



## European Thematic Network ROSEBUD



**- Demonstration Course -**



# Efficiency Assessment Tools (EAT)

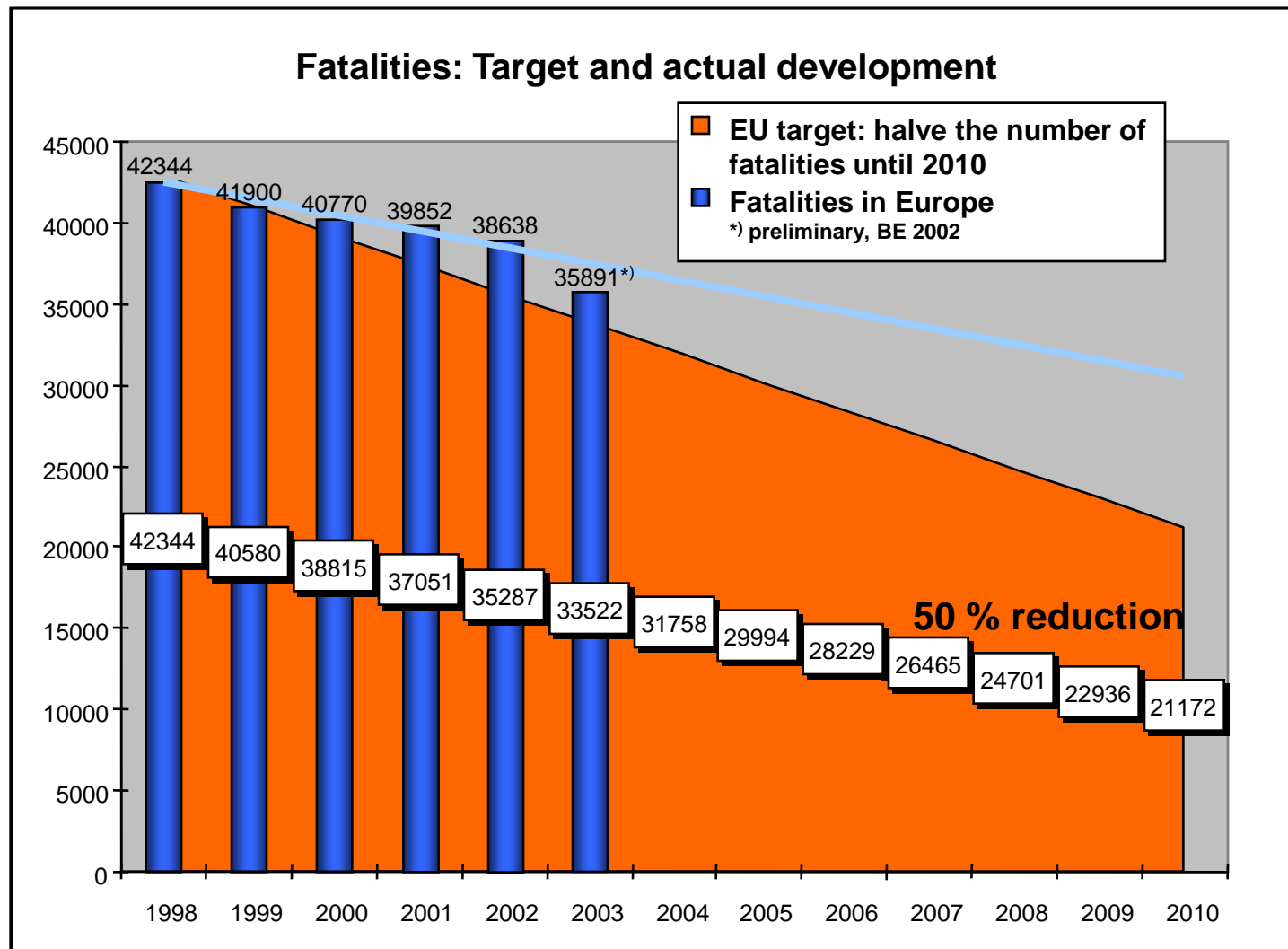
Why EAT?

- Safety budget is limited
- Rational approach required

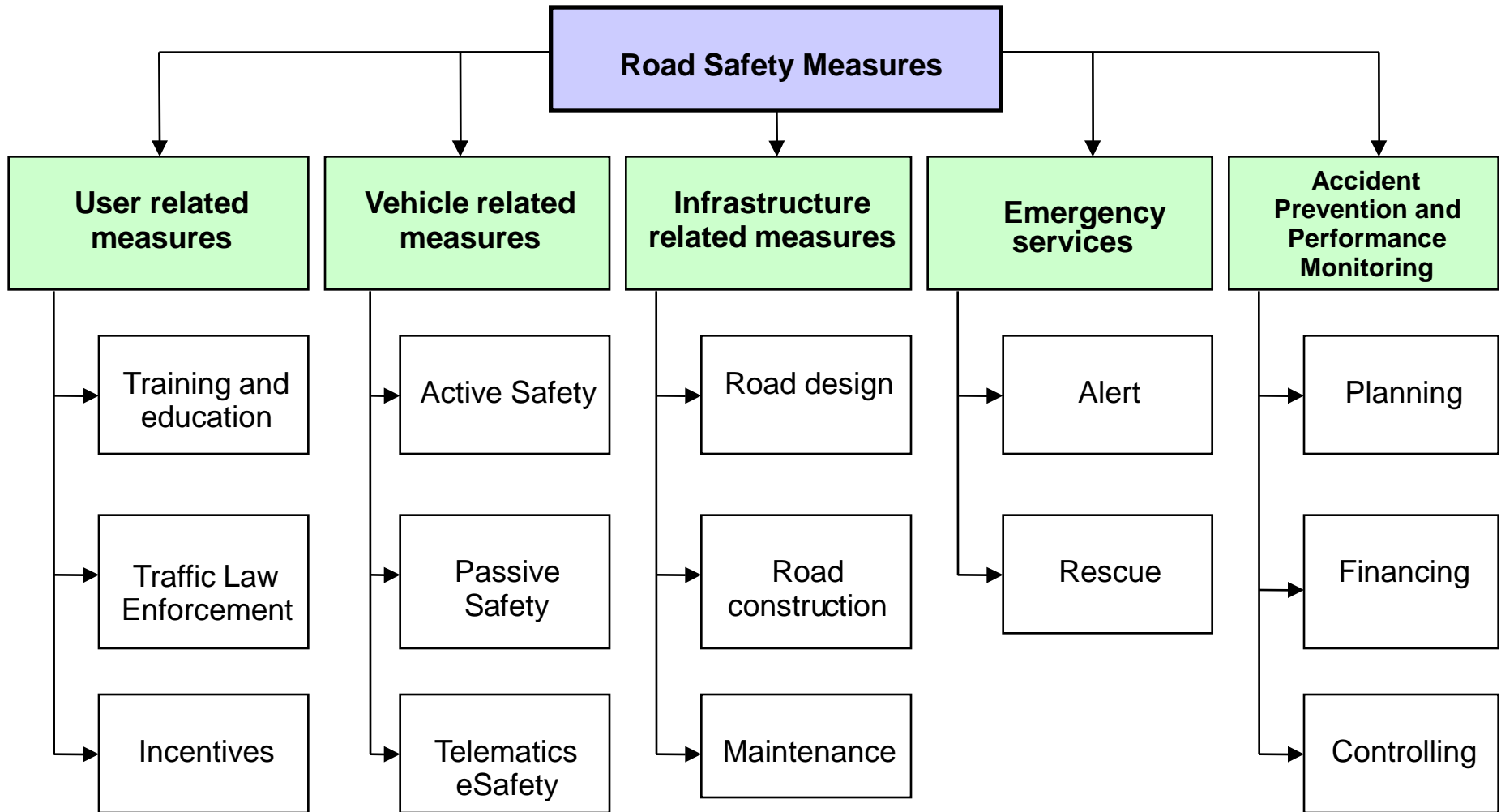
**Objectives:**

- **Identifying benefits, costs and impacts**
- **Establishing a beneficial safety outcome**
- **Comparing alternatives**
- **Assisting in prioritizing of projects**

# Road safety in Europe (EU 15)



# Road safety measures





- **The aim of the assessment is to identify the most efficient measures.**
- **This will enable the society to allocate the resources to the most beneficial use.**



## Efficiency assessment can help

- Efficiency assessment = a systematic assessment of the improvement in road safety that can be realised by means of various road safety measures
- Two main forms of efficiency assessment:
  - Cost-effectiveness analysis (CEA)
  - Cost-benefit analysis (CBA)

## **Main elements of efficiency assessment**

- A list of road safety measures
- An estimate of the effects of these measures on accidents or injuries
- An estimate of the costs of the measures
- For cost-benefit analysis, monetary valuation of impacts is needed

## Cost Effectiveness Analysis

$$\text{Cost Effectiveness} = \frac{\text{Number of accidents prevented}}{\text{Costs of implementation}}$$

### Necessary data

- **Implementation costs**
- **Estimate of the number of accidents prevented**

## Cost-effectiveness analysis

- Pros:
  - A simple technique which focuses on safety effects
  - Does not require monetary valuation of safety
- Cons:
  - Can only be used for ranking measures
  - Does not consider tradeoffs against other policy objectives
  - It is not possible to consider different accidents consequences (severe and slight injuries, property damages)

# Cost Benefit Analysis

$$\text{Cost benefit ratio} = \frac{\text{present value of all benefits}}{\text{present value of implementation costs}}$$

Particularly useful if

- multiple policy objectives exist
- policy objectives are conflicting
- objectives refer to goods without market prices (safety, environment, mobility)



## **CBA: Necessary data**

- **Costs of implementation**
- **Estimate of the number of accidents prevented**
- **Other quantified effects (environmental, traveltime, vehicle operation etc.)**

## CBA: Necessary data

- **Monetary values (benefits)**

Changes of

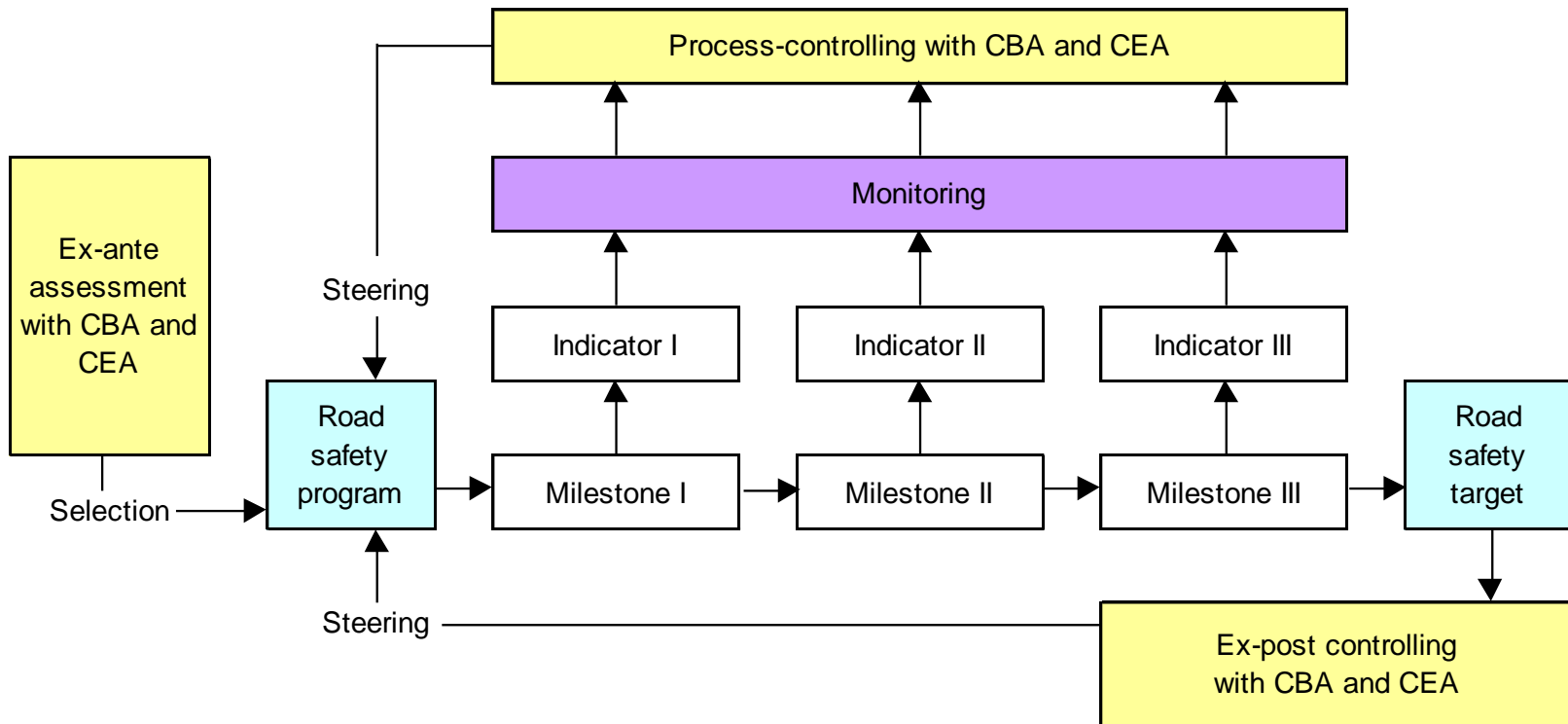
- accident costs
- environmental costs (noise, air pollution)
- mobility costs (time consumption)
- travel costs (vehicle operating)

## Cost-benefit analysis

- Pros:
  - Considers all relevant policy impacts
  - Enables a direct comparison of costs and benefits
- Cons:
  - Monetary valuation e.g. of human life and quality is controversial and difficult, but inevitable
  - Not all effects can be assessed (e.g. distributional effects)

## CBA: basic rules of the game

- Consumer sovereignty is respected
- Maximum efficiency (Pareto-optimality) in resource allocation is sought
- The existing distribution of income is taken as given



**Possible scheme of a systematic evaluation of road safety activities**

## Site overview

# Section Control Kaisermühlen Tunnel

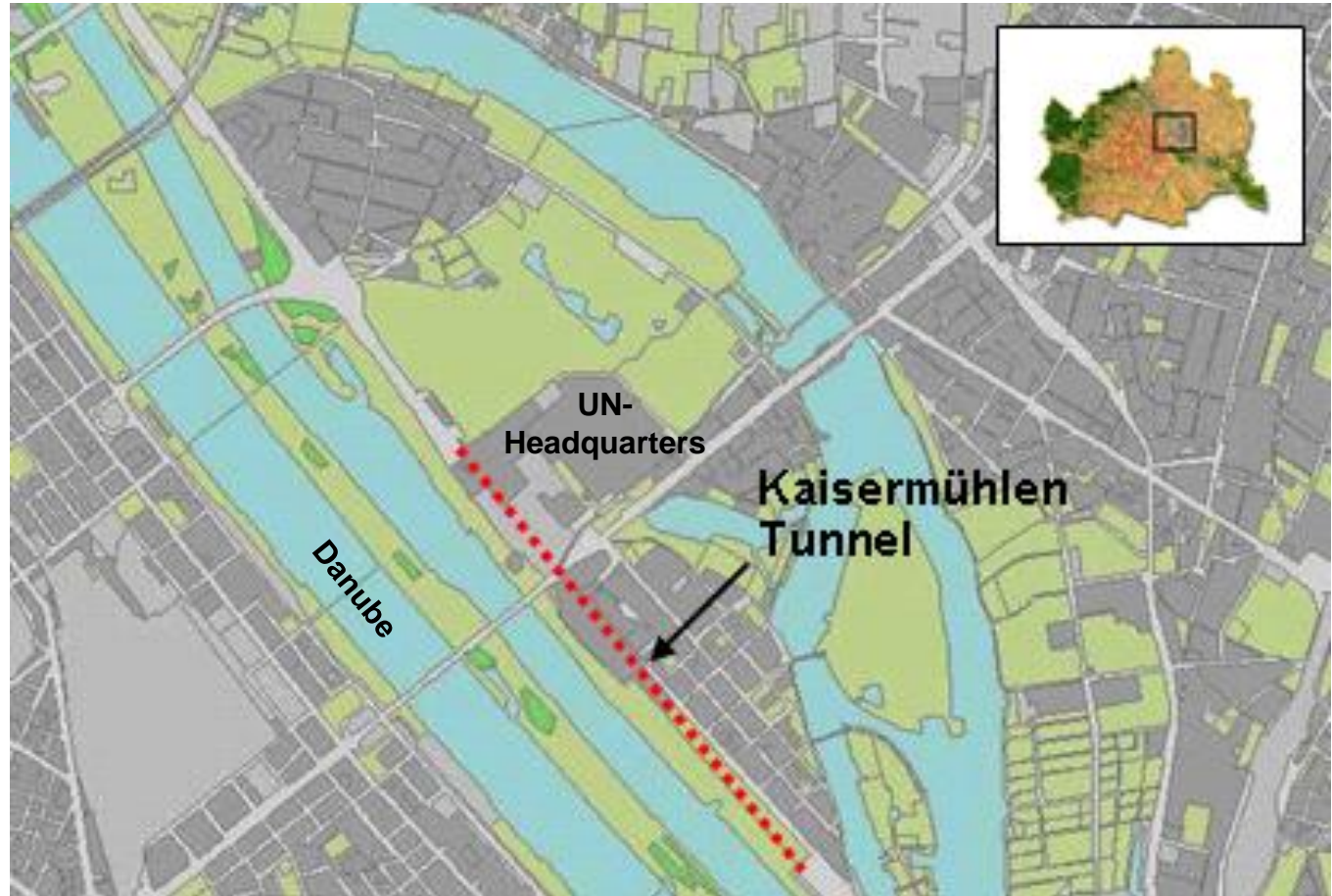


Assessment carried out by the

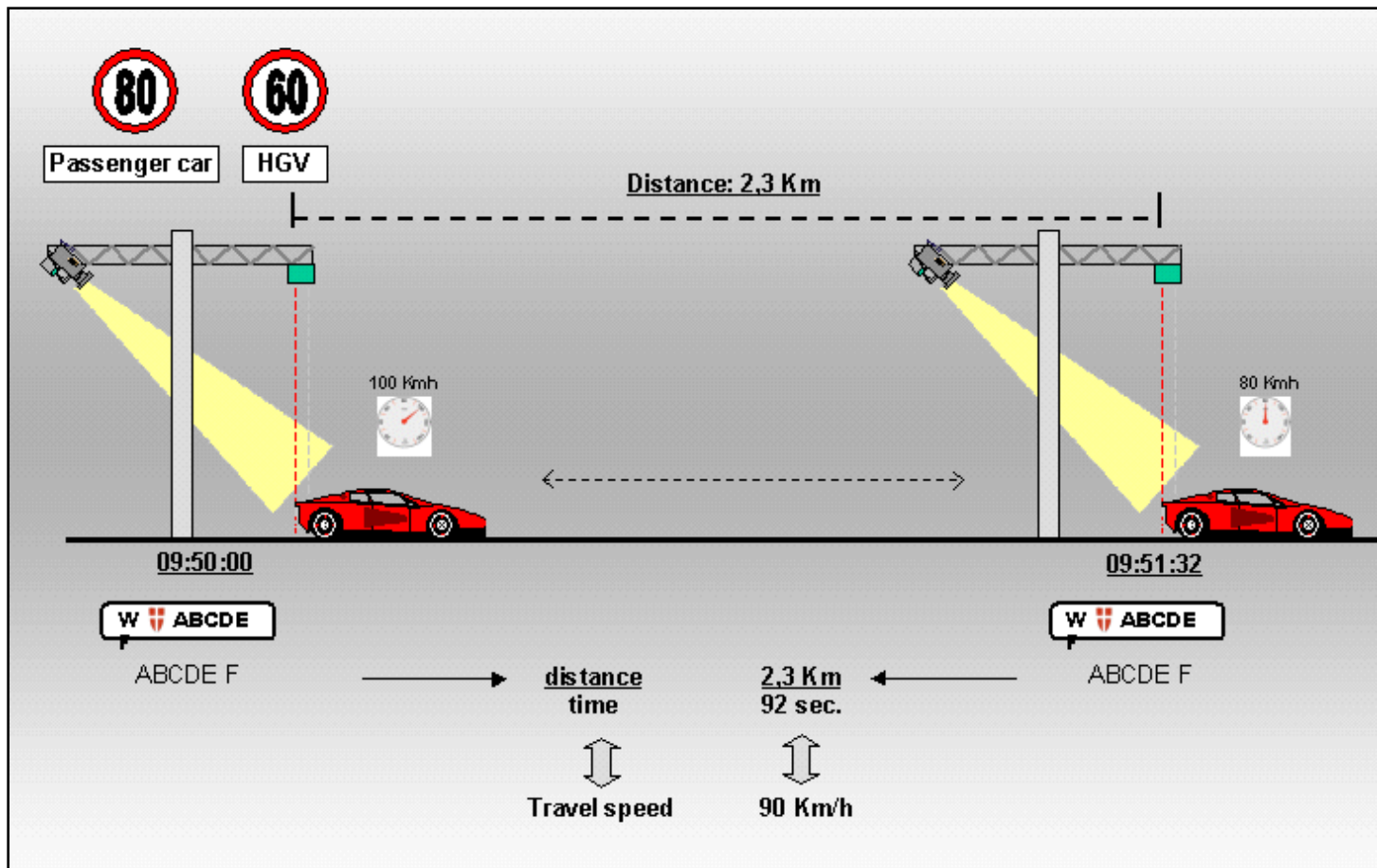


**KURATORIUM  
FÜR VERKEHRS  
SICHERHEIT**

# Section Control Kaisermühlen Tunnel



## System description





## Costs/Benefits

### Costs of the measure

- ☐ Investment costs
- ☐ Annual costs of operation and maintenance

### Economic benefits

- ☐ Reduction of accident costs (numbers, severity of injury)
- ☐ Reduction of road traffic emissions



Section Control  
Kaisermühlen Tunnel

From	To	Period	Injury accidents	Fatalities	Seriously injured	Slightly injured
12.08.1999	12.08.2000	IV <sub>b</sub>	7	1	0	10
12.08.2000	12.08.2001	III <sub>b</sub>	7	0	1	9
12.08.2001	12.08.2002	II <sub>b</sub>	7	1	1	11
12.08.2002	12.08.2003	I <sub>b</sub>	7	0	0	9
Mean (IV <sub>b</sub> – I <sub>b</sub> )			7.0	0.5	0.5	9.8
12.08.2003	12.08.2004	I <sub>a</sub>	5	0	0	7

☰ Reduction in total numbers of casualty accidents and severity of injury

☰ since August 2002: no fatal accident or serious injury recorded



## Section Control Kaisermühlen Tunnel

Components of the CBA	Benefits	Costs
Road traffic emissions	79,108	
Saving of accident costs	1,025,903	
Installation and maintenance costs		204,272
<b>Total</b>	<b>1,105,011</b>	<b>204,272</b>

Category	Amount of savings	€ per unit (2002-price)	Cumulated value
Fatalities	1	949,897	949,897
Seriously injured	1	51,439	51,439
Slightly injured	3	4,359	13,077
Property damage	2	5,745	11,490
<b>Total</b>			<b>1,025,903</b>



$$\text{CBR} = \frac{\sum \text{Benefits}}{\sum \text{Costs}} = \frac{1,105,011}{204,272} = \mathbf{5.4}$$

⇒ ROSEBUD (WP1): **CBR > 3**  
are ranked „**excellent**“

## Recent analyses of road safety policy

- There is a large potential for improving road safety
- Only a part of this potential will be realised if current policies are continued
- If priorities for road safety measures were based on cost-benefit analyses, large gains in safety could be realised

## Efficiency analysis in context

- Not all inefficient policy priorities can be eliminated by doing efficiency analysis
- A systematic use of efficiency analysis can, however, help achieving targets more efficiently

## Do policy makers value efficiency analysis?

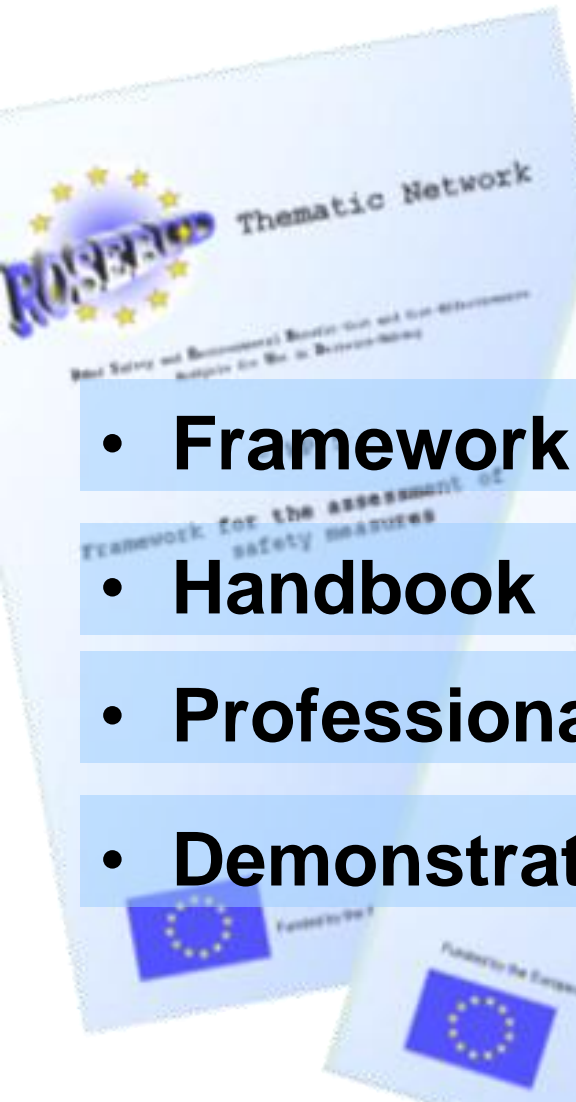
- Yes, cost-effectiveness analysis is regarded as useful
- Opinions differ more with respect to cost-benefit analysis
- The techniques are continuously being improved – making them more relevant for policy makers



## Final remarks

- Efficiency analysis should be part of any road safety programme
- In many countries efficiency analyses are not used to their full potential
- More efficient policy priorities will improve road safety
- Having the European reduction target in mind, the benefits of reducing road accident fatalities by at least 50% exceed the costs
- Efficiency assessment can help bringing better results in road safety policy

# Final ROSEBUD - products



- Framework
- Handbook
- Professional Guidelines
- Demonstration Course

The two main potential benefits from the Road Safety Audit process are to reduce the frequency of accidents and casualties and to reduce the need to redesign a scheme after it has been implemented. Audits are performed by independent auditors and are based on detailed checklists listing the items to be examined. The independent auditor or an auditor team is commissioned by the owner of the infrastructure (federal, regional and local authority, private owner). The Auditor should have experiences with road safety and construction. Road safety audits are often described as a first step to implement a complete quality management system for roads. The aim of the safety audit is to put a value, from the standpoint of traffic safety, on all new road construction projects and major road maintenance works on existing roads, so that any shortcomings in road safety could be detected in time.

### Grand Rapids, Michigan:

...hung on a box span of wire and they are now able to be ... lanes. Now there are three traffic signal heads, two for ... the left turn lane. Pavement markings now show a sepa- ... section.



Before safety audit



After road safety audit

Examples of road safety audits	B/C-ratio
mark	1.45
CBA	Result: <b>acceptab</b>
L. (1999); Herrstedt L. (2000)	
of Road Safety Audits (RSA) in Germany	4-99
CBA	Result: <b>excellent</b>
(2002)	
Audits in Norway	1.34
CBA	Result: <b>acceptab</b>
VIK R. (1999); EIVIK R. (2001); EIVIK R. (2003)	

... assess road safety audits? The effects of road safety audits depend on the ... on of the proposals made by the auditor. The effectiveness of road safety auditing is ... and effectiveness\* - depending on the effectiveness of the implementation of the

