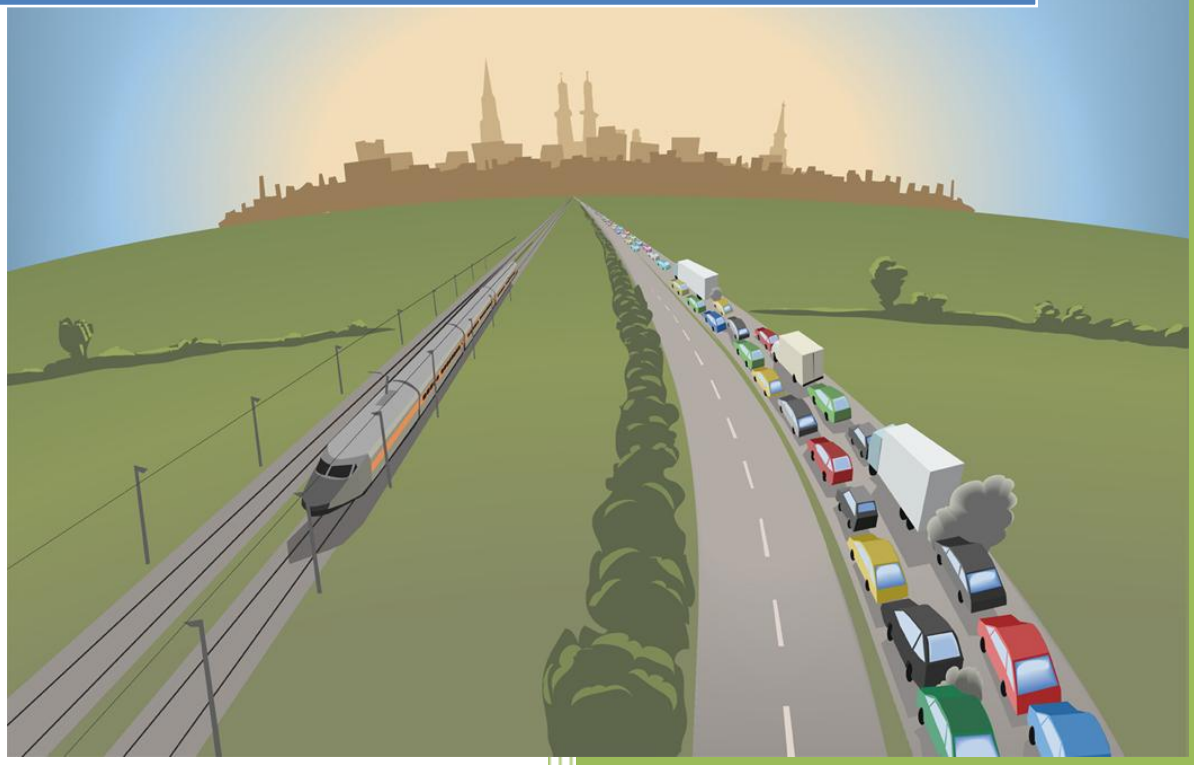
Reducing greenhouse gas emissions from commuting in the municipality of Sønderborg



Master thesis by

Kristiana Stoyanova and

Per Alnor Kjær

Supervisors:

Niels Vestergaard and Jacob Kronbak

University of Southern Denmark

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Abstract

This report quantifies the emissions of greenhouse gases (GHGs) from commuting in the municipality of Sønderborg in 2008 and 2030 and presents strategies aiming at reducing these emissions that can be introduced by the municipality.

Sønderborg municipality is used as a case study as it has the ambition of becoming a CO_2 neutral municipality. Transportation is chosen for the main topic of this report as it is one of the sectors where reductions in emissions are most difficult to attain. This is the case especially for commuting, which is essential transportation for most workers as they cannot avoid undertaking it. Commuting results in emissions of GHGs due to the burning of fossil fuels and reduction of these emissions is therefore vital if the 'zero emissions' goal of Sønderborg municipality is to be reached.

In order to assess the reduction potential of different strategies, it is essential to quantify the emissions from commuting. This is done by constructing a model that decomposes the emissions of GHGs into their driving parameters. This methodology is known as Kaya identity and is used in the IPCC's report on emissions scenarios. The four driving parameters in the analysed case are: the number of commuters (P), the travel intensity of the commuters (T), the energy intensity of commuting (E) and the carbon intensity per unit of energy used for commuting (C). A thorough analysis of these parameters and the driving factors behind them is carried out and presented.

Using this methodology the GHG emissions in 2008 and in a Reference scenario for 2030 are estimated. In the Reference scenario the GHG emissions from commuting are reduced by 28% between 2008 and 2030, which is mainly caused by the adoption of legislation concerning the energy intensity of vehicles and the mixing of biofuels in conventional fuels, but also by the decreasing commuting population in the municipality.

In order to find to what extent the municipality itself can reduce the emissions from commuting further, various strategies have been analysed with respect to their reduction potential and cost effectiveness. These include voluntary initiatives, physical changes and public transport improvements.

One voluntary strategy has the largest potential for additional reductions of emissions: ‘teleworking full-time’, where 12% of the commuters start working from home. This strategy reduces the total carbon emissions from commuting with an additional 12% compared to the Reference scenario. Physical change in the form of land-use development aiming at ‘increasing the urban density’ follows with a carbon reduction potential of 8%. A strategy to increase bicycling through ‘bicycle improvements’ is found to have a reduction potential of 4,35%, while ‘car sharing’ for 7% of the workforce has a reduction potential of 3,5%. Improvements in the public transportation system are found to have small reduction potential due to its low utilisation.

When the strategies are compared according to their costs for abating one ton of CO_2 equivalent the cheapest of the strategies with highest potential is the ‘full-time teleworking' with a cost of 0 kr. per abated ton of CO_2 eq., followed by ’increased density’ with 500 kr/t CO_2 eq. and ‘bicycle improvements’ at 680 kr/t CO_2 eq. Furthermore, it was found that ‘reducing bus travel time’ and introducing ‘biodiesel buses’ are cheap reduction strategies despite their low potential (0,17% and 1,7%) with 0 kr/t CO_2 eq. and 22 kr/t CO_2 eq. respectively. Moreover, substituting the current bus fleet with smaller ‘midibuses’ is found to induce a financial benefits of 3595 kr. per abated ton of CO_2 eq. which is the only strategy having positive net benefits.

On the basis of these results it is recommended that the municipality puts considerable efforts in promoting and encouraging full-time teleworking, which can be done by close cooperation between the municipality’s institutions and the private actors in the municipality. Moreover, reducing the long-term need for transportation by increasing the urban density and promoting mixed-use development is recommended as this is an effective manner to reduce transportation demand in the long run. Reducing the travel distances allows for greater use of alternative modes such as bicycling and walking. Therefore, providing better conditions for bicycling especially can be beneficial for the emissions accounts and the population’s health in the long run. Finally, a substitution of the bus fleet with ‘midibuses’ is highly recommended due to the carbon savings and the positive net benefits from this strategy.

Overall the potential of the strategies analysed in this report proves to be small, where a single carbon mitigation strategy obtains not more than a 12% reduction in emissions. Thus, attaining the ambitious

‘zero emissions’ goal cannot be achieved in the transportation sector solely by the efforts of the municipality. It is likely, however, that a combination of strategies could have a greater potential for reducing the GHG emissions, but in order to achieve ‘zero emissions’ dedicated economic and legal policies need to be implemented by the higher authorities, such as the government or the EU.