



Benefits and Costs of Cycling Infrastructure Investment

Introduction

More and more municipalities invest public funds in order to provide a better cycling infrastructure. In terms of cost-benefit ratio, these projects seem promising: Paths and parking facilities for bicycles are far less expensive than for cars. Furthermore, increased cycle use helps minimise the consequential costs of traffic in areas such as environment, health, and land use.

Individual cycling measures, however, differ considerably with regard to their cost-benefit efficiency. Hence, in times of tight municipal budgets it is increasingly important to substantiate investments in cycling infrastructure, and to show why they are beneficial by providing figures

The benefits of infrastructural measures for cycling are determined to a large degree by their potential to achieve a mode shift, from mechanised modes to cycling. The question is, however, how to measure or project these benefits and how to put them in relation with the costs? And also: What is the impact of infrastructural measures on cycle use in general?

Costs for measures may vary considerably according to the type of measures. Some solutions offer clearly positive effects even with relatively low expenditures.

What are the financial requirements of municipalities?

For the German government's new National Cycling Plan that will enter into force in 2013, a short assessment has been commissioned that identified the finan-

cial requirements of municipalities and districts in relation with the size of the population.

According to this assessment, German and municipalities, regardless of their size, can expect the following annual resource requirements per resident:

- approx. EUR 6,00 to 15,00 for building, maintaining and operating the infrastructure, from which

*Cover image: Marking a new bike lane in Hanover
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EUR 1,00 to 3,00 is for operational maintenance alone

- approx. EUR 1,00 to 2,50 for parking facilities in public spaces, as well as
- approx. EUR 0,50 to 2,00 for the so-called 'soft' measures (communication, service, etc.)

In combination with further measures (e.g. bike rental stations), individual municipalities have resource requirements ranging from EUR 8,00 to 19,00 per resident and year. The exact total amount varies according to the starting level and future perspectives.

A study conducted by the Austrian Federal Ministry for Transport, Innovation and Technology shows that consistent and successful cycling promotion is possible despite a low budget. The study shows, for example, the measures that can be implemented with a cycling budget of EUR 50,000.

building 300 m of a cycle path	marking 6,5 km of a bike lane
signing 35 km of a cycle route network	establishing and designing 6-7 residential streets
purchasing 600 cycle stands	providing 50 covered cycle-parking spaces including lighting
establishing a pool of 50-100 rental bikes	offering 100 bicycle training sessions
organising 50 bicycle check days	hiring a cycling coordinator for 1,5 years

What you can do with a cycling budget of EUR 50,000?
Source: BMVIT 2011; Figure: Difu

Austria: Study on cost-efficient measures to promote cycling

The Austrian study published in 2011 included a comprehensive guideline evaluating the cost-efficiency of common measures to promote cycling. On the basis of literature research and interviews with experts from science and practice, individual measures are evaluated with respect to required financial investments, administrative burden, public acceptance, and also benefits for cycling. The 'top 5 measures' – those most efficient – for each area of cycling promotion are highlighted. In the area of infrastructure, especially

regulatory measures (such as opening up one-way streets and bus lanes to cycling traffic) are highlighted for their effectiveness compared to construction measures.

Overall, the study looks at a wide range of infrastructural measures. In order to distinguish the different measures, they can be grouped into infrastructure for moving cycling traffic (i.e. primarily street designs) and infrastructure for stationary cycling traffic (i.e. bicycle parking measures).

Infrastructure for moving cycling traffic

Creating a signing and route guidance system to optimise the existing network is a measure that carries huge benefits for cycling traffic and enjoys widespread public acceptance while requiring only moderate financial resources. The costs of providing such a system are EUR 400 to 600 per kilometre. In addition, temporarily closing the streets in front of schools to motorised traffic can be done at very low cost and is, at the same time, relatively promising in terms of benefits for cycling traffic and public acceptance.

With respect to the expansion of the existing cycle-route network, classic infrastructural measures are compared with regulatory changes, which often involve much lower costs. It is relatively inexpensive to open up bus lanes, pedestrian zones but also one-way streets to cycling traffic. Both types of measures have clearly positive effects. The costs of providing cycle or multi-purpose lanes are much lower compared with building separate cycle paths. This measure improves the situation on main roads and hence, carries huge benefits and enjoys widespread public acceptance.

Coloured surfaces as well as advanced stop lines, or 'bike boxes' at intersections have clearly positive effects at very low costs and minimal administrative burden. So-called adopt-a-cycle path programmes to maintain cycling infrastructure are equally inexpensive and effective measures. Often volunteers or participants of social programmes conduct route monitoring trips on a selected stretch of cycle route.

Infrastructure for stationary cycling traffic

Bicycle stands for short-term cycle parking have positive effects both in terms of benefit and public acceptance; costs would be low with only EUR 60 to 100 per cycle stand.

Covered cycle-parking facilities with lighting or bicycle stations for long-term cycle parking are often much more costly but have very positive effects both in terms

Sources

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City of Copenhagen (2009): Economic Evaluation of Cycling Projects – methodology and unit prices. COWI/Kongens Lyngby

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cycle path building (cycle route network on main roads)		
cycle lane / multi-purpose lane		
reducing hazard spots		
advanced stop line or 'bike box'		
bicycle street in the secondary road network		
cycling traffic guidance system		
phased traffic lights for cycle traffic in the traffic light circuit		
opening up of one-way streets to cycling traffic		
opening up of pedestrian zones to cycling traffic		
expansion of speed limits (30 km/h; 18 mph)		
expense	benefit for cycling traffic	
administrative effort	public acceptance	

Costs and benefits of various cycling measures.
Source: BMVIT 2011; Figure: Difu

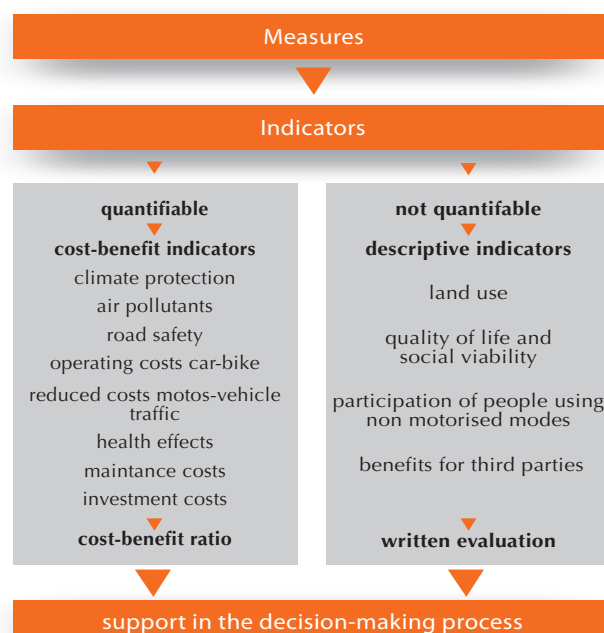
of benefits and public acceptance. Bicycle lockers (Fahrradboxen), for example, offer lower-cost parking spaces, though with slightly less positive effects. Left luggage lockers enjoy public acceptance and are very inexpensive with costs of about EUR 300 plus per locker.

Measuring costs and benefits of cycling measures: Berlin Wannsee route

In 2008, a procedure to conduct systematic cost-benefit analyses for cycling measures was published (Schäfer et al. 2008). It had been commissioned by the German Federal Ministry of Transport, Building and Urban Development (BMVBS). This procedure serves to assess the actual traffic costs and, on this basis, helps to identify how effective specific measures are in terms of their cost-benefit ratio.

The procedure was used, for example, in Berlin to evaluate the Wannsee route that was established in 2005. The route starts in the city centre and runs through the

south-western part of Berlin right through to the neighbouring city of Potsdam. In total, EUR 354,700 were invested in the measure: 350,000 in building the infrastructure, 4,700 in cycle route signing. In order to determine the demand for the newly established route, traffic counts were conducted on a specific section of the route, which provided concrete data on the use of the route prior to and after its creation. Once the Wannsee route had been established, cycling traffic in this section increased by 50 per cent. This amounts to 230,000 additional passenger kilometres or 192,000 saved vehicle kilometres (with an occupancy rate of 1.2 people on average) taking account of applicable experience-based data, namely an average trip distance of 5 kilometres (3 miles), and a cycle use on 200 days per year. This process of change had the following framework conditions: The operation period of the infrastructure and signing, 25 and 10 years respectively; the changed car accident rates; and the percentage of 'active cyclists', taken from experience-based data and used to assess health effects. Taking account of these conditions, the benefits of the measure are identified mainly in three dimensions: reductions in infrastructure operating costs (48% of overall benefits); reduction in CO₂ emissions (15%); reductions in material damage caused by accidents (15%). Based on this, a positive cost-benefit ratio of 3.43 was calculated. A cost-benefit ratio of only 2.49 was projected in an alternative sce-



Wannsee route: process of cost benefit analyses.
Source: Schäfer, Walther, Röhling 2008; Figure: Difu

Schäfer, Tanja; Walther, Christoph; Röhling, Wolfgang (2008): Kosten-Nutzen-Analyse. Bewertung der Effizienz von Radverkehrsmaßnahmen. Denzlingen, Karlsruhe (i.A. des BMVBS)

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nario, using an accident rate that remains almost the same due to a different calculation.

The procedure also allows for prognoses to be made about what shift away from motorised traffic is necessary to achieve a certain cost-benefit ratio. For the Wannsee route 37% (if the accident rate decreases) or 49% (if the accident rate remains the same) of additional cycling traffic must be the result of a shift away from car trips if the ratio is to be greater than 1.0, hence, for the benefits to outweigh the costs of the measure.

What impact does infrastructure actually have on the cycling mode share?

Parameters for the expected mode shifts are needed if the benefits of a cycling-infrastructure measure are to be projected in advance. This begs the general question: What is the impact of infrastructural conditions on cycling levels in a city or municipality (see also CyE A-9)? Researchers at the University of Minnesota in the US have tackled this question in four statistical studies. The first study examined the impact of the distance between place of residence and nearest cycle path or lane on cycle use among the population. In a second study commuters were asked how much more time they would be willing to spend travelling to be able to use a high-quality cycle link. The third study looked at changes in cycling levels in areas where considerable infrastructural improvements had been made. In the fourth study residents living near a high-quality link were asked about their travel behaviour.

Overall, the researchers from Minnesota came to the conclusion that infrastructural improvements have a limited impact on cycling levels, but have positive effects in some areas. Moreover, they point out a central methodical challenge. Often it would be hard to pinpoint whether a growth in the cycle mode share is attributable to infrastructural improvements or, rather, whether

measures are increasingly implemented in areas where cycling levels are already increasing.

How to finance cycling infrastructure?

The financing of cycling infrastructure is, despite the differences in Europe, fundamentally incumbent upon the municipalities or the authorities responsible for roads; Germany has a distinct system of infrastructure funding by the Länder. Among other things, the quality of the planned cycle facility, i.e. compliance with technical regulations, is also important for infrastructure funding.

There is a growing debate about using climate protection funds (especially from emissions trading) to close the gaps in local cycle route networks. Increasingly cycling is also used as a measure to prevent health problems, until now with a focus on campaigns. 'Bürgeradwege' (citizen cycle paths) are a fast way to provide safe links mainly in rural localities in North Rhine-Westphalia. In the district of Steinfurt, for example, residents volunteer on weekends to build the cycle paths themselves while building material and machinery is provided by the public builder's yard.

Conclusion

The current positive development of cycling in Germany and many other countries is also due to the expansion of the cycle route networks. It is absolutely necessary to further modify existing infrastructure for safety and partly also for capacity reasons. This does not only include pavement cycle paths. There is a variety of different solutions available now which allow municipalities to provide good conditions for moving and stationary cycling traffic. Cost-benefit analyses help to use funds purposefully and justify the investments vis-à-vis third parties or decision-makers for budget decisions.



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More Informations on modal split impacts can be found in
CyE A-9 Cycling's Modal Shares in Cities

"Cycling Expertise" is available online:
www.nrvp.de/en/cye

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