EUROPEAN CYCLISTS' FEDERATION

Cost-benefit analysis for cycling

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During the last years, several attempts have been made to develop methodologies for analysing the relations between costs and benefits for cycling in general as well as for specific cycling infrastructure projects. While there still is a substantial need for more work on a common methodology, the studies done so far show that in most circumstances, cycling is very cost-effective compared to other modes of transport. A large part of the benefits of cycling that have been quantified until now result from its positive effect on public health, notably through reducing mortality.

1. The WHO HEAT tool

Originally developed in 2007, the World Health Organisation's (WHO) Health Economic Assessment Tool (HEAT) for walking and cycling has recently been updated and published in a version called "HEAT 4.0". The original tool was meant to estimate the value of reduced mortality that results from regular walking or cycling. In the update, the health effects of road crashes and air pollution and the effects on carbon emissions are also considered. The tool can be used for several types of assessment:

- assessing current (or past) levels of cycling or walking, such as showing the value of cycling or walking in a city or country;
- assessing changes over time, such as comparing before-and-after situations or scenario A versus scenario B (such as with or without measures taken); and
- evaluating new or existing projects, including calculating benefit–cost ratios. HEAT can be used as a stand-alone tool or to provide input into more comprehensive economic appraisal exercises or prospective health impact assessment.

The calculation of the health effects, which is the central part of the tool, is based on the value of a statistical life (VSL). The VSL is not the value of an identified person's life but rather an aggregation of individual values for small changes in risk of death: for example, how much a representative sample of the population would be willing to pay (in monetary terms) for a policy that would reduce their annual risk of prematurely dying from 3 in 10 000 to 2 in 10 000.

The HEAT tool works with a large variety of input data that can be adjusted to local conditions. If this data is not available, the tool suggests default values. However, the result will be more accurate the more high-quality input data is available.

A limitation of the HEAT tool is that it only assesses health affects for the adult population between 20-64 years. The effects for cycling on children and adolescents and senior citizens are therefore not considered. Another issue is that the populations assessed do not disproportionately comprise sedentary or very active individuals. This could lead to a certain overestimation of benefits in highly active populations or a certain underestimation of benefits in less active ones. For this reason, the application of the HEAT tool in the Netherlands where cycling and general activity levels are already high, has been met with some hesitance. However, for populations with low to medium cycling and activity levels the results should be more accurate.

The WHO's HEAT tool can be accessed here: http://www.heatwalkingcycling.org

2. Study on costs and benefits of cycling in Auckland/New Zealand

Researchers from the University of Auckland studied the societal costs and benefits of commuter bicycling in their city. Using 'system dynamics' modelling and building on knowledge from the local community, policy-makers and academics, they found that a best-practice cycling policy would deliver returns up to 24 times higher than the initial investments, while also saving 4 000 years of life in between 2012 and 2051 and halving greenhouse gas emissions. The study considered costs and rates of injuries, health effects of air pollution and physical inactivity, greenhouse gas emissions, and fuel cost savings.

The extremely high rate of return in this study is of course also linked to the long period in the future (until 2050) into which the benefits are projected.

The full text of the study can be found here: http://ehp.niehs.nih.gov/wp-content/uploads/122/4/ehp.1307250.pdf

3. Study on the local economic benefits of cycling in Brussels/Belgium

A similar study analysing direct and indirect effects of investments in cycling has been carried out for the Brussels region in Belgium by the region's transport authority. Looking at the situation in 2002 and 2012 and projecting the results into the near future (2020), the study found that investments in cycling yielded returns that were 5 to 9 times higher than the original investments already under current conditions. An ambitious cycling policy would lead to societal gains in Brussels of around €300 to 550 million, which would be 8 to 19 times the original investment. Furthermore, 500 additional jobs linked to cycling could be created until 2020.

The study can be found here (in French):
http://www.bruxellesmobilite.irisnet.be/static/attachments/news/na/6757/%EF%BF%BDluation%20%EF%BF%BDnomique%20v%EF%BF%BD%20FR%2020140530_.pdf

4. United Kingdom: Department for Transport study on cost-benefit ratio of cycling projects

In August 2014, the British Department for Transport published a report on cost-benefit ratios of cycling projects in both urban and rural environments (under the Cycle City Ambition Grant and the Cycling in National Parks Grant). The analysis showed that the average cost-benefit ratio for these projects was very high, with £5.50 of social benefits for every £1 of public money spent. Most of the benefits (61%) resulted from enhanced physical fitness, with congestion relief (18%) and journey ambience (18%) making up for most of the rest.

The report can be found here:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/348943/vfm-assessment-of-cycling-grants.pdf

5. The Netherlands: Societal cost-benefit analysis for cycling projects

In the Netherlands, the Ministry for Infrastructure and Environment has commissioned Decisio, a consultancy company, to develop a web tool for analyzing costs and benefits of cycling projects. The tool considers a number of costs, direct and indirect effects as well as externalities:

Costs	Direct Effects	Indirect Effects	Externalities
Initial investment	Travel time reduction cyclists	Health benefits	Emissions
Maintenance	Travel time reduction and reliability car traffic	Productivity (less job absence)	Noise
		Subsidies public transport	Road Safety
		Tax revenues from fuel taxes	

The tool can be used for estimating the cost-benefit ratio of individual cycling projects, but also for calculating the benefits of replacing one kilometer driven by car or bus by cycling. An example for densely populated urban areas is provided below:

	Cycling replacing car	Cycling replacing bus
Network effects (congestion)	€ 0.330	€ 0.000
Work productivity	€ 0.046	€ 0.046
Life expectancy	€ 0.025	€ 0.025
Public budgets (taxes/subsidies)	€ -0.030	€ 0.387

Total indirect effects	€ 0.041	€ 0.458
Emissions	€ 0.030	€ 0.029
Noise	€ 0.010	€ 0.016
Road safety	€ -0.001	€ 0.010
Total externalities	€ 0.039	€ 0.055
Total benefits	€ 0.411	€ 0.513

The tool was originally available online, but has been taken down in the meanwhile since it was considered that the underlying assumptions and parameters were not yet precise enough to present it side by side with other cost-benefit analysis tools for road or rail infrastructure.

The accompanying report is available here: http://decisio.nl/wp-content/uploads/Summary-SCBA-investments-in-cycling.pdf

6. Germany: Cost-benefit analysis of the Ruhr Cycle Highway

The feasibility study for the cycle highway currently under construction which will connect the biggest cities in the Ruhr area over a length of ca. 100 km also includes a cost-benefit analysis. The analysis is based on research work executed in 2006 on demand of the German Federal Transport Ministry.

The analysis considers the following indicators:

- the pollutant emission reduction and
- the improved road safety due to reduced vehicle trips,
- the contribution to health care, as e.g. saved expenditures caused by an increase of cycling,
- the reduced consumption of resources.

The researchers studied two demand alternatives: a conservative one with a raise in cycling modal share from 10% to 14% and a more optimistic one with a raise in cycling modal share from 10% to 20% due to the construction of the new cycle highway. These two variants deliver the following results per year (transforming the initial investment costs into annual payments and taking into account the yearly maintenance costs):

- for an increase in cycling modal share of 4 percentage points: a cost-benefit ratio of 1 : 1.86
- for an increase in cycling modal share of 10 percentage points: a cost-benefit ration of 1 : 4.8

The model departs from the assumption that the shift in modal share towards cycling mainly comes from individual motorised transport. This shift creates the highest benefits, but this assumption has been questioned in other studies.

The English summary of the feasibility study can be found here: https://www.radschnellwege.nrw/fileadmin/user_upload/projekte/rs1/downloads/RS1_abstract_web_21.11.2016.pdf

The underlying research work can be found here (in German): https://nationaler-radverkehrsplan.de/de/aktuell/nachrichten/veroeffentlichung-der-forschungsergebnisse-des