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**Socio-Economic Impact Assessment
of Intelligent Vehicle Safety Systems –
Methodological Approach
and Case Studies**

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Information Needs concerning Market Deployment of IVSS

- **To what extent can Intelligent Vehicle Safety Systems contribute to a higher road safety?**
- **Is the market introduction of the new technologies beneficial from a socio-economic point of view?**
- **Which societal groups benefit most from market introduction and are there any groups which can expect only limited or late benefits due to their social status?**
- **To what extent can Intelligent Vehicle Safety Systems stimulate the employment in an economy?**
- **[...]**

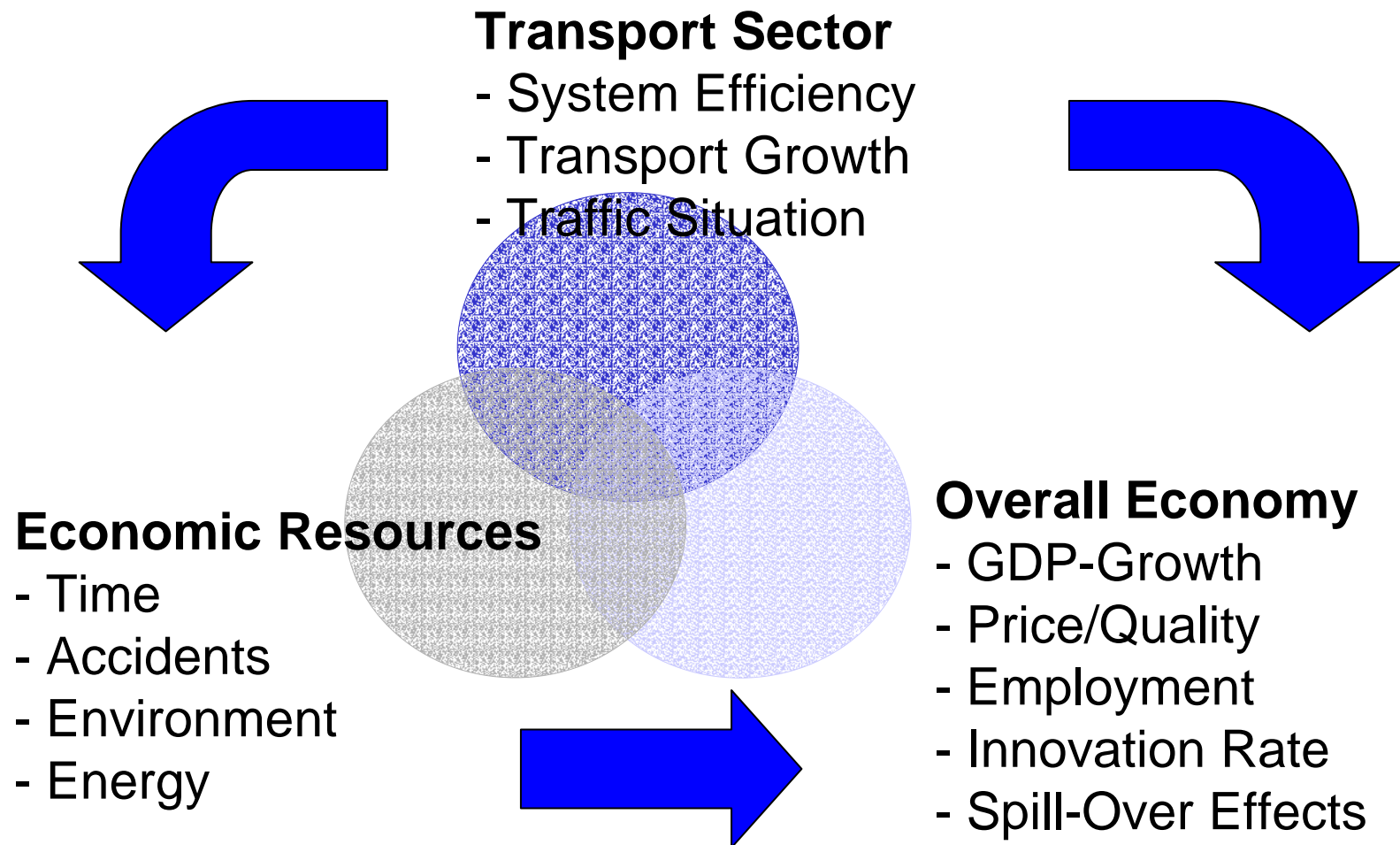
SEiSS History

- **eSafety Working Group on Road Safety – Final Report (Nov 2002)**
→ Recommendation to estimate socio-economic benefits
- **Commission Communication “ICT for safe and intelligent Vehicles” (Sept 2003)**
→ Announcement of DG INFSO Action for Assessment of Socio-Economic Impacts
- **Exploratory Study on the potential Socio-Economic Impact (July 2004-Jan 2005)**
→ Focus on
 - methodological framework for socio-economic impact assessment,
 - workability of approach,
 - verification by exemplary case studies

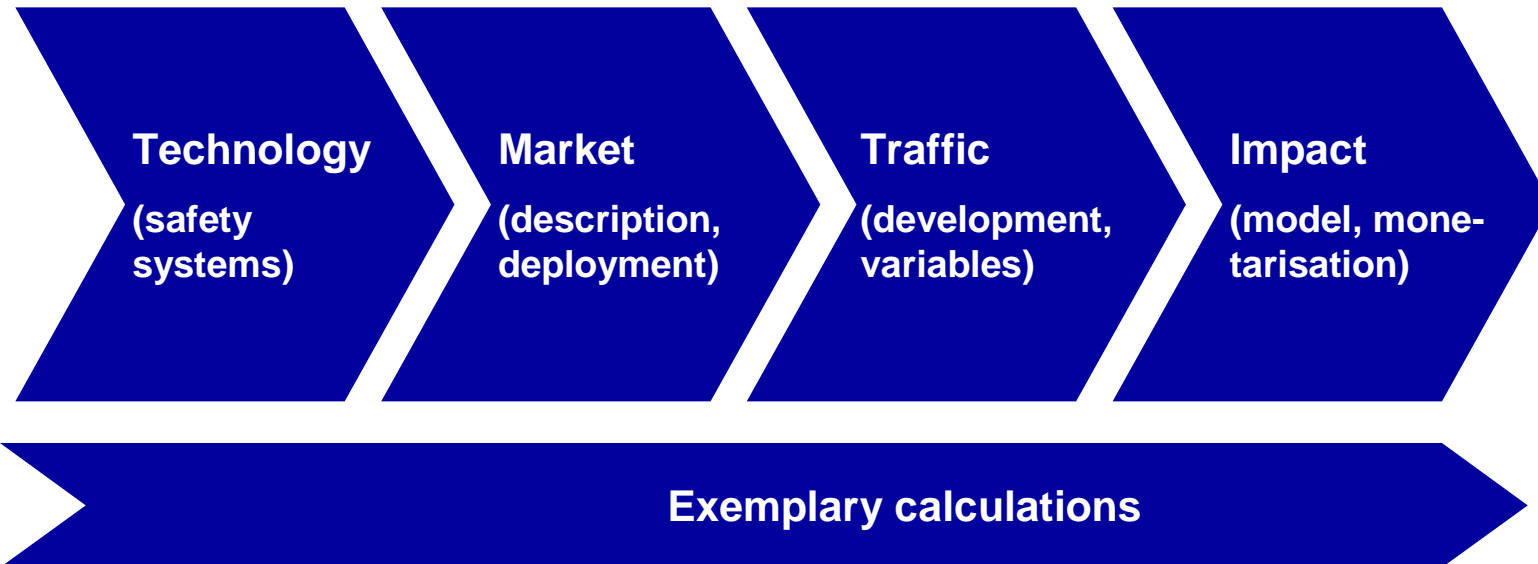
Acronym: SEiSS

Partners: VDI/VDE-IT GmbH (Germany), IfV Köln (Germany)

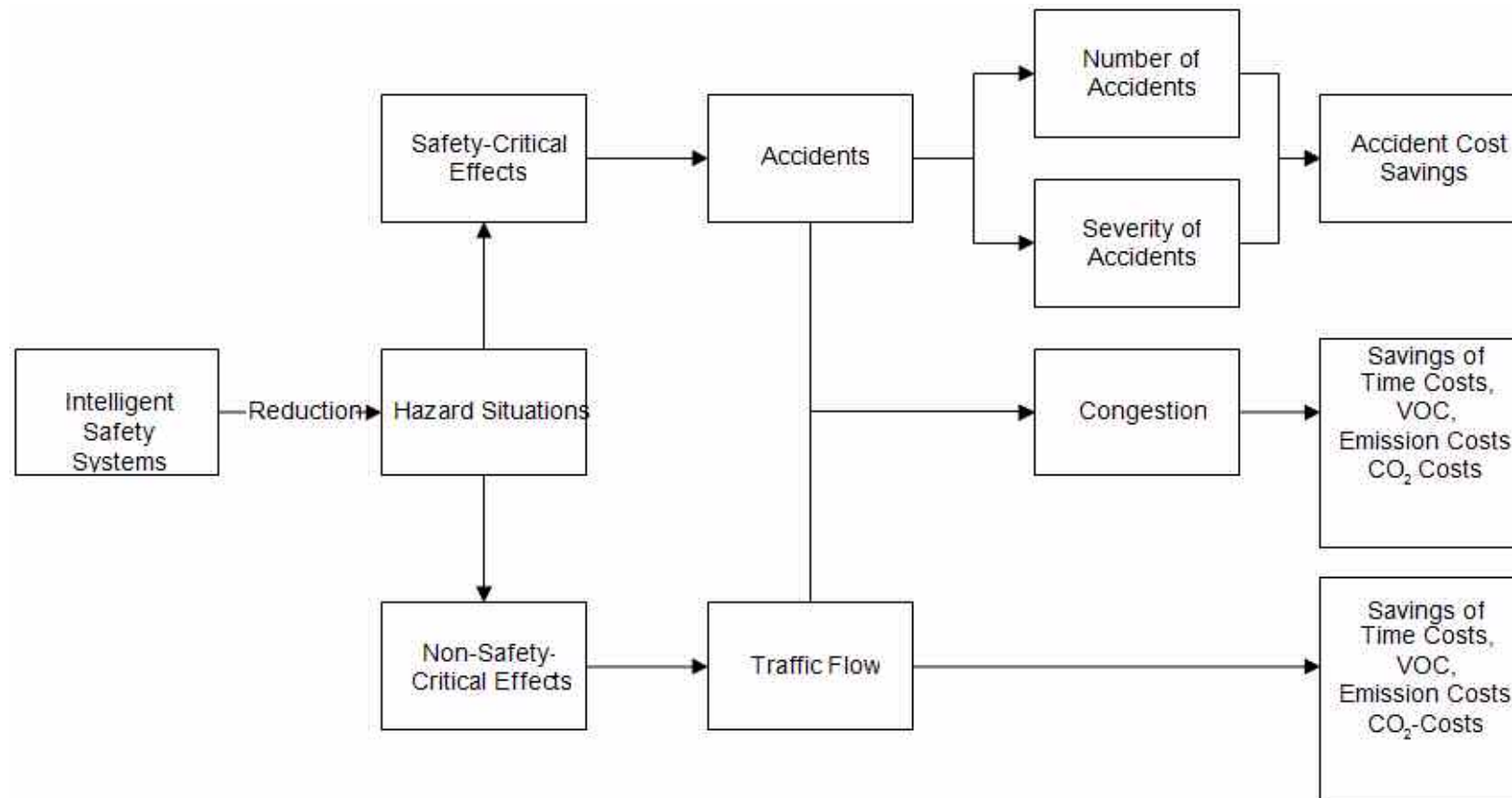
Definition of Socio-Economic Impact



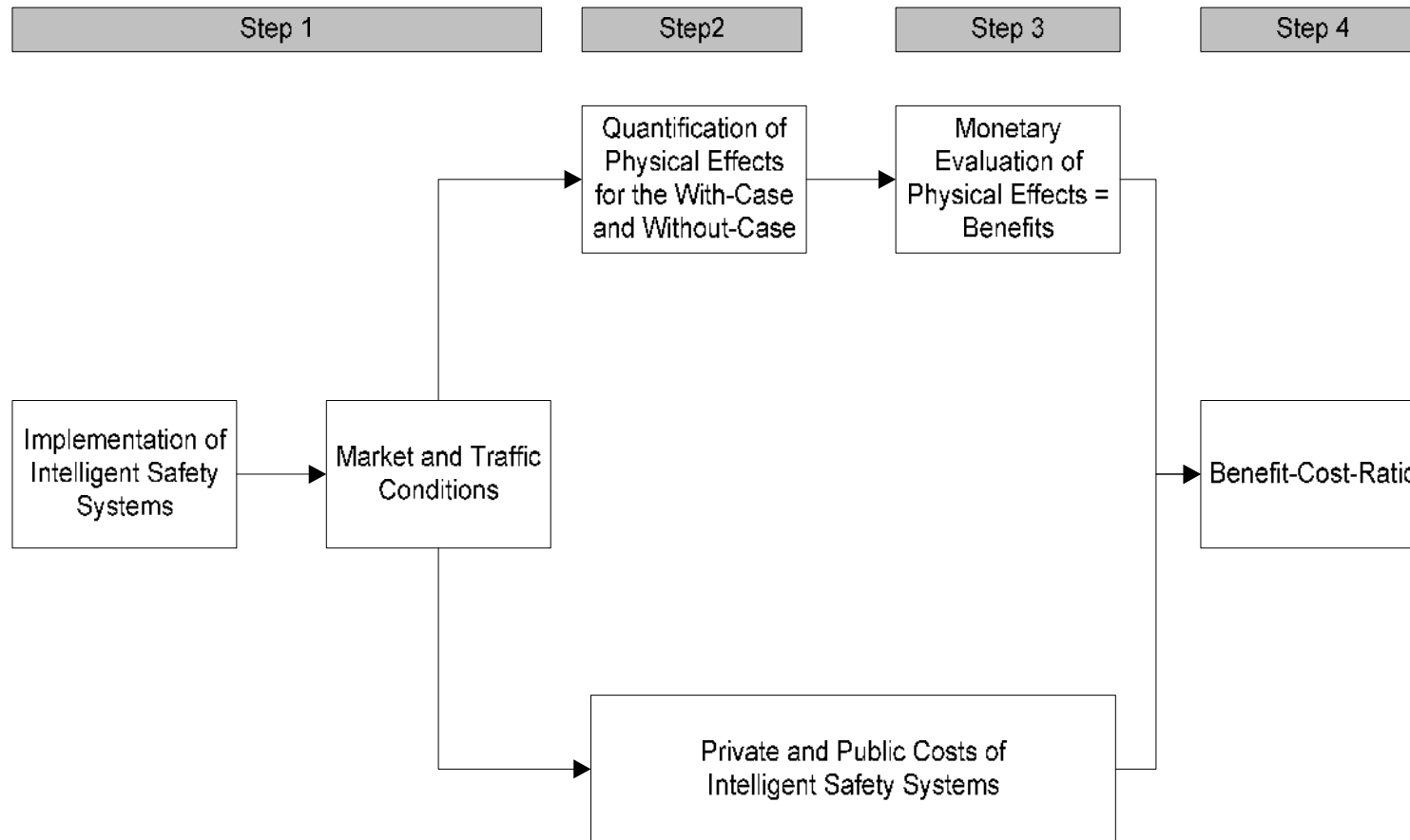
SEiSS Approach



System Impact Channels on avoiding Hazard Situations



Steps of Monetary Evaluation of Intelligent Vehicle Safety Systems



Output of Step 4: Benefit-Cost Ratio

$$BCR = \frac{\sum_{t=0}^{T-1} B_t (1+i)^{-t}}{\sum_{t=0}^{T-1} C_t (1+i)^{-t}}$$

where

BCR

:= benefit-cost ratio

T

:= time horizon pre-defined

B_t

:= benefits estimated for the year t

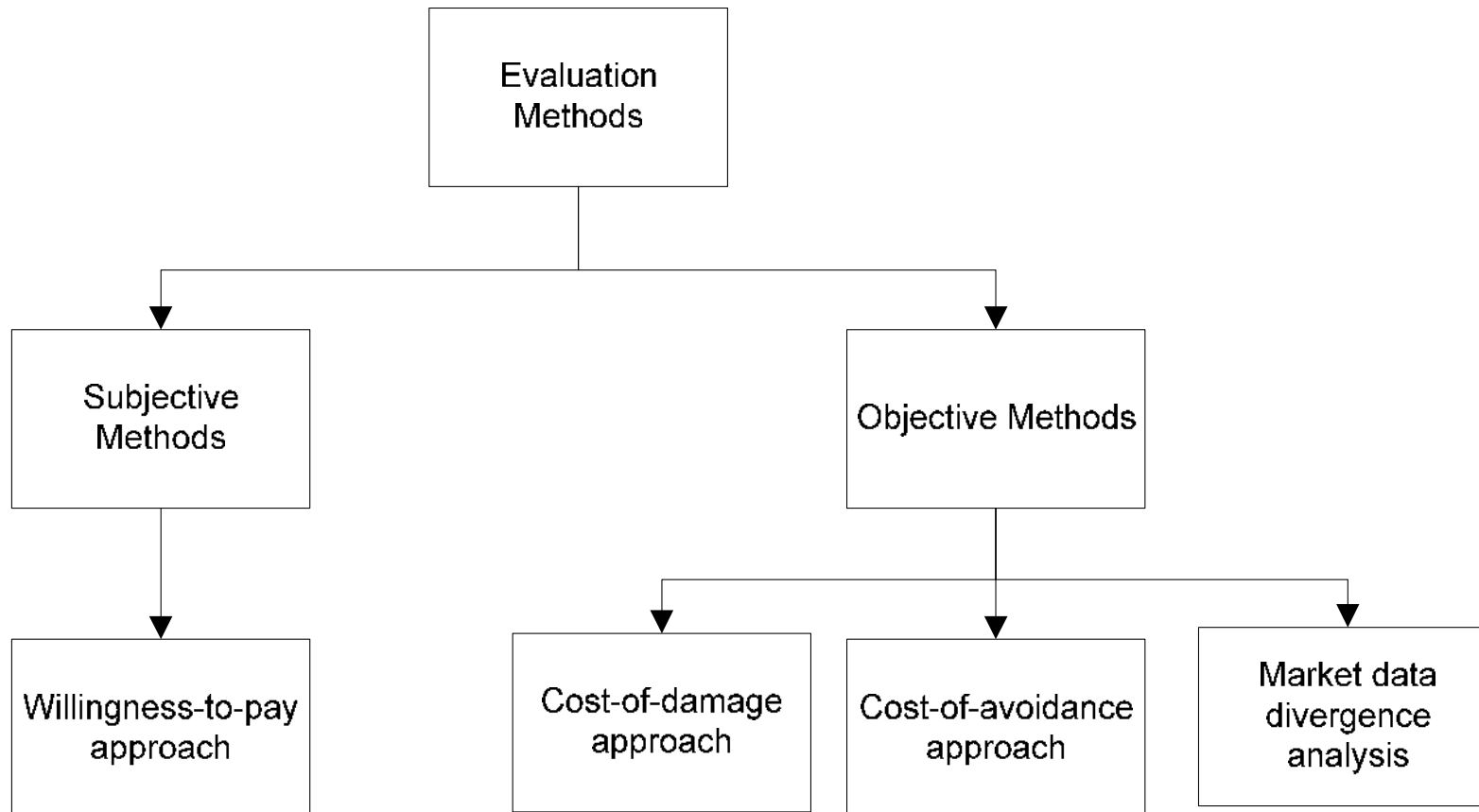
C_t

:= costs estimated for the year t

i

:= discount rate

Methods for Monetary Evaluation of Impacts



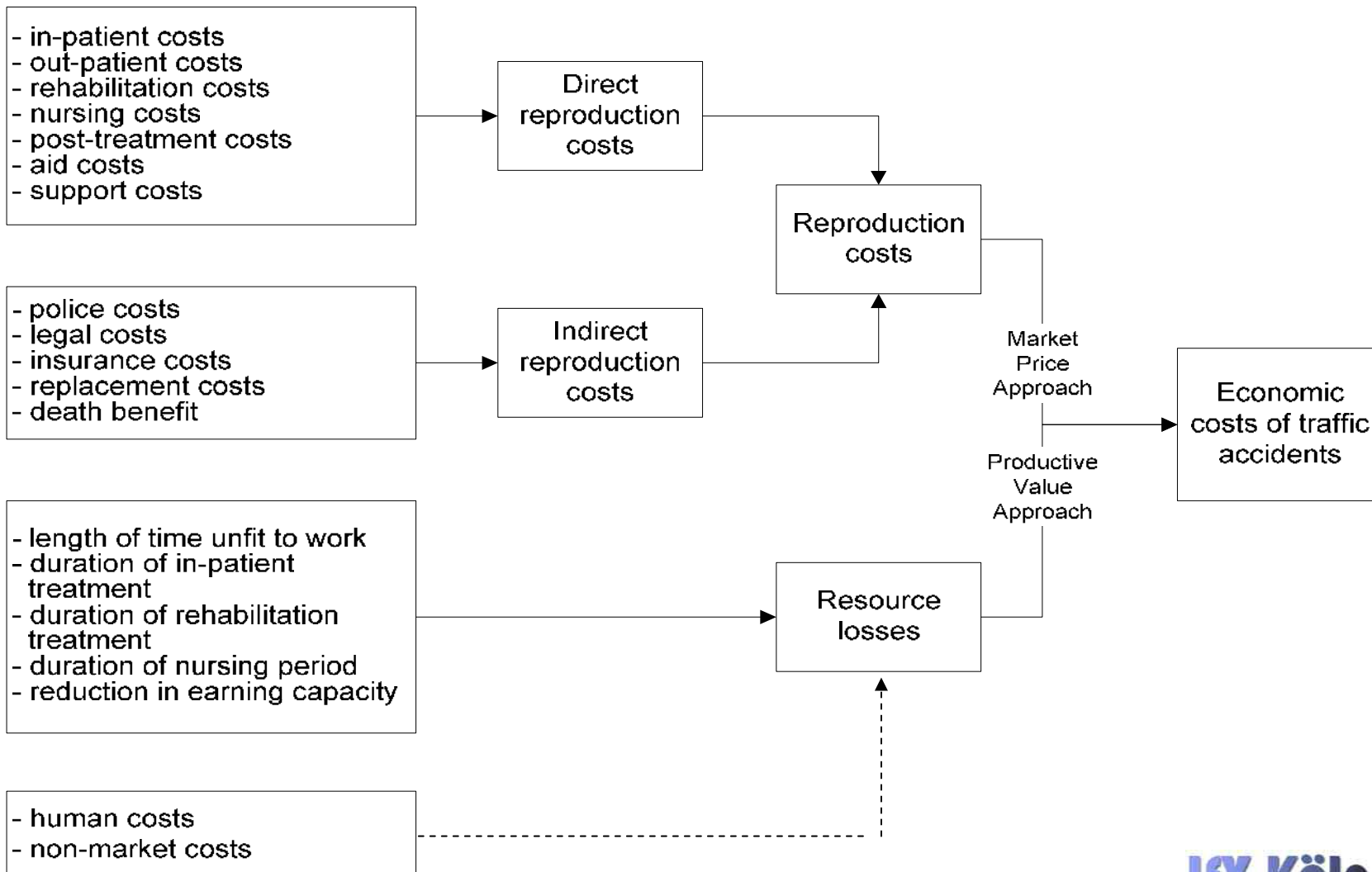
Comparison between Cost-of-damages and Willingness-to-pay

Accident severity	Cost-of-damages	Willingness-to-pay
Injury Level 1 (Minor)	\$12,200	\$13,418
Injury Level 2 (Moderate)	\$39,759	\$43,655
Injury Level 3 (Serious)	\$114,771	\$120,018
Injury Level 4 (Severe)	\$202,141	\$221,951
Injury Level 5 (Critical)	\$685,781	\$752,988
Fatality	\$962,440	\$3,580,536
Only property damage	\$3,397	---

Annotation:

Injury Levels correspond to the accident severity scale of the American Association of Automotive Medicine

Elements of Accident Cost Analysis



Input for introduced Benefit Assessment – European Accident Cost Unit Rates

Benefit Component	Type of Accident		
	With Fatalities	Severe Injuries	Slight Injuries
Accident Costs without Property Damage	1,000,000 €	135,000 €	15,000 €
Congestion Costs	15,000 €	5,000 €	5,000 €
Property Damage (per Accident)	6,000 €		

Note: Property Damage is not applied in the eCall Case Study.

Sources:

European Commission, Proposal for a Directive of the European Parliament and of the Council amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures, Annex III (Cost Calculation and Allocation), COM (2003) 448 final, Brussels 23.07.2003;
ICF Consulting, Cost-Benefit Analysis of Road Safety Improvements, London 2003.

Workability of the proposed Methodology – Exemplary Calculations for IVSS

IVSS	eCall	Safe following (ACC)	Lane Change Assistance and Lane Departure Warning
Criteria			
Reference Years for Socio-Economic Impact Assessment	Based on 2002	2010 / 2020	2010 / 2020
Market Penetration (Total Car Fleet)	100%	3% (2010) 8% (2020)	0.6% (2010) 7% (2020)
System Costs	100 €– 150 € (on board components)*	750 €(2010) 400 €(2020)	600 €(2010) 400 €(2020)
Geographical Coverage	EU-25	EU-25	EU-25

Note: *... PSAP and training costs are also applied in the Case Study

Benefit-Cost Estimations based on SEiSS Methodology for selected IVSS

IVSS	Sub-Cases	Estimated Effects in Mill. € per Year		
		Total Benefits	System Costs	Benefit- Cost Ratio
eCall	Low Impact – High Costs	5,870	4,550	1.3
	High Impact – Low Costs	25,900	3,030	8.5
ACC	2010	490	540	0.9
	2020	990	840	1.2
LDW/ LCA	2010	173	86	2.0
	2020	1,530	730	2.1

SEiSS Conclusion and Challenges

**The assessment of the socio-economic impact of IVSS
can be done
on the basis of a comprehensive and transparent methodology.**

Further challenges are:

- **Harmonisation of IVSS definitions and input parameters**
- **Further improvement of databases (EU 25, standardisation)**
- **R&D for accident causation**
- **Improvement of information exchange across professional communities**
- **Awareness of different stakeholder interests (EC, member states, OEMs, suppliers, insurance companies etc.)**
- **Dissemination and outreach to be based on common understanding**

Challenges to Socio-Economic Impact Assessment

“Thirty years ago, life was simple. Everybody knew what cost-benefit analysis meant. It meant the assessment of costs and benefits to society, whoever the benefits accrued to. Now we have moved to a different form of social organisation, with hierarchical and overlapping Government structures (EU, national, regional, local) and public-private partnerships. This places a lot more strain on the evaluation system [...]”

Source:

Mackie, P., Nellthorp, J., Transport Appraisal in a Policy Context, in: Pearman, A., Mackie, P., Nellthorp, J. (Eds.), Transport Projects, Programmes and Policies – Evaluation Needs and Capabilities, Aldershot 2003, p. 14.

Risks and Restrictions for CBA of IVSS

- **Technological reasons (e.g. safety problems)**
- **Legal constraints (e.g. liability)**
- **Administrative restraints (e.g. capacities for planning, implementation and control)**
- **Distributional restraints (e.g. socially unbalanced effects)**
- **Financial constraints (e.g. too expensive)**

Evaluation Methods for Stakeholder

1. Break Even Analysis

- System Users
- OEM

2. Financial Analysis

3. Business Case Analysis

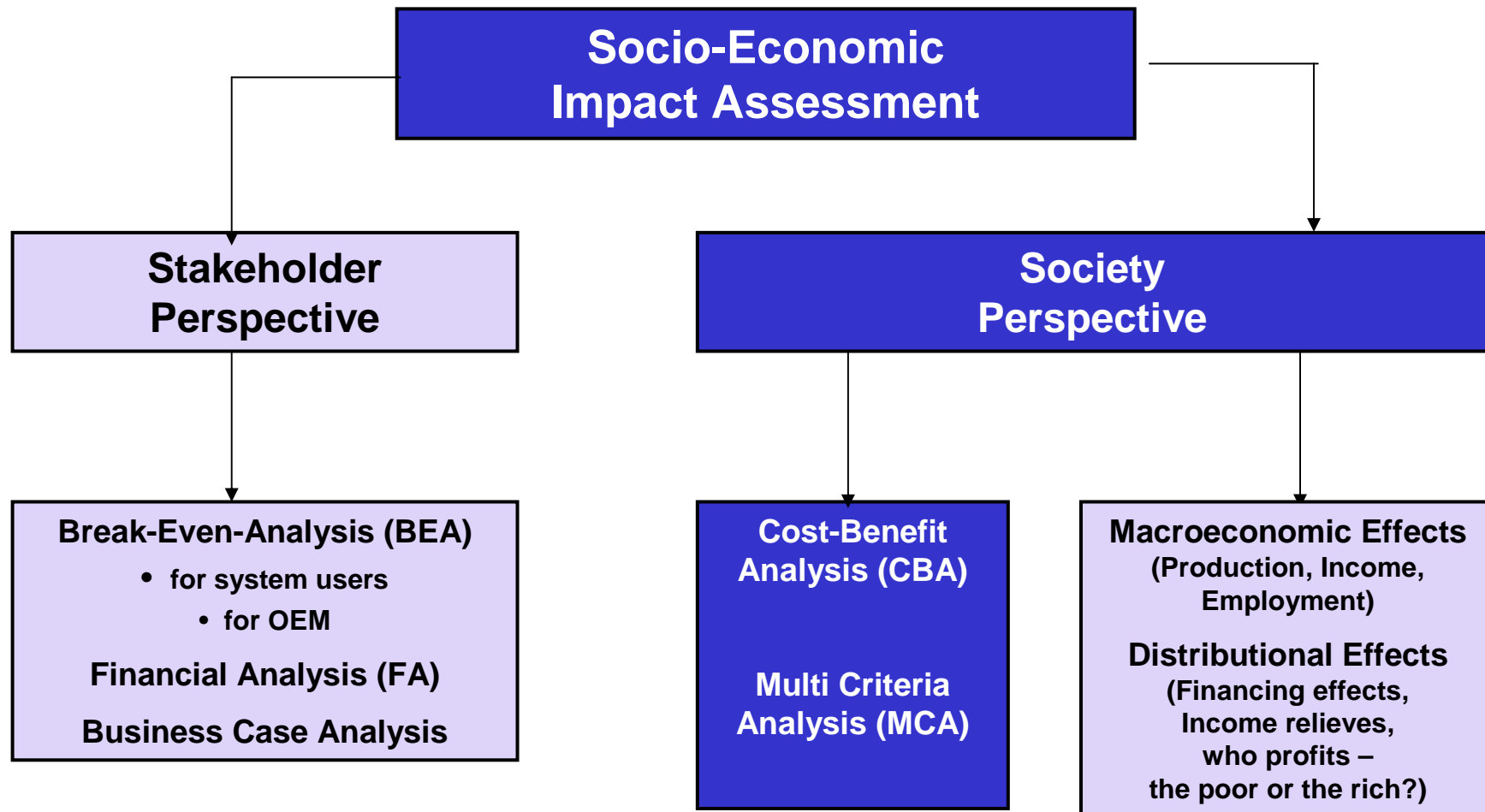
4. Macroeconomic Effects

- Production
- Income
- Employment

5. Distributional Effects

- Financing effects
- Income relieves
- Who profits – the poor or the rich?

Socio-Economic Impact Assessment Framework



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SEiSS Report: available for download @ www.escope.info