



Scenarios for the Transport System and Energy Supply and their Potential Effects

TRANSPORT STRATEGIES UNDER THE SCARCITY OF ENERGY SUPPLY

<http://www.steps-eu.com/>



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TIS.Pt – Transportes, Inovação e Sistemas, S.A.

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The STEPs Project (2004-2006)

- The EU 6th RTD Framework project STEPs (Scenarios for the Transport System and Energy Supply and their Potential Effects) developed and assessed possible scenarios for the transport system and energy supply of the future.
- Together with the project TRIAS (*), it reflects the EU research efforts to address “*scenarios for the transport system and energy supply of the future*”
- In the project five urban/regional models were applied to forecast the long-term economic, social and environmental impacts of different scenarios of fuel price increases and different combinations of infrastructure, technology and demand regulation policies.
- The results of the STEPs analyses serve as a basis for the development of a view on future policy and research requirements in the area of transport and energy scenarios

(*). Sustainability Impact Assessment of Strategies Integrating Transport, Technology and Energy Scenarios”

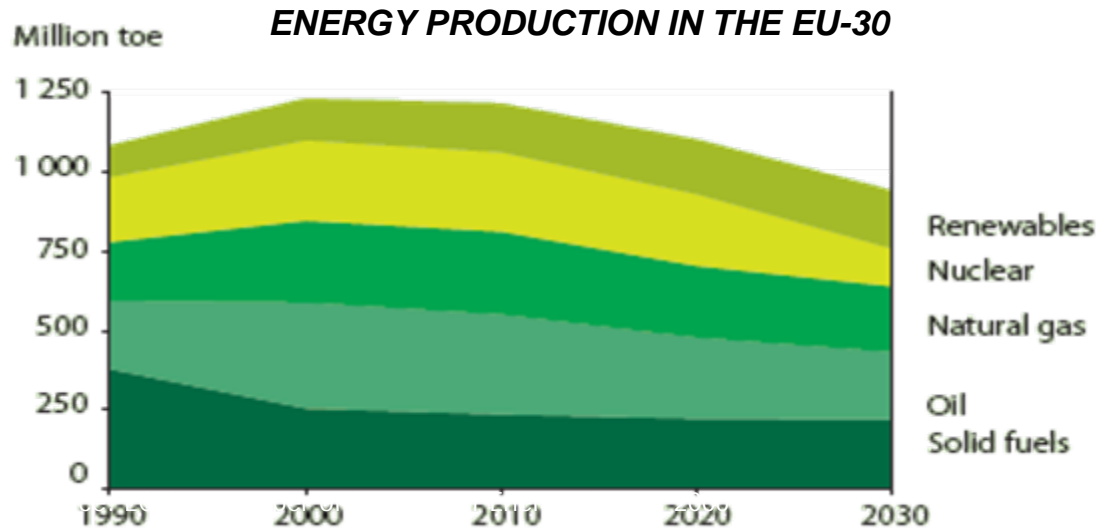
BACKGROUND

Energy Supply Issues

- **GEOPOLITICAL constraints** weigh heavily on the energy sector, hence with a strong impact in transportation. Europe imports 50% of its needs. Around 2030 this figure will have risen to 70%., concerning almost exclusively fossil fuels if nothing is done.
- **ENVIRONMENTAL constraints** are making themselves felt in daily life. It is necessary to lay the groundwork to produce energy or to travel in a way which is more sustainable. Fossil fuels give rise to many environmental problems connected with their combustion and transport applications
- **GEOLOGICAL constraints** in 50 years, there will be almost no more oil or gas. Alternatively, it will be very costly to extract these products, in a way which bears no relation to current prices. In other words, these natural resources exist in finite quantities and we have been squandering them.

BACKGROUND

Primary Energy Sources

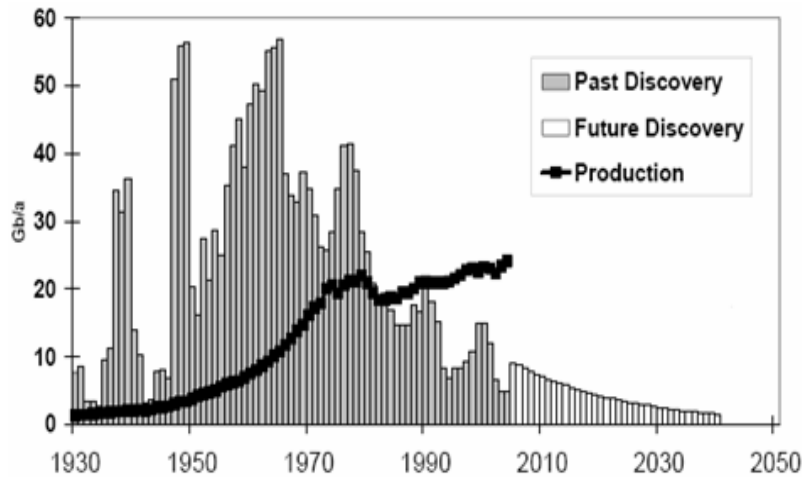


The situation as of 2000 was already acknowledged to be far from promising. It was clearly stated in the Green Paper on Security of Energy Supply (2001) that ***'...even if the EU has managed to reduce its energy intensity (the quantity of energy needed to produce a unit of wealth), all the warning lights are flashing. Energy consumption is rising by 1 to 2% a year. Dependence on EU countries is starting to rise above 50% again. Our scarce domestic resources are beginning to run out; in the case of coal, we talk about 'economic depletion', as it is far too expensive to mine...'***

BACKGROUND

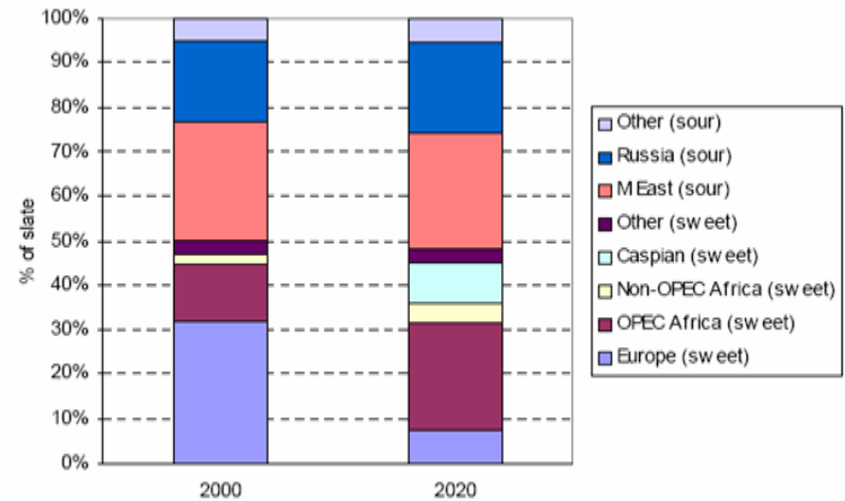
Primary Energy Sources

DISCOVERY OF REGULAR OIL (current and future)



(based on Exxon Mobil Data, 2002) Source: CAMPBELL C.J., 2005

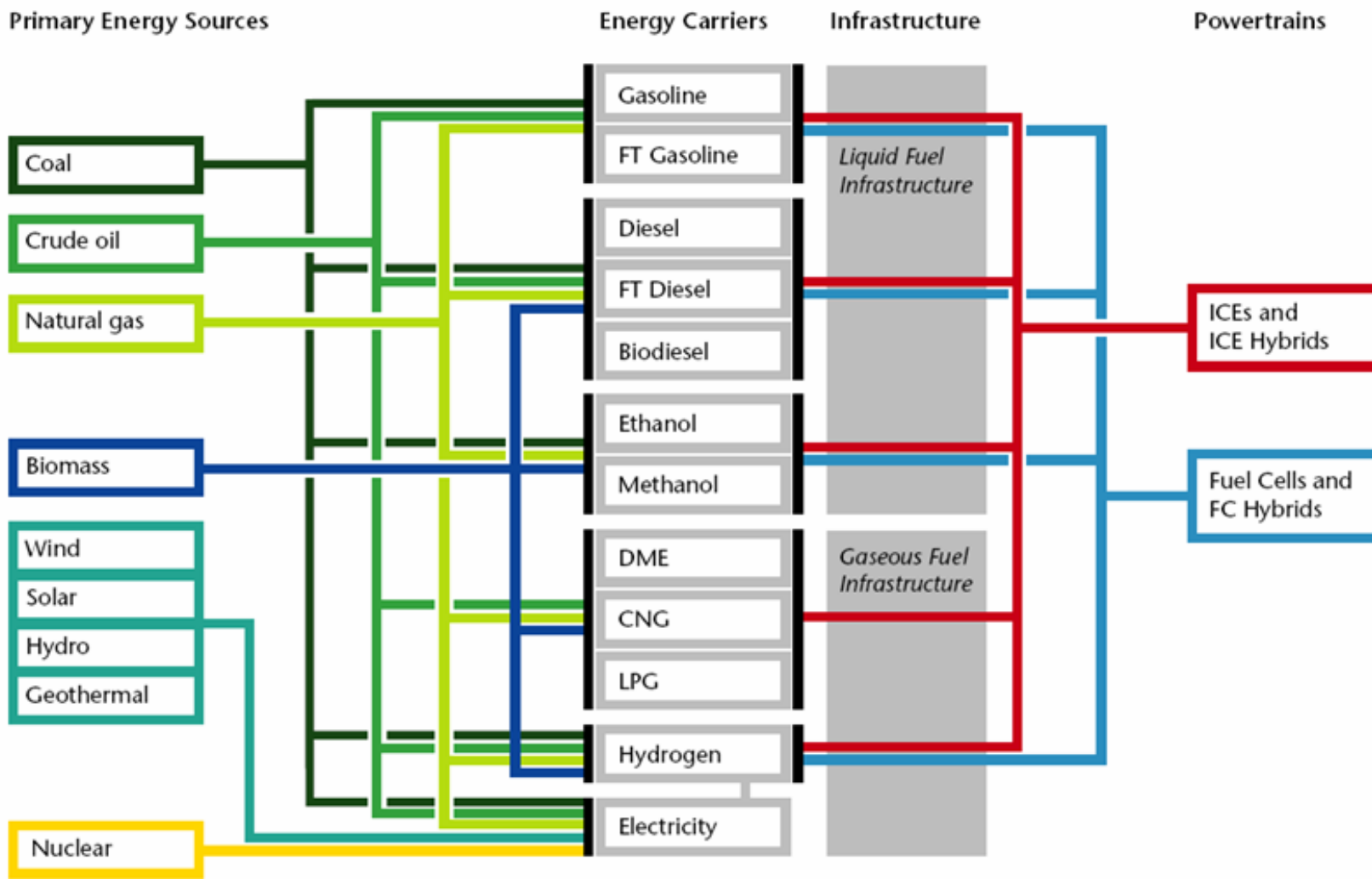
EU CRUDE OIL SUPPLY (2000 >> 2020)



Between the late 60s and 2007 the price of crude oil has grown by a factor of seven (in real terms). In the last two years it has almost doubled.

Experts believe that, because of the ultimate depletion of oil resources, political instability in the Middle East and growing energy demand by fast developing countries like China, India and Brazil, oil prices will follow an upwards spiral

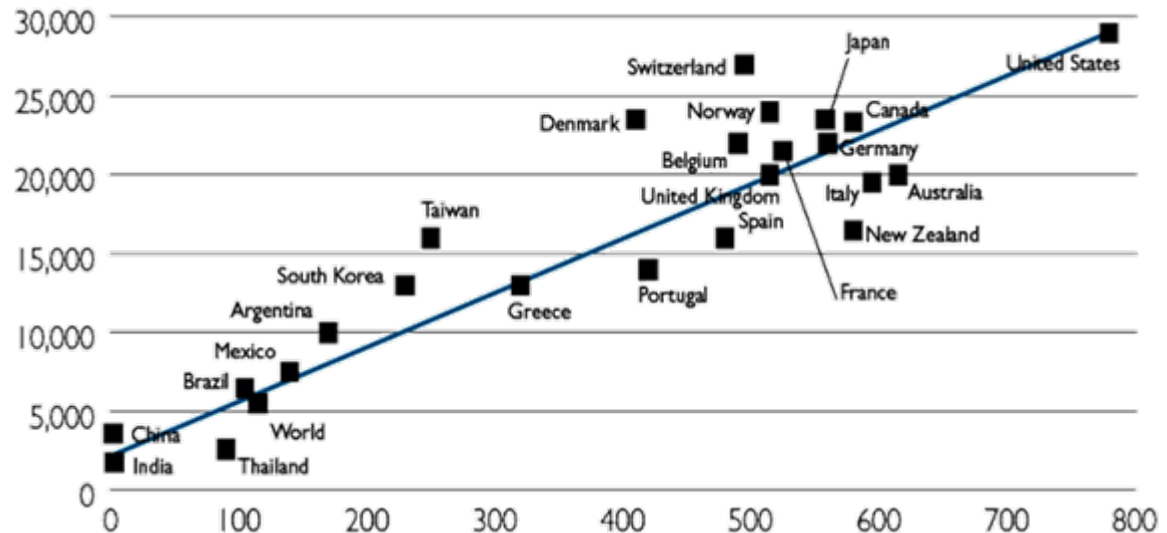
Complex Options: fuel/technology pathways



Source: World Business Council for Sustainable Development, 2004 - Sustainable Mobility Project

BACKGROUND

Transportation/Energy Driving Forces



- On a world wide base the growth of the car industry and the world car fleet is a key vector for increasing energy- particularly oil
- The world's car fleet now stands at about 775 million units and is increasing at a world-wide average of about 6%/year, with the most rapid growth taking place in China and India
- Through 1990-2002 the Chinese car fleet has increased at an average of more than 13% per year, growth of the car fleet attained more than 50% in 2001-2002, and national production reached 6 Million units/year.

Transport and urban development

- **The growth of the modern city is based on mobility. The railway and later the automobile made the expansion of cities into metropolitan areas possible.**
- **Because transport has been fast, efficient and cheap, households could afford to enjoy life in the suburbs and continue to work in the city.**
- **Mobility is commonly associated with freedom of choice and the pursuit of desirable activities.**
- **The limits to mobility are determined by time and money budgets.**



- If travel becomes faster or less expensive, people will make more and longer trips.
- If travel becomes faster or less expensive, people will choose more distant locations.
- If people will get more affluent, they will make more and longer trips and choose more distant locations.
- If people have to work less, they will make more and longer trips and choose more distant locations.
- If all this happens together, people will make more and longer trips and choose more distant locations.

THE STEPS PROJECT

Development of Scenarios

- The project developed a set of scenarios assuming different rates of fuel price increase against the adoption of 3 active policy options (Infra&tech, demand regulation, combination of both) and 2 *laissez-faire* options

	Fuel price increase		
	+1% p.a.	+4% p.a.	+7% p.a.
Do-nothing	A-1	B-1	C-1
Business as usual	A0	B0	C0
Infrastructure & technology	A1	B1	C1
Demand regulation	A2	B2	C2
All policies	A3	B3	C3

= 15 Scenarios

THE STEPS PROJECT

Development of Scenarios

FRAMEWORK OF THE SCENARIO DESIGN: two dimensions

Exogenous variables	Policy variables
1 Globalisation	9 'Liberation' of the energy market
2 European integration	10 Environmental policy
3 Economic growth (GDP)	11 Spatial planning
4 Demographics	12 Technological Innovation policy
5 Technological progress	13 Transport policy
6 Availability of Energy Resources	14 Fiscal Policy
7 Spatial development	15 Energy Policy
8 Transport costs	

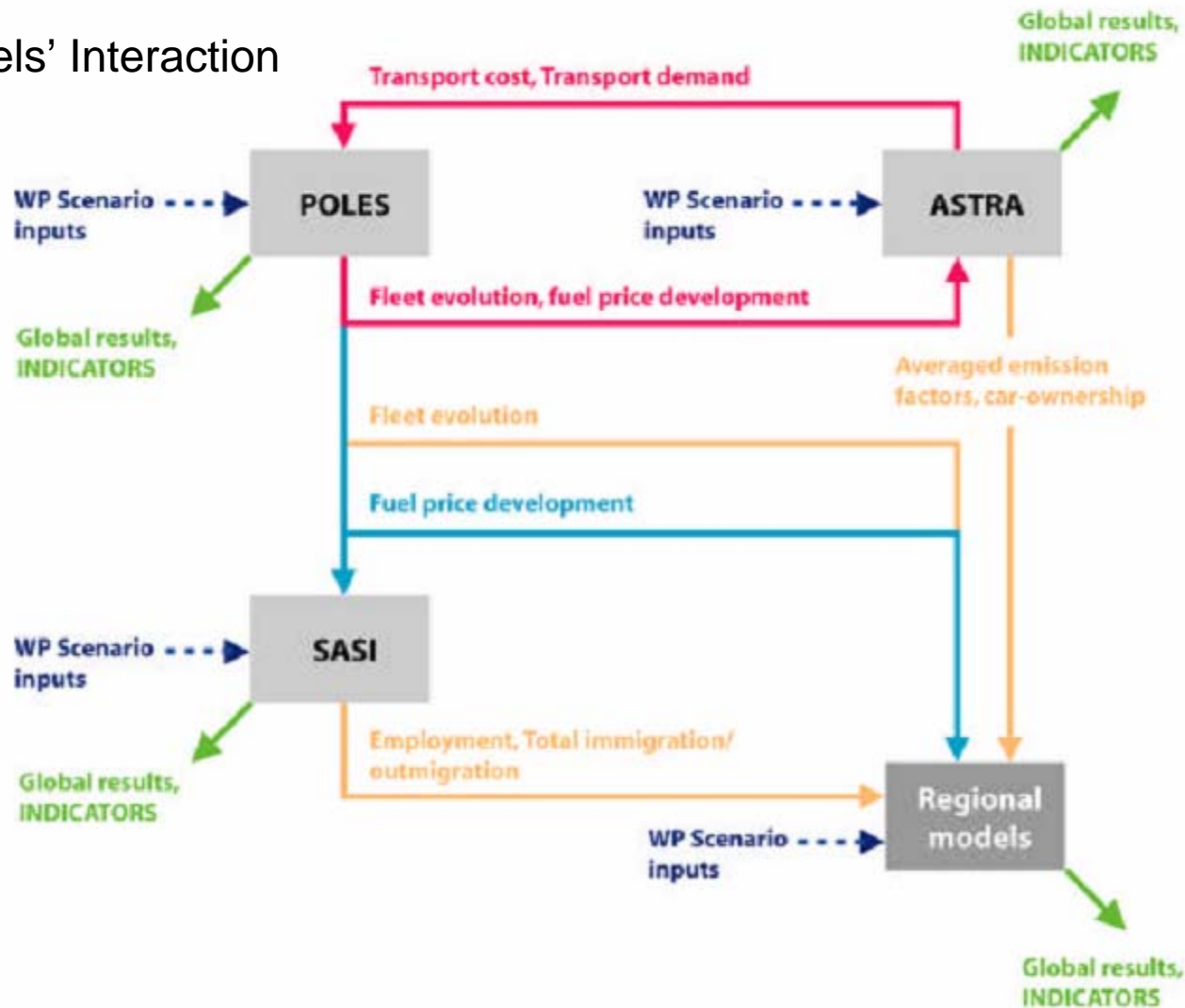
Models involved in STEPs project

European models	Urban/regional models
ASTRA Model	Brussels IRIS model
SASI model	Dortmund model
POLES model	Edinburgh SPM model
	Helsinki Meplan model
	South Tyrol Meplan model

THE STEPS PROJECT

Development of Scenarios

Models' Interaction



Where are we going?

The existing land use and mobility patterns in cities are not sustainable and tend to become less sustainable:

Further growth in **income** will result in

- further **spatial decentralisation** of land uses,
- higher **car ownership**,
- more and longer **trips**,
- more **energy** consumption and **greenhouse gases**,
- more **traffic noise** and **air pollution**,
- less **open space** and **natural habitats**.

We cannot go on like that forever.

New challenges

The prospects of **climate change** and **energy scarcity** require action to reduce **greenhouse gas emissions** and **energy consumption** by transport.

Technological innovation alone is not likely to achieve the necessary reductions. This implies that also **reductions in mobility** will be required.

The most efficient way to reduce mobility is to increase the **price of energy**.

It is therefore likely that fuel prices will rise significantly, either by exogenous world market developments or by political intervention in form of taxes or user charges.

Economic impacts

Fuel price increases will have **significant negative** impacts on the **economic development** of urban regions.

Growing fuel costs and related policy responses will lead to a reduction in **accessibility** and **economic growth**.

Higher costs of transport will make goods more expensive and increase the **cost of living**.

The economically **stronger** urban regions will be affected more – in absolute terms. This will lead to a **reduction in polarisation** and a **more balanced** urban system.

Mobility impacts

Fuel price increases will lead to significant changes in daily ***travel behaviour***.

The long-term trend towards more and longer trips and more trips by car will be ***stopped*** or even ***reversed***.

Average ***travel distances*** per capita will return to the level of the 1990s, average ***travel distances by car*** to the level of the 1980s and before.

There will be a renaissance of ***walking and cycling***, and the share of ***public transport*** trips will more than double. The share of ***car*** trips will decline to that of the 1970s.

Social impacts

These changes in travel behaviour will not be voluntary but ***forced responses to severe constraints*** and will imply a substantial loss of ***quality of life***.

The reductions in trips and trip distances will affect ***social or leisure trips*** most: every such trip not made will mean a friend not visited, a meeting not attended or a theatre performance or soccer match not seen.

Rising costs of transport will mean also ***financial stress*** for households, who will have to spend more on travel than before, although their income will grow less and housing will become more expensive.

Environmental impacts

The positive side-effects of the reduction in traffic caused by rising fuel prices will be its **environmental** effects.

Every car trip not made and every km the remaining trips will be shorter will mean less **greenhouse gases, air pollution** and **accidents**.

The efforts to develop more **energy-efficient cars** and **alternative vehicles** stimulated by fuel price increases will contribute to the positive environmental balance.

From the point of view of achieving the **Kyoto** objectives, high fuel prices are the best possible prospect.

Do we have to rebuild our cities?

European cities contain a huge potential for **internal re-organisation** by better co-ordination of activities.

If travel will be more expensive, daily life will become more **local**: far destinations will be replaced by nearby ones that can be reached by cycling/walking.

Accessibility will again become important in **location decisions**: households will move closer to jobs, shops and schools and firms closer to workers and clients.

High-density mixed-use urban structures will result in further reductions in fuel consumption **without** severe loss of quality of life.

Integrated strategies

The challenges of ***climate change*** and ***energy scarcity*** cities are facing today require ***integrated and long-term land use and transport strategies***.

Successful ***integrated land use and transport strategies*** at the municipal and regional level include:

- a combination of ***pricing policies*** directed at car users with moderate public transport fares,
- ***public transport infrastructure investments*** to improve public transport speed and service,
- a ***land use plan*** supporting living near central areas, in satellite cities or along public transport corridors.

Governance

Integrated and long-term land use and transport strategies at the municipal and regional level require:

- a strong **regional planning system** and efficient mechanisms of **horizontal** and **vertical** co-ordination,
- a broad **public debate** between **researchers**, **policy makers**, **stakeholders** and **citizens**,
- raising **public awareness** of the importance of adopting **a more sustainable way of life**.

Through 2010

Initiatives will be taken to slow the growth rate of oil use / CO₂ as much as possible. To do that, NGVs (ICE), Biofuels and HYBRID vehicles seem promising alternatives right from today, with the particularity that HYBRIDs may clear the way to fully electric vehicles relying either on improved energy storage capacity or on Fuel Cells running on Hydrogen

After 2010

Expectations seem to be towards a more sustainable transport system, featuring near-zero CO₂ emissions in urban contexts and decreased relative dependence on oil based on modal shifting and a growing share of an improved generation of EVs and HYBRID based on NG, Biofuels and Diesel, as well as ICE improvements. Fuel cells hold a potential, yet to be released, depending on large scale clean production and distribution of Hydrogen.

- We are facing a crucial period to prepare and shape the next decade in terms of deep and urgent structural changes. Hence, one should take into account not only current technological trends, and policies in place but also their expected projection into the future.
- What might be unexpectedly and dramatically determined in terms of EU policy or Oil Market behavior from now until 2010, represents a significant challenge for modeling exercises.
- The challenge is not only to consider what we know already today, but also what might result from influencing key drivers such as growing evidence of climate change consequences, including in the economy itself, rising oil prices in result of a possible shift from a mild demand driven context to a more severe oil supply driven context.

- **STEPS acknowledges the existence of worrying signals regarding conventional energy availability and severe environmental consequences, as underscored by key international organizations. These are consistently pointing at the emergence of disruptive developments in the ENERGY / TRANSPORTATION conventional relationship.**
- **The EC's post-Kyoto policy strategy needs to deliver a clear and inspirational long-term perspective to promote innovation by means of an ambitious framework, covering all transports modes, but specially road transportation.**
- **Policies adopted elsewhere, namely USA and Japan will also play an important role, as together with EU policy they have the potential to set the stage for a deeper change in the urban and land use management strategies, global transportation technology solutions and active energy supply sources research.**

THANK YOU FOR YOUR ATTENTION !

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This presentation includes elements compiled by different STEPs partners. An interesting presentation by Prof Michael Wegener in the SOLUTIONS Annual Conference, at the University College London, can be found at:
<http://www.suburbansolutions.ac.uk/he-london-confer-07.aspx>

More information

Fiorello, D., Huismans, G., López, E., Marques, C., Steenberghen, T., Wegener, M., Zografos, G. (2006): *Transport Strategies under the Scarcity of Energy Supply*. Final Report of the project "STEPS – Scenarios for the Transport and Energy Supply and their Potential Effects", edited by A. Monzon and A. Nuijten. The Hague: Bucks Consultants. <http://www.steps-eu.com/reports.htm>.