

# Emitting less when going shopping – can we do that?

**With the global climate crisis emerging rapidly, the emissions of carbon dioxide need to decrease dramatically. A recent study uses the concept of accessibility, with CO<sub>2</sub> emissions as the base, to assess shopping centres' location. The study shows that public transport, especially trains, are superior in carbon efficiency and that both shopping and residential buildings should be located along with the railway network, not highways.**

Over the last decades, shopping centres have been established outside the city centres, making shopping trips longer and emitting more greenhouse gases to the atmosphere. The two shopping centres of the study are Emporia and C4 Shopping, located in the Swedish province of Scania. Emporia, outside of Malmö, is located right next to a railway station, but also major roads and highways. C4 Shopping, right outside of Kristianstad, is also closely placed to the big highway that runs outside of the city.

The study is made to see if the localisation of a shopping centre has an impact on the *accessibility* from a CO<sub>2</sub> point-of-view. Accessibility can be defined in many ways. In this study, the accessibility is indicated by the number of people reached by the shopping centre, within a certain CO<sub>2</sub> *budget*.

When we make choices in everyday life, we take different things into account. Sometimes, the choices are limited by time, others by money. This can be the deciding factor when travelling: some trips can be too expensive or take too much time for it to be convenient, hence we make another choice

instead. This study uses a *budget* of CO<sub>2</sub> emissions instead of money or minutes. Instead of looking at “how far can you get in 20 minutes?”, the question instead is “*how far can you get in a certain amount of CO<sub>2</sub> emissions?*”.

To calculate different emission budgets, today's levels are used and compared with future emission reduction target. Today, the transportation sector stands for almost a third of all emissions in Sweden. In 2030, Sweden is to have reduced its emissions from domestic transportation by 70% compared to 2010. This is a reduction of more than 8 million tonnes of CO<sub>2</sub>, as much as entire Cyprus emitted in 2018.

The budgets (one for 2017 levels and one for 2030 targets) are based on how our trips for shopping usually looks like, for example how long a shopping trip is on average.

The emissions differ between different types of travel modes. The majority of the car fleet in Sweden is run on fossil fuels, emitting a lot of CO<sub>2</sub> per kilometre. Meanwhile, most buses in the studied region are biofuels, having a lower emission factor. The trains are completely electrified, hence having the lowest emissions of CO<sub>2</sub> per kilometre. The number of passengers of the different modes is also taken into account.

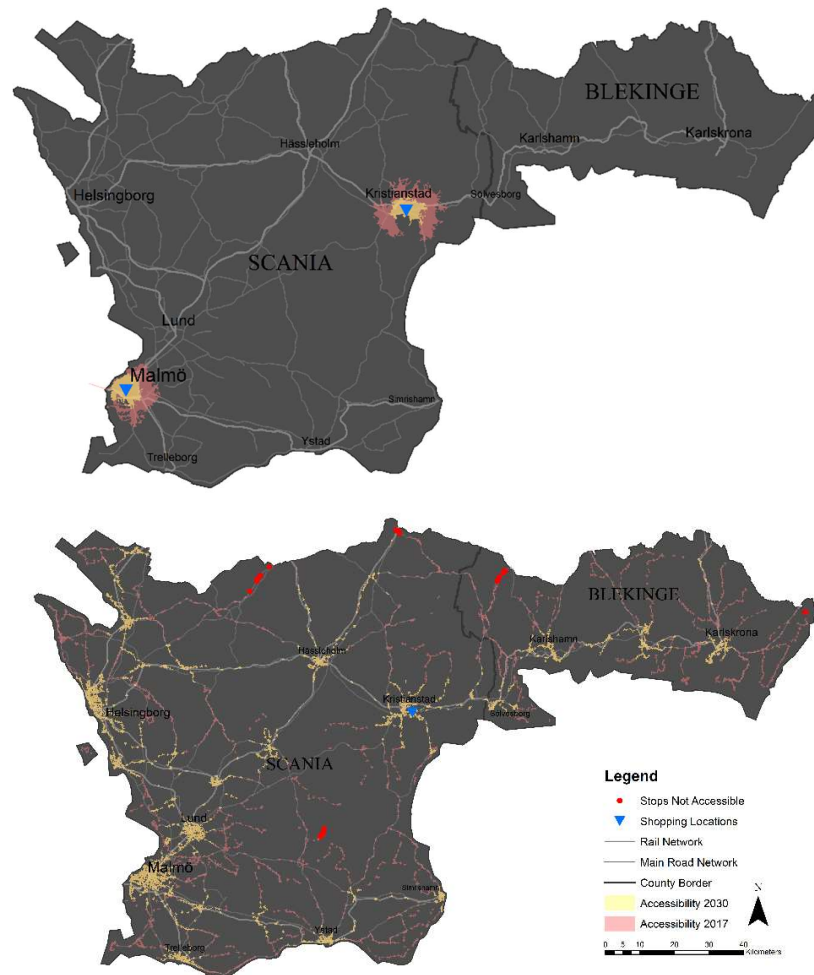
Results show that Emporia has a higher index of accessibility in all cases. This is both due to its localisation close to a railway station, but also because Malmö is a much bigger city than Kristianstad. There are simply more people nearby Emporia than C4 Shopping.

Shopping centres that are placed outside of the city centres are made to be easily accessed by car. However, when using CO<sub>2</sub> as a budget, this is quite the opposite. As the car emits more per person and kilometre than a bus or train, the reach of the car is less than public transport using the same budget – meaning that fewer people are reached and that the accessibility is lower.

The results also show that if the emission reduction targets are to be strictly applied in 2030, our shopping alternatives will decrease compared to today, as we no longer can travel as far as today.

The answer to the headline question is that yes, we can potentially emit less when travelling for shopping. To do this, however, we need to locate the shopping centres and develop residential buildings close to railway stations. The public transport network should also be further expanded to reach more rural areas.

The method of CO<sub>2</sub>-based accessibility can be used to visualise the carbon footprint of shopping centres (and other facilities). The method has a new perspective on accessibility and can hopefully shine new light to where facilities should be located to increase sustainability in our society and decision-making processes.



The accessible areas (the reach) of Emporia and C4 Shopping by car (above picture) and the reach of C4 Shopping by public transport. Yellow only is 2030 emission budget. Yellow and red are 2017 emission budget