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ASSESSING THE IMPACT OF ROAD TRANSPORT PROJECTS

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Typical objectives of transport projects

- Reduction of congestion on the intersections, links or road network (increasing the capacity, improving the traffic management, etc.)
  - Road network development (construction of the new links)
    - Transport infrastructure development
      - Reduction of transport operation costs
    - Improvement of traffic safety, reduction of the number and the risk of accidents
  - Minimisation of environmental impact
- Improvement of transport accessibility

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Cost-Benefit Analysis

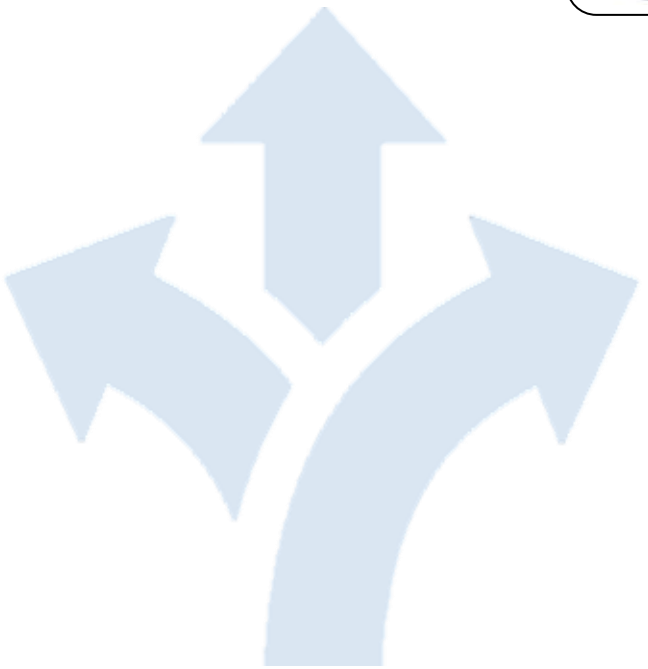
Cost-Benefit Analysis (CBA) is an analytical tool for judging the economic advantages or disadvantages of an investment decision by assessing its costs and benefits in order to assess the welfare change attributable to it[1].

CBA concept[1]

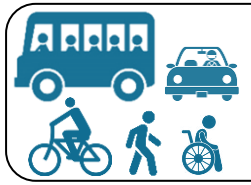
- Long-term perspective;
- **Expression of transport project effects in monetary terms;**
- Microeconomic approach – calculation of economic performance indicators to assess expected welfare changes);
- Incremental approach – comparison of a scenario with-the-project with a scenario without-the-project ("*Business-As-Usual*", "*do-minimum*", or "*do-nothing*" scenario).
- Consideration of the interests of society through ensuring the balance between technical, economic, social, and environmental indicators and matching them with development policy.

Source: [1] *Guide to Cost-Benefit Analysis of Investment Projects* (2015). European Commission, Directorate-General for Regional and Urban policy

4 The impacts of transport projects



The changes in fleet and infrastructure operation and maintenance costs



The changes for transport users

The impact on the safety

Environmental impact

Other economic impacts for the city or region

5 The changes in operation and maintenance costs

The costs of fleet and infrastructure operation and maintenance

MARKET VALUE

- The costs for project technical design and implementation schedule development
- The costs of land purchase or rent
- The costs of construction
- The costs of purchase of infrastructure elements and vehicle fleet
- Amortisation
- The costs of infrastructure and vehicle fleet maintenance and repair
- Overhead costs
- Administrative costs
- Labour costs for drivers
- Vehicle fleet operation costs:
  - fuel and oils;
  - tyres;
  - batteries and accumulators.

Revenues of transport operators

The changes for transport users

Parameters to assess the changes for transport users

- Reduction of travel time
- The increase in travel comfort and convenience to the user
- Barrier effects for non-motorized trips
- Fares

7 Monetary valuation of the changes in travel time

Travel time savings are significand and, sometimes, a single benefit of a transport project.

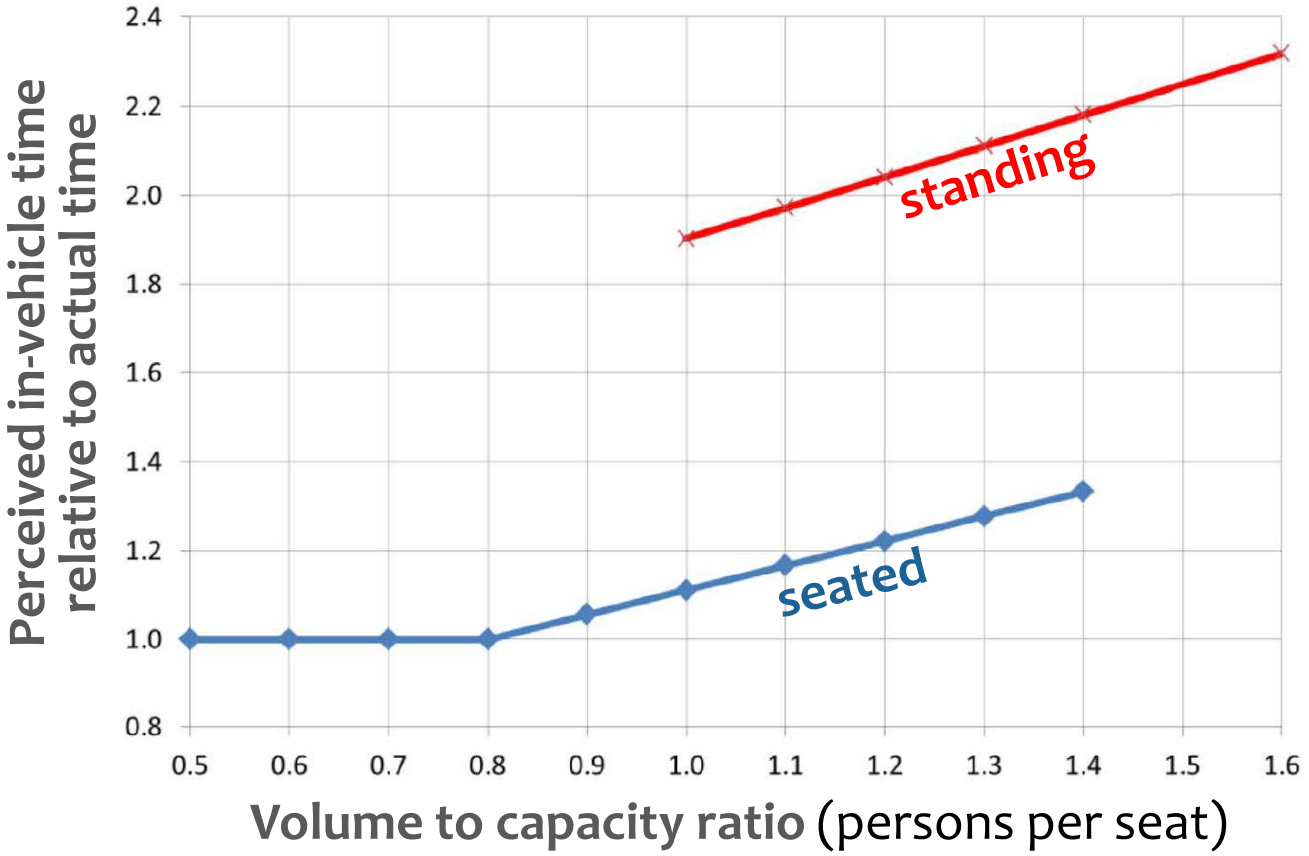
Transport mode	The components of the *Generalized Costs* for transport users		
	time	fares paid by users (tariffs, tolls)	Vehicle Operating Costs (VOC)
Public transport	+	+	–
Private transport	+	+	+

Value of Time (VoT)

- Questionnaire survey to transport users
- **Estimation based on statistical data**
  - working time – 100 % of labour costs for the employer (wage rate and additional employee related costs)
  - non-working time – 25-40 % of the working time

Perception of the travel time components

In-vehicle time



Source : Transit Capacity and Quality of Service Manual: TCRP Report 165. Washington: Transportation Research Board, 2013.

The ratio of walking, initial waiting, and transfer time to in-vehicle time

	In-vehicle time	Walking time (access, egress)	Waiting time	Transfer time
U.S. average	**1.0**	**2.2**	**2.1**	**2.5**
U.K. average	**1.0**	**1.7**	**1.8**	**-**

Benefits from safety improvements

Cost savings from prevented accidents and improved road safety

- Savings related to the prevention of an accident itself
  - material losses
  - administrative costs for police and emergency service
  - administrative costs for the court
  - costs of insurances
- Savings related to the injury prevention
  - **fatality and injury risks**
  - medical costs
  - net production losses
- Savings related to mass infection prevention

Savings related to the accident prevention

Value of Statistical Life (VOSL) is the value that society deems economically efficient to spend on avoiding the death of an undefined individual.

At the same time, *Human Capital Approach* states that ***VOSL*** is that an individual is 'worth' to the society what he/she/they would have produced in the remainder of their lifetime (can be taken as future labour income).

By convention, the VOSL is usually assumed to be the life of a young adult with at least 40 years of life ahead.

Source: Guide to Cost-Benefit Analysis of Investment Projects (2015). European Commission, Directorate-General for Regional and Urban policy

Average value of prevention per reported road collision

Severity	Cost per collision, £ (2024)
Fatal	2 834 336
Serious	324 895
Slight	32 502
Damage only	3 020

Source: GB, Department for Transport, Road safety statistics: data tables, https://www.gov.uk/government/statistical-data-sets/reported-road-accidents-vehicles-and-casualties-tables-for-great-britain#full-publication-update-history

The statistical risk of an accident

For example:

The mean risk of injury per million vehicles entering a three-leg junction is $0.091 \cdot 10^{-6}$.

The reduction in the number of accidents

For example:

Converting three leg junction (T-junction) to a roundabout reduces the number of fatalities by 49 %.

Source: SafetyNet (2009) Cost-benefit analysis. https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/specialist/knowledge/pdf/cost_benefit_analysis.pdf

Environmental impact assessment

Savings from the reduction of road transport environmental impact

- The changes in CO emissions
- The changes in CO_2 emissions
- The changes in NO_x emissions
- The changes in C_nH_m emissions
- The changes in PM emissions

→ Emissions from stationary sources (in tons)

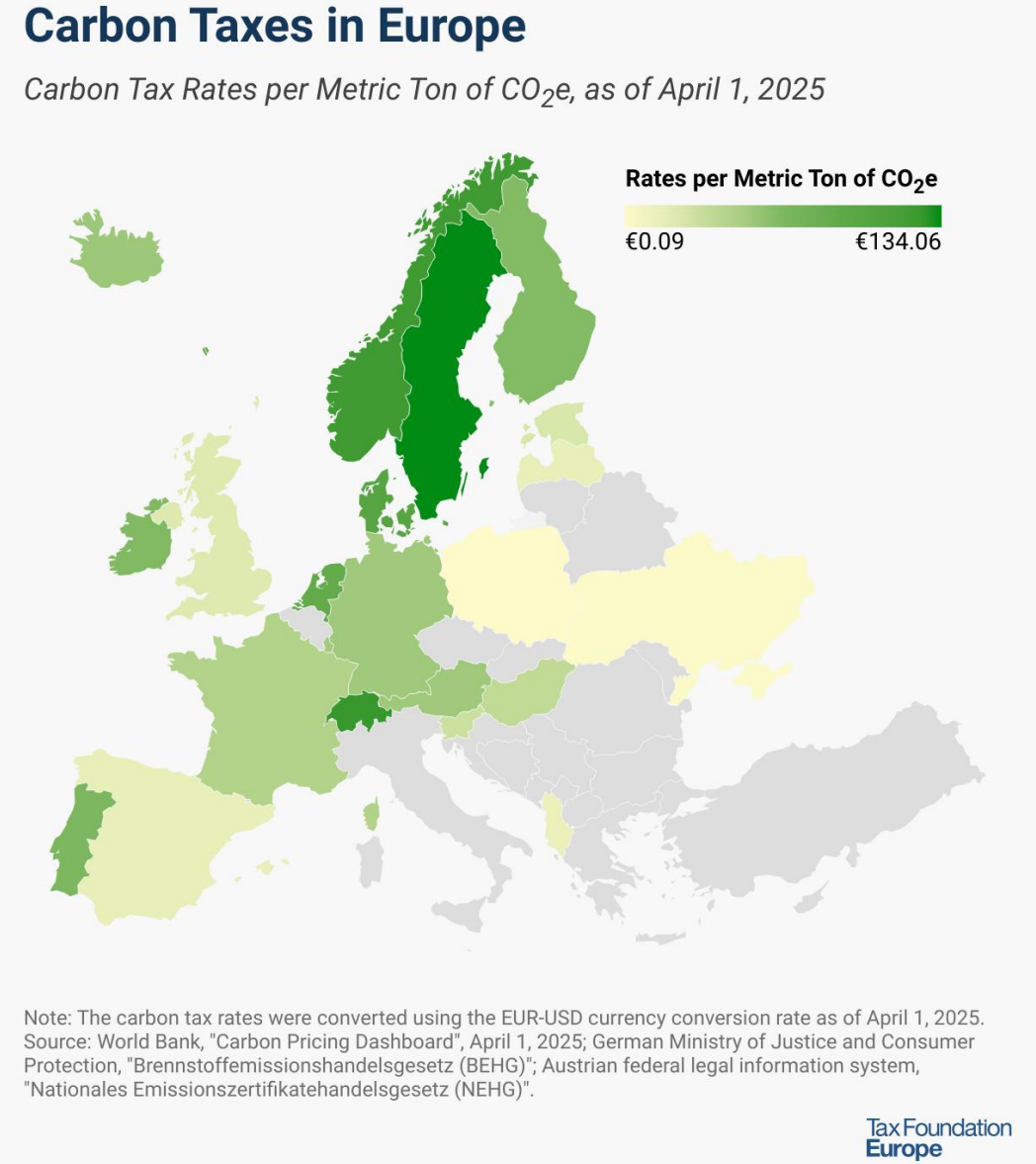
→ Emissions from vehicles in g/km or g/liter:

- *HDM* (Highway Design and Maintenance Standards Model)
- *HBEFA* (Handbook Emission Factors for Road Transport)
- *Emission Factors*
- *Emission inventories*

→ The cost per 1 ton of emissions

- The changes in noise emissions → Reference values for emission sources → Monetary cost estimates from the
  - questionnaires;
  - impact on real estate prices
- The changes in vibration impact → ISO standards, national manuals (like *Transit Noise and Vibration Impact Assessment Manual*)

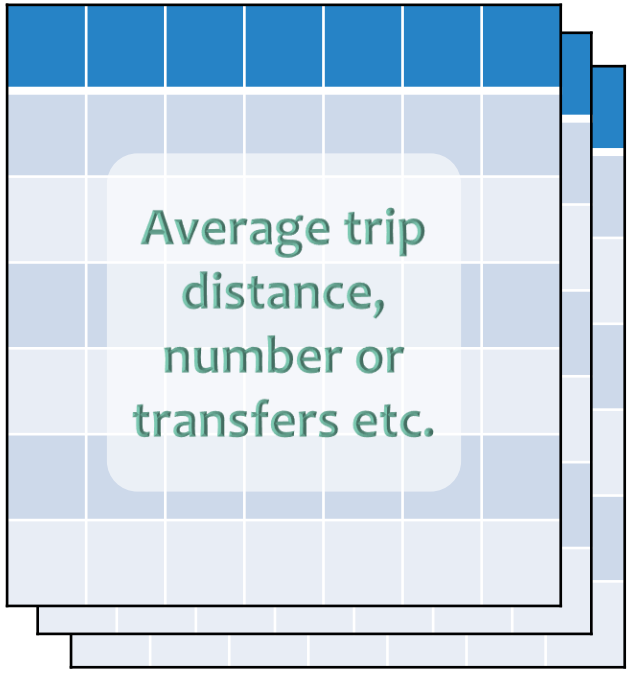
Taxes on emissions



Source: https://taxfoundation.org/data/all/eu/carbon-taxes-europe/

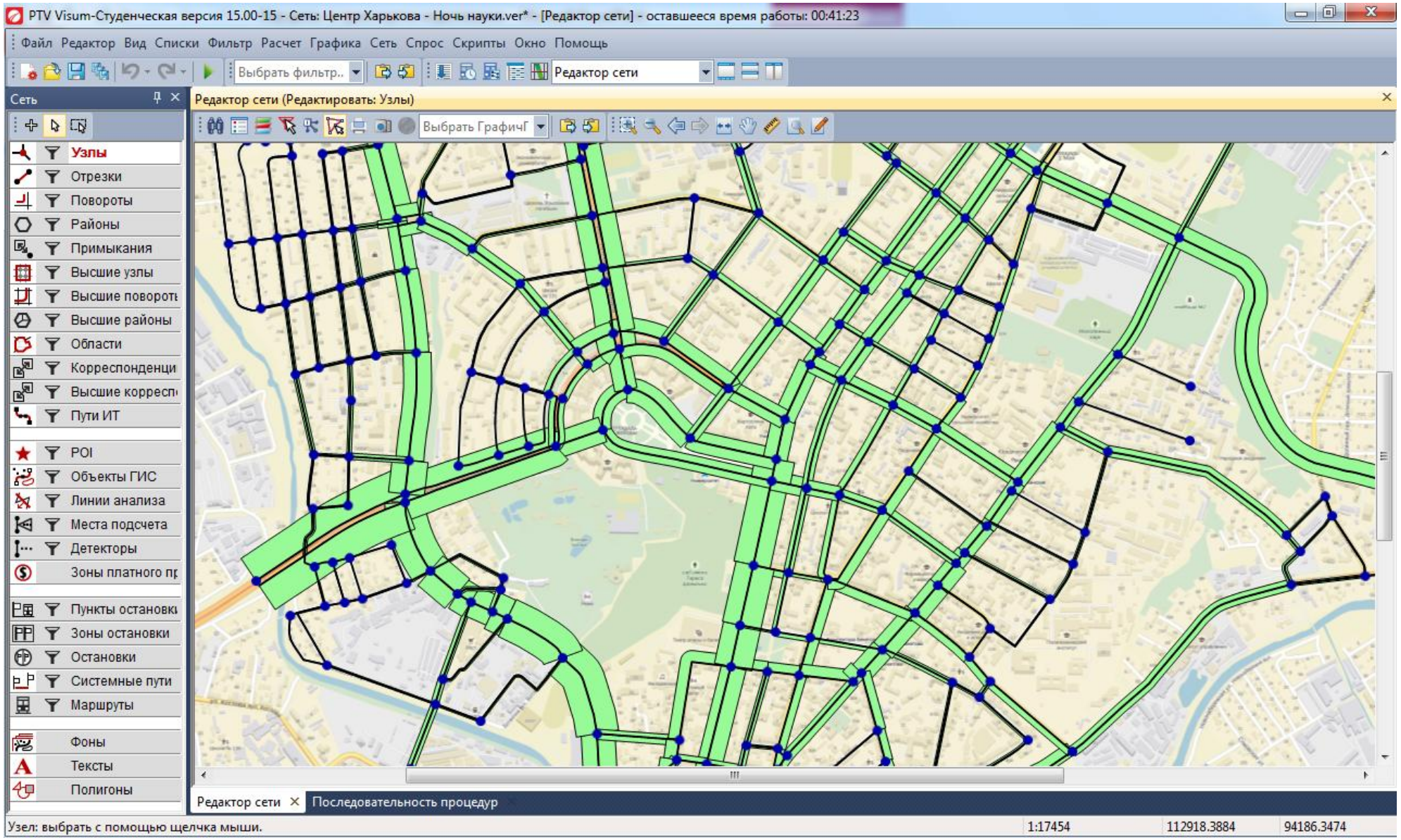
Transport modelling as the data source

Transport model



Calculation of the costs and benefits for transport users and transport operators

Presentation of the modelling results



Thank you for your attention !

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