On the Future of Passenger Mobility and its GHG Emissions in Vienna: Scenarios for Different Types of Policies

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Agenda

- Mobility in Vienna
- Core objective
- State of the art
- Methods of approach
- Assumptions for the scenarios and results
- Conclusions
Mobility in Vienna

- Urban areas host about 50% of global population and generate 70% of GHG emissions

- Vienna -> reduction of GHG emissions until 2050 by 80% compared to emissions in 1990 (Smart City Wien Framework Strategy)

- Transport sector (43%), energy generation (20%), buildings (17%)

- Road Transportation contributed 72% of CO$_2$ emissions within transport sector

- Still fossil fueled, largely car-oriented
Mobility in Vienna

GHG-emissions [tons]

- Hard coal
- Petrol
- Petroleum
- Diesel
- Liquid petroleum gas (LPG)
- Natural gas
- Biogenic fuels
- Electrical energy
Core objective:

• Analysis of scenarios for future development of energy use and resulting GHG emissions in transport in Vienna up to 2030

• Consideration of flow energy, flow emissions and embedded emissions of car/vehicle production

• Derivation of three scenarios (1) BAU-Scenario, (2) Public Transport Scenario, (3) BEV Scenario
  • conventional electricity mix, electricity from RES

Methods of approach:

• Excel model to estimate energy and CO2 flows and embodied energy and embodied CO2 and calculate corresponding emissions from manufacturing
State of the art

Data is from
- Alter-Motive Project from the EEG (2008-2011)
- ODYSSEE MURE (2016-2018)
- TransLoC (2018-2022)
- Statistic Austria

Peer-reviewed paper:
- Electric Mobility in Cities: The Case of Vienna (2021, Ajanovic et al.)
- How policy measures succeeded to promote electric mobility – Worldwide review and outlook (2018, Rietmann et al.)
- Future local passenger transport system scenarios and implications for policy and practice (2020, Enoch et al.)
Methodology

- \( \tau_{\text{REG}} \) registration tax
- \( \tau_F \) tax on fuel
- \( V_{\text{new}} \) vehicles new registered
- \( V_{\text{stock}} \) vehicle stock
- \( \text{Vkm} \) vehicle km driven [km]
- \( \text{IC}_{\text{new}} \) investment costs [€/car] new registered vehicles
- \( \text{IC}_{\text{new}} \) investment costs [€/car] new registered vehicles
- \( \text{F}_{\text{new}} \) fuel intensity [litre/100 km] new registered vehicles
- \( \text{F}_{\text{stock}} \) fuel intensity [litre/100 km] vehicle stock
- \( f_{\text{CO2_SP}} \) specific CO2 emissions per litre fuel
- \( Y \) income
- \( \text{PS}_{\text{stock}} \) service price [€/km] vehicle stock
- \( \text{PS}_{\text{new}} \) service price [€/km] new vehicles
- \( \text{PF} \) fuel price [€/litre]
- \( \text{PS}_{\text{stock}} \) service price [€/km] vehicle stock
- \( \text{IC}_{\text{new}} \) investment costs [€/car] new registered vehicles
- \( \text{F}_{\text{new}} \) fuel intensity [litre/100 km] new registered vehicles
- \( \text{F}_{\text{stock}} \) fuel intensity [litre/100 km] vehicle stock
- \( f_{\text{CO2_SP}} \) specific CO2 emissions per litre fuel
- \( Y \) income
- \( \tau_F \) tax on fuel
- \( \tau_{\text{REG}} \) registration tax
Scenario Assumptions:

- Average growth rate PT of 2.6%/year in recent years to 2.6%/year up to 2030
- Average growth rate alternative-fueled cars of 3%/year up to 2030
- Private diesel use -> reduction of 4%/year
Scenario Assumptions:

- Average growth rate PT of 2.6%/year in recent years to 4%/year up to 2030
- Average growth rate alternative-fueled cars of 3%/year up to 2030
- Private diesel use -> reduction of 4%/year
Battery Electric Vehicle Scenario

Scenario Assumptions:

- Average growth rate PT of 2.6% in recent years to 2.6% up to 2030
- Average growth rate BEV of 3%/year in recent years to 4%/year up to 2030
- Private diesel use -> reduction of 4%/year
Development of CO2 Emissions in Scenarios

- Each scenario with a conventional electricity mix and electricity from RES
- Public scenario with electricity from RES → lowest CO2 emissions
Conclusion

- Political measures -> most significant impact on CO2 emissions in transport (reduction of pkm driven)
- Electrification of transport -> need to increase the electricity generation from RES
- Promotion of public transport
- Public Transport scenario with electricity from RES -> lowest total CO2 emissions (minus of 15% CO2 emissions compared to BAU-scenario)
References