

Research Brief

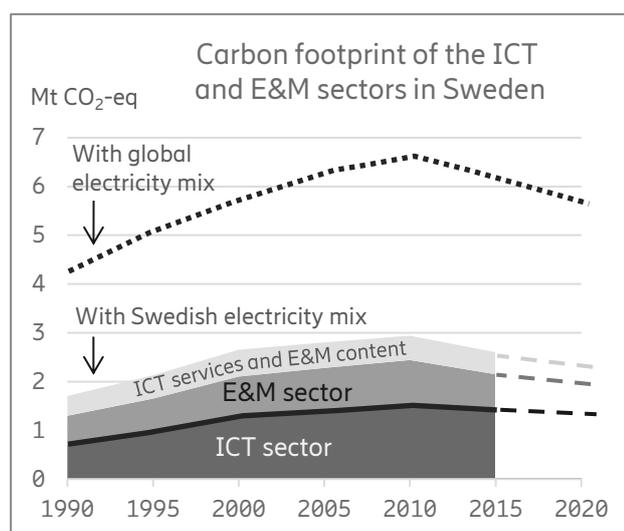
Carbon footprint of ICT in Sweden - a detailed case study

Despite the fact that more ICT devices than ever are in use and that data traffic continues to increase, the carbon footprint for ICT in Sweden has started to decrease, in contrast to former projections. The ICT carbon footprint is about 1.2% of Sweden's total carbon footprint (2015), a reduction of about 7% compared to 2010.

Footprint evolution in ICT-mature Sweden

From 1990 the energy consumption of the Information and Communication (ICT) sector in Sweden roughly doubled until 2010, mainly because of an increased use of computers in Swedish homes. Sweden has one of the highest numbers of PCs, tablets and smartphones per person (2.7 per capita), as well as one of the highest ratios of data traffic per person in the world.

The carbon footprint of the Swedish ICT sector in 2015 was estimated to be about 1.4 Mt CO₂-equivalents (CO₂-eq), or approximately 140 kg per capita,



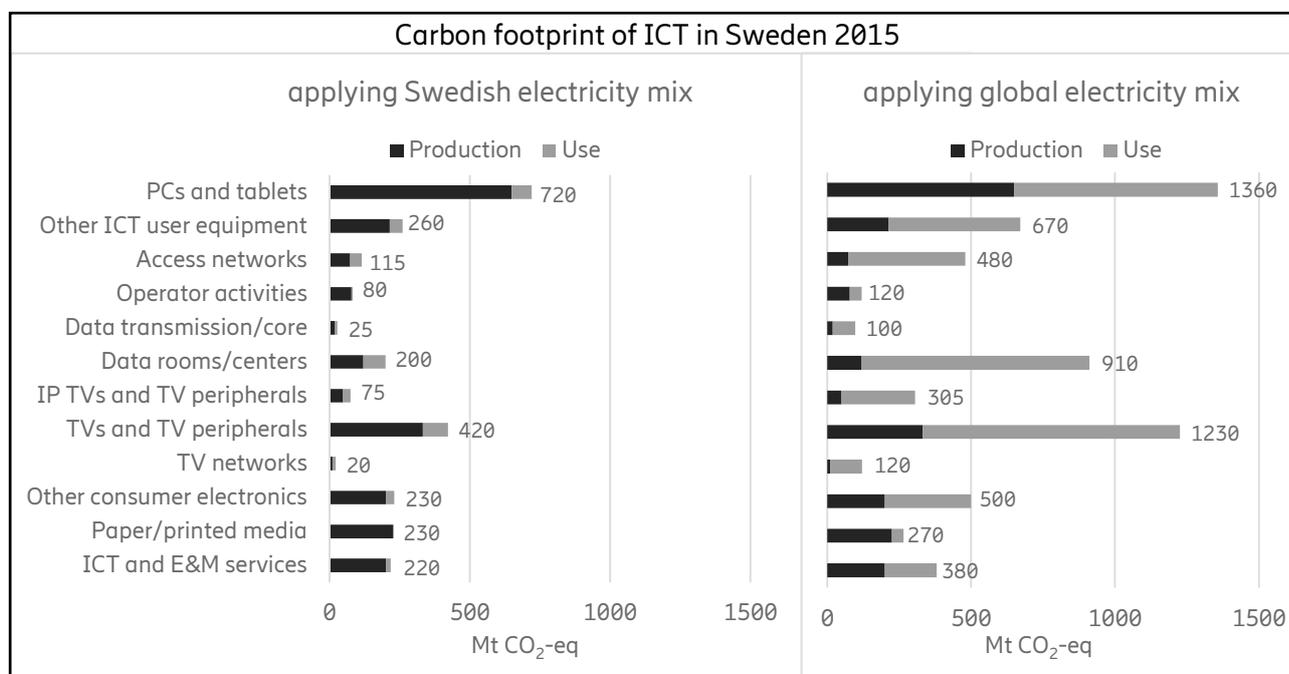


which corresponds to about 1.2% of the overall Swedish carbon footprint from a consumption perspective, including impact from production abroad.

The life cycle impacts of user equipment, mobile and fixed access networks, data transmission and IP core networks, network operators and their activities, data centers and enterprise networks are included in this estimation of the ICT sector.

In 2015 the carbon footprint for ICT in Sweden was about 7% lower than in 2010. During the same period, data traffic roughly increased by a factor five, or 35% per year. On average, a Swedish person in 2015 used about 1.3 TB data annually, which is about ten times higher than the global average.

The main reason for the decrease of the ICT carbon footprint is that usage has changed to smaller personal portable devices, such as tablets and smartphones, accompanied by improvements made in equipment energy consumption.



Similar development in entertainment & media

For the closely related Entertainment and Media (E&M) sector, the carbon footprint was estimated to be about 0.75 Mt CO₂-eq in 2015, which is nearly 20% lower than in 2010. The E&M sector includes TV and TV peripherals, audio, video, camera and other consumer electronics, as well as paper media. The E&M sector has gone through a similar development as the ICT sector, though the decreasing trend until 2015 has been slightly steeper.



This is probably due to the fact that more entertainment is now taking place on smaller ICT devices, which is confirmed by changed sales patterns.

Overall PCs, TVs and data centers constitute a major share of the total footprint. For 2015, the ICT services and E&M content production, including paper media, was estimated to be about 0.45 Mt CO₂-eq, or 0.4% of Sweden's carbon footprint.

Beyond 2015 further decrease projected

Reasonable future projections require a good understanding of both the historical trends and the current situation. It is also important to remember that development of ICT technology has never been static.

For Sweden, the carbon footprint of the ICT and E&M sectors is expected to continue to decrease beyond 2015 in line with the current trend of increasing use of smaller devices, as well as further improvements in energy efficiency.

Sweden has a low carbon electricity mix and to further reduce the Swedish ICT carbon footprint, the focus should be on lowering the embodied footprint related to production abroad, especially of user devices. By keeping a phone or computer for a longer time, users would help reduce the impact from production, as fewer devices would then need to be produced.

Swedish results in a global perspective

By applying a world average electricity mix, the energy consumption will increase the carbon footprint and the significance of the use stage, and the main decarbonization efforts should be focused there.

Sweden has one of the highest rates of ICT equipment and data traffic per person. There is a shift from using large screens to smaller devices that use less electricity. Also, the increase in data traffic has started to slow down over recent years. Sweden is probably approaching the limit of how much video a person can consume. In the long run, developments similar to those in Sweden are expected globally and a decrease in global sales of PCs and TVs can already be seen.

From a life cycle perspective, it is worth noting that Sweden has one of the highest collection and recycling rates for electrical and electronic equipment waste in the world. Formal recycling of materials, especially metals, will significantly help avoiding emissions from raw material acquisition and building a circular economy and more sustainable world.

Reference to full paper:

[Malmodin, Jens & Lundén, Dag. \(2016\). The energy and carbon footprint of the ICT and E&M sector in Sweden 1995-2015 and beyond. ICT for Sustainability 2016. 10.2291/ict4s-16.2016.25.](#)