Newsletter

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# RACE2050

RESPONSIBLE INNOVATION AGENDA FOR COMPETITIVE EUROPEAN TRANSPORT INDUSTRIES UP TO 2050

INSIDE THIS ISSUE:



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## COORDINATOR'S INTRODUCTION

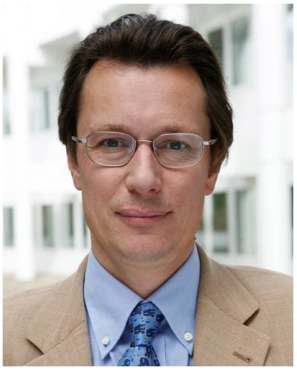
RACE 2050 aims at identifying key success factors for a climate and environment friendly and socially acceptable growth of the European transport industry, in a long perspective up to 2050.

While many other European industries, in the last four decades, have suffered from global competition and declined (as the textile industry), or almost disappeared (as the mining industry), the European transport industry remained at large competitive and strong on a global level. It stands as one of the largest and most competitive European industries. This is generally true both for equipment and services, though with great differences between various branches.

There are some dozen serious long-term foresight studies on the future of European transport industry on our bookshelves. Several studies suggested roadmaps to reach an envisioned future, mostly a greener, less $CO_2$-intensive and more user friendly transport industry. Our idea is not just to add another foresight study to the library but to integrate the tremendous foresight intelligence in a comparative synopsis, and to compare and assess the different visions and policies to reach these goals. We will then discuss the results with experts from the transport industry, research community, policy makers and foresight experts. We invite you to participate in this endeavour.

By this, we come up with weighted explanations and *long durée* core concepts for a sustainable strength of transport industry. Secondly, we are interested to increase the impact of transport foresight studies. By studying the impact and effects of former foresight studies, we want to learn how to present our own integrative foresight synopsis and what to expect from decision makers. The present strength of the European transport industry is to a large extend the fruit of preparedness for change in the past or – more precisely – a preparedness to learn from sometimes dramatic transport foresight studies and threat scenarios and to follow convincing positive visions and leitmotifs. We hope to obtain a new understanding of the positive effects of transport and transport industry threat scenarios in the past, and to deliver strategic and didactic outlines for high impact transport foresights in the future. At the same time, the project will identify the effects of positive scenarios.

We are very much looking forward to your comments in the coming years!



Hans Dienel, TUB, coordinator

"LIFE IS A SERIES OF COLLISIONS WITH THE FUTURE" -*JOSÉ ORTEGA Y GASSET*

# Future Challenges of the European Transport Industry

## Interview with Dr. András Siegler, Director of the Transport Directorate, DG Research & Innovation, European Commission

*"The European transport sector will face growing competition from other world regions. At the same time, oil will become more scarce and consequently more expensive whilst the total fuel demand in all transport modes will increase; the additional demand for transport fuel will emerge in the developing countries (especially in China and India). In contrast, the transport fuel demand in the developed countries is expected to drop – despite an increasing mobility."*

**Q. What will be the biggest challenge of the European transport industry in 2030 and 2050?**

Samuel Goldwyn, the Founder of the Metro-Goldwyn-Mayer (MGM) said "Never make forecasts, especially about the future". Fortunately, we didn't follow his advice; foresight exercises are necessary because they carry the potential of shaping actions to promote, if not create, a more desirable future from the user's point of view, in spite of some weaknesses such as less definitive data, uncertain models and a high degree of speculation. Understanding the dynamics and magnitude of likely future developments is essential because it offers us the opportunity to adjust our future plans and expectations.

Transport and logistics are fundamental for economic development, growth and prosperity of regions and urban environments worldwide. In the next decades the global transport sector will face challenges relating to population demographics, urbanization, traffic congestion, local pollution, noise, and economics. These challenges will be impacted by uncertainties emerging inter alia from unpredicted global economic situations, and potential technology breakthroughs.

For Europe, an efficient and sustainable transport sector is essential for being economically competitive at world level. Once upon a time our transport system could develop against a background of generally cheap oil, expanding infrastructure, European technological leadership and limited environmental constraints. We must now adapt to a very different set of conditions. We need to break our almost complete dependence on oil to keep fueling our road transport systems. Oil is likely to become more and more scarce in the years to come, demand remains strong and markets as volatile as ever, so reliable alternatives need to be in place.

Hence, the question is how new, breakthrough transport technologies and solutions can emerge in the next four decades, and how these may be able to satisfy the coming additional demands.

**Q. How do you envision the difference of 2050 European transport industry compared to the present situation? (in particular with regard to its competitiveness)**

Nowadays we don't have to rely anymore on crystal balls, astrology or palmistry in order to look forward and scan the future; we have a wide range of scientific forecasting tools and methods at our disposal. Experts in the field of foresight have produced a series of studies dedicated to the future of the transport system. According to the most widely agreed scenarios, the European transport sector will face growing competition from other world regions. At the same time, oil will become more scarce and consequently more expensive whilst the total fuel demand in all transport modes will increase; the additional demand for transport fuel will emerge in the developing countries

(especially in China and India). In contrast, the transport fuel demand in the developed countries is expected to drop – despite an increasing mobility.

The total number of cars in the world is also expected to dramatically increase, mainly in the developing world, while the developed countries will see a moderate increase.

Most of the additional demand is expected to come from regions undergoing strong economic and population growth (China, India, Russia, Latin America, and the Middle East).

**Q. Could you briefly describe some policy measures planned by the EC, which aim to improve the global competitiveness of the European transport industry?**

We already know many of the challenges that we have to address: climate change, protection of the environment, energy supply security, and safety, to name only a few. In 2011 the Commission presented its vision for a competitive, resource efficient and sustainable transport system in Europe in the new White Paper: "Roadmap to a Single European Trans-

port Area". Based on its three main pillars, i.e. internal market, infrastructure and innovation, the White Paper presents efficient transport as being vital for the future prosperity of Europe. Decarbonisation of transport is a major theme in the Transport White Paper. Transport is a significant and still growing source of GHG emissions. A reduction of at least 60% of GHGs by 2050 with respect to 1990 is required from the transport sector. A large part of the 40 initiatives listed in the White Paper will contribute to achieving this goal.

Already for several decades the European Union has been supporting research and innovation for more sustainable transport, offering a wide spectrum of activities: e.g. cleaner and more efficient vehicles, vessels and aircrafts, competitive production processes, safety and urban transport. In the current 7th Research Framework Programme, transport research and innovation activities were addressed in a number of thematic areas. In "Horizon 2020" they will be embedded in the socio-economic challenge: "Smart, Green and Integrated Transport". The challenge will cover activities from research to market with a new focus on innovation-related activities such as demonstration, test-beds, standardization, support for public procurement and market replication.

The technical and scientific content of the "Smart, Green and Integrated Transport" chapter will be designed to maximise impact on the most important transport-related societal challenges. It will look at improving the performance of the transport system in terms of delivering more effective mobility services avoiding traffic congestion, emitting less greenhouse gases or toxic emissions, and achieving a better cooperation between the different transport modes in order to maximise the use of transport capacity. The decarbonisation of transport will be a major target of the programme. In this respect, it will address both technological avenues: the improvement of traditional engines and the introduction of new types of fuels and energy sources.

**Q. In your opinion, what is the relevance of a project like RACE2050 for the European transport industry and for the EU policies?**

Generally speaking, what we need is not a lot of reports and deliverables catching dust on our shelves, but reliable and robust results of the research projects we fund, to be fed in the policy making process and in designing future research programmes. In RACE2050, the two sets of scenarios to be developed, namely one for 2030 and another one for 2050, will help us better understand the drivers of change regarding the competitiveness of the European transport industry.

Paraphrasing Winston Churchill, the farther backward we can look the farther forward we are likely to see; by studying the actual impacts of previous foresight studies, Race2050 will help us to look farther forward.

*"...the two sets of scenarios to be developed, namely one for 2030 and another one for 2050, will help us better understand the drivers of change regarding the competitiveness of the European transport industry."*

**On September 27th, 2012, the RACE 2050 team climbed this lookout in downtown Berlin, and has bravely gazed into the future**

# Competitiveness of European Transport Industry

## What factors underpin the competitiveness of European Transport Industry?

Johanna Ludvigen, Institute of Transport Economics, Norway

The European transport industry represents one of the most technologically advanced manufacturing and service provision sectors. It retains relatively high competitive position in Europe and globally. Especially manufacturing of cars, aircrafts, rail-signaling-systems, rolling stock, traction equipment as well as provision of logistics and tourism services support millions of well paid jobs and generate positive economic ripples in other sectors. In this context one may ask, what factors or their combinations underlay this success? How the European transport industry did manage to successfully overcome major competitive threats which defeated shipbuilding, textile production and mining sectors?

*What factors or combinations of factors underlie the European transport success? And how will those factors affect the industry in the future?*

Several direct and indirect forces were at work here, two of which stand out: the capacity and capability to innovate and internalise the technology breakthroughs from the industry's own development and other manufacturing engineering fields. The above also indicates that the European transport industry has benefited from strong governmental support for research and technical education. Publicly funded research and technology developments enabled the industry to reinvent itself, revitalize its competitive advantage and strengthen economies of scale. A series of mergers and acquisitions that took place at the outset of this century absorbed the underperforming players by technologically stronger parties enhancing thereby the general technical and managerial standards of the entire sector. The pollution reduction legislation enforced by European Commission, which is the toughest in the world, coupled with customer demands for more environment-friendly vehicles and transport modes, forced the industry to produce cleaner, quicker and more innovative products and services. These performed well in markets for environmentally benign, fuel-efficient vehicles, equipment, service provision lines, facilities, and transportation and delivery systems. Products on which the European automotive industry has traditionally built its consumer strengths – the small and luxury cars – have also proven successful in response to high petrol prices and space scarcity in European and Asian cities.

Subsequently, the 2004 and 2007 accession of the nine central, south-eastern and north-eastern former communist countries to the European Community bestowed the industry with opportunities to fulfill large spectrum of highly unmet mobility needs. Investments in new physical plants, licensing of common production platforms, managerial and technical standards and manufacturing know-how in the new member states reinforced further the economies of scope and scale. This has

also boosted the transport industry's ability to penetrate the extra-EU markets through foreign direct investments and/or other internationalization measures. In addition, manufacturers of rail rolling stock, signaling and traction equipment and traffic management systems benefited from demand for modernization of national rail sectors in the new member states and creation of the European Railway Area. Competition from Japanese and Chinese manufacturers has also sharpened the rivalry awareness and made transport industry's managers more fit to compete for European clients.

Although these factors enhanced the competitiveness of the European transport industry in the past, it is far from certain how they may perform in the future.

*"How did the European transport industry manage to successfully overcome major competitive threats which defeated shipbuilding, textile production and mining sectors?"*

# Transport Industry's Past Futures

Robin Kellerman, Technische Universitat Berlin, Germany

In RACE2050 we plan to focus on the "history of the future" by intending a long term scrutiny of the impact of past foresight studies. We are convinced that the present strength of the European transport industry is partly the fruit of preparedness for change in the past, or – more precisely – ability and willingness to learn from sometimes catastrophic transport foresight studies in the past.

Beside the political and market goals of scenarios, we aim to identify to what extent transport forecasts have - explicitly or implicitly - mirrored societal, technological and political attitudes, visions and trends. By applying a historical, diachronic and comparative approach, we shall therefore investigate how former foresights from the 1960s until the 1990s might have induced European transport industry's changes, adaptations and, in particular, how those past "nightmare" visions impacted the industry competitiveness. Three main catastrophic scenarios were drawn for the European transport industry:

- The American threat (in the 1960s and early 1970s) and its emphasis on missing economies of scale in Europe

- The Japanese threat (in the 1980s) and its emphasis on low quality and poor production efficiency

- The Chinese threat (from the 1990s and beyond) with its emphasis on low production costs and off-shoring of European car production

In a long term approach, those negative foresights now appear to have had positive influence on the European transport industry, making the whole sector able to change, learn, adapt and stay globally competitive. The core activity of Work Package 2 is to investigate the complex relationship among the scenarios making process, the social debate, the industrial policy and the market feedback. Beside the beneficial reaction of the European transport industry to those negative scenarios, we will investigate how those foresights acted as a catalyst of modernisation and not as discouraging factor for the European transport sector.


This investigation is relevant not just to understand the past, but mainly to recognize and to list the constellation of elements which supported positive outcomes.

*"We aim to identify to what extent transport forecasts have - explicitly or implicitly - mirrored societal, technological and political attitudes, visions and trends."*

# Applying Morphological Analysis to the Study of Transport Futures

Tom Ritchey, *Ritchey Consulting*, Sweden

One of the basic methodologies that will be employed in the RACE2050 project will be the non-quantified modelling method *General Morphological Analysis* (GMA). It will be used to structure and analyse the morphology of the European transport sector, and to develop a modelling laboratory for alternative anticipatory transport scenarios for the years 2020 and 2050.

So what is GMA, and how does it work?

*General Morphological Analysis* is a method for modelling complex social and organisational planning problems that are not amenable to quantification. It examines all the possible relationships between various social, political and organizational dimensions of a complex problem, and allows us to consider all potential outcomes. GMA produces *non-quantified, multidimensional inference models* unlike other mathematical or scientific models. Computer-aided GMA was originally developed at FOI (the Swedish Defence Research Agency) in the 1990s in order to better facilitate long-term defence and civil preparedness planning. It was specifically designed in order to deal with multi-stakeholder social and organisational policy problems and to facilitate collaboration between different disciplines and different societal sectors.

GMA is carried out in professionally facilitated modelling workshops populated by relevant subject specialists. The method involves a number of iterative steps or phases corresponding to *cycles of analysis and synthesis*, the basic process for developing all scientific models. The process is iterative and may be repeated several times. New knowledge and insight generated in the development of the morphological models is one of the important results of a GMA work session. The iterative steps performed are:

*„General Morphological Analysis is a method for modelling complex social and organisational planning problems that are not amenable to quantification. It examines all the possible relationships between various social, political and organizational dimensions of a complex problem, and allows us to consider all potential outcomes."*

<u>Analysis phase</u>

1) *Identify relevant variables*: Identify and define the main parameters, dimensions or problem variables that need to be considered within the complex problem or scenario (the shaded column headings in figure 1 below).

2) *Identify/define value ranges*: Each variable is assigned a range of relevant alternative values or conditions that the variable can assume (columns under each shaded heading in figure below).

<u>Synthesis phase</u>

3) *Relate all variable values to each other* and assess their mutual consistency. This is called a "Cross-Consistency Assessment" (CCA.)

4) *Synthesize mutually consistent configurations*. A "configuration" consists of one or more states in each of the variables (e.g. the marked cells in the figure below). The sum total of all internally consistent configurations makes up the *solution space* of the morphological model.

5) *Use the model interactively* to investigate and group all mutually consistent configurations in order to identify alternative scenarios and/or policy solutions. Iterate the whole process, if required.

Previous projects carried out with GMA in the transport sector include "*Dependencies between Critical Transport Systems in Time of Crisis*" (Swedish Emergency Management Agency); "*Scenarios and Preparedness Planning for Transport of Dangerous Goods*" (Swedish Transport Authority); "*Transport Security for the Stockholm Region in a 20 year Perspective*" (City of Stockholm); and "*Threat Scenarios and Security Strategies for the Transport of Radioactive Waste*" (Swedish Nuclear Power Inspectorate – see chart on next page).

The example in the chart (on the next page) shows what types of physical/technical and administrative measures can be employed for the protection of the transport of radioactive waste in the face of possible threats encountered during different stages of the transport. In this case, the red cells are user selected, showing the threat of hindering the transport from arriving or departing from a nuclear facility. The blue cells show what types of measures are appropriate for this case. (Note: the model shown here is truncated due to security concerns. The original model contained more than 200 possible threat situations.) The complete article can be downloaded at:

www.swemorph.com/pdf/ma-patram1.pdf.

***Other downloadable publications on GMA:***

Ritchey, T.: "Problem Structuring using Computer-Aided Morphological Analysis". **Journal of the Operational Research Society** (2006) 57, 792-801. www.swemorph.com/pdf/psm-gma.pdf

Ritchey, T.: "Modelling Alternative Futures with General Morphological Analysis". World Future Review, **World Futures Society**, Spring 2011, pp. 83-94. www.swemorph.com/pdf/wfr-ritchey.pdf)

| Transport step: where is the cargo in the transport chain? | What is the transport subjected to ? | Level of physical protection/ technical measures for protection | Administrative routines and measures for protection |
|---|---|---|---|
| Onboard Swedish merchant vessel (open water) | Stop/hinder the transport | Police guard/escort | Increased secrecy |
| Merchant vessel on way in or out of Swedish port | Destroy | Unarmed escort | Up-graded securing checks on personnel |
| Loading/unloading in port (in special protected areas) | Highjack the entire transport (when attended) | Continual surveillance of vehicle and cargo | Up-graded admittance controls |
| Temporary storage in port area | Steal the entire transport (when unattended) | Seal off geographical area | Limit the number of people involved |
| Road transport | Steal the cargo (when attended) | Rapid police mobilisation | Protected parking areas |
| Rail transport | Steal the cargo (when unattended) | Hardened/attack protected vehicle | Up-graded delivery supervision |
| Planned stop during road transport | | Hardened/ protected containers | Present SKI levels |
| Unplanned stop during road transport | | Present SKI levels | |
| Arrival to/ departure from nuclear facility | | | |

**Example for using General Morphological Analysis (GMA): Segment of a morphological model developed for the Swedish Nuclear Power Inspectorate concerning *Threat Scenarios and Security Strategies for the Transport of Radioactive Waste.***

# Playing with Wild Cards

Aharon Hauptman, Interdisciplinary Center for Technology Analysis & Forecasting at Tel Aviv University, Israel

Imagine a revolutionary technological breakthrough leading to a widespread use of affordable pilotless personal air transportation systems (a.k.a "flying cars"). Or a total breakdown of the European transportation network because of an overload in computerized control systems. Or a dramatic decrease of personal travel thanks to a development of "super-real" virtual-reality-based telepresence. All these are "wild cards": possible future events with low-probability but very high impact (on the society and the transportation industry) if they occur.

Many past foresights studies tended to focus on "most likely" possible futures. This is hardly the best way to anticipate strategic surprises, although experience shows that we are always surprised by unexpected events (think about the volcanic eruption that severely disrupted the air transportation). Major surprises are often caused by missing relevant signals of change, or simply by denial. "Thinking about the unthinkable" is a recommended "antidote" to our natural tendency to ignore or to deny such surprises.

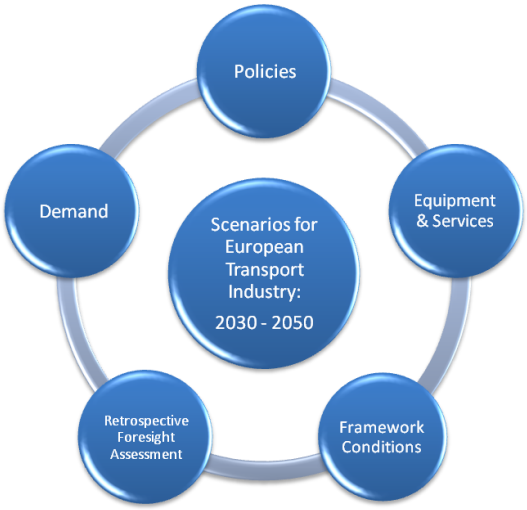
It is noteworthy that the EU Transport project CONSAVE 2050 (Constrained Scenarios on Aviation and Emissions) strongly recommended that future-oriented projects in the transportation area pay special attention to wild cards.

The growing interest in wild cards in Europe has also been reflected in the FP7 project iKNOW (http://wiwe.iknowfutures.eu), which assembled and analysed numerous wild cards potentially shaping the future research and innovation policy in many fields.

Therefore, in addition to plausible scenarios, attention will also be paid in RACE2050 to positive as well as negative wild cards, be it unexpected vulnerabilities or unanticipated opportunities. Elicitation and analysis of potential wild cards and related "weak signals" (possible "precursor events" that may hint at a growing likelihood of a wild card) will be carried out by a combination of several means, such as special brainstorming sessions, interviews with subject matter experts, and an online expert survey. Sources for information and inspiration will be enriched by relevant historical parallels and creative ideas from other fields.

Thinking about wild cards, we should not forget the famous saying of the renowned futurist Herman Kahn: *"The most surprising future is one which contains no surprises!"*

## RACE2050 Work Plan




RACE2050 foresight study aims to identify key success factors for sustainable growth of the European Transport industry and for policies which can increase its strength in a long perspective up to 2050.

Lessons from previous foresight studies and visions will help create an integrative foresight, which will enable the European transport industry maintain its leading position in world economy up to 2050.

Key success factors will be identified. Important drivers of change will be extracted by analyzing current policies, emerging technologies, energy and environment aspects, demand forces, geopolitical trends and other relevant domains.

"Wild Cards" analysis will provide additional important inputs.

General Morphological Analysis (GMA) will be used to integrate and assess a multitude of driving forces for alternative scenarios.

## RACE2050 Consortium

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## Key Expected Outcomes of RACE2050

- Novel scenarios for 2030 and 2050 on the competitiveness of the European transport industry.
- Recommendations for the necessary policies, including research policies, to reach the goals of desirable scenarios.
- Web-based interactive foresight synopsis tool, envisioned to create a long-term legacy for stakeholders.