

Socio-economic costs and benefits of vehicle safety systems

INTRODUCTION

A **cost-benefit analysis tool** was developed in the Horizon 2020 project VIRTUAL. The tool is aimed at calculating the socio-economic costs and benefits of vehicle safety systems. It provides insight in the costs of vehicle safety systems, the safety impacts, quality of life gains, monetary benefits and socio-economic return.

The tool serves to **support road safety stakeholders** in making decision on developing, introducing and implementing (new) vehicle safety systems or new regulations and legislation.

KEY FEATURES OF THE TOOL

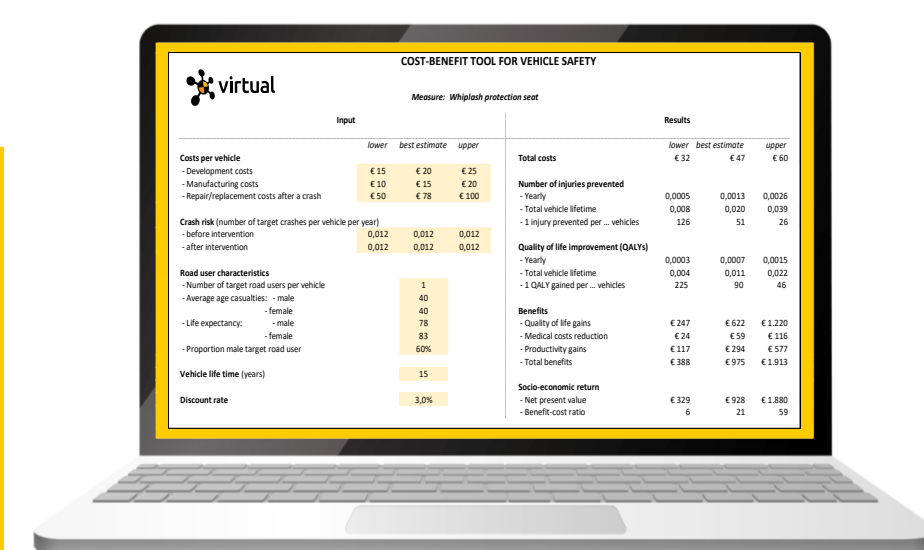
- Safety impacts of vehicle safety systems are assessed using a **detailed classification of injuries** (39 injury groups).
- A linkage with **Human Body Models** is established to estimate injury prevention. HBMs simulate the impacts of a collision on the human body, resulting in impact on injury probability and severity.
- Safety impacts are translated into **quality of life gains**, using QALYs (Quality Adjusted Life Years).
- Both **case-specific user inputs** (e.g. crash risks) and **fixed inputs** (e.g. monetary valuations) are used in the calculations.

CASE STUDIES

The cost-benefit tool has been applied in the VIRTUAL project to assess the costs and benefits of several vehicle safety systems:

- **Autonomous Emergency Braking (AEB)** systems, aimed at preventing car-pedestrian and car-cyclist collisions or reduce injury severity.
- **Improved seat designs** in passenger cars, aimed at reducing whiplash associated disorders.
- **Improved tram fronts** to reduce the severity of tram-pedestrian injuries.

The case studies illustrate the feasibility and added value of the novel elements, such as using HBMs in cost-benefit analysis and translating HBM results into QALYs.



COST-BENEFIT TOOL FOR VEHICLE SAFETY							
Measure: Whiplash protection seat							
Input	Results						
	lower	best estimate	upper				
Costs per vehicle				Total costs	€ 32	€ 47	€ 60
- Development costs	€ 15	€ 20	€ 25	Number of injuries prevented			
- Manufacturing costs	€ 10	€ 15	€ 20	- Yearly	0,0005	0,0013	0,0026
- Repair/replacement costs after a crash	€ 50	€ 78	€ 100	- Total vehicle lifetime	0,008	0,020	0,039
Crash risk (target crashes per vehicle per year)				- 1 injury prevented per ... vehicle	126	51	26
- before intervention	0,012	0,012	0,012	Quality of life improvement (QALYs)			
- after intervention	0,012	0,012	0,012	- Yearly	0,0003	0,0007	0,0015
Road user characteristics				- Total vehicle lifetime	0,004	0,011	0,022
- Number of target road users per vehicle		1		- 1 QALY gained per ... vehicles	225	90	46
- Average age casualties: - male		40		Benefits			
- female		40		- Quality of life gains	€ 247	€ 622	€ 1.220
- Life expectancy: - male		78		- Medical costs reduction	€ 24	€ 59	€ 116
- female		83		- Productivity gains	€ 117	€ 294	€ 577
- Proportion male target road user		60%		- Total benefits	€ 388	€ 975	€ 1.913
Vehicle life time (years)		15		Socio-economic return			
Discount rate		3,0%		- Net present value	€ 329	€ 928	€ 1.880
				- Benefit-cost ratio	6	21	59

VIRTUAL PROJECT

The objective of the VIRTUAL project is to improve the safety of road users by providing procedures and **open access tools** to assess the benefit of new safety systems | <https://projectvirtual.eu/>

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 768960.

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