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Low carbon lifestyles: potential for Sweden for 2050[1]

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From a geographical perspective, Sweden has relatively low greenhouse gas (GHG) emissions per capita compared to other high-income countries. The GHG emissions in Sweden have also been in decline since the mid-nineties, which of course is a major success. But what the official statistics, which are published in accordance with the Kyoto Protocol, do not say anything about is the emissions that Swedish consumption and lifestyles cause abroad. This paper is based on a consumption perspective which includes emissions occurring in other countries due to our consumption patterns, including our international transport. Accordingly the emissions related to what Sweden exports are excluded.

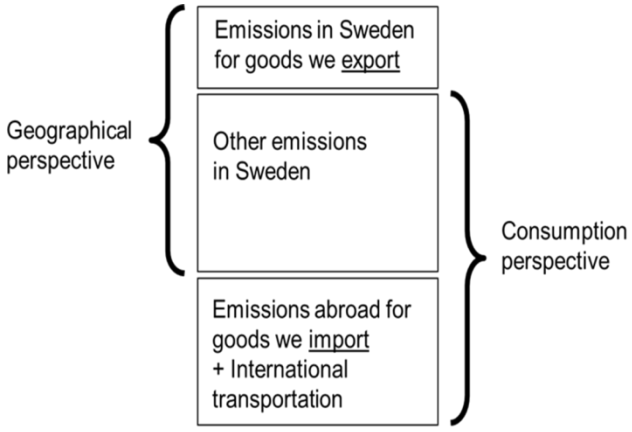


Figure 1. Two perspectives on emissions

When greenhouse gas (GHG) emissions are analyzed from a consumption perspective a gradual increase can be identified: these emissions were 15 percent higher in 2010 than in 1993. Behind this lies a strong increase in the volume of consumption while the improvements in eco-efficiency (emissions per expenditure) have not kept the same pace.

[1] This short conference paper has the character of a policy brief. It is based on our report (*Hållbara konsumtionsmönster*) about sustainable consumption patterns to the Swedish Environmental Protection agency (Larsson 2015) as well as the Mistra urban futures report *Low-carbon Gothenburg 2.0. Technological potentials and lifestyle changes* (Larsson & Bolin 2014).

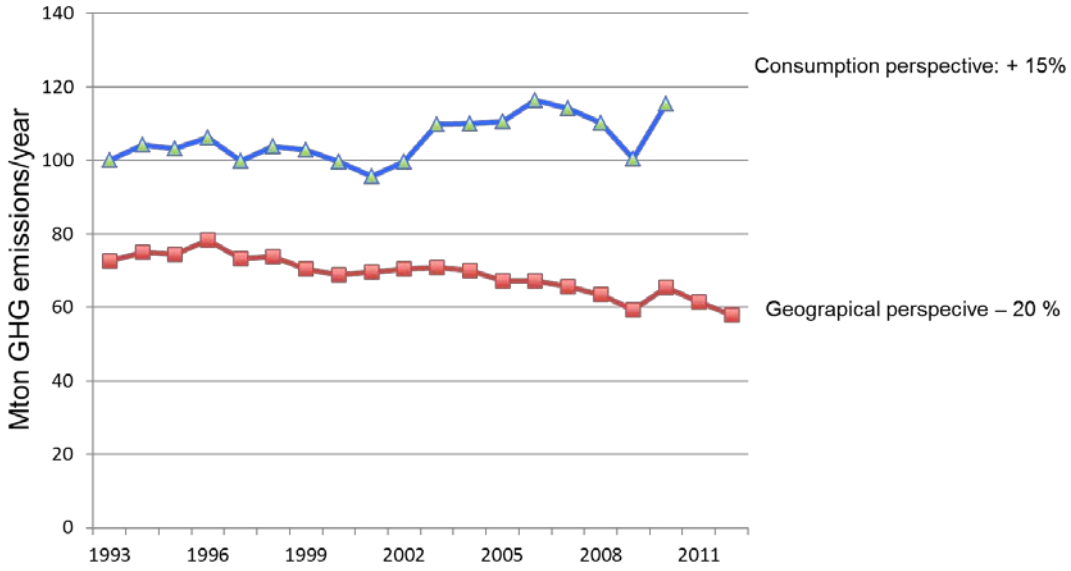


Figure 2. Development of Swedish greenhouse gas emissions

The UN has set the target that the global warming should not exceed 2 degrees. According to a number of studies, the 2-degree target requires that the total global greenhouse gas emissions must be cut by around 50 percent by 2050, compared with the base year 1990 (Rogelj et al. 2011). Since greenhouse gases have different degrees of impact on global warming the emissions are usually expressed in terms of carbon dioxide equivalents. If the emissions for 2050 are allocated equally among an estimated global population of 9.6 billion people, it corresponds to less than two tonnes of carbon dioxide per person. That is about 80 percent lower than current emissions from Swedish consumption per person. The overriding issue in this paper is to analyse how we can achieve consumption patterns that result in such radical reductions.

Eco-efficient production will not be enough

Emission reductions can be achieved by reducing the consumption of particularly greenhouse gas intensive products and services and by making the production processes more eco-efficient. The pace of this eco-efficiency has been 1.4 percent per year over the past 20 years (Nässén 2015). One of the paper's scenarios shows that not even a doubling of the rate of eco-efficiency improvement is sufficient to achieve sustainable emission levels by 2050. The most radical scenario includes, in addition to a doubling of eco-efficiency, an increased proportion of service consumption and slower consumption growth by shortening working hours. This decreases the calculated emissions further, but not all the way to the goal.

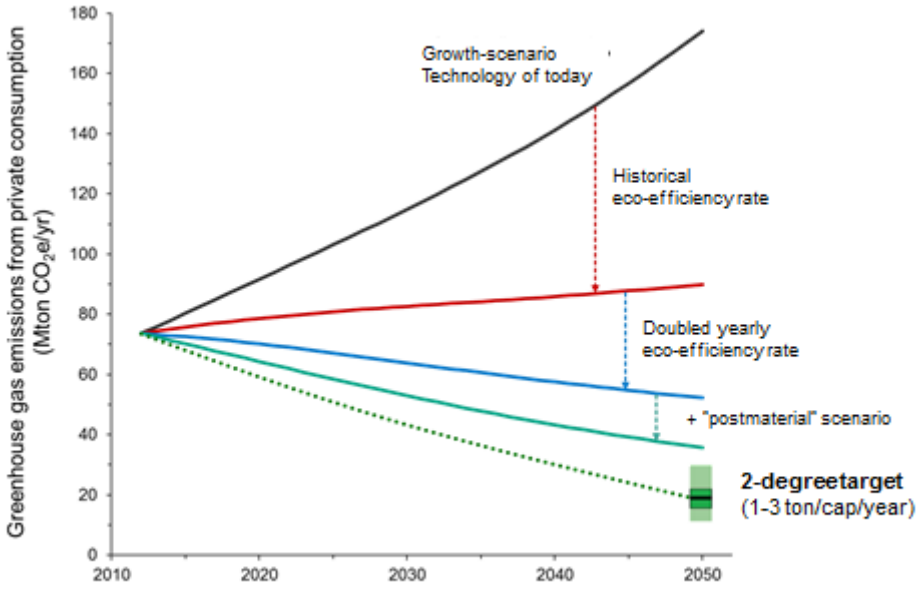


Figure 3. Scenarios for greenhouse gas emission from private consumption in Sweden 2012-2050

There are good opportunities for mitigation of emissions from e.g. road transport and from production of goods and electricity and by making changes in the global energy system. However, there are at least two areas of consumption where we assess that the technical potential is not sufficient to achieve sufficient emission reductions: food and air-travel.

Food: Large differences between various foods

When it comes to food production GHG emissions mainly occur from cultivation and animal husbandry. Meat and dairy production gives rise to methane emissions from ruminant stomachs, as well as nitrous oxide and methane emissions from manure management. From cultivation nitrous oxide emissions are occurring from nitrogen fertilization. Use of fossil fuels for cultivation and transport, and emissions from the production of fertilizers, represent, in most cases, a smaller portion of a food's climate impact.

The annual emissions caused by each Swede's food consumption are estimated to 1.8 tonnes of carbon dioxide equivalents per year. 75 percent of these emissions come from meat and dairy consumption, despite the fact that these food categories represent only 35 percent of our calorie intake. The fact that emission levels are so different for different types of food means that a change in the composition of what we eat has a very high potential for reducing emissions. The figure below outlines four future scenarios based on different development paths. The scenario that assumes a lower proportion of beef and lamb in our diet (foods that have the greatest impact on the climate) would in 2050 cause emissions of around one ton of carbon dioxide equivalents per person per year. If meat, dairy and fish were entirely replaced by vegetable food, emissions would come down to around 0.3 tonnes.

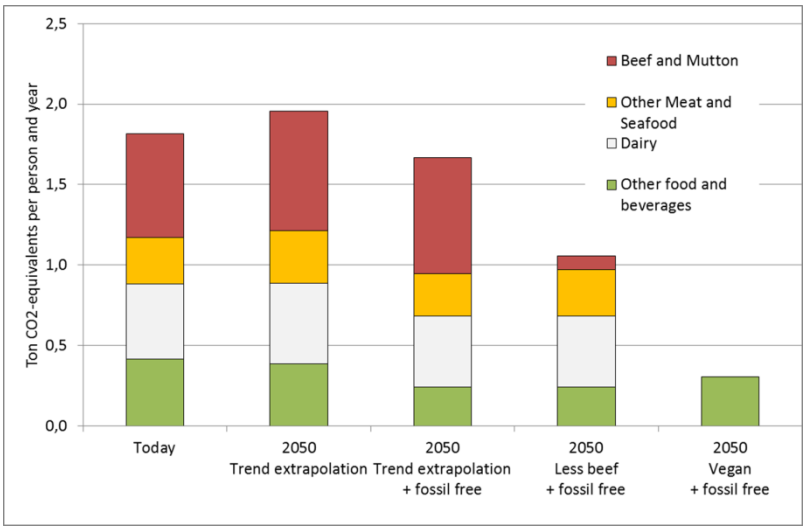
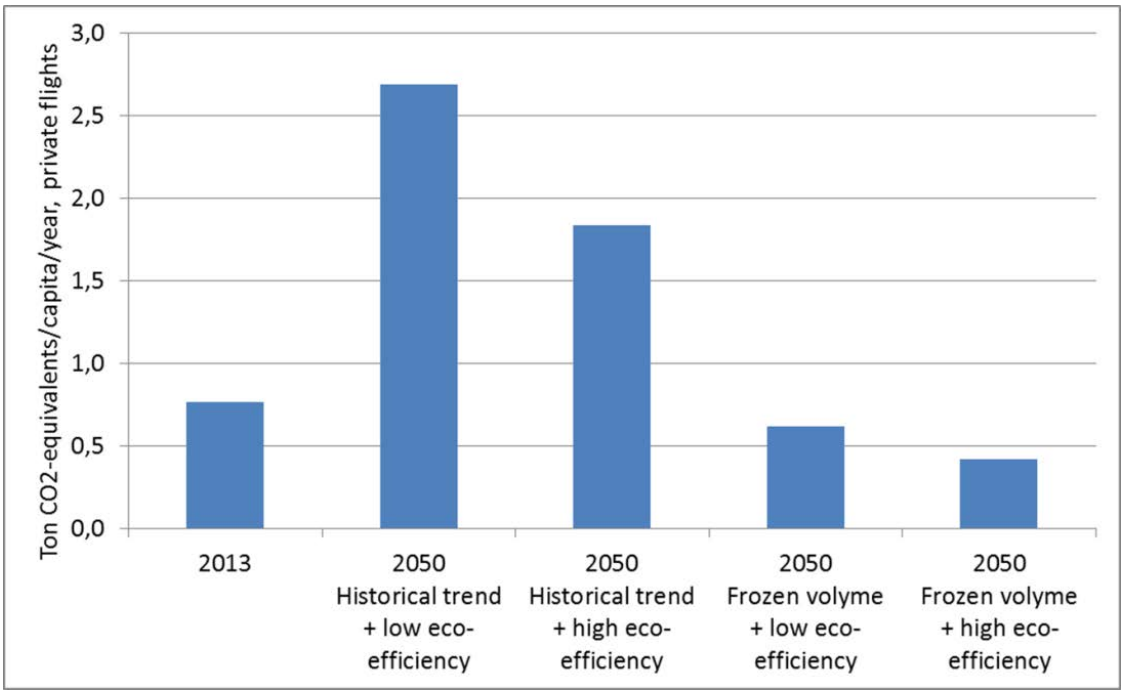


Figure 4. Greenhouse gas emissions from food 2012 and 2050

Air-travel

Climate impact from aviation arises both in the form of carbon dioxide emissions from combustion of fossil jet fuel and through the formation of mainly contrails at high altitude. The greenhouse gas emissions from the Swedes' air-travel have, according to our calculations, double the last 20 years and were 2013 about 1.1 tons of carbon dioxide equivalents. That is in the same magnitude as the emissions from all cars in Swedish. Climate impact of aviation can be lowered by measures such as more efficient engines, new aircraft designs and shorter flight paths. However, the effects of such measures are limited and seem far from sufficient to prevent a further increase of total emissions from aviation.

75 percent of the air-travel emissions are stemming from private air-travel and 25 percent from business travel (Swedavia 2011). The gives at hand that out of the 1.1 tons 0.8 tons come from private air travel. The development of private air travel is sketched in different scenarios for 2050. In one of them the historical growth rate of air-travel is combined with an optimistic scenario of eco-efficiency improvements. The emissions in this scenario are expected to be 1.8 tonnes of carbon dioxide equivalents per person in 2050. If the volume on the other hand remains at the current level, emissions could be expected to decrease to between 0.4-0.6 ton by 2050, depending on the degree of eco-efficiency.



Figur 5. Greenhouse gas emissions from private air travel 2012 and 2050

Pathways to sustainable consumption regarding food and air travel by 2050

The analyses above indicate that it could be possible to reduce overall emissions to levels that are roughly within the estimated emission budget of around two tons per person in 2050. But such a transition requires a very higher rate of annual eco-efficiency improvements combined with relatively large changes in our consumption patterns.

It is a great challenge to achieve sustainable consumption patterns. The climate impact from both food and air travel is growing and together amount to almost 3 tons of carbon dioxide equivalents per person per year. The conclusion is that to have good chances to achieve the climate target and the generation goal powerful policy instruments need to be developed and introduced. Proposals for new instruments are seldom positively received by the public and interest groups. Experts and public bodies may contribute to more positive attitudes by spreading knowledge about the climate impact of food and aviation and about the implications of different policy instruments. Politicians and others influencing public opinion can contribute to the public discussion about our joint responsibility, argue for the benefits of the new policy instruments, and thereby increase the acceptance for them.

Acknowledgement

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http://www.mistraurbanfutures.org/en/project/wise-%E2%80%93-well-being-sustainable-cities

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