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

Experiences from a case study in Munich

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mobil.TUM

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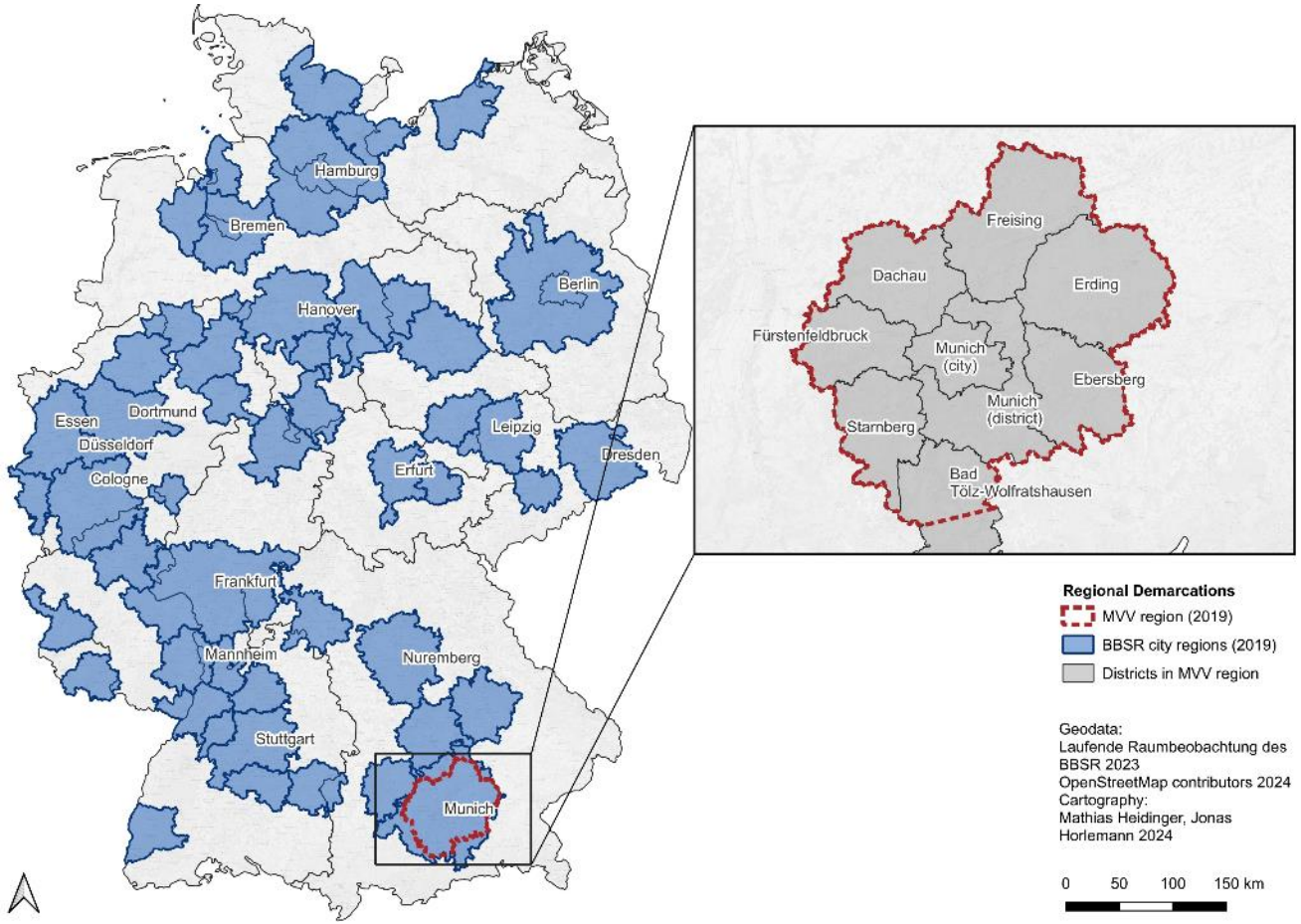
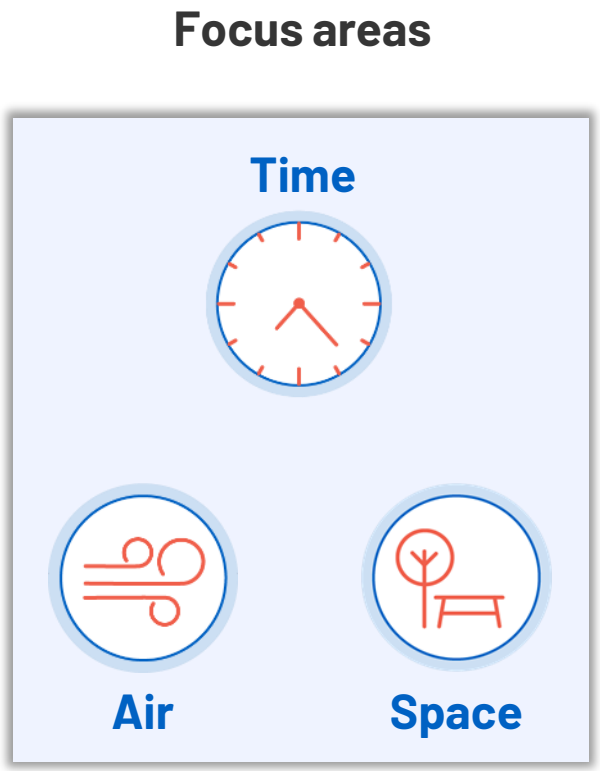
City regions face substantial challenges



Three focus areas in city regions...



… leading to three goals in city regions

Focus areas

Goals

→ **Ensuring Accessibility**

→ **Achieving Emission Targets**

→ **Adopting effective transport and spatial interventions**

… leading to three goals in city regions

Focus areas

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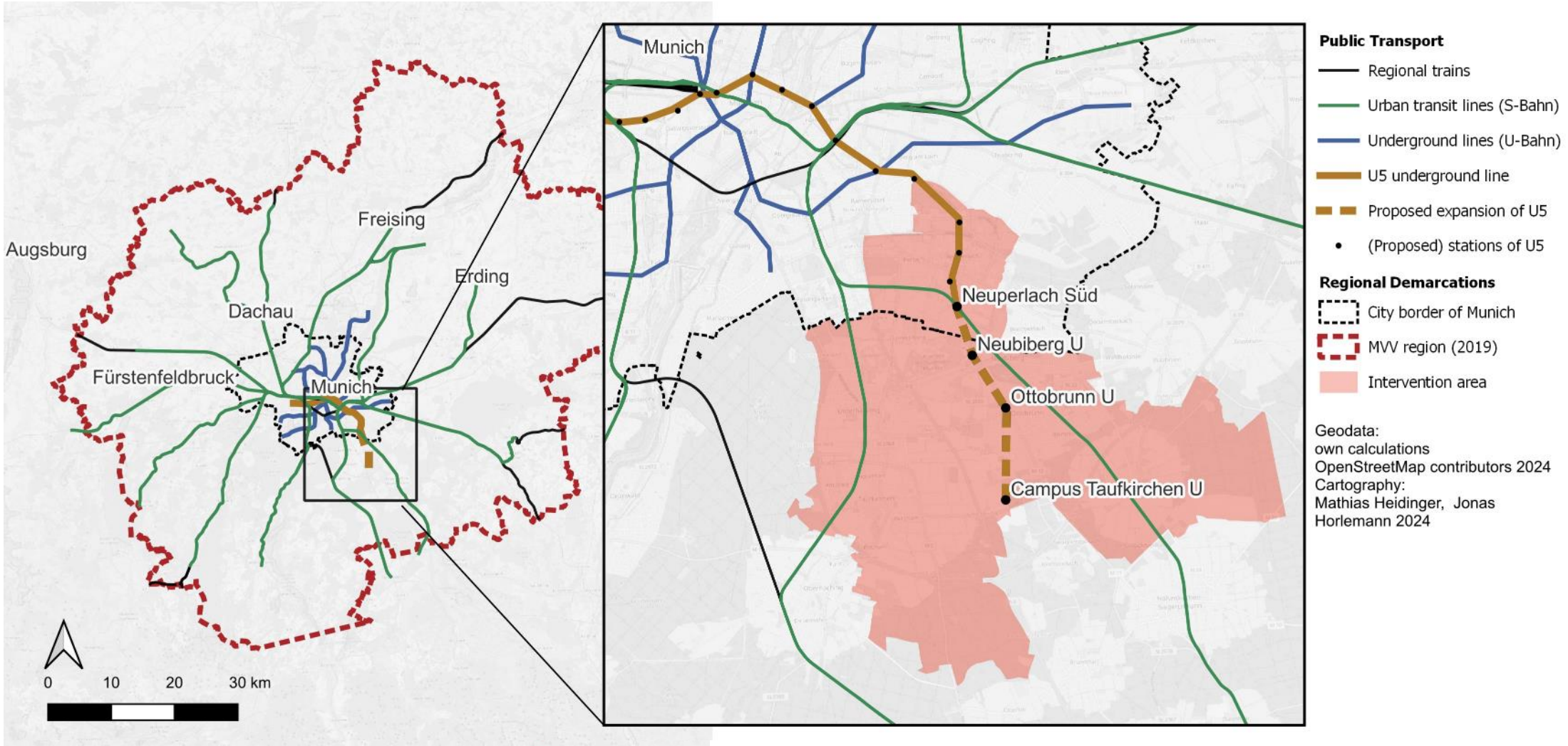
→ **Ensuring Accessibility**

→ **Achieving Emission Targets**

→ **Adopting effective transport and spatial interventions**

How to assess these interventions?

One possible intervention: U5 southeast extension + push measures

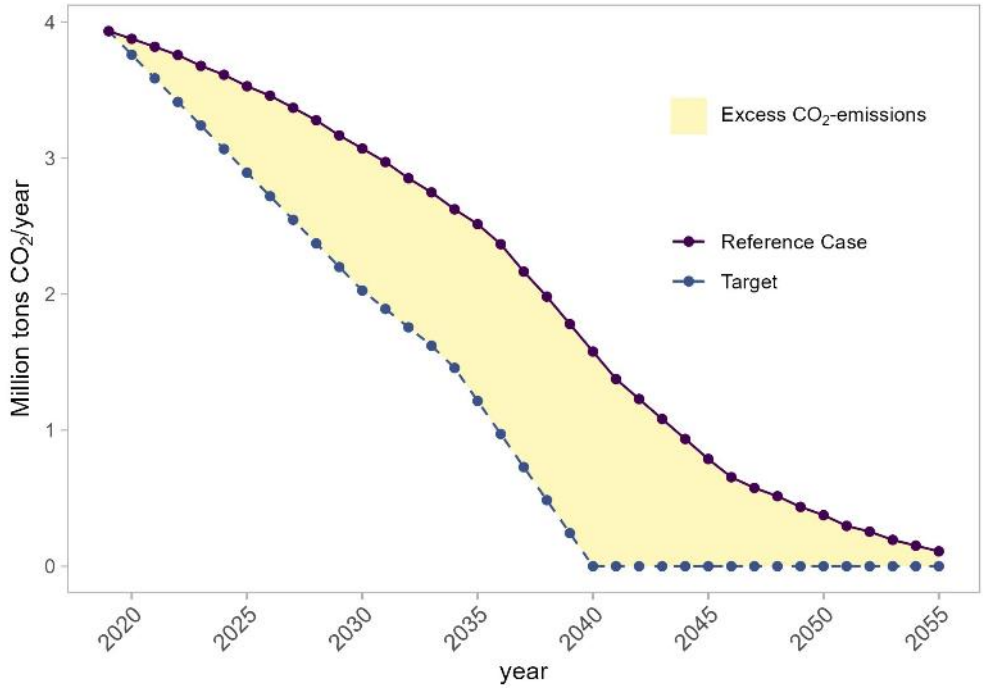


How to assess transport and spatial interventions?

The standard approach:	**A novel approach:**
Forecasting	1 Forecasting **+ Targets**
Travel demand	2 **Accessibility**
One transport project	3 **Push & Pull in intervention area**
Cost benefit analysis	4 **New metrics**
“predict and provide” as long as benefits exceed costs	**“Sustainable mobility”:** maintain accessibility, achieve societal targets

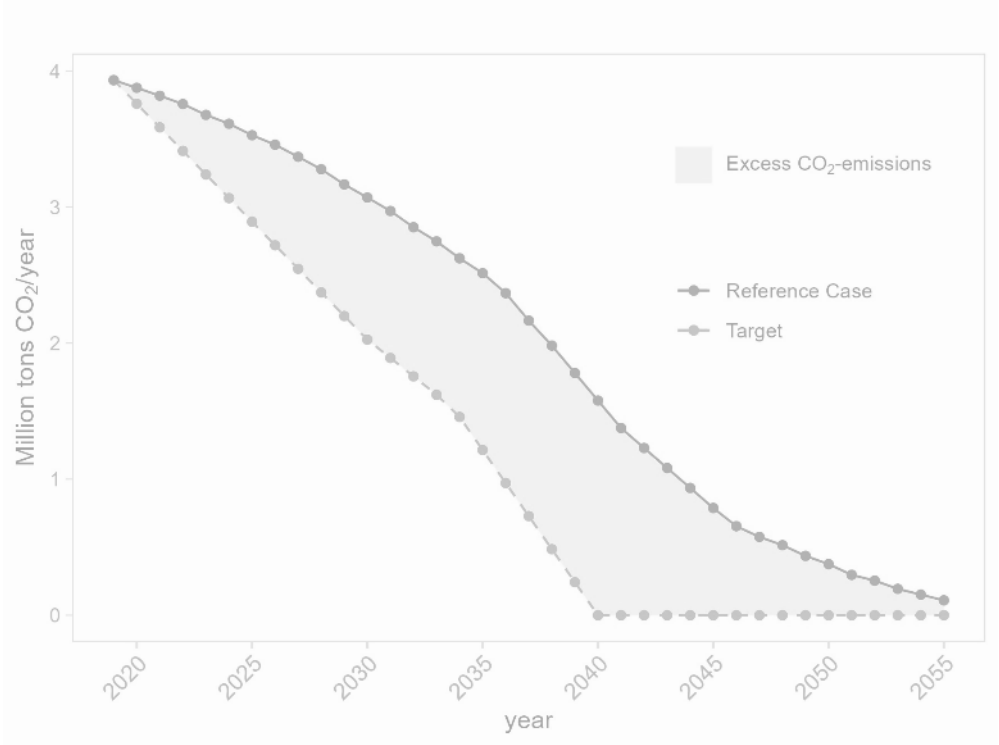
1 Targets

Achieve CO_2 targets

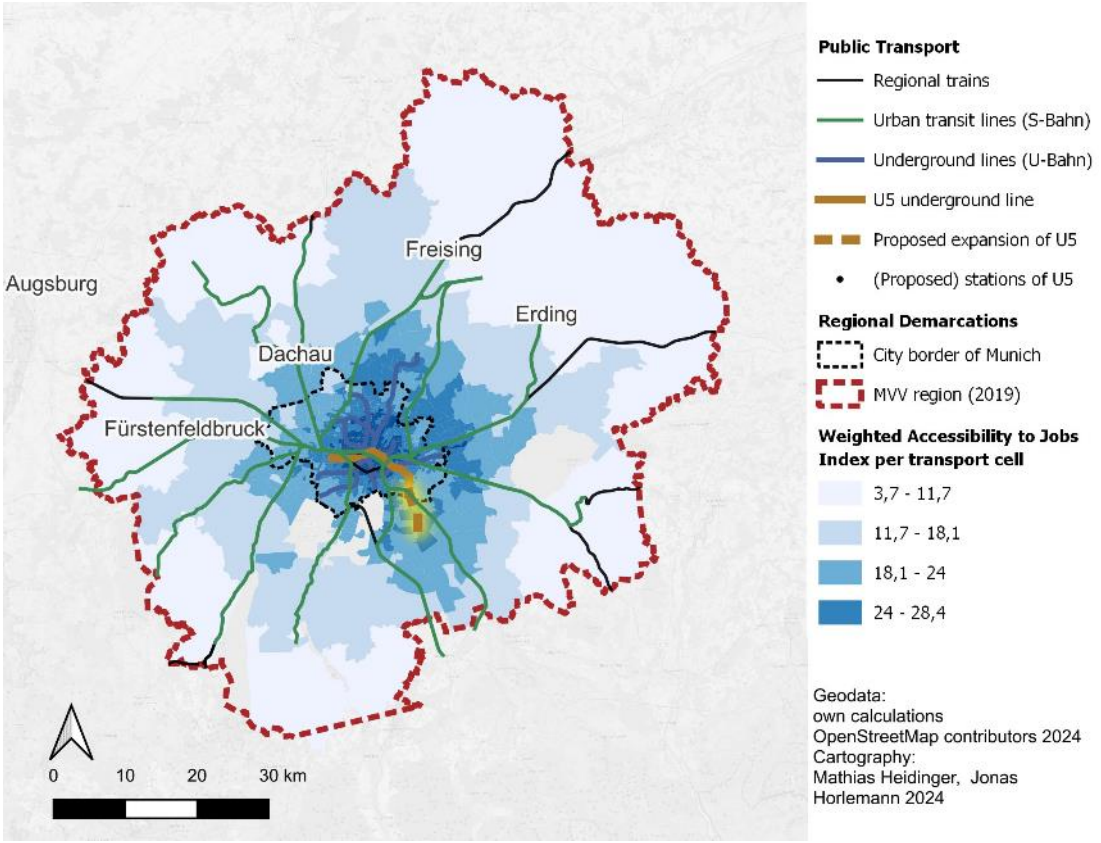


1 Targets

Achieve CO_2 targets



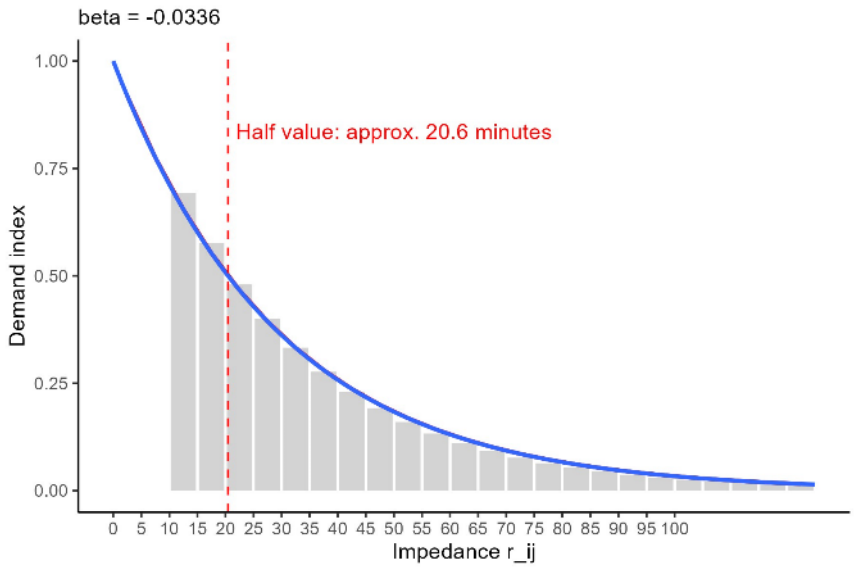
Maintain Accessibility



2 Accessibility

1. Accessibility to jobs per cell:

$$A_i = \frac{1}{\sum_j w_j} \sum_j w_j e^{\beta \sum_k \mu_{ijk} r_{ijk}} * 100$$



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p = population, w = workforce, r = travel impedance, μ = modal split,
k = transport mode, i = origin cell, j = destination cell

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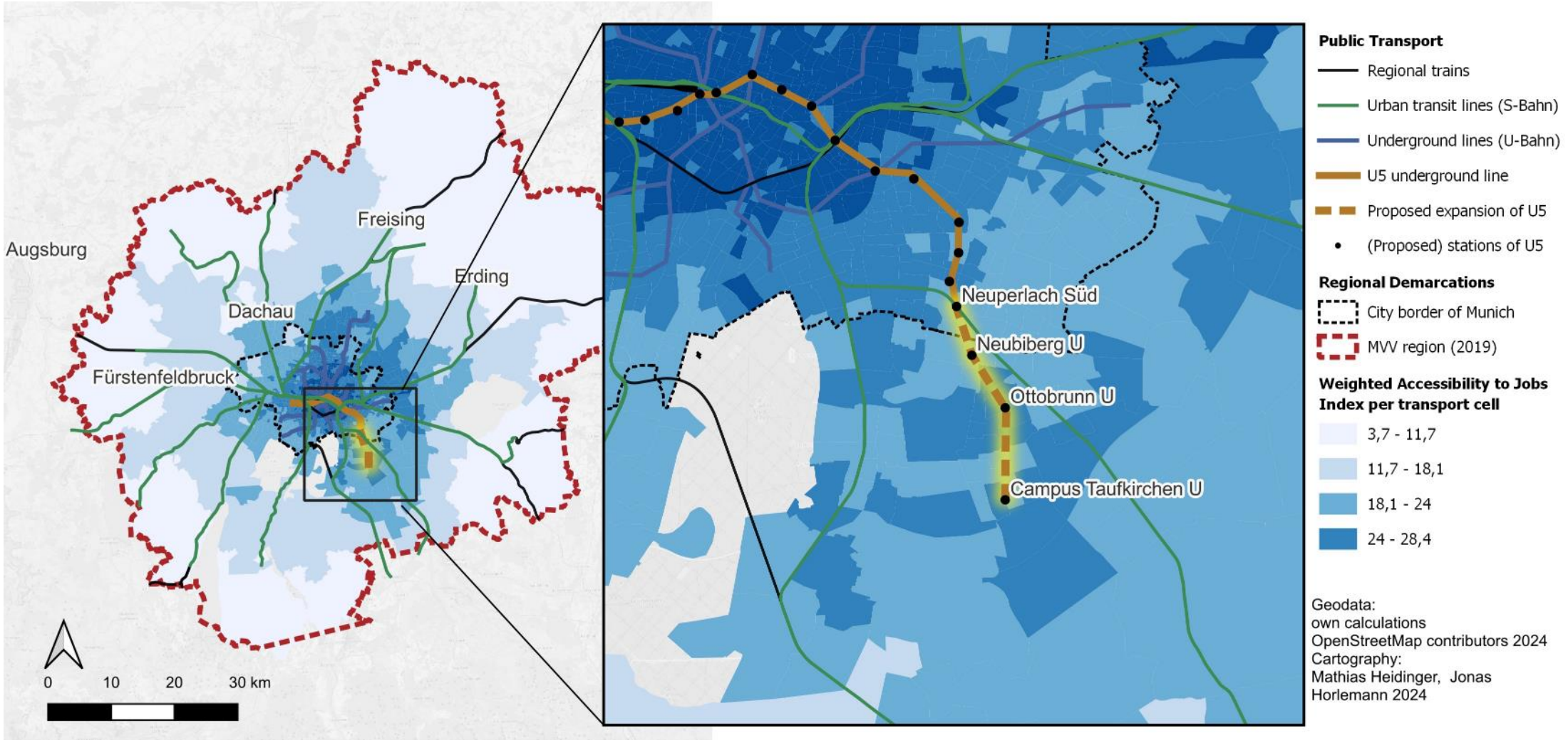

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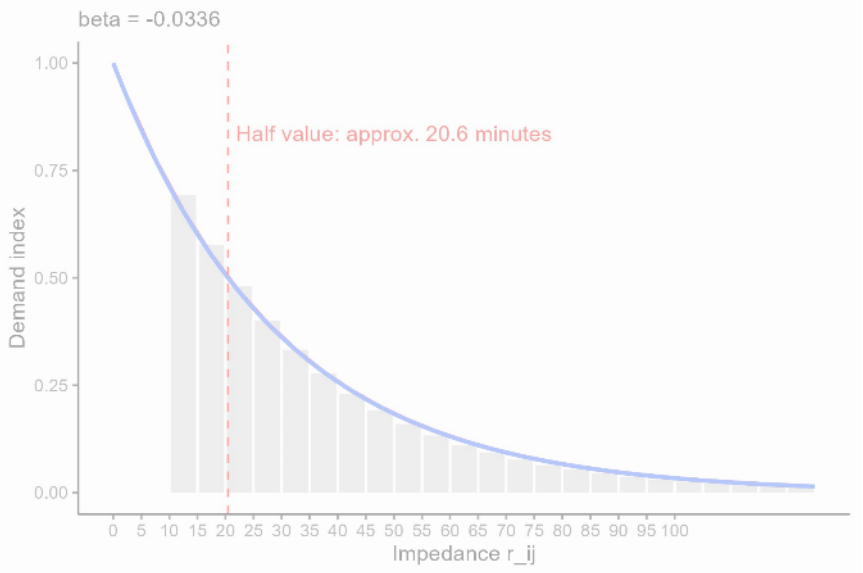

2. Compound regional index:

$$A = \frac{1}{\sum_i p_i} A_i$$

$$A_{ref} = 21.2$$

Constant before / after the intervention

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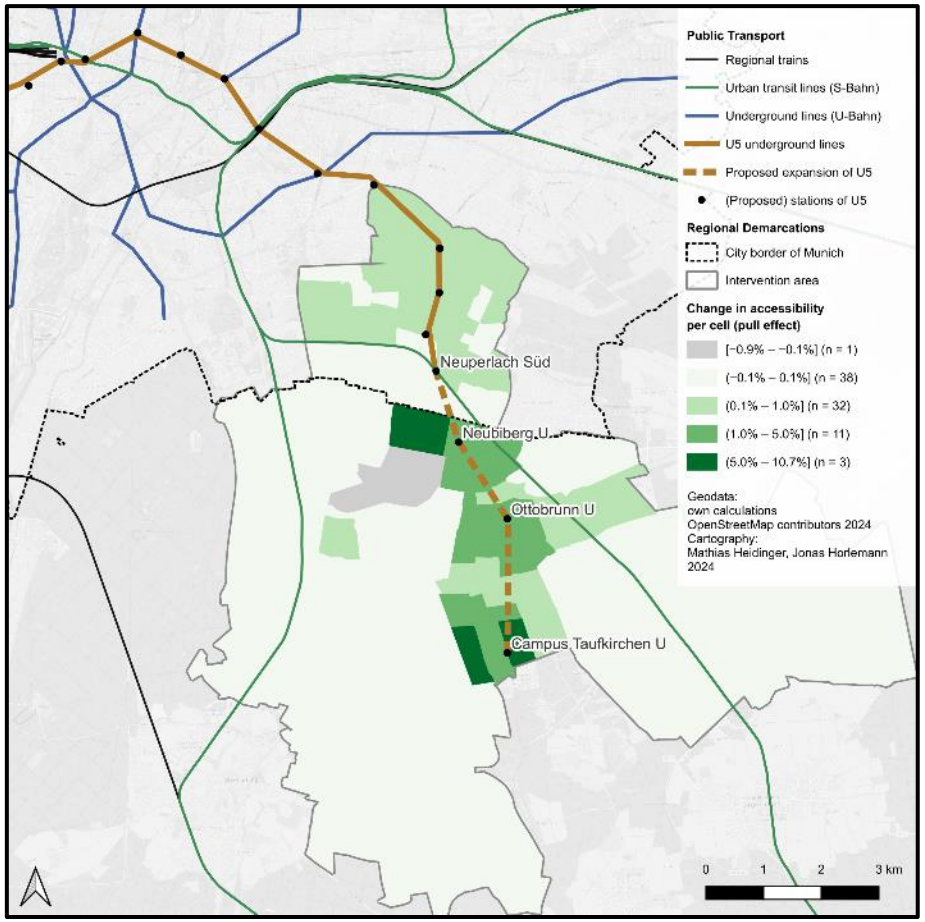
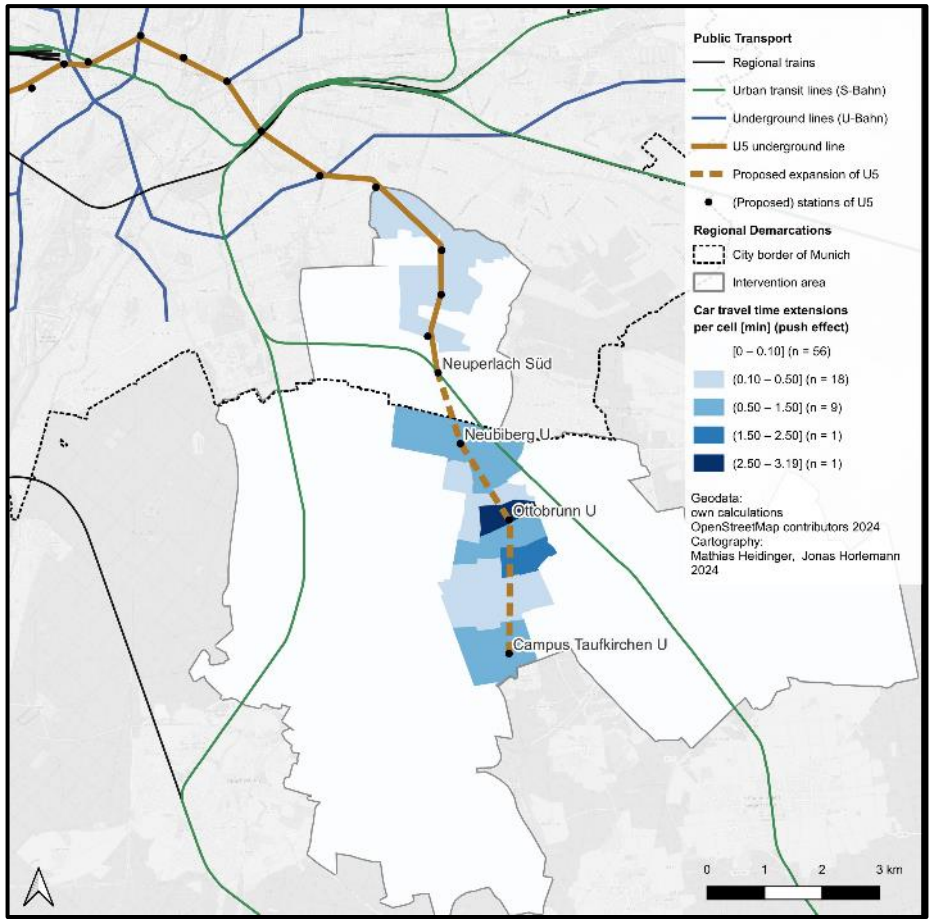
3 Push and Pull

Public transit accessibility changes [%]



Car travel time extensions [min.]



4 New metrics

Impact Analysis

Indicator	Target	Scheme impact
Accessibility to jobs	constant	constant
Costs*	-	291 million EUR_{2016}
CO_2-emissions*	-29,000 kt	-27 kt
...	...	...

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* Assessment period: 2019-2055

4 New metrics

	Impact Analysis		Assessment	
Indicator	**Target**	**Scheme impact**	**Contribution to target**	**Cost-effectiveness ratio**
Accessibility to jobs	constant	constant		
Costs*	-	291 million EUR_{2016}		
CO_2-emissions*	-29,000 kt	-27 kt	0.1%	10,858 EUR_{2016}/t CO_2
...	...	...	...	...

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* Assessment period: 2019-2055

Discussion

	Advantages	Disadvantages
Framework	scalable for development of transport **programs** in metropolitan regions	inconsistent with current **planning** and **funding** frameworks
Indicators	contribution to quantitative **targets**; additional indicators possible	**distribution** of effects neglected
Assessment	**new premise**: achieve quantitative targets with cost-effective means	**incomplete** assessment
Case Study	**possible adaptation**: accessibility targets based on urban structure	**status quo bias**: “maintain accessibility”
Modeling	combine accessibility improvements with **spatial push** measures	Extensive data and models required
Results	CO_2-mitigation potential by public transport **infrastructure** seems to be **low**	weak assessment **results**

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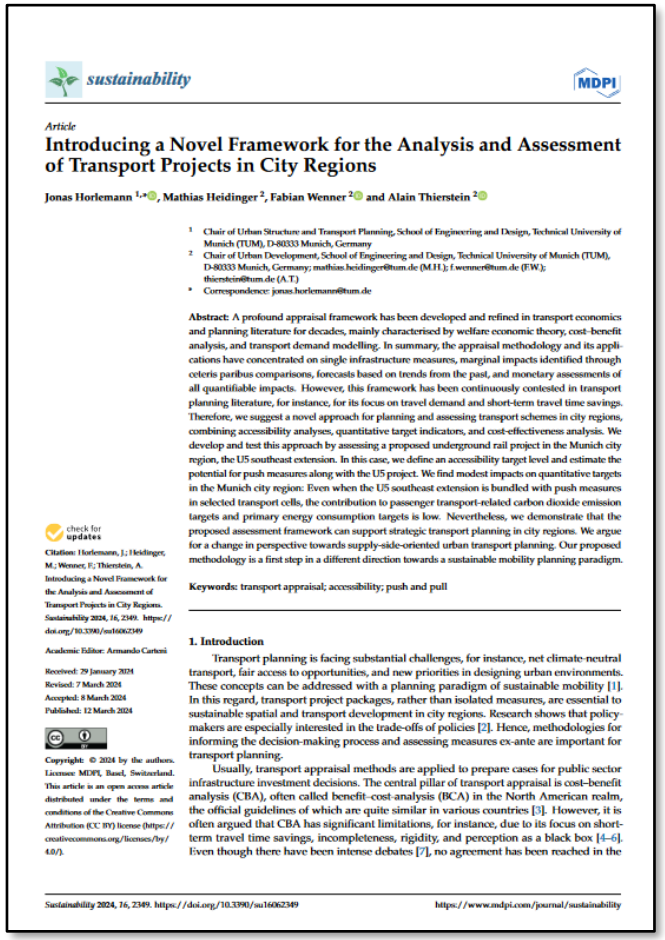
References



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Article

Introducing a Novel Framework for the Analysis and Assessment of Transport Projects in City Regions

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Abstract: A profound appraisal framework has been developed and refined in transport economics and planning literature for decades, mainly characterised by welfare economic theory, cost–benefit analysis, and transport demand modelling. In summary, the appraisal methodology and its applications have concentrated on single infrastructure measures, marginal impacts identified through ceteris paribus comparisons, forecasts based on trends from the past, and monetary assessments of all quantifiable impacts. However, this framework has been continuously contested in transport planning literature, for instance, for its focus on travel demand and short-term travel time savings. Therefore, we suggest a novel approach for planning and assessing transport schemes in city regions, combining accessibility analyses, quantitative target indicators, and cost-effectiveness analysis. We develop and test this approach by assessing a proposed underground rail project in the Munich city region, the U5 southeast extension. In this case, we define an accessibility target level and estimate the potential for push measures along with the U5 project. We find modest impacts on quantitative targets in the Munich city region: Even when the U5 southeast extension is bundled with push measures in selected transport cells, the contribution to passenger transport-related carbon dioxide emission targets and primary energy consumption targets is low. Nevertheless, we demonstrate that the proposed assessment framework can support strategic transport planning in city regions. We argue for a change in perspective towards supply-side-oriented urban transport planning. Our proposed methodology is a first step in a different direction towards a sustainable mobility planning paradigm.

Keywords: transport appraisal; accessibility; push and pull

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1. Introduction

Transport planning is facing substantial challenges, for instance, net climate-neutral transport, fair access to opportunities, and new priorities in designing urban environments. These concepts can be addressed with a planning paradigm of sustainable mobility [1]. In this regard, transport project packages, rather than isolated measures, are essential to sustainable spatial and transport development in city regions. Research shows that policy-makers are especially interested in the trade-offs of policies [2]. Hence, methodologies for informing the decision-making process and assessing measures ex-ante are important for transport planning.

Usually, transport appraisal methods are applied to prepare cases for public sector infrastructure investment decisions. The central pillar of transport appraisal is cost–benefit analysis (CBA), often called benefit–cost-analysis (BCA) in the North American realm, the official guidelines of which are quite similar in various countries [3]. However, it is often argued that CBA has significant limitations, for instance, due to its focus on short-term travel time savings, incompleteness, rigidity, and perception as a black box [4–6]. Even though there have been intense debates [7], no agreement has been reached in the

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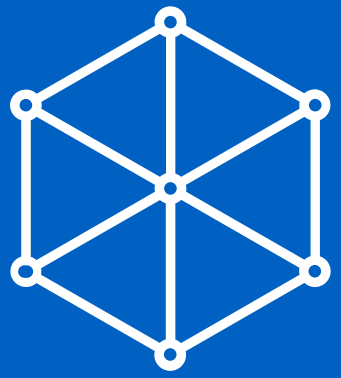

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