



Environmentally Sustainable Transport - EST -

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Lessons learned

Guidelines for moving towards EST

presented by

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The views expressed in this presentation are those of the author
and not necessarily those of the institution he works for.

Global Trends and Projections

- first global outlook 1995 -



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Indicator	OECD	OECD	Non-OECD
	1980 - 1995	1995 - 2010	1995 - 2010
Population	+13%	+ 8%	+ 24%
GDP	+44%	+ 35%	+123%
Vehicle Stock	+50%	+ 33%	+ 76%
VKT	+65%	+ 42%	+ 70%
Road Fuel	+37%	+ 21%	+ 55%
Aviation	+70%	+100%	+200%

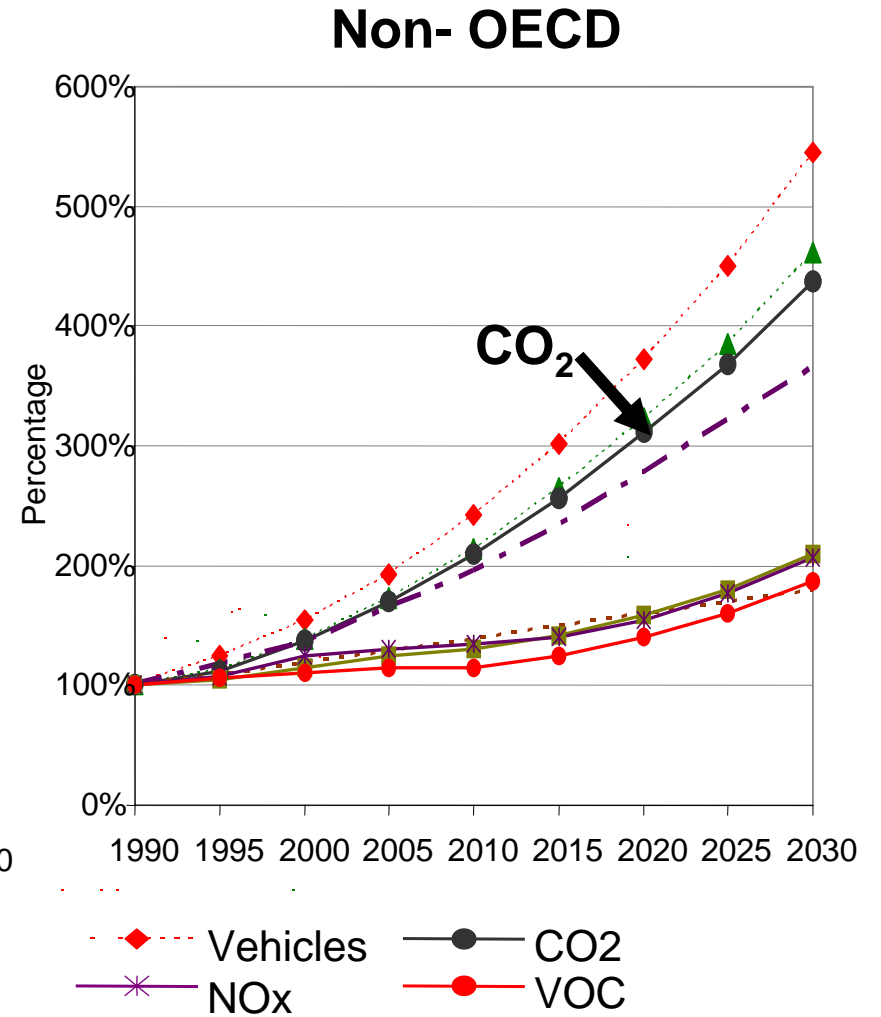
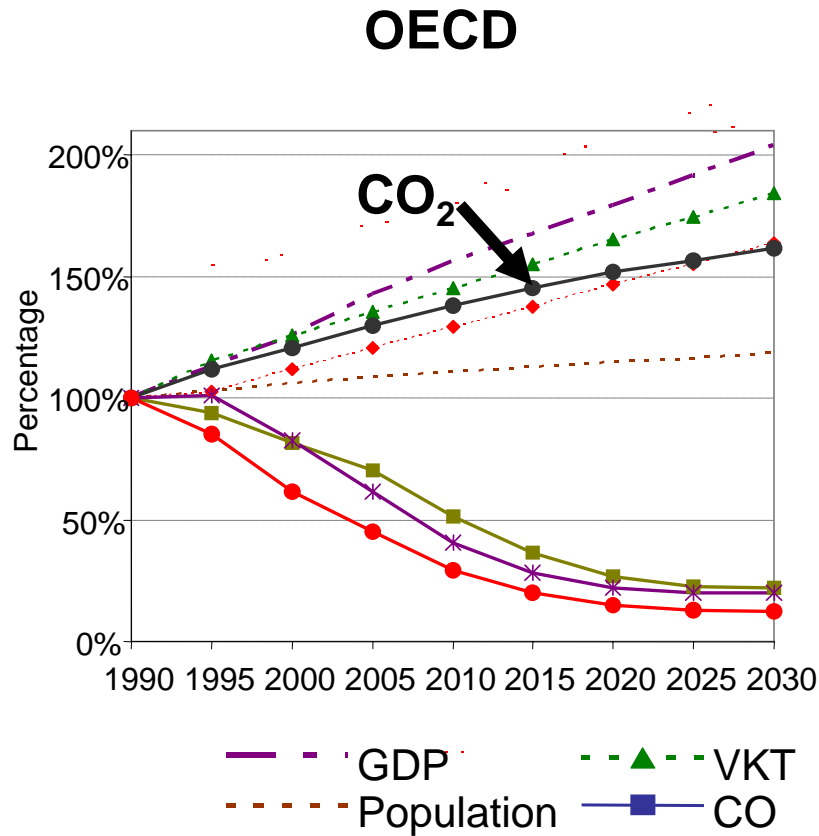
Source: OECD Environmental outlook, 2001; ICAO, 1996

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Trends and Projections of Motor Vehicle Pollution and Economic Indicators 1990 - 2030



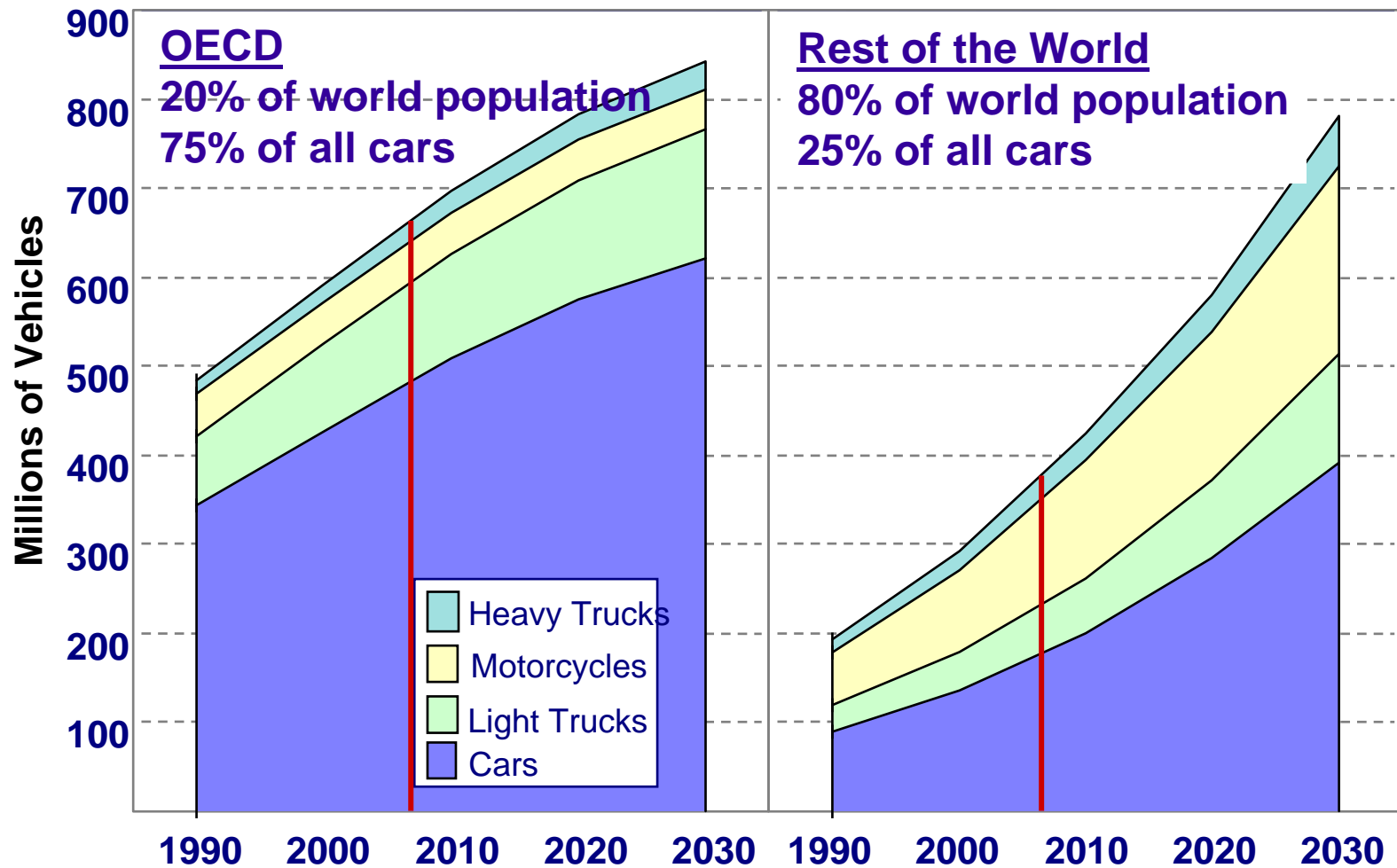
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Motor Vehicle Stock

- trends and projections 1990 - 2030



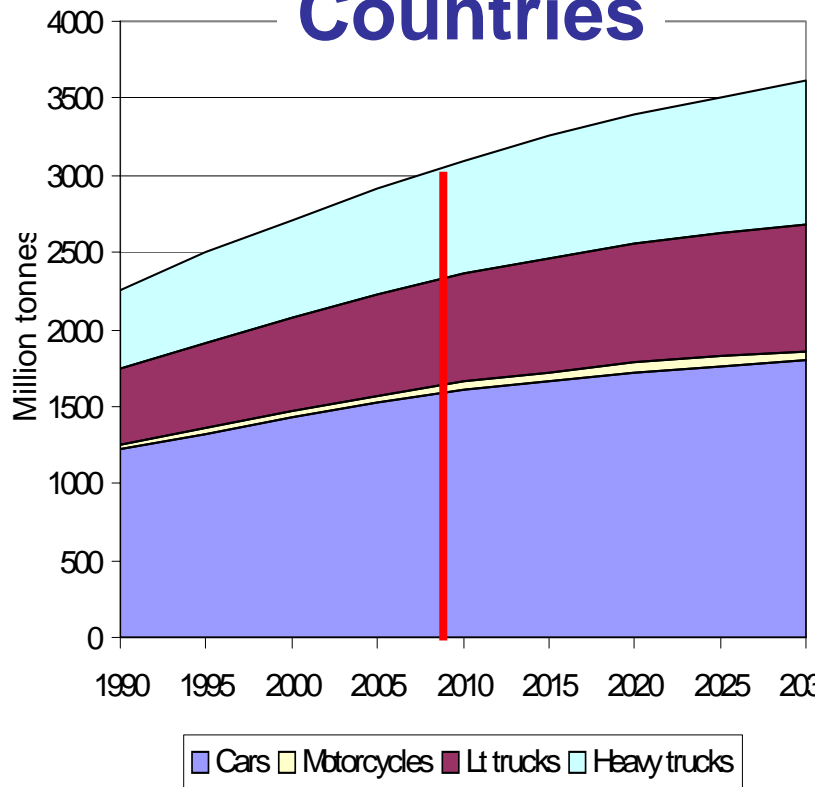
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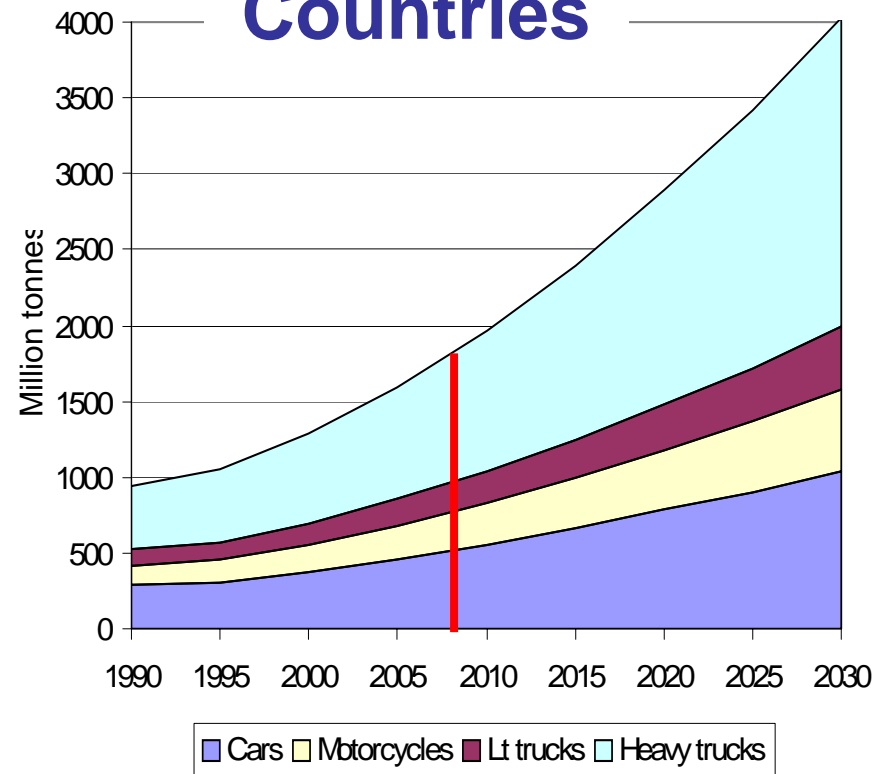
Global CO₂ Emissions by Motor Vehicles

Projections 1990-2030

OECD Countries



Non-OECD Countries

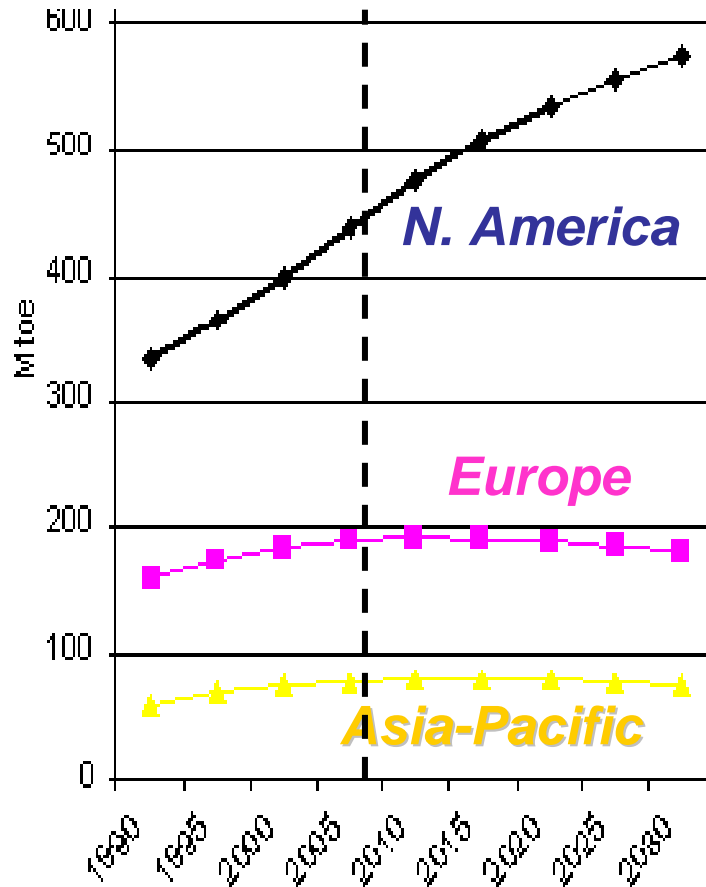


Motor Vehicle Fuel Use – Current and projected trends up to 2030

OECD

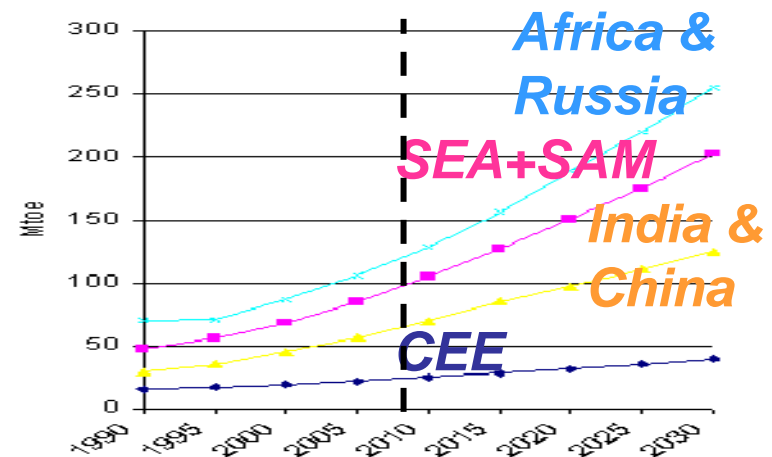
Petrol Use

2005 to 2030: +40%



Non-OECD

2005 to 2030: +200%

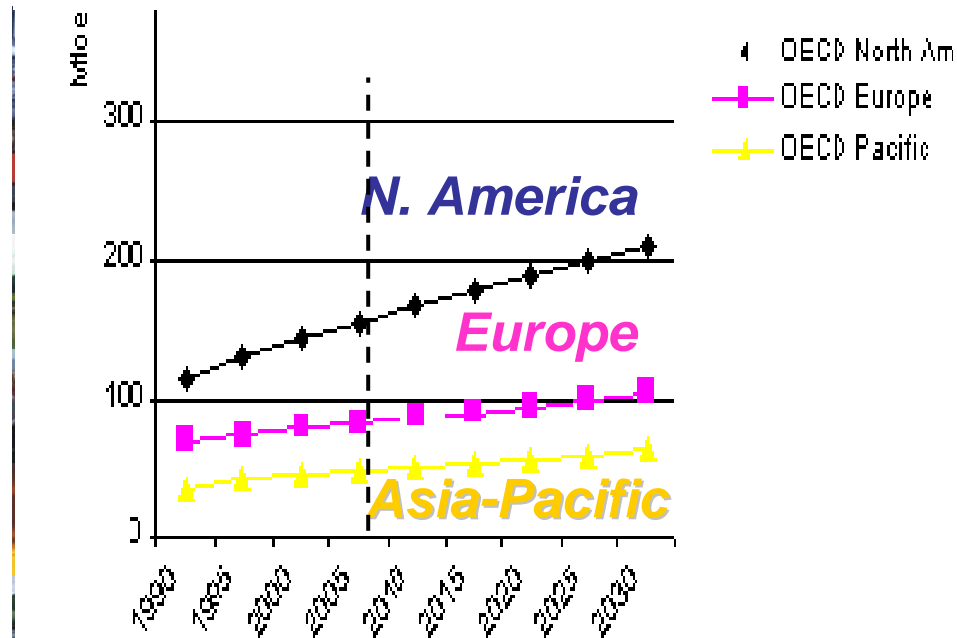


Motor Vehicle Fuel Use – Current and projected trends up to 2030

Diesel Use

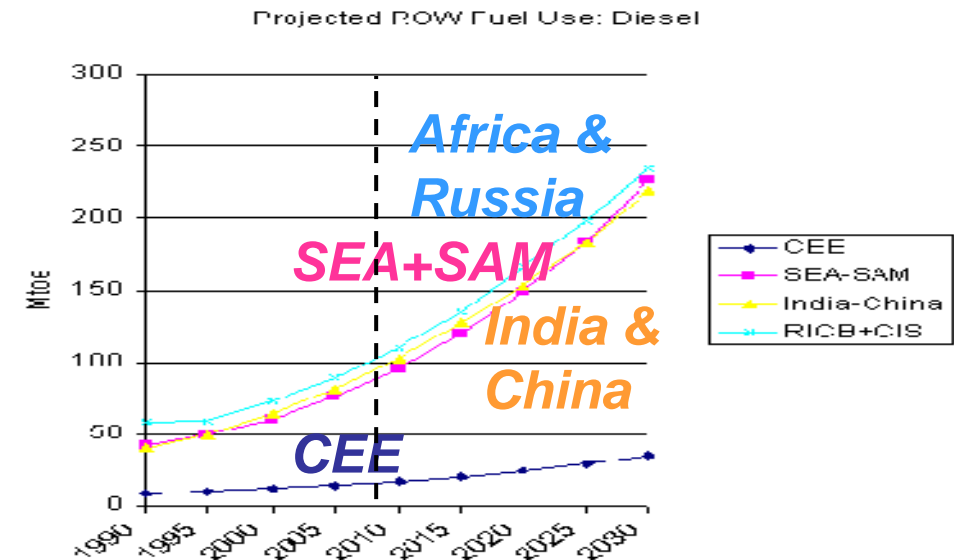
OECD

2005 to 2030: +37%



Non-OECD

2005 to 2030: +180%

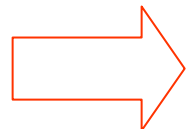


Long-term Environmental Impacts



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	OECD	Non-OECD	Sources
<u>urban:</u> - noise - NO ₂ , PM _{2.5}	+ -	↗↗ ↗↗	HGV, airplanes HGV / trucks
<u>regional:</u> - O ₃ , acidific. - water / sea	↘ ↗	↗↗ ↗↗	Cars, trucks Ships
<u>global:</u> - CO ₂ , CFCs - POP, waste	↗↗ ↗↗↗	↗↗↗ ↗↗↗	Cars, trucks, airplanes cars, airplanes



Global trends are unsustainable !

General conclusions

CO₂ emissions from motor vehicles

- ❖ *Motor vehicle emissions trends are unsustainable - mainly due to projected high growth and significant increase of CO₂ and other greenhouse gas emissions*
- ❖ *Growth of diesel fuel demand faster than for gasoline raising concerns about climate effects also due to black carbon (PM) responsible of 50% of CO₂ contribution to global warming.*
- ❖ *Alternative fuels (CNG, biofuels, synthetic fuels) could replace some oil (20% of market share in 2020 in the EU) reducing 10% or more of transport CO₂ emissions –
.....just started, but high potential for CO₂ reductions.*

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Conclusions for Developing Economies

- Pollution from motor vehicles -

- *All emission trends raise concerns due to the current and projected high growth of transport. There is an urgent need for introducing tighter controls in these countries.*
- *While rapidly developing economies in Asia, like China and India and in South America implement regulations to curb emissions, they also need to address fuel use and CO2 emissions.*
- *Efforts and support for modal shifts towards more environmentally friendly modes by improving rail and public transport services at all levels.*
- *Fast introduction of clean technologies for vehicles and fuels for all modes through economic and fiscal incentives and investments.*
- *Concerns about countries with no controls and use of low-level technology: the CIS and Africa*

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Transport growth meets demand!



Sustainable Transportation

- Future challenges and choices -

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Sustainable Development

- the 3 corner stones -

Development that meet the needs of the present without compromising the ability of future generations to meet their own needs!

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well-being

Social

Economy

Environment

Environmental Sustainability Principles

- ◆ **Regeneration**: rate of use of **renewable resources** below rate of their regeneration
- ◆ **Substitutability**: rate of use of **non-renewable resources** below rate of their replacement by renewable resources
- ◆ **Assimilation**: releases to the environment should not exceed **critical thresholds** or **critical limits**
- ◆ **Avoiding irreversibility**: avoidance of **irreversible effects**

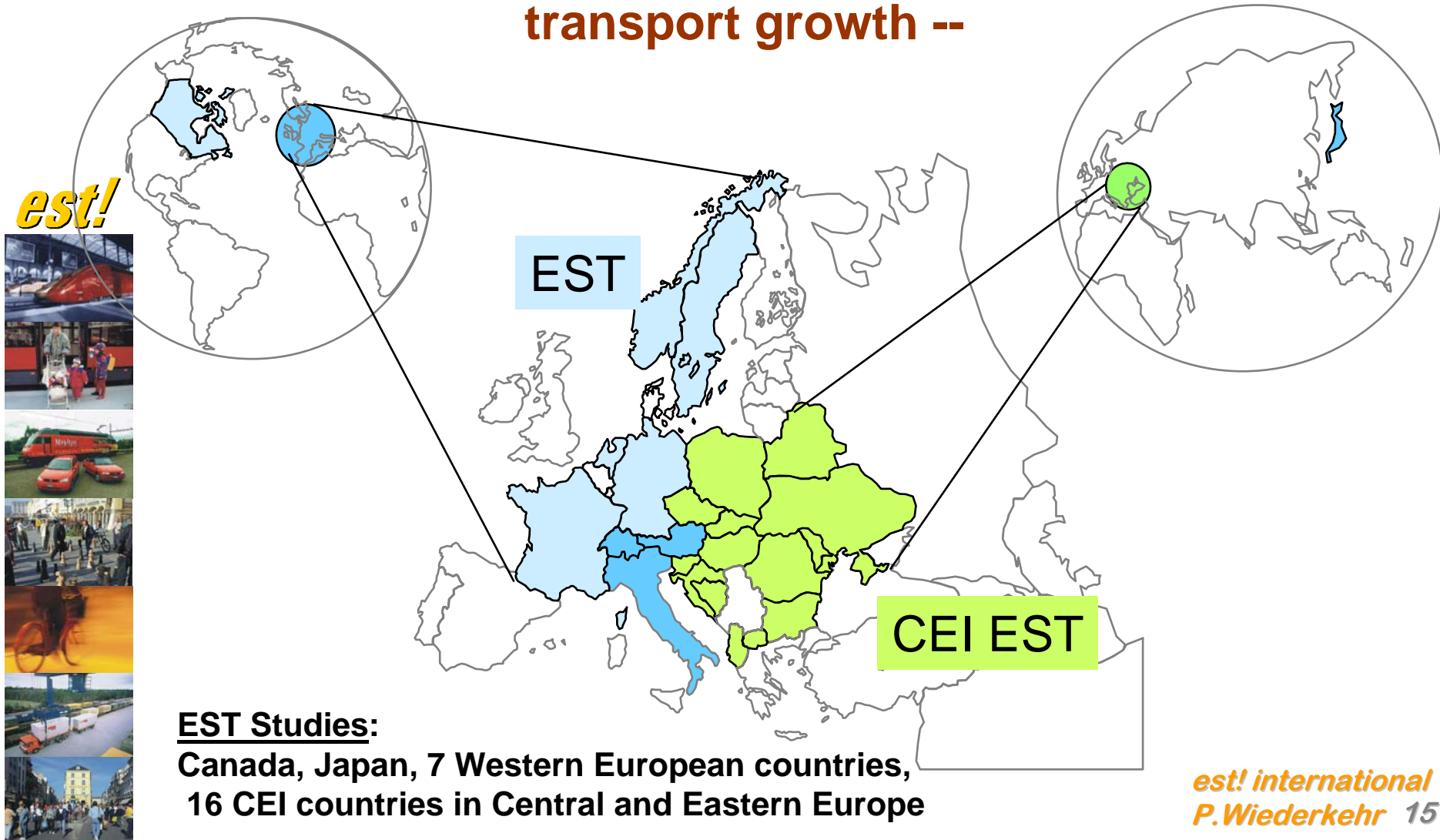
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Countries participating in the EST project

1995 – 2001

-- Sustainable development vs.
transport growth --



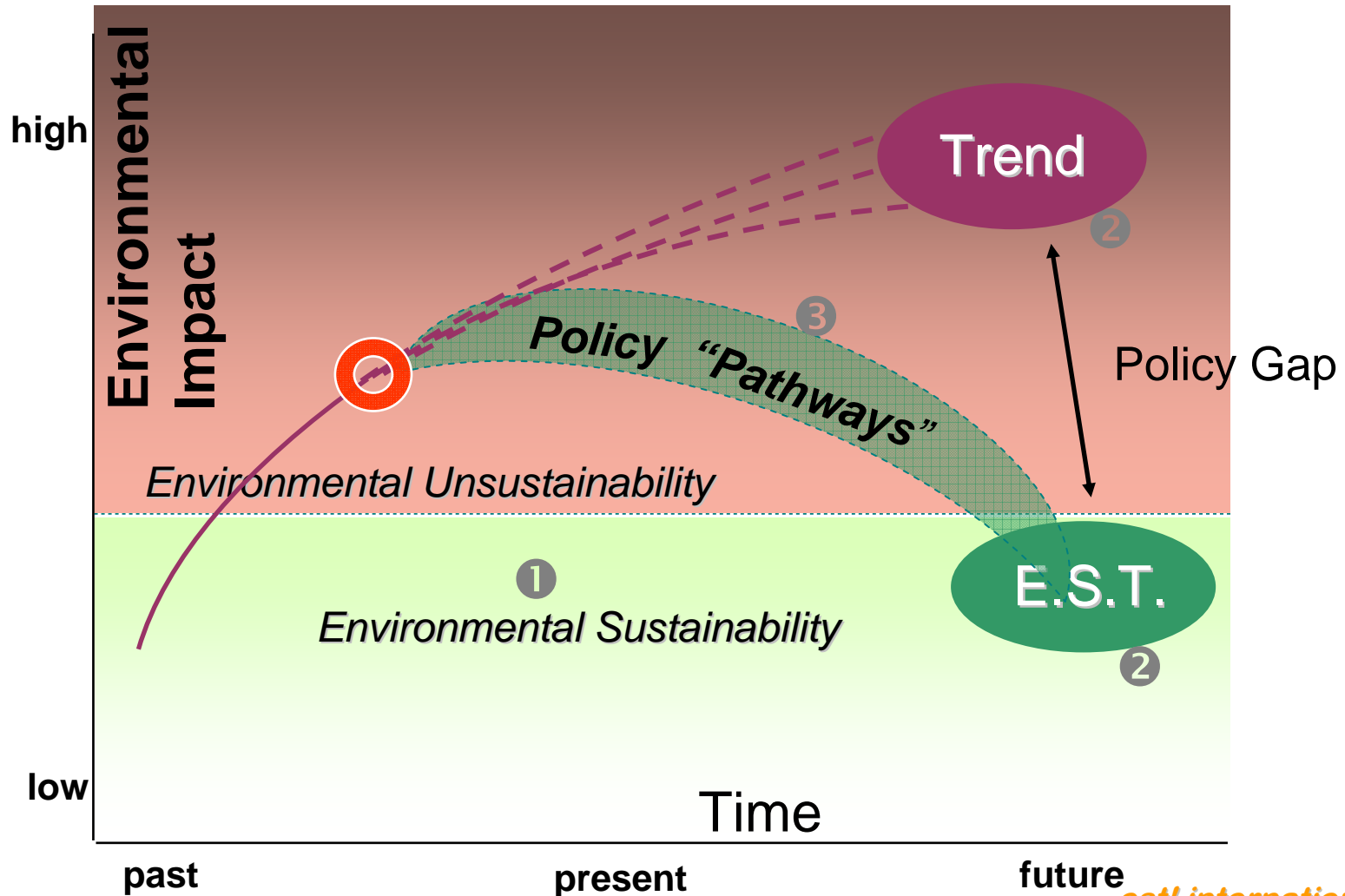
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EST Studies:

Canada, Japan, 7 Western European countries,
16 CEI countries in Central and Eastern Europe

The EST Concept and Approach

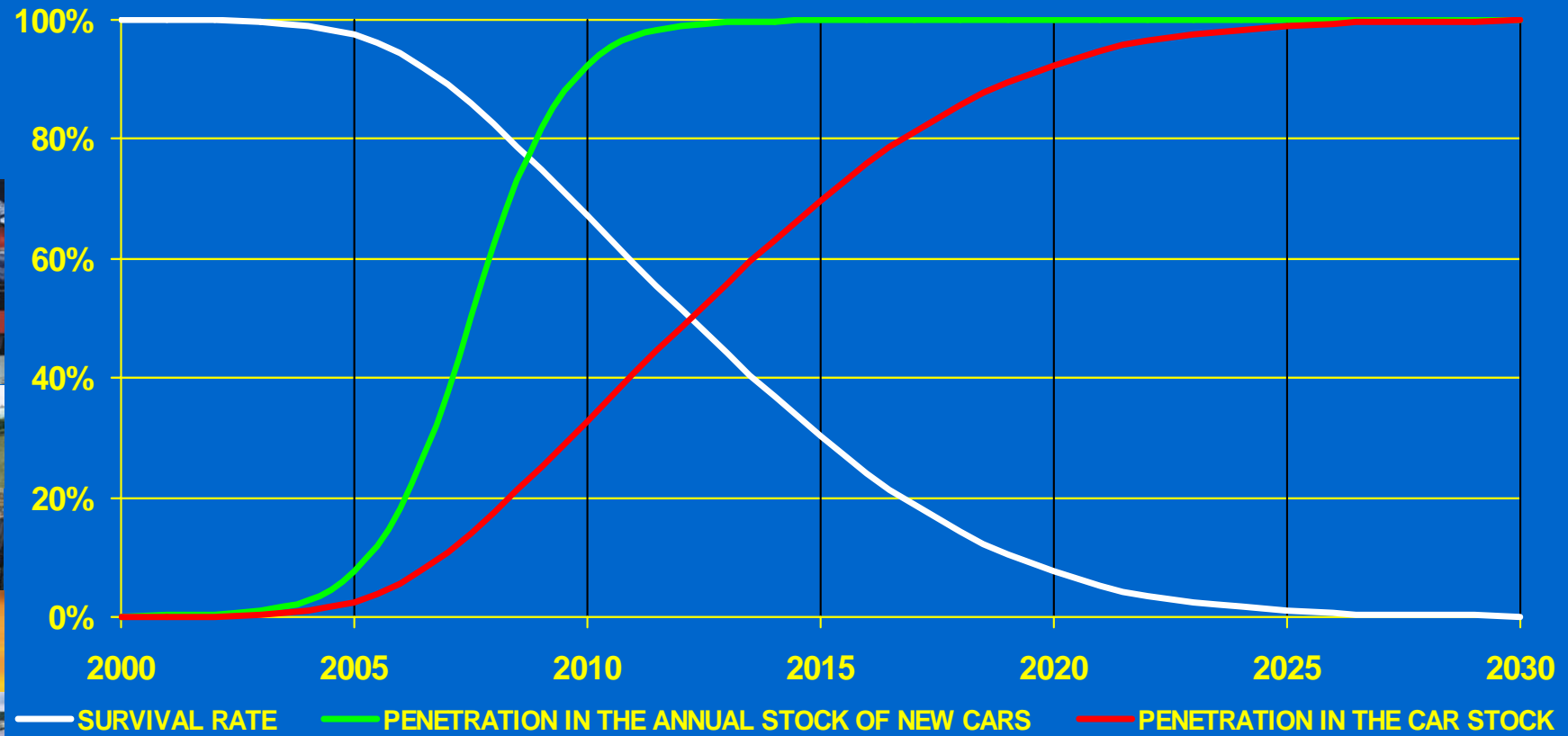
- The role for proactive policy



Penetration of New Vehicle Technology

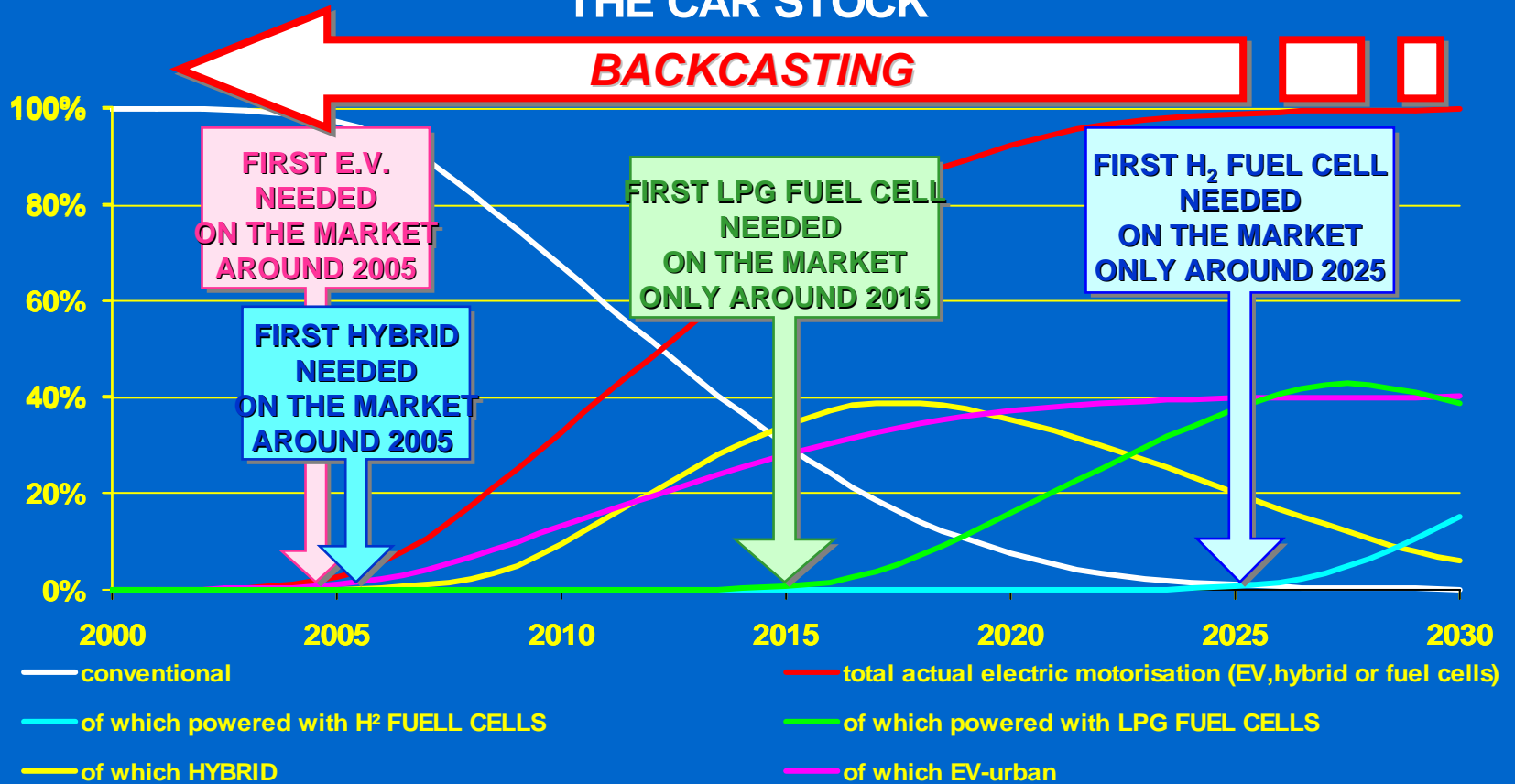
NEW CARS SOLD AND TOTAL CAR STOCK (NORMAL RHYTHM)

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Backcasting for Introducing Technology

RELATIVE SHARES OF THE NEW TECHNOLOGIES IN THE CAR STOCK



Source: A. Morechoine,
ADEME, EST 1999.

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EST Technology Innovation by 2030: *zero emission for “passenger cars“*

Biofuel for conventional/ hybrid fuel/electric vehicles

<i>Market share</i>	<i>2015</i>	<i>2020</i>	<i>2030</i>
Hybrid veh.	15%	25%	20%
Electric veh.	5%	15%	30%
Biofuel ICE	10%	20%	30%
(High F.E. ICE	70%	40%	20%)

<i>Emissions:</i>	<i>NOx</i>	<i>PM</i>	<i>CO₂</i>
Hybrid	- 50%	- 80%	- 50%
Biofuel	- 6%	- 25%	- 90%
CNG/diesel	- 75%	- 95%	- 20%

Natural gas and hydrogen fuel cell passenger vehicles

<i>Market share</i>	<i>2015</i>	<i>2020</i>	<i>2030</i>
CNG FC:	start	15%	20%
LH ₂ FC:	---	start	5%

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EU Alternative Fuels Targets on Market Share

3 options with a potential of more than 5% fuel consumption

Development scenario to attain 20% market share by 2020

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	Biofuel	Natural Gas	Hydrogen	Total
2005	2	-	-	2
2010	5.75	2	-	8
2015	(7)	5	2	14
2020	(8)	10	5	(23)
GHG	-75% - 95%	-15%	-<100%	

Source: EC, 2004

➔ Saving of 10% of EU transport CO₂ emissions

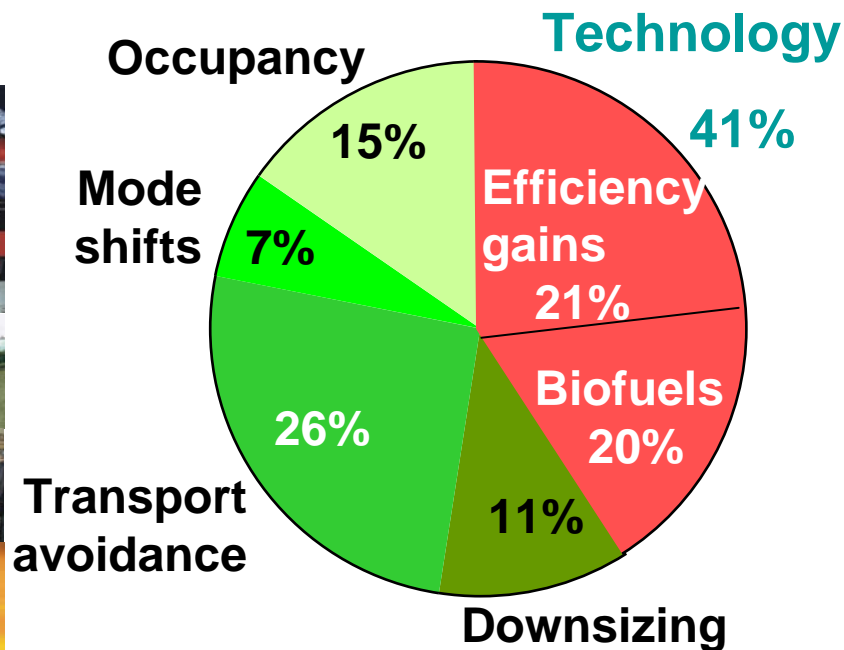
Strategies to achieve EST

Passenger Transport

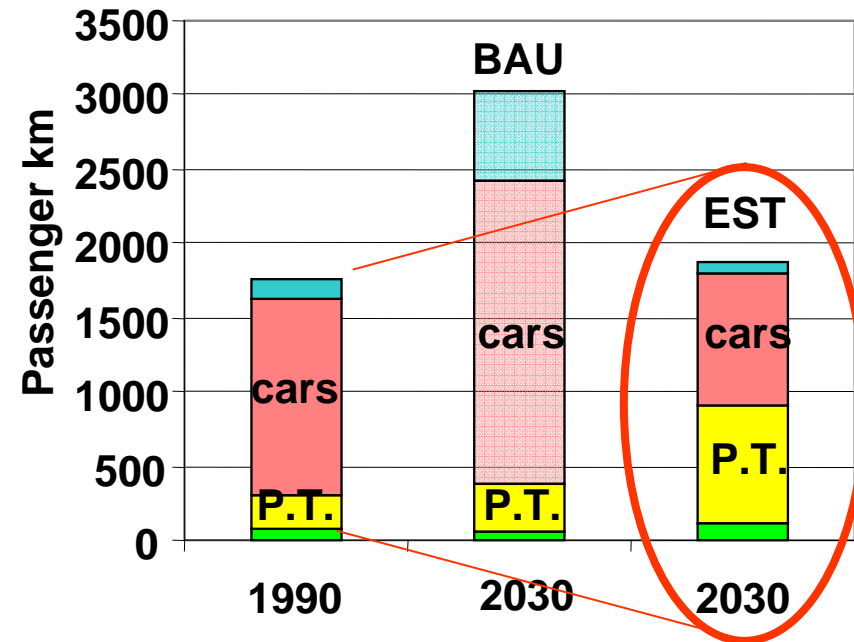
Demand Management

59%

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Modal Split



- Aircraft
- Passenger cars
- Public transport +
- non-motorised

Strategies to achieve EST

Freight Transport

Demand Management

54%

Load-factor

Technology 46%

Zero Emission Technology 25%

Bio-, Synfuels 21%

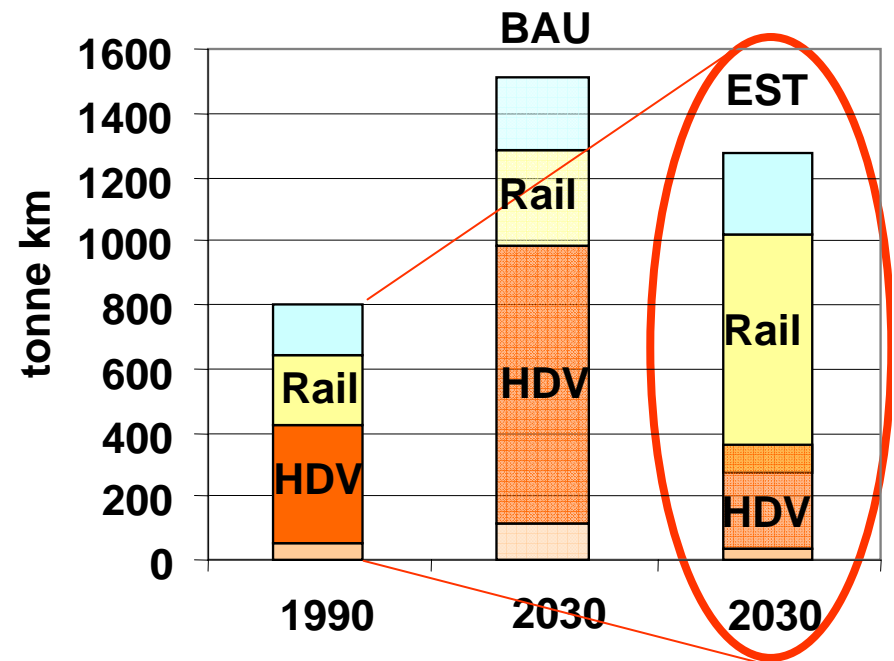
Mode shifts 24%

19%

Transport avoidance

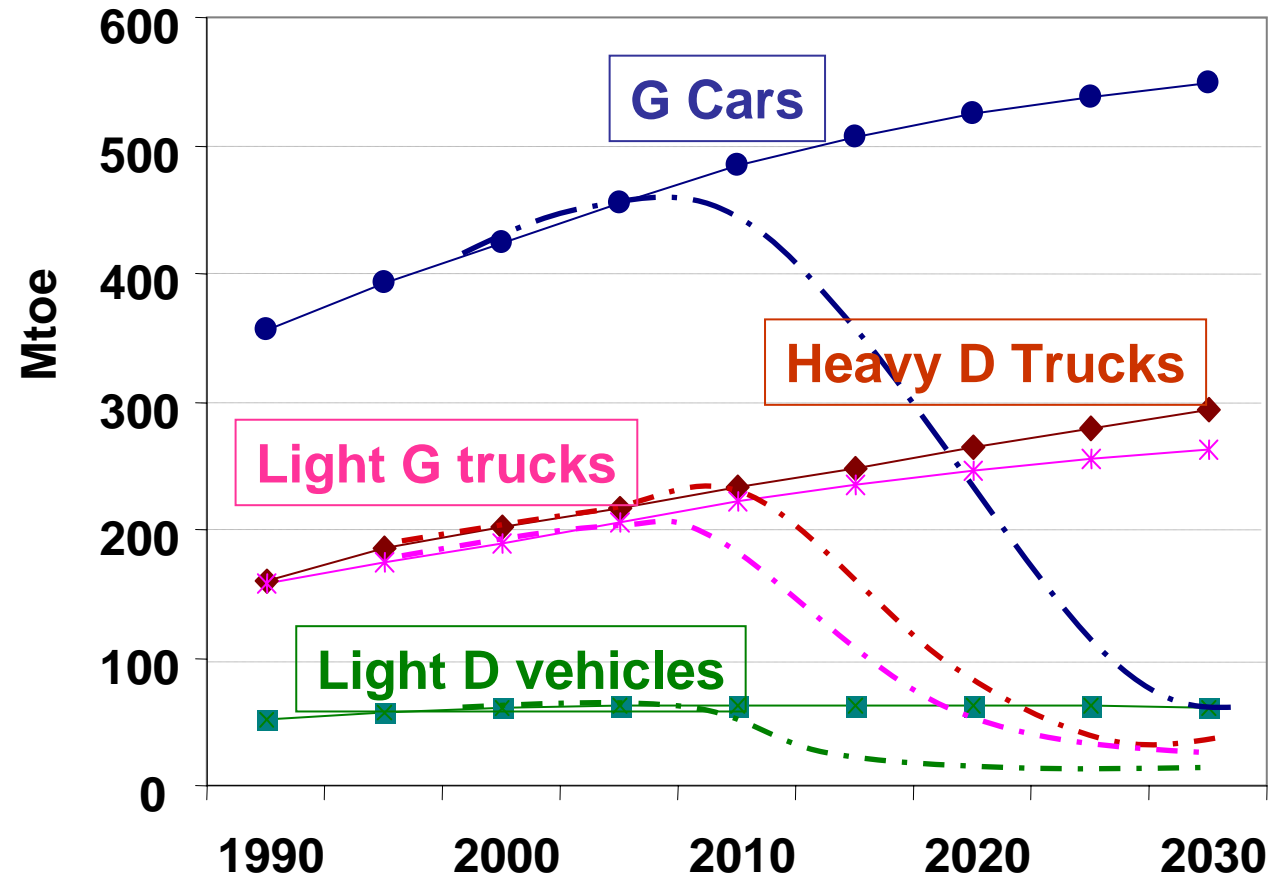


Modal split



- Waterways
- Rail freight
- Heavy trucks
- Light duty vehicles

Road Fuel Use Projections and EST Scenarios in the OECD Area

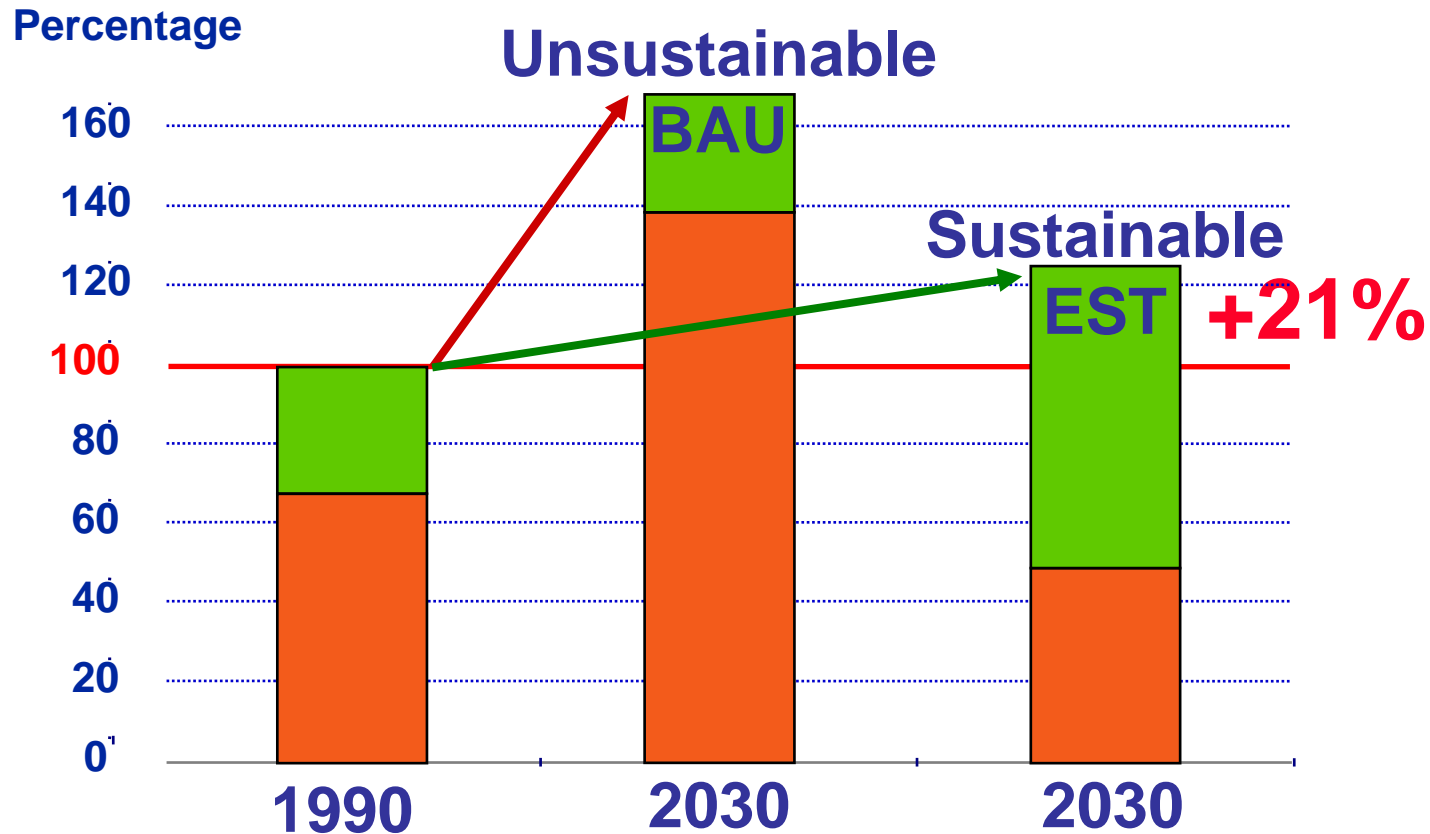


BAU trends

EST trajectories



Transport Modal Split in 2030

EST versus business-as-usual trends



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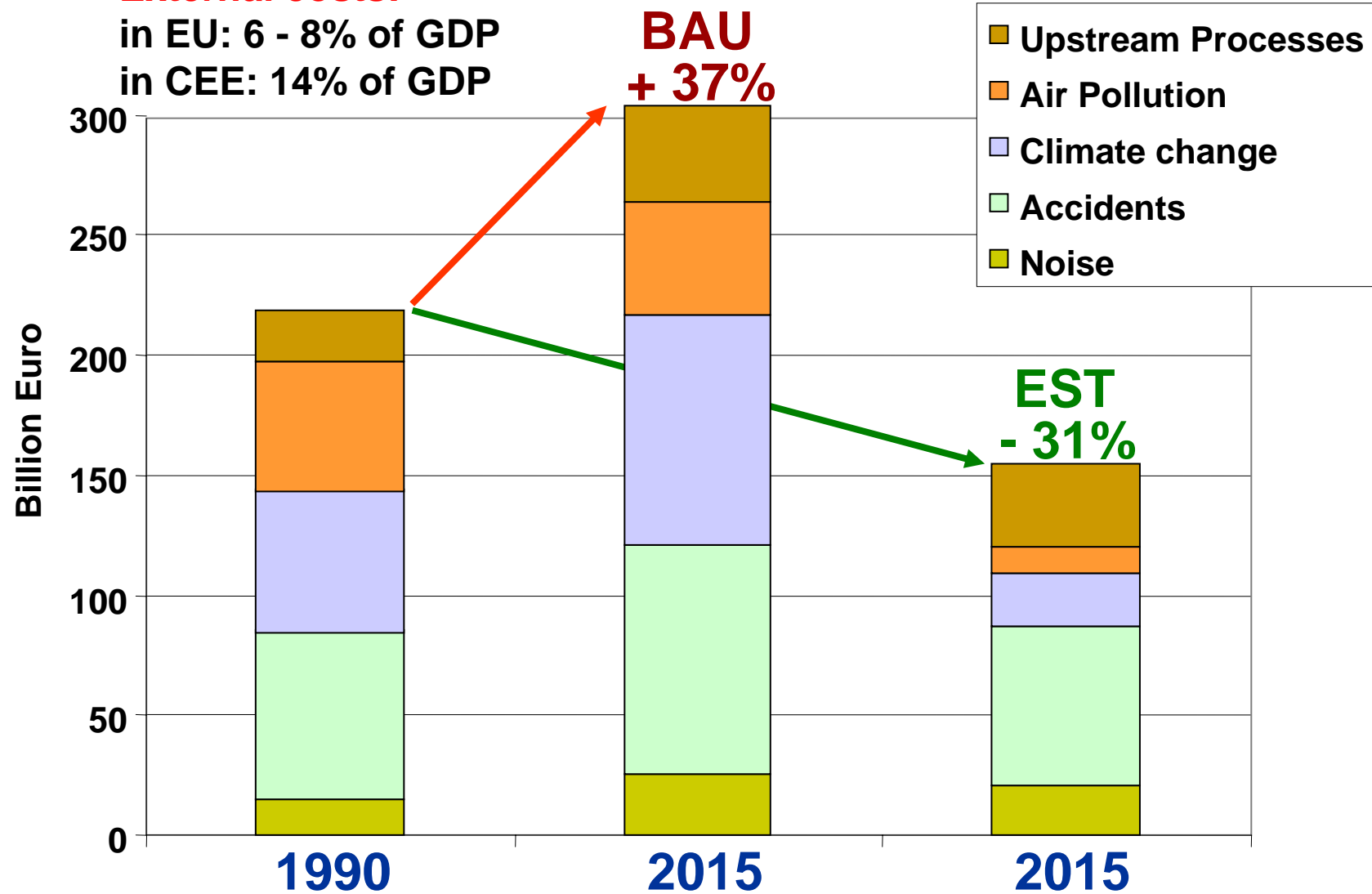
-  more environmentally friendly mode
-  less environmentally friendly mode

Economic and social implications

External costs:

in EU: 6 - 8% of GDP

in CEE: 14% of GDP



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The EST Guidelines

- ① Develop a *long-term vision* of a desirable transport future
- ② Assess *long-term transport trends*
- ③ Define *health and environmental objectives*
- ④ Set *quantified, sector-specific targets*
- ⑤ Identify *strategies to achieve EST*

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The EST Guidelines

- ⑥ Assess the *social and economic implications* of the vision
- ⑦ Construct *packages of instruments*
- ⑧ Develop an *implementation plan*
- ⑨ Set provisions for *monitoring, implementation and public reporting on the EST strategy*
- ⑩ Build broad *support and co-operation for implementing EST*

Backcasting towards EST - Results

Key features to meet long-term sustainability goals, notably preventing climate change:

- **Aggressive introduction of zero-emission vehicles (standards) and low-carbon fuels (FE requirements, biofuels)**

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and

- **Comprehensive policies for demand-side management both for passenger and freight:**
 - Integrated **new mobility services** for passenger transport and multi-modal logistics for freight
 - Changing **modal share** of passenger and freight transport through transport **infrastructure investment**, **welfare-increasing pricing and fiscal policies**
 - Information and awareness raising and **support of initiatives for climate friendly mobility.**



Lessons from the EST Project

- Policy instruments and measures -

- ❖ air quality standards drive technology improvements and market penetration
- ❖ Emission control requirements and standards:
 - emission standards for vehicles: effective, but slow stock renewal
 - fuel quality standards and alternative fuels: fast effects
- ❖ Financial and fiscal instruments:
 - little impact on transport volume; price elasticity close to zero (price changes vs. transport increase)
- ❖ Planning and infrastructure expansion: “predict and provide” prevail “bigger – faster – more costly “ (maintenance!);
- ❖ Information, awareness raising:
key factor for promoting best practices, but resistance to change; buzz word “sustainable mobility”

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EST conclusions

- ❖ **EST approach still valid: reduced externalities!**
 - goals unchanged; some adjustments concerning promising technologies (e.g. hydrogen fuel cells vs. EVs)
- ❖ **Change towards climate friendly mobility needed:**
 - despite of strong fossil fuel dependence, resistance to change very strong!
- ❖ **Transport infrastructure determines mobility pattern for the next decades:**
 - little concern about energy and resource use
- ❖ **Mobility management has highest potential for CO2 reduction!**
 - trip avoidance, modal shift to less impacting modes, increasing load factor
- ❖ **Aggressive introduction of carbon-free or carbon neutral motor vehicle technology, supplemented by renewable energy**

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“ Winning the oil endgame “

“It is entirely possible to cut projected U.S. oil consumption **in half by 2025,** and **eliminate it completely by 2050,** without compromising rapid economic growth.

.....
Once the U.S. has saved half of its oil, it can cost-effectively replace an additional **20% with advanced biofuels** and the **rest (30%) with natural gas.**”

Amory B. Lovins,
* Winning the oil endgame,
2004
Rocky Mountain Institute,
Colorado, USA.

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Vancouver
1996

..... the future Vienna 2000

Nagoya 2003

Abu Dhabi 2005

Berlin 2008

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