



# A Harmonized European Approach for the Assessment of Transport Projects

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## The Problem

- **Transport is of vital importance for economy and welfare, however causes costs, time losses and environmental, health, and social impacts.**
- **When making decisions about transport projects all relevant economic, environmental and social impacts should be taken into account.**
- > **All EU countries have and apply an appraisal framework.**



**But:**

- **The frameworks applied differ considerably with regard to scope, methodology and parameter values used.**
- > Incomplete and - for transnational transport projects - inconsistent assessment results might occur.**
- > Harmonized guidelines for assessing transnational projects are needed.**
- > These have been developed within the research project HEATCO –financed by the EC, DG TREN.**



**The guidelines could be used**

- for assessing and comparing TEN-T projects,**
- for appraisal of other transnational projects.**

**On the long run, the guidelines might also  
contribute to a harmonisation of the different  
national appraisal methods within the EU.**



# The HEATCO Approach for Transport Project Assessment

**Aid for answering the question:**

**Is a transport project worthwhile from an overall social point of view?**

**Which of several alternative projects should be chosen?**

**Includes:**

- **General issues (discounting, evaluation period, PPP adjustment...)**
- **Accident risks**
- **Air pollution**
- **Noise**
- **Greenhouse gas emissions**
- **Costs including distribution of costs**
- **Value of time and congestion**

# The HEATCO Approach: Principles

- Define a 'do minimum' case and a case with project, determine differences;
- Carry out a cost-benefit-analysis (CBA) for those effects, that can be monetized:

$$\text{Benefits} - \text{Costs} > 0 ?$$

- Report non-monetized effects; report results from environmental impact assessment on local effects; if resources allow, estimate indirect socioeconomic effects (e.g. on employment, economic growth, change of population) using a general equilibrium model .

In the guidelines, a methodology for monetizing effects and default monetary values are given.

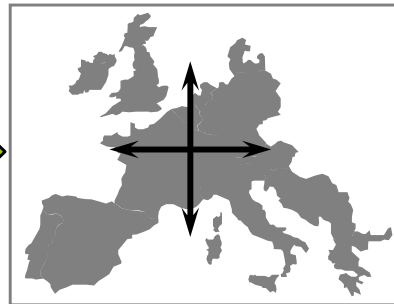


# Environmental Impacts: The Impact Pathway Approach

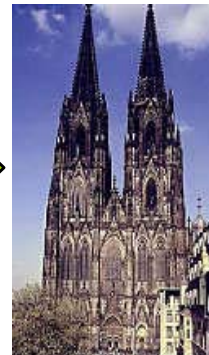
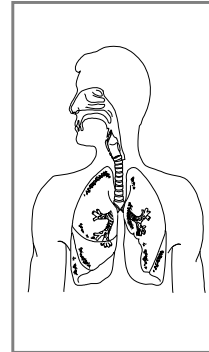
**Pollutant/Noise Emission**



**Transport and Chemical Transformation**



**Physical Impacts**



**Monetary Valuation**



**Value impacts, not pressures !**



## Impacts included (I)

Impact Cat.	Pollutant / Burden	Effects
Human Health mortality	PM <sub>10</sub>	Reduction in life expectancy due to short and long time exposure
	SO <sub>2</sub> , O <sub>3</sub>	
	Benzene, BaP, 1,3-butad., Diesel part.	Reduction in life expectancy due to short time exposure
	Noise	Reduction in life expectancy due to long time exposure
Human Health morbidity	PM <sub>10</sub> , O <sub>3</sub> , SO <sub>2</sub>	Respiratory hospital admissions
	PM <sub>10</sub> , O <sub>3</sub>	Restricted activity days
	PM <sub>10</sub> , CO	Congestive heart failure
	Benzene, BaP, 1,3-butad., Diesel part.	Cancer risk (non-fatal)
	PM <sub>10</sub>	Cerebrovascular hospital admissions, cases of chronic bronchitis, cases of chronic cough in children, cough in asthmatics, lower respiratory symptoms
	O <sub>3</sub>	Asthma attacks, symptom days
Noise	Myocardial infarction, angina pectoris, hypertension, sleep disturbance	





## Impacts included (II)

<b>Impact Category</b>	<b>Pollutant / Burden</b>	<b>Effects</b>
<b>Building Material</b>	<b>SO<sub>2</sub>, Acid deposition</b>	<b>Ageing of galvanised steel, limestone, mortar, sandstone, paint, rendering, and zinc for utilitarian buildings</b>
	<b>Combustion particles</b>	<b>Soiling of buildings</b>
<b>Crops</b>	<b>SO<sub>2</sub></b>	<b>Yield change for wheat, barley, rye, oats, potato, sugar beet</b>
	<b>O<sub>3</sub></b>	<b>Yield change for wheat, barley, rye, oats, potato, rice, tobacco, sunflower seed</b>
	<b>Acid deposition</b>	<b>Increased need for liming</b>
<b>Amenity losses</b>	<b>Noise</b>	<b>Amenity losses due to noise exposure</b>
<b>Ecosystems</b>	<b>SO<sub>2</sub>, NO<sub>x</sub>, NH<sub>3</sub></b>	<b>Eutrophication, Acidification</b>

# The HEATCO approach: Environmental Impacts

## General Approach

Assessment of impacts is based on the (measured) preferences of the affected well-informed population

E.g. use of contingent valuation studies (WTP), choice experiments,...

Benefit transfer of unit values e.g. with income adjustments

Increase of monetary values with time: income elasticity of 1.0



# The HEATCO Approach: Air Pollution

Impacts of air pollution from transport (years of life lost per 1000 t of emission)

Pollutant emitted	NO <sub>x</sub>	NM VOC	SO <sub>2</sub>	PM <sub>2.5</sub>	PM <sub>2.5</sub>
Effective pollutant	O <sub>3</sub> , Nitrates	O <sub>3</sub>	Sulfates, Acid depos.	PM <sub>2.5</sub>	PM <sub>2.5</sub>
Local environment				urban	non-urban
Czech Republic	50	1	58	5 900	1 180
Finland	11	0,2	9	5 100	450
Belgium	57	1	81	6 200	1 470



# The HEATCO Approach: Air Pollution

**Fall-back Values for air pollution from transport (€<sub>2002,PPP</sub> per tonne pollutant emitted)**

<b>Pollutant emitted</b>	<b>NO<sub>x</sub></b>	<b>NMVOC</b>	<b>SO<sub>2</sub></b>	<b>PM<sub>2.5</sub></b>	<b>PM<sub>2.5</sub></b>
<b>Effective pollutant</b>	<b>O<sub>3</sub>, Nitrates</b>	<b>O<sub>3</sub></b>	<b>Sulfates, Acid deposition</b>	<b>PM<sub>2.5</sub></b>	<b>PM<sub>2.5</sub></b>
<b>Local environment</b>				<b>urban</b>	<b>non-urban</b>
<b>Czech Republic</b>	<b>3,200</b>	<b>1,100</b>	<b>4,100</b>	<b>270,000</b>	<b>76,000</b>
<b>Finland</b>	<b>900</b>	<b>200</b>	<b>600</b>	<b>360,000</b>	<b>30,000</b>

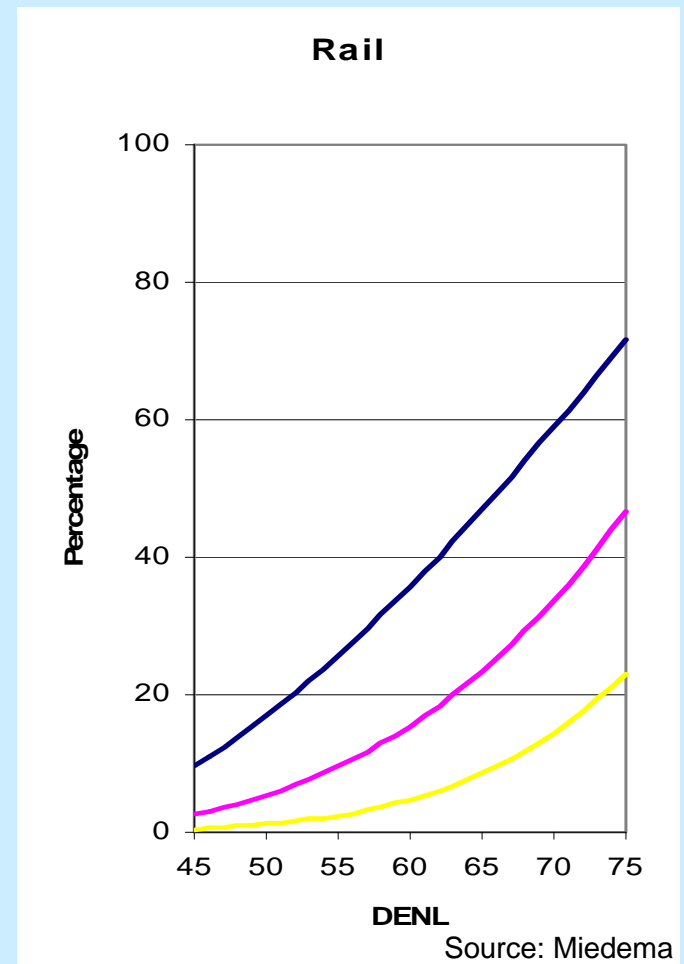
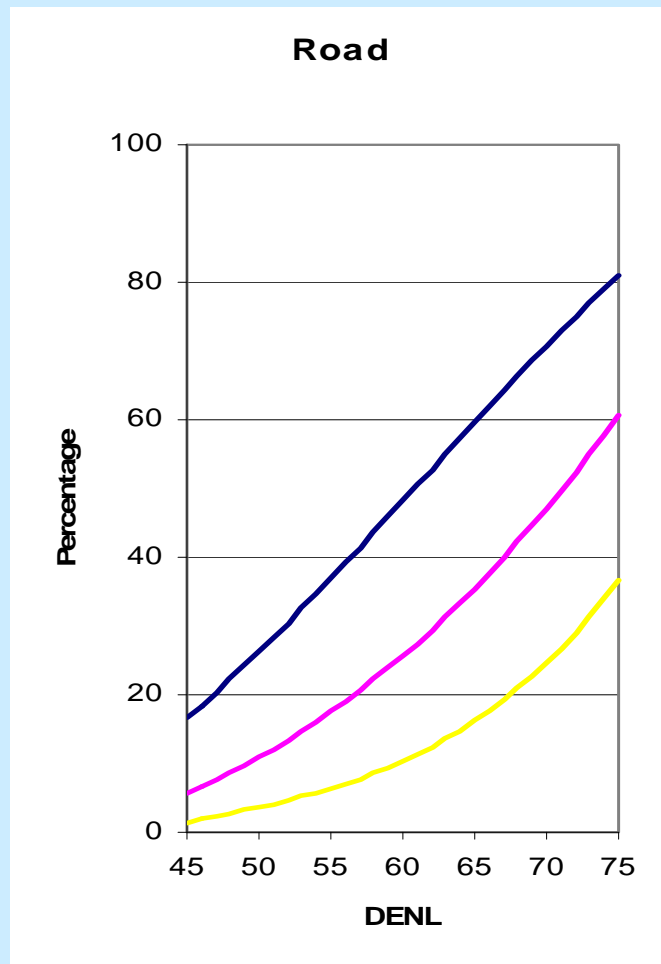
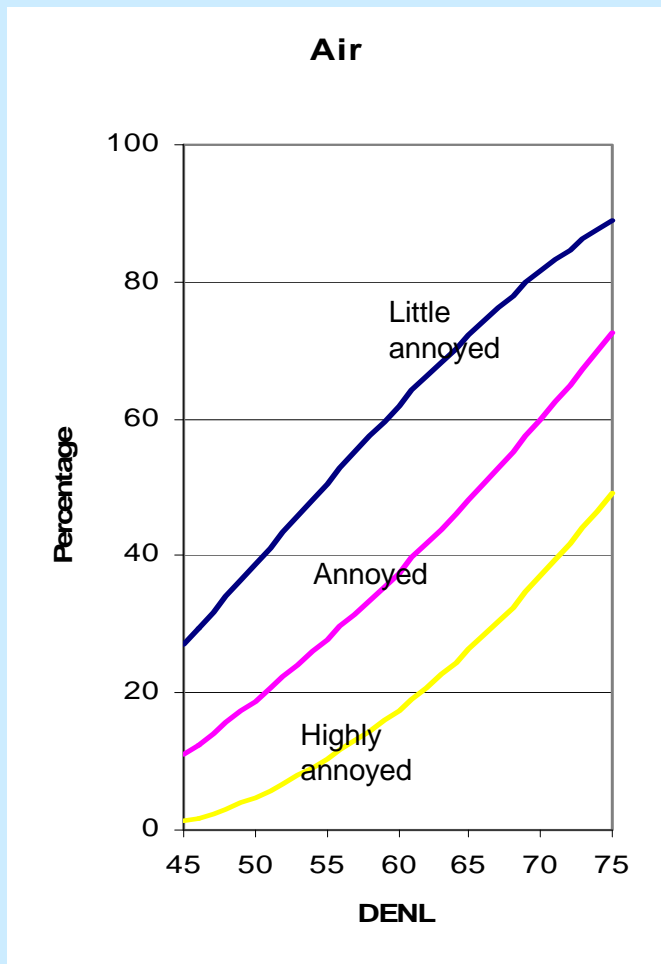


# HEATCO Approach:

# Noise

## Noise - Impacts Considered

- Health effects: hypertension, heart diseases
- Annoyance





# The HEATCO approach: Noise Impacts

## Monetary values for different noise levels (Germany)

**central (SP)**

**new approach**

**high (hed.)**

$L_{DEN}$ dB(A)	road	rail	air	road	rail	air	road	rail	air
43	0	0	0	5	2	8	0	0	0
51	9	0	14	11	6	18	20	0	31
60	88	44	136	21	12	29	200	100	310
75	291	248	412	113	98	119	573	473	848



# The HEATCO Approach: Accident Risks

## Cost components:

**Value of safety per se: WTP (willingness to pay) to reduce accident risks**

**requirement: values from up-to-date stated preferences studies**

**Direct cost: medical and rehabilitation cost, legal cost, emergency services and property damage cost.**

**Indirect cost: production capacity lost for economy**



# The HEATCO Approach: Accident Risks

## Fall-back Values for Casualties (€<sub>2002</sub> per case)

Country	Fatality	Severe injury	Slight injury
	(1000 € <sub>2002,PPP</sub> , factor prices)		
<b>Czech Republic</b>	<b>932</b>	<b>125</b>	<b>9,1</b>
<b>Finland</b>	<b>1,548</b>	<b>206</b>	<b>15,4</b>
<b>Germany</b>	<b>1,493</b>	<b>207</b>	<b>16,7</b>
<b>Greece</b>	<b>1,069</b>	<b>140</b>	<b>10,7</b>





# The HEATCO Approach: Global Warming

**Shadow Prices for Reducing Global Warming  
 (€2002/tonne CO<sub>2</sub>-equiv.), factor prices; based on  
 Watkiss et al. 2005)**

	Central guidance	For sensitivity analysis	
Year of emission		Lower central estimate	Upper central estimate
2000 – 2009	<b>22</b>	14	51
2010 – 2019	<b>26</b>	16	63
2020 – 2029	<b>32</b>	20	81
2030 – 2039	<b>40</b>	26	103
2040 – 2049	<b>55</b>	36	131
2050	<b>83</b>	51	166



# Approach for Evaluating Time

Trip category	Minimum approach
Passenger – work	Cost saving (meta-analysis)
Passenger – non-work	Willingness to pay (meta-analysis)
Commercial Goods traffic	Cost saving (meta-analysis)



**Value of Travel Time – Recommended Default Values for the Czech Republic, Passenger Transport (€2002 PPP per passenger per hour, factor prices)**

	<b>Air</b>	<b>Bus</b>	<b>Car, Train</b>
<b>Business</b>	<b>37</b>	<b>21</b>	<b>27</b>
<b>Other long dist.</b>	<b>17</b>	<b>8</b>	<b>12</b>
<b>Commute short</b>	<b>16</b>	<b>8</b>	<b>11</b>

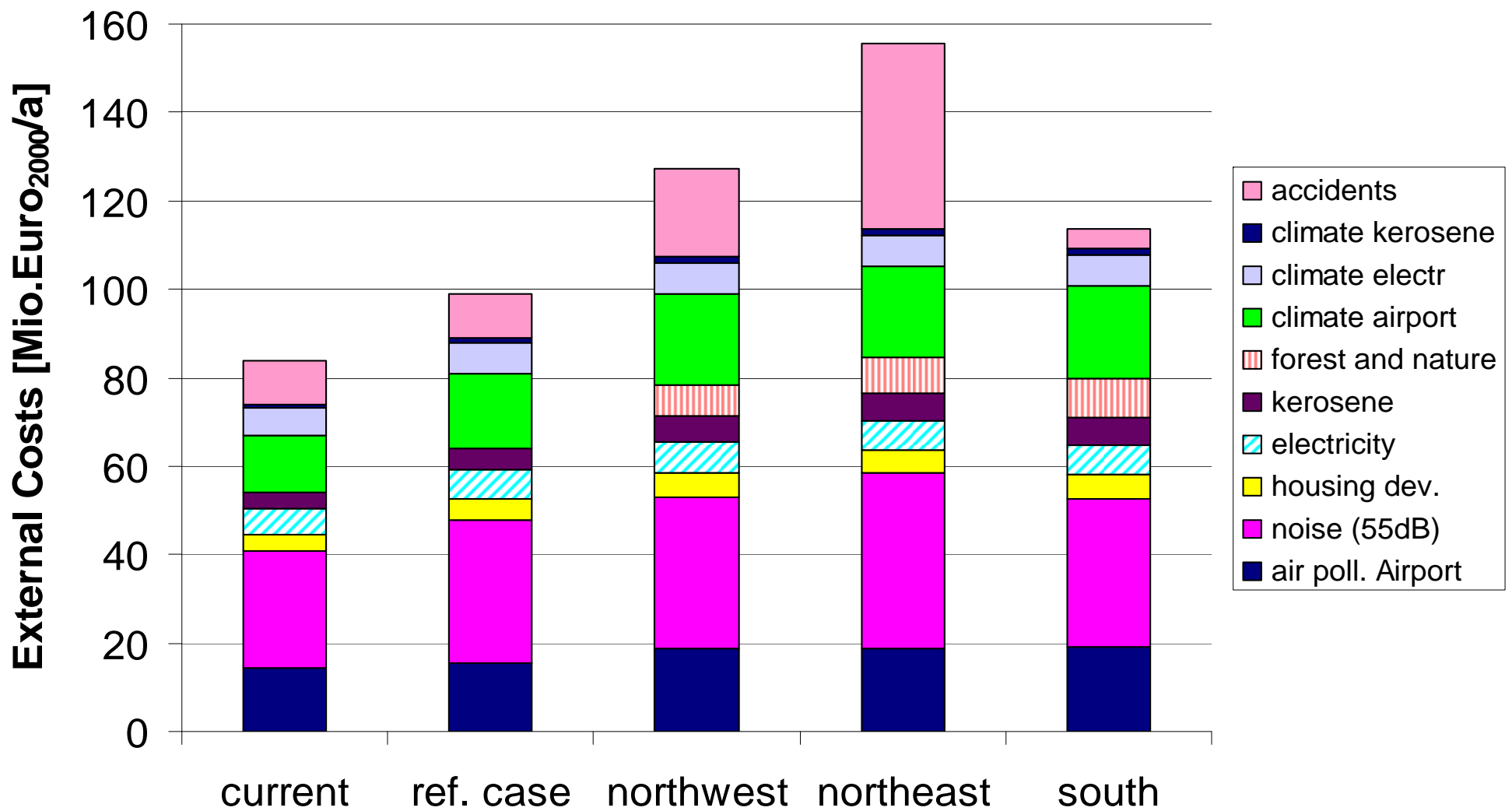
**Walk time: 2 \* in-vehicle time; wait time: 2,5 \* in-vehicle time; standing: 1,5 \* in-vehicle time.**

**Value of Travel Time– freight trips (€2002 PPP per freight tonne per hour, factor prices)**

<b>Road</b>	<b>Rail</b>
<b>3,8</b>	<b>1,6</b>



Example 1: Building of a new (additional) runway at the Frankfurt airport  
 – external costs of different alternatives



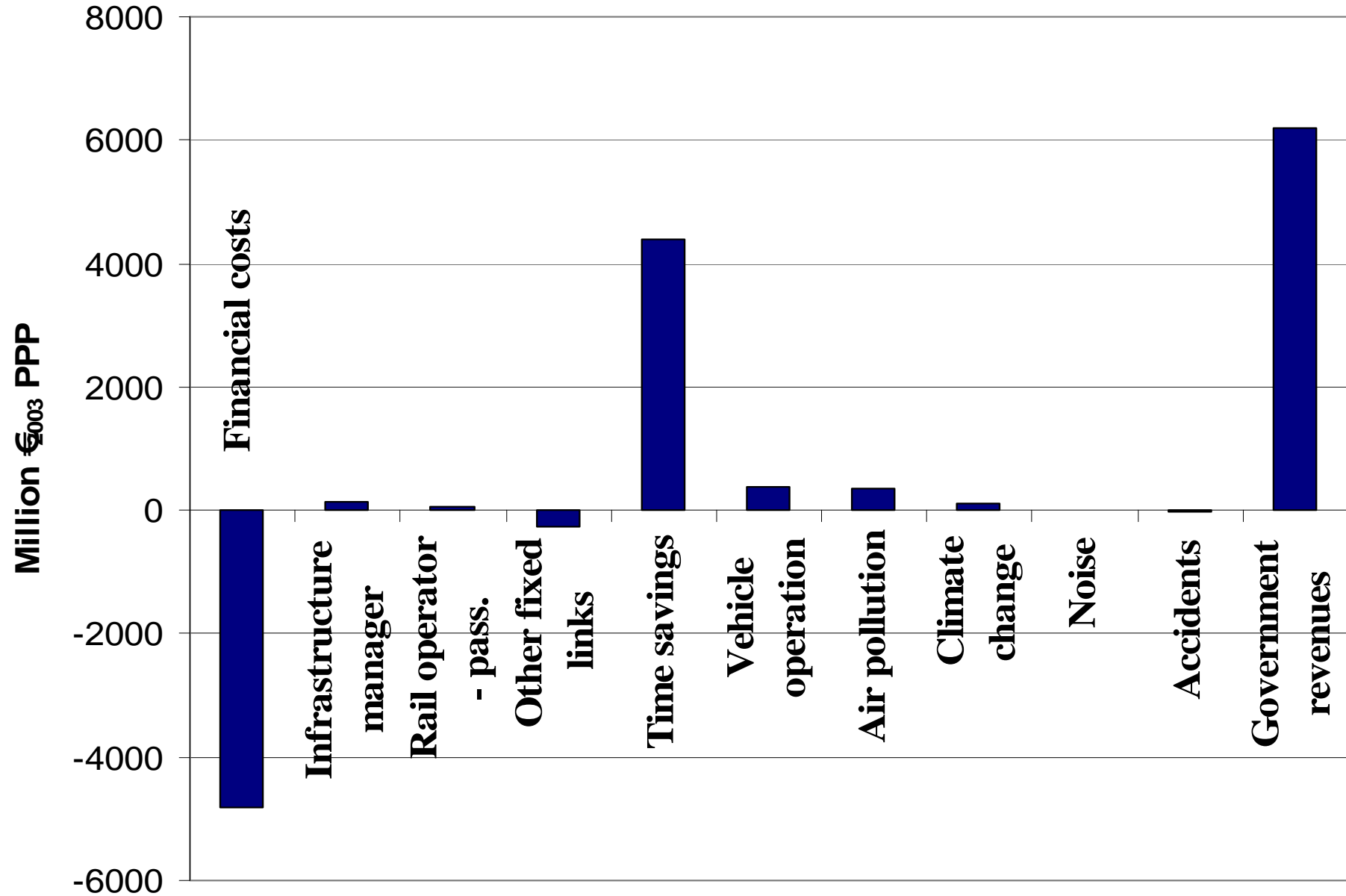


# Example II: Link Across the Fehmarn Belt



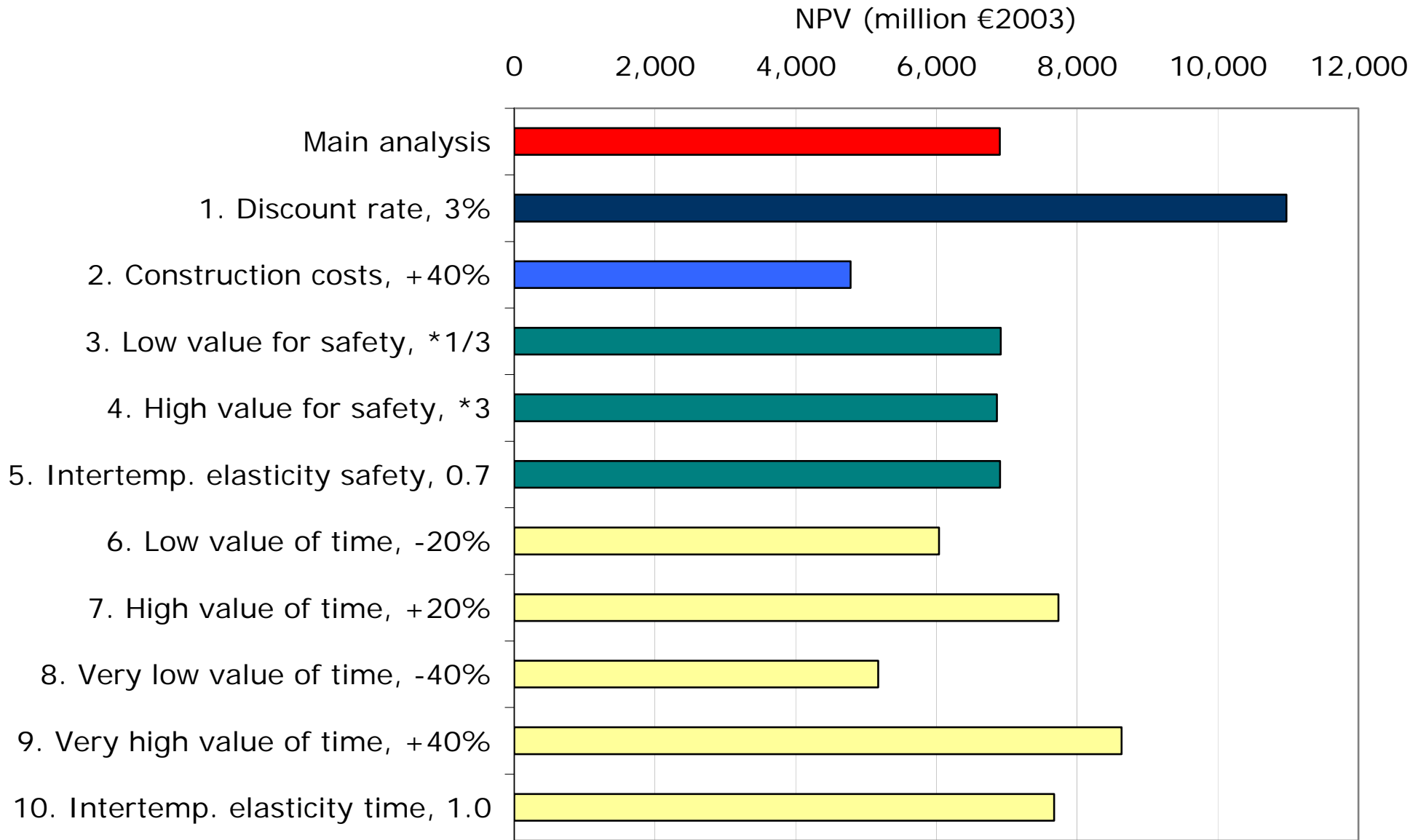


### Net Present Value for Different Cost Categories: Link Across Fehmarn Belt



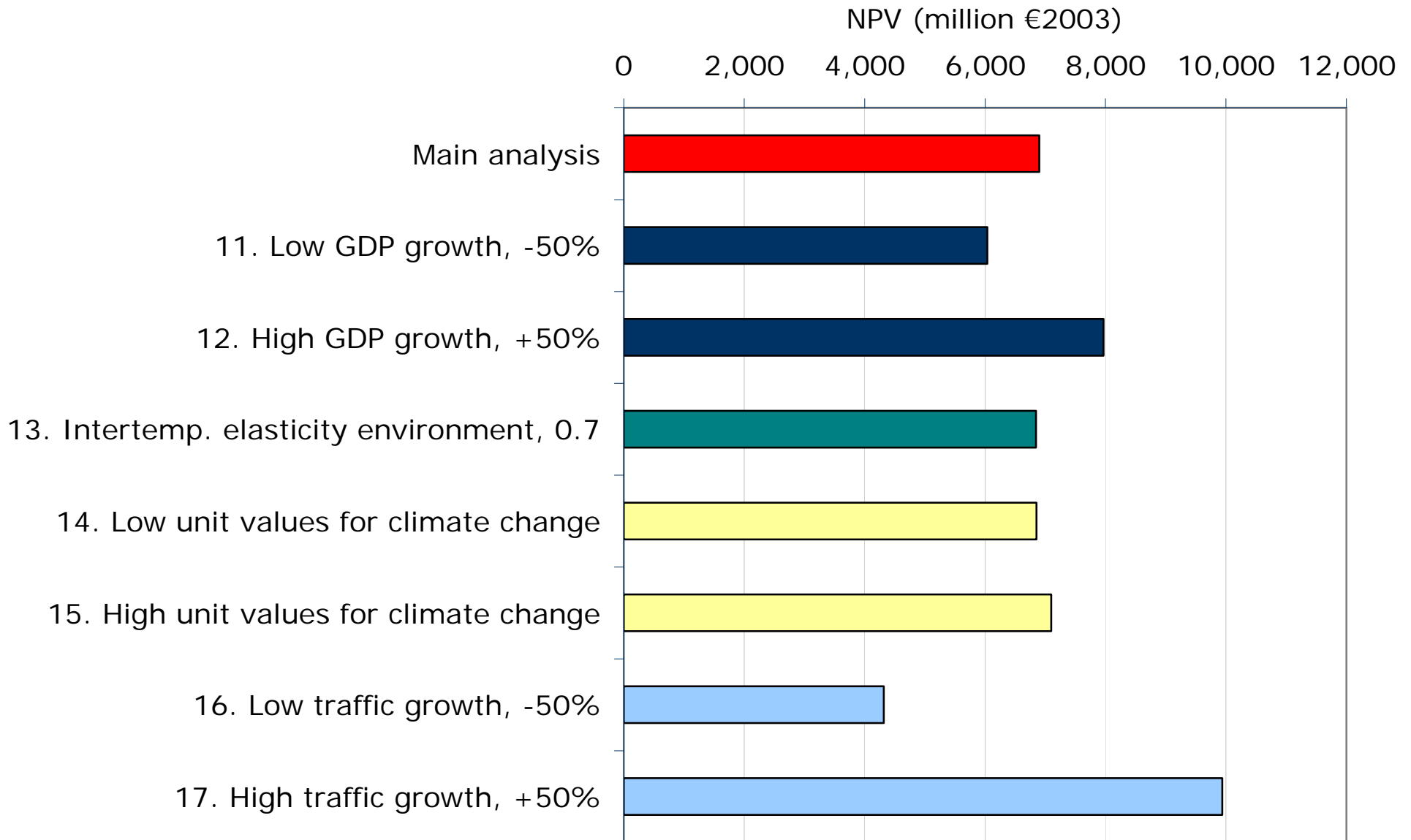


# Sensitivity tests (I)





# Sensitivity tests (II)







**The guidelines, report on current practice,  
results of the survey and other  
information is available on the HEATCO  
webpage:**

**<http://heatco.ier.uni-stuttgart.de>**