agreement, reached at the United Nations Climate Change Conference in December 2015, countries pledged to act collectively to keep the global temperature increase well below 2 degrees Celsius (2°C) above pre-industrial levels. They also pledged to pursue efforts to limit warming to 1.5°C. However, these ambitions stand in stark contrast to actual greenhouse gas emission trends.

Global emissions are still growing, and so is humans' impact on the climate. As the concentration of greenhouse gases in the atmosphere increases, the climate becomes warmer, sea levels rise, ice melts, precipitation patterns change, extreme weather events become more common, and more people are affected by the impacts of climate change.[1] Even warming of 1.5°C poses significant risks to humans and the environment, and the risks grow with further global warming.[2]

If emissions continue to increase, climate change impacts will most likely become both more serious and more common. The greater the temperature increase, the higher the risk of runaway costs – both from the damage caused by climate impacts, and from the need for adaptation.[2]

By reducing emissions, eventually to net-zero, we can limit climate change and avoid the worst scenarios. The UN's evaluation[3] of the nationally determined contributions[a] under the Paris Agreement and other analyses indicate that what has been proposed by the 182 countries that have submitted plans is not enough to achieve the 2°C goal;[4,5] national plans must be further enhanced. The Paris Agreement set a five-year cycle for increasing ambition.[6]

Far-reaching efforts to drive societal changes are needed: energy and material efficiencies must be improved in all sectors, and fossil sources of energy must be phased out, replaced by more wind and solar power. Industry and transport in particular must be electrified, and the use of sustainably produced biofuels needs to increase. Demand also needs to shift from products with high fossil-fuel intensity to ones with low fossil-fuel intensity. Significant changes in behaviours and attitudes will be needed when it comes to consumption, along with completely new ways of planning and organising our societies.[2,7]

The challenges of limiting global warming to 1.5–2°C are undoubtedly extensive, but the transition also brings opportunities. Several studies[8-10] have shown that a transition to a fossil-free economy, though it involves costs, will also bring welfare gains and financial opportunities.[11]

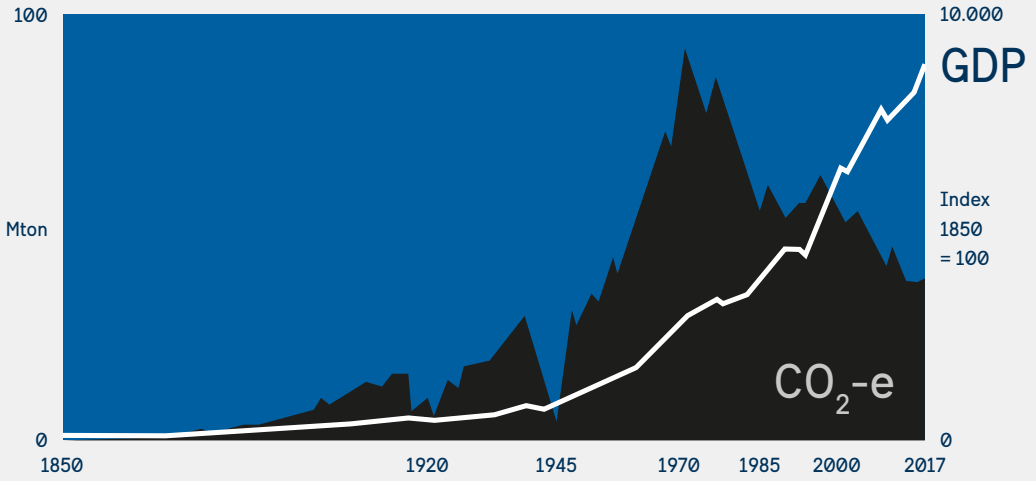
[a] The nationally determined contributions (NDCs) that have been reported to date by 182 countries (February 2019).

2. Emission trends in Sweden

This chapter discusses emission trends in Sweden in the early 1900s, how these trends were reversed in the 1970s, and the factors that affected them. One important observation is that external factors beyond Sweden's control, such as oil crises, have played a crucial role in the development of Sweden's energy systems and the resulting climate impact.[12-18]

In the mid-19th century, Sweden was one of the poorest countries in Europe, and economic growth was modest. Low-intensity farming dominated the economy, and urbanisation had not yet taken off. That changed at the end of the 19th century, as rapid productivity growth and expansion of increasingly energy-intensive basic industries boosted the economy. Fundamental to this growth was an escalating use of new technologies and fossil fuels: first coal, then increasingly oil over the first half of the 20th century. With the emergence of industrialised society, greenhouse gas emissions increased rapidly (except during the two world wars), as shown in Figure 1. The increase in emissions was particularly significant after the end of the Second World War in 1945.

FIGURE 1 – TERRITORIAL CARBON DIOXIDE EMISSIONS IN SWEDEN FROM FOSSIL FUEL COMBUSTION (MILLION TONNES) AND INDEXED GDP DEVELOPMENT (INDEX 1850 = 100), 1850–2017.



Source: IEA, WRI and Bolt, et al.

OIL CRISIS AND ENERGY POLICIES BREAK THE TREND

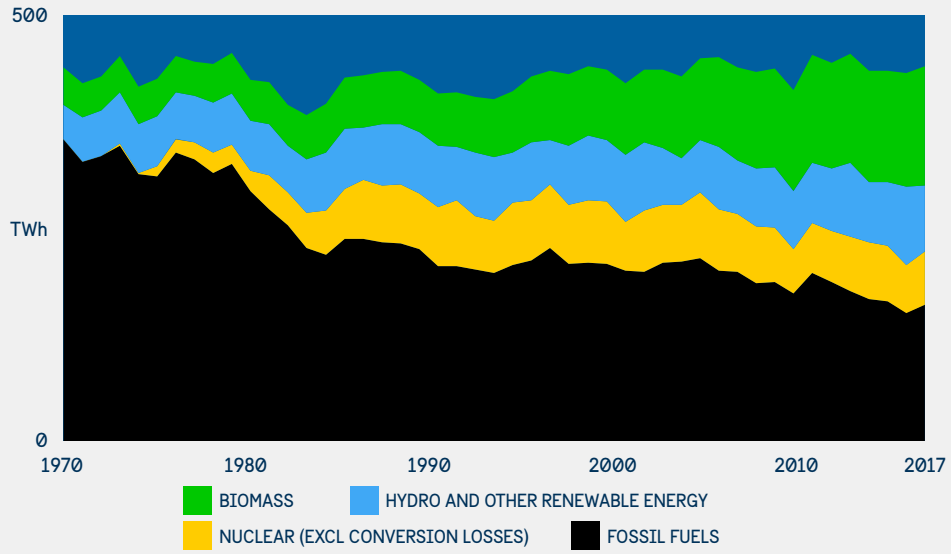
In 1973–1974, global oil prices tripled as a result of joint actions taken by members of the Organization of the Petroleum Exporting Countries (OPEC). This caused a global oil crisis that also had a major impact on Sweden. At the time, three-quarters of Sweden's energy supply came from oil products, so the consequences were felt across large parts of the economy.

To handle the situation, the Government carried out extensive campaigns to encourage the public to reduce energy consumption. Because of the acute situation, temporary rationing legislation and energy-saving provisions for government agencies were also introduced. Demand fell by around 15% through the combination of rising prices and public savings measures.

From 1975 to 1985, oil's share of the energy supply fell from just under 70% to below 40%. During the same period, the energy input from nuclear power increased from close to zero to around 15%. This rapid shift was made possible by previous energy and security policy decisions to develop nuclear power, which in turn were a response to increased demand for electricity and requirements for energy self-sufficiency. The shift is reflected in Figure 2.

The expansion of district heating systems (mainly municipally owned) that took off during the 1970s also contributed to increasing energy efficiency and the use of biofuels. These shifts, combined with the impact of the economic crisis, which reduced energy demand, made CO_2 emissions fall rapidly, by a total of nearly 40% between 1976 and 1983.

FIGURE 2 – ENERGY SUPPLY FROM DIFFERENT ENERGY CARRIERS IN SWEDEN (TWH), 1970–2017.



Source: Swedish Energy Agency.

Another fundamental reason for the decline in emissions is that the growth in energy use slowed sharply from the mid-1970s due to structural changes in the Swedish economy, from the dominance of energy-intensive basic industries to a greater presence of knowledge-based industries with lower energy intensity.[12] Housing construction and infrastructure expansion also slowed. A similar trend reversal occurred in many other Western countries, reflecting what has come to be called the third industrial revolution.[19]

Overall, greenhouse gas emissions decreased between 1970 and the 1990s as a side effect of decisions driven by other motives – energy security and competitiveness, primarily – and external factors that Sweden had limited ability to influence. As climate issues started to become more salient in the 1990s, however, political initiatives were taken and regulations were put into place expressly to reduce greenhouse gas emissions. Such policies, in which the main objective is to reduce greenhouse gas emissions, are referred to in this report as "direct climate policy".

THE EMERGENCE OF DIRECT CLIMATE POLICY

A parliamentary decision from 1988 established the first Swedish climate policy objective: "to stabilise emissions at current levels". However, this objective only concerned carbon dioxide. The next step was taken in 1991, when all greenhouse gases were included in a new goal formulation. In January that year, a carbon tax was introduced, the first concrete step to steer towards reduced emissions. The carbon tax was part of a broad tax reform of 1990–1991[b], which also included changes to existing environmental and energy taxes. The purpose of the tax reform was to place a larger share of the financial burden of emissions on the polluter and to create incentives to reduce those emissions. See the box below for more examples of adopted parliamentary decisions on emissions targets.

[b] The overall objective of the tax reform was to achieve effective taxation from a socio-economic perspective while meeting certain redistributive policy objectives. The carbon tax was only part of many changes that were made in what has come to be called the "tax reform of the century". See the Swedish National Audit Office report, Enhetlig beskattning? ("Uniform taxation?") (RiR 2010:11) for further reading.

facts:

PARLIAMENTARY DECISIONS ON EMISSIONS TARGETS FROM 1980 TO THE PRESENT DAY

1988 The first climate policy target for Sweden was adopted. The target included only carbon dioxide and aimed to stabilise emissions at "current levels".

1991 An amendment to the 1988 target expanded the policy to cover all greenhouse gases and all sectors.

1993 A national climate strategy was adopted that was aligned with the UN Framework Convention of Climate Change's goal of stabilising emissions in industrialised countries. The new national target stated that carbon dioxide emissions from fossil fuels would be stabilised at 1990 levels by 2000 and subsequently be reduced.

The Parliament's **1997** transport policy decision adopted, among other measures, a target stating that carbon dioxide emissions from transport in 2010 should be stabilised at 1990 levels.

1999 The Parliament established the environmental objective "reduced climate impact" as part of the environmental objectives system. This consisted of a target for global concentrations of carbon dioxide in the atmosphere, but did not in itself contain a specific reduction target for Sweden. National targets were later added to the environmental objectives system as interim targets.

2002 The bill "Sweden's climate strategy" was adopted, which formulated a Swedish climate policy with climate goals. As a long-term target for 2050, emissions for Sweden should be lower than 4.5 tonnes of CO_2 equivalent per year per inhabitant in order to further reduce emissions. The short-term target was to cut Sweden's emissions of all greenhouse gases covered by the Kyoto Protocol, on average, by 4% from 1990 levels during 2008–2012. This would be done without compensation for uptake by carbon sinks or through the use of flexible mechanisms.

2009 Two bills were adopted for "a coherent climate and energy policy", with a number of key components. The bills set a target of 40% lower greenhouse gas emissions in the non-trading sector by 2020, a new target of a fossil-fuel independent vehicle fleet by 2030, and a vision of net-zero emissions by 2050.

2017 A new climate policy framework for Sweden was adopted, with new emissions targets: Sweden aims to have net-zero greenhouse gas emissions by 2045, followed by negative emissions through the use of so-called supplementary measures.

Though other factors have also been important, there is strong evidence that, together with the energy tax, the carbon tax has been a key factor in reducing emissions throughout the economy over the last three decades,[20-24] not least by driving the phase-out of fossil fuels for heating. The carbon tax has been gradually increased in this period, and exceptions have been reduced in order to further boost the incentives to reduce emissions.

In addition to the carbon tax, many other climate policy decisions have been taken and executed by the Parliament and the Government since the early 1990s. For example, the Swedish state has invested in emission-reduction actions at the local and regional levels through various state-funded measures, such as the LIP Local Investment Programmes (1998–2002), the KLIMP Climate Investment Programmes (2003–2008), the Swedish Transport Administration's Urban Environment Agreement (2015–) and Swedish Energy Agency assistance to municipal climate and energy advisors.

Furthermore, the expansion of renewable electricity production has been promoted through the introduction of the Electricity Certificate System (2003–), and the electric-vehicle charging infrastructure has been expanded with support from Klimatklivet ("the Climate Leap", 2015–). Research and innovation funding for the development of new solutions for a fossil-free society has also played a major role in climate policy.

The emissions targets have been gradually tightened, and new strategies for reducing emissions have been created. In April 1999, the Parliament approved the environmental objectives system, with the stated goal of environmental policy being to "hand over to the next generation a society in which the major environmental problems are solved, without causing increased environmental and health problems outside Sweden's borders". Reduced climate impact is one of the 16 environmental quality objectives in the system. Today, the interim targets of the new climate policy framework are also included in the environmental objectives system.

3. Current policies will not achieve the climate policy goals

Sweden has seen a long-term trend of emission reductions, but since 2015, the rate of reduction has slowed. To achieve national targets, emissions must be reduced significantly faster. In this context it is important to understand that Sweden's greenhouse gas emissions are affected by policies and decisions at the national level but are also covered by policies and regulations at the EU level.

EU CLIMATE POLICY

The EU's current long-term strategy calls for total greenhouse gas emissions across the EU to be reduced by 85–90% by 2050. [25] As part of this strategy, the EU aims to reduce greenhouse gas emissions by 40% from 1990 levels by 2030, while preserving carbon sinks. These targets also constitute the EU's contribution to the Paris Agreement. In 2018, the European Commission developed a proposal for a new long-term strategy to ensure that the EU achieves climate neutrality by 2050.[26-29]

The EU's climate goals for 2030 are to be achieved through three regulations. The first two are (1) the European Emissions Trading Scheme (EU ETS) and (2) the Effort-Sharing Regulation (ESR) covering emissions outside the EU ETS. The third regulation regulates the management of greenhouse gas emissions and removals from land use, land use change and forestry (LULUCF).

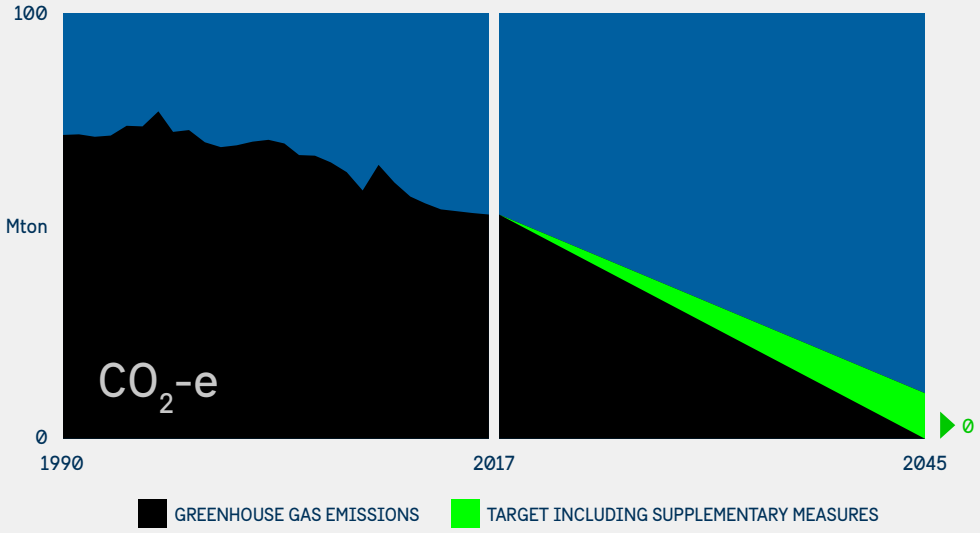
Since 2005, the EU ETS trading system has been regulating emissions from heavy energy-using installations (power stations and industrial plants), and more recently also airlines operating within the EU. The system sets a common cap for all the emissions included. In contrast, the ESR specifies national emissions targets for each member state. Since the ESR-emissions are outside the trading system, they are sometimes referred to as the non-trading sector. However, it is not a sector in the strict sense; rather, the emissions come from various sources including transport, agriculture, working machineries and others. Emissions covered by the ESR are referred to in this report as "emissions not included in the trading system".

GOALS IN THE CLIMATE POLICY FRAMEWORK

The overall climate target of the Swedish policy climate framework is net-zero greenhouse gas emissions (see the box on greenhouse gas emissions) to the atmosphere by 2045, followed by negative emissions. This target covers all emissions within Sweden's borders – so-called territorial emissions (see the box on different ways of reporting greenhouse gas emissions). The goal does not include emissions from international transport (so-called international bunker fuels) or emissions and removals from land use, land use change and forestry (LULUCF).

The goal of net-zero emissions means that emissions should be reduced at least 85% by 2045 from 1990 levels; see Figure 3. The remaining emissions may be offset by so-called supplementary measures. Examples of such measures are increased carbon sinks, bioenergy with carbon capture and storage, or investments in climate change mitigation projects in other countries. After 2045, the supplementary measures should exceed the remaining emissions in order to create "negative emissions".

FIGURE 3 – HISTORICAL GREENHOUSE GAS EMISSIONS, IN MILLIONS OF TONNES OF CO_2 EQUIVALENT, AND THE TARGET OF NET-ZERO EMISSIONS BY 2045



facts:

GREENHOUSE GAS EMISSIONS

The greenhouse gases covered by Sweden's climate goals include emissions within Sweden's borders of carbon dioxide, methane, nitrous oxide and fluorinated greenhouse gases. In order to compare the impact of these different emissions, the amount emitted of each is multiplied by the global warming potential (GWP) of the gas, which is relative to the warming effect of carbon dioxide. The GWP is different for each gas, but with this approach, all emissions are expressed in CO_2 equivalents. In accordance with the IPCC's methodological guidelines, carbon dioxide emissions from biomass incineration are calculated as zero in greenhouse gas inventories.

By this measure, carbon dioxide accounts for slightly more than 80% of Swedish emissions, methane and nitrous oxide emissions for nearly 10% each, and fluorinated greenhouse gases for the remainder. The major sources of emissions are transport, industry, agriculture, electricity and district heating, operation of machinery, product use and waste.

The Swedish Environmental Protection Agency (EPA) is responsible for the national greenhouse gas inventory, which is prepared in accordance with internationally agreed methodological guidelines from the IPCC. Emissions are reported annually to the EU and to the UN in a time series from 1990 to the latest year. In Sweden, official annual emission statistics are published with slightly less than a one-year delay.

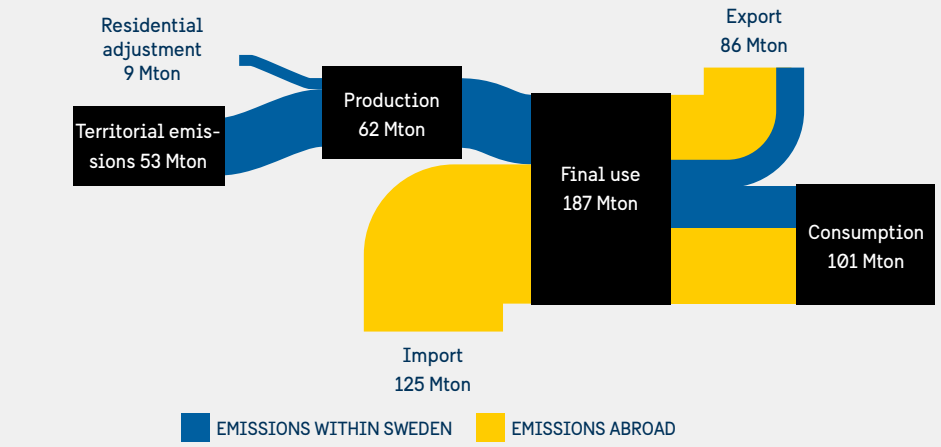
In addition to the annual statistics, preliminary emission estimates are published with about a five-month delay. This means that the preliminary estimate for 2018 was reported in May 2019. In addition, quarterly estimates for greenhouse gas emissions are reported by both the Swedish EPA and Statistics Sweden, but using different sector breakdowns and system boundaries.

facts:

DIFFERENT WAYS OF REPORTING GREENHOUSE GAS EMISSIONS

Sweden's greenhouse gas emissions are presented in different ways by the Swedish EPA and Statistics Sweden depending on the area of application (see Figure 4).

FIGURE 4 – FLOW CHART OF SWEDEN'S GREENHOUSE GAS EMISSIONS.



Source: Swedish EPA.

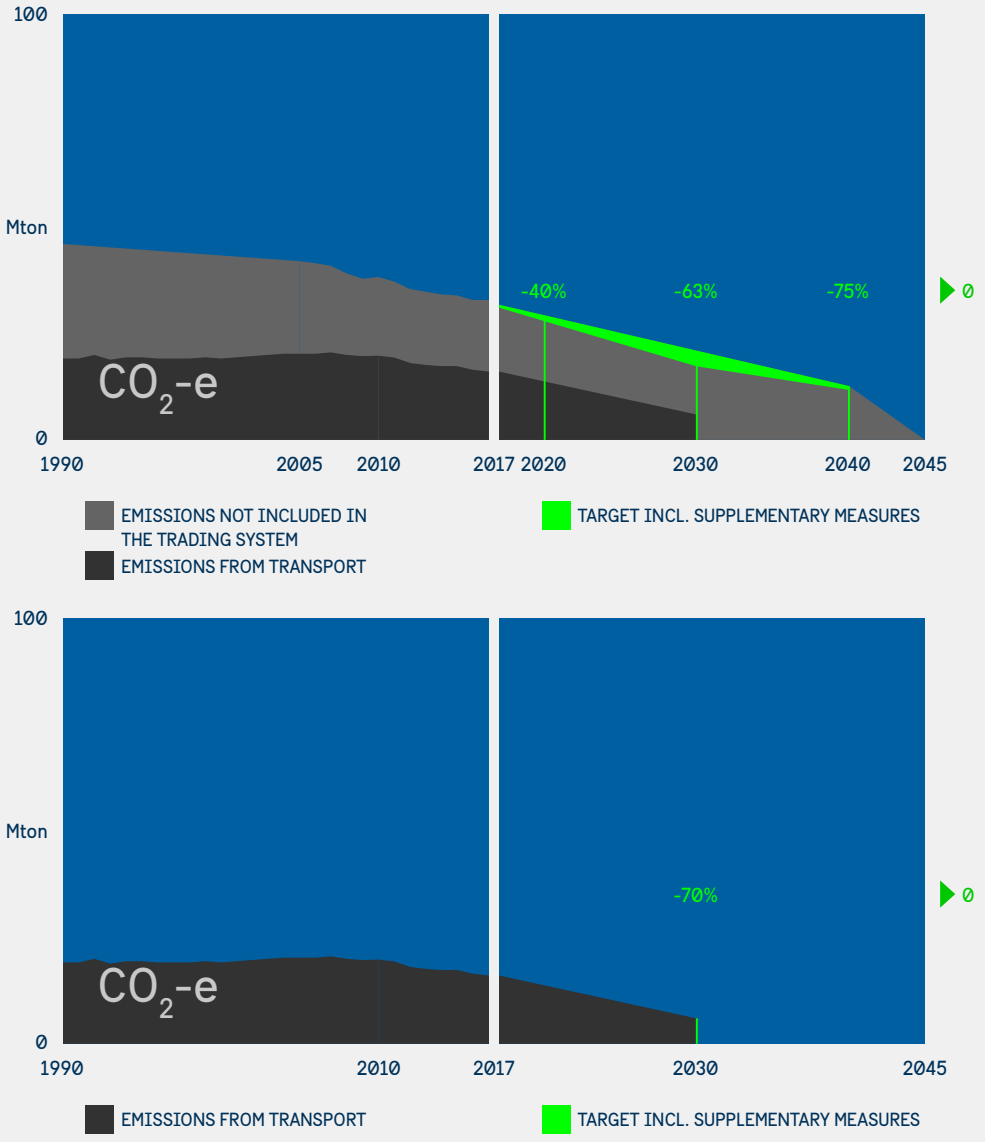
Territorial emissions, or emissions of greenhouse gases that take place within Sweden's borders, are relevant for meeting both national and international targets. These statistics include emissions from sources within Sweden's geographical borders.

There are other ways to report greenhouse gas emissions using other system boundaries,[30] namely production and consumption-based emissions. **Production-based emissions** include emissions caused by the Swedish economy. This includes some emissions outside Sweden's borders, especially from international transport. The sum of production-based emissions and the emissions caused by our total imports represent all emissions caused by final use in Sweden. When what we export is removed, we obtain the consumption-based emissions. **Consumption-based emissions** include emissions from consumption of both domestically made and imported products. For imports, emissions are estimated using a model based on financial transactions and emission factors corresponding to the emissions in the countries that Sweden trades with. These assumptions make the estimates very uncertain.[31,32]

In addition to the overall goal of achieving net-zero emissions by 2045, Sweden has set interim targets. Under these targets, emissions that are not part of the trading system should be reduced by 40% by 2020, 63% by 2030 and 75% by 2040, compared with 1990 levels. Parts of the interim targets for 2030 and 2040 can be achieved by means of supplementary measures corresponding to a maximum of 8 and 2 percentage points of the emission reduction targets for 2030 and 2040, respectively. The national 2030 goal is more ambitious than the binding target included in the ESR.[c] Finally, the Swedish climate framework contains a special target for reducing transport emissions by 70% by 2030 from 2010 levels.

[c] Sweden's target within ESR is to reduce those emissions by 40% by 2030 from 2005 levels. The Swedish climate framework target of a 63% reduction by 2030 from 1990 levels corresponds to a decrease of 59% from 2005 levels.

FIGURE 5 – GREENHOUSE GAS EMISSIONS AND TARGETS FOR EMISSIONS NOT INCLUDED IN THE TRADING SYSTEM AND FROM TRANSPORT (MILLION TONNES OF CO_2 EQUIVALENT).



WILL THE CLIMATE GOALS BE MET?

The Climate Policy Council has used existing underlying data and reports to assess progress towards each of the targets in the climate policy framework. We present our assessments in the following sections.

INTERIM TARGETS FOR 2020, 2030 AND 2040 AND FOR THE TRANSPORT SECTOR

THE 2020 INTERIM TARGET

Greenhouse gas emissions from sectors not included in the trading system should be reduced by 40% by 2020 from 1990 levels. When the target was decided, the Government determined that 13 percentage points of these emission reductions would take the form of investments in climate projects in other countries, through so-called flexible mechanisms.

The Climate Policy Council finds that the target is achievable with some use of flexible mechanisms.

The 2020 target was set in 2009 to cover emissions not included in the EU trading system.[33 d] In its 2019 in-depth evaluation of the environmental objectives,[34] the Swedish EPA found that the target is achievable, so long as emission reduction measures are sufficiently implemented (for example, through investment in other EU countries or flexible mechanisms), or further emission reduction measures are introduced.

In order to achieve the target, emissions not included in the trading system must be reduced from 32.4 million tonnes of CO_2 equivalent in 2017 to 28.6 [e] million tonnes by 2020. According to the latest scenario for emissions[153] (see the box on emission scenarios), this will not happen with national emission reductions and existing policies only. As it currently stands, flexible mechanisms will need to contribute about another 1 million tonnes of CO_2 equivalent. When the target was set by the Parliament in 2009, such measures were estimated to contribute close to 7 million tonnes.[33]

As part of the action plan for achieving the 2020 interim target and providing the needed emission reductions by means of flexible mechanisms, Sweden has been investing for several years now in international climate projects that generate emission allowances. This has been done under the flexible mechanisms of the Kyoto Protocol and has created verified emission reductions under the Clean Development Mechanism (CDM) and Joint Implementation (JI).

facts:

EMISSION SCENARIOS

Scenarios of Sweden's future greenhouse gas emissions are reported to the EU and the UN every two years and are developed by the Swedish EPA, in cooperation with several government agencies. A reference scenario is available for existing policies. If planned policy instruments exist, for example in a bill, a scenario that includes such policies should also be reported. Alternative scenarios are presented to show the sensitivity to different assumptions. The latest reference scenario,[36, 153] presented on 15 March 2019, includes policies agreed upon as of mid-2018.

Scenarios are inherently uncertain predictions of the future and depend on the assumptions that are made. The uncertainty increases as the scenarios extend further into the future. Different scenarios are used for different purposes, but a common use is for assessing future compliance with the climate goals.

THE 2030 AND 2040 INTERIM TARGETS

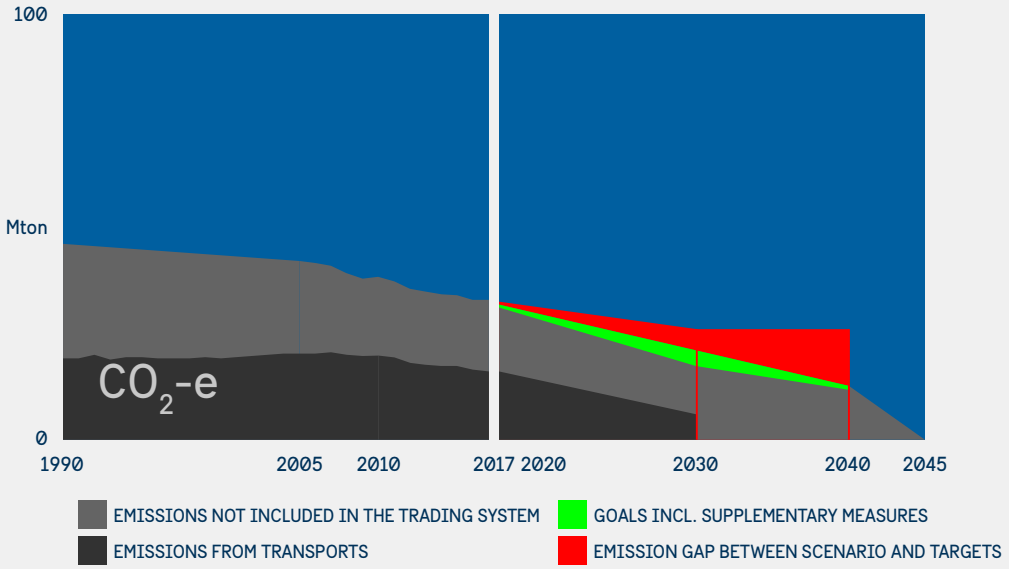
Greenhouse gas emissions not included in the trading system should be at least 63% lower by 2030 and 75% lower by 2040 than 1990 emissions. A maximum of 8 and 2 percentage points in reductions, respectively, may be achieved through supplementary measures.

The Climate Policy Council finds that the targets will not be met without further policy action.

[d] The scope of the 2020 target is, in principle, the same as for the 2030 and 2040 targets (total emissions, minus those included in the trading system, minus CO_2 emissions from domestic flights). However, the scope of the trading system has expanded since the 2020 target was adopted. More greenhouse gases and installations are now included in the system.

[e] The target level is preliminary and will be set during 2022–2023, when verified emission figures are available for the entire time series 1990–2020.

FIGURE 6 – HISTORICAL EMISSIONS, TARGETS AND SCENARIOS FOR EMISSIONS NOT INCLUDED IN THE TRADING SYSTEM (MILLION TONNES OF CO_2 EQUIVALENT).



The climate policy framework defines indicative emission pathways for the interim targets for 2030 and 2040. If emissions exceed the indicative pathway, this warrants an analysis and possible proposals for further climate policy action.[37]

The latest emission statistics (2017) show that emissions not included in the trading system amount to 32.4 million tonnes of CO_2 equivalent. They are thus above the indicative emission pathway. The Government should therefore propose additional instruments and other policy measures to align emissions with the pathway.

In its latest in-depth evaluation of the environmental objectives,[34] the Swedish EPA found that the 2030 interim target did not appear to be achievable through existing and agreed-upon instruments. However, it assessed that the target is within reach and can be achieved by leveraging supplementary measures[f] or using additional domestic emission reductions. This assessment was based on scenarios from 2017.[38] At the time, there was no basis for assessing the 2040 target.

Since then, the Swedish EPA has presented new scenarios that show an even larger gap needs to be closed to achieve the 2030 interim target. According to the new scenarios, which include policies approved as of mid-2018, a gap of about 9 million tonnes remains for 2030.[153] For 2040, the gap is 15 million tonnes.[36] Using supplementary measures does not suffice to close these gaps; instead, additional policies for reducing domestic emissions are needed.

The transport sector accounts for about half the emissions that are not part of the trading system. Achieving the target for the transport sector is thus central for achieving the overall 2030 interim target for emissions outside the trading system.

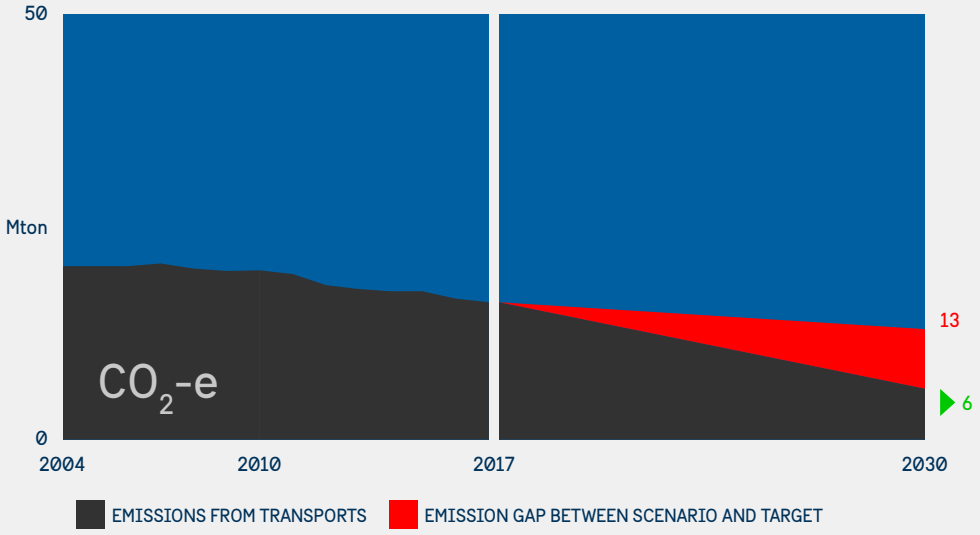
[f] The amount of supplementary measures that may be used falls just under 4 million tonnes CO_2 equivalent in 2030 and 1 million tonnes CO_2 equivalent in 2040.

THE TRANSPORT SECTOR GOAL

Greenhouse gas emissions from domestic transport shall be reduced by at least 70% by 2030 from 2010 levels. This target does not include domestic flights, which are part of the trading system.

The Climate Policy Council finds that the target will not be met without further policy action.

FIGURE 7 – HISTORICAL EMISSIONS AND SCENARIOS FOR EMISSIONS FROM DOMESTIC TRANSPORT (EXCLUDING AVIATION), MILLION TONNES OF CO_2 EQUIVALENT.



THE TRANSPORT SECTOR GOAL

This interim target covers emissions of all domestic transport at sea and on land. It does not include flights, however, since CO_2 emissions from aviation are part of the EU Emissions Trading System. As with total emissions, emissions in the transport sector must continue to shrink towards zero after 2030.

Transport sector emissions fell by 19% between 2010 and 2017.[30] This decline is due to increased energy efficiency and the use of biofuels, but could have been even greater if traffic had not increased overall. To achieve the target, emissions must be reduced significantly faster.

The latest scenarios from the Swedish EPA show that emissions will decrease to roughly 13 million tonnes of CO_2 equivalent for 2030 under agreed policies.[153] A gap of 7 million tonnes thus remains for achieving the target level of 6 million tonnes of CO_2 equivalent. There are 12 years left until the target year, and closing the gap by that time requires powerful instruments and other policy measures. The Swedish EPA also draws the same conclusion in its latest in-depth evaluation of the environmental objectives.[34]

Trends in the transport sector are presented in a special thematic section in the report (Chapters 6–8). In these chapters, we address the underlying factors that drive emissions, evaluate existing policies and recommend possible measures to move closer to achieving the target.

EMISSIONS INCLUDED IN THE TRADING SYSTEM

EMISSIONS TRADING SYSTEM

Emissions included in the trading system are not covered by a separate interim target, but they are included in Sweden's overall goal of net-zero emissions by 2045.

The Climate Policy Council finds that emission trends are not aligned with what is needed to achieve Sweden's overall target.

Emissions included in the EU emission trading system – from major electricity and district heating production facilities, manufacturing industries and air carriers flying within the EU – are covered by a common EU-wide goal, which is not distributed between Member States. In Sweden, these emissions are also covered by the national overall goal of net-zero emissions by 2045.

Basic industries account for the majority (roughly 80%) of emissions within the trading system in Sweden. Ten production facilities in the steel, iron and cement industry account for over half of these emissions.[38]

The trading system is now in its third trading period, which runs until 2020. During this period, the annual reduction rate for the emission cap is set at 1.74%. During the fourth trading period that spans 2021–2030, the annual reduction rate is set at 2.2%. The cumulative reduction to be achieved from 2005 to 2030 is 43% for all emissions included in the EU trading system. The idea behind an EU-wide trading system is that emission reductions will take place wherever they are most cost-effective. What share of the reductions will occur in Sweden alone is therefore not determined.

Emissions in 2017 from Swedish installations within the system were close to 19.7 million tonnes of CO_2 equivalent. Compared with 2016, emissions remained largely unchanged. From early 2005 until 2017, emissions fell by 18% (including aviation). According to the scenarios, emissions will be reduced by an additional 3 percentage points by 2045.[36]

If emissions included in the trading system in Sweden were to comply with the EU's linear reduction factor for the trading system as a whole[9], these emissions would amount to slightly more than 10 million tonnes in 2045. This almost corresponds to the entire emission allocation that can be offset by supplementary measures in Sweden's goal of net-zero emissions.

The emission reduction rate within the trading system depends on what happens to the system within the EU. At present, there is no EU-level governance to reduce emissions within the trading system to zero in all Member States. In order for Sweden's emissions within the trading system to reach zero by 2045, further policy measures are needed.

OVERALL GOAL OF NET-ZERO EMISSIONS, AND NEGATIVE EMISSIONS AFTER 2045

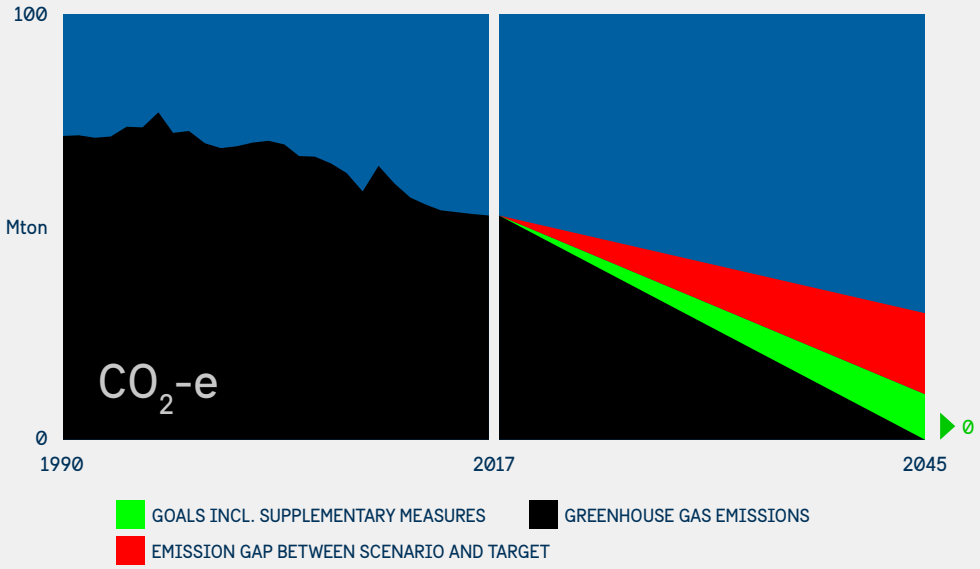
OVERALL GOAL

By 2045 Sweden shall have no net greenhouse gas emissions to the atmosphere, and thereafter it will achieve negative emissions.

The Climate Policy Council finds that the target will not be met without further policy action.

[9] If the linear reduction factor for 2030 is assumed to remain valid until 2045.

FIGURE 8 – HISTORICAL EMISSIONS AND SCENARIOS FOR SWEDEN'S TOTAL EMISSIONS (MILLION TONNES OF CO_2 EQUIVALENT).



The overall goal consists of two components:

1. to reach net-zero emissions by 2045, and
2. to implement sufficient supplementary measures in order to achieve negative net emissions beyond 2045

The climate policy framework lacks guidance on how to assess Sweden's total emission trends. In its 2018 climate report, the Government chose to compare the emission rate with a linear trajectory towards the target. A linear reduction means large annual percentage decreases later in the period, closer to the target. The Government also presented an alternative comparison with an emission trajectory based on an annual percentage reduction rate. In absolute terms, such a pathway would result in higher emission reductions early in the period (before 2030) and a flattened emission curve closer to the target, compared with a linear trajectory.

The cumulative emissions over the entire period are quite different for the two trajectories. This is significant as in the case of carbon dioxide, it is the cumulative emissions that determine the impact on the climate. If total territorial emissions from Sweden follow a linear trajectory up to 2045 instead of a pathway with a percentage annual reduction, then cumulative emissions will be around 150 million tonnes greater. This corresponds to about three years of Sweden's current total annual emissions[39] (see the fact box on emission pathways and cumulative emissions).

However one compares, the emission reduction rate must increase significantly to align with what is needed to achieve the target. Instead of the current annual reduction rate of about 1%, an annual emission reduction rate of 5–8% is required.[h]

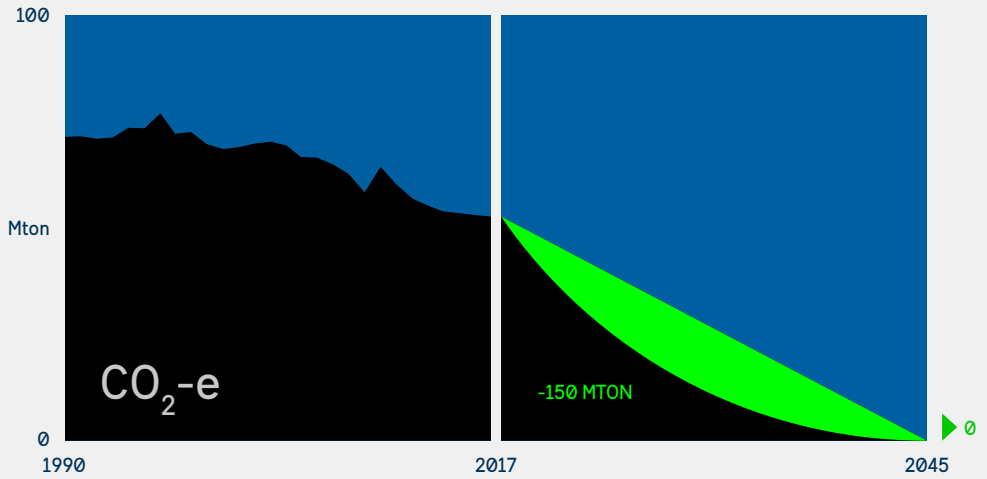
[h] This means 5% if supplementary measures are used, and 8% if emissions are to decrease to zero.

facts:

EMISSION PATHWAYS AND CUMULATIVE EMISSIONS

A linear emission pathway, where emissions in absolute terms decrease steadily year on year, represents an increasing relative emission reduction during the period. As an alternative to a linear emission pathway, it is possible to envision emission pathways with an annual percentage reduction rate. This reduces emissions in absolute terms more towards the beginning than the end. Both the Swedish EPA and the Government have discussed such emission trajectories. A linear and a percentage trajectory mean large differences in cumulative emissions over the entire period, which is what determines the impact of emissions on the climate.

FIGURE 9 – DIFFERENCE IN EMISSIONS BETWEEN A LINEAR PATHWAY AND A CURVE PATHWAY WITH AN ANNUAL PERCENTAGE REDUCTION.



The latest scenarios from the Swedish EPA indicate that emissions are decreasing from today's 53 million tonnes of CO_2 equivalent to 45 million tonnes in 2045 if current policies continue to apply.[36] However, such long-term scenarios have very high uncertainty, so the reduction rate and the interim targets are a more important basis for assessing fulfillment of the long-term target.

As noted in previous sections, the Council finds that only the 2020 target is achievable with current policies. The proposed policy measures are not far-reaching enough to achieve the other interim targets. For emissions within the trading system, there is no specific national target. Nevertheless, these emissions need to be reduced more rapidly if they are to align with the overall goal of net-zero emissions by 2045.

Compensating for the remaining emissions in 2045 and thereafter achieving negative net emissions requires supplementary measures. Such measures can include an increase of the net uptake of carbon dioxide in forests and land, verifiable emission reductions by investing in climate action in other countries, and bioenergy with carbon capture and storage (BECCS). According to the climate policy framework, supplementary measures must conform with internationally agreed rules. Such rules do not yet exist in the Paris Agreement, nor is it clear how or when they will be designed. The potential for Sweden for supplementary measures is currently uncertain. In 2018, the Government appointed a special inquiry to describe and quantify how the various measures could and should contribute to achieving the target.[40]

Overall, the Council finds that the target of net-zero emissions by 2045, and negative emissions thereafter, will not be met without further policy action.

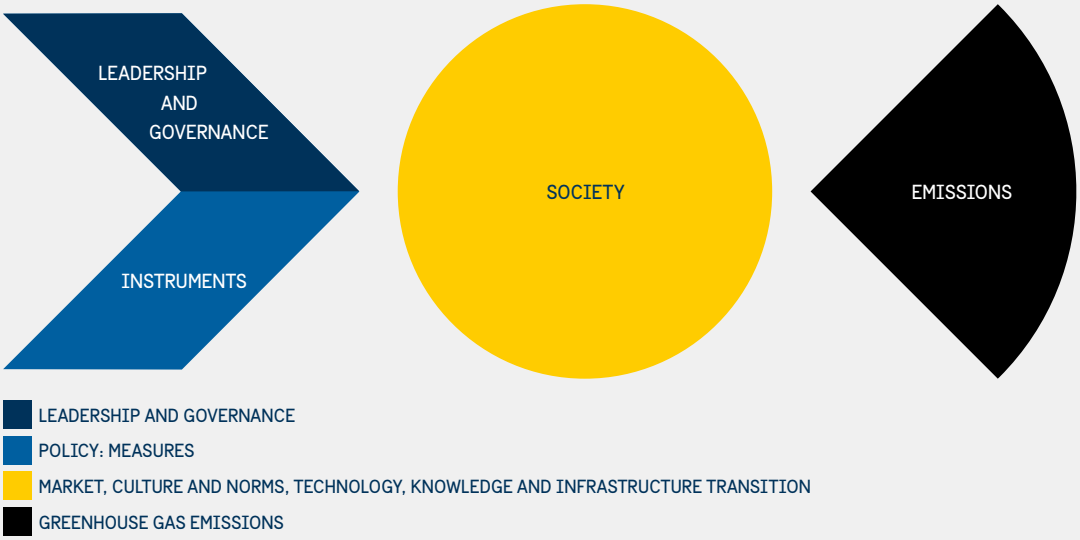
4. Observations and recommendations on the comprehensive policy

The Climate Policy Council has examined the Government's comprehensive policy and made a number of observations and recommendations. They concern two dimensions: leadership and governance and policy instruments.[41-50]

4.1 ANALYTICAL FRAMEWORK FOR EVALUATING THE COMPREHENSIVE POLICY

Society's climate impact depends on many factors beyond national policy. It involves a complex interaction of technical, economic, social and cultural factors at all levels: local, national, EU and global. The circle in Figure 10 represents a system and all the stakeholders that interact within it. The system could be the transport system, for example, or all of Swedish society.

FIGURE 10 – POLICY INFLUENCES STAKEHOLDERS ACROSS SOCIETY, WHO IN TURN INFLUENCE GREENHOUSE GAS EMISSION TRENDS.



The term "climate policy" usually decribes the sum total of different policy instruments which, wholly or partly, have the stated aim of reducing society's climate impact. This can be called direct climate policy. The Council's evaluation of how "the comprehensive policy" aligns with the climate goals broadens the perspective in two respects.

First, there are many policies that affect greenhouse gas emissions without specifically focusing on that purpose or deliberately aiming to do so. This can be called indirect climate policy. It involves many different policy areas which are not normally included in climate policy, but which can help to strengthen or weaken the climate policy goals. The challenge is to see climate change from a holistic perspective in which all policy areas contribute to progress that becomes economically, socially and environmentally sustainable. Different types of evaluation systems, as well as dialogue and learning moments across policy areas, can contribute to better integration of climate considerations in ongoing efforts.[51]

Second, emission trends are also affected by the overall goals and guiding principles formulated, how they are implemented, and the management and culture that characterise the work of the government offices and government agencies, and in other public-sector areas.

Using this broader perspective, the Council has chosen to examine the comprehensive policy based on that two dimensions: (1) leadership and governance and (2) instruments.

LEADERSHIP AND GOVERNANCE – INSTITUTIONS, AGENDA AND MANAGEMENT

By setting targets, organising government agencies and issuing a variety of instructions and guidelines, the Parliament and the Government can influence the framework for policy development. Decisions taken in a policy area are shaped by the following:

- How institutions and organisations are structured;
- What knowledge they possess; and
- Their ways of operating, administrative traditions and cultures.

These factors affect how and what decisions are taken and implemented at different levels – from the upper reaches of the Government to individual civil servants. The state also plays a role as capital investor, for example in the case of National Pension Insurance Funds (the AP funds) and their guidelines.[52] Interactions with municipalities and cities, businesses, academia and civil society are also crucial. This includes how the Government and the Parliament communicate climate goals and climate policy to citizens and all other stakeholders.

INSTRUMENTS – TAXES, REGULATIONS, PUBLIC CONSUMPTION AND PUBLIC INVESTMENT

Factors that more directly affect citizens, companies and other stakeholders include what is usually defined as policy or public instruments (regulatory, economic and informative instruments), as well as how the state in a wider sense appropriates its funds for public consumption and investment. The latter includes investments in knowledge-building, such as in research and higher education as well as innovation.[53]

In general, environmental policy instruments aim to correct market failures by adjusting prices, allocating property rights, making information available, or establishing rules that encourage certain behaviours. Taxes or rules implemented for other reasons (for example, fiscal charges introduced to obtain the necessary Treasury revenues) may also have an impact on greenhouse gas emissions. For example, a tax exemption can in practice subsidise emissions, or a regulation can inadvertently counteract the introduction of new low-carbon technologies.

Public expenditure and procurement account for around half of the gross domestic product and thus have a major effect on emission trends. For example, changing the criteria for public investment and procurement of goods and services can affect emissions. Even public measures that do not explicitly focus on climate policy can play a major role. This applies not least to investments in infrastructure – which can produce long-term lock-in effects that are either aligned with the climate targets or undermine them.

GOVERNMENT LEADERSHIP AND GOVERNANCE

It is possible to significantly reduce greenhouse gas emissions by streamlining and optimising existing technologies and societal functions. However, in order to achieve net-zero emissions, more profound, systemic innovations and societal changes are needed level across sectors.[54–59] This in turn puts high demands on political leadership.

rec:

RECOMMENDATIONS — GOVERNMENT LEADERSHIP AND GOVERNANCE
Clarify that net-zero emissions means zero emissions in most sectors.

According to the scenarios from the All-Party Committee on Environmental Objectives that formed the basis of the climate targets, emissions in most sectors are to be reduced to near-zero by 2045. Beyond 2045, some greenhouse gas emissions will remain in the form of methane and nitrous oxide from the agricultural sector and from other diffuse sources.[60]

There are currently no solutions available for reducing agricultural emissions to zero. In this context, the Council finds that a realistic goal of net-zero emissions would mean that all electricity generation, heating and cooling, as well as the entire transport sector and all use of working machinery would need to have zero emissions by 2045. This should be the vision for the Government and governmental agencies, even though there are no formal sectoral objectives yet except for domestic transport. Such a vision is also well aligned with the energy policy target of 100% renewable electricity production by 2040.[61]

For Sweden to achieve the net-zero emissions target, industries that currently have high emissions (mainly within steel and cement production) also need to reduce them. Within the next 25 years, they need to develop and implement new carbon-neutral processes and introduce technologies for capturing and taking care of the carbon dioxide generated in these processes. The Council believes that engagement between policy-makers and industry is crucial to achieving this.

The long-term target does not stop at net-zero emissions, but aims for negative emissions after 2045. Even if Sweden were to reach zero emissions by 2045 completely without supplementary measures, such measures will be required to achieve negative emissions after 2045.

For Sweden, at the moment there is no overall assessment of the long-term extent of supplementary measures. The Government has launched an inquiry[62] to assess the potential of different measures and to propose a strategy for Sweden to achieve negative net greenhouse gas emissions beyond 2045. The strategy is to be presented in January 2020.

rec:

RECOMMENDATIONS — GOVERNMENT LEADERSHIP AND GOVERNANCE

Include the implications for climate targets in all impact assessments in public inquiries and government bills. New policy instruments should be preceded by plans for follow-up and evaluation to ensure high climate benefits and cost-effectiveness.

The climate policy framework clarifies that efforts to achieve the climate goals must be integrated into decision-making across all policy areas. Climate considerations must be integrated in policy decisions and actions across all sectors. This has been highlighted internationally within the EU, by the OECD[63] and in the New Climate Economy.[9] This means that a consequence analysis must be included as a basis for all policy decisions that directly or indirectly affect the climate goals.

The Instrument of Government[64] states that government decisions in Sweden must always be prepared by a committee in order to comprehensively examine different aspects and interests. The Committees Ordinance,[65] which contains provisions for how this should be done, does not mention environmental or climate impacts among the issues to be considered. The ordinance's enumeration of concerns to examine seems to reflect priorities from past time periods rather than a modern, cohesive sustainability analysis. The provision to describe "socio-economic consequences" in general could include climate and other environmental impacts, but this is not an obvious interpretation.

When new laws or rules are proposed, the impact assessment should comply with the requirements of the Ordinance on Regulatory Impact Assessment.[66] The same applies to government supervisory authorities that decide on regulations or general advice.

The All-Party Committee on Environmental Objectives has proposed to include the climate goals in these two regulations, which govern all the impact assessments of the state apparatus.[60] The proposal was supported by the Government Communication of April 2018, "A climate strategy for Sweden".[67] In it, the Government states that both the Committees Ordinance and the Ordinance on Regulatory Impact Assessment should be "reviewed" on the grounds that "climate impacts should be analysed where relevant". However, it does not state how or when this is to happen. The Government has so far not carried out such a review.

The Climate Policy Council is of the opinion that the Government should implement the proposal from the All-Party Committee on Environmental Objectives, so the goal of integrating climate concerns into all policy areas can be realised. Any proposals resulting from inquiries and government agencies that are relevant to the climate targets, in all policy areas, should be analysed on the basis of how they affect the potential to achieve those targets.[i] This can be done through an explicit requirement in the Committees Ordinance and the Ordinance on Regulatory Impact Assessment. This would align with the Committee's referral procedure proposal and can be implemented immediately.

Following the implementation of clearer requirements for impact assessments, the Government itself should report how proposals before the Parliament affect the potential to achieve the climate targets. The report should be included in the budget bill and other relevant bills. In addition, the Council believes that it should be a requirement to draw up plans for follow-up and evaluation of climate policy proposals before they are implemented. The purpose of the plans would be to ensure a consistently high climate benefit and policy cost-effectiveness.

rec:

RECOMMENDATIONS — GOVERNMENT LEADERSHIP AND GOVERNANCE

Stimulate broad engagement and coordinate different initiatives. All stakeholders are needed: businesses, trade unions, municipalities and regions, academia, government agencies and civil society.

All stakeholders are vital for developing a fossil-free society. Businesses, civil society, municipalities and regions already support the climate targets and are taking action to achieve them. Some examples include the fossil-free roadmaps that several industry sectors have voluntarily developed within the framework of the Government's Fossil-Free Sweden initiative, which over 350 stakeholders have joined to date; the awareness-raising efforts of the Royal Swedish Academy of Engineering Sciences (IVA) through projects like the Climate Crossroads; proactive climate efforts in many municipalities and regions; and the many initiatives taken by civil society organisations.

In parallel, the County Administrative Boards have been specifically tasked by the Government to develop regional climate and energy strategies,[68] and the Swedish Energy Agency is to develop sectoral strategies for energy efficiency.[69]

The Government and its agencies are instrumental in creating coherence and coordination among all these initiatives. They should also create the foundation for synergies and knowledge-sharing to increase the pace of transition. The idea here is to stimulate progress all across society. For example, business and industrial policies – and not just a designated "environmental technology sector" – must be mobilised. In addition, municipalities must be given more opportunities to contribute to the transition.

A successful climate policy will also be grounded in legitimacy, trust, fairness and acceptance. Trust – between different stakeholders, between citizens and those in power, and between different parts of the country – is vital when implementing major societal changes. A climate policy that is perceived as unfair or,

[i] The corresponding language for "potential to achieve the integration policy objectives" is currently available in Committees Ordinance 1998:1474.

for whatever reason, has low public acceptance, cannot be implemented successfully. Redistributive policy considerations are therefore needed, and they may point the way to a specific path. Policy instruments and other measures that make emission-intensive options more expensive may necessitate initiatives to make the cost increase manageable for groups that might otherwise oppose them. Experience from other countries tells us that climate action can face significant obstacles unless issues of legitimacy and distribution are managed wisely and proactively. There are dividing lines between urban and rural areas, between the economically prosperous and the economically struggling, between men and women, and between different social groups depending on the opportunities they enjoy in their everyday lives.[70–79]

All stakeholders involved in the transition and in the public debate on climate policy depend on a reliable knowledge base and research on emission trends and evidence of the effects of different measures. In this context, publicly available emission statistics play a key role. It is important to quantify impacts and obtain feedback on the changes that are implemented.

The Swedish EPA is responsible for the official emissions statistics, which are used to track progress towards Sweden's climate targets. The EPA presents both annual and quarterly emissions figures. Statistics Sweden publishes annual and quarterly data on production-based emissions, broken down by sector in the same way as the economic statistics.[j] (See Chapter 3 and the box on greenhouse gas emissions.) Since the system boundary is different, Statistics Sweden's emissions data can differ in both level and trend compared with the Swedish EPA's figures.

The publication of emissions data by multiple stakeholders who use different system boundaries and sector break-down is not problematic in itself, as long as it is made clear what the data cover and how they relate to the climate goals. The Climate Policy Council considers that the Swedish EPA and Statistics Sweden have a shared responsibility to make it clear to the public and decision-makers that it is the EPA's official statistics that should be used to gauge progress towards agreed climate targets in Sweden, the EU and the UN. The Swedish EPA and Statistics Sweden should coordinate the timing of their publication dates and their communication of the relevant statistical products.

The growing interest from many different stakeholders increases expectations and demands for climate statistics. For example, many people want more rapid feedback on "how it's going", while others want a clearer breakdown of the statistics at the regional and local levels. It is not certain that official emissions statistics can meet all these expectations. Other methods of providing feedback and trend visualisation need to be developed.

Broad, multi-partisan support for both the climate policy framework and the long-term targets is a great strength. Both the climate goals and the Climate Act enjoy broad majority support in the Swedish Parliament.[k] Representatives of industry, trade unions, researchers, non-profit organisations, municipalities and regions, as well as other stakeholders, were involved in the work of the All-Party Committee on Environmental Objectives, and they endorsed the essential findings of the committee in the consultation process.

The broad consensus on the climate policy framework provides more predictability for those who want to invest in a fossil-free future. It also builds up a more secure platform for change, collaboration and innovation for all the stakeholders who need to contribute to climate change mitigation and adaptation. In addition, unity creates the foundation for competitiveness and growth so that Sweden can achieve its goal of becoming the world's first fossil-free welfare country.

The Climate Policy Council wishes to stress to the Parliament the importance of safeguarding the broad, long-term agreement on climate policy. This involves working within the climate policy framework and together safeguarding the agreement and ensuring continued progress.

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[j] The quarterly figures from Statistics Sweden are also preliminary and are based on the same basic emissions data as Swedish EPA data.

[k] The Sweden Democrats entered a reservation in the Parliament against the proposal for the climate policy framework. The Left Party entered a reservation in favour of limiting the use of supplementary measures to achieve the climate goals and to include consumption-based emissions in the framework, but may be considered to stand behind the goals set by the Parliament. 2016/17:MJU24.

CROSS-SECTORAL INSTRUMENTS

In addition to the need to bolster the Government's leadership and guidance in order to achieve the target of net-zero emissions by 2045, policy instruments must also be developed and enhanced. The Council makes three recommendations regarding general cross-sectoral instruments.

rec:

RECOMMENDATIONS — CROSS-SECTORAL INSTRUMENTS

Eliminate the remaining exemptions from CO_2 taxation for activities outside the trading system.

In January 1991, Sweden was one of the first countries in the world to introduce a tax on carbon dioxide emissions.[1] Since then, the carbon tax has been a central instrument of Swedish climate policy. An energy tax supplements and reinforces the contribution of the carbon tax to reducing CO_2 emissions in several areas.

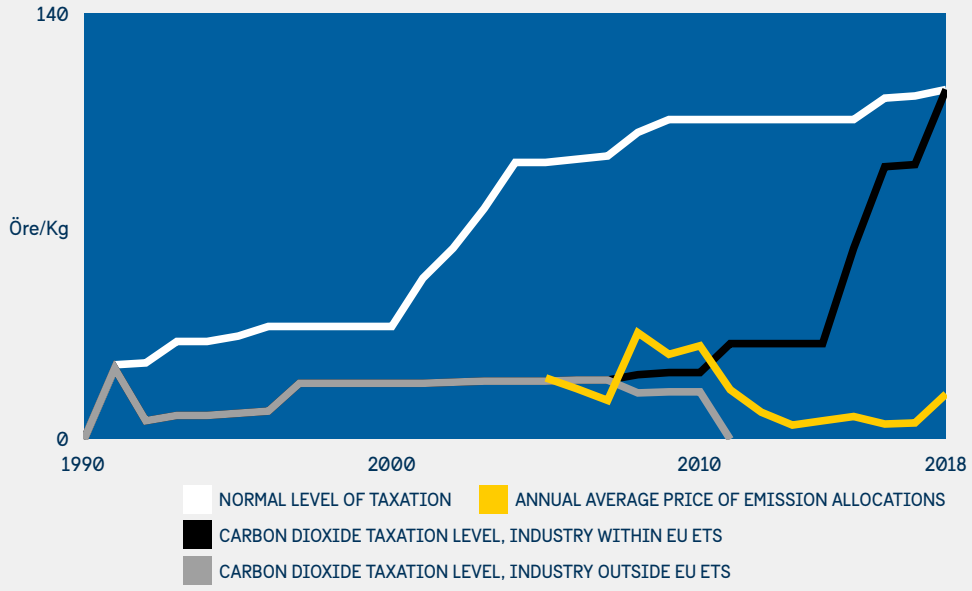
This policy is based on the "polluter pays" principle. A general price for carbon dioxide also limits so-called rebound effects. Such effects arise when efficiency improvements reduce emissions in one area, providing economic headroom for increased demand and thus increased emissions in another area.

Early on, it proved politically difficult to apply the principle of a uniform nationwide carbon tax in those parts of the economy that face international competition and where energy costs often represent a significant cost item. For this reason, tax reductions in some sectors were introduced as early as 1992. The energy tax was also lowered when the carbon tax was introduced, which meant that the price of fuels such as petrol and diesel did not initially increase significantly.[80]

Over time, especially after 2000, the tax level increased, and exemptions were limited. For example, tax exemptions for heating fuels in industry and agriculture were gradually reduced from 79% to 70% in 2011, falling to 40% in 2015. The exemptions were further lowered in 2016, and in 2018 they were completely phased out. Today, around 90% of CO_2 emissions not included in the trading system are covered by the full level of taxation.[81]

[1] Sweden introduced the tax at the same time as a carbon tax was introduced in Norway. Finland and the Netherlands introduced their carbon taxes back in early 1990.

FIGURE 11 – NORMAL LEVEL OF TAXATION, REDUCTIONS FOR INDUSTRY, AND AVERAGE PRICE OF EMISSION ALLOWANCES FOR INSTALLATIONS INCLUDED IN THE EU EMISSIONS TRADING SYSTEM.



Source: Swedish Energy Agency, ICE and budget bills 2005–2018, adapted by Mathias FridDahl, Linköping University.

However, some exceptions to uniform taxation still remain. In 2016, in view of the vulnerable competitive situation of Swedish agriculture and forestry, the government lowered the carbon tax for fuel used in agricultural and forestry machinery over a period of three years.[82] The 2019 budget adopted by the Parliament further reduces the carbon tax for agricultural and forestry machinery.[81]

The carbon tax constitutes a key climate policy instrument. A reduction in the carbon tax should not be used as an industry policy tool. Exemptions in the uniform taxation of CO_2 emissions outside the trading system should be phased out altogether.

rec:

RECOMMENDATIONS — CROSS-SECTORAL INSTRUMENTS

Work proactively within the EU to tighten up the trading system and use cost-effective national instruments to reduce emissions from Swedish installations within the system.

The EU Emissions Trading System (EU ETS) was introduced in 2005, setting a cap on total emissions throughout the system. Emissions trading is an economic policy instrument which, like a carbon tax, puts a price on CO_2 emissions and thus creates incentives for cost-effective emission reductions – not least in industry and the energy sector.

Because emissions trading covers all major industrial and energy installations within the common European market, they face the same price for carbon dioxide emissions. The introduction of the trading system solved part of the problem of impacts on international competitiveness limiting the feasible scope of national instruments.[83-85]

Nowadays, the carbon tax and trading system together form the basis of the cross-sectoral economic

instruments of Swedish climate policy. Still, several factors indicate that the price signals from these instruments are not sufficient: multiple parallel societal goals, the risk of carbon leakage, and various institutional and behavioural barriers.[86] Therefore, those basic instruments have been supplemented with others, such as the electricity certification system, technology procurement, publicly funded information campaigns, a differential tax on vehicles, and various investment grants. Furthermore, EU-level instruments, such as emissions standards for new vehicles, have been important for driving vehicle fleet efficiency. However, there is also a risk of inefficiency when several complementary instruments are introduced in parallel. This is why the instruments must be analysed and monitored in order to ensure a high level of climate benefit.

Emissions trading has worked in the sense that emissions have not exceeded the fixed ceiling. Instead, large volumes of emission allowances have remained unused. The price of emission allowances has been consistently low, which has led to weak incentives to invest in new technologies for long-term emission reductions.[87] Several factors have contributed to the low price: the financial crisis of 2007–2008, the possibility of using inexpensive flexible mechanisms during certain periods, energy prices and renewable energy subsidies. Some of these factors have made a positive impact on technology development, but have further reduced prices in the trading system.

In 2014, the trading system was changed with the aim of strengthening the price signals. At that time, so-called backloading of unused emission allowances was introduced. These have been subsequently transferred to the market stability reserve (MSR), which started operating in January 2019.[88,89]

Under the MSR, from 2023 onwards the total number of emission allowances in the reserve should not exceed the total quantity of allowances auctioned in the previous year. Excess emission allowances will be permanently cancelled from the reserve. This means that the total amount of allowances in the trading system can be reduced. It is probable that the reform has already had an effect on the price, which increased from 7 euros per tonne in November 2017 to 23 euros at the beginning of March 2019[m].

With the new rules, national instruments that reduce the emissions included in the trading system can contribute to reducing total emissions within the trading system throughout the EU.[90,91] The earlier such instruments are introduced, the greater the long-term effect will be on total emissions in the EU. As a result, the recent trading system reform has weakened arguments against introducing complementary national instruments in the covered sectors. In the past, it could be argued that such national instruments only moved emissions from one nation to another.

The Government's 2018 climate report noted that additional national efforts must be stepped up to reduce emissions, even in the sectors covered by the trading system. The Climate Policy Council believes that the Government should identify proposals that can cost-effectively contribute to larger emission reductions.[n,81]

Further reforms of the trading system are under discussion. Among other topics, a price floor has been proposed by several countries to prevent the price of emission allowances from falling too low. It is also possible for individual countries to impose a price floor on their own, as the UK has done. Sweden's position in the EU negotiations on the future design of the trading system is a key element of national climate policy. In view of the need to accelerate the rate of emission reductions in sectors covered by the EU ETS, Sweden should proactively promote tightening up the trading system.[92–95]

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[m] https://www.eex.com/en/market-data/environmental-markets/spot-market/european-emission-allowances#!/2019/03/07

[n] In February 2019, the Ministry of Finance presented a memorandum proposing to almost completely remove reductions in the energy and carbon dioxide taxes for cogeneration plants within the trading system.

RECOMMENDATIONS — CROSS-SECTORAL INSTRUMENTS

Introduce legislation to give the Government the right to review plans to establish business activities that have the potential to hinder the attainment of national climate objectives.

Governance of the sectors covered by the trading system is currently weak. This raises questions about the relationship between the trading system and the environmental assessment of major point sources, such as proposed new industrial facilities with significant greenhouse gas emissions. In Sweden, the issue has arisen in connection with PreemRaff's plans to increase capacity at its oil refinery in Lysekil.[96] Once expanded, the refinery is projected to emit twice as much CO_2 as it does today, or about 3.4 million tonnes of CO_2 equivalent. This corresponds to 17% of today's total industrial emissions throughout Sweden.

In Germany, too, the question of national instruments for emissions included in the trading system has emerged. The question was raised at the time when the German government devised a plan to actively phase out all coal power generation before 2038.[97]

According to the EU Trade Directive[98] (which regulates the EU ETS) and the Industrial Emissions Directive (IED),[99] it is not possible for Member States to impose requirements related to greenhouse gas emissions when issuing a permit for an installation covered by the trading system. In the Swedish Environmental Code, the directives have been transposed into a provision that does not impose any requirements on such installations with regard to fossil fuel use. The provisions exist in order to protect the objective of the trading system, which is intended to result in cost-effective emission reductions in the EU.

The legal position is not entirely clear, however, and the issue is complex. For example, the UK has adopted national legislation[100,101] on limiting CO_2 emissions distinct from the standard environmental assessment and the IED. The EU has been informed of the legislation and the European Commission has not returned with any objection.

However, questions about the Environmental Code and the climate extend beyond what applies to installations covered by the trading system. Swedish law requires an environmental impact assessment when a permit application is considered for all business activities that affect the environment. Chapter 6 of the Environmental Code mentions climate impact as one of the environmental impacts to be taken into account in these assessments. On the other hand, the climate is not explicitly included in Section 1 of the general provisions of the Environmental Code, which specifies the overall objectives and areas of application. The section lists human health and the environment, biodiversity, valuable natural and cultural environments, resource management and reuse – but not the climate.

In its 2019 statement, the Government announced that all relevant legislation should be reviewed from the perspective of the climate policy framework. The Climate Policy Council recommends that in this context, the Government introduce climate considerations into that section of the Environmental Code.

Furthermore, the Council finds that the Government should introduce legal rules which, in addition to the regular permitting procedure under the Environmental Code and industrial emissions directive, give the Government the opportunity to consider new business activities that could affect the climate. The permit consideration should be subject to the admissibility of the installation or the conditions governing greenhouse gas emissions. This should apply to activities that can have a significant impact on Sweden's ability to achieve its national climate targets – also for activities covered by the trading system.

5. The Council's statement on the Government's climate report

The Government's first climate report under to the Climate Act was submitted to the Parliament as part of the 2019 Budget Bill. The climate report is structured in line with the climate targets and is based on the documentation provided by the Swedish EPA to the Government in March 2018.[102] It contains information on emissions trends, scenarios and policy decisions aimed at limiting emissions.

According to the Climate Act, the Government only needs to report decisions taken over the past year. However, the Government chose to report its climate decisions from both 2017 and 2018.

Section 4 of the Climate Act lays down three requirements for the contents of the Government's report to the Parliament. We comment on these requirements in Table 1.

TABLE 1 CLIMATE ACT REQUIREMENTS FOR THE CLIMATE REPORT AND CLIMATE POLICY COUNCIL COMMENTS.

Climate Act requirements	Reporting on emission trends.	Reporting on major climate policy decisions during the year and what these decisions can mean for greenhouse gas emissions trends.	Assessment of the need for further measures, and when and how decisions on such measures can be taken.
Climate Policy Council comments	The Government reports the historical emissions trend up to 2016 for the various climate goals and the scenarios that were developed in 2017 for the continued emissions trends. Updates of the emissions statistics and the scenarios that have become available since the climate report was presented.	The Government has mainly included decisions that explicitly aim to reduce greenhouse gas emissions – in other words, direct climate policy. Important measures in other policy areas are not recognised, even though they have a major impact on the potential to achieve the climate targets. With few exceptions, the Government does not report the effect of decisions taken on continued emissions trends.	The Government states that further measures are needed in several areas, but does not state which measures are involved or when and how decisions on such measures can be taken.

CLIMATE REPORTING

The Climate Policy Council considers that the Government's climate report only partially meets the requirements of §4 of the Climate Act.

The shortcomings in the climate report are mainly that the Government has not assessed the following:

- How decisions can affect emissions;
- Which additional measures can be needed; and
- When and how the Government will take decisions on such measures.

This last shortcoming is said to be due to the fact that the climate report was submitted by a transitional government. The Government states that it does not include anything about which measures may be relevant "because this bill should not contain any proposals that are politically controversial or have a clear partisan orientation".

The Climate Policy Council takes note of the Government's narrow interpretation of climate policy – that it only reports on decisions that have an explicit climate-related purpose, or what this report calls direct climate policy. We also note that the climate report is presented as a sub-annex to the budget bill annex for expenditure area 20, "General environment and nature conservation". It could be perceived that climate change is still seen as part of environmental policy first and foremost, and not as a cross-sectoral challenge that should inform comprehensive policy. The Climate Policy Council believes that the climate report should be presented at the same level as the Budget Statement, since the climate issue affects all policy areas. The Budget Statement is the primary document in the national budget that contains the Government's description of its overall objectives and priorities.

To maintain the credibility of the climate policy framework, it is essential that the Government periodically present an assessment of the climate impact of all decisions taken. The assessment should also indicate whether there is a need for further measures, and when and how decisions on such measures can be taken.

The Climate Policy Council considers it valuable that the Government has chosen to briefly report on global emissions trends and international cooperation on climate change. On that point, the climate report goes beyond legislative requirements. It is also positive that the report highlights cross-sectoral climate efforts. This concerns, for example, government agencies' environmental management efforts, regional and municipal climate efforts, and the transformation of the business sector, which was catalysed by the Government's Fossil-Free Sweden initiative. However, the Climate Policy Council would also have liked to see the Government report on its priorities on the issues being pursued in international efforts, just as with its national policies. Such reporting could, for example, address the Government's objectives and priorities in relevant negotiations that could affect the chances of achieving the national climate objectives – negotiations that took place in the previous year as well as those that lie ahead.

The Climate Policy Council would like to point out that the lack of a forward-looking perspective in the first climate report increases the significance of the four-year climate action plan that the Government will present in 2019. We look forward to reviewing the climate action plan and providing our assessment of it, which we are slated to do three months after the plan is reported.

DOMESTIC TRANSPORT

The Government notes that reducing emissions from domestic transport is crucial for achieving the long-term target by 2045 and the interim targets for emissions not covered by the trading system. The Climate Policy Council shares this view.

In April 2018, the Government presented what it calls "an action plan for fossil-free transport and electrification" as part of its communication "A climate strategy for Sweden".[67] For the most part, the action plan is an overall description of decisions already taken and inquiries already assigned. It does not provide any details on measures that must be taken to better guide the transport sector.

The Government writes that "the climate impact of road traffic depends on three factors: how energy-efficient vehicles are, what fuels are used and the volume of traffic. The transition of the transport sector to fossil-fuel independence thus requires measures aimed at more efficient vehicles, sustainable fossil-free fuels and increased transport efficiency, allowing for reduced traffic without impairing accessibility". The Government also writes that measures are needed in all areas, but that a gradual increase in the use of biofuels is central to achieving the climate goal for the transport sector. The Government briefly comments on developments surrounding each factor and then describes decisions that affect these developments.

Something the Government does not highlight in its climate report is the goal of increasing the share of pedestrian, bicycle and public transport in cities, the goal from the Government Communication "Strategy for liveable cities – Policy for sustainable urban development.[103]

In Chapter 8 we address the overall transport policy and our view of the need for additional instruments and other measures.

OTHER SECTORS NOT COVERED BY THE TRADING SYSTEM

The Government notes in its climate report that Sweden is close to reaching the 2020 interim target for those emissions not covered by the trading system. It considers that the target will be achieved without having to use emission allowances acquired through investments in global climate projects (so-called flexible mechanisms). Following the climate report, new emission data and scenarios have been released. These data show that emissions are decreasing too slowly to reach the target with domestic emission reductions only, and that the gap remains – in other words, there are still no instruments or principles for governance in place that provide sufficient emission reductions. Thus, the target is achievable by either using flexible mechanisms or introducing additional policy measures.

In the 2018 Budget Bill, the decision was announced to delete 5 million emission credits (equivalent to 5 million tonnes of CO_2 equivalent) that were acquired through the global climate action programme under the Kyoto Protocol through 2016. The Climate Policy Council notes that the transitional government did not propose to delete any emission credits in its 2019 Budget Bill. Nor has the Government mentioned any previous deletion of emission credits in the climate report. We believe that Sweden should continually delete any surplus of emissions credits – those that are not needed to meet the climate goals – issued under the Kyoto Protocol. In this way, emissions credits cannot be saved, sold or transferred to other periods. The units have little economic value due to the large surplus of the emissions credits available, but deleting them helps to reduce the total number of emission allowances.

After domestic transport, agriculture followed by working machinery accounts for the biggest emissions from sectors not covered by the trading system, by roughly 20% and 10%, respectively. The emissions reported in the agricultural sector come mostly from methane from animal digestion, methane and nitrous oxide from manure handling, and nitrous oxide and carbon dioxide from land use.

Reducing agricultural emissions poses one of the most difficult climate change challenges, and some emissions from agriculture will probably linger beyond 2045. The Government does not report any actions taken in the past two years to reduce the climate impact of agriculture, either by reducing emissions or by increasing the capacity of agricultural land as a carbon sink. For working machinery, which is also used in agriculture, the Government mentions one implemented measure: it is subject to the newly introduced reduction obligation for fuels.

For smaller industries outside the trading system, the carbon tax on heating fuels is a strong regulator. The Government is taking a step in the right direction when it notes that previous tax reductions for these fuels, which have been progressively limited, are now completely phased out. Another investment the Government mentions in the context of phasing out fossil fuels is support from the Climate Leap investment programme.

SWEDEN'S TOTAL GREENHOUSE GAS EMISSIONS

Sweden's total greenhouse gas emissions[o] include emissions from activities within Swedish territory, which in turn are allocated to the emissions included in the trading system, and to emissions not included in the trading system.

[o] The estimate of emissions from operations within Swedish territory does not include emissions and removals from land use, changes in land use and forestry (LULUCF).

The Government emphasises that the trading system is a cost-effective instrument designed to ensure that the EU achieves its common goal. It is not designed to achieve the national targets of individual Member States. In addition, the Government refers to its remit to the Swedish National Institute of Economic Research, which states that starting from the trading system review for the fourth trading period, national measures might have an effect on the total EU emission cap.

The Government was a strong driving force behind the revision of the trading system rules for the fourth trading period in order to reduce surpluses and strengthen price signals. This led to the reform of the market stability reserve (MSR), which will allow portions of the surplus to be removed from the system in the future.

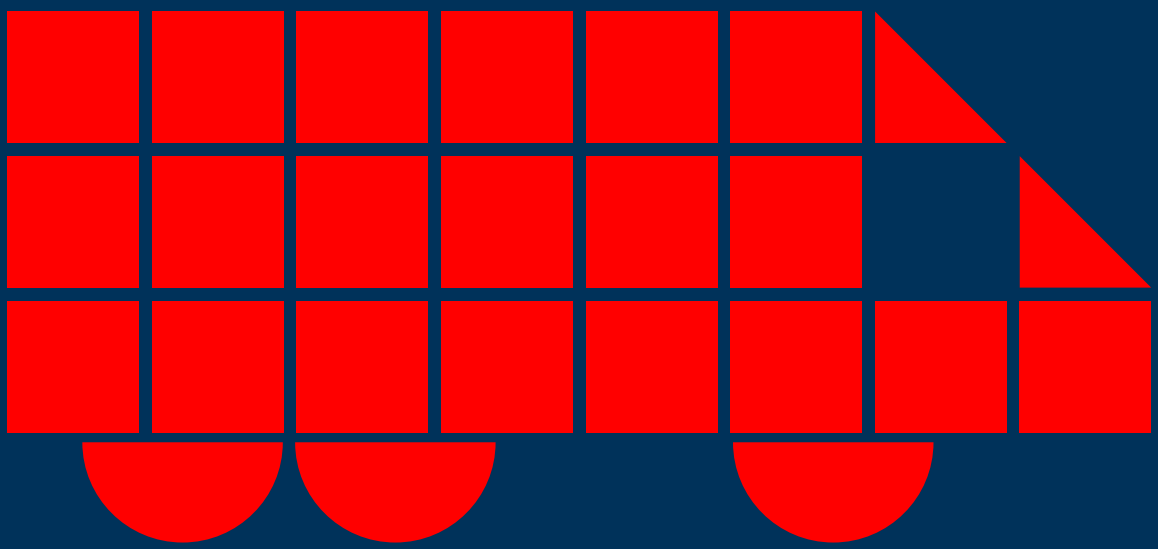
The Government further notes that achieving the 2045 target requires further (national) measures to reduce emissions, both in terms of emissions included in the trading system and those not included. The Climate Policy Council shares this view.

The Government also reports on additional investments that affect emissions from industry: the Industriklivet ("Industry Leap") project, including HYBRIT, Energisteget, and the Swedish Energy Agency remit to coordinate efforts to develop sector strategies. In addition, a number of decisions in the energy area are presented, such as the 2017 energy policy agreement,[104] the extension of the electricity certificate system (which provides for increased electricity generation from renewable energy sources), tax reduction for self-produced renewable electricity, investment aid for solar cells and other decisions. A fundamental decision the Parliament has taken is to reduce the carbon tax discount given to power and heat cogeneration plants that are part of the trading system. Coal is being phased out of Swedish power and heat cogeneration plants, and the tax change can accelerate this trend.

The Government also reports on decisions concerning domestic flights. It has adopted an aviation strategy that includes emission reductions among its objectives. In April 2018, an excise duty was introduced on air travel. Recently, an inquiry into a greater use of biofuels for aviation was also reported.[105]

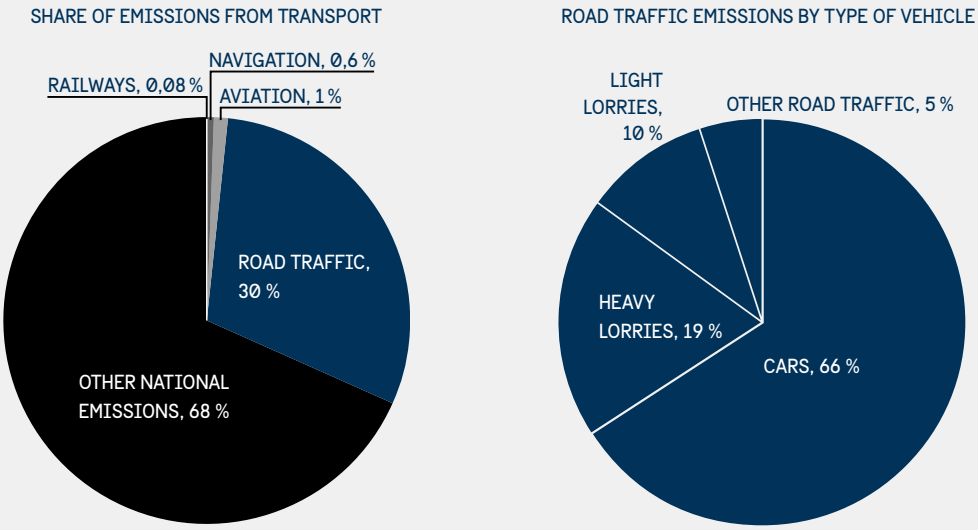
In addition to the emissions covered by the climate targets, the Government briefly describes its efforts to restore and create wetlands. The investment is expected to total 200 million SEK (approximately 20 million euro) annually, also for 2019 and 2020. Sweden is also one of the countries behind the so-called "4 per 1000" Initiative, which is now supported by 100 or so countries and organisations. The initiative aims to increase the carbon content in cultivated land by 0.4% annually. However, the climate report does not specify how this will be implemented or what effect these decisions can have on emission trends. In this context, the Government also notes briefly that the EU has reached an agreement for the Land Use and Land Use Change (LULUCF) sector in the EU climate framework for 2030.

6. The transport sector's greenhouse gas emissions – key historical and future trends



The transport sector encompasses all domestic transport by land, sea and air, and today accounts for roughly one third of Sweden's total greenhouse gas emissions. Road traffic causes more than 90% of these emissions.[30] Of that share, passenger cars account for 66% of emissions, while heavy vehicles account for 19%. The transport sector's high emissions are due to the fact that a large share of domestic transport involves road vehicles that are mainly fuelled by petrol and diesel.

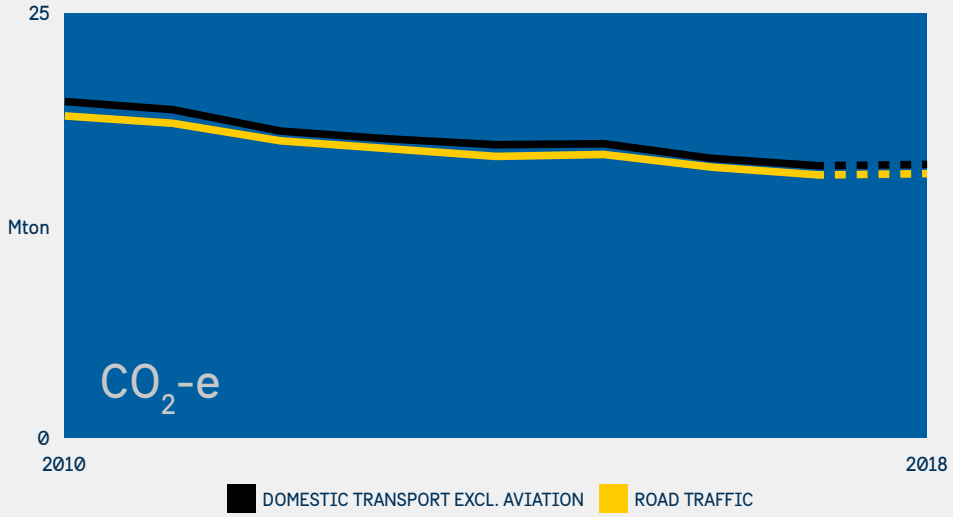
FIGURE 12 – LEFT: GREENHOUSE GAS EMISSIONS FROM ROAD TRANSPORT, SHIPPING, AVIATION AND RAIL AS A SHARE OF TOTAL EMISSIONS. RIGHT: GREENHOUSE GAS EMISSIONS FROM PASSENGER CARS, HEAVY AND LIGHT COMMERCIAL VEHICLES, AND OTHER ROAD TRAFFIC AS A SHARE OF EMISSIONS FROM ROAD TRAFFIC, 2017.



Source: Swedish EPA

Emissions covered by the 2030 transport goal fell by 19% between 2010 and 2017, or about 3% per year (see Figure 13). Preliminary data from the Swedish Transport Administration show that emissions increased slightly in 2018.[106] Aviation emissions are not included in the transport goal, since they are covered by the trading system and are therefore not addressed below. However, emissions from domestic flights are included in the overall goal of net-zero emissions by 2045.

FIGURE 13 – GREENHOUSE GAS EMISSIONS FROM TRANSPORT (MILLION TONNES OF CO_2 EQUIVALENT), 2010–2018.



Source: Swedish EPA/Swedish Transport Administration

The transport sector's emissions are affected by three main drivers:

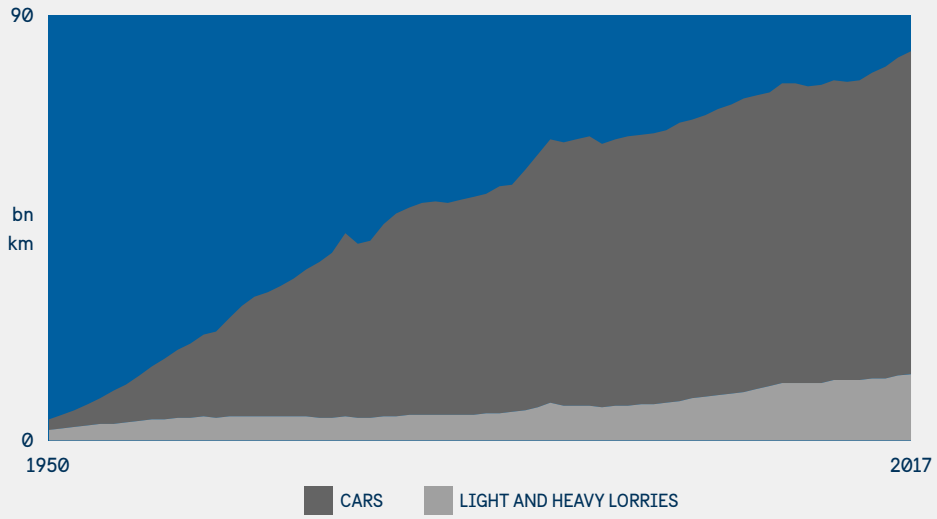
- Traffic volume: The total number of kilometres that all vehicles travel in the transport system;
- Transport system efficiency: The relative share of transport that uses different modes (such as trains, buses or cars) and how efficiently these modes of transport are utilised;
- Emission intensity: The amount of greenhouse gas emissions generated per kilometre, which can be affected by the fuel used, vehicle fuel efficiency, vehicle weight, the way of driving, road design and speed.

We describe the historical trends of each of these drivers in more detail in the following sections, followed by an overview of three trends that will affect the evolution of the transport system and thus emission trends in the coming years: electrification, automation and the emergence of new services and sharing solutions.

PERSISTENT TREND WITH INCREASED TRAFFIC VOLUMES

The long-term trend of the transport system has been towards more cars and increasing traffic (Figure 14). Contributing factors have been economic development, population growth, a change in the structure of society, shifting production patterns in industry, and the increased globalisation of value chains.
In particular, passenger car traffic has risen sharply since 1950, and lorry traffic grew more than fivefold during this period. The increasing volume of traffic represents the main drier of increased greenhouse gas emissions from transport, even in recent years.

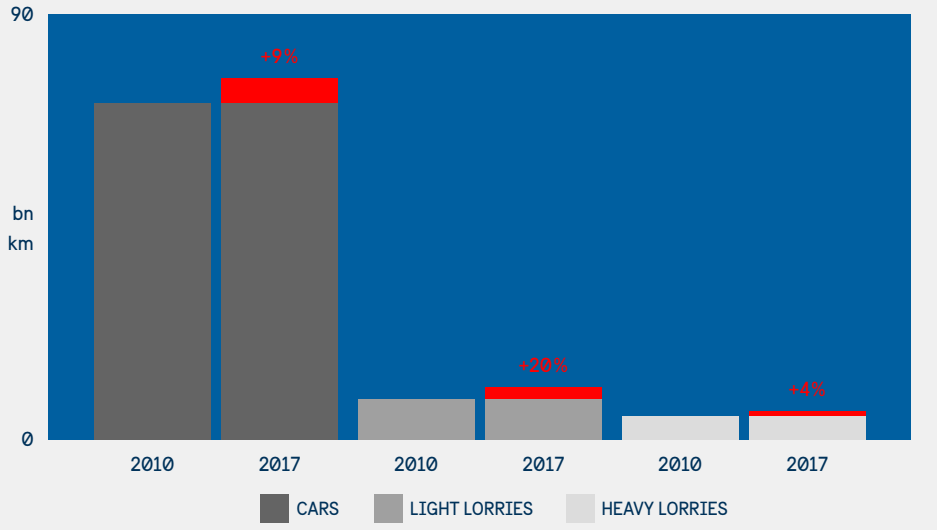
FIGURE 14 – ROAD TRAFFIC TRENDS (BILLIONS OF VEHICLE KILOMETRES), 1950–2017.



Source: Transport Analysis

The interim target for the transport sector applies to the period from 2010 to 2030. Figure 15 shows road traffic trends between 2010 and 2017, broken down by mode of transport. All types of road transport have continued to increase, with the biggest increase seen in light commercial vehicle and passenger car transport.

FIGURE 15 – TRAFFIC VOLUME FOR PASSENGER CARS AND COMMERCIAL VEHICLES (BILLIONS OF VEHICLE KILOMETRES), 2010 AND 2017.



Source: Transport Analysis

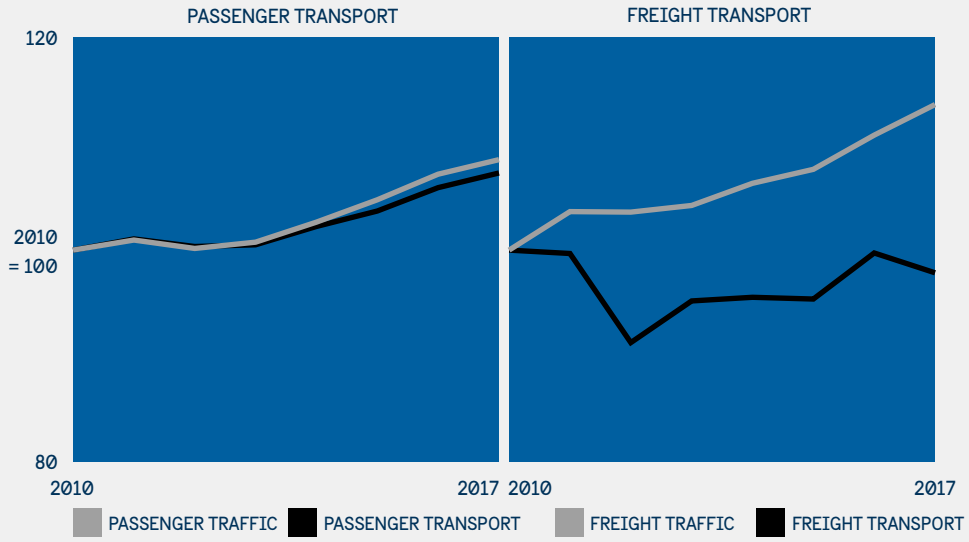
6.2 THE EFFICIENCY OF THE TRANSPORT SYSTEM HAS INCREASED OVER TIME, BUT PROGRESS IS SLOWING DOWN

The efficiency of the transport system can be characterised in different ways. Comparing the quantity of goods transported with economic growth, for example, reflects the extent to which economic development is transport-dependent. Transport trends can also be compared with the value of the goods being transported, reflecting the economic productivity of the transport sector.

Comparing traffic volume trends (measured in vehicle kilometres) with the total transport volume (measured in passenger kilometres and freight kilometres) is a means of capturing efficiency in the transport system's basic function, i.e. how efficiently goods and people are transported. The more goods that can be transported by a given amount of traffic, the higher the overall utilisation rate of the transport system – that is, its efficiency.[p] In general, efficiency increases with larger shares of passenger transport using public, shared transport and larger shares of freight transport using heavy goods vehicles. It is also possible to increase the utilisation rate of road transport through better logistics planning and route optimisation. A shift from road to rail and sea transport also increases efficiency.

From a longer-term perspective, the transport system – thanks to better infrastructure, new technologies and faster, bigger and more efficient vehicles – has improved logistics planning and become increasingly efficient. Thus, transport volumes have increased in relation to the amount of traffic. However, as shown in Figure 16, the trend after 2010 indicates that traffic volumes have increased more than the volumes of transported passengers and goods. This indicates that the efficiency of the entire transport system has declined, particularly for freight transport.

FIGURE 16 – TRANSPORT AND TRAFFIC VOLUME TRENDS FOR PASSENGER TRANSPORT AND FREIGHT TRANSPORT, INDEX 2010=100.



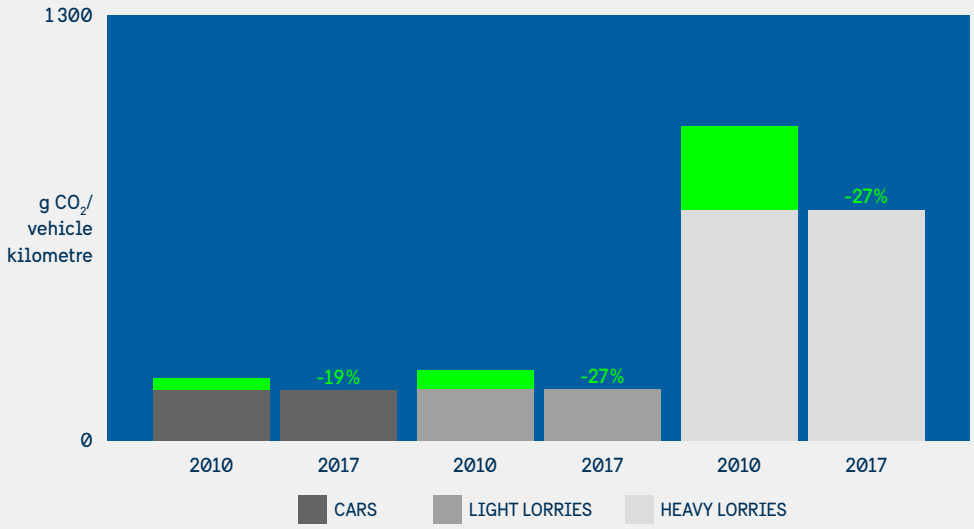
Source: Transport Analysis and own adaptation.

[p] Fill rate is a term that lacks a general definition, but is often used to describe how efficient transport is. The rate is measured as a percentage of the utilised loading metres (total area) and sometimes as a percentage of the total volume of a truck. The fill rate can also be defined based on the proportion of the total weight the vehicle uses.

THE EMISSIONS INTENSITY OF ROAD TRANSPORT HAS IMPROVED, BUT THE PACE HAS SLOWED DOWN

The emissions intensity of road transport is determined by the use of energy per kilometre for the vehicles used, combined with the fossil fuel content of the energy. The emissions intensity decreases as energy efficiency improves or fossil fuel content decreases. Both these factors contributed to a reduction in the emissions intensity of road traffic between 2010 and 2017, which is shown in Figure 17. Heavy and light commercial vehicles have shown the greatest improvement, while passenger cars show somewhat slower improvement.

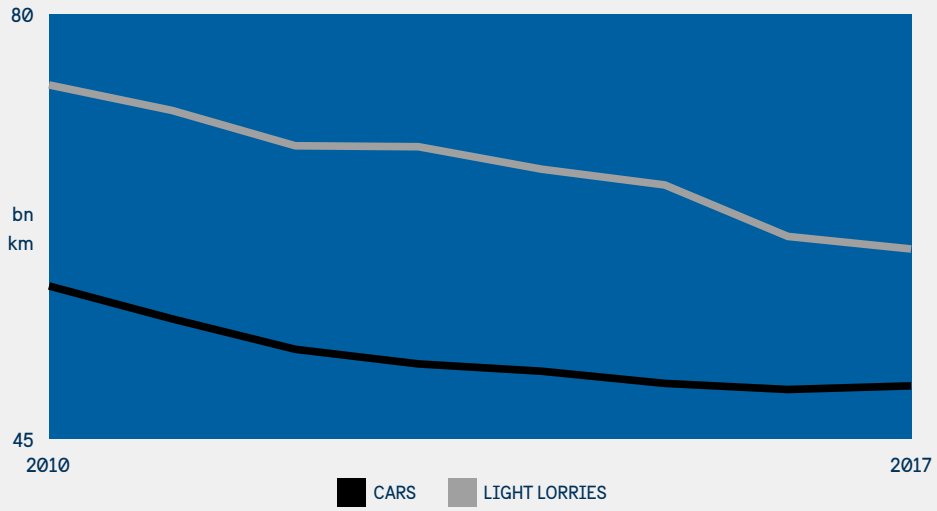
FIGURE 17 – AVERAGE CO_2 EMISSIONS (GRAMS OF CO_2/VEHICLE KILOMETRE) FOR PASSENGER CARS AND LIGHT AND HEAVY COMMERCIAL VEHICLES, 2010 AND 2017.



Source: Swedish Transport Administration.

The energy efficiency of newly registered vehicles improved sharply between 2010 and 2017, and somewhat more slowly for light commercial vehicles (see Figure 18). For passenger cars, energy consumption per kilometre has long been declining; newer cars are more efficient than older ones, making the vehicle fleet gradually more efficient. However, 2017 was the first year since the beginning of the 21st century that the trend reversed.

FIGURE 18 – ENERGY EFFICIENCY OF NEW VEHICLES (KWH/100 KM), 2010–2017.

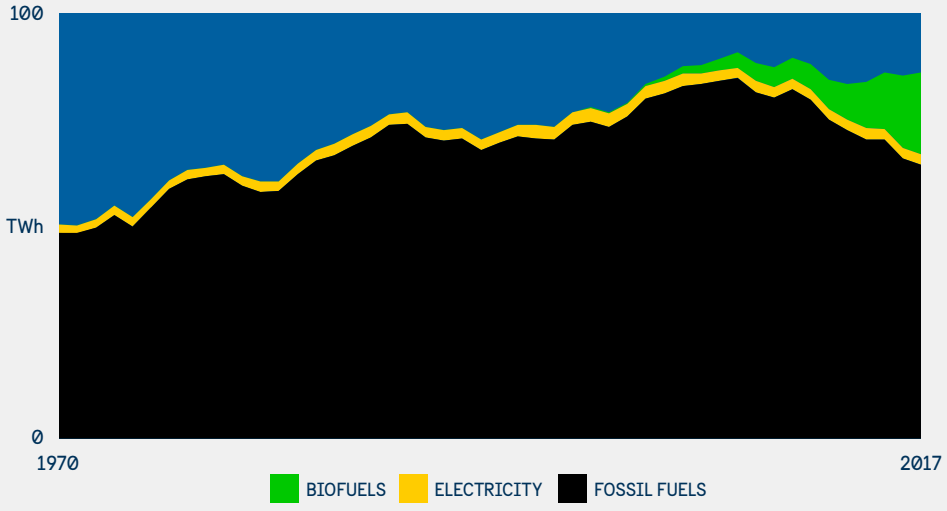


Source: Swedish Energy Agency, Transport Analysis, Swedish Transport Administration, adapted by the 2030 Secretariat.

Energy use in the transport sector is still dominated by fossil fuels (Figure 19). Electricity (the yellow field in Figure 19) is mainly used for rail transport, and its share has been stable for a long time. The growth we now see in electric car sales is still too small to have an effect on the distribution of the use of different types of energy in the transport sector. On the other hand, biofuel use has grown rapidly since the beginning of the 21st century (Figure 20). The growth started in 2000 with the use of ethanol, but since 2007 biodiesel (mainly hydrogenated vegetable oil, or HVO) has accounted for the entire growth. In 2017, the total share of biofuels was just over 22%.

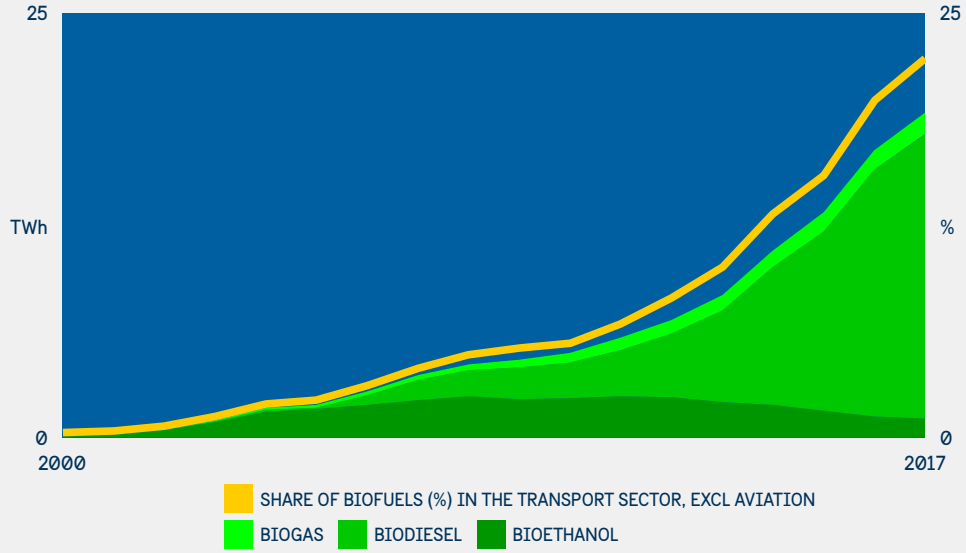
Data from the Swedish Petroleum and Biofuels Institute (SPBI) show that the use of biofuels fell by 5% in 2018. The use of HVO fell by 14%. One explanation is the transition to a reduction obligation, which entails full taxation of the biofuels blended into petrol and diesel. The price of HVO has also increased in relation to diesel.[106]

FIGURE 19 – FINAL ENERGY USE IN THE TRANSPORT SECTOR, EXCLUDING AVIATION, 2000–2017 (TWH).



Source: Swedish Energy Agency.

FIGURE 20 – BIOFUELS IN THE TRANSPORT SECTOR PER FUEL TYPE, EXCLUDING AVIATION, 2000–2017 (TWH), LEFT AXIS, AND SHARE OF TOTAL ENERGY USE, RIGHT AXIS.



Source: Swedish Energy Agency.

In recent years, the reduction of CO_2 emissions from new cars has been driven by a general boost in the efficiency of all engine types. The year 2017 deviates from this pattern because the decline was mainly due to an increased number of electric cars and hybrids with emissions below 50 grams of carbon dioxide per kilometre. Together with gas-powered cars, electric cars and hybrids in the first three quarters of 2018 accounted for 8.4% of newly registered passenger cars, which can be compared with 5.8% in the corresponding 2017 period. At the same time, the percentage of cars affected by the malus component of the bonus-malus system[q] has fallen to 86% in the first three quarters of 2018, compared with 89% in the corresponding 2017 period.[107]

Clean electric vehicles and plug-in hybrids are more energy-efficient and have lower emissions than vehicles with an internal combustion engine. However, although sales of chargeable cars are accelerating, electrification has not yet had a major impact on total emissions. Chargeable vehicles' share of the fleet is still just over 1% (1.3% at year-end 2018.[108])

6.4 KEY TRENDS FOR THE FUTURE TRANSPORT SYSTEM

For the future development of the transport system, three trends currently show the most promise for bringing about profound changes over the coming decades:[109-112]

- Electrification;
- Automation; and
- The emergence of new services and sharing solutions.

[q] A bonus-malus-system for the purchase of new light vehicles, was implemented in 1 July 2018. Vehicles with low emissions of carbon dioxide qualify for a bonus at purchase, while vehicles with high emissions of carbon dioxide will be taxed at a higher rate for the first three years.

Together, these three trends have the potential to radically change the transport patterns of goods and people. All three will likely cause significant cost reductions, which can drive demand for road transport and thus lead to increased emissions, congestion and other traffic-related problems. More sustainable transport solutions, such as increased use of public transport, rail, cycling and walking, will find it harder to compete. The gains made from a more efficient use of the transport system therefore risk being counteracted by increased traffic volumes (see Table 2), so the overall effect on greenhouse gas emissions is uncertain.

Faced with this three-part challenge – stimulation economic growth and development, achieving zero fossil emissions and keeping up with rapid technological change that Sweden cannot significantly influence – policies must be proactive, and key approaches must be identified early on. This will open up opportunities to create sound ground rules for the implementation of new technologies, while minimising risks.

TABLE 2 KEY TRENDS IN THE TRANSPORT SECTOR AND THEIR IMPACT ON UNDERLYING DRIVERS OF EMISSIONS.

Trend	Traffic volume	Efficiency of the transport system	Emissions intensity
ELECTRIFICATION	 Reduced marginal cost increases demand.	 Road transport is increasing at the expense of public transport.	 Energy-efficient vehicles without direct emissions.
AUTOMATION	 Increased convenience and reduced marginal cost increase demand.	 New opportunities for automating public transport.	–
NEW SERVICES AND SHARING	 Increased efficiency reduces costs and increases demand.	 Higher number of passengers per vehicle	–

 Increased emissions

 Decreased emissions

 Unknown effect on emissions

ELECTRIFICATION

Electric vehicles have many advantages over vehicles with an internal combustion engine. However, the high cost of batteries with sufficient capacity has been a major obstacle, which has made the purchase cost of electric vehicles high and market demand low.[113]

In recent years, innovations in battery technology and strong government stimulus in many countries have driven down costs and improved battery performance. This, in turn, has enabled a rapid increase in the supply of fully or partly electric vehicles.[114] Global sales of electric cars topped 1 million in 2017. More than half of these vehicles were sold in China. Norway, meanwhile, has the largest share of electric cars in new sales; close to 40% of all new cars sold in 2017 were chargeable.[115]

In Sweden, electric car sales rose by more than 50% from 2017 to 2018,[116] but in 2018 chargeable cars (clean electric cars and plug-in hybrids) still represented only about 8% of the total new sales of passenger cars. If hybrid vehicles are also included, the share rises to just over 13%. Forecasts that the Transport Analysis agency have created[117] indicate that with current policies, the share of clean electric cars will represent about 6% of the entire vehicle fleet in 2030, and will increase thereafter. Both light and heavy electric lorries are entering the market and are expected to take off soon, with the launch of several new models during 2019.[112]

Policy instruments that raise the cost of liquid fuels can benefit electric-powered vehicles even more, when the relative cost of electric power compared to petrol and diesel power falls further. Examples of such instruments can include a tax on liquid fuels, or requiring a progressively greater share of biofuels.

Electrification also generates side benefits, such as reduced noise and improved air quality in cities. At the same time, however, there is a risk of increased traffic volumes with more congestion and queues on the roads due to the low marginal costs of electric power.

There is much to suggest that electrification will accelerate in Sweden in the coming years, both for passenger cars and for lorries. Nevertheless, vehicle fleets are transitioning rather slowly. Cars in Sweden have an average lifespan of 18 years.[118] This implies an inherent inertia and means that the percentage of electric vehicle kilometres on Swedish roads will remain relatively low in 2030.[119]

AUTOMATION

With autonomous driving, driving software performs all or part of the task of driving. From a societal perspective, increased automation of the vehicle fleet is seen as an opportunity to improve road safety by reducing the number of accidents caused by human error. In addition, fuel consumption can be reduced thanks to the smooth driving of these autonomous vehicles and optimal route selections. Another positive consequence is the more efficient use of existing traffic infrastructure through capabilities such as platooning, in which several vehicles drive closely together in an aerodynamic, fuel-efficient convoy.

For the haulage industry, the possibility of new services and lower transport costs are strong drivers for developing automated freight transport solutions. For buyers in private industry, transport costs are also a strong driver. Automation can help to provide a solution in two ways:

- By increasing efficiency and thereby reducing fuel costs; and
- By lowering or completely eliminating the cost of drivers.

For most types of transport, these two categories combined represent around two thirds of all costs.[r] Major auto manufacturers expect to launch largely self-driving vehicles on the market around 2020, and up to 15% of new sales of passenger cars might be completely self-driving by 2030.[110]

The Transport Analysis Agency has assessed that, with the right instruments, self-driving vehicles will improve the conditions for achieving the transport policy objectives. The agency points to a variety of cost savings and quality improvements that contribute to the functional goal of increased accessibility. It also predicts that commercial vehicles will be automated sooner than passenger vehicles.[117] The combination of societal and economic arguments indicates that self-driving vehicles may become an everyday part of the streetscape in Sweden by the mid-2030.[120]

However, there are also risks to consider. For Sweden, an examination of autonomous vehicles[121] underscores several drawbacks to introducing connected, automated driving on our roads. This includes the risk of increased traffic volumes as more empty vehicles circulate on the roads, and the risk that loads will be shifted away from more efficient means of transport.

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[r] https://www.akeri.se/sv/transportekonomi/index

NEW SERVICES AND SHARING SOLUTIONS

Fundamentally, sharing solutions are about increasing the degree of utilisation of products and physical resources. Today, information and communication technology (ICT) provides new digital services that can distribute sharing solutions beyond a circle of close acquaintances or one's own company. The transport sector already provides examples of sharing services available on the market, such as carpooling, and other services with the potential to emerge, such as sharing services for transporting goods.

Sharing solutions can help reduce greenhouse gas emissions from the transport system by increasing transport efficiency. A study of the circular economy assessed measures to facilitate the development of carpooling as a priority. It found that most studies show positive impacts on energy use and the climate from carpooling; it also helps increase resource efficiency.[s, 122-124]

There is a sluggishness when it comes to new services in the transport sector and their ability to make an impact. Some of the reasons for this can be found in current legislation and regulations.[125,126] Significant behavioural changes will be required to enable sharing services to significantly scale up, reduce travel and lower emissions from passenger transport. Sharing solutions and new services targeted to companies, which are driven more by financial incentives, might be adopted more quickly.[127]

Opinions differ on whether more opportunities to share resources increase demand for travel and transport or, on the contrary, whether this leads to less traffic. In the current situation, it is not obvious how this trend will evolve or how it will affect greenhouse gas emissions from the transport sector.

From a broader perspective, digitalisation helps to increase the utilisation rate for vehicles and infrastructure, which in turn allows for a much more efficient use of resources and lower greenhouse gas emissions. The effects on greenhouse gas emissions go beyond the transport sector. For example, if the vehicle fleet can be used more efficiently, emissions from vehicle manufacturing and raw material extraction can also be reduced.[128] If self-driving vehicles use the road surface more efficiently, emissions from new motorway construction and asphalt and cement production can be reduced.[129] Resource-efficient, circular business models in the transport sector thus contribute to reducing global emissions in other sectors as well.

[r] A special investigator was appointed in August 2018 and tasked with submitting proposals on how to promote car, motorcycle and moped pooling services. The main reason is to stimulate a circular economy with more resource-efficient passenger transport options (Dir. 2018:93). The final report is to be submitted to the Government on 18 December 2019.

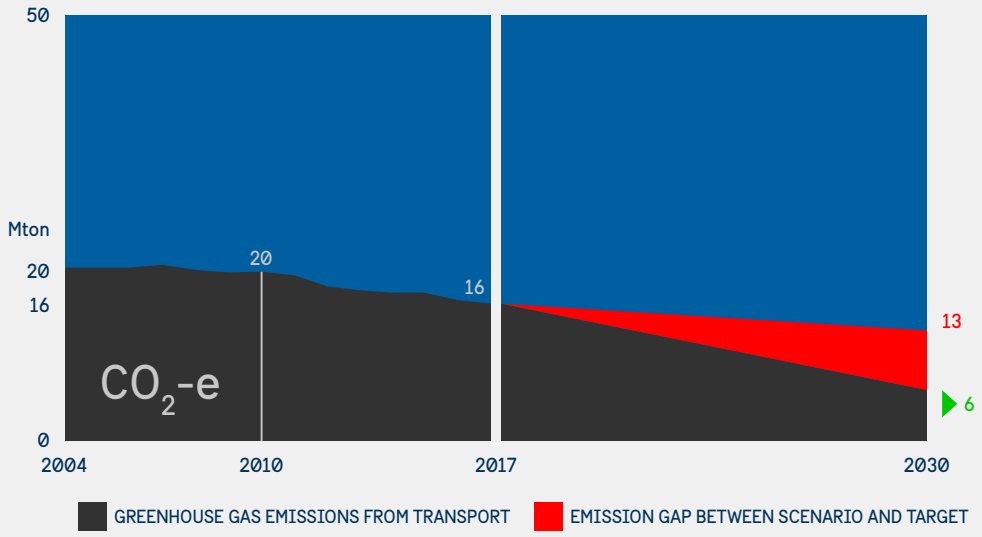
7. The road to fossil-free transport

The technical and economic potential already exist for achieving the target of a 70% reduction in transport emissions by 2030. However, there is no overarching official strategy for getting there.

In its latest scenarios, the Swedish EPA indicates that with current policies, emissions from the transport sector[s] will be reduced from today's 16 million tonnes of CO_2 equivalent to close to 13 million tonnes by 2030. The Swedish Transport Administration's scenario[106] shows roughly the same, with a reduction to 12 million tonnes of CO_2 equivalent.

This implies an emissions gap of 6–7 million tonnes (see Figure 21). In these scenarios, the emission reductions expected by 2030 are mainly due to an increased biofuel blend and more efficient vehicles. Only minor contributions are expected from electrification of the vehicle fleet and a more efficient transport system.

FIGURE 21 – THE LATEST SCENARIOS SHOW THAT WITH CURRENT POLICIES, 6–7 MILLION TONNES OF CO_2 EQUIVALENT REMAIN IN EXCESS OF THE 2030 TARGET.



Source: Swedish EPA/Swedish Transport Administration.

TRANSPORT SECTOR GOALS

On current trends and under current policies, the transport sector will only progress halfway to the 2030 target of reducing emissions by at least 70%.

[s] From the part of the transport sector covered by the target, i.e. domestic transport excluding air.

To close the remaining emission gap, three types of changes can make significant contributions during the period leading up to 2030:

1. Create a more transport-efficient society by limiting demand for transport and shifting transport to more efficient modes.
2. Increase the pace of electrification by fostering a transition to electric vehicles and accelerating the expansion of charging infrastructure.
3. Phase out fossil fuels through more efficient vehicles and an increased share of biofuels.

REDUCED DEMAND AND MORE EFFICIENT MODES OF TRANSPORT – THE ROAD TO A TRANSPORT-EFFICIENT SOCIETY

The increase in traffic volumes, historically and today, has involved cars and lorries powered mainly by fossil fuels.[130] By promoting development that prioritises accessibility through proximity and by creating more dense, mixed-use neighbourhoods, some of the transport that we currently use can be replaced or completely avoided.[130–136]

More trips need to occur by bicycle, walking and public transport, which have higher energy efficiency and lower emissions than car traffic. Freight transport involves using longer and heavier vehicles, more rail and sea transport, and making use of all transport modes more efficiently through improved logistics planning, traffic management and traffic information.[137] In urban areas, freight transport can be streamlined through measures such as better coordination and groupage as well as the use of lighter, emission-free vehicles.[138–140]

Studies suggest a high cost-effectiveness[136,141] when implementing changes that lead to a more transport-efficient society. It is generally not about doing more, but about doing the right things. For example, road surfaces in cities can be converted from car use to pedestrian and bicycle use at a low cost without long decision-making processes. Other changes take longer and may require extra investment. This is true for changes involving the expansion of public transport or densification and mixed-function in urban areas, where people have close access to activities, functions and other values. Reducing car dependence in urban areas can bring about positive distributional effects and can improve the urban environment and public health.[75,138,142]

The Swedish Transport Administration assesses that the potential for emission reductions through a more transport-efficient society is considerable. The agency assesses that car traffic can be reduced by 27–40% by 2030 from current levels without decreased accessibility. Estimates indicate that lorry traffic could be reduced by about 6% over the same period. But for this to happen, policy instruments are needed. In fact, without introduction of new policies, the Swedish Transport Administration assesses that passenger car traffic will instead increase by 20% by 2030, while lorry traffic will increase by 30%. Such a development would run counter to the climate targets.[143]

Creating a more transport-efficient society demands radical changes. For example, infrastructure planning needs to be reorganised at the national, regional and local levels. Initiatives that benefit passenger and commercial transport by car must be replaced by initiatives that promote collective solutions, cycling and walking. More people need to choose public transport and to share cars instead of owning their own. Speeding this development requires building confidence in rail and its reliability and punctuality. New infrastructure is also crucial for increasing the capacity of both long-distance travel and local public transport. The Climate Policy Council does not take a stance on how to distribute these investments between, for example, high-speed and conventional rail. This issue should be determined within the framework of infrastructure planning, which is discussed in Chapter 8.

As far as possible, face-to-face meetings need to be replaced by travel-free meetings. Behaviours can be deeply ingrained, so sustainable solutions need to become more attractive. Policy is important in this, but we also need new business models for the mobility services of the future.

Many of these changes will need to take place in cities and urban areas that offer viable alternatives to cars. In more sparsely populated parts of the country, the car is often the only possible means to access work and services. Instead, more efficient vehicles and fossil-free fuels will be central to reducing emissions, coupled with expanded public transport. Equity aspects must therefore be managed, and the instruments adapted to different conditions and circumstances.[75] This is further discussed in Chapter 8.

ACCELERATE ELECTRIFICATION

There is much evidence that electrification will play a central role in solving the transport sector's climate challenges, in particular beyond 2030. Electric technologies have many advantages over vehicles with internal combustion engines, including zero local greenhouse gas emissions, reduced emissions of other pollutants, lower noise levels and significantly lower operating costs. To date, progress has been slow because of high purchase costs, limited availability and uncertainties around issues such as battery life. However, the falling cost of key components for electric vehicles and improved availability are strengthening the economic arguments for the electrification of both passenger transport and freight transport vehicles.

However, other obstacles stand in the way of accelerated electrification. Among them are bottlenecks in the value chain, especially for batteries, and the need to expand production capacity to meet demand. All this, in turn, is hampered by increasing competition for limited reserves of critical metals, posing challenges to the environment as well as to workplace health and safety. The expansion of new battery factories is underway, as is research for developing alternative battery solutions, including in Sweden.

The development of both electric vehicles and battery technology mostly takes place in other countries and can only be affected marginally by decisions in Sweden. The global pace of electrification will thus largely determine future potential in Sweden.

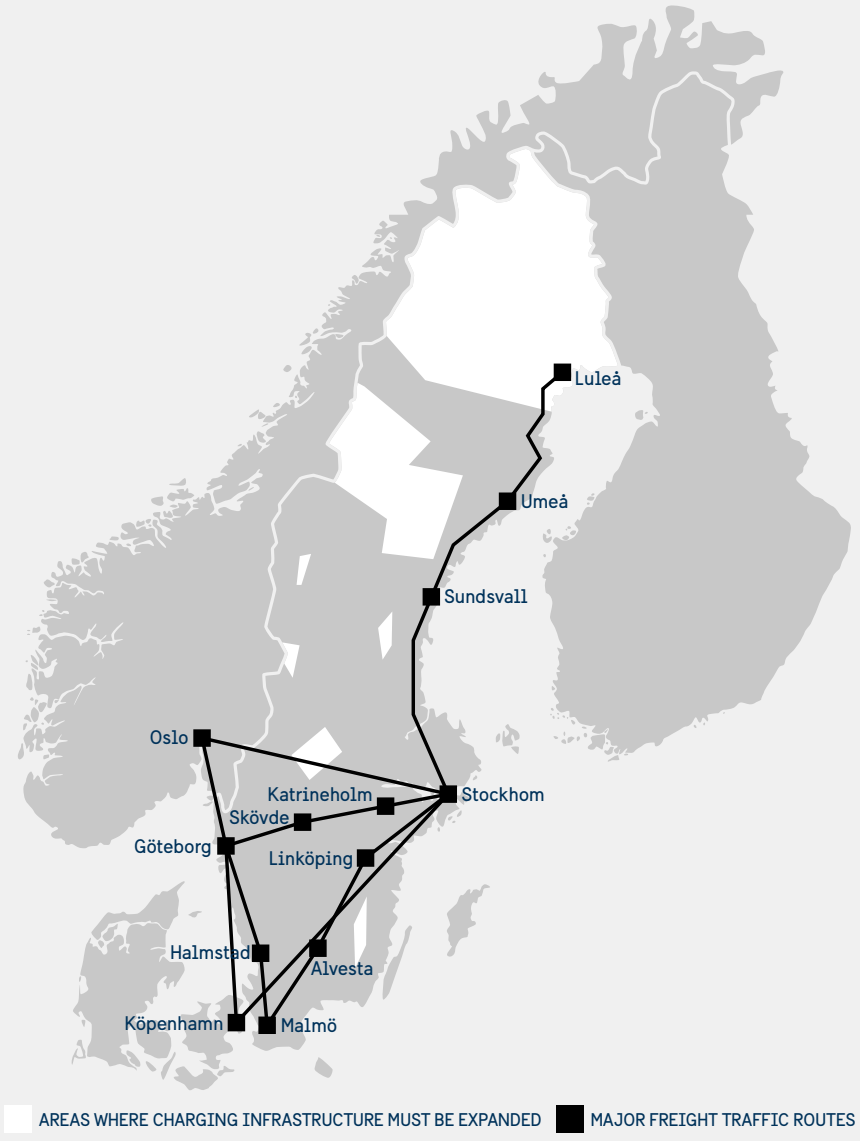
Despite the global market's influence on the pace of electrification, political decisions in Sweden can remove national obstacles to electrification. One such obstacle is limited access to charging stations, which have received some state support.[t] The need for public charging infrastructure for electric cars varies depending on the type of vehicle and part of the country. For example, passenger cars are mainly charged at home, requiring only small, private investments.

However, providing charging infrastructure to all users of electric vehicles throughout the country will require a comprehensive public charging network for electric vehicles. Such a network is already being developed in cities, while the infrastructure in more sparsely populated regions is not developing as quickly.[144] A comprehensive charging infrastructure for passenger cars can be achieved by establishing quick-charging stations every 100 kilometres, on routes identified by the Swedish Transport Administration[144] as "white spots" along the main roads (the white areas on the map in Figure 22). This would ensure that, across the country, a charging station would always be within reach, providing increased reliability and availability. According to estimates from the technology consultancy WSP, such infrastructure would have a long-term cost of only 7.5 million SEK (approximately 750 000 euro) annually over the lifetime of the equipment. This includes capital expenditure for the charging stations and infrastructure, but not investments in increased capacity in the electricity grids.[145]

By contrast, freight transport needs a nationwide charging infrastructure with a very high capacity, involving substantially more investment than for passenger cars. Freight transport requires an initial focus on establishing the charging infrastructure in depots and transport nodes, including ports, terminals and logistics centres where large volumes of goods pass through. In addition, some kind of electrified motorways is needed along busy routes, such as between the three capital cities in Scandinavia (Copenhagen, Oslo and Stockholm) and along the Baltic Sea coast between Luleå and Stockholm. By installing charging infrastructure in transport nodes and along the main roads connecting these nodes, much of the freight transport can be performed by electrified vehicles.

[t] For example, through the Climate Leap.

FIGURE 22 – THE WHITE AREAS SHOW WHERE THE CHARGING INFRASTRUCTURE FOR CARS MUST BE EXPANDED, WHILE THE BLACK LINES SHOW MAJOR FREIGHT TRAFFIC ROUTES WHERE INVESTMENTS IN CHARGING INFRASTRUCTURE FOR HEAVY TRAFFIC SHOULD BE FOCUSED.



Source: Developed by WSP on behalf of the Climate Policy Council.

Electrification has accelerated rapidly in many countries over the past decade. Global sales of chargeable cars increased by 67% annually between 2011 and 2017.[112] Even the least positive scenarios envision a sharp increase in the number of chargeable vehicles by 2030, for passenger cars as well as for buses and lorries.[112] The IEA estimates that 25–35% of new passenger car sales in the EU will be chargeable vehicles in 2030, with the Nordic countries in the upper range.[115,146]

For Sweden, the Transport Agency, the Transport Administration, the Energy Agency and the Environmental Protection Agency assessed in a joint analysis[144] that chargeable vehicles can represent between 20% and 38% of new sales in 2030. In the same year, chargeable vehicles will make up 10–15% of the total vehicle fleet. This is a conservative estimate compared with that of the interest group Power Circle, which argues that virtually all sales will consist of chargeable vehicles as early as 2030. This means that the number of chargeable vehicles would make up about half of the vehicle fleet that year.[116]

REDUCE EMISSIONS FROM CONVENTIONAL VEHICLES THROUGH INCREASED EFFICIENCY AND USE OF BIOFUELS

The primary factors behind the decline in emissions from road traffic since 2010 are increased use of biofuels and increased vehicle efficiency. To a certain extent, the overall efficiency of vehicle fleets improves by default, as more efficient new vehicles replace older ones. Particularly for commercial traffic, there is also a strong financial incentive for more efficient vehicles, since fuel accounts for around a third of the total cost of an average transport route. Blending biofuels into petrol and diesel for use in conventional internal combustion engines has so far offered an attractive alternative to electrification. This is because no new infrastructure is required, and because the availability of adapted vehicles is not a limiting factor.

Despite the fact that the pace of efficiency improvement seems to have dropped off, in its latest scenarios the Swedish Transport Administration estimates a relatively large potential[u] to make cars and trucks more efficient by 2030. It estimates an average of 34% for passenger cars and light commercial vehicles and 20% for heavy goods vehicles. To achieve this potential for passenger cars, new vehicles in Sweden will need to be improved by 25% by 2025 and 50% by 2030 compared with 2021 levels. This is in addition to the efficiency requirements already imposed on car manufacturers in the EU. More economical driving, better speed limit compliance and road surfaces with lower rolling resistance can add a further efficiency gain of 15%.[147]

To a large extent, the use of biofuels has been regulated since 1 July 2018 by the reduction obligation on petrol and diesel. This obligation regulates biofuel blending in petrol and diesel by at least 2.6% for petrol and at least 19.3% for diesel, which reduces greenhouse gas emissions from those fuels. By 2020, the minimum level will rise to 4.2% for petrol and 21% for diesel. An indicative target for the instrument has been set to reduce emissions from the use of fuel by 40% by 2030. This would require a level of roughly 50% biofuels in all petrol and diesel.

The reduction obligation is a strong and predictable policy instrument, in the sense that the percentage of biofuel is fixed while the total fuel volume and the cost are unknown. What primarily restricts the ability to use more biofuels is the supply of sustainably produced fuel and the market price. Biofuels are a global commodity, and Sweden is a small player. The exception is hydrotreated vegetable oil, or HVO, of which Sweden currently imports about a third of the global supply.[112]

Only Sweden and a few other countries today are living up to the EU's 2020 target of 10% renewable energy in the transport sector. For other countries to reach the target, they need to rapidly increase their use of biofuels in 2019 and 2020. This is likely to raise the price and make supply in Sweden more uncertain.

Biomass is set to meet the growing demand for renewable materials, food, fossil-free chemicals and more. At the same time, the EU is placing tougher sustainability requirements on biofuels; in 2019, Swedish legislation is being aligned with these changes[v].

Even after accounting for physical constraints, the gross potential for biofuel production in Sweden is great, mainly from forests but even from agriculture to some extent.[148] Still, domestic production is relatively small, and the expansion of production capacity within a decade is likely to be limited. The fuels produced must be competitive or have sufficient long-term incentives for commercial operators to be willing to invest in production. Various assessments of potential for the sustainable production of biofuels in Sweden by 2030 often fall in the range of 10–30 TWh.[143,149-152] This can be compared with a total use of just under 20 TWh in 2018, of which about 3 TWh was produced in Sweden. In its latest scenario,

[u] This means reducing fuel consumption per kilometre.

[v] https://www.regeringen.se/pressmeddelanden/2018/11/okade-hallbarhetskrav-for-biodrivmedel-och-flytande-biobranslen/

the Swedish EPA estimates that the current reduction obligation arrangement should lead to a biofuel use equivalent to 22 TWh in 2030.[153] With a 50% blend by 2030 as in the indicative pathway, the use of biofuels in 2030 would be equivalent to 39 TWh. The Swedish EPA notes that in practice, it is uncertain whether such a large increase will be possible and states that measures reducing the overall use of fuel (for example, by reducing traffic volumes) improve the ability to comply with the reduction obligation.

There is no correlation between Swedish production and use of biofuels. Even Swedish biofuels will be sold where demand and prices are highest, within Europe or globally. As a result, an investment in Swedish biofuels would not necessarily help achieving the national climate targets for transport. Still, there may be other reasons to realise the potential for producing sustainable biofuels in Sweden, such as a more secure supply, industrial development and exports, and the fact that the climate change transition will enjoy greater social acceptance if it provides jobs and economic development in Sweden. Another common argument for this is that it is difficult to serve as a model for other countries if Sweden, which has rich biomass resources, builds its transition on long-term net imports of large volumes of biofuels.[149]

In conclusion, there is much to suggest that biofuels will form a central part of the solution by 2030. However, significant uncertainties lie ahead. This is true for both price and supply, competing demand from aviation, shipping and working machinery, and the demand for biomass in other sectors.[154]

STRATEGIC CHOICES UNDER UNCERTAINTY

There is sufficient total potential for measures in the three areas mentioned to reduce emissions from domestic transport by 70% by 2030 and achieve completely fossil-free transport by 2045.[38,112,155-159]

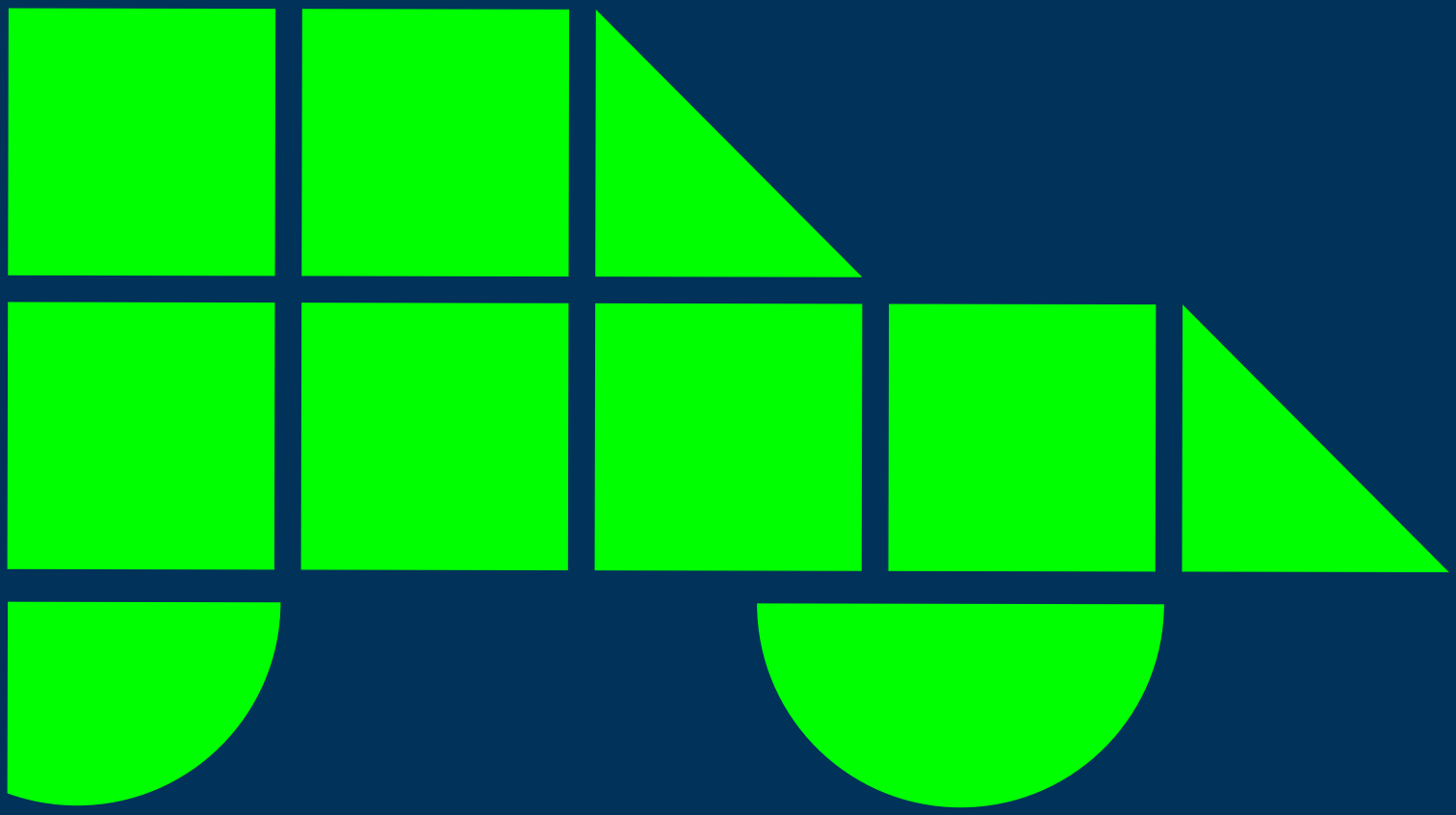
The target can be achieved in different ways, but it requires significant contributions from all three areas: a more transport-efficient society, more rapid electrification, and more bioenergy in higher-efficiency vehicles. Yet at this point, it is not feasible to determine the optimal contributions from each different area.

Thus, the focus should be on the following:

1. Better leverage the potential for increased transport efficiency.
2. Create the best possible conditions nationwide for a more rapid electrification of the transport sector.
3. Make the vehicle fleet more efficient and the percentage of biofuels sufficient to meet the part of the 2030 climate target that is not achievable by other measures.

With this approach, Sweden can avoid a situation in which its domestic transport increasingly depends on imported biofuels or requires an unreasonably large share of the domestic biomass supply.

8. Policies for fossil-free transport



In Chapter 7, we describe key changes in the transport system that can help to achieve the climate targets. Bringing this about quickly enough, and to the extent needed, requires significant political reforms now, in the 2018–2022 government term.

The short time that remains ahead of achieving the transport goals by 2030 is challenging – not least because the transport sector is characterised by long-life technical systems that create lock-ins. Key challenges include transforming urban planning and infrastructure that typically take a long time, building acceptance of policies and changing everyday behaviours, and managing distributional and equity considerations.

New policies must provide the clearest long-term direction possible to reduce uncertainty and risk to stakeholders. They also must provide rapid feedback and learning mechanisms to make any necessary adjustments over the course of this journey. This requires reforming the policy goals and governance principles, as well as stronger instruments. Overall, this needs to produce results in all three action areas: more efficient transport, more rapid electrification and more bioenergy in higher-efficiency vehicles.

The Climate Policy Council summarises its conclusions on leadership and governance and on instruments in the following 10 recommendations to the Government.

TRANSPORT SECTOR GOALS

Achieving the target of a minimum 70% emissions reduction from domestic transport by 2030 requires comprehensive policy measures during this government term.

LEADERSHIP AND GOVERNANCE

Based on the policy assessment conducted, we provide several observations on leadership and governance in the transport sector. The observations concern the transport policy goals, lack of clarity on who is responsible for achieving them, the use of forecasting guidance versus target-based guidance, priorities for infrastructure investments, and the potential to create transport-efficient cities.

THE TRANSPORT POLICY GOALS AND THEIR APPLICATION RUN COUNTER TO THE CLIMATE GOALS

The transport policy goals are currently divided into an overall goal of effective and sustainable transport services, a functional goal of providing accessibility to all, and an impact goal for the environment (including climate), safety and health. The overall goal of ensuring transport services focuses on mobility itself and not its function – providing citizens and businesses with accessibility to their workplaces, schools, services, customers and other functions.[160]

In particular, the impact goal of the transport system is to "contribute to" the achievement of the environmental quality objectives. Climate is only mentioned indirectly in the transport policy goals, since the climate goal is one of the 16 environmental quality objectives. The language on road safety is stronger: the transport system should be "adapted" so that no one is killed or seriously injured.

The current structure and formulation of the transport goals make it seem desirable but not necessary to achieve the climate targets. This is also how the transport policy authorities seem to interpret the goals in their own work.[161] The predominant focus is to supply transport services, in particular for road traffic. In practice, the transport policy goals and their implementation run counter to the climate targets.

THE TRANSPORT POLICY GOALS

OVERALL
The aim of transport policy is to provide citizens and businesses throughout the country with transport services that are socio-economically efficient and sustainable in the long term.

FUNCTIONAL GOALS
The design, operation and use of the transport system shall help to provide everyone with access to basic services of good quality and usability, and boost momentum for development across the country. The transport system must be gender-equal, addressing the transport needs of both women and men.

IMPACT GOALS
The design, operation and uses of the transport system shall be adapted to ensure that no one is killed or seriously injured, to help achieve the overall generational goal for the environment and environmental.

LACK OF CLARITY ON WHO IS RESPONSIBLE FOR ACHIEVING THE TRANSPORT SECTOR'S CLIMATE GOALS

There is no clear, collective responsibility for the climate goals of the transport sector – the only sectoral goal that Sweden has established. As an interim target for the objective "Reduced climate impact" in the environmental objectives system, progress towards climate goals is tracked by the Swedish EPA, but the agency has little or no formal influence within the transport sector.

The Swedish Energy Agency has been tasked by the Government with coordinating the transition of the transport sector to fossil-fuel independence. The coordination remit (called "SOFT") is being carried out during 2016–2019 together with the Swedish Transport Agency, Swedish Traffic Administration, Transport Analysis, Swedish EPA and Swedish National Housing Board. In April 2017, government authorities presented a strategic plan for transitioning the transport sector to fossil-fuel independence. The plan contained commitments which the authorities intended to implement in addition to several proposals which the Government and the Parliament need to decide on. At the beginning of 2019, the authorities presented a status report stating that all 29 commitments are active and most are proceeding according to plan. Of the proposals addressed to the Government, 40% are assessed as activated – for example, through new remits or inquiries.[162]

The Government's process for implementing the proposals in SOFT's strategic plan is unclear. The Government has neither established the plan nor stated what proposals it intends to proceed with. The Government Communication "A climate strategy for Sweden"[67] , which was delivered to the Parliament one year later in April 2018, included an "action plan for fossil-free transport and electrification". The Government highlighted that the authorities' strategic plan is an important point of departure for continued efforts. However, it did not provide any guidance on whether, how or when it intends to follow up on all the proposals presented in the strategy or how to prioritise them.

Ambiguities and contradictions are also apparent across the municipal, regional and state levels. Many municipalities are striving to reduce car traffic and promote more sustainable travel and transport to and from larger urban areas, while the state expects municipalities to adapt the road network to the higher traffic volumes as indicated in the Transport Agency's base forecast (see next section).[161,163]

INFRASTRUCTURE PLANNING IS FORECAST-DRIVEN RATHER THAN TARGET-DRIVEN

National planning of transport system infrastructure is often geared to addressing increases in road transport and road traffic volumes. This is because it is based on the traffic forecasts that use historical links to population growth and economic development. Planning is largely driven by forecasts, not by policy goals.[161]

The Swedish Transport Administration's proposal for the most recent 2018–2029 national transport plan used base forecasts for transportation demand, which are determined by policy. These showed that road

traffic would increase by roughly 30% by 2040, mainly in urban regions. Such a traffic increase is difficult to reconcile with achieving the climate target of 70% reduced emissions over the same period. In the Transport Administration's alternative scenarios, which result in achievement of the climate goals, urban road traffic is instead reduced by 10–20%.[155,164]

In models used to assess whether or not a particular infrastructure investment is economically viable, time savings in car traffic weigh very heavily. The benefits of a wider road, for example, will appear to be great if a significant increase in traffic is forecast, as congestion would then be avoided. Extensive research is available that indicates a clear correlation between how the transport system is planned and how it is used, i.e. how traffic volumes develop. If capacity increases for a certain mode of transport, then it will be more attractive to travel that way, which will lead to more traffic.[135] This amounts to a kind of circular reasoning: When planning is based on road traffic forecasts, investment in roads will appear to be socio-economically viable and thus be implemented, and this, in turn, will contribute to an increase in road traffic.

As early as 2012, the Swedish National Audit Office noted in its review[165] that the profitability of many projects is based on assumptions about traffic volumes and increases in traffic which, with current knowledge, are likely to be difficult to reconcile with the climate goals. The audit office also argued that reporting to the Parliament is presently not transparent, consistent or accurate from the perspective of the climate targets.

In a 2019 report, the National Audit Office points to differences in how the Transport Agency and the national Swedish grid agency, Svenska kraftnät, use scenarios as a basis for planning.[166] In all its scenarios Svenska kraftnät presumes that the energy policy goals will be achieved, while the Transport Agency approaches the transport sector's climate goals as a sensitivity analysis in relation to the base forecast that governs planning. So while the Transport Agency and Svenska kraftnät have similar tasks for expanding infrastructure as needed, they have very different points of departure for their scenarios.

ORDER OF PRIORITY FOR INFRASTRUCTURE INVESTMENT IS NOT APPLIED IN PRACTICE

Decisions on transport infrastructure investment must be preceded by a review under the so-called four-step principle, which involves the implementation of measures in the following order of priority:

Can the identified deficiency be addressed by:

1. a change or decrease in demand?
2. a more efficient use of existing infrastructure?
3. limited rebuilding?
4. major rebuilding or new investments?

The four-step principle for road investments was introduced by the former transport administration agency back in 1997. In its 2011 planning bill, the Government decided that planning and action measures should be preceded by an unbiased study taking into account mode of transport and using the four-step principle. The Transport Administration calls these studies "strategic choices of measures".

Repeated criticism has been levelled at the failure of actual plans to reflect the four-step principle, which is also evident from a recent study by the National Audit Office.[167] Since the analysis in a strategic choice of measures is normally based on shortcomings in an individual road or rail link, it is difficult to apply step 1 and step 2 measures, which are normally less costly but require other types of intervention. It also makes it difficult to apply an overarching approach that considers all modes of transport. According to the Transport Administrations' own interpretation, another problem is that the agency lacks the mandate to co-finance step 1 and step 2 measures and to propose broader initiatives or instruments for the Government's consideration. Such initiatives and proposals could affect transport demand or the use of existing infrastructure.

From a regional and a municipal perspective, this means that the state is only willing to co-finance measures that should in fact be given the lowest priority. This discourages interest in implementing measures that may be more socio-economically effective.

All in all, the current application of the four-step principle, with a focus on step 3 and step 4 measures, will increase costs and make climate mitigation and adaptation more difficult.

THE POTENTIAL FOR MORE EFFICIENT TRANSPORT IN CITIES CAN BE BETTER LEVERAGED

Denser settlements provide more opportunities for people to use public transport, cycle and walk, and to make local and regional freight transport more efficient. Opportunities could be better leveraged if we started by recognising the different capacities and conditions of urban and rural areas when considering how they can contribute to a transport-efficient society. For example, there could be a differentiation of goals and policy instruments for urban and rural areas.

In 2018, the Government introduced an urban traffic target aiming to increase public transport, walking and cycling as a share of total passenger traffic from 20% in 2010 to 25% in 2025, with a longer-term target of doubling this figure.[67] This represents a step towards a more differentiated approach to transport planning. However, the target is not as precise or ambitious as it could be because it is expressed in relative terms. This means that the target can be achieved while urban car traffic continues to increase. The target would have been more appropriate if it had been broken down locally, where it is to be put into effect. It is worth mentioning that Norway has introduced a target in which all increases in urban passenger transport will be met by pedestrian, bicycle and public transport, which corresponds to a zero-growth target for car traffic in cities. This target was part of a climate policy agreement in the Norwegian Parliament and was later adopted in Norway's transport policy target.[168] It is applied locally by means of state co-funding with Norwegian municipalities.

The so-called urban environment agreements are an effort to promote sustainable urban environments by stimulating a greater share of travel by public transport or bicycle. These measures aim at energy-efficient solutions with low greenhouse gas emissions and help to meet the environmental quality objective "A good built environment". To obtain state aid, additional measures must be implemented that contribute to sustainable transport or increased housing construction. The urban environment agreements are still too limited in extent to have a significant impact on emissions. The latest national plan for the transport system (2018–2029)[169] earmarks 1 billion SEK (approximately 100 million euro) annually, or 12 billion for the entire period, for urban environment agreements out of the plan's total budget of 700 billion SEK.

RECOMMENDATIONS

The Climate Policy Council finds it doubtful that the current transport policy goals and the Government's traffic plans fully meet the requirements of Section 3 of the Climate Act, which states that the Government's work should be based on the long-term time-bound targets set by the Parliament.

The Climate Policy Council recommends that the Government implement the following changes in the transport policy goals and in its guidance in order to achieve the 2030 emission reduction targets for transport and create the conditions to achieve completely fossil-free transport by 2045.

rec:

RECOMMENDATIONS — LEADERSHIP AND GOVERNANCE
Decide on a time-bound action plan to achieve fossil-free transport beyond the 2030 target.

Reducing transport emissions by 70% by 2030 is an interim target. The Climate Policy Council believes that the Government should formulate an unambiguous target for completely fossil-free transport by 2045, together with a timetable with clear decision points for achieving the target.

Responsibility for the entire implementation of a timetable for fossil-free transport must be clearly identified and communicated both in the Government and the government offices. Responsibility for the transport sector's climate goals should also be made clear at the level of government agencies. This can be done by making the Energy Agency's coordination task of shifting the transport sector to fossil-fuel independence (SOFT) a permanent one. The relevant government agencies could be given an ongoing mandate to provide information to the Government and implement a timetable for fossil-free transport. The Government, the agencies and the municipalities should use a common, clear and transparent approach – not the current approach of different strategies and action plans with an uncertain status.

rec:

RECOMMENDATIONS — LEADERSHIP AND GOVERNANCE

Align the transport policy goals with the climate targets.

The transport policy goals should be rewritten to explicitly aim to improve accessibility within the framework of the climate targets, and not just take the targets into consideration, which is the current diffuse formulation. With the climate targets as a framework, transport planning would gain a clearer focus and objective.[w]

Such a change in transport policy goals should lead to more consequential changes in the work of government agencies and other stakeholders when planning the transport system. Some examples of possible changes are as follows:

- Future national and regional transport plans are not planned using policy-based scenarios, but rather scenarios that are based on achieving the climate targets. This would be similar to the way Svenska kraftnät uses scenarios as a basis for planning the energy system.
- Directives, government ordinances with instructions, and appropriation directions are updated in line with the revised goals.
- The analyses used to assess the socio-economic viability of a measure are used to assess the most cost-effective measures for providing accessibility within the framework of the climate targets.

rec:

RECOMMENDATIONS — GOVERNMENT LEADERSHIP AND GOVERNANCE

Strengthen regulatory and spatial planning processes that reduce dependence on cars.

To gain a more transport-efficient society and achieve the climate goal for domestic transport, current **infrastructure planning** needs to change. However, such planning mainly concerns infrastructure investment and maintenance. **Transport planning** from a broader perspective is needed, integrating various forms of administrative, economic and informative instruments. This would make it easier to achieve both the climate targets and functional goals in a sustainable manner. The Government has received background material for implementing such changes in the Swedish Transport Administration's concept paper "Transportation Planning 2.0", which was developed together with several government agencies within the framework of the Government's Environmental Objectives Council.[170] Integrated transport planning would help to create better conditions for limiting growth in transport demand and breaking car dependence in urban areas.

[w] Such a goal formulation would align with what the Swedish Institute for Transport and Communication Analysis (SIKA) proposed in its dossier report for the current transport goals.

The Government should also leverage the lessons learned from Swedish negotiations for the integration of several policy areas with transport planning, and the pursuit of a more consultative process with the municipalities and regions.

More tightly integrated transport planning – together with revised transport goals and a clear timetable for fossil-free transport – should lead to a number of changes in processes and regulations for spatial planning. Some examples of possible changes are:

- Reformulate or supplement the urban traffic target with a view to no increase in car traffic in cities. Formulate the goal so that it can be used and followed up on locally by the municipalities.
- Base government investment decisions about urban and peri-urban transport systems on the principles of cities' environmental agreements, which are intended to promote sustainable transport. Develop corresponding principles in a way that also suits smaller municipalities.
- Give the Transport Administration the mandate and directives to allow full application of the four-step principle for infrastructure investments. Develop more fit-for-purpose principles, which encourage step 1 and step 2 measures, for sharing investment costs between the state, regions and municipalities.
- For pending projects, reconsider current investment plans for the transport system based on the assumption that the climate goal for the transport sector should be achieved.

rec:

RECOMMENDATIONS — LEADERSHIP AND GOVERNANCE

Take into account different conditions and offset negative redistributive effects of climate policy – for example, between urban and rural areas.

Strong policy reforms that will leave a lasting effect on citizens and businesses are needed to achieve the transport sector's climate goals. Many actions will have positive synergies with other overarching goals: better health, a better urban environment, increased mobility and greater freedom for many who cannot afford or do not want to own their own car, to name a few. But there are also conflicting goals and different conditions for coping with the transition to fossil-free transport – financial or otherwise. Political developments in other European countries tell us that climate efforts can be significantly hampered unless issues of legitimacy and distributional aspects are managed wisely and proactively. There are dividing lines between urban and rural areas, between the economically prosperous and the economically struggling, between men and women, and between different social groups depending on opportunities in their everyday lives.

Policy needs to account for these differences and work to prevent undesirable distributional effects. This entails choices at many crossroads. Instruments that make emissions-intensive alternatives more expensive may require policy measures to counteract this increase and make it manageable for groups that might otherwise be against it. This especially applies to taxes, but also involves issues of accessibility. For example, in areas where public transport cannot be used effectively, it is important to ensure access to charging stations and sustainable fuels as well as reliable digital communication. Even in smaller towns and land patches between urban areas, public transport solutions can play a greater role than they do today, but in different ways than they do in cities. For example, different ride-hailing public transport services can be used which can be cheaper and more efficient with the help of automated technology.[171,172]

INSTRUMENTS

With regard to current instruments in the transport sector, the Climate Policy Council makes the following observations.

EXISTING POLICY INSTRUMENTS ARE TOO WEAK TO ACHIEVE A TRANSPORT-EFFICIENT SOCIETY

Instruments that increase the use of biofuels have so far contributed the most to reducing greenhouse gas emissions from transport. Incentives for emissions-efficient passenger cars, through the green vehicle rebate and the bonus-malus system, have also made a positive impact. Beside the carbon and energy taxes, however, the instruments for more efficient transport solutions and for reduced transport demand are relatively few and weak.[173] This problem was discussed in the previous section on government leadership and transport policy instruments.

Municipalities, which often have ambitious climate goals for the transport sector, lack the legal tools needed to encourage carpooling or to avoid subsidised parking. This makes it difficult to achieve the goals.

With sharply falling marginal costs for electrified and automated road transport, demand is expected to increase substantially. This would, in turn, raise the socio-economic costs, due to more congestion and new infrastructure.[152] At the same time, substantial loss of current fuel tax revenue would occur. The taxation system currently in place for the transport system is based on the use of fossil fuels, and will not be fit for purpose when transport is electrified.

CAR OWNERSHIP, DRIVING AND PARKING ARE OFTEN SUBSIDISED IN WAYS THAT RUN COUNTER TO THE CLIMATE TARGETS

It is not only that the instruments for more efficient transport are weak. Along with often making infrastructure planning choices that encourage car use, the Government subsidises car ownership and use in several ways, running counter to the climate targets.

For example, the rules for company cars used privately are currently designed in a way that encourages car ownership and increased driving for private use. There are rules for car-benefit taxation of parking at workplaces, but compliance is poor.[151]

As currently designed, the travel expense deduction favours long-distance commuting by car compared with public transport, also in metropolitan regions. This rule also stimulates urban sprawl, with longer distances between the home and the workplace.[174,175] The travel expense deduction is currently under investigation,[38] with the aim of making it distance-based and transport-mode neutral.

INSTRUMENTS FOR LOW-EMISSION VEHICLES ARE TARGETED TO NEW CAR SALES BUT HAVE A WEAKER EFFECT FOR THE ENTIRE FLEET

Within the EU, new vehicle emission levels are regulated by specific emission requirements for new vehicles that must be met by vehicle manufacturers in each Member State. The emission requirements for passenger cars and light commercial vehicles will contribute to the Swedish climate objectives, but they must be supplemented by additional instruments to increase the pace of overhaul of the vehicle fleet. On 27 February 2019, an agreement was reached between the European Council and the European Parliament on tightening the emission requirements for heavy goods vehicles[x], which will gradually increase sales of low-emission vehicles.

The bonus-malus system, introduced in 2018, is linked to vehicle taxation. It aims to direct new sales towards more efficient vehicles. One problem with both this and previous instruments mainly targeted to new sales in Sweden is that green cars are sold from Sweden to other countries after a relatively short time.[176] This means that the instruments do not fully contribute to the conversion of the Swedish vehicle fleet. The demand for low-emission vehicles in other countries partly depends on their own subsidies for owning and driving such cars, not just for buying them.

[x] http://www.europarl.europa.eu/news/en/press-room/20190227IPR28906/cutting-CO_2-emissions-from-trucks-environment-meps-confirm-deal-with-council

UNCLEAR LEVEL OF AMBITION AND INADEQUATE INSTRUMENTS FOR ELECTRIFICATION

The electrification of traffic is happening more rapidly than many forecasts had suggested. However, the pace needs to quicken even more so that the transport sector can achieve the 2030 climate target and become fossil-free by 2045.

There are obstacles on multiple levels that have to be removed. On an overarching level, clear national ambitions and coordination of public interventions are needed. The Government's investment in the Climate Leap has provided grants for charging stations, but no strategic analysis is available indicating where public funding is most beneficial. For passenger car traffic, destination charging and home charging are most important. Here, there is considerable uncertainty about which charging stations will be available at rental properties or housing associations. The heavy goods transport sector is experiencing uncertainty over technology choices and the coordination between Swedish power grids and regional and local powerline companies, as well as the future role of government in the electrification of major freight traffic routes.[145]

THERE ARE EFFECTIVE INSTRUMENTS FOR THE INCREASED USE OF BIOFUELS – BUT NOT FOR DOMESTIC PRODUCTION

For quite some time, Sweden has applied several instruments to encourage the use of biofuels over fossil fuels. This has helped to ensure that the share of biofuels in Sweden is the highest in Europe, with more than 20% of total fuel use in the transport sector. Policy goals and government reports often make the *connection between an increase in biofuel use and the sustainable production of these fuels in Sweden.

Prior to 2018 the main instrument was the exemption of biofuels, wholly or partially, from carbon and energy taxes. This, however, assumed exemptions from the EU state aid rules, which are granted only a few years at a time, with limitations. Investments in domestic production capacity have been conspicuously missing, and many of the current production facilities are operating below maximum capacity.

Beginning on 1 July 2018, when the instrument "Bränslebytet" was introduced, a reduction obligation replaced previous tax breaks for low-level biofuel blends. This has created greater stability and predictability around biofuel demand. However, for the time being the reduction obligation mainly governs the continued import of biofuels for low blends. High blends or completely fossil-free fuel still rely on temporary tax exemptions, and uncertainty for investors remains a significant obstacle to domestic production. Another effect of the reduction obligation is that the level of carbon tax now has little importance for the share of biofuels in road transport, because the blending requirements are independent of the taxation level.

In its 2019 statement, the Government announced that no new cars running on petrol or diesel should be allowed to be sold after 2030.[177] It remains unclear how such a goal should be put into practice, because the same fuels can in principle be produced from both fossil fuels and renewable raw materials. The Climate Policy Council considers it important to set a deadline on the sale of all fossil fuels, whether petrol, diesel or natural gas.

rec:

RECOMMENDATIONS — INSTRUMENTS

Prepare a reform of road traffic taxation grounded in increased electrification and the use of autonomous vehicles, while promoting regional fairness.

RECOMMENDATIONS

A new system of taxation will be needed for road traffic. Because electrified and autonomous vehicles significantly lower the marginal cost of road transport, they risk leading to a loss of competitiveness for

[y] According to statistics from the Swedish Petroleum and Biofuels Institute, SPBI.

more efficient alternatives, and thus to unmanageable increases in traffic. If the electricity is produced from fossil-free sources of energy, the reasons for taxing the fuel become weaker.

The tax should be restructured to be based on distance travelled, not fuel. With modern technology, the tax can differentiate based on vehicle, time and location. It can thus be adapted to the different socio-economic costs between urban and rural areas, between cars with different emissions, and between different times of day. In this way, the tax can become a much more sophisticated instrument for sustainable, economically efficient transport. In addition, such a tax can make it easier for policies to counteract regional inequalities.

The restructuring should not be done immediately or in haste, but should be evaluated, prepared for and thoroughly considered. Of course, electrification may even be faster than current forecasts indicate, but if tax restructuring is seen as going too fast, there is a risk that it could counteract the desired development.

rec:

RECOMMENDATIONS — INSTRUMENTS

Stop subsidising car ownership, driving and parking.

Car use is still subsidised in a way that is incompatible with the climate targets or with ambitions for a more transport-efficient society. There are still laws and rules that allow car ownership, driving and parking to be subsidised. These rules need to be changed – for example:

- Change the taxation of company cars so that it does not subsidise car ownership and driving, but instead promotes more energy-efficient alternative modes of transport.[152,178]
- Tighten compliance with the car-benefit taxation rules for parking at workplaces. Those who enjoy the company car benefit should be taxed separately for any free parking benefit.
- Change the travel deduction for commuting between the home and the workplace so that it is based on distance and is transport-mode-neutral. The tax should also be designed so that it does not create regional imbalances. The travel expense deduction is currently under investigation.[179]

rec:

RECOMMENDATIONS — INSTRUMENTS

Strengthen municipal mandates and tools in order to promote fossil-free transport.

Many municipalities and regions want to contribute to national and global climate goals while reducing local environmental problems and creating attractive cities and regions. But the local and regional levels need more tools in order to steer traffic and urban planning towards efficient, sustainable solutions.[180] Examples of measures for this include:

- Give municipalities the right to grant public land for special parking spaces for carpooling, just as they can now set aside land for special parking bays for people with disabilities.
- Change legislation so that municipalities can introduce congestion charges and thus reduce climate impact, as an alternative or a complement to green zones.
- Give municipalities the right to require so-called green transport plans from developers, operators and property owners when building new developments or significantly altering existing ones. This can be accomplished through a bundled package of stimulus and other measures that encourage employees and customers to travel more sustainably.[151]

rec:

RECOMMENDATIONS — INSTRUMENTS

Speed up the electrification of road transport across all of Sweden.

An expansion of charging stations is already underway in Sweden, largely on commercial terms. But in parts of the country, a charging station is not a profitable investment. In these areas, the Government needs to assume responsibility for building up the necessary infrastructure. It is important for businesses, rural residents and even visitors to be able to rely on the charging station availability within a reasonable range.

The Government also needs to take a more active role in creating regulatory frameworks that stimulate the electrification of transport and in coordinating public and private investments and other initiatives.

The electrification of road transport in Sweden should not be limited by a lack of charging stations or of regulatory frameworks, but only by the availability and market development of chargeable vehicles. Clear national targets for a faster electrification of transport should be formulated as part of the time-bound action plan for fossil-free transport. At the same time, the action plan should also consider other renewable fuels, including the role of government in the potentially growing importance of hydrogen as a fuel in the longer term.

For example, the following initiatives can be taken to accelerate the electrification of both passenger and freight transport:[145]

- Within a short period of time, build quick-charging stations along major roads in the countryside as proposed by the Swedish Transport Administration.[144] The "white spots" without charging stations can be covered at a small cost to the state. This would ensure that, across the country, a charging station would always be within reach, providing increased security and availability for everyone.
- Implement a targeted effort to electrify the major national transport corridors, with larger ports as nodes.
- Appoint regional coordinators in charge of raising awareness about electrified transport, identify needs and promote interaction between different public and private stakeholders. Leverage the experience of wind power coordinators and broadband coordinators.
- Remove obstacles to destination and home charging, especially in apartment buildings. Make it easier for housing associations, and introduce "charging rights" for their members.
- Ensure that grid capacity is sufficient – enhance coordination between national, regional and local actors.

rec:

RECOMMENDATIONS — INSTRUMENTS

Set a stop date for the sale of fossil fuels.

It is essential to clearly set the direction, final goal and timeframe for the transition to fossil-free transport.[11,181] This is important for private investors as well as public authorities and others responsible for implementing policy. The same applies to individual consumers. Clear information on which fuels will be available in the future is important so that people can decide whether to buy a new car in the next few years. It is also important from a longer-term perspective with regards to the availability and prices of used vehicles. Therefore, a formal end date should be established for the sale of fossil fuels in Sweden.

With the current overall goal of net-zero emissions, the stop date should be set no later than 2045 (see Chapter 4). The accelerating impact of electrification and other technology solutions in the transport sector suggest that a stop date can be set earlier. The fact that other sectors are believed to have greater difficulty in achieving zero emissions according to the climate target timetable suggests that a stop date should be set earlier.[60] The Climate Policy Council finds that a stop date for the sale of fossil fuels should be set to before 2045. The date should apply for both road transport and working machinery. The question of a stop date for fossil fuels should be investigated during this government term, including timing, technical design and possible exceptions that may be necessary.[182,177,z]

A stop date for the sale of fossil fuels can be supplemented by the introduction of a formal requirement in the near future that all new cars sold should be able to run on a fossil-free fuel (including electricity) or on a fuel with a high biofuel blend.

However, formalising an end date for fossil fuels is not enough. In addition, the current instruments for stimulating the conversion to renewable fuels will need to be developed. This can be done, for example, through the following actions:

- Introduce a deadline for the reduction obligation or equivalent system containing interim targets that aims for 100% fossil-free fuels by a specific date. For the period leading up to 2030, establish blend levels for the reduction obligation. This is one of the questions to be investigated in the Swedish Energy Agency's remit on the reduction obligation system.[183] The levels must be sufficiently ambitious to cover the part of the 2030 climate target not achievable by other measures, such as efficiency and electrification.
- Consolidate the separate quotas for petrol and diesel into one quota within an appropriate time frame. This issue is also part of the Energy Agency's remit.[183] In the long term, incorporate clean or high biofuel blends into the system so that they do not remain reliant on short-term tax exemptions from the EU.
- Consider industrial policy initiatives to reduce the risks for stakeholders who wish to invest in domestic production of fossil-free fuels – for example, through some form of feed-in tariff or auction.

rek:

RECOMMENDATIONS — INSTRUMENTS

Develop additional policy instruments to promote climate-efficient vehicles.

Even during a conversion to renewable fuels, vehicles that use these fuels need to become more efficient, so that fossil fuels can be replaced at an adequate pace. Mandatory vehicle requirements are best developed by the EU, but complementary national instruments should be strengthened to achieve the climate goals in a sustainable manner.

This can be done, for example, through the following actions:

- Within the next few years, introduce a requirement for all new cars sold to be able to run on a fossil-free fuel (including electricity) or on a fuel with a high biofuel blend.
- Strengthen instruments in the bonus-malus system for passenger cars and implement regulatory changes that counteract a rapid re-exportation of green cars – for example, through rebate rules.

[z] In the multi-partisan agreement that enabled the current government to be formed, an inquiry was announced into stopping sales of vehicles that run on petrol or diesel. The inquiry is also to examine the question of when fossil fuels should be completely phased out. However, the latter question is not mentioned in the Government's policy statement of 2019.

- Introduce incentives for post-conversion as well – for example, of diesel-powered cars to ethanol. This can be done at a limited cost.
- Introduce bonus-malus or an equivalent system for heavy vehicles.[ab]
- Use public procurement as an instrument, by setting higher standards for how government agencies purchase vehicles, fuel and transport services.

[ab] On 1 March 2019, Transport Analysis presented an analysis of various instruments for more environmentally friendly heavy-duty lorries and proposed introducing a green lorry rebate.

The Swedish Climate Policy Council's remit

On 15 June 2017, the Parliament adopted a climate policy framework for Sweden by a large majority.[37,184] The purpose of the framework is to highlight the need for a societal transition in order to achieve the climate targets, to involve all policy areas and stakeholders in this transition, and to continuously keep the Parliament up to date on the progress of these efforts.[185]

The climate policy framework contains three parts:

- The long-term goals for Swedish climate policy;
- A planning and follow-up system in which the Government reports to the Parliament on the progress of the transition; and
- The Swedish Climate Policy Council.

Parts of the framework are regulated in a Climate Act, which entered into force on 1 January 2018. The Climate Policy Council was formed on that same day.

The Climate Policy Council is an independent, interdisciplinary expert body tasked with evaluating how well the Government's overall policy is aligned with the climate goals established by the Parliament and the Government.[186] The council's remit underscores the broad nature of the climate issue. Our remit is not to examine any particular area that has been specifically defined as climate policy, but rather to examine the Government's overall policies – in other words, all policy areas and how they are collectively aligned with the climate targets.

Within the framework of the overarching mandate, the council shall, according to the Government's remit,[186] do the following:

- Evaluate whether the focus of different relevant policy areas contributes to or counteracts the potential to achieve the climate goals.
- Highlight the effects of agreed, proposed instruments from a broad societal perspective.
- Identify policy areas that require further action.
- Analyse how to achieve targets, both short- and long-term, in a cost-effective way.
- Evaluate the bases and models on which the Government builds its policy.
- Foster more debate in society on climate policy.

According to the Climate Act, for its part the Government must provide a climate report to the Parliament every year in the budget bill. The report should describe emissions trends, major climate policy decisions during the past year, and an assessment of what additional measures may be needed. Every four years (the year after ordinary parliamentary elections) the Government must also present a climate policy action plan to the Parliament. The action plan must contain a more detailed description of the outcome of the climate policy pursued to date. Additionally, it must state the Government's plans during the electoral period, including how decisions in various areas are judged to affect the potential to achieve the climate goals and what additional decisions may be needed to achieve the national and global climate objectives.

By the last day in March of each year, the Climate Policy Council must submit a report to the Government. The report must contain the council's assessment of progress on the climate efforts and emission trends as well as an assessment of the alignment of government policies with the climate goals.[186] For the years the Government presents its action plan, the Climate Policy Council must submit a report to the Government evaluating the plan within three months of its publication.

The Climate Act's obligations on the Government, together with the Climate Policy Council's reports, thus form a comprehensive planning and follow-up system. In addition to this, many government agencies contribute to follow-up and planning, and they provide decision-support documentation on the effects of agreed, implemented policies.

9. Glossary

BECCS	Technology for the capture and storage of carbon dioxide from bioenergy use – for example, from the incineration of biomass.
Carbon dioxide (CO2) equivalent	A unit used to describe the global warming impact of emissions of different greenhouse gases. For any type of greenhouse gas, such as methane, nitrous oxide or fluorinated gases, it signifies the amount of CO2 which would have the equivalent global warming impact.
Carbon sink	A reservoir that removes carbon dioxide from the atmosphere, such as plants that capture carbon in biomass through photosynthesis.
EU ETS	EU Emissions Trading System. Includes emissions from major industries, incineration plants and civil aviation within EU.
Flexible mechanisms	The instruments under the Kyoto Protocol which allow emissions trading: the Clean Development Mechanism (CDM) and Joint Implementation (JI).
Greenhouse gas emissions	Emissions of greenhouse gases including carbon dioxide, methane, nitrous oxide and fluorinated gases.
HVO	Hydrogenated vegetable oil. HVO can be manufactured from simpler grades of fats and fatty residues. Examples include PFAD (see PFAD entry).
Indicative emission pathway	A possible emissions trajectory from actual 2015 emissions levels to the proposed targets for 2030, 2040 and thereafter to 2045 that should aid in the follow-up of trends in the ESR sector (the non-ETS sector emissions). The emission pathway should be expressed as a linear reduction from actual 2015 emission levels, via the interim targets for 2030 and 2040, to the long-term 2045 target.
Indirect climate policy	Policies that affect greenhouse gas emissions even though they do not explicitly aim to do so.
IPCC	Intergovernmental Panel on Climate Change. This UN climate panel was established in 1988 by two UN agencies, the World Meteorological Organisation (WMO) and the United Nations Environment Programme. Its objective is to provide governments at all levels with scientific information that they can use to develop climate policies.
Kyoto Protocol	An international agreement from 1997 under the United Nations Framework Convention on Climate Change (UNFCCC) for reducing greenhouse gas emissions. The first commitment period was 2008–2012 and the second period, now ongoing, is 2013–2020.
LULUCF	Land Use, Land Use Change and Forestry. This corresponds to emissions and removals in cropland, forests, grassland and managed wetlands. Covered within the EU by the LULUCF Regulation.
MSR	Market stability reserve. A reserve containing allowances within the EU ETS which may be returned to the market. An important part of the latest EU ETS reform is that starting in 2023, the total number of allowances in the reserve may not be greater than the total quantity of allowances auctioned in the previous year. If this is the case, the corresponding number of allowances will be permanently cancelled from the reserve.
NDC	Nationally determined contributions. These form the basis of the Paris Agreement for the parties' contribution to emission reductions, climate adaptation and financing.
Negative emissions	Removal of carbon dioxide from the atmosphere through measures such as afforestation or BECCS.
Net-zero emissions	The balancing of greenhouse gas emissions with their removal.
OPEC	Organization of the Petroleum Exporting Countries. An international organisation comprising the fourteen countries of Algeria, Angola, Ecuador, Equatorial Guinea, United Arab Emirates, Gabon, Iran, Iraq, Congo, Kuwait, Libya, Nigeria, Saudi Arabia and Venezuela.

PFAD	Palm fatty acid distillate. A by-product of palm oil refining that can be used as a raw material in the manufacture of HVO diesel, for example.
Supplementary measures	Within the Swedish climate policy framework, supplementary measures may be used to compensate for remaining emissions. Examples of supplementary measures include increased carbon sinks, BECCS, and investments in emission-reduction measures in other countries. Within the climate policy framework, interim targets may be achieved with a limited amount of supplementary measures. After 2045, supplementary measures are to exceed any remaining emissions.
Traffic volume	Also referred to as traffic work. The total volume of traffic within a given area and during a specific period of time, in terms of the movement of the vehicles themselves. Traffic work is specified in the unit vehicle-kilometre, derived by multiplying the number of vehicles by the distance in kilometres each vehicle travels.
Transport volume	Also referred to as transport work. The movement of passengers or goods by a transport service. Transport work is divided into passenger transport work and freight transport work. Passenger transport work is measured in passenger-kilometres, which is the number of persons traveling (in a vehicle, for example) multiplied by the number of kilometres travelled for each passenger. Freight transport work is measured in tonne-kilometres, which is each freight unit mass in tonnes multiplied by the transport distance in kilometres for each unit.

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ISBN: 978-91-984671-2-3