

mobil.TUM 2024 – The Future of Mobility and Urban Space, April 10-12, 2024

An alternative framework for the assessment of ‘push and pull’ transport schemes in metropolitan regions

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Keywords: *appraisal, accessibility, push and pull*

This work addresses the following topic(s) from the Call for Contributions:
(Please check at least one box)

- Placemaking to integrate urban spaces and mobility
- Promoting sustainable mobility choices in metropolitan regions
- Governing responsible mobility innovations
- Shaping the transition towards mobility justice
- System analysis, design, and evaluation
- other: _____

Extended Abstract

Problem statement

A profound appraisal framework has been developed in the transport economics and transport planning literature for decades, mainly driven by welfare economic theory, benefit-cost analysis, and appropriate transport demand modeling. These building blocks have been operationalized in transport appraisal guidelines of countries and organizations. The methodology has focused on marginal project impacts identified through *ceteris-paribus* comparisons, forecasts based on trends from the past, and monetary assessments of all quantifiable effects. As a result, appraisal in practice has been applied for assessing single transport infrastructure projects. Following this approach, the decision problem is simplified towards the question: Given forecast transport demand, would the benefits justify the project’s costs?

While this methodology fits well with budgetary codes prescribing a positive value-for-money assessment, it is outdated nevertheless. Ultimately, the current approach aligns with a paradigm of ‘predict and provide, as long as benefits exceed costs’. In recent years, however, transport planning has shifted towards a sustainable mobility paradigm (Banister, 2008). Practically applied transport appraisal methods have not yet followed this paradigm shift except for monetizing external effects. There is a need to integrate strict environmental targets into the assessment. Furthermore, schemes consisting of push and pull measures should be assessed. The current transport appraisal methodology has difficulties in coping with these requests. Hence, there is potential for alternative assessment frameworks complementing traditional transport appraisal methods.

Research objectives

The research objective is to develop and test an alternative framework for transport infrastructure assessment, unifying several alternative building blocks of appraisal. This framework aims to assist in developing and assessing push and pull schemes to achieve quantitative targets, for instance, carbon emission reductions. We focus specifically on personal transport within metropolitan regions and push and pull schemes in distinct

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intervention areas of these regions. Therefore, our research question is: How can we combine alternative methodologies such as accessibility analyses, quantitative targets, and cost-effectiveness analysis to develop and test an appraisal methodology for packages of transport measures in metropolitan regions?

Methodological approach

We define a non-conclusive list of quantitative assessment indicators. Each indicator is assigned a quantitative target over the assessment period. For example, we derive a residual greenhouse gas budget for personal transport within a metropolitan region, following targets in climate protection laws.

As a primary assessment indicator, we construct an accessibility index for transport relations within the metropolitan region. We suggest using the targets for this accessibility indicator to design integrated transport project packages. For instance, if the target is to maintain weighted accessibility across modes, then any improvement in public transport accessibility can be combined with restrictions in accessibility by motorized individual transport. Then, we can assess the impacts of integrated transport project packages on quantitative targets using cost-effectiveness analysis.

We test this methodological approach in a case study of the planned U5 underground southeast extension in the Munich metropolitan area. Using gravity-based accessibility to jobs in the metropolitan region as a proxy, we determine restrictions for car use in specific transport cells. These restrictions or push measures, respectively, are expressed in terms of car travel time extensions. Assuming these push measures are implemented jointly with the U5 southeast extension, we estimate emission reductions due to modal shift and costs for infrastructure, maintenance, and operation of this project package.

(Expected) results

The case study results show that the cost-effectiveness of the U5 southeast extension with respect to emission reductions is low, even when combined with car use restrictions in specific transport cells. This finding suggests that large infrastructure projects are too expensive and take too long to implement until they contribute to significant emission reductions. The suggested methodological framework demonstrates this stylized fact and can thus be regarded as a helpful tool for planning and assessing more integrated transport schemes in line with quantitative targets.

We discuss the advantages and drawbacks of the suggested assessment procedure with respect to the framework, the indicators, the assessment premises, and our simplified modeling approach in the case study.

We conclude that a mix of assessment procedures is necessary to demonstrate the advantages and disadvantages of transport infrastructure projects. One option in this regard is the cost-effectiveness of a project with respect to a priori quantitative targets, e.g., emission targets. While cost-effectiveness analysis is inherently incomplete, it can still serve as a decision support among other tools.

References

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<https://doi.org/10.1016/j.tranpol.2007.10.005>