Calculating the economic benefits of cycling in EU-27

Fabian Küster, Senior Policy Officer
Benoit Blondel, Health and Environment Policy Officer

June 24, 2013

We calculate an annual economic benefit of cycling in the EU-27 of at least € 205 bn.

In 2010, 7.4 % of European citizens used the bicycle as their preferred mode of transportation.[1] Using the best statistics we currently have at hand, we assume that this translates into 94 bn km cycled in that year.[2] All calculations on the internal and external benefits of cycling have been done based on this value.

This paper is ECF's first calculation to monetise the internal and external benefits that come with this level of cycling in the EU-27, based on:

- Health benefits of cycling;
- Congestion-easing due to cycle use;
- Fuel savings due to cycle use;
- Reduced CO2 emissions due to cycle use;
- Reduced air pollution due to cycle use;
- Reduced noise pollution due to cycle use.

The six categories combined accumulate to an economic benefit of € 143.2 – 155.3 bn. The largest single benefit of cycling is on the health side, representing about 80 % of the total internal and external benefits withheld for this exercise. The wider social benefits of cycling to local communities (increase in quality of life due to higher accessibility, improved quality of the public realm, increased interaction between residents, a boost to the vitality of town centres, etc.) could not be included in this paper due to a lack of verifiable data.[3]

---

[1] Eurobarometer 312, Published in March 2011, Fieldwork in October 2010.
[2] According to Eurostat, in 2000 in the EU15 distance cycled was 71 billion kilometres, implying an average cycling distance of 188 km per person per year. Assuming conservatively that cycling modal share has not increased since 2000, this brings the EU27 cycling distance to 94 billion km/year.
[3] It is difficult to measure the costs of motorized transport on a number of issues, as a UK study concluded: "There are also many costs which are difficult to estimate and for which robust figures are not currently available. These include severance of communities (that is, the social impacts caused by a barrier such as a busy road reducing community interaction and cohesion), loss of tranquility, degradation of landscape and countryside, the opportunity cost of land used for roads and parking, waste disposal (cars, tyr es, used oil), diffuse water pollution from oil runoff, and wildlife casualties. These are not trivial costs." In: Hopkinson, Lisa. *The War on Motoring: Myth or Reality?* Aug 2012. www.ippr.org/images/media/files/publication/2012/08/war-on-motoring-myth_Aug2012_9542.pdf

In addition, a number of industry sectors benefit from 'cycling, in particular the tourism industry due to recreational and tourism cycling, as well as the bicycle industry (retail and employment effects in manufacturing industry). Economic effects of bike-sharing programmes, and building and maintenance of bicycle infrastructure have not been included in this paper, again due to the lack of verifiable data.

- Tourism industry
- Bicycle industry

The economic impact of cycling in these two categories amounts to about € 62 bn.

For both categories combined, we calculate a minimum economic benefit of cycling in the EU-27 of € 205.2 – 217.3 bn.

Benefit to cost ratios

For policy-makers to take meaningful decisions it is obviously crucial to put these benefits into relation with costs in order to calculate the benefit to cost ration (BCR). However, we do not have – again – EU-wide figures to produce such an analysis.

However, calculations at a smaller scale suggest that investing in cycling is usually good value for money. A report for the UK Department of Health in 2010 concluded that *"…the economic justification for investments to facilitate cycling and walking has been undervalued or not even considered in public policy decision-making. Yet, almost all of the studies report economic benefits which are highly significant, with benefit to cost ratios averaging 13:1 (UK and non-UK)."* [4] In comparison, UK government guidance on the evaluation of major projects says that a 'medium' value-for-money project will have a BCR of between 1.5 – 2, and a 'high' value-for-money project a BCR of at least 2.[5]

[4] http://webarchive.nationalarchives.gov.uk/20050301192906/http:/dft.gov.uk/stellent/groups/dft_econappr/documents/pdf/dft_econappr_pdf_022512.pdf

[5] DfT. *Value for Money Assessments*. http://assets.dft.gov.uk/publications/value-for-money-assessments-guidance/vfmguidance.pdf Quoted by CTC, *Cycling and the economy*, May 2013. http://www.ctc.org.uk/campaigning/views-and-briefings/cycling-and-economy

Benefit calculations in detail

Table 1 below shows the overall estimated benefits across different facets of EU society, including health, environment and congestion-easing.

Table 1: Internal and external economic benefits of cycling at 7.4 % cycling mode share in EU-27 (2010)

Type of benefit	In € for 2010
1 Health benefits: reduced mortality	€ 114 – 121 bn
2 Congestion-easing	€ 24.2 bn
3 Fuel savings at US$ 100/ barrel	€ 2.7 – 5.8 bn
4 Reduced CO2 emission	€ 1.4 – 3.0 bn
5 Reduced air pollution	€ 0.9 bn
6 Reduced noise pollution	€ 0.3 bn
Total	**€ 143.2 – 155.2 bn**

In addition to the direct benefits of cycling, Table 2 shows to what extent the tourism industry as well as bicycle industry benefit from cycling.

Table 2: Annual economic impact on European businesses related to cycling in EU-27

Type of industry	In € for 2010/2011
1 Tourism industry	€ 44 bn
2 Bicycle industry	€ 18 bn
Total	**€ 62 bn**

1) Health benefits of cycling

In 2010: € 114-121 bn/year

Explanation, assumptions and sources:

- Regular cycling keeps people fit and improves their health. It helps prevent and tackle obesity and a range of other diseases, in particular cardiovascular diseases;
- The Health Economic Assessment Tool for Cycling (HEAT), a free on-line tool developed by the World Health Organisation, helps calculate how much cycling saves from reductions in mortality. It can be used to assess the value of existing cycle use, or what the benefits might be for an increase on a particular piece of infrastructure;
- Our calculation reflects the annual benefit of current level of cycling linked to reduced premature mortality among adult cyclists (age category 20-64), for a volume of cycling of 77 billion km/year (i.e. a total of 94 bn km/year, of which 17 bn km are attributed to the 5-20 age category). Using HEAT[6], it is estimated that the current level of bicycle use represents EU-wide health benefits of € 114 – 121 billion a year[7], depending on how kilometres are spread over the population. These figures - though impressive - are conservative figures because HEAT is for the time being focusing only on all-cause mortality, while physical activity also has positive effects on many aspects of morbidity;
- The value of the health benefits linked to the volume of cycling of the 5-20 age category is not calculated, nor is the economic value of reduced morbidity among adult cyclists.

[6] When using a value of statistical life of €1.67 million (Becker U., *The true costs of automobility: external costs of car use in EU-27*, 2012) and using a death rate of 971 per 100.000 (Eurostat, 2009).

[7] Considering HEAT is designed for adult population, km cycled by the '0 to 19 years' age group (i.e. 22 billion km/y, assuming the 0 to 15 age group cycle the same amount as the average, and the 0 to 19 age group 53% more than the average) are not taken into consideration (taking these into consideration could lead to an overestimation of the resulting benefits). Considering 7% of EU citizens cite cycling is their main mode of transport (Eurostat 2011), the remaining 72 billion km are spread as follows: 7% of the '20 years and over' age group are assumed to cycle (5.8 km/day x 225days/year=) 1305 km/year (together 36 billion km); 43% of this age group is assumed to cycle the remaining km, i.e. 209 km/year (together also 36 billion km); 50% of the population is assumed never to cycle. Based on these assumptions, EU-wide health benefits due to reduced premature mortality is valued at € 114 billion/year. The higher figure (€121 billion/year) is obtained when spreading km cycled by the 20+ age group evenly across this entire age group.

2) Congestion-easing due to cycle use

In 2010: €24.2 bn/year

Explanation, assumptions and sources:

- Cycles are extremely efficient in their use of road space, as each lane of a typical urban road can accommodate 14,000 cycles per hour, compared to 2,000 cars per hour only;[8]
- Congestion is a serious issue for business as it causes serious delays for passengers and in the distribution of goods. The European Commission estimates that congestion costs the EU economy about 1 % of GDP (about €130 bn);[9]
- An EU urban population of 41% (accounting for 62.5% of volume of cycling), EU rural population of 23% (accounting for 11.5% of volume of cycling), and 35% living in intermediate regions (accounting for 26% of volume of cycling). On population of urban, intermediate and rural regions, see Eurostat;
- For marginal social cost price of congestion, middle value figures from the *Handbook on estimation of external costs in the transport sector* (IMPACT, 2008) were used, with values of 0.1€/vkm for rural km, 0.2/vkm for intermediate regions km, and 0.4€/vkm for urban km.

Proposed ranges of marginal social cost prices (optimal external costs) of congestion by road class and type of area (€/vkm 2000)

Area and road type	Passenger cars		
	Min.	Centr.	Max
Large urban areas (> 2,000,000)			
Urban motorways	0.30	0.50	0.90
Urban collectors	0.20	0.50	1.20
Local streets centre	1.50	2.00	3.00
Local streets cordon	0.50	0.75	1.00
Small and medium urban areas (< 2,000,000			
Urban motorways	0.10	0.25	0.40
Urban collectors	0.05	0.30	0.50
Local streets cordon	0.10	0.30	0.50
Rural areas			
Motorways*	0.00	0.10	0.20
Trunk roads*	0.00	0.05	0.15

[8] Botma H & Papendrecht H, *Traffic operation of bicycle traffic,* TU-Delft, 1991. http://pubsindex.trb.org/view.aspx?id=365588
[9] http://ec.europa.eu/transport/strategies/facts-and-figures/transport-matters/index_en.htm

3) Fuel savings due to cycle use

In 2010: €2.7 – 5.9 bn/year

Explanation, assumptions and sources:

- "Transport continues to rely nearly entirely on oil and oil products: for more than 95% of its needs worldwide and 96% in EU-27. [...] Since Europe imports 84.1% of its crude oil from abroad, this makes transport, and hence the wider economy of Europe, very reliant on the availability of oil and petroleum products on world markets."[10]
- In 2011, this crude oil imports cost the EU about € 1bn daily, of which about 50 % due to transport consumption;[11]
- At 2010 cycling levels, cycling saves 11 to 24 millions of tonnes of CO2e, depending on the mode of transport that the bicycle is considered to substitute[12]. This CO2e is produced by 35 to 76 million barrels of crude oil. One average barrel of crude oil yields a total of 100.73kg of liquid fuels (Riegel, Handbook of industrial chemistry, 2003);
- At 100 USD/barrel this translates into US$ 3.5 to 7.6 bn.[13](= € 2.7 bn – 5.8 bn)[14];
- Carbon-based fuels emit 3.15 times its own weight in CO2 when burnt (Jardine C., Calculating the Environmental Impact of aviation emissions, Oxford university centre for the environment, 2005).

4) Reduced CO2 emissions due to cycle use

In 2010: €1.4-3.0 bn/year

Explanation, assumptions and sources:

- Cycling is a low-carbon mode of transport. In the ECF study "Quantifying CO2 savings of cycling" (2011), CO2e emissions were estimated at 21g per km cycled;
- Assuming the bicycle saves, for a volume of cycling of 94 billion km/year, 11 to 24 million tonnes of CO2e: 11 million tonnes of CO2 (representing savings of 1.4 bn/year) when using the following replacement ratio for bicycle trips: bus 42%, car 32% and walking 26%; and 24 million of tonnes CO2 (representing savings of 3.0 bn/year) when the bicycle is considered to replace car trips;
- Carbon pollution cost of €123/ton CO2: a study in the Journal of Environmental Studies and Sciences shows that current calculations on the future financial impacts of climate change are being underestimated by the US government somewhere between 2.6 and 12 times. The government uses a figure for the damage caused by carbon pollution at $21 per ton of CO2, whereas a more accurate estimate is in the range of $55-266 (€42-

[10] Commission Staff Working Paper, Impact Assessment (SEC(2011) 358 final) *Accompanying document to the* WHITE PAPER Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system.
[11] http://www.transportenvironment.org/sites/te/files/media/2011%2004%2013%20fuel%20tax%20report%20final%20merged.pdf
[12] 11 millions of tonnes if the bicycle is considered to replace 42% of 'public transport' trips, 32% of car trips and 26% of walking trips (figures derived from the EU funded OBIS project), 24 millions of tonnes if the bicycle trips are considered to replace only car trips.
[13] One barrel crude oil yields a total of 100.73 kg of liquid fuels, and a carbon-based fuel emit 3.15 its own weight in CO2. Therefore, one barrel crude oil produces 317 kg CO2.
[14] 1 USD = 0.76 EUR. Exchange rate 24/06/2013.

205) per ton— this even being a middle-of-the-road climate scenario, not worst case. The middle figure is €123/ton CO2.

5) Reduced air pollution due to cycle use

In 2010: € 0.9 bn/year

Explanation, assumptions and sources:

- For the mix of traffic conditions (70% city kilometers, 25% on roads and 5% on highways) that best reflect bicycle trips: TNO, *Fietsen is groen, gezond en voordelig*, 2010;
- For air pollution costs (in €ct/vkm) for passenger cars, by size of engine, type of fuel type of road and emission standards: Handbook on estimation of external costs in the transport sector, IMPACT, 2008. Figures used are for middle size passenger car (1,4-2,0 L, 28% diesel, 72% petrol);
- EU passenger car fleet: 28% are diesel cars, 72% are petrol cars: Dieselisation in the EEA, EEA, 2009;
- For proportion of EU vehicle fleet meeting certain emission standards: EEA's TERM034 Estimated share of pre Euro/conventional and Euro I-V gasoline and diesel passenger cars and light-duty vehicles.

6) Reduced noise pollution due to cycle use

In 2010: € 0.3 bn/year

Explanation, assumptions and sources:

- Using the values of the 'Handbook on estimation of external costs in the transport
- The bicycle substitutes other modes of transport as follows: bus (40%, average v bus occupancy of 10), car (30%), walking (20%), motor cycle (10%);
- 90% of distance travelled by bike would otherwise take place during day time, 10% during night time;
- 50% of km cycled are urban km, 30% are suburban km and 20% rural km.

7) Tourism industry

In 2011: € 45 bn/year

Explanation, assumptions and sources:

- There are an estimated 2.295 billion cycle tourism trips in Europe with a value in excess of €44 billion per annum. This is the estimated sum total of domestic and international

cycle tourism trips. The number of cycle overnight tourists is 20.4 million spending around €9 billion annually.[15]

8) Bicycle industry

In 2011: € 18 bn/year

Explanation, assumptions and sources:

- In most European countries, bike sales outnumber car sales! 2013 will see almost 2 bikes sold for every new car. In 2011, about 20 million bikes were sold in the EU, thereof 3.6 million in the UK (i.e. about 1 in 5.5). A London School of Economics (LSE) study measured the turnover of the 'British cycling economy' in 2010 at £ 2.9bn (€ 3.41 bn)[16]. Included in this 'Gross Cycling Product' are:
  - 28 per cent increase in volume of cycle sales in 2010, generating £ 1.62bn
  - £ 853m further contribution to the UK economy through the purchase of cycling accessories and bicycle maintenance, resulting in total retail sector sales of £ 2.47bn
  - Over £ 500m generated in wages and £ 100m in taxes from 23,000 employed directly in bicycle sales, distribution and the maintenance of cycling infrastructure.
  - Health benefits save the economy £ 128m per year in absenteeism
- The LSE study is the most complete study measuring a national 'Gross Cycling Product'. Extrapolating the British values to the European level however is not a straight-forward exercise. It uses as average sales price of a bicycle £ 439 in 2010 (or € 505 at average exchange rate in 2011: £ 1 = € 1.15) whereas a report published Colibi/Coliped on the European bicycle market mentions an average 2011 sales price of € 280 of a bicycle sold in the UK, or 1.1 € bn turnover in bicycles sales.[17] This compares with an average sales price of a new bicycle in the EU-27 of about € 330. [UK - EU ratios: 1: 0.75 (LSE study); 1: 1.15 (Colibi/Coliped)];
- On the other hand, the UK has retained only a very small bicycle and bicycle parts/accessoires manufacturing industry, producing 40,000 bicycles out of a total EU bicycle production of 11.7 million units, and employing only 320 people from an EU-27 total of 19,800. Ratio: 1:62.
- Considering the uncertainties about the average sales price of a British bicycle (LSE figures vs. Colibi/Coliped figures) compared to the average sales price in the EU-27; considering that the UK has retained little employment in bicycle manufacturing industry; taking into account that the LSE includes health benefits which are already included under header 1); we retain the bicycle sales ratio of 1: 5.5 for calculating the "Gross domestic product" of the "EU cycling economy": £ 2.9bn – 128m= £ 2.78bn = € 3.27bn * 5.5 = € 18 bn.

[15] The European Cycle Route Network EuroVelo, 2012.
http://www.europarl.europa.eu/committees/en/tran/studiesdownload.html?languageDocument=EN&file=78331
[16] At exchange rate June 24, 2013: 1 GBP = 1.18 EUR
[17] Colibi/ Coliped: European Bicycle Market 2012 Edition. Industry and market profile, 2011 statistics.
http://www.coliped.com/docs/issuu/European%20Bicycle%20Market%20&%20Industry%20Profile%20-%20Edition%202012.pdf