M Cube
Munich Cluster for the Future of Mobility in Metropolitan Regions

MCube Innovation Recommendation 04

Better plans, better decisions

New approaches for the assessment of traffic-infrastructure investments

For sustainable and socially inclusive mobility, we need responsible political decisions. The Munich Cluster for the Future of Mobility (MCube) uses applied and transdisciplinary research to provide a basis for decision-making on the mobility of the future. With the MCube Innovation Recommendations series, we communicate research results and recommendations for action to policy-makers and all interested.

Context

The mobility transition poses major challenges for metropolitan regions. On the one hand, the diverse mobility needs of the population need to be addressed to enable everyone to participate in social life equally. On the other hand, the urgency to meet climate targets is increasing steadily. In general, sustainable development goals such as inclusion and climate protection have become more relevant, alongside the fluidity of transport. As a result, priorities in the design of urban spaces have changed.

Transport infrastructure projects play a critical role in the planning of urban areas. A functioning infrastructure guarantees accessibility to everyday facilities such as schools, workplaces, doctors and supermarkets and thus contributes to the quality of life in metropolitan areas. Newly constructed transport infrastructure therefore offers enormous potential to facilitate social participation, economic value creation and knowledge exchange. However, such projects usually involve considerable investments, complex planning and lengthy construction processes. Consequently, in the planning phase positive and negative impacts of a project should be thoroughly evaluated to serve as a basis for decision-making.

To evaluate transport infrastructure projects benefit-cost analyses are the common standard. They express possible advantages and disadvantages of a project in monetary terms and then summarise them in a final indicator - the so-called benefit-cost ratio. If the benefits outweigh the costs of a project, it is categorised as economically viable. In Germany, this is an important prerequisite for the realisation of an infrastructure project, as public funding is only available on this condition. As 75% of the investment costs of public transport infrastructure projects are usually covered by the federal government, it is difficult to imagine realisation without this support.

In this Innovation Recommendation, we present four approaches to improve the assessment of transport infrastructure projects. The recommendations are primarily aimed at decision-makers and transport planners in politics, administration, science and business.

U5 *To illustrate the recommendations more clearly, we use a case study in the area of the Munich Transport and Tariff Association (MVV) in its boundaries of 2019. Specifically, we look at a possible extension of the U5 underground line into the southern rural surroundings of Munich city.*

Innovation Recommendation

1. Taking climate goals into account
2. Combining push and pull measures
3. Assessing target contribution and cost-effectiveness
4. Aligning settlement development and public transport

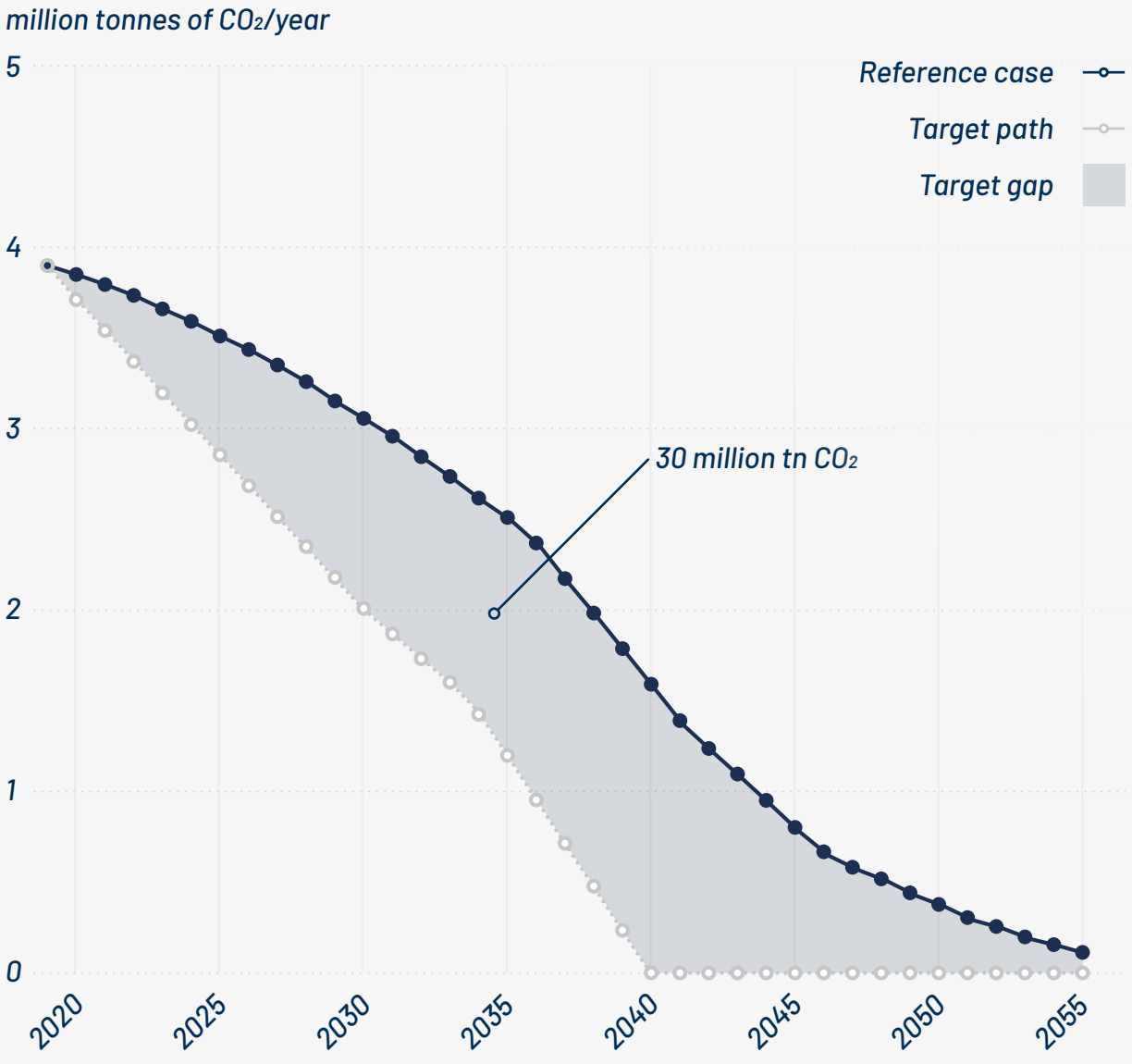
1. Taking climate goals into account

In traditional benefit-cost analyses for transport projects greenhouse gas emissions are already taken into account. They analyse how the project impacts transport emissions. If people switch from car to public transport as a result of an improvement in the local public transportation system, a positive climate balance - i.e. fewer greenhouse gas emissions - is expected. The emissions are assigned a monetary value that corresponds to the environmental damaged they cause. This way, they can be integrated in the benefit-cost-analysis. However, this means that emissions are generally considered in absolute terms, not in relation to statutory climate targets. Let's assume that a project can avoid 30,000 tonnes of CO_2 per year. Is that a lot or a little? This can only be assessed if the emissions are set in relation to CO_2 reduction targets.

The German Federal Climate Change Act stipulates the extent to which greenhouse gas emissions from the transport sector in Germany must be reduced by 2030. The Bavarian Climate Protection Act further stipulates that climate neutrality must be achieved by 2040.

The following figure shows how much CO_2 emissions from passenger transport in the MVV area must be reduced to achieve these climate targets. We compare this with a reference case that considers all transport projects that have already been decided upon, the expected fleet-electrification and the increasing share of renewable energies in transport.

CO_2 emissions from passenger transport in the MVV area



The annual CO2 emissions in the reference case are significantly higher than what is legally demanded. This results in a gap of around 30 million tonnes of CO2 emissions between 2019 and 2055. This gap must be closed by additional transport measures.

We recommend assessing the benefits of transport projects in terms of climate targets and visible gaps in current emissions trends.

This way, a holistic programme consisting of several measures can be developed for a region. The goal should be to completely close gaps in the climate balance through this bundle of measures.

2. Combining push and pull measures

For a long time, experts have recommended to implement transport measures as packages. According to a "Carrot and Stick" or "Push and Pull" principle, such bundles of measures have a stronger impact than individual measures and increase acceptance among the population. Pull measures are intended to make sustainable behaviour such as the use of public transport more attractive. Push measures, on the other hand, reduce the incentives for car use. Push measures are not meant to be car-bans but continue to allow freedom of choice.
In practice, balanced combinations of push and pull measures are rarely found in transport infrastructure projects. One reason for this is that there are currently no financial incentives to realize such measure-packages. For example, while expansion projects for public transport in Germany are co-financed by the federal government, there are no funding opportunities for accompanying push measures. Therefore, they are not taken into account in classic benefit-cost analyses.

We recommend planning infrastructure projects as part of a policy package consisting of push and pull measures. They should be collectively assessed and financed.

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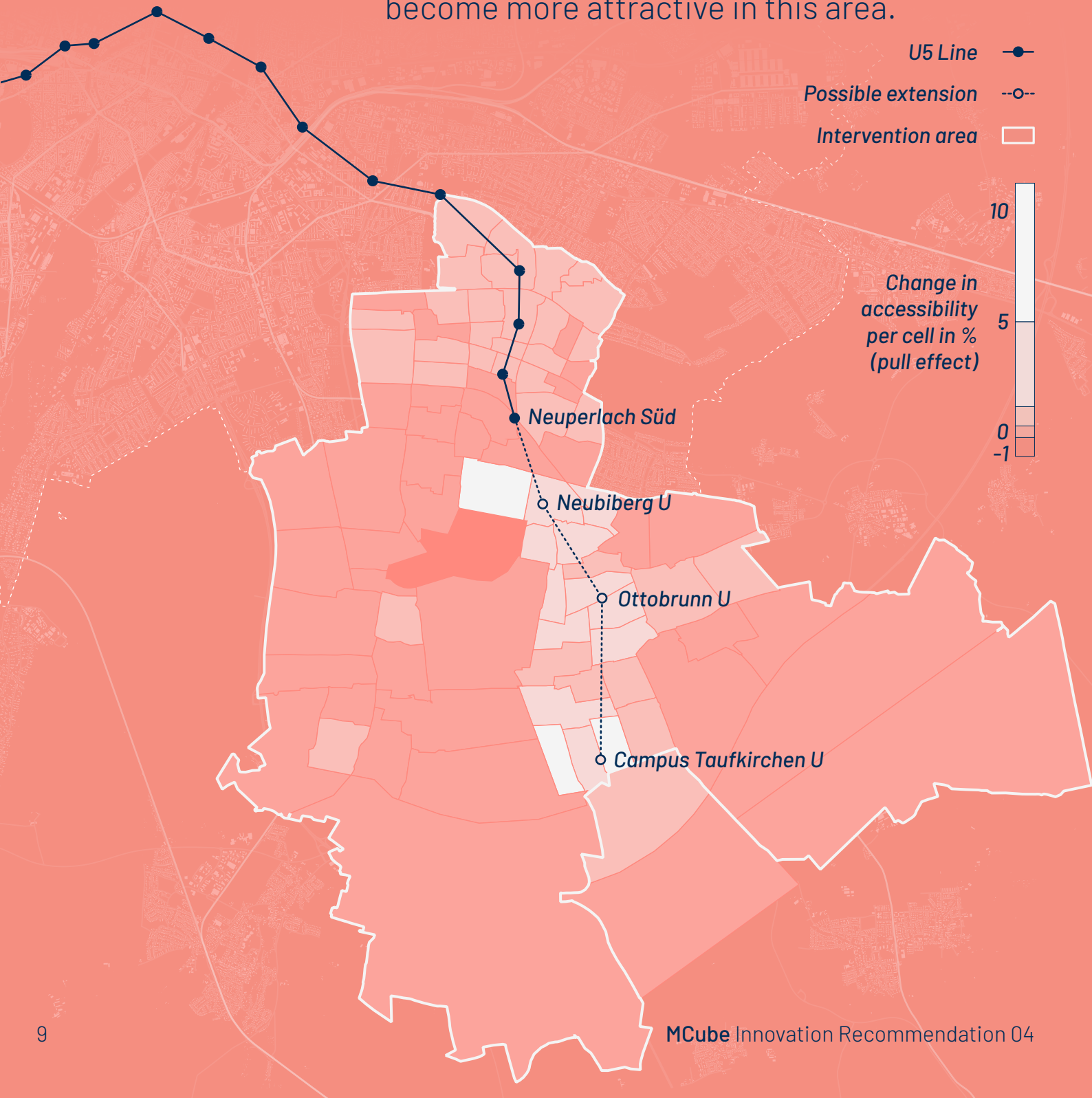
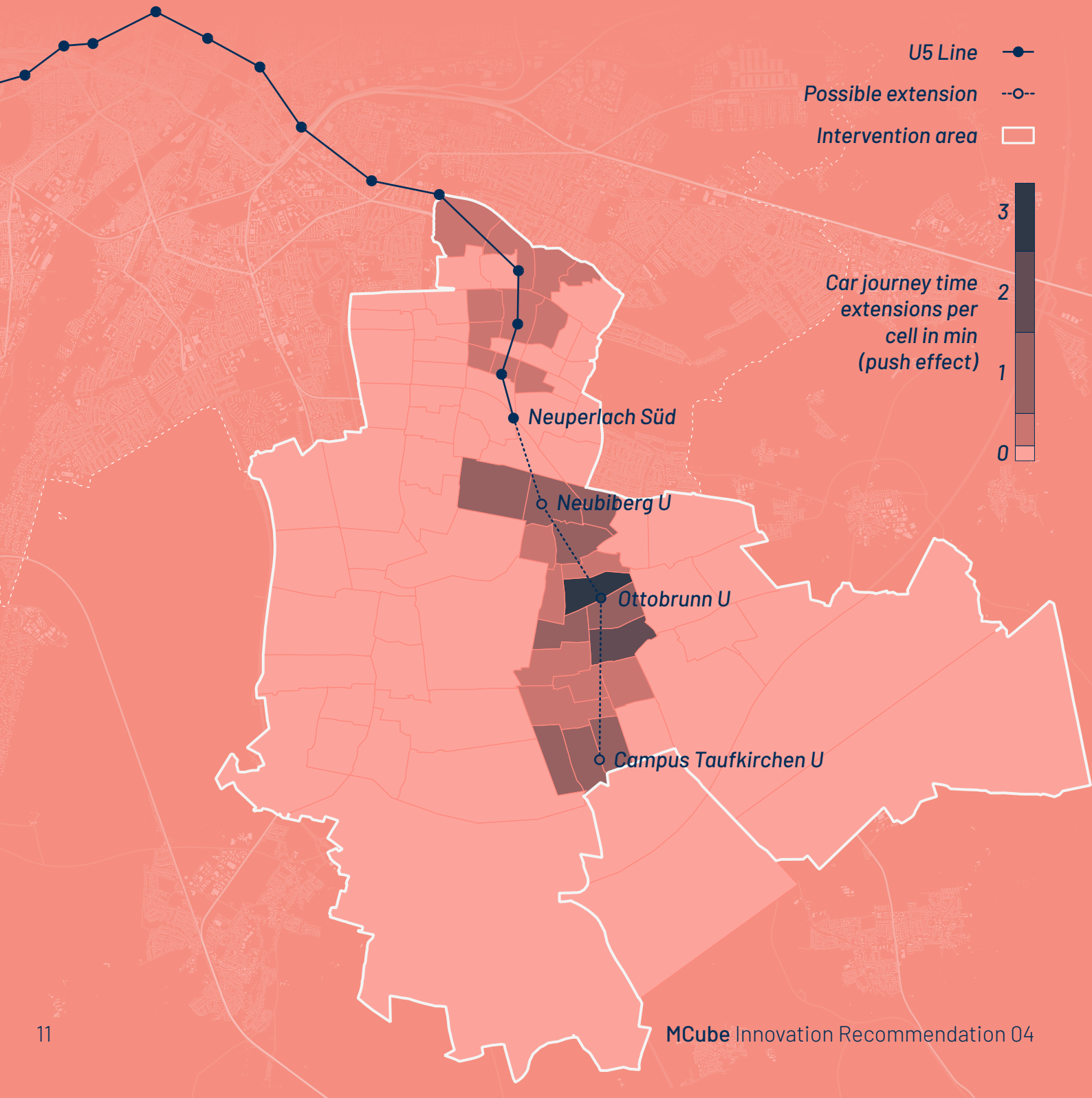
We use the case study - the extension of the U5 underground line to the southern outskirts of Munich - to show how pull- and push-measures can be designed and assessed. The extension of the underground system is an example for a pull-measure that promotes the use of public transport. The following figure illustrates how accessibility improves in the vicinity of the new underground stations. This means, the use of public transport will become more attractive in this area.



Improved accessibility by public transport makes it possible to implement accompanying push measures that make the use of cars less attractive. In our case, the overall accessibility should remain the same. The push measures must not restrict accessibility any more than they are improved by the pull measures. Once implemented, everyone can reach their destinations with the same effort, perhaps just using different means of transportation.

The following figure shows how much car traffic could be restricted around the possible underground railway extension. Concrete push measures to reduce car use include speed limits, redesigning the street space or reducing the number of parking spaces. This can lead to reduced noise pollution and increased traffic safety, improving the quality of life in public spaces. According to our analysis, car traffic around potential new subway stations could be slowed by up to three minutes.

With our method, we can show where push measures can best be used to strengthen the effect of planned pull measures. We can also show how strong push measures can be applied to maintain accessibility - across all modes of transport - at the current level.



3. Assessing target contribution and cost-effectiveness

The usual procedures to assess transport infrastructure projects in Germany follow similar principles. A traffic forecast is used to determine how many people are travelling from A to B. This determines how many people and vehicles will be travelling on the respective road sections and on public transport. The next step is to determine how an individual transport project will affect transport supply (e.g., travel times, operating costs or train frequency) and transport demand (e.g., passenger kilometres). The indicators calculated from this are translated into a monetary value and thus made comparable. Taken together, this results in the benefit-cost ratio, which determines whether the federal government will co-finance a project.

This approach often leads to the benefit-cost ratio playing too important a role in planning and political decision-making. As a result, the benefits of transport projects are not considered in sufficient detail. In particular, decision-makers are not informed about the extent to which a project contributes to over-arching political goals.

We recommend focusing assessment procedures on overarching mobility goals.

This is best achieved by combining several transport measures. The contribution of individual projects can then be determined using two key figures:

1. The **target contribution** highlights the percentage contribution a project makes to achieve an overarching goal, for example reducing greenhouse gas emissions. This means that projects that contribute the most to achieving the target can be prioritized.

2. **Cost-effectiveness** shows how effective a project is in relation to its costs. This allows projects to be selected that achieve a certain impact at the lowest cost.

With the help of these key figures, transport projects can be prioritised and implemented until the overarching goals are achieved.

Infrastructure projects are generally less cost-effective than non-structural measures due to the high investment costs and long construction and planning times. Nevertheless, construction measures are often necessary to achieve social goals.

Low cost-effectiveness is not necessarily an exclusion criterion for sensible measures, especially if other measures to achieve regional objectives have already been exhausted. This must be taken into account in the funding practice for transport infrastructure projects.

4. Aligning settlement development and public transport

For years, people have primarily migrated into urban areas instead of rural areas. This also includes the state capital of Munich and its surrounding areas, where the steady influx leads to increased demand for housing. The growing demand is not only affecting the city, but the entire MVV region, as more and more people are also moving to the surrounding area to find cheaper prices or suitable properties on the market. As the city of Munich is the economic centre of the region, the distance between work and home is growing and with it the number of commuters. This leads to increased traffic congestion on the roads and in public transport.

To manage these challenges for the city and surrounding areas, we recommend planning for transit-oriented development. This means concentrating residents and workers in places with good public transport accessibility.

To achieve this, the building coverage in existing settlement areas must become denser. In technical terms, this is known as redensification. This is the only way to minimise the traffic problems that are caused by the influx of new population.

In Germany the current integration of traffic management and settlement development is insufficient. In the case study of the possible U5 extension, we therefore calculate area-specific potentials to analyse where redensification of the existing settlement area is possible and sensible.

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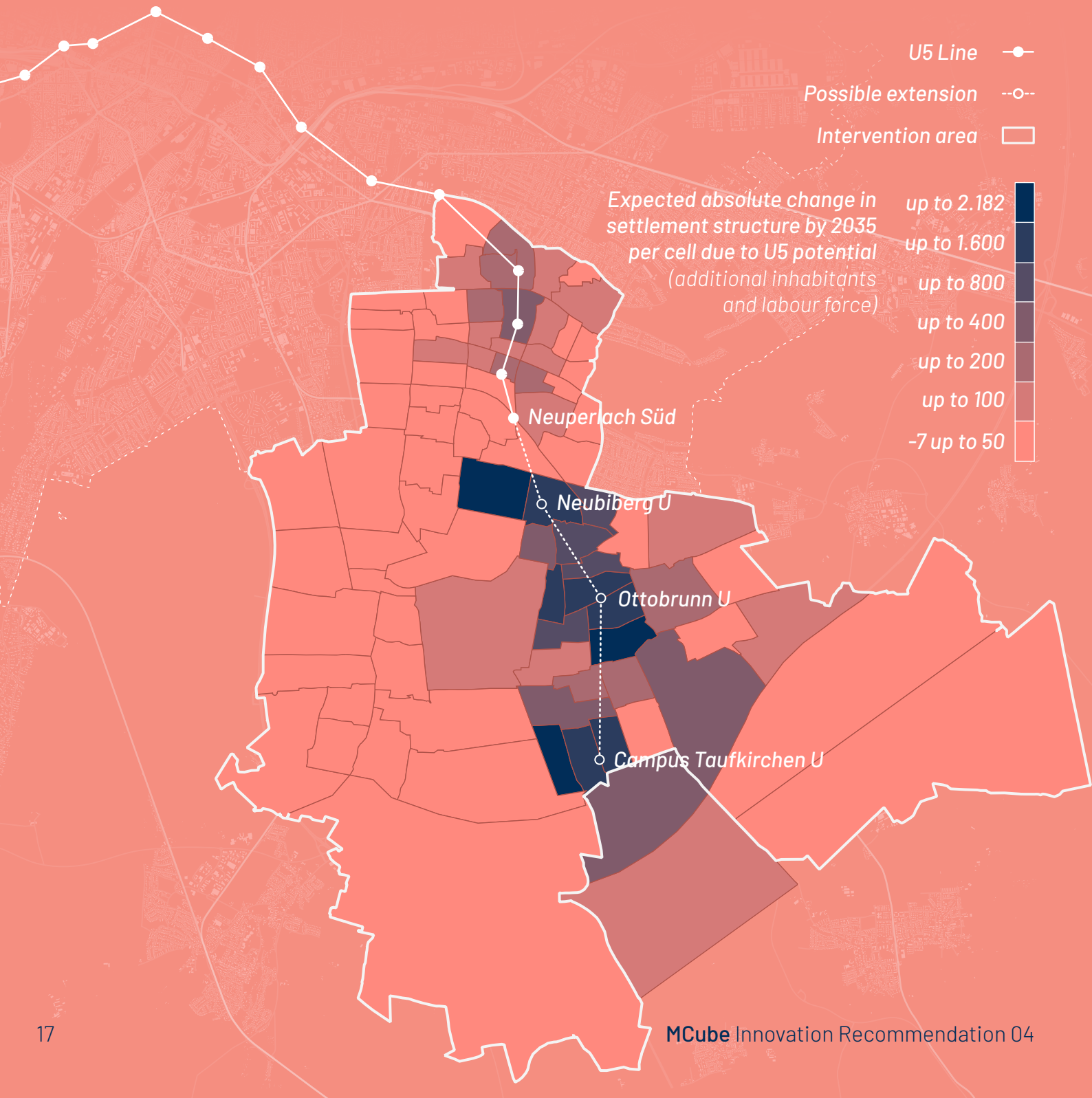
The potentials indicate the number of additional residents or employees who could live or work in the specific area. The basis for this potential is the extent to which the possible U5 extension improves the accessibility of the settlement areas by public transport. This potential can be used for the creation of urban development concepts or in municipal land-use planning.



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June 2024

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The results and recommendations for action presented were developed as part of the „BeneVit - Innovative assessment methods for sustainable transportation investments" project. These results are published for a wide audience in collaboration with the MCube integration project „Responsible Mobility Innovation & Governance (ReMGo)".

MCube - the Munich Cluster for the Future of Mobility in Metropolitan Regions - utilises the unique agglomeration of players in the field of mobility innovation to make Munich a pioneer for sustainable and transformative mobility innovations. The aim of the cluster is to test and research leap innovations in the mobility sector and to develop scalable solutions with a model character for Germany and worldwide.