MATERIAL ECONOMICS

THE CLIMATE BENEFITS OF SWEDISH EXPORTS

Summary in English

SUMMARY

The Swedish goal of net-zero emissions by the year 2045 has become the guiding star of the country's climate policy. However, reducing territorial emissions is only part of Sweden's role in the climate transition.

Lately, the climate footprint of Swedish consumption has been recognized, and the government is now investigating whether consumption emission reduction goals should be included in the Swedish climate goals. Meanwhile, the effects of Swedish exports on the climate are barely discussed at all.

I. SWEDEN AS AN EXPORT NATION HAS GREAT POTENTIAL TO CONTRIBUTE TO THE GLOBAL CLIMATE TRANSITION

Swedish exports contribute to lowering global emissions in numerous ways: through climate-friendly production in Sweden that emits less CO_2 than that in other countries, through products that contribute to higher energy- and resource-efficiency, and through digitalisation and other system changes required to achieve global climate goals.

Despite this, the climate contributions of Swedish exports are hardly discussed. Industrial and economic policy is kept almost completely separate from climate policy. One reason for this is the lack of data – it is simply not widely known how significant the climate benefits from Swedish exports are. This report makes a first contribution to quantifying them, by estimating how clean production in Sweden replaces more emission-intensive production in other countries.

II. PRODUCTION OF SWEDISH EXPORT GOODS ALREADY CREATES CLIMATE BENEFITS EQUIVALENT OF 26 MILLION TONNES OF CO_2 PER YEAR

We develop a method that compares Swedish production with that in other countries. Specifically, we calculate – industry by industry – the climate footprint of Swedish export goods, identify relevant reference facilities abroad and calculate the climate footprint of equivalent production in those facilities. By comparing the numbers we get an estimate of the amount of greenhouse gas emissions avoided.

Our analysis shows that the goods exported from Sweden each year would have caused emissions of 37 million tonnes (Mt) CO_2 had they been produced in other countries. However, in Sweden, they caused only 11 Mt CO_2. This means that Swedish exports avoid global emissions of as much as 26 Mt CO_2 per year – a robust and intuitive definition of climate benefits directly through exports.

Three factors contribute to these large climate benefits:

- **Swedish electricity is already close to fossil-free,** two or three decades ahead of other countries. By using nearly CO_2-free electricity in their processes, Swedish companies contribute to an equivalent of 11.5 Mt CO_2 reductions per year. The large expansion of fossil free electricity production in the last decade has also enabled electricity exports that avoid another 4.7 Mt CO_2 that would otherwise have been emitted in the importing countries.

- **Swedish industrial processes are highly efficient.** Continuous investments in improving processes and the use of climate-friendly input materials have resulted in 15–20 % lower emissions than comparable production in other countries. This applies to mining, steel production, refineries, the petrochemical industry, and cement production, among others. The total climate benefit from this is 5.3 Mt CO_2 per year.

- **Swedish industry uses sustainable bioenergy on a large scale,** which avoids the use of fossil fuels and associated emissions of 3.9 Mt CO_2 per year, mainly in paper and pulp production.

Along with the benefits of cleaner production, Swedish exports have climate benefits in the use of the products that are exported, and through positive system effects:

- **Contributions to energy and resource efficiency** during the use phase: Many Swedish export products are highly efficient (e.g. trucks, heat exchangers, power engineering) contribute to material efficiency (e.g. high-strength steel) or can replace more fossil-intensive alternatives (e.g. timber). The amount of emission reductions quickly grow in impact. For example, the more energy efficient trucks sold by Swedish manufacturers each year reduce emissions by 7–8 Mt CO_2 during their lifetimes. Similarly, the high-strength steel that Swedish producers export each year contribute to more than 10 Mt CO_2 reduction. And annual Swedish timber exports that replace fossil-intensive materials reduce emissions by 25 Mt CO_2.

- **Transformation towards low-carbon systems:** Swedish exports make important contributions through key components in green products. For example, Swedish steel is used in a third of all wind turbines in the world; vacuum technology from Swedish companies is used in the production of many of the world's solar cells; and Sweden has the ability to produce large quantities of the metals and minerals needed for the electrification of the economy in a climate transition. Swedish exports also contribute to digitalisation which is the basis of many of the changes we need to make, including Swedish leadership in 5G technology. Finally, Swedish industry can export know-how. If, for example, the technology behind fossil-free steel production is licensed globally, it could lead to emission reductions of 50 Mt CO_2 per year.

III. A GREEN NEW INDUSTRIALISATION COULD INCREASE THE CLIMATE BENEFITS OF SWEDISH EXPORTS TO 52–65 MT CO_2 PER YEAR UNTIL 2040, THROUGH CLEANER PRODUCTION ALONE

The already considerable climate benefits of Swedish exports can still increase. We show that the climate benefits from cleaner production could amount to 65 Mt CO_2 per year by 2040. An important conclusion is that this potential is highly relevant even if the rest of the world transitions: even in a scenario in which global warming is limited to 2°C, the climate benefits of Swedish exports would amount to 52–55 Mt CO_2 per year – more than today's total emissions within Sweden's borders.

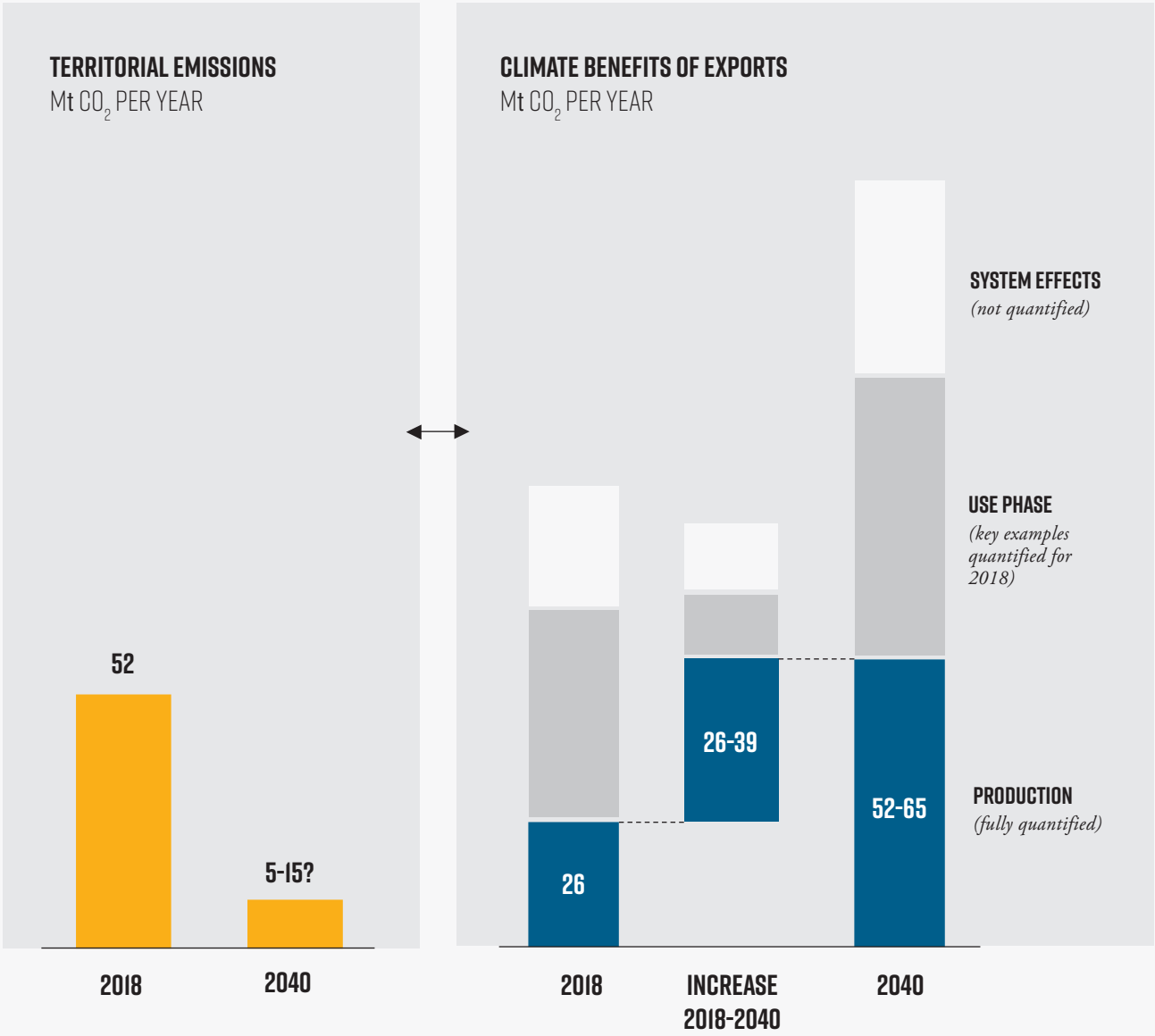
A successful Swedish low-carbon journey is an important factor. Swedish companies have world-leading plans to reach net-zero emissions from their own production. However, an equally important contribution comes from the ability to seize new business opportunities that build on the Swedish lead in innovation and available resources. New production technologies and industries within only four areas (fossil-free iron and steel production, battery production, chemical recycling of plastics, and exports of climate-friendly electricity or hydrogen) can avoid another 29–32 Mt CO_2 in annual emissions – and many other possibilities remain.

Great efforts are required. A rapid new industrialisation of Sweden is needed to seize these opportunities, with a rate of change resembling that of the post-World War II years, not the gradual changes seen in the past 3–4 decades. Key needs are increased risk-taking and rapid development of technology, renewed business and environmental permits, development of electricity and other infrastructure, a competitive power system, and policy mechanisms that stimulate the first, critical, investments and make clean production profitable. For example, Swedish industries' electricity use needs to increase from today's 50 TWh to 130 TWh within just a couple of decades.

If this effort succeeds, it could make as large a contribution to the climate transition as achieving the goal of net-zero territorial emissions (Exhibit 1). Industrial and economic policy is therefore crucial to a climate transition that maximises Sweden's climate contributions.

Exhibit 1

CLIMATE BENEFITS OF SWEDISH EXPORTS COMPARED TO SWEDISH TERRITORIAL EMISSIONS



KÄLLA: MATERIAL ECONOMICS ANALYSIS, BASED ON SEVERAL SOURCES (SEE THE FULL VERSION OF THE REPORT FOR LIST OF SOURCES)

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Summary in English

This is an English summary of the report 'Klimatnyttan av svensk export'.

The report puts Swedish industrial emissions in an international perspective and investigates how Swedish exports affect global climate goals. It shows that Swedish goods reduce emissions in other countries, and that a successful export focused industry may be one of the greatest contributions that Sweden makes to the global climate transition.

The study was carried out by Materials Economics, at the request of Svenskt Näringsliv and with support from Vinnova, within the initiative Klimatagendan.

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