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Sustainable transport policy: taxes have highest impact in lowering carbon emissions, Denmark



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In order to meet [global emission reduction targets](#), the [transport sector](#) must become more sustainable. To assess the impact and effectiveness of various transport policy measures in reaching emission reduction targets, a quantitative assessment of policy scenarios was conducted for Denmark. The results indicate that market signals, in the form of taxes on CO₂ and fossil fuels, retain the highest impact in lowering carbon emissions in the transport sector, while the promotion of Mobility-as-a-Service (MaaS), rather than autonomous transport, is the most cost-effective measure.

Transport activity accounts for 23% of [energy](#)-related greenhouse-gas emissions at the global level. Within the whole Danish energy system, the transport sector accounted for 42% of total CO₂ emissions in 2015. If emission reduction targets are to be met, there is, therefore, an urgent need to make the transport sector more sustainable. Strategies for achieving this include the implementation of [policy measures](#) designed to promote technological developments, regulatory instruments and social change. However, accurately identifying the most effective measures can be a challenge.

Researchers conducted a quantitative assessment of the impact and effectiveness of a range of transport and energy policy measures on achieving national and European emission-reduction targets in Denmark. A series of policy scenarios were generated, based on workshops conducted with experts, stakeholders and citizens. The four scenarios were:

- New mobility (measures relevant to e-bikes, car occupancy and teleworking);
- Electrification (measures relevant to fossil-fuel tax, electricity tax, vehicle-registration tax and fossil-fuel phase-out);
- Market-driven (measures relevant to internal combustion engine (ICE) bans and CO₂ tax);
- Sea and air (measures relevant to the decarbonisation of the aviation and maritime sectors).



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Sustainable transport policy: taxes have highest impact in lowering carbon emissions, Denmark (continued)

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These scenarios were analysed to elucidate the single and combined effects of policy measures. Analysis was facilitated by a newly developed Scenario Interface tool (an Excel-based tool that helps those unfamiliar with modelling to create energy and transport scenarios). The tool was coupled with the Danish energy system model TIMES-DK, which includes the complete national energy system, covering long-term technology investments.

The results suggest that market signals, in the form of taxes on CO₂ and fossil fuels, retain the highest impact in lowering carbon emissions in the transport sector. Mobility-as-a-service (MaaS) describes a shift away from personal vehicle ownership towards a combination of transportation services from public and private transportation providers (including such options as ride-sharing and e-hailing services, bike-, car- and scooter-sharing programmes and on-demand bus services). MaaS was identified as the most cost-effective measure. The New mobility scenario also illustrated how cost savings at system level could be achieved through the combination of policy measures such as the promotion of MaaS, working from home and increased adoption of e-bikes.

This research has implications for transport and energy policy. In addition to highlighting the need to address the transition to sustainable transport through the design and implementation of coherent policy packages, the study provides useful insights regarding the potential impact and effectiveness of a wide range of policy measures, considered on their own and in combination.

The study also identifies a particularly urgent need to develop policy measures aimed at making the maritime and aviation sectors more sustainable, as these sectors have a particularly large impact in terms of fossil-fuel consumption and greenhouse-gas emissions.