The role of a Sustainable Mobility Guarantee for the social-ecological transformation: Cost Benefit Analysis (CBA) for the case of Austria

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Key findings (preliminary)

→ A Sustainable Mobility Guarantee could be implemented with investing a total of 20 - 46 Billion Euro until the year 2040
→ Benefits outweigh the costs in several scenarios
→ Reducing car use is key to achieving high benefits (avoided climate change damage, accidents and congestion cost)
→ Further research is needed to identify the sensitivities of uncertain parameters

Introduction

The emergence of the "Sustainable Mobility Guarantee" (SMG) concept reflects urgent societal challenges, particularly in the face of climate change and its impact on human health. The Sustainable Mobility Guarantee aligns with the Universal Basic Services approach, aiming to meet citizens' mobility needs sustainably [4]. This study evaluates the economic implications of implementing a Sustainable Mobility Guarantee. Through previous research and modeling [5,6], I analyze the financial investment required for implementing such a guarantee and the benefits that it would bring with it. The study contributes to understanding the (financial) feasibility and potential impact of transitioning to post-carbon mobility.

Methods

The Cost-Benefit Analysis (CBA) represents an analytical approach for evaluating investments and their associated changes in benefits. The goal is to demonstrate the most efficient allocation of financial resources by comparing the costs of different investment alternatives to their societal benefits. Considered costs and benefits are shown in Fig. 3. The parameters are shown for different scenarios to show the variation of cost estimates and different implementation scenarios. In order to conduct a CBA, all benefits need to be translated into monetary values. For estimating the necessary investment, many uncertainties exist, such as missing data on the gap between current services and PT services for an SMG and different options of providing the quality level of services (e.g. railway, bus services and DRT). The calculation is therefore to be understood as a first rough estimation. I assume a different mix of services as well as different service quality levels for the scenarios. The price base is the year 2021 with constant prices. Prices from different years are adjusted to the year 2021 based on inflation data from Statistik Austria (2022). The considered time period is 2020-2040.
The following references served as guides for the analysis:

- Quantification of average external costs "Handbook on the external costs of transport"[1]
- Cost rates: "Methodenkonvention 3.1 zur Ermittlung von Umweltkosten"[2]
- Quantification of health effects of active mobility: "The Social Cost of Automobility, Cycling and Walking in the European Union" [3]

Out of scope and not included in the calculations are positive economic effects in the form of value-added, job security, taxes, and levies resulting from the investments made.

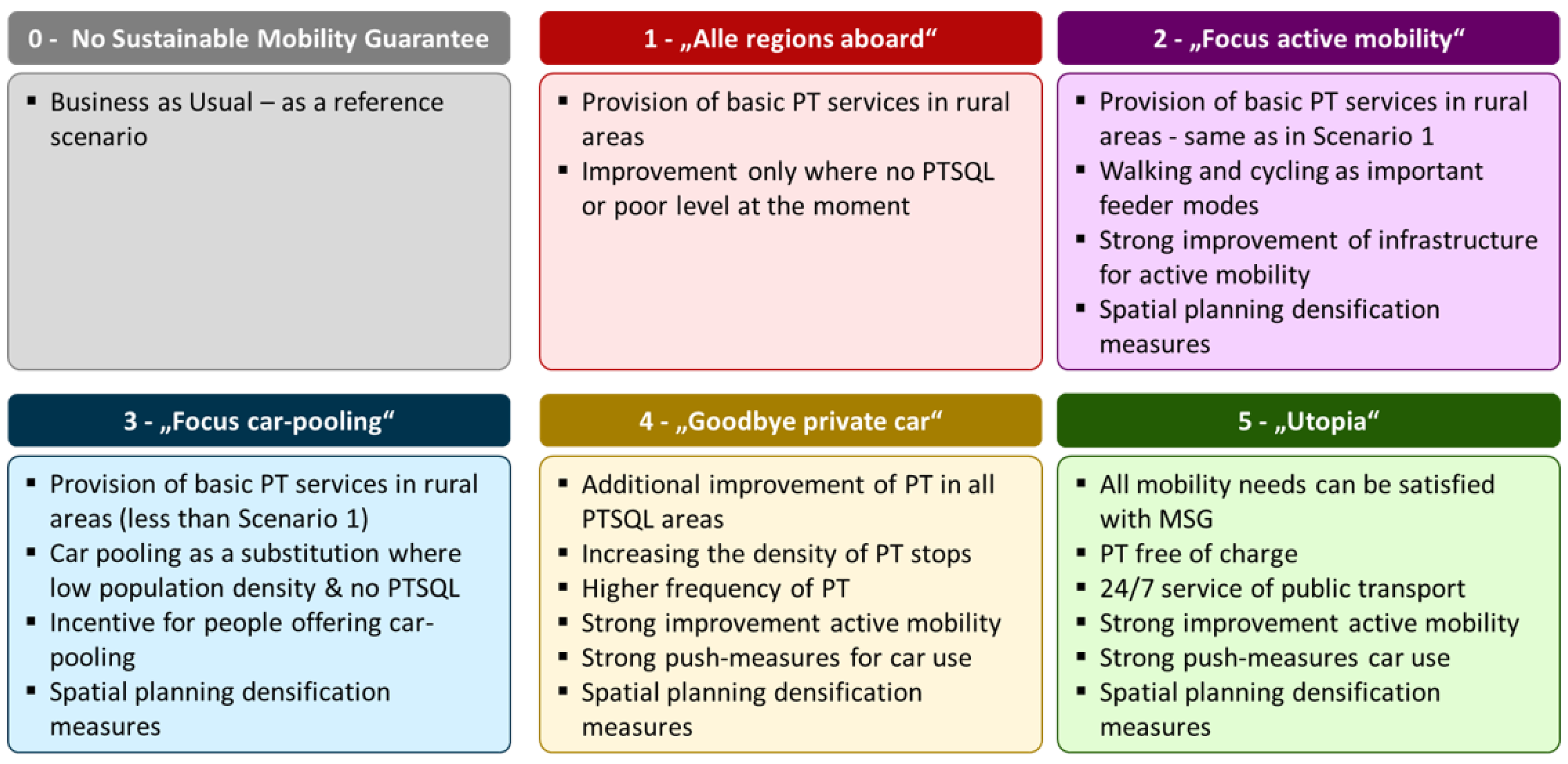

Fig. 1: Overview of scenarios

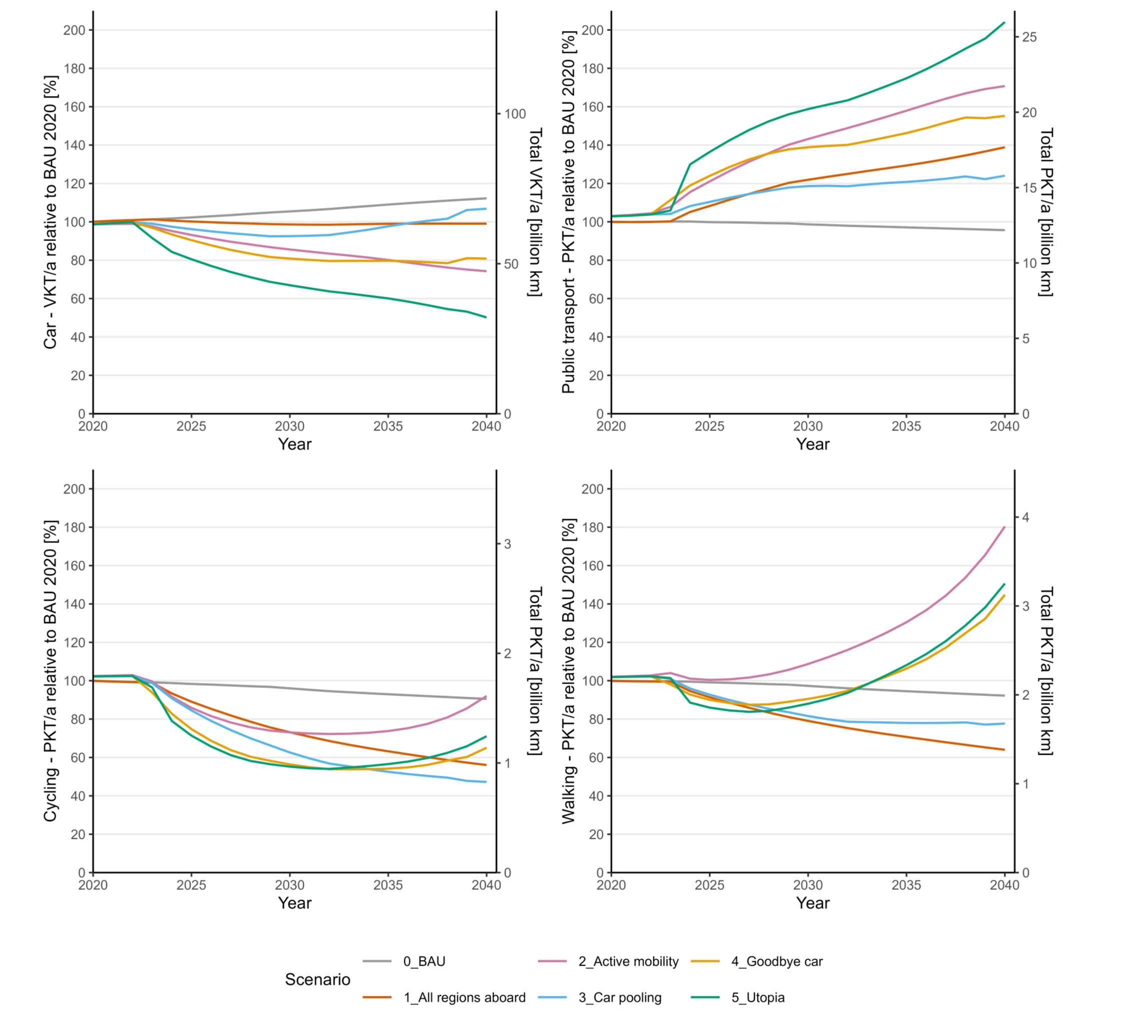

Fig. 2: Transport model simulation results

Results & Discussion

The impact of a Sustainable Mobility Guarantee on travel behaviour for different implementation scenarios has been analysed in previous works [5,6]. Fig. 1 shows an overview of the anylsed scenarios and Fig. 2 shows the results in terms of vehicle km travelled (VKT) and person-km travelled (PKT). The simulation results were used as input for the CBA. Results of the CBA for two exemplary scenarios are shown in Fig. 3. Results show that:

- Initial investment ranges between 12 and 30 Bn. EUR
- Additional operational costs for public transport range between 600 Mio and 1.5 Bn. EUR per year

On the benefit side, the reduction of car use leads to less air pollution, avoided climate change damage, less accidents, noise and congestion. Well-to-tank emissions for private cars can be reduced as well. With increased walking and cycling, health benefits for individuals reduce costs for healthcare and longer lives offer economic benefits. In some scenarios, road pricing is introduced, which could serve as additional state profit.

The balance sheet of the CBA shows that the total benefits outweigh the costs in several scenarios. The most relevant parameters to keep costs low and benefits high are to reduce the need for expensive rail infrastructure (e.g. with more buses and DRT services) while keeping active travel high (for health benefits) and reducing car traffic. Simulation results and CBA come with several limitations. E.g. Scenario 2 is incompatible with climate goals since the fleet is not entirely electrified in 2040. This is not reflected in the current CBA. Moreover, CBAs do not account for distributional effects.

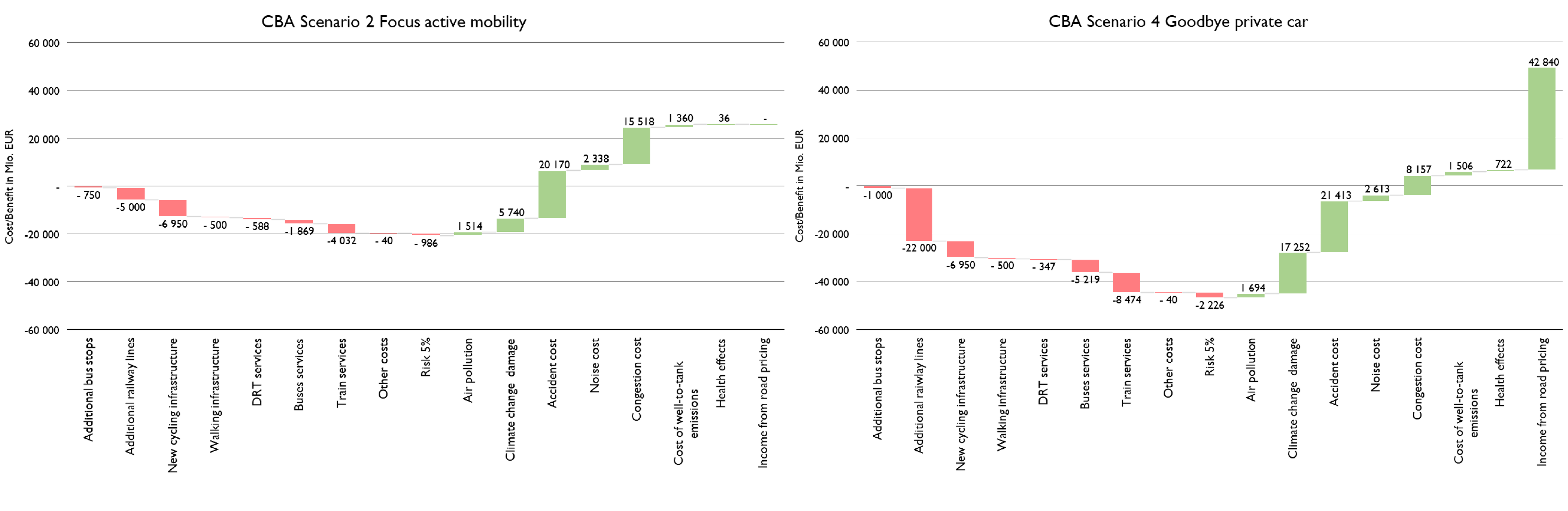

Fig. 3: Cost and benefits for (a) Scenario „Focus active mobility" ; (b) Scenario „Goodybe private car" – preliminary results

Conclusion

The results show that the implementation of a SMG is feasible. The effectiveness of implementing it can be influenced by tweaking the relevant parameters, e.g. higher share of DRT and limiting new railway lines, promoting active mobility as well as combining new services with restrictive measures for car use.
These are preliminary results. Further analysis is necessary to find optimal implementation, especially regarding DRT and PT services. Sensitivity testing needs to be done to show the effect of varying uncertain parameters such as discount rate, climate change damage costs or the selection of the timeframe. The results can help to design the most effective policies for sustainable transport.

References
[1] European Commission. (2015). Guide to Cost-Benefit Analysis of Investment Projects for Cohesion Policy 2014-2020.
[2] Matthey, A., & Bünger, B. (2020). Methodenkonvention 3.1 zur Ermittlung von Umweltkosten.Kostensätze Stand 12/2020. Umweltbundesamt.
[3] Gössling, S., Choi, A., Dekker, K. and Metzler, D. (2019). The Social Cost of Automobility, Cycling and Walkingin the European Union. Ecological Economics,158, 65-74. doi: 10.1016/j.ecolecon.2018.12.016
[4] Coote, A. (2020). Universal basic services a nd sustainable consumption. Sustainability: Science, Practice and Policy, 17, 32 46. doi: 10.1080/15487733.2020.1843854
[5] Laa, B., Shibayama, T., Brezina, T., Schönfelder, S., Damjanovic, D., Szalai, E. and Hammel, M. (2022). A nationwide mobility service guarantee for Austria: possible design scenarios and implications. European Transport Research Review,14. doi: 10.1186/s12544-022-00550-5
[6] Laa, B. and Pfaffenbichler, P. (2022). Modelling the Effect of a Nationwide Mobility Service Guarantee on Travel Behaviour Using the Strategic Model MARS. European Transport Conference, 7 9 September 2022, Milan, Italy.

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Relevant SDGs