

Yverdon, 29 August 2008 | Christoph Schreyer

SATW Congress

inFRAS

EXTERNAL COSTS OF TRANSPORT

Today +
Future development

CONTENT

1. Background

2. External Costs in Switzerland

3. Trends in the future

Background

iNFRA

The concept of external costs

Background

External Costs of Transport

What's it all about?

Transport activities cause:

- Environmental impacts
- Accidents

External costs not taken account by transport users, thus

- incorrect incentives
- welfare losses

Internalisation means, making external effects part of the decision process of the transport user.

Background

Three main aims of external cost information:

Benchmarking

- Comparison of different modes of transport: The monetary language of environmental comparison

Cost Benefit Analysis

- Right prices for assessment

Pricing and Internalisation policies


- Road pricing, track pricing, slot pricing
- Cost effectiveness of environmental measures

Background

External Costs in Switzerland – Update 2005

Update external costs 2005

- Published in July 2008,
study from Ecoplan and INFRAS
- Covers the 8 categories:
 - Accidents
 - Noise
 - Air pollution (Health, Buildings,
crop losses, forest damages)
 - Climate change
 - Nature & landscape
 - Soil damages
 - Urban areas
 - Up- and downstream processes

 Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Bundesamt für Raumentwicklung ARE
Bundesamt für Umwelt BAFU

études
Externe Kosten des Verkehrs in der
Schweiz
Aktualisierung für das Jahr 2005 mit
Bandbreiten
Schlussbericht

INFRAS

Methodological pillars

Damage costs

- direct: quantifiable damage costs
- indirect: repair cost approach
- critical:
 - value of a human life?
 - future damages?

Avoidance costs

- Costs to avoid damages
- critical:
 - optimal avoidance strategy?

Optimum: Avoidance = Damage costs

External costs of transport Switzerland 2005

iNFRAS

Important cost categories

Accident costs

Input data

- Road: 415 casualties, 7'700 serious injuries
- Rail: 2 (staff), 18 serious injuries

Cost elements considered:

- medical costs
- net production losses + replacement costs
- immaterial costs (VOSL)
- administrative costs + material damages

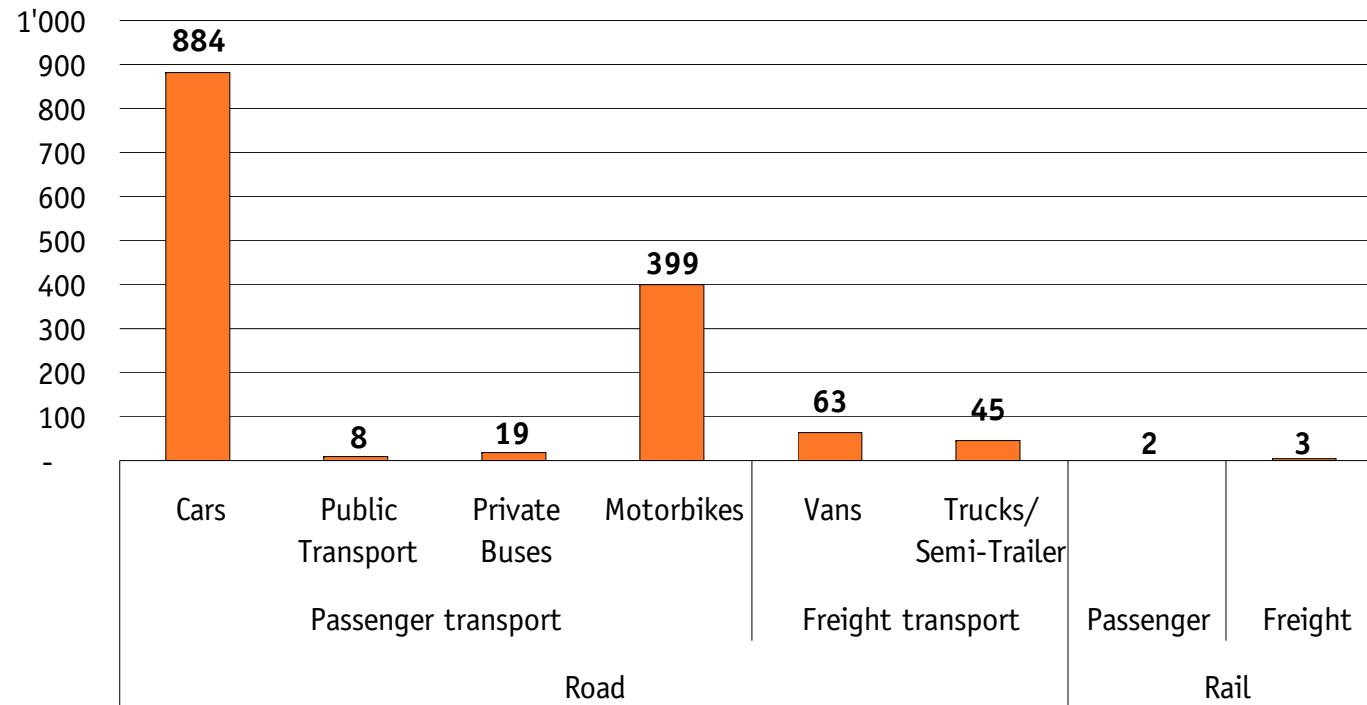


Accident costs



Results

Mio. CHF



Total accident costs: 1.4 billion CHF

Noise costs



Impacts

- loss of rent, caused by noise
- noise related health impacts (heart diseases, high blood pressure, etc.)

Input data

- Noise data base SonBase (Number of affected people/flats)

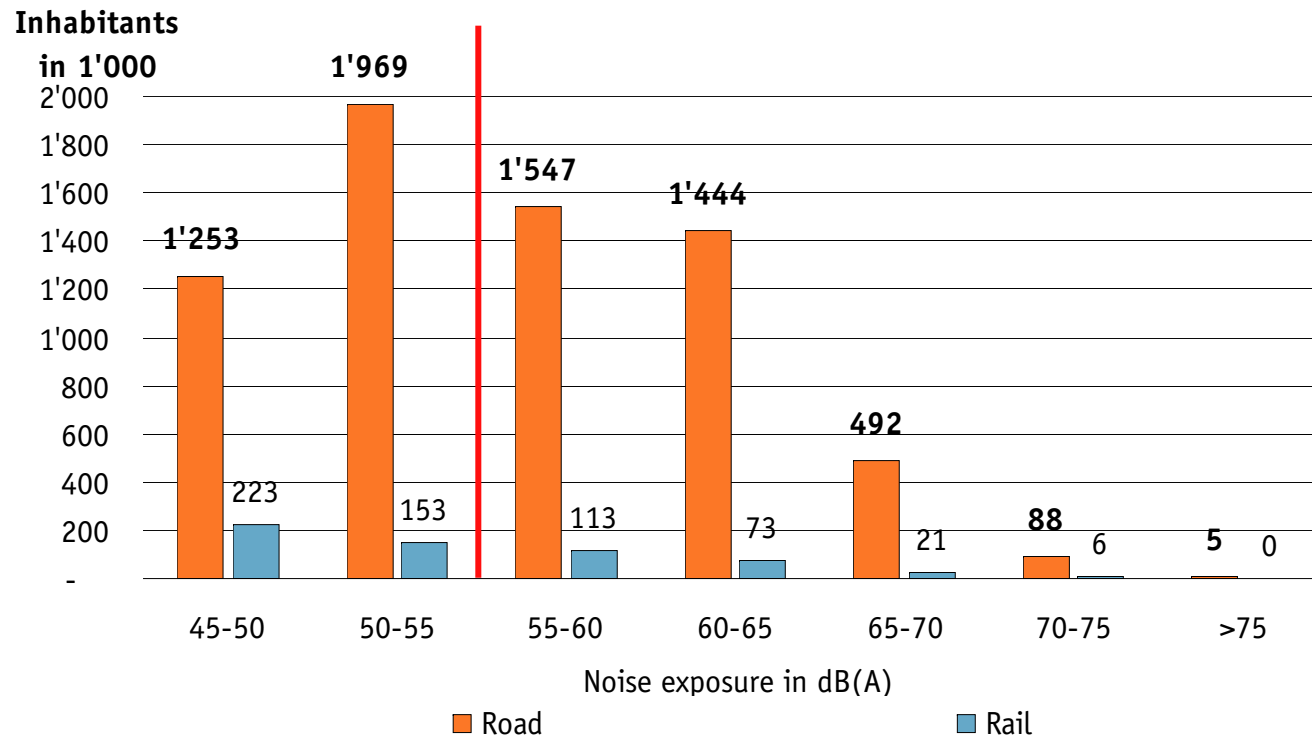
Cost elements considered:

- health costs (similar to accident costs)
- housing prices

Noise costs



Number of noise affected people:



- Exposure >55 dB(A): Road: 3.6 Mill./Rail 0.2 Mill.
- at night: Road: 350'000, Rail 100'000

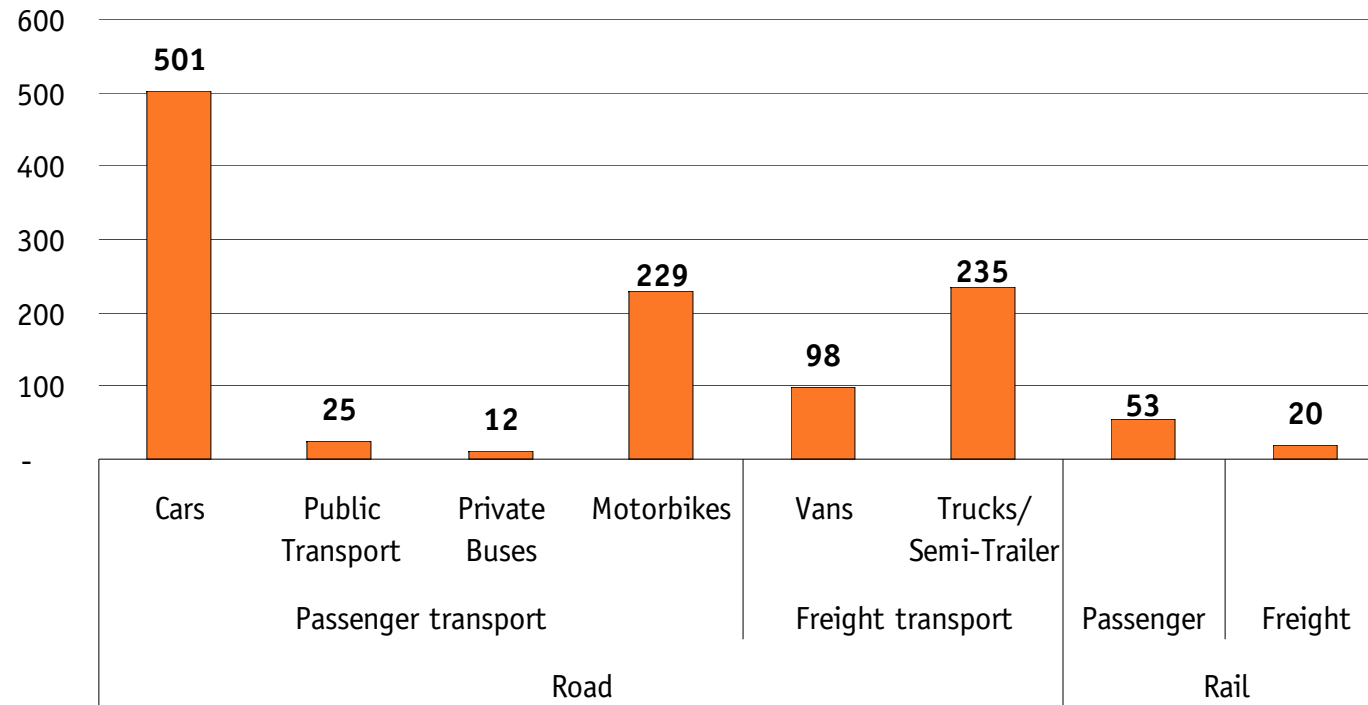
External costs of transport in Switzerland 2005

Noise costs



Results:

Mio. CHF



Total noise costs: 1.2 billion CHF

Air pollution costs



Impacts

- Air pollution related morbidity and mortality
 - > health costs
- Building damages
- Crop losses/forest damages

Input data

- Exposition to transport related PM10 (exhaust and non-exhaust emissions)

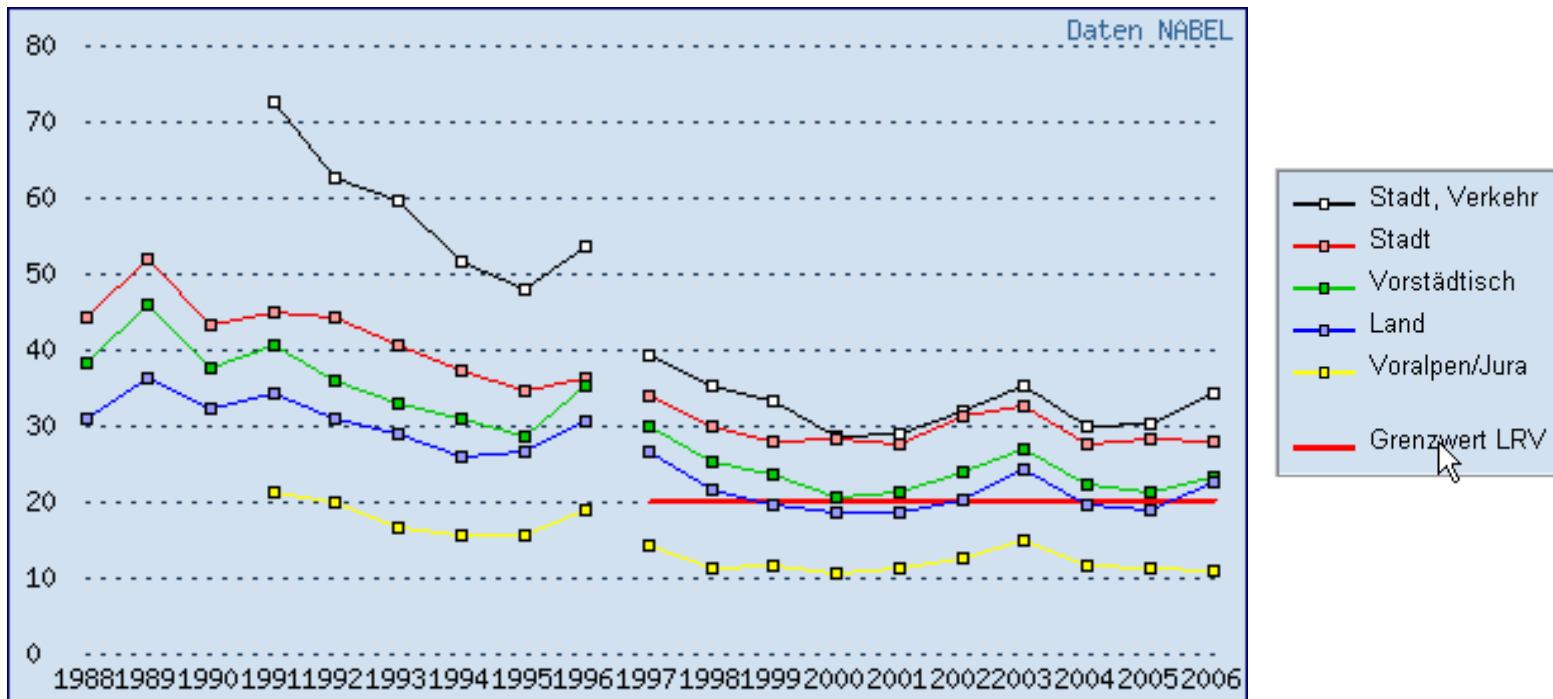
Cost elements considered:

- health costs (similar to accident costs)
- repair/restoration costs (building damages)

Air pollution costs



PM10 Exposure – Development 1988 - 2006

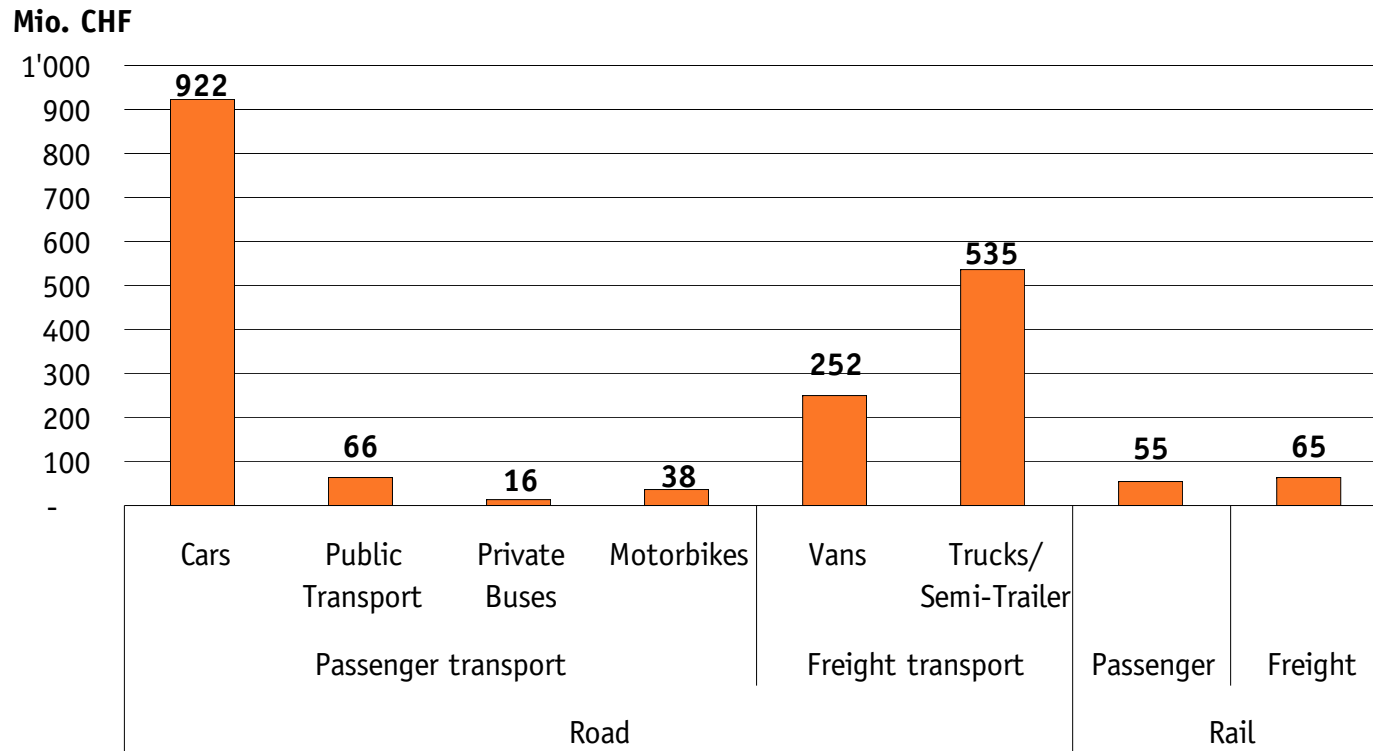


External costs of transport in Switzerland 2005

Air pollution costs



Results:



Total air pollution costs: 2 billion CHF

Climate change costs



Impacts

- Global temperature rise leads to...
 - sea level rise
 - agricultural impacts
 - water supply
 - health impacts
 - extreme weather events
 - major events (Greenland ice sheet, loss or reversal of the gulf stream, etc.)

Input data

- Transport related greenhouse gas emissions

Climate change costs



1. Damage cost approach

- detailed modelling of physical impacts
- estimate economic impacts
- critical:
 - lack of knowledge
 - vast uncertainties regarding the valuation of future damages

2. Avoidance cost approach

- least-cost approach to achieve required goals
- targets on different system levels (national, EU, world, transport sectors vs. all sectors)

Definition of a range of values

- Short-term: 40 CHF/t CO₂ Long-term: 140 CHF/t CO₂
- Central value: 90 CHF/t CO₂

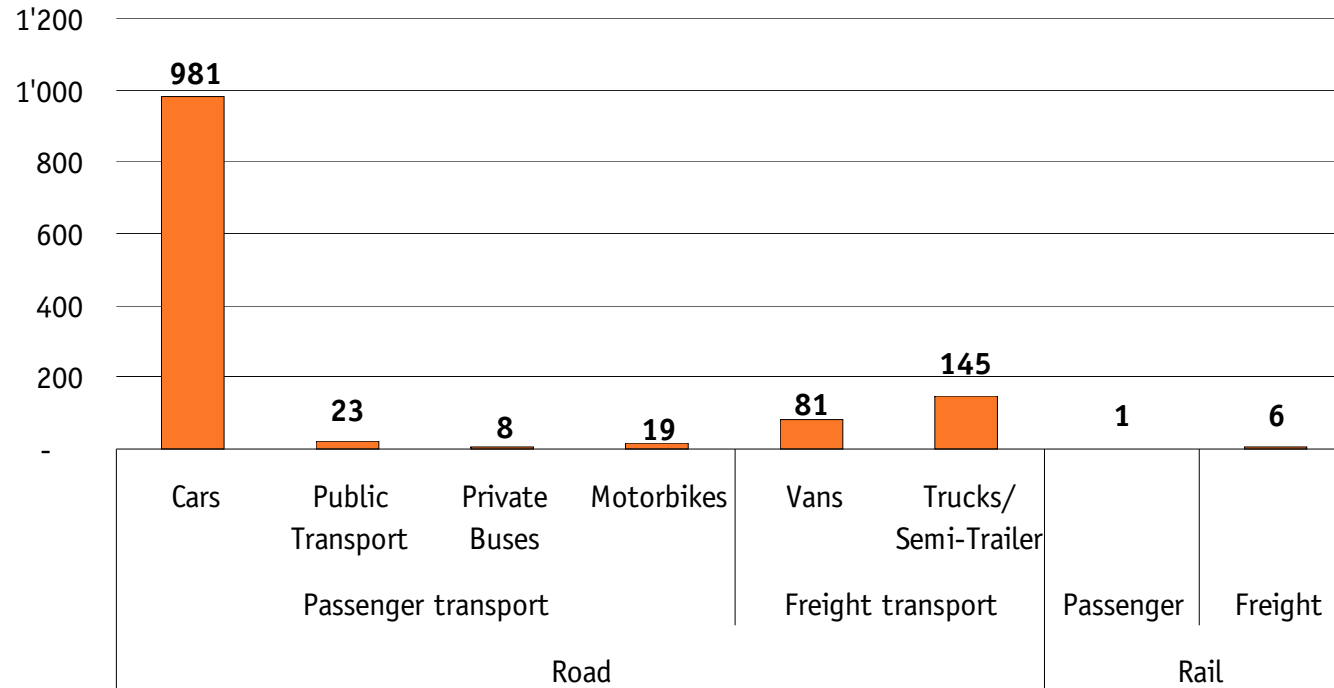
External costs of transport in Switzerland 2005

Climate Change Costs



Results:

Mio. CHF



Total climate change costs: 1.3 billion CHF

Other external costs

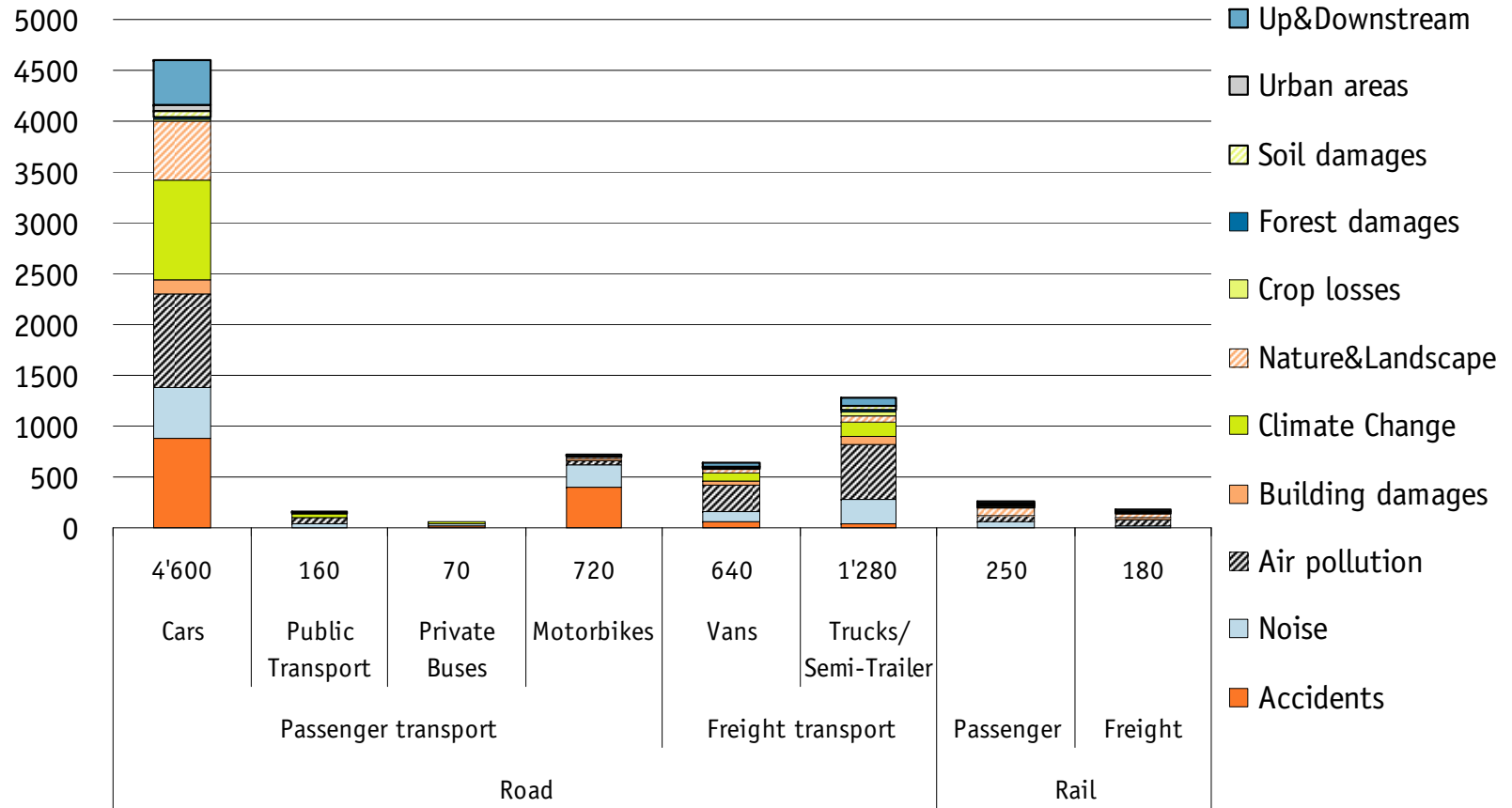
- **Nature and landscape:**
Virtual repair cost approach
- **Soil and water pollution:**
Repair cost approach
- **Up- and Downstream effects:**
Energy, vehicle + infrastructure
production (only GHG)
- **Urban effects:** Additional costs for non-
motorised transport



External costs of transport in Switzerland 2005

Total external costs

Mill. CHF



Total external costs: 7.9 billion CHF

Comparison Road-Rail: Passenger transport

Rp./pkm

30

25

20

15

10

5

0

5.5 Rp./pkm

Cars

3.3 Rp./pkm

Public Transport

26.3 Rp./pkm

Motor bikes

1.6 Rp./pkm

Passenger transport

Road

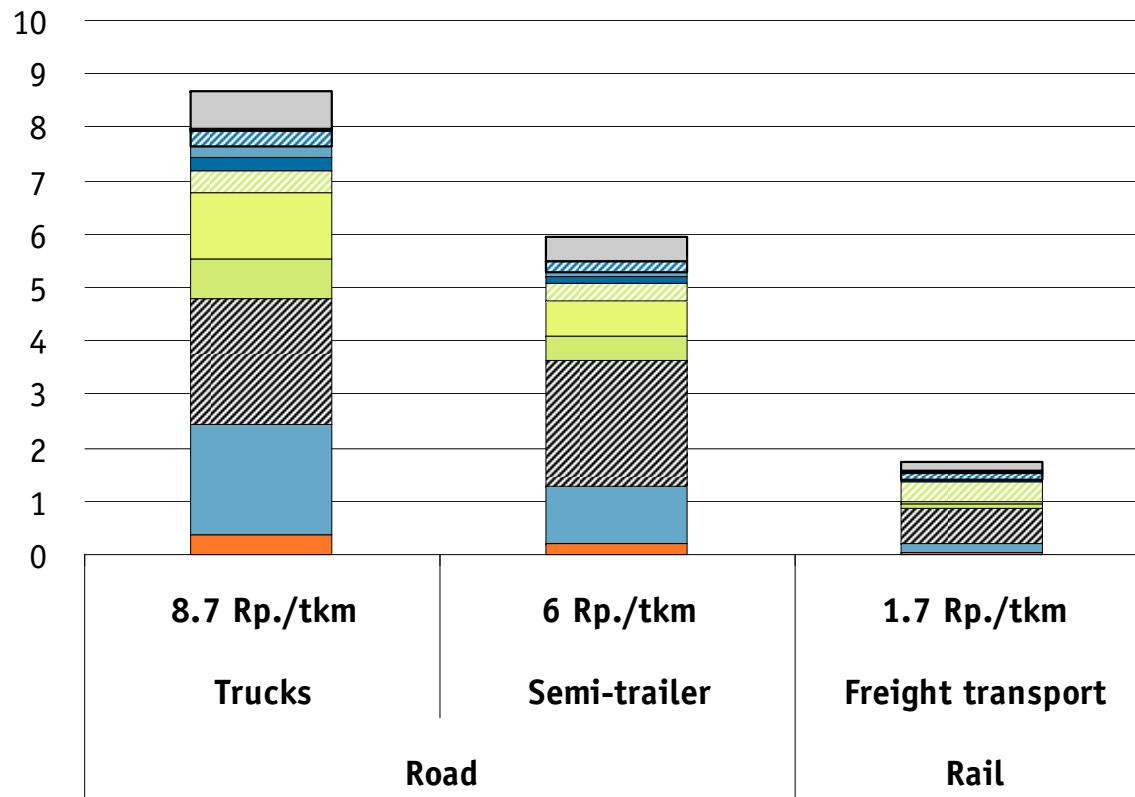
Rail

- Up&Downstream
- Urban areas
- ▨ Soil damages
- Forest damages
- Crop losses
- ▨ Nature&Landscape
- Climate Change
- Building damages
- ▨ Air pollution
- Noise
- Accidents

Ratio Road/Rail: Cars: 3.5, PT: 2, Motorbikes: 17

Comparison Road-Rail: Freight transport

Rp./tkm



- Up&Downstream
- Urban areas
- ▨ Soil damages
- Forest damages
- Crop losses
- ▨ Nature&Landscape
- Climate Change
- Building damages
- ▨ Air pollution
- Noise
- Accidents

Ratio Road/Rail: Trucks: 5, Semi-trailer: 3.5

Future Development of external costs

iNFRA

Main cost drivers

Development of external costs

Main cost drivers:

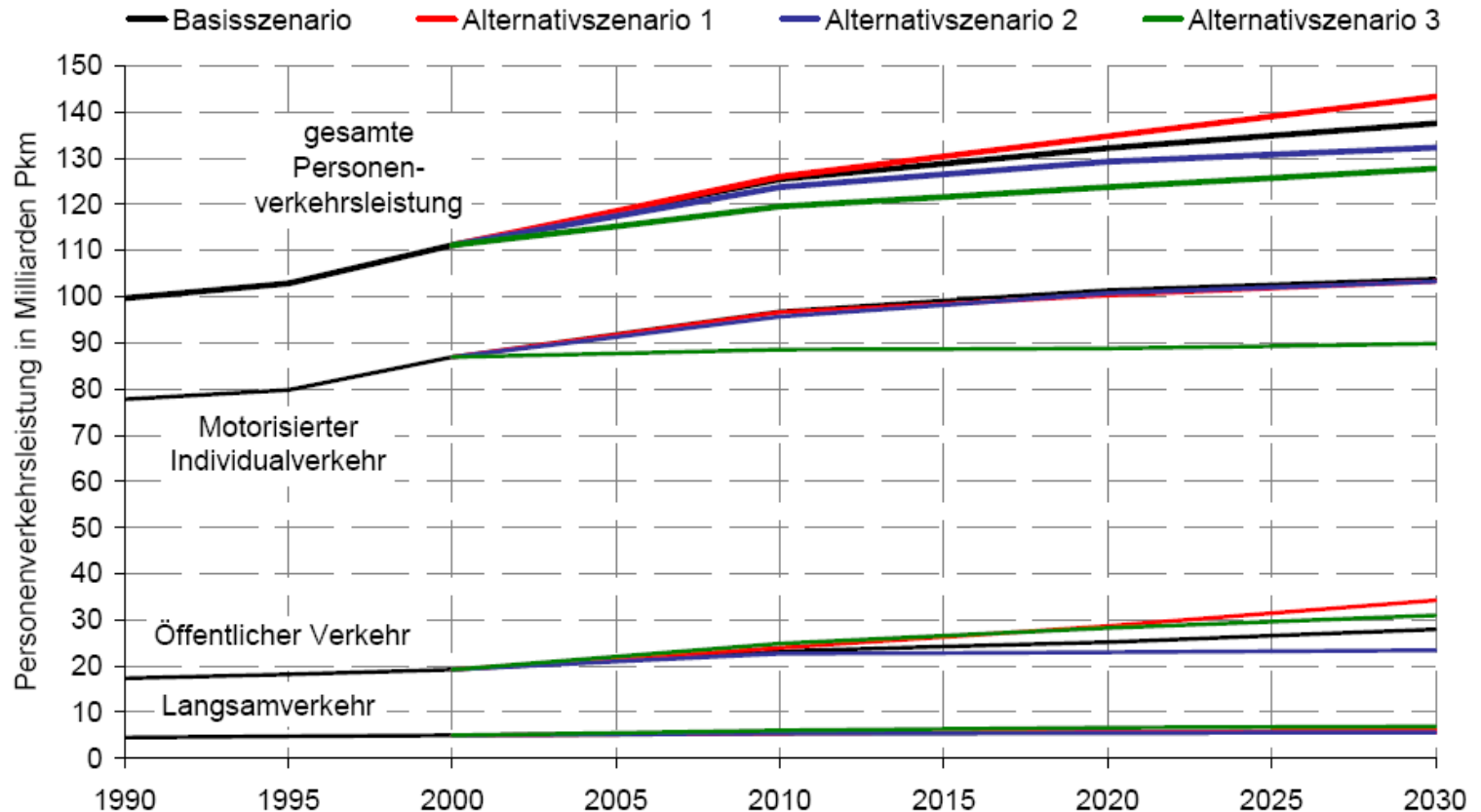
- Transport demand passenger and freight transport
- Road and rail safety development
- Emission factors
- Population: number, settlement, life expectancy
- Income, GDP
- Transport policy (Infrastructure, modal split)

Development of important cost indicators:

- CO₂ avoidance costs
- Price development (medical costs, net production, general inflation)

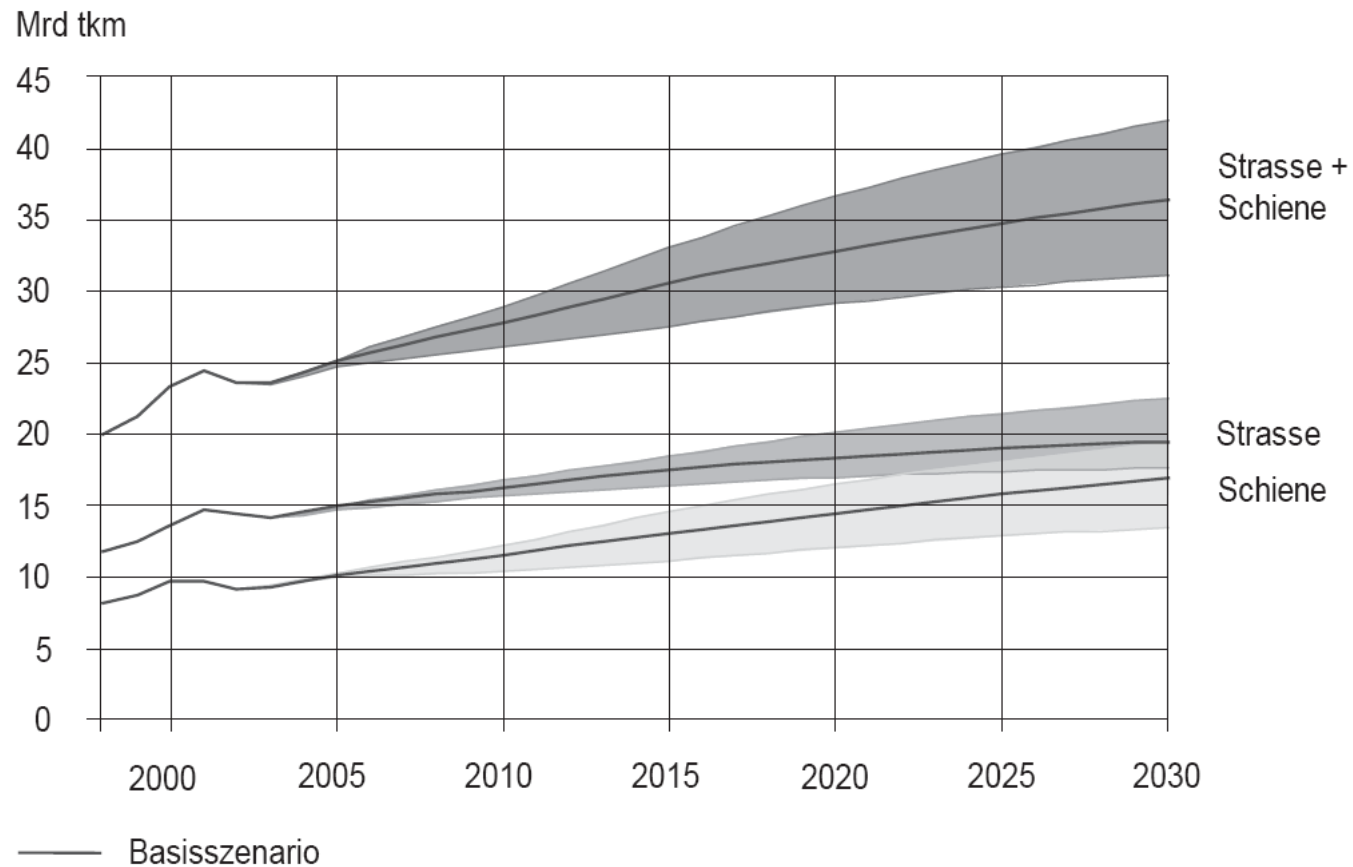
Transport demand: Passenger transport

2000-2030: Increase between 15% and 29%



Transport demand: Freight transport

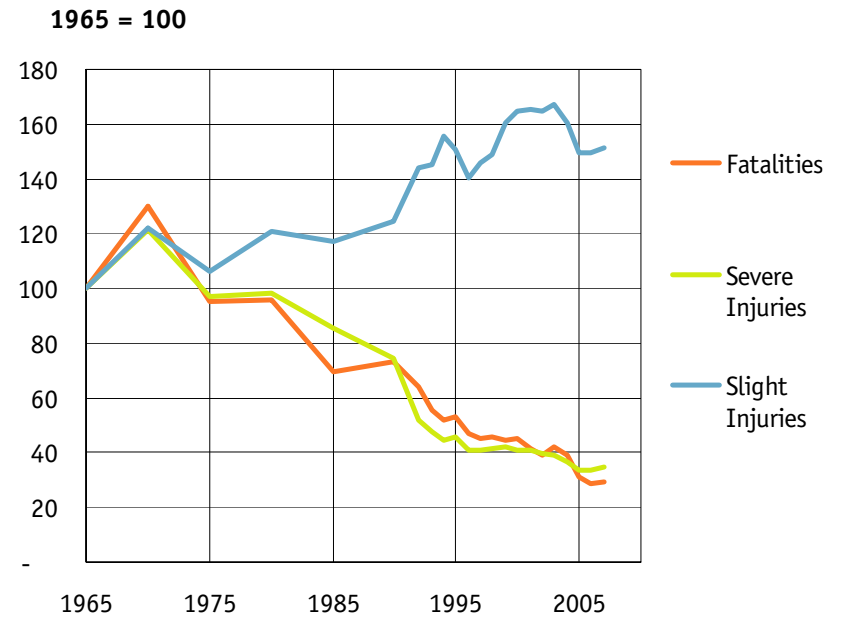
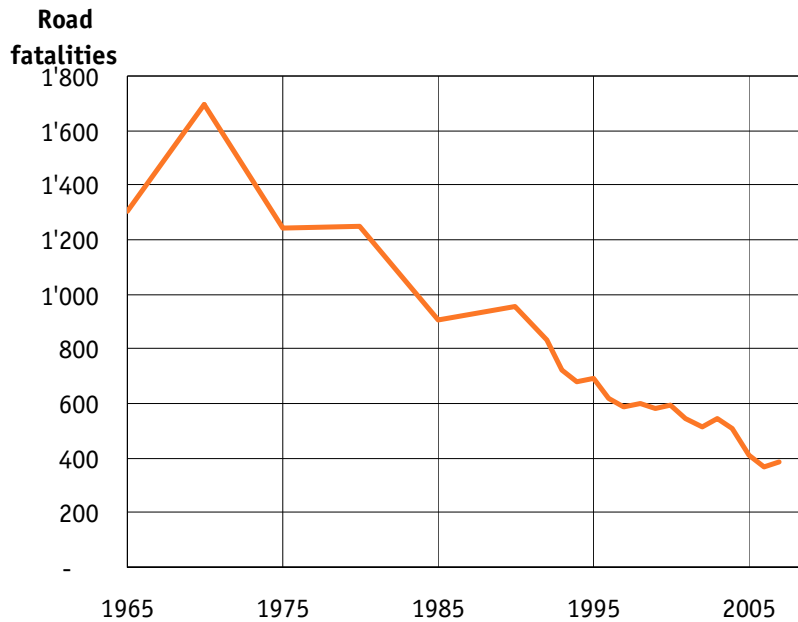
2000-2030: between +32% and +78% (Baseline: +54%)



Accidents: Decreasing number of casualties

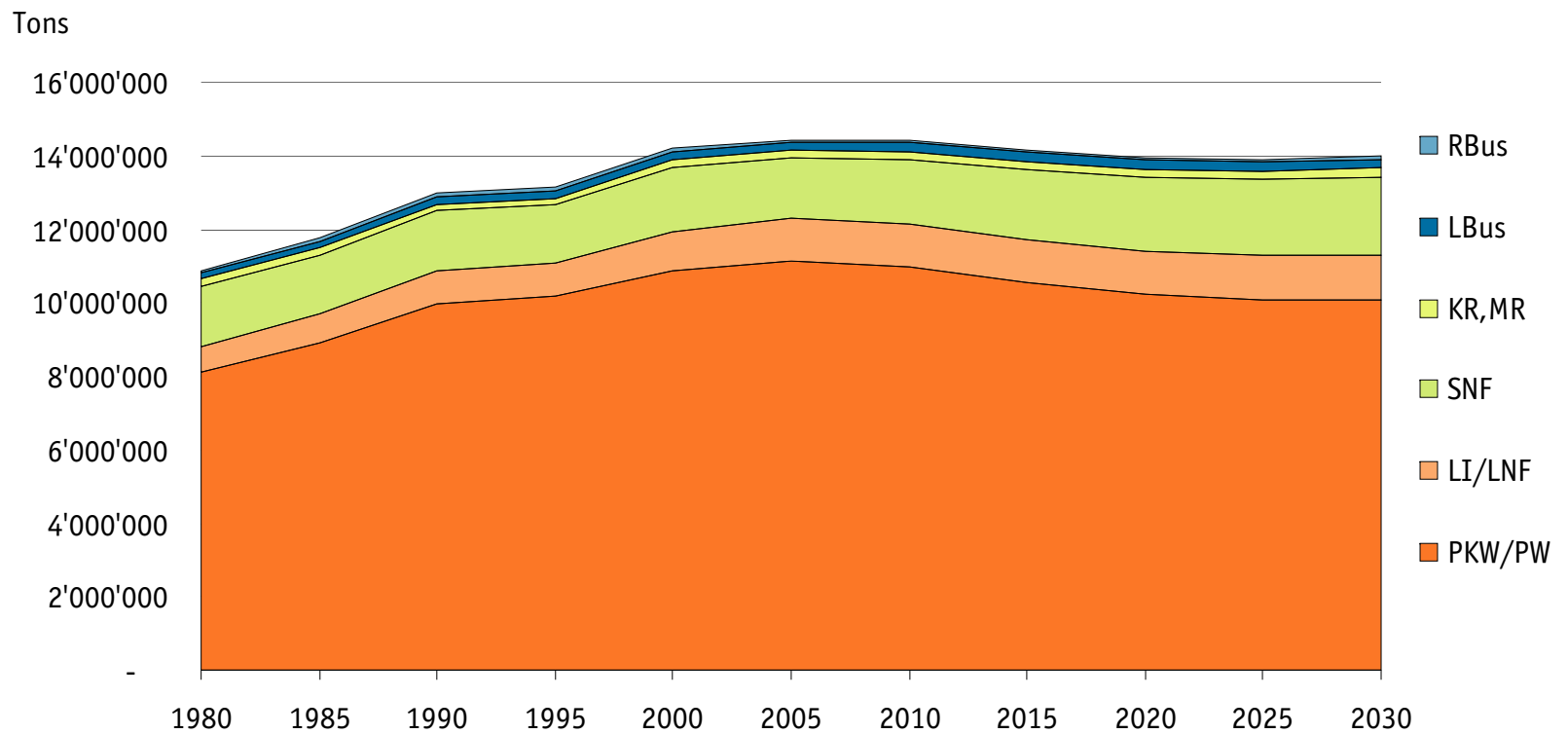
1965-2007: Fatalities -71%, Severe Injuries -65%

2007-2030: ?



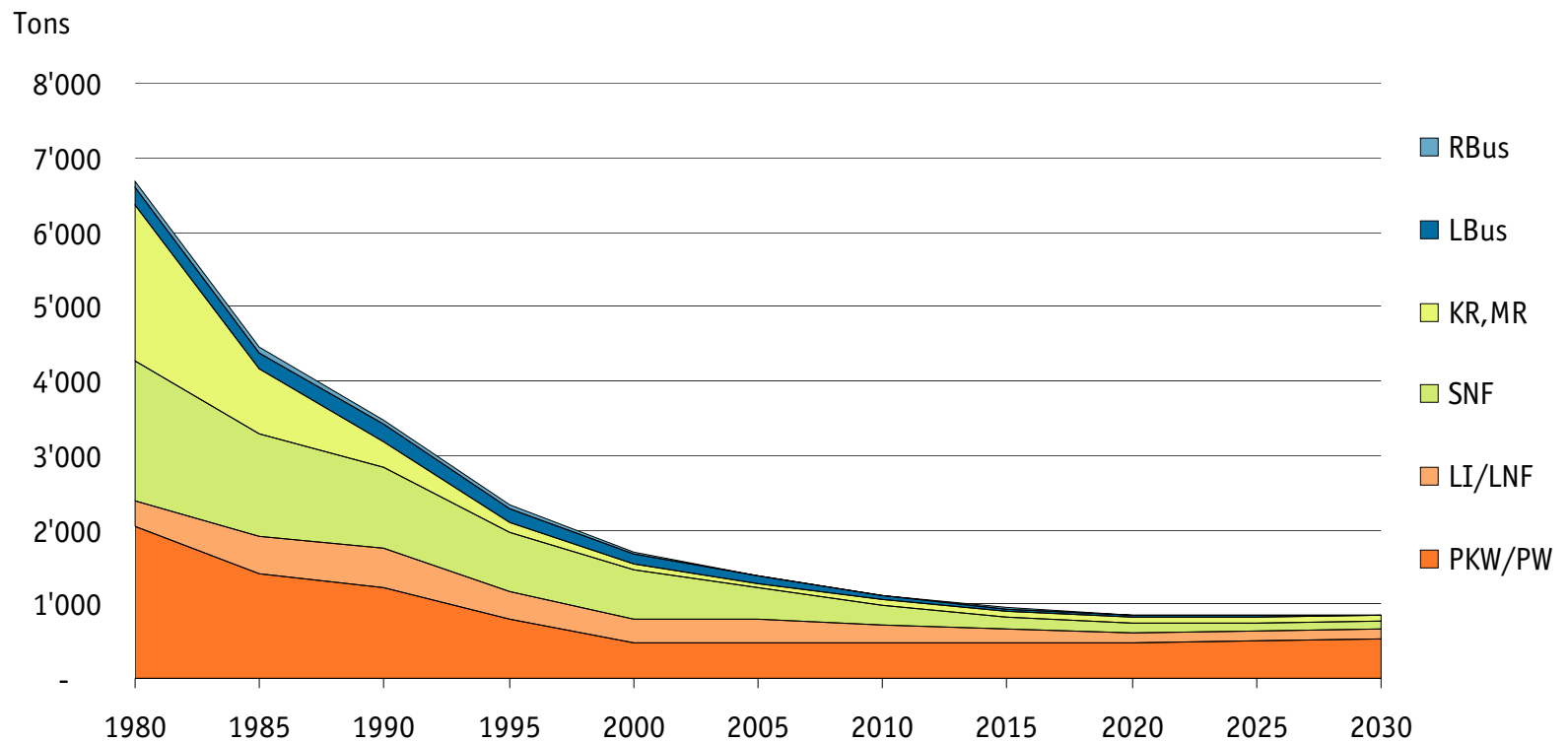
Emissions: CO2

Stabilisation of GHG emissions



Emissions: Particles

Reduction 2005-2030 of exhaust particle emissions by 38%



Future Development of External Costs

Cost category	Development 2005-2030	Explanation
Accident costs	⇒	›Decreasing number of casualties ›Higher life expectancy
Air pollution costs	⇒/↘	›Emissions decrease ›Higher life expectancy
Noise cost	⇒/↘	›Decreasing noise emissions ›Higher life expectancy
Climate Change	⇒/↗	›Stable GHG emissions ›Higher damage and avoidance costs
Overall	⇒	›Income increase offsets partly possible reduction

Applications of external cost information

Pricing and Internalisation policies

- EU level: Revision of the Eurovignette considers explicitly Air Pollution and Noise costs
- CH: LSVA (heavy vehicle fee) is also based on external cost information

Cost Benefit Analysis

- Revision of the VSS Norm 641 828: Cost-Benefit analysis for road transport

Thank you!

For further information:

www.infras.ch

<http://www.are.admin.ch/themen/verkehr>

Emissions: NOx

Reduction of NOx-emissions by 48%

