D5.3 Results of the Second Innovation Seminar

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Author/Responsible(s):	FORC/Auli Keskinen
Contributors:	
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Summary of this report:	The results of the second innovation seminar held in May 2009 are explained together with detailed conduct of the seminar and lists of ideas. The innovation process is discussed in detail.
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Distribution list

European Commission	Emilio Davila Gonzalez Wolfgang Höfs
ROADIDEA partners	E-mail list www.roadidea.eu

Executive Summary

Innovation processes of the ROADIDEA project are mainly based on futures research methodologies Futures Workshop and Charrette as explained by the WFUNA (World Federation of the United Nations Associations) Millennium Project. The processes will be continuous based on digital communication methods, with two major innovation seminars, which both include at least two-day sessions. The first innovation seminar was held on 12-13 May 2008 in Prague. There were altogether 36 participants in the seminar including 3 members of the Steering Committee and the Coordinator of another INFSO project.

Preparations for the second innovation seminar included a survey of the state of the art of the existing ideas and pilots. The questionnaire summarised various questions such as vision, obstacles, legal problems, data availability, exploitability, business opportunities, primary and secondary target customers, and plan for work in 2009. The Technical Committee was used as the platform to discuss the guidelines and futures scenarios up to 2030 to be used in the seminar. Several advance material in addition to these was sent to participants to study in April-May 2009.

The session 1 was introductory including briefings from the guest speakers. The session 2 of the seminar discussed the state-of-the-art of the existing ideas and pilots in three (randomly selected) groups and plenary. The work for the remaining 10 months was discussed. In the session 3 the main session 4 was introduced, the alternative futures for 2030 discussed (prepared by the Millennium Project in 2008). The tasks of the session 4 were discussed at the preparatory Pub Session that was conducted in 9 small groups. In the final session 4 of Free Radicals, the three groups (grouping was done through random sampling) conducted a futures workshop under three alternative world scenarios. These scenarios were: 1) Business as Usual (not used in the seminar), 2) Environmental Backlash, 3) High-Tech Economy - Technology Push and 4) Political Turmoil.

The futures workshop used brainstorming in three groups and two evaluation cycles to find 5 best ideas as radical as possible for the future in 2030. There were 13 ideas shortlisted and evaluated. The five best of these (in order of preference) are:

- **Semi-public transport** Service production & support systems of advanced private & public transport services
- **DYNAMOBI** Cooperative dynamic navigation, multimodal and scalable
- **No-man driving** Autonomous driving
- **Waste to energy** Bio-waste used as energy for cars
- **TRAWORK** Travelling on offices - working on transport

The evaluation of both ideas and the innovation procedures will be conducted in the work package 8. It will suffice here to quote Chief Evaluator's report: "...the Dubrovnik seminar was conducted on a very high professional level." (Kumpula 2009)

All material is presented as public documents in web site www.roadidea.eu. The 5 best ideas are also opened for interaction using wiki software.

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1. PURPOSE AND BACKGROUND

The seminar was held in Dubrovnik, Croatia, in a beach hotel called Neptune. The premises included a spacious meeting room where all three groups could work with ease. The lunch and coffee breaks were held in a large patio, which proved to be an ideal place for the Pub session as well. The weather was sunny and warm as expected. It was important to have frequent possibility to do work outside in the open air, since the fine spring weather was cherished by all.

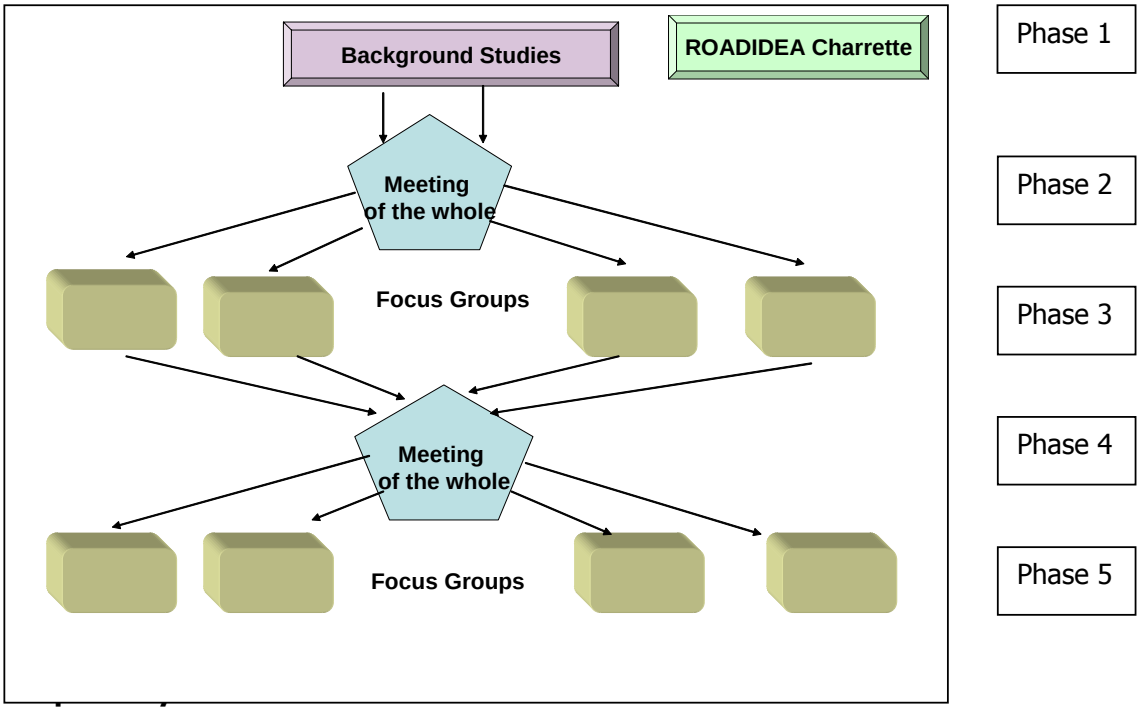
Dubrovnik

The participants of the innovation seminar consisted of 24 members in the ROADIDEA consortium partners and 8 other partners who represented parallel projects, Steering Committee and one industrial designer acting as the chief evaluator. Most of the consortium partners had attended the first seminar and thus the methodologies used were familiar to them (annex 10).

1.1 Methodology

The methodology consisted of Charrette Method and Futures Workshop. This seminar was the Phase 4 of the Charrette (for detailed explanation of the methodology, see Deliverable D5.1 Plan for Innovation Procedures in ROADIDEA).

Figure 1: The Charrette Method Outline



The preparatory actions included finding a suitable meeting premises, purchasing the tools for brainstorming and preparing guidelines for participants and other Read-Me materials concerning the agenda, methods, guidelines, the existing ideas and pilots and the futures scenarios for 2030. The Croatian partner's proposition to hold the seminar in Dubrovnik was well received and good conference site was found. The tools for brainstorming consist of flip papers, multicoloured post-its (pink for group leaders, yellow, green and orange for alternative scenarios), multi-coloured felt-tip pens and 15 heart stickers for each participant.

In addition, the TC members were trained to conduct a synectics session (this was done in the Teolo -TC meeting in March 2009). The synectics method was not applied in the seminar as such, but the training helped the TC members to act as group leaders conducting the brainstorming work. From the TC there were six members acting as group leaders in sessions 2 and 4, and nine TC members in Pub Session.

The advance reading material "Read-Me's" consisted of the following documents:

1. Existing Ideas Collection with Discussions (annex 1). This material consists of the contents of the idea wikis (explanation of the ideas, and discussions).
2. The state of the art of existing ideas and pilots as summarised by IDEAteams for discussion in the session 2 (annex 7).
3. Guidelines for participants (annex 2) and guidance for group leaders (annex 3).
4. Scenario Material of Four Alternative Worlds in 2030 (annex 4). This contains a shortened version of the actual document (Glenn & Gordon 2008), and explanation of scenarios and wild cards.
5. Seminar Agenda (as is given in this chapter. The annex 5 contains the implemented final agenda that is the updated version presenting what actually happened).
6. Apel, Heino (2004) *Future Workshop*, http://www.die-bonn.de/esprid/dokumente/doc-2004/apel04_02.pdf (This explains the futures workshop idea and practice)
7. INNOVATION (2007) *Innovation Process: Diversion and Conversion of Ideas. The Jazz of Innovation. 29 Obstacles To Innovation*. (This highlights the process of innovation in general). http://www.1000ventures.com/business_guide/im_knowledge_idea.html#IP
8. Hiltunen, Elina (2007) *Where Do Future-oriented People Find Weak Signals?* FFRC eBook 2/2007. Finland Futures Research Centre, Turku School of Economics. 40 s. http://www.tukkk.fi/tutu/julkaisut/e_julkaisut/Sources%20for%20weak%20signals-%20Hiltunen_2007-2_3.pdf (Elina Hiltunen has worked as futures expert for Nokia and is now focusing on consulting and her dissertation on the same subject.)

While conducting the preparatory actions and constructing the reading material there were three questionnaires conducted among the TC (the technical committee) member and appointed IDEA teams as follows:

- to IDEAteams and TC: summary of the state of the art of existing ideas and pilots, their primary and secondary target groups and WP's where they have been discussed or applied. This was the main item in the session 2 (results in annex 7).

- to TC: Public transport problems/questions (initially from 3rd preliminary idea of DoW) - not applied as such but inserted in the thinking of the alternative worlds for 2030.

- to TC: Discussing the 13 sets of alternative future scenarios for selecting the three alternative worlds for 2030. The innovation manager selected the scenarios of the Millennium Project as the framework for the session 4.

1.2 Seminar Programme

The planned final agenda of the 2nd Innovation Seminar is presented in the following table. The implemented agenda, however, was somewhat revised as was pertinent due to the time spent in various sessions (annex 5).

Table 1. Planned Final Agenda

Day 14 May	**Sessions**	**Session form**	**Content**
9.00 – 12.00 Chair Pirkko S. *Incl. 20 min coffee break*	Session 1 Introduction	plenary	- Pirkko Saarikivi: Seminar introduction - Emilio Davila-Gonzalez: "Greetings from the European Commission" ***** - Risto Kulmala: "Intelligent vehicle and infrastructure systems -eSafety and EasyWay" - Ivan Fencl: "How to make transport in the future more safe?" - Peter Jesty: "Introduction to the European ITS Framework (FRAME) Architecture" - Jaime Martens: "Ideas in environmental sensor development for road and traffic administration" - Pekka Kumpula: "Sustainable and user-centric innovations" - Auli Keskinen: Seminar sessions introductions
12.00 – 13.00	Lunch		briefing with group leaders 12.45-13.00 Jörgen Bogren, Jörg Dubbert, Armi Vilkman, Lulu Hyvätti, Rene Kelpin, Auli Keskinen, Hanne Lindqvist, Pertti Nurmi, Matti Roine, Pirkko Saarikivi
13.00 – 15.30 Chair Matti R. *Incl. 20 min coffee break*	Session 2 State of the art of the existing ideas and pilots	3 groups & plenary	Notice revised groups! Presentation and discussion on the existing ideas and pilots. Listings of further actions for years 2009 - 2010 Plenary summary
15.30 - 16.00 Chair Auli K.	Session 3 introduction to pub session	plenary	Introduction to Free Radicals session Presentation of the three pre-selected futures scenarios: World 1, World 2 and World 3: World1=green, World2=yellow, World3=orange, group leaders= pink
16.00 - 18.00	Pub Session preparation for session 4	free grouping (groups of 4-5 people) *outdoors*	Free Radicals session start: Free group discussion on futures scenarios, basic assumptions and wild cards. Choosing the group membership for session 4. Invited TC members as group leaders. At the end, material to Pirkko, Lulu, Auli (revising the groups for session 4, basic assumptions and wild cards)
20.00	Dinner		19.00 start
Day 15 May			
9.00 – 12.00 *coffee available*	Session 4 Free Radicals	3 groups	Brainstorming group sessions under Road Traffic in Europe in 2030 - Information Products and Services in three different futures worlds Notice groups! two leaders per group.
12.00 – 13.00	Lunch		
13.00 – 14.00	Session 4 continues	3 groups	Brainstorming continues: grouping, naming, short-listing of 5 best ideas in each world. Each idea on separate flip-paper, attach to plenary room.
14.00 - 15.30 Chair Matti R. *coffee available*	Evaluation of Innovation Aspects	plenary	15 short-listed ideas: one supplementary cycle (add and study), one evaluation cycle (give hearts: 3, 2 and 1), ideas evaluated using "evaluation table" (group leaders), calculate hearts: short-list of 5
15.30 - 17.00 Chair Pirkko S.	Summary Session	plenary	Results of the seminar- 5 best ideas are presented (Auli). Closing of seminar, further actions for 2009-2010,financial and managerial questions

* did not attend

1.3 Seminar Tasks in Detail

Three TC members (Coordinator, Financial Manager and Innovation Manager) had organised the premises and working materials the day before the seminar. Large copies of group information sheets and flip papers were attached to the wall of the room well in advance. The agenda, list of participants and other relevant material was available at the door when the participants arrived. The heart stickers, felt-tip pens and post-its were handed out when due. The Chief Evaluator was present all the time and participated in brainstorming.

The first session consisted of introduction and guest talks. Other sessions were conducted in three groups (sessions 2 and 4), in nine groups (Pub session) and in plenary whenever the summarising of the group work was at hand.

The processes in sessions are explained in the table 2.

Table 2. Processes in Seminar sessions: Futures Workshop

Brainstorming	Ideas are created by individuals and groups. First individual ideas are presented (some of these may be pre-planned) then ideas are discussed and new ideas will arise from "riding" on existing ones.
Grouping and Naming	Ideas are grouped - if ideas are close to each others then these are combined. Grouping generally adds new ideas to be born. After grouping, the ideas are given illustrative names
Cycling	Group work results are attached to flip papers and all participants walk around these with two tasks: 1) reading, commenting and forming opinion about the "goodness" of the idea 2) attaching hearts according to the person's preferences.
Deliberative Evaluation	Evaluating ideas means giving them "hearts" according to individual preferences after having deliberated with other participants

Roles of participants and their tasks: guidance for participants, guidelines for group leaders (annex 2 and 3).

The participants could be divided in three: 1) consortium participants attending the seminar and brainstorming using their individual expertise, i.e. their "tacit knowledge", 2) six of the TC members who were trained to conduct brainstorming sessions acting as group leaders, but they also attended to the brainstorming, and 3) invited guests who exercised outsider approach making questions and comments and participated also in the actual brainstorming work. In addition, a group of TC members and outside guests conducted a group evaluation of the five best ideas under the leadership of the Chief Evaluator using the Evaluation Table (annex 9).

2. RESULTS OF THE SEMINAR

2.1 Session 1: Introduction

In session 1, the invited quests presented brief introductions to their work that has connections to ROADIDEA work. In addition, the Coordinator and the Innovation Manager gave seminar and session work introductions. The power-point material of these talks is publicly available in the ROADIDEA web site.

The speakers were:

- Pirkko Saarikivi: Seminar introduction
- Risto Kulmala: "Intelligent vehicle and infrastructure systems -eSafety and EasyWay"
- Ivan Fencl: "How to make transport in the future more safe?"
- Peter Jesty: "Introduction to the European ITS Framework (FRAME) Architecture"
- Jaime Martens: "Ideas in environmental sensor development for road and traffic administration"
- Pekka Kumpula: "Sustainable and user-centric innovations"
- Auli Keskinen: Seminar sessions introductions

2.2 Session 2: State of the art of the existing ideas and pilots

The work in session 2 was started in three groups with two group leaders in each (see annex 2). The existing ideas and pilots (that were the result of the first innovation seminar and under development work during the time period between the two innovation seminars) were summarised in three tables. The information in the tables (see annex 7) was collected and completed by the IDEAteams (a questionnaire conducted during preparatory actions period).

The grouping of participants was done by simple random sampling (in actual fact this was easily done by appointing people to the groups from the alphabetic order). The result is random in many points: nationality, friendship, expertise, age and gender.

The main results of the group work focused on the state of the art of the ideas and pilots and the work to be done in the next Charrette phase 5 (the next 10 months or so). The results are summarised in the three tables below (table 3, table 4 and table 5). For further details, see annex 7.

Table 3. Summary of Ideas Work to be done in 2009 Part I

IDEA	**Cross-border weather alerts**, location based systems	**Mobile phones as sensors,** mobile sensor data acquisition	**MyRoute** mobile pocket guide, route selection information while planning	**MyTravel** Toilet Tom-Tom, updating info while travelling	**In-vehicle information** on speed, traffic and road condition	**EUROADMAP** weather databases; sponsor-based business model
To be done in 2009	Collaboration between Sweden and Finland continues Other parallel projects explained, e.g. METEORISK (Alpine collaboration project), www.meteoalarm.eu, Viking, Projects of SIRWEC partners	Finland and Germany situation will be covered 2009 (Armi Vilkman from Destia, Rene Kelpin from DLR) Many companies covering this at the moment, but overview will be given anyway.	Proposal for system operational architecture can be studied (WP4)	Proposal for system operational architecture can be studied (WP4)	12 month report on current situation	WP2 will continue data source investigation, collaboration between WP3 and WP2 are needed.

Table 4. Summary of Ideas Work to be done in 2009 Part II

IDEA	**PULP FRICTION** friction models; rwis & weather & maintenance	**EYEAR** Road eye; friction data collection & transmission	**Traffic forecast models**	**PORT** port-related traffic modelling see PORT pilot	**FREE-DATA** free geospatial and weather data	**RTFM** better & tailored user interfaces; regard personal needs	**STAY-HOME** effects of staying home instead of travelling
To be done in 2009	Pilot will continue, lot of work there, see Friction pilot	Close follow-up of other parallel projects See also Pulp Friction	Study if possible other pilots in the future. Destia vs. Semcon-Caran of how to present Gothenburg Pilot	possible further studies?	Basic study done and documented (also EU), no future actions	Follow-up of current parallel projects	Basic study done and documented, no future actions

Table 5. Summary of Pilots Work to be done in 2009

PILOT	Friction	Gothenburg	Fog	Port
To be done in 2009	Testing improvements Future need, salt effects on the road …. model has great potential for future development Mobile interface in the future possible. Is there a possibility to measure light in the future?	1: The code source problem needs to be solved 2: Operational problems need to be solved (who is doing what, who pays?) "Innovative aspect in this is how to open a platform for developers (Destia) maybe an extranet service, but it is impossible that the platform owner is doing the developing work." eFRAME project results can be used in further planning	Target: Hourly charts, first result in November Internet, mobile phones or maybe automatic SMS messages in 2009 More development with algorithm and the problems, forecasting model development later Combined signals studied	Difficulties to get data Progress is slow but sure; is long time idea that will be developed in the future, good changes for future project

2.3 Session 3: Introduction to Pub session, Pub session

Introduction to Pub session

The Pub session was tested in the first innovation seminar. In general, such an ad-hoc type of innovation forum was seen to be beneficial. In the second seminar the discussions were given more guidance and time which proved to be a functional solution.

In the Pub session, self-organised small groups (4-5 people) lead by group leaders from session 2 enforced by other TC members - altogether 9 group leaders - the grouping for session 4 Free Radicals (annex 3), basic assumptions and wild cards were discussed.

Pub session

The basic assumptions and wild cards for 2030 were suggested to be as in table 6 (for further explanation of wild cards, see annex 4). The other item to discuss was the advance grouping done for the session 4. The participants could discuss the grouping and present their view if they thought that they would like to change the group. Finally, no participants indicated a need of change the grouping.

Table 6. Basic Assumptions and Wild Cards in 2030

Basic Assumptions 2030 (similar to Megatrends)	Wild Cards aka Weak Signals 2030
Galileo system or some such available People on earth 8-10 Billion: 5 B in cities, 3-4 B rural Climate change situation worse Economic slow down and great variances Ecological immigration worse and global	Pandemics Sweet water scarcity Superconducting in low temperatures solved Bioterrorism Nuclear disaster Life on an exoplanet

In the following there are some highlights to be reported that came up in the pub session discussions.

- Public transport is a real alternative fro individual transportation
- Also flying? (are the cars in future also flying?)
- Fuel production from biomasses
- Every public transport has a toilet!
- Biomass -> fuel: every house is a "petrol station" (i.e. the fuel could be detracted from the human and other biomass at every household)
- Energy storage? Wireless energy transmission (it could be possible to transfer electricity wirelessly - efforts have already been successful in laboratories)
- Weather: better monitoring -> better and reliable forecast (computer performance and data standardised) (this is a wish that has been around "forever")
- Problems in world 2030 could include:
  - megacities - special traffic problems
  - population hot spots (India & China)
  - food production for Europe and big cities (solution Europa: Green land?) (food production is in crisis because of diminishing arable land)
- Flying cars (not using street at the ground)
  - ground road network reserved for emergency & delivery
  - ground network well illuminated
  - ground for growing food and fuel plants
- Challenges for the future:
  - 3 dimensional traffic navigation models - possible?
  - emerging solutions for covered (underground) road network - totally new approaches to road network development
- Galileo satellite (specific for specific purposes) - the European counterpart for GPS is under way becoming reality
- Radar equipped cars -> no collisions! (very possible development)
- Self driving not necessary (-> playground for drivers) (experiments currently under way)
- Pay as you drive, pay as much as you drive! New principles...
- Knowledge transfer from developed to developing countries - an opportunity
- Driver license buy luxury and expensive -> go to public transport - this might be a consequence of the dramatic measures to abate climate change

Coffee Break

Pub Session

2.4 Session 4: Free Radicals

In the beginning of the session the Innovation Manager held a plenary briefing focusing on futures thinking and the chosen scenarios. The basic understanding of futures research needed more guidance - this was evident even after the first innovation seminar - therefore it was necessary to introduce the ontology and paradigm of the discipline even though there was ample material disseminated concerning this (annex 4). The participants were also briefed through the guidelines before the seminar (annex 2)

The grouping for the three brainstorming groups was based on simple random sampling. Each group was allocated two group leaders (members of TC), who also were briefed through prior guidance (annex 3) and a training session on synectics method. After the session all flip papers containing evaluation information (collection of hearts and ranking) were photographed for documenting. These photos are also available in the ROADIDEA website.

Alternative futures used in the futures workshop of Free Radicals were scenarios for 2030 (annex 4). The scenarios are the result of global networked Delphi research work executed by the Millennium Project. The Millennium Project is the most renowned and globally rewarded knowledge base creator on alternative futures images, trends and signals. The project was started by the American Council to the United Nation's University in 1997. Ten years later it moved over to work under WFUNA. The work of the project is continuously based on a wide global network of thousands of experts in all disciplines. More detailed information of this global futures knowledge creator can be found in www.millennium-project.org. Finland through its Futures Research Centre is one of the most active nodes of the network representing Nordic countries.

The four scenarios describe four different worlds for 2030. The first scenario is deemed as impossible since it would mean that the world would continue "business-as-usual" and that would is a disaster scenario, which will not be taken into account. It is, however, interesting and educative to study, what can happen if the global community will not improve its ways. The scenarios were as follows (table 7):

Table 7. Millennium Scenarios for 2030 (Millennium Project 2008)

Scenario 1: Business as Usual—The Skeptic	**Scenario 2. Environmental Backlash**
Moderate growth in technological breakthroughs Moderate environmental movement impacts Moderate economic growth Moderate changes in geopolitics and war/peace/terrorism	Moderate growth in technological breakthroughs High environmental movement impacts Moderate economic growth Moderate changes in geopolitics and war/peace/ terrorism
Scenario 3: High-tech Economy – Technology Pushes Off the Limits	**Scenario 4. Political Turmoil**
High growth in technological breakthroughs Low environmental movement impacts High economic growth Few changes in geopolitics and war/peace/terrorism	Moderate growth in technological breakthroughs Low environmental movement impacts Moderate/low economic growth Major changes in geopolitics and war/peace/terrorism

The participants were divided into three randomly sampled groups (see annex 6). Each group was allocated one of the three scenarios (Worlds 2, 3 and 4) as the operational environment for the innovation work. The groups resulted to altogether 13 ideas (see annex 8), out of which 5 best were evaluated using futures workshop method (brainstorming cycles). In addition, the overall conditions of the futures alternative worlds were discussed, and additional wild cards were discovered (further explanation of wild cards, see annex 4).

Brainstorming in Groups

Many interesting additional wild cards were also discussed. These can be used as starting points for further brainstorming by asking: If this would happen what would its effect of traffic, transport and information service needs be? These wild cards are:

- Key low volume material becomes unavailable - e.g. rare earth!
- Russia will join the EU
- Global supply chains will be forcefully maintained by major powers (and used as political leverage)
- No war zones - No US - No NATO
- Virtual reality becomes mainstream
- Cluster living - no need for car
- Flexibility at work and traffic - home office means less traffic - tax reduction could promote this, changing of influences to traffic - working time, holidays
- CEBRA - central brain ref. "Matrix"
- Tax incentives (Society's stick and carrot!)

2.5 Evaluation of Ideas

Evaluation of the ideas was carried out by using two-step brainstorming cycle. In the first cycle the 13 ideas that were created during the Free Radicals session were scanned by each individual participant. The participants circulated the flip papers presenting the idea, formed an opinion on these and made additional comments if feasible. Deliberation among participants was encouraged during the cycle.

Picture 1:
Heart stickers

In the second cycle each participant was allocated 15 heart stickers to be used as evaluation points (see picture 1). The hearts were attached to the ideas as follows: Three hearts to an excellent idea, two to a a good idea and one to a potential/acceptable idea. Then, the total number of hearts of each idea was calculated and a short-list of five best ideas (i.e. the more hearts the better idea) was formed (see section 2.6).

In addition, evaluation of the ideas and the innovation process are done in work package 8 and reported in Deliverable D8.3 (see chapter 3).

Examples of brainstorming areas, results of group work and evaluation cycles is shown in the picture 2:

Picture 2: Examples of group work results on flip papers and evaluation by "giving hearts"

2.6 The Five Best Ideas

In the following there are the five best ideas described in the order of preference. For details, see annex 8. The sixth best was, however, also evaluated by the group and is found as the last additional short-listed idea.

1. Semi-public transport *Service production & support systems of advanced private public transport services* (55 points)

The basic understanding of the idea is that in future, best travel services are in public transport units. Personal cars are not allowed for fancy nomadic devices, buses, trains. Car-pool vans will have all fancy services. The service production and support systems of advanced private public transport services has been developed taking into account security and safety services.

There will be 3-dimensional (taxi) traffic navigation. Radar-based collision avoidance systems are implemented in vehicles. Autonomous driving is common. There also may be flying taxis that follow the road networks.

Car sharing will be based on electronic vehicles. Accurate travel and travel time information to make best choice will be commonly available. Personal travel device service (rent) is ready to be used on (large) public transport stations. There also may be some kind of relaxing system as service in the vehicles. Comfort on-demand at a price!

2. DYNAMOBI *Cooperative dynamic navigation, multimodal and scalable* (52 points)

DYNAMOBI service system is based on navigation services that are easy to use, multimodal, modular, and scalable. Navigation guides the user to his/her destination. The user just points at the target in digital map or gives the name by keyboard or speech. The multimodality includes all transport modes, also walking, cycling, rollerblading, skiing etc. The scalability means that all travel distances can be combined: from a town or city to a country to continent to the globe.

The service system is modular utilising local and regional traffic network models in a grid. The models react to incidents and congestion immediately, predicting their duration and impact on the network (recurring congestion nationally built in) thus being dynamic. The cooperation is ensured by users with the system who get individual guidance, which will depend on how the other users are behaving and following the guidance so that in case of too many rerouting to the same route, a part is guided to the next alternative, etc. (relying on users being positioned when needed or prompted by user query). There will also be travel related booking and payment services.

3. No-man driving *Autonomous driving (43 points)*

If there is no person physically driving the car it is called Autonomous Driving. Then it is important to know who is actually driving, i.e. who is responsible of the act. It can also be that some type of semiautonomous driving is an option: a combination of physical driver and computer-aided system (either in the car or in the infrastructure). It is evident that travel time is radically shorter in the case of autonomous driving. It is important that there are good systems for e.g. speed control.

It is important to test the reactions of the car (how well the car can function). The driving wheel could have a heart beat monitor and other life indicators, thus ensuring to avoid bad drivers: drunken, old, sick, young (risky drivers!).

The speed control can be done by cameras using a black box in the car. The "outside" signals coming from infrastructure might do the speed regulation, behaviour control, witnessing the happenings on the road and in the car, driving in the background all the time and recommending breaks, mandatory overnights etc.

Increasing the perception of risk with acoustic design of vehicle and acoustic risk indication features could be developed. Systems can be developed to avoid also adverse and bad weather driving, and intelligent road condition monitoring. The liability questions must be solved, too.

4. Waste to energy *Bio-waste used as energy for cars (42 points)*

If bio-waste were into packed tubes they could be used as an energy source later in the cars. Also biogas (& methane) from waste can be used as fuel. There could be bio-waste collection service and people may have tax refunds through producing bio-waste for energy production. A stand-alone bus "fuelling" from bio-waste could be developed.

Biomass power plants and car battery charging in-house could be developed thus forming the independent energy demand & supply cycle. Dense network of fuel stations with different fuels including changeable accumulators (batteries) could be established and even give possibility to leave your waste for bio-energy production!

Geobacteria have already been harnessed to produce electricity from human and other type of bio-waste in the laboratory. The IT systems development is naturally needed for organising and maintaining these processes.

5. TRAWORK *Travelling on offices - working on transport (41 points)*

The idea is to have virtual offices, actually perhaps "office-on-demand"!
Travelling on offices and thus working on transport is already possible; e.g. using laptop on fast speeding trains and even have internet connections has been developed.

Office-on-demand rental company could be a business idea. There could also be service for shopping while working. Targeted transport services for companies (working during journey) are needed, as will as fluent "rent a vehicle" and taxi services. This means that there should be WAN everywhere (web services).

Daily activities & travelling management and optimisation services together with dynamic incident-based traffic network management & services systems are needed. This implies also new thinking in creating new business models. Traffic forecasting during incident duration with impacts would also be an asset.

6. LEGO-BLOCK TRANSPORT *Intelligent modular structures (39 points)*

The cars parts (cabin, engine, wheels) should be modular as lego-blocks, and super light weight vehicle be cheap or as status expensive. Modular car trains are possible. Wind shade for better aerodynamics of cars are needed. Small sizing as a trend - slot time plan would mean better routes, high speed travel possible, and lower fuel consumption.

3. QUALITY ASSESSMENT

Lessons Learned

Lessons learned from the first innovation seminar were taken into account when planning the second. The most important of these were as follows (table 8).

Table 8. Lessons learned from the 1st innovation seminar and the revisions

Item to be revised	Revision
Number of outsiders	Out of 33 participants there were finally 8 (about a quarter) invited guests (outsiders).
Writing the post-its (big enough text for a group to read)	Use felt-tip pens and CAPITAL LETTERS always when writing on post-its or flip papers!
What are weak signals aka wild cards? (improving understanding on the issue)	New material has been disseminated to participants explaining the wild cards. These were also discussed in session 3.
Speaking time allocation (some participants had problems getting their view across)	Respect equal opportunities!
Group leaders / advisers needed (this was apparent)	Two group leaders (except for Pub session where there were 9 leaders *in toto*) using pink post-it's and having coloured name tags.

These issues were well covered in the second innovation seminar. Lessons learned from this second innovation seminar include mostly understanding of the evaluation work in a new way using a chief evaluator - a complete outsider of the substantial domains of ROADIDEA - but a skilled design expert and using an evaluation table which especially concentrates on the evaluation of innovation aspects.

Risks and Mitigation

The stated risks in the DoW concerned the quality of the ideas and the innovation aspects in general. The risks were found to be minor in the second innovation seminar thanks to the improvements established. The risks and their mitigations are as follows (table 9).

Table 9. Risks and Mitigation

Risks	Mitigation
Futures seminars do not provide new, potential transport service ideas.	Invited experts and users to Steering Committee and the sessions of seminars open to public ensure adequate basis for ideas based on real user needs. Well-known systematic methods are used in the innovation process. The participants included 8 outside experts representing various expertises (see annex 10).
New ideas are too futuristic to implement and evaluate.	Radical innovations that are not yet technically feasible will be accepted as examples in the general Roadmap.

The innovation aspects are covered in the respective work package 8: Validation and Evaluation. The Chief Evaluator's report will be attached in the D8.3 as an annex. Here it is important to mention that the Chief Evaluator has the opinion that "the team sizes in the seminar were generally too large." It is indeed true that the ideal size would be 4-6 but there will always be time constrains and other practical limitations that hinder the

establishment of ideals. This is however, a point to be taken seriously in any coming futures workshop. Another point of Chief Evaluator's report refers to the quality of team members. In an international collaboration project like ROADIDEA it is practically impossible to select the team members any further - they are as they were adopted as partners in the consortium. Having additional experts and quests is another way around this "shortage" which is the way how this innovation seminar was improved (Kumpula 2009).

Overall Evaluation

The next table 10 presents the summary of the six best ideas that were evaluated by the group using the Evaluation Table. The highest scores are highlighted.

Table 10. Evaluation of Innovation Aspects of the Six Best Ideas

Innovation Aspects and Factor Values	**IDEA 1 Semi-public trans-port**	**IDEA 2 DYNA-MOBI**	**IDEA 3 No-man driving**	**IDEA 5 TRA-WORK**	**IDEA 6 Lego block trans-port**
New or innovative/existence of a new element 0=the idea exists and is on the market already, 1= similar services on the market but idea has some new aspects, 2= completely new idea not known to be implemented, 3= completely new idea not known to be developed anywhere, 4= revolutionary and radical new idea	2	3	1	2	3
Relation to the state-of-the-art 0=no added value, 1= unclear added value, 2=minor added value, 3=large added value, 4=revolutionary	3	3	3	2	3
Scale and potential impact of the idea 0=no foreseen impact, 1=small scale innovation, small impact, 2=small scale innovation, large impact, 3=large scale innovation, small impact, 4=large scale innovation, large impact	3	**4**	2	2	**4**
Potential for multiple use 0= does not solve known problems, 1=solutions for a single problem, 2=solutions for a few deployment cases, 3=solutions for many similar deployment cases, 4= revolutionary new solution with multitude of potential deployment sectors	3	**4**	**4**	3	3
Relevance to global policy objectives 0=no clear contribution or idea politically not accepted, 1=low contribution, 2=average contribution with usual impact, 3=clear strong contribution to sustainable development, strong impact, 4= revolutionary new concept solving key problems in society	3	3	3	3	3
Feasibility of the concept/obstacle to implementation 0=idea hard to implement in general, 1=idea hard to implement in the short run, 2=idea can be implemented with an average effort and risk, 3=idea easy to implement, 4=industry will compete on this idea for quick implementation	1	1	1	2	0
Relevance for business generation 0=no business opportunity foreseen, 1=unclear business case, some potential maybe in the future, 2=clear business case today, but small market, 3= clear business case, large market, 4=killer application, large market	2,3	**4**	3	3	3
Public interest 0=no public interest in the idea, 1= some public interest, 2=clear public interest, but no business case, 3= clear public interest with business case, 4= public will go wild with this idea	**4**	3	1	3	3,**4**

Note: IDEA 4 Waste to Energy was not evaluated because of lack of necessary knowledge.

In summary, complete evaluation of the ideas and the innovation process are done in work package 8 and reported in Deliverable D8.3. The evaluation will include:

- the results of the evaluation done through the two brainstorming cycles in the second innovation seminar
- the results of the quest artist's (Chief Evaluator Pekka Kumpula) evaluation (Kumpula 2009)
- evaluation of the innovation aspects of the short-listed ideas from both first and second innovation seminars are evaluated by using the Evaluation Table (see annex 9)

In general, it shall suffice here to quote Chief Evaluator's report: "...the Dubrovnik seminar was conducted on a very high professional level."

4. CONCLUSIONS

The participants of the innovation seminar consisted of 24 members in the ROADIDEA consortium partners and 8 other partners who represented parallel projects, Steering Committee and one industrial designer acting as the chief evaluator.

Results of the second innovation seminar include user input and output from the guests, results from innovation procedures and a selection of five ideas to be further studied under the remaining time frame of the project. In the order of preferences of the participants, the five best ideas are:

- **Semi-public transport** Service production & support systems of advanced private & public transport services (1.)
- **DYNAMOBI** Cooperative dynamic navigation, multimodal and scalable (2.)
- **No-man driving** Autonomous driving (3.)
- **Waste to energy** Bio-waste used as energy for cars (4.)
- **TRAWORK** Travelling on offices - working on transport (5.)

In addition, the innovation procedures run much smoother and productive than in the first seminar. This will give good ground for establishing an "ROADIDEA Innovation Model" as needed for the final report. The items of this model can be outlined as including: futures workshop with interdisciplinary random group work and plenary evaluation cycles, self-organised ad-hoc sessions (pub, walking etc.), synectics sessions, short-listing and group evaluation.

The evaluation will be fully reported in the deliverable D8.3 of work package 8.

Further Actions

The main target of ROADIDEA is to study the overall innovation potential of European transport services, and especially analyse the barriers for their further exploitation. In this respect the seminar provided ample material for studies and for the first pilot product development phase. Especially, the material gained in the second innovation seminar will be used in preparing the final Road Map.

The ROADIDEA innovation methodology of Charrette Model and Futures Workshop will be followed as was indicated in deliverable D5.1. Following the Charrette Model this seminar was the phase 4 (one before the final stage: for detailed explanation of the model, see Deliverable D5.1. Plan for Innovation Procedures in ROADIDEA). The final phase 5 will consist of further studies done in the Work Packages (Focus Groups) through the remaining time period of the ROADIDEA project.

All seminar material will be available to consortium partners and made public on ROADIDEA web site www.roadidea.eu. Each idea is assigned to a wiki software in order to facilitate collaboration with outside experts.

The existing ideas (i.e. the ideas produced by the first innovation seminar) will be further studied according to the plan indicated in the chapter 2.2.

The new 5 best ideas have been allocated for a small IDEAteam to take care of the further work. The IDEAteam that is responsible for studying the new ideas has the following tasks:

Đurđica Marković (Meteo-Info d.o.o.) will take care off finding relevant information on the state of the art of the new ideas and is responsible producing the report for the final Road Map. Rene Kelpin (DLR) will study the idea: Semi-Public Transport data needs, Matti Roine (VTT) will investigate the implications of the new ideas for the service development, and Marcus Wigan (Demis) will write a paper about the seminar for information dissemination purposes.

References

D5.1 Plan for Innovation Procedures in ROADIDEA (M4)

D5.2 Results of the First Innovation Seminar (M8)

Kumpula, Pekka (2009), *Evaluation report of the ROADIDEA 2nd Innovation Seminar Dubrovnik 14 to 15.5.2009,* ROADIDEA Deliverable D8.3 Report on the Validation and Evaluation Results (M24)

Literature:

Apel, Heino (2004), *Future Workshop,*
http://www.die-bonn.de/esprid/dokumente/doc-2004/apel04_02.pdf

Coffman, Bryan S (1997), *Weak Signal® Research*, MG Taylor Corporation,
http://www.mgtaylor.com/mgtaylor/jotm/winter97/wsrintro.htm

EU Directorate-General for Research (2002), *Practical Guide to Regional Foresight in the UNITED KINGDOM*, EUR 20478, Brussels, 2002,http://foretech.online.bg/docs/CGRF.pdf

Future Search Network (2007), *Future Search Methodology*, 4700 Wissahickon Ave, Suite 126 Philadelphia PA 19144, ttp://www.futuresearch.net/method/methodology/index.cfm

Gell-Mann, Murray (1995), *Introduction. Complexity*, Vol. 1, no.1, John Wiley et Sons,
http://www.scribd.com/doc/7887206/COMPLEXITY-by-Murray-Gell-Mann

Glenn, Jerome C & Gordon, Theodore J (2003), *Futures Research Methodology*, V2.0,
Millennium Project WFUNA, http://www.millennium-project.org/millennium/FRM-v2.html

Glenn, Jerome & Gordon, Theodore (2008), *State of the Future 2008*, WFUNA Millennium Project, Annual Report, Chapter 3.6, www.millennium-project.org

Hiltunen, Elina (2007), *Where Do Future-oriented People Find Weak Signals?* FFRC eBook 2/2007. Finland Futures Research Centre, Turku School of Economics. 40 s.
http://www.tse.fi/FI/yksikot/erillislaitokset/tutu/Documents/publications/eTutu_2007-2.pdf

INNOVATION (2007),
http://www.1000ventures.com/business_guide/im_knowledge_idea.html#IP

Keskinen, Auli & Aaltonen, Mika & Mitleton-Kelly, Eve (2003), *Organisational Complexity. Foreword by Stuart Kauffman.* FFRC Publications, 6/2003, Finland Futures Research Centre, Turku School of Economics, Helsinki, 81 p.
http://www.tse.fi/FI/yksikot/erillislaitokset/tutu/Documents/publications/tutu_2003-6.pdf

Mitleton-Kelly, Eve (2007), *Addressing Apparently Intractable Problems: In-depth Analysis to Understand Multiple Underlying Conditions in a Problem Space,* International Conference on Complex Systems, Oct 28 – Nov 2, 2007, Boston, MA,
http://knowledgetoday.org/wiki/index.php/ICCS07/137

Annex 1 Existing Ideas Collection with Discussions

ROADIDEA IDEAS COLLECTION FROM 1INNOSEM AND SUBSEQUENT DEVELOPMENT THROUGH INTRAWIKIS

www.roadidea.eu

SUMMARISED ON M16 by Auli Keskinen

SERVICE IDEAS

1. CROSS BORDER WEATHER ALERTS

Cross border weather alerts, location-based systems

Vision: Localised on trip alerts about difficult weather conditions, setting the cooperation with national meteorological institutes

2. MOBILE PHONES AS SENSORS

Mobile sensor data acquisition

Vision: Pre and on-trip traffic information service, Nokia's mobile millennium most famous case (more info http://www.traffic.berkeley.edu) also existing systems in many places in Europe.

3. MyRoute, MOBILE POCKET GUIDEBOOK

My Route Mobile Pocket Guide is a system for providing travel information and updates over a mobile network. It gives the traveller / driver comprehensive real time traffic information needed for well-informed travel decisions (pre-trip information) as well as information during the journey (on-trip).

As described at the seminar:

- Personalised combination of routing and route selection driving conditions information from various sources (weather, traffic, ecological and economic and multimodal transport choices, including location info) delivered through mobile phone and internet, "green routing", "info while planning"

Description

My Route Mobile Pocket Guide is a system for providing travel information and updates over a mobile network. It gives the traveller / driver comprehensive real time traffic information needed for well-informed travel decisions (pre-trip information) as well as information during the journey (on-trip).

There are many ways to get traffic information (Internet, Teletext, TV, radio). But the information the traveller can get from those services usually are:

- either already out of date by the time driver gets them or can actually use them,
- it's passive information that's often irrelevant to traveller's personal route
- most of these services only cover parts of the highway network,
- delays are given in kilometres instead of minutes, thus the driver / traveller still has no idea how long the delay would be

Combining real-time information about events (incidents, accidents, construction sites, etc), real-time information about traffic conditions, information about traffic forecast (potential road traffic conditions), travel time information, speed limit information, weather information and available parking and rest areas, it would support the traveller in finding the best, the most efficient and safest way to reach wished destination. It would influence the modal choice, route selection and the time of departure as well as contribute to the reduction of incidents and emissions from vehicles.

The first part of the service is its **pre-trip part**, which enables user to choose the best route according to the driver's criteria such as: quickest, shortest, environmentally most friendly, avoiding toll roads and congestion charge areas, by required arrival time etc. It also inform the driver about traffic signs, prohibited manoeuvres, vehicle restrictions, points of interest, tourist information, speed camera data and much more on the chosen route.

The second part of the service is its **on-trip part**, which enables user to stay informed and in control when he / she's on the road. Whenever some significant situation occurs on the chosen rout, by using voice messaging alert system, My Route Mobile Pocket Guide service will inform the driver of a new situation and suggest the smartest possible action in order to achieve required arrival time and budget.

My Route Mobile Pocket Guide is suitable as much for people (private drivers) as for businesses. It can be used in the field of transport, urban planning end economics, by policymakers and consultants dealing with mobility issues, by authorities dealing with traffic flow, it could supply traffic information to (local) governments.

Technical approach

Implementation of **My Route Mobile Pocket Guide** requires at least further elements:

- Easily accessible application with road map of assigned area (town, region, country, cross - border)
- Central database system (traffic and weather; current and forecasted) with update function and the search function providing information along a specified route and connected to an SMS alert centre
- The GPS receiver with Bluetooth technology to ensure the best possible reception wherever the driver / traveller goes
- Subscription model to information flow

Geographical scope

My Route Mobile Pocket Guide is suitable as well for long distance journeys as for daily commuting, and applicable in local, regional and national as well as European level. The level itself depends directly on the Central database system scope.

Data Needs

Full realization of My Route Mobil Pocket Guide idea mostly depends on combination of current and forecasted traffic and weather data. There is a need for both, temporal and spatial data coverage. Raw known data can't be used directly – data fusion or integration is necessary as well as value adding aggregation.

Data for pre-trip part of the service are mostly spatial. Database should include:

- Road selection: road, highway, roads with no toll, roads with no congestion charges;
- Route selection: shortest, quickest, cheapest, environmentally most friendly, safest;
- Resting places selection: position, purpose, size, working time
- Travel time information
- Weather and traffic forecast data

Real-time data or on-trip data are mostly temporally:

- Real-time weather data
- Weather nowcasting data
- Traffic real-time data
- Traffic nowcasting data including "breaking news data"

Pre-trip data should be modified and corrected during the trip by fresh real-time data or "breaking news data" – information about incident events on the route like car crash caused jam or similar.

Such service requires permanent communication between personal communication device (cellular phone for example) and Central database which could be local or regional. Communication frequency should be in minutes or Central base should have information about all users in its region and send fresh information including "breaking news" when they occur.

Some real-time data could be "two-way" data, means that device collects some data from vehicle sensor and sends to Central database. But, such activity has some legal problems which should be solved in advance.

Route Rainfall Prediction Demo

As a demonstration of the kind of pre-trip service discussed here, there now is an operational ROADIDEA web site for a Route Rainfall Prediction in Holland.
http://www3.demis.nl/roadideaplanner/. It uses rainfall prediction 1 by 1 km grid data up to hours ahead to prediction the amount of rainfall given a certain departure time. This kind of prediction is important for road exposed to the weather, such as bicyclists, motor cyclists, scooter drivers and pedestrians. More information on this demo can be found here.

DISCUSSION

Marcus Wigan (DEMIS): the most advanced mobile phones (iMate, N95, iPhone) have GPS built in plus good application programming interfaces-- this would suggest that targeting these devices and their built in capacities would be worthwhile, as they are all at the top end of the price scale, and thus owned by people possibly more likely to pay for extra facilities.

Mikko Tarkiainen (VTT):
Here is briefly about the products and services that are already on the market.
Real-time traffic information is also available for Personal Navigation Devices (PND) via Traffic Message Channel (TMC) and connected PNDs via GPRS connection. Mobile navigation (smart phones) applications get real time traffic info via GPRS (e.g. Nokia Maps http://europe.nokia.com/A4984203).

User can get real time traffic and weather alerts on time to navigators (via TMC or GPRS) and real time traffic information should be up-to-date. Traffic and weather alerts are provided for selected route in the PND or mobile navigator. Only problem is, if user has not set the destination into navigator (e.g. when commuting on familiar route). Traffic information usually covers mainly highway network, but e.g. in Finland incidents are reported and included into traffic information from all roads. Navigators (e.g. Tomtom) provides estimated delay times for incidents. Tomtom HD Traffic receives up-to-date traffic information in every 3 minutes and utilises it in route calculation (http://www.tomtom.com/services/service.php?id=2).

Real time traffic information providers combine information from various sources: E.g. Destia provides up-to-date information on incidents, accidents, congestion, major road works, dangerous road surface conditions etc. Predictive traffic information is already available e.g. from INRIX (http://www.inrix.com/), TrafficCast International, Journey Dynamics etc. based on combination of vehicle probe-based road speed profiles and the modelling metadata such as planned events, weather, vehicle type and driving behaviour.

Tomtom IQ Routes and Navteq Traffic optimise routing based on information about real average speeds (historical data) on roads and speed limits (better than only speed limit information) (http://www.tomtom.com/page/iq-routes). Speed limit information is also available via PNDs based on information from road/map database or speed limit sign recognition with camera. Japanese multi-modal navigation provider NAVITIME has launched service also in Europe, which provides (multi-modal), including walking, driving, and a variety of public transportation methods, both PC and mobile application and CO2 emission data (http://www.navitime.com/mobile/userguide/index.act). Google Maps provides routing for drivers and public transport users (http://www.google.com/transit) on www-pages and also on mobile (http://www.google.com/mobile/default/maps-transit.html).

There is no reason to implement new application for this idea as there are already similar products on the market (connected PNDs and smart phone navigation applications. Of course these products and services are not "ready" and there is lot of development needed before all functions are usable and provides value added information that user really needs. It is hard to find any new innovation from the general description of this idea and we should look into several years ahead. Innovations might be found in user needs of specific user groups?

Anyway, there is lot of stuff already available and this area is developing fast.

4. MyTravel, TOILET-TOMTOM

My Travel Toilet Tom-Tom service is offered to all drivers and travellers. It gives a driver / traveller the possibility to find information on availability of toilets along a planned

route, with particular impact on places for disabled persons and mothers with small children. It could also give the driver / traveller possibility to check the other resting possibilities at chosen place.

As described at the seminar:

- Personalised updating information while driving on selected route from various sources (weather, traffic, gasoline stations, shopping centres, etc. including location info) delivered through mobile phones, road signs, audio, text and images, "green driving", "info while driving"

Description

My Travel Toilet Tom-Tom service is offered to all drivers and travellers. It gives a driver / traveller the possibility to find information on availability of toilets along a planned route, with particular impact on places for disabled persons and mothers with small children. It could also give the driver / traveller possibility to check the other resting possibilities at chosen place. Although My Travel Toilet Tom-Tom idea could seem a little bit frivolous, the service will have impact on the state of mind of the driver, and thus reduce driver's nervousness, inattentiveness, uneasiness, and so reduce the risk of incidents. My Travel Toilet Tom-Tom could be integrated in some other Tom-Tom applications regarding travel planning.

Technical approach

Tom-Tom mobility solutions offer their users possibility to deal with many mobility issues at lower cost and without need for a complex implementation to carry out.

Implementation of My Travel toilet Tom-Tom idea requires at least further elements:

- Easily accessible application with road map of assigned area (town, region, country... cross - border)
- Database with all available toilets / resting facilities along the assigned area with update function and the search function providing information on available toilets / resting facilities along a specified route
- The GPS receiver with Bluetooth technology to eliminate the need for connecting cables and a high performance GPS antenna to ensure the best possible reception wherever the driver / traveller goes
- Subscription model to information flow

Geographical scope

My Travel Toilet Tom-Tom service's assignment is mostly local and regional. But, as a part of some other Tom-Tom services, it can be used even more widely.

Data Needs

There is a need for spatial data coverage for the application which would be used for potential My Travel Toilet Tom-Tom service. Database should consist of facilities by further categorization:

- by position
- by purpose
- by size
- by working time

Raw known data can be used directly, but has to be updated regularly.

Links

TomTomFree - POI
http://www.tomtomfree.com/singlePOIfile.htm

TomTom - Public Toilet information for Australia,
http://tomtom.gps-data-team.com/bulk_poi.php

DISCUSSION

Mikko Tarkiainen: PNDs and mobile navigation applications provides already well established functions for local and on-route search for Point Of Interests (POI) and facilities such as restaurants, petrol stations etc. that also have toilets. Information about Public toilets and more accurate information about toilets in other facilities could be included into the POI list of a navigator as done in Australia and UK.
http://www.poifriend.com/category.php?id=14450

5. IN-VEHICLE INFORMATION

Invehicle information about speed, road condition and traffic situation

Vision: On-trip driver supporting systems / information, existing services (navigators as old and mobile phones as new media)

6. EUROADMAP

European road weather databases using sponsor-based business model

Description:

European road weather databases using sponsor-based business model.

The pilot is aimed at the very heterogeneous field of given road weather data in Europe. The availability of road weather data ranges from well described, free available and intensively applied data sets in Scandinavia or Germany to non existent data sets in some east-European countries.

While for Scandinavian countries as Finland and Sweden a reliable knowledge of the road conditions derived from road weather information is very important not only in the winter season, the necessity for daily road weather information in central and south European countries seems to be negligible. However, not only northern European countries may increase road safety by using accurate and actual road weather information. Also for instance strong wind regions as the Croatian east-Adriatic coast or alpine regions in the Alp's countries could use road weather information for forecasting road conditions more

intensively. There are multiple areas in Europe that have exceptional weather conditions that need to be taken into account by road users.

First of all the pilot needs a thorough European wide investigation of available road weather data sets, their formats, and utilizations. Measurement devices and communication technologies have to be considered as well as the quality and reliability of measured weather data. For this purpose a contribution of all ROADIDEA project members is needed. The ROADIDEA WP2 data source investigation methodology can be adapted and used for this first step of the pilot implementation. By and large the necessary data is there, at least for problematic regions but the problem is with integration and distribution. For example, the TEMPO-programme has reported a substantial increase in coverage of traveller information services (traffic situation via internet, VMS, RDS-TMC) in Europe during the recent years.

In order to give a European wide overview of existing road weather data a general format has to be designed, which allows storing all data sets in one EUROADMAP data base. This overview is to be done on a web site, which accesses the mentioned data base and which could be use as a trading platform as well.

In order to carry this out, a business case need to be pointed out so that wide-coverage distributors, such as BBC and similar global information service enterprises could work as integrators. This is already today done for weather information services and a similar business case needs to be addressed.

A similar approach was followed in the EU research project Track&Trade, in which vehicle probe data from taxi fleets (FCD) was investigated, visualized on a web site in traffic state maps and traded directly. A business model has been developed which included different aggregation levels of the raw data and different billing models accordingly.

The EUROADMAP pilot might follow the Track&Trade example directly.

A special challenge in case of EUROADMAP is the merging of overlapping road weather data sets with inconsistent attributes and values, i.e. coverage overlappings of two neighbour weather stations with different formats at inner-European borders. For the project run time of ROADIDEA a visualization of available road weather data sets all over Europe would be reasonable. This includes the data set investigation, a format consideration, a data base implementation as well as the visualization on a web site. The web site could link to existing web applications (DESTIA) based on the visualized road weather data sets.

Big information services companies should be contacted and the business case should be inquired and made explicit. A demonstration should be interesting to them.

Data Needs

During the ROADIDEA data source investigation a couple of **road weather data** as well as **grid weather data** was identified and described. This data is needed from the ROADIDEA platform. As described above a further investigation of available road weather data has to be performed. These data sets are to be stored in the ROADIDEA data base as well and are to be provided for the EUROADMAP pilot, too.

In practice, there needs to be an access to **national road authorities' (or their service providers') road weather data bases** and integrate this information on digital map information.

Technical approach

The following technical components are needed for the pilot:

- data base
- web server with data base and map interfaces

Only standardized communication channels are to be used. Data base accesses using SQL commands. The web site communication (only visualization) is to be established via the HTTP protocol.

It is recommended to use the ROADIDEA platform (includes at least a data base as well as a web server) for this pilot.

Geographical scope

The geographical scope could be

- 'bilateral' between selected two countries on specific road stretches
- a corridor–specific, e.g. Trans-Alpine routes, or Adriatic coastal corridor or based on Euro-regional division as in EasyWay project.

Other necessary steps

For demonstration purpose, the access to road weather data, which is a combination of road data from road authorities and weather data available now globe-wide, would be sufficient.

For real business case, there must be the 'integrator' and 'distributor' of road weather information. For professional services, such as drivers of large transport companies, the companies themselves could act as a client to integrators and distributors who in turn could be SME service providers, targeting their services to dedicated segments of professional users that have willingness to pay for the services.

In consumer market, i.e. the ordinary road users in their passenger cars, the distributors and integrators must be larger entities, precisely as it is today for global weather information provision. This is done for free just because it provides an access to offer these consumers other types of services.

7. EYEAR

Road Eye: friction data collection and transmission (acoustic, optical, invehicle etc.)

Description

The idea

The idea is centred on friction data collection and transmission. It is supposed to improve the detection of road friction data by introducing measurements based on floating vehicles. In this sense, EYEAR is a form of an extended floating car data detection technology. The vehicle is used to carry optical friction sensors and brake sensors which detect the degree of the local friction on the road.

a) Combined with the GPS-position, it would be possible to detect road sections which low friction values and – based on this – to generate a map-based overview of temporarily dangerous road sections and respective warning messages which can be distributed to the road users as a service and to road maintenance staff as an improved basis for taking counter-actions like salt spraying or snow ploughing.

b) Based on car-to-car communication, a vehicle which detects low friction values could inform the immediately following vehicles and warn the driver of the hazard.

Technical approach
The friction data need to be location referenced (GPS) and transferred from the sensors to the onboard unit of the vehicle via the CAN-bus system of the vehicle.

Approach a)
In order to implement such an application, a fleet of a larger size (5% of all vehicles in the network) need to be equipped with friction sensors, on-board units and data communication. A quick data transmission to a central computer system is needed in order to be able to process the friction data sets from several vehicles in order to generation warning messages to the general road user via information services and road maintenance information to the road authorities. For this, a larger vehicle fleet is necessary.

Approach b)
Using car-to-car information technology, messages about slipperiness could be given from one car to the other by short-range communication. If one car detects a slippery road section, the warning message could be given to the following vehicles. This requires the equipment of cars by respective intelligent on-board computers and a reliable short-range communication.

Geographical scope
The application is relevant in all countries, but with a stronger focus on countries with harder winter weather conditions (e.g. in Northern Europe).

Data Needs

The application needs to detect the following data:
- measured friction values from single vehicles
- vehicle positions

Approach a): It is necessary to equip a larger fleet of vehicles in order to obtain a good geographical coverage and to guarantee a high credibility and quality of the database.
Those vehicle fleets should be preferred which often operate in the area in question and which have a digital mobile data communication method on board which allows a low-cost data communication procedure.

The application could be improved by predicted friction values coming from models.

The application generates location-referenced warning messages on slippery roads due to adverse weather conditions (ice, snow, rain). The messages are sent as information content to service providers and road managers.

Approach b): The data needs are in principle the same. However, the application can already be used by a few vehicles. The idea concentrates on local warnings within a group of vehicles. Data need to be transferred reliably on a short-range communication line.

DISCUSSION

Pertti Nurmi:

I think you quite nicely packaged the EYERAR concept in your email of yesterday. I recall that EYEAR originated within our group (#4) at the innovation seminar. As a matter of fact, I have a feeling that the name EYEAR came from my (mixed) head. Whether this is an innovative idea at all is maybe questionable or at least speculative. You know, we have been involved at least in two projects where we have actually already elaborated these issues quite extensively.

(i) COLDPSOTS Project: We studied problematic local road weather phenomena and features with a purpose to try to improve the present road weather model. For this, we carried out mobile temperature and friction measurements along specific highways in Finland in addition to analyzing known static features along these highways (like road topography, closeness to lakes etc). The mobile measurements revealed valuable information about prevailing (and changing) driving conditions (in the form of friction <-> slipperiness) along the roads, when the more traditional fixed road weather station network could provide only spot-wise information. This project was actually managed by and carried thru with Pirkko Saarikivi/Foreca. A continuation idea might be e.g. to have mobile instrumentation installed on route buses or trucks which typically follow same specific routes enabling collection of huge amounts of information for later analysis (Ilkka Juga produced this idea at our seminar). This would of course require a whole lot of elaboration involving collaboration with bus/track etc companies.

(ii) CARLINK Project: Here the goal was to develop an intelligent wireless traffic service platform between cars supported with wireless transceivers beside the roads/highways and also lower capacity connection directly between cars and a Traffic Service Central Unit. The project has been carried thru with collaborators from Luxembourg and Spain. For obvious reasons, our application has been road weather, i.e. weather observations and forecasts form the information which is being transmitted car-to-car. We had a pilot study testing the system components along the major Helsinki-Turku highway late last September.

EYEAR, as we see it, could on the one hand be seen like a combination/continuation of COLDSPOTS-CARLINK ideology and on the other hand could perhaps be, simply, encompassed within the Pulp Friction pilot idea.

Pirkko Saarikivi:
Thank you for the summary, Jörg! Pertti already mentioned the only thing which I recalled missing: the equipment (whatever) could be mounted on vehicles using regular

routes, another example in the countryside is milk collecting trucks. The challenge remains in measuring equipment that is small and cheap enough. Of course the slipperiness warning signals generated today are valuable, too, though not giving quantitative values.

MODELLING IDEAS

8. PULP FRICTION

Friction model: combined with RWIS and weather and maintenance activities

What's new:
• Mobile measurements (see below)
http://www.roadidea.eu/community/wikis/Innovations/Mobile%20measurements.aspx
• Photos see link and see link. Photos can be freely used in the ROADIDEA project.
• Mobile measurements: data available (see Mobile measurements)
• Mobile measurements: analyzed results (see Mobile measurements)

The description of the "Pulp Friction" pilot
Finnish road weather observation network consists of about 475 stations (situation in November 2008). 90 of those stations are new types of optical sensors which give an estimation of prevailing friction on the surface, too. The road weather station network provides good monitoring system for road maintenance personnel as well as meteorologists. There is several road weather products developed which help monitoring the road weather.

In the road weather warning service, which is operated by FMI and Finnish Road Administration together, the road conditions are divided into three categories: normal, bad and very bad road conditions. There is a link between friction and road conditions: friction above 0.3 means normal road conditions, friction 0.15…0.3 bad road conditions and friction below 0.15 is linked to very bad road conditions (by Yrjö Pilli-Sihvola, Finnish Road Administration, see table 1). Estimated friction data from road weather stations is not included to the weather warning service system so far, but in the Pulp Friction pilot the usability will be studied.

The Pulp Friction pilot is mainly considering of road weather and friction. FMI will do two separate studies. On the first research the relationship between observed friction value and the classified road condition will be studied. In this pilot FMI is evaluating the road classification criteria against the "subjective" value for road conditions given by the personnel in the Road Monitoring Centre of Finnish Road Administration (and also against other RWIS data). If the results look good we could have a more automated analysis of road conditions based on friction measurements.

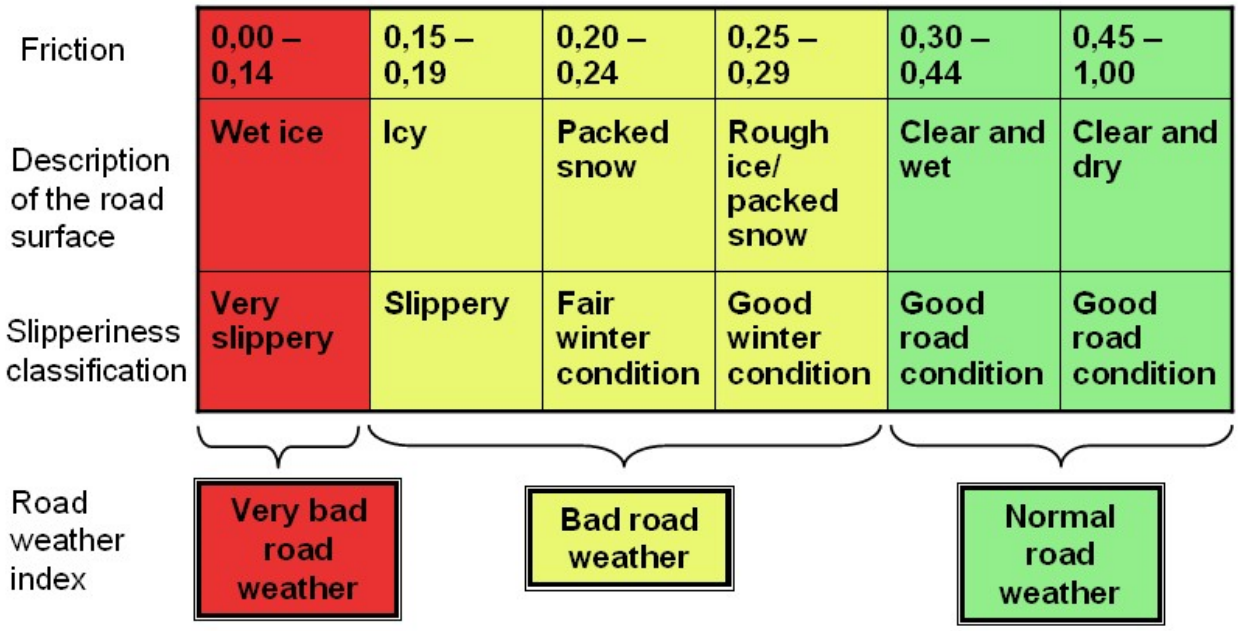


Figure 1: Correlation between friction, description of the road surface, slipperiness classification and road weather index.

The main idea of the other research is to study the correlation between road condition and road weather observation and create a friction model based on that information. The friction model could do an estimation of prevailing friction based on prevailing and past road weather observation and weather. Also, the friction model can predict the coming friction based on the forecasted road weather model data. The friction model will probably be part of FMI's existing road weather model.

The needed input data is road weather observations (including friction observations) and road weather models inputs and outputs. FMI's road weather model is an operative product already, so it won't need any new inputs. Road weather classification indexes for last winter are compared to the prevailing friction value and the connection between those values will be studies. The road weather classification index data is stored in FMI for previous winters.

The outcomes of these two separates studies will be aimed for the road maintenance personnel and meteorologist to help monitoring prevailing road weather and to estimate the prevailing and forecasted road weather. Also, some products based on friction or processed friction can be developed for driver.

See also Mobile measurements on winter 2009 (MOBILE MEASUREMENTS) below.

What have been done

Road weather observations from winter 2007-2008 have been collected and analyzed. Also, observations from previous winter 2008-2009 have been collected and they are waiting for analyzing.

Status of the pilot

Statistical analysis of the road weather observations has been done and correlations between observed friction and other road weather parameters have been found. FMI's road weather model has been developed so that friction is included to the model and predicted friction is now a new output of the model.

Next step: Parameters, including e.g. predicted friction, road surface temperature and state of the road, will be delivered to Destia's platform via ftp.

Later: Another friction parameter will be developed and tested. In this case the value of friction will be based on the deduction.

Links

- Road weather stations with optical sensors in Finland (link):

- Finnish Meteorological Institute: warnings
- Finnish Road Administration: RWS-observations
- Weather warnings in Europe: Meteoalarm

Mobile measurements on winter 2009

Vaisala DST and DSC measurement devices are available for Pulp Friction pilot. Devices can be installed on the roof of car using Thule roof racks.
Measurement system contains:

- Vaisala DST (surface temperature, air temperature(?), dew point(?), relative humidity(?)
- Vaisala DSC (friction information, thickness of water, snow and ice layer on the surface)
- GPS receiver (position of the vehicle)
- Cables to the computer

Measurements are stored while driving so values can be studied afterwards. Also, measurements from the nearby or passed by road weather stations can be collected and compared to the mobile measurements.

Measurements will take place mainly on Utti region on a highway 6 during January and February (and March if needed). Depending on the weather measurements can be done also in the coastal area (for example on Hamina region) or inland region (more north).

Interesting cases:

- Measurements before and after road maintenance action (salting)
- Special road sites, like ramps and crossings
- Slippery conditions (icing, snowfall, freezing rain)
- "Normal conditions" (below zero or around zero temperatures and no precipitation)
- Measurements on a short road portion several times after each other

Measurement cases:

Monday 2nd February 2009
Installing the devices. Installing done, but no data coming to the computer. Problems with Windows Vista(?).

Wednesday 4th February 2009
New laptop (Windows XP) bought. Visiting Vaisala. Devices start to work fine and the measurements can start. Driving and collecting data from Vaisala (Vantaa) to Ruoholahti (Helsinki).

Friday 6th February 2009
First real test day. Driving to Tampere and touring around Tampere region. Measuring all the time. Also, VTT's iCor measurement device in the car in Tampere region. Devices work fine, the only problem is air temperature, which seems to be incorrect. Weather dry and cloudy. Temperature around -5 C.

Photos taken during measurement campaigns.

Monday - Tuesday 9th - 10th February 2009
Driving to Kouvola and measuring all the time. Measuring several times on the central area and on the highway 6 between Kouvola and Utti during day, evening and morning (see route on Google maps). Again problems with air temperature, otherwise values are good.

Cloudy weather on Monday, fog on Tuesday morning. Temperature below zero. Temperature during the night not as cold as expected (because of formed fog).

In the end of February
Several measurements made by Pirkko. More details later.

Monday 2nd March
Note: The surface temperature meter has been broken :(
We thought it was the air temperature meter which was broken but it really was the surface temperature meter. Too bad, but what can you do. New instrument installed.

Tuesday - Wednesday 3rd - 4th March 2009
SRIS/Roadidea expedition in Finland with Semcon.

Driving to Kouvola with Semcon. Several measurement cases in Kouvola during Tue evening and Wed morning. Driving back to Helsinki on Wed around noon.

Weather on Tuesday very bad: snowing and roads were very slippery and icy. Roads

already in better condition on Wednesday. Temperature was between -2 and -5 C Degrees.

We were lucky and managed to measure case "before and after salting"!! Photos taken during our measurement campaign.

Data and a presentation of mobile measurement campaign are available.

9. TRAFFIC FORECAST MODELS

Traffic forecast models

Pekka Leviäkangas summarises the recent discussions on traffic forecast models in ROADIDEA as follows:

Models - traffic, weather, road conditions, pavements, bridges, etc. - produce a lot of different types of information and so far we have mainly listed data sources by considering data bases or data banks. However, these models run by road administrations or affiliated organisations produce information that in a way could be regarded as public information. The information from models could well serve as a basis for new innovative services. Hence, the model discussion was very relevant in ROADIDEA context. Basically, we would need a similar analysis, as we did for data bases and real-time sensor networks, regarding various models. This is probably out of the scope in such extent, but could still be considered in a number of places in this project.

I think it was also concluded in the discussion that ROADIDEA will not develop new models for traffic forecasting or weather forecasting or such, but it could well contribute to existing models by providing innovative additional components, sub-models, value-adding integrated models, etc. This falls natural within the scope of ROADIDEA. WP2, WP3, and WP4 could all contribute to this. I see the greatest role for WP3, which is about methods and modelling.

The current Task Allocation Plan (the excel sheet with more detailed task descriptions and partner roles) does not explicitly exclude this possibility, but neither does it support it directly. But good ideas should not be suppressed by project bureaucracy. Particularly so in this project.

Marcus Wigan observes that:

While we will not develop new models for traffic flow(we do not have the resources and there is a good choice out there already) we DO have to take advantage of available information to synthesise specific user services.. and this may be done both from a combination of sensor inputs and other data feeds- and also by using traffic flow models (maybe short run time series kinds) as part of the data fusion process.

Bayesian updating is one such technique and is very much in the RoadIdea frame. As RoadIdea is concerned with user services- and thus fairly short term estimation horizons- the more sophisticated data fusion approaches exemplified by those described(and downloadable from) www.opus-project.org are probably also excluded as they run rather slowly.. but- if anyone wishes to examine these methods, the entire source code in Open Source and available.. if it is not all on the site specified, I can arrange it be...

The data flows and sources for traffic data are beginning to become standardised in many countries. the ADUS committee of the US TRb has produced both a US ASTM Standard on ITS data, and also is monitoring the practical results of efforts to work to it (there is a session at TRB2009 on this alone). Here are links for the current activity.

Quality Control Procedures for Archived Operations Traffic Data: Synthesis of Practice and Recommendations
<http://www.fhwa.dot.gov/policy/ohpi/reports/qcproc/index.htm>www.fhwa.dot.gov/policy/ohpi/reports/qcproc/index.htm

The publication has been posted and listed on the ADUS page:
<http://www.fhwa.dot.gov/policy/ohpi/travel/adus.htm>www.fhwa.dot.gov/policy/ohpi/travel/adus.htm

Drawn from the ADUS committee circulations(im on ADUS)
The role of extending Standards (WP29, TUV,ASTMS, ISO...) offers notable leverage of anything we come up with.

10. PORT

Port-related traffic modelling

Vision: The pilot idea argues that there is a correlation between the ship arrivals/ departures at the container terminals and the generated road container traffic. After a certain delay time for container handling at the terminal a certain share of containers appears as road container traffic. A model is required which predicts the incoming and outgoing container trucks at a terminal gate in a certain time span depending on the knowledge on the pattern of the container ship arrivals/ departures.

If this prediction has been made, it shall be determined how the generated road container traffic originating/ or coming to the different container terminals mixes with the overall traffic on the roads from and to the port. This will than deliver conclusions on the road traffic situation.

There is information about the container ship movement in the port. This information comes from information databases of the port authority and from the port IT service provider from different information services. It is known how many containers are brought and picked up by container vessels. Also the container destinations/origins in the hinterland are known.

There are also figures about road traffic on the access roads to/from the port. Data is available from the Port Authority and DAKOSY (IT Service Provider). The procurement and assessment of data needs time. It cannot yet be determined whether the available data is useful and whether other data is needed. A process model is needed asap which determines the interdependencies in the transport of containers.

There is the problem that data is available in the hands of private service providers who might want give it only against payments, private service providers might want to negotiate if other service platforms/ providers come into the game, container transport data is private and confidential

DISCUSSION

Jörg Dubbert wrote on 21 Nov 2008:

Dear colleagues,

Today and yesterday I had two meetings with a) Hamburg Port Authority and b) DAKOSY (the Hamburg Port IT Service Operator).

Here comes a brief report:
a) Meeting with Hamburg Port Authority (HPA):

I have discussed the information flows and the data sources. HPA have received the WP2 questionnaires for data source identification. The first reaction was that maybe not all information can be given in such a detailed way. Several questionnaires would need to be filled for a variety of data sets. HPA has data sets about ship arrivals/departures, data about the land-modes and the road traffic situation. HPA will collect the information for relevant available source as far as currently possible.

JD (Pöyry) presented a first process chart which illustrates the container transport processes and the aims of the pilot. He will try to described the technical idea in further detail. The container transport process in the port regions must be analysed. The modelling of the container transport processes need more investigation and description. The innovative problem will be how to combine data from different data sources and to build a model for the prediction of the road traffic situation. The description of the processes is not yet so detailed that the Destia WP6 questionnaire could be filled.

The aim of the model would be:

To predict the road traffic situation in the port road network based on the knowledge of ship arrivals/departures.

It will became relevant to keep confidentiality about data as it is data about private customers.

HPA will provide data samples and studies.

HPA would be interested in taking part in the second innovation seminar, provided
- they are invited and the travel costs are borne by ROADIDEA,
- it is guaranteed that port logistics is a signification topic at the event, and the idea can be push forward significantly.

JD will revise the technical description of the application.

It was commented that DAKOSY probably could contribute significantly to the application. So a detailed discussion with DAKOSY it very important.

A next meeting is foreseen for the beginning of January 2009.

Meeting with DAKOSY:DAKOSY have also received the questionnaires, but had not yet the time to analyse them. There will certainly be relevant data in the IT Services TRUCKSTATION, ZAPPS, SHIPS and other.

DAKOSY will be ready for another meeting not before 9 December.

DAKOSY gave first comments on the overview chart and advised that road transport moves are also triggered by container stuffing and stripping companies, container depots and container transfers from terminal to terminal. This must be reflected in the model.

JD asked to put aside discussions about the commercial value of the data at the moment and to focus on the technical development.

GENERAL DEVELOPMENT IDEAS

11. FREEDATA

Free geospatial and weather data

The idea

Free Data is the first and according the seminar participants, most popular of the three general ideas that were short-listed for further study after the First ROADIDEA Innovations Seminar. This idea is not suggesting a new service as such, but a new general data policy that would affect many present and coming transport services in Europe. In principle, Free Data indicates that key data sources for transport services - i.e. weather observations and models, road weather observations and models, traffic volume data, car measurements and other geospatial data - should be accessible and available free of charge (or with minimum copying costs) and in a convenient manner for any service provider for further utilisation. These various data sources may be from public or private sources. In the following, these both alternatives are considered.

In the US and Japan, open and unrestricted data policy is a part of everyday life, resulting in very fast product development and much wider variety of information services and number of companies providing the services. In Europe, investments in production of Public Sector Information (PSI) are about half of what they are in the US, but the economic value using this information is only 20% compared to the US market. Several studies have indicated that the restrictive data policy in Europe is the main barrier and reason for this huge gap. European Commission has reacted to this fact by developing several Directives, which in theory support open data policy. Directive on the public access to Environmental information (1990, revised 2003), Directive on the re-use of Public Sector Information (2002, just now under revision), and the INSPIRE Directive (2006) are examples of Directives giving legal guidelines on the re-use of e.g. weather information.

However, in practice nothing much has happened. Weather information is still in most EU countries very expensive and for small SME weather service providers a strong barrier to entry to the market. Road weather information is in some countries (like in Finland) available free of charge, but in most countries it is governed by several public or private bodies and completely inaccessible. Map information is also still very expensive in Europe, though recently due to the American sources such as Google, free alternatives are now available and useful in some applications. There are also many private data

sources that would be very useful in developing new services, but that cannot be accessed even if one is willing to pay. Good examples are CAN-BUS output which various car manufacturers still keep as their confidential asset, and available to their own customers only.

The availability and pricing of other transport information varies considerable from country to country and in all cases requires contacts and contracts with the source. There is now centralised transport information server or portal in Europe. Compare with **Clarus-initiative** in the US: free web-based server for all road weather information! see http://www.clarusinitiative.org, integrated surface transportation weather observing, forecasting and data management system.

Technical approach

The data that is needed and that is useful in service innovations is the same, whether free or with a price. Thus the first step is to achieve the decrease in data prices through the advent of open data policy in all EU countries. There are some positive signs and decisions in some of the countries (the Netherlands, the UK, Spain and the non-EU country Norway), but the progress has been extremely slow in the past decade. In the new East-European EU countries, the effect to the overall situation has been unfortunately very negative.

But nevertheless, let us be optimistic. Sometimes in the future, Europe will also adopt open and unrestricted data policy. Transport service developers can afford to use several data sources and combine data in new innovative ways, and integrate new data to their existing services. Second major step will be implementing a European-wide data server for easy and efficient access to data. With present web technologies, it is a trivial task technically, but major effort politically and administratively. Here a concerted action from the European Commission is definitively needed.

Geographical scope

Free Data covers all geographical scales and entire Europe. Hopefully also the surrounding countries gradually adopt open data policy, such as in the US and Japan today, to allow global service solutions.

Data Needs

Free Data concept covers all data that is nowadays used and that will be used in the future. Realistically, some data, e.g. from private sources, may still have a price tag and licensing conditions. However, the necessary combination of reliable and comprehensive data set for a transport data provide should be available for a reasonable price, just like the PSI Directive already indicates.

DISSEMINATION INTERACTIONS

The price of data is a key factor determining the viability of many of the ideas and innovations with which ROADIDEA is concerned, and a lower or marginal cost would make may more realisable. This factor, price of data, needs to be part of the projection of the findings of ROADIDEA in the dissemination phase, as the cumulative impact of data pricing and the role in innovations support in opening it up, will then be apparent. Consequently FREEDATA is an underpinning for the Business Model evaluation stages.

DISCUSSION

Marcus Wigan: observation
There is increasing interest in many business and innovation communities in making raw weather and other data free at the end point to the end user. One way of handling this in Road Idea is to consider doing a business case demonstrating the utility of the EC adopting this approach. If this seems unlikely, the Free Our Data (geospatial community movement in the UK against the Ordnance Survey's controls and pricing and IP management), and a current Upper House Inquiry in Victoria Au where i live are both examples where the OECD evaluations of this as an economic benefit to the overall community and to innovations in particular are widely cited.

It is therefore worth looking at the impact and viability of services that add value to some level of base information being made fee at the end point(even if the EC pays for its production to those creating it)

Destia will have constructive views on this, but it is worth taking further as it is NOT a 'blue sky' proposal (the US Dept of Commerce continues to regard it as a competitive advantage for the USA).

12. RTFM

Better and tailored user-interfaces of text, image, audio, considering personal characteristics of users: language, disabilities, age, health, and other personal needs

1. Purpose

There are many different variables why better and tailored user-interfaces of text, image and audio are needed. Often these variables may function simultaneously. New ideas and innovations don't exist in a vacuum. In order to proceed from the state-of-the-art it is important to study these variables in their current context.

The structures of modern European societies are in a constant flux. Europe has to face several demographic challenges in the coming decades. The societies are ageing, the fertility rates are low and the life expectancy is getting higher and higher. At the same time a baby-boom generation is reaching retirement age. If the current development continues there will be a sizeable increase on the percentage of the EU's population ages over 65 years.[i]

According to resent study, with regard to ICT, the 50+ age group is more polarised than ever before: 47% have not computer access at home and 53% have not internet access. Compared to younger age groups the difference is noticeable. Also within the 50+ groups there is distinct correlation between age and the ICT usage level. The younger the person is the higher the usage. There are also other differentiating variables within the older age groups, such as socio-economic factors. It has proven that older people with disabilities or other functional impairment are less likely to use ICT and linked to socio-economic disadvantages this trend even more noticeable.[ii]

Disabilities and other functional impairments may hinder the usage of ICT devices. According to a study, on average 17% of all Europeans had somewhat limited and 6% of all Europeans had severely limited capabilities to carry out normal activities because of physical or mental health conditions during past six months. Limitations were common in particular amongst the older people. Of the studied respondents aged 85 and over, only quarter had not been limited at all in their activities past six months.[iii]

Within European single market area people, goods, services and money move as freely as within one country. Over 15 million EU citizens have moved to another EU country. Trade within the single market area has risen by 30% since 1992. All and all the single Market has increased the EU's prosperity by 2,15% of GDP.[iv] Besides the 23 official languages in Europe, there are over 200 different languages spoken in Europe. From 400 million living in Europe 60 million speaks other than the official language of the resident country. The multitude of different languages and the level of language proficiency is a real problem with user-interfaces. Many of the ICT device manuals are proven to be too long, poorly translated and impractical. The multitude of functions may stay unused because of the time and effort it takes to familiarize to an ICT device properly.

Due to the ongoing digitalization process there is a mass of information available. The challenge is how to manage the information overload. Also ICT devices are getting more and more complex and multifunctional. To get the full benefit from them often requires familiarization to the device. Even though there might be various reasons for having difficulties operating an ICT device, the need and the market for a better and tailored user-interfaces clearly exists.

2. State-of-the-art in Framework programs

There are several EU projects that studies the different aspects of user interfaces in a changing societies. FP7 Project ICESTARS (Integrated circuit/EM simulation and design technologies for advanced radio systems-on-chip) is a collaborative project that aims to design technologies for advanced radio systems-on-chip. The project has technologically oriented perspective.

FP7 Collaborative project NAPA-WINE (Integrated circuit/EM simulation and design technologies for advanced radio systems-on-chip) aims to analyze the massive deployment of IPTV platforms that will facilitate the change of paradigm of current TV broadcasting from mass TV towards personalized TV.

FP7 Intra-European Fellowships program INFERENCEHCI (Inference and machine learning methods in human-computer interaction) plans to constructing human-computer interaction interfaces that are more efficient, less fatiguing and more interesting to use.

FP7 Collaborative project 3DPHONE (All 3D Imaging phone) tries to develop technologies and core applications enabling a new level of mobile 3D experience. The project includes interface and application development.

FP6 Specific Targeted Research Project EIAO (European Internet accessibility observatory) wanted to improve access to Internet content for people with special need such as visual impairment or users accessing web content by mobile phones.

FP6 Specific Targeted Research Project ENABLE (A wearable system supporting services to enable elderly people to live well, independently and at ease) developed a personal, user-centred enabling system, with services, for use by an elderly person in or out of the house, to mitigate the effects of any disability and to increase the quality of life.

FP6 Integrated Project WINNER (Wireless World Initiative New Radio) worked towards enhancing the performance of mobile communication systems. The purpose was to make mobile communication systems more adaptable to user needs.

FP6 specific Targeted Research Project IM@GINE IT (Intelligent mobility agents, advanced positioning and mapping technologies integration interoperable multimodal, location based services).

3. Identifying different user-interfaces and their problems

Technological innovations have progressed towards digitalization, miniaturization and convergence of multifunctional and multimodal products.

Internet has evolved in several levels: innovations in technology, business models and communication have enabled a totally new level of cooperation between different user groups. At the same time the complexity of the information society has matured. Security and privacy issues have become an important factor to be considered.

Mobile and wireless technologies, services and devices have increased in EU area. The number of mobile phone subscriptions has increased almost fourteen times between 1996 and 2005 in the EU27.[v] According to the Eurobarometer survey 64.4 on the use of e-communications by households, mobile phone penetration rate is 80% among EU-25 households. [vi]

New innovations in user-interfaces are gaining Market awareness. GIS positioning based devices, motion sensor games and e-paper are just a few examples.

The problems that may arise from new innovations are much the same as in the ICT field in general such as security issues, user-interface problems, reliability and validity of the content and accessibility problems.

References

[i] http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-CD-07-001-SPOT/EN/KS-CD-07-001-SPOT-EN.PDF

[ii] Seniorwatch 2. Assessment of the Senior Market for ICT Progress and Developments Final Study Report. 2008.

[iii] Health and long-term care in the European Union. Special Eurobarometer. Report. 2007.

[iv] http://ec.europa.eu/internal_market/benefits_en.htm

[v]ttp://epp.eurostat.ec.europa.eu/pls/portal/docs/PAGE/PGP_PRD_CAT_PREREL/PGE_CAT_PREREL_YEAR_2007/PGE_CAT_PREREL_YEAR_2007_MONTH_11/3-27112007-EN-AP.PDF

[vi] http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-DY-07-001/EN/KS-DY-07-001-EN.PDF

13. STAYHOME

What are the effects of choosing staying home instead of choosing to travel a certain route?

STUDYING THE EFFECTS OF CHOOSING STAYING HOME INSTEAD OF CHOOSING TO TRAVEL A CERTAIN ROUTE

1. Purpose

Purpose of this document is to study the effects of choosing staying home instead of choosing to travel a certain route. On ROADIDEA innovation seminar in Budapest, one recurring idea and question was, what can be done to limit transport needs altogether? Is it possible to just stay home?

Transport policies involves a wide range of often contradictory requirements and variables such as safety, energy consumption, greenhouse gas emissions, air pollution, noise, infrastructure provision and maintenance to mention just a few. At the same time there is a growing need for better transport solutions caused by urban economic growth and the need for reducing GHG emissions. ROADIDEA project's main aim is to provide clean, safe and efficient mobility for people and goods using a user-rather than a technology-centered approach. In this paper the approach to the transport logistics is somewhat unorthodox, what are the effects of choosing staying home instead of choosing to travel a certain route?

Staying home may not be a realistic and viable alternative in most parts of Europe right now. In the light of current progress, the future from science fiction novels, where all divisions of life may be taken care from home is not so far away.

2. Staying home - multifunctional approach

Transport development has been one of the key drivers and facilitators for economic prosperity worldwide. At the same time the transport section is also significant contributor to GHG emissions. EU and North America dominate transport-sector emissions in the world and EU alone represents 19,2% of global transport emissions . While environment policies have managed to reduce overall emissions in EU, transport sector emissions keeps rising in the EU area, especially in the new EU states. [i] Both in EU and US the legislative framework has reacted to rising emissions by contributing tougher vehicle emission limits. It has been estimated that traffic related pollution costs Europe 1,7% of its GDP, approximately 160 billion Euros per year. Besides contributing

to GHG emissions and climate change, aerosol particles from the traffic have several other negative impacts. They may hinder the visibility in urban areas (smog), and also increase the overall level of airborne pollutants causing health problems. Several studies have shown that fine particles from the traffic correlates with mortality. [ii]

The most obvious and efficient way to reduce overall traffic is teleworking and working from home. However if the aim is to study the effects of staying home we must also consider all the different motivators and reason for travelling such as social, economic, political, cultural, religious and other possible reasons. Our daily routines may include numerous separate transport activities that vary according to personal needs.

2.1 Urbanisation

In the EU 74% of the total population lives in cities and towns with more than 5 000 inhabitants. [iii] City planning requires that services, shops etc. are well served via urban transport. Staying home instead of choosing to travel is only possible, if society's basic services are with in reach of every individual. Urbanisation is the inevitable requirement for efficient service clusters to form.

Urban living environment results several negative impacts on traffic. Noise pollution is getting worse, the number of traffic accidents is growing and traffic congestions are resulting more and more delays. Every year nearly 100 billion Euros (1% of EU's GDP) are lost due to problems caused by chronic congestions.[iv] As a reaction against urban living style there has been a current trend towards suburbanisation and urban sprawl. Suburbanisation on the other hand may lead to low-density, spatially segregated land use which results increased transport demands.

According to Kyoto Protocol under the United Nations Framework Convention on Climate Change, 128 countries agreed to reduce greenhouse gas emissions world wide by 8%. The EU managed to reduce it's emissions 2,9% between 1990-2002. Further on European leaders agreed on reduction of greenhouse gas emissions by at least 20% by 2020. [v] Energy sector produces more than 80% of all greenhouse gas emissions followed by industrial processes and waste. Transport is the third largest sector to cause greenhouse emissions (2002 19,4% of all greenhouse gas emissions in EU-25).[vi]

2.2 Digital technology

Digital technology has changed the rules of communication and information distribution. According to Internet World Stats almost 1,5 billion people use internet with 21,9% population penetration. In Europe the usage is even bigger where over 384 million people have access to internet, which means 48,1% population penetration.[vii] The majority of European households have a computer and nearly half of the household population has now access to internet. [viii] Digitalisation has already enabled several transport needs to be obsolete. It is possible to order food, pay bills, buy tickets and get education via internet just to mention a few of the numerous possibilities that modern technology allows us to do. New technologies improves the quality of life especially for elderly and those who are physically disabled.

In a modern digital society staying home is already a possibility to a group of people. All human needs can be fulfilled thru different modes of digital technology. While restricting

all travelling may be economically and environmentally reasoned, the process of socialization and culturally related reasons still dominate our behavior.

Information technologies risks increase as the societies gets more depended on technology. Trends in cyber crime show significant growth and Pin fishing, credit card frauds and information breaches are common technology related crimes. Misuse of information is a serious problem at every level in society.

2.3 Teleworking

Internet usage does not correlate with working from home or teleworking. It has been said that outside the assembly line, almost any work can be done by teleworking. How ever in reality teleworking is still a very marginal phenomenon. Less than 3% of the total working population in EU is working from home. Some 4 % works from home occasionally.

According to European Working Conditions Survey report 2005 employers in European countries use average of around 40 minutes a day to travelling to and from work. Almost 60% of EU workers work all or almost all the time at company premises. On the other hand, although teleworking or working from home is not yet a real alternative to working on company premises, it is used by a substantial proportion of people as a complement to their normal working arrangements.[ix]

The obvious advantages of teleworking include reduction of traffic related negative impacts such as pollution, noise, congestions etc. Recent studies show that overall productivity increases, job satisfaction rises and recruitment and retaining the employees gets easier. Teleworking also reduces company overheads and lowers operational expenses. Teleworking may even persuade population to locate closer to the central business districts and increase centralization of cities. This means that telecommunications and technology are not decreasing the value of face-to-face interaction and the need for cities and their services.[x]

Teleworking causes also negative impacts. Working isolated from workplace causes more mental health symptoms of stress compared to employers working in a work place. The differentiation of work time and recreation time may be more difficult and separation from the social network may also hinder career development and thus affect earnings.

The same time a company saves on equipment and premises, teleworking may cause new expenditures. When in a work place resources and equipments can be shared and time allocated, teleworking requires individual resources like computers, telephones and office equipment.

3. Staying home, effects

3.1 Economy

European transport sector is growing continuously. The fastest growing mode of transport was aviation with average increase of about 8% for international passengers. According to Eurostat the number of passenger cars per 1000 inhabitants has almost continuously increased between 1997 and 2002 in every EU country. While traffic has

increased in EU the number of deaths in road accident has reduced from 1997 to 2002. In 2002 49 700 persons were killed in road accidents. Also road freight transport has increased by 4,9% between 1997-2002 and the passenger transport by rail (passenger-kilometers per inhabitant) has increased on average by 7%.

Transport sector is a major contributor on economy. The biggest sector in being the road transport, which provides jobs for more than 12 million people and it contributes 10% of European Gross Domestic Product.[xi] Decreasing the transport sector means sizeable changes in society. The economic impacts alone would be very dramatic.

3.2 Environment

In a study about attitudes of European citizens towards the environment it was shown that EU citizens attach great value to the environment and are increasingly aware of the impact of its role in their everyday lives. 96% of Europeans stated that protecting the environment was important for them personally. How ever economic factors were seen also important. The study showed that environmental and economic factors influenced their quality of life to a large and nearly equal extent. Socio-demographic factors affected the concept of environment to climate change. The younger the respondents are and the longer they have spent in full-time education, the more likely they are to concept of environment to climate change.[xii]

European mobility week is an example of the current trend towards more environmentally friendly forms of transport. Growing concern over climate change and the oil price fluctuations have drawn much public attention towards reducing traffic related negative impacts.

Urban living compared to rural living has more impact on environment quantitatively. How ever in general, cities use natural resources more efficient. Concentration of people results more infrastructure, more services and more efficient use of resources. Car use is considerably lower in cities compared to rural areas. Also per capita land and energy consumption are lower. Even if urban living causes many environmental problems, the logical answer to many traffic related problems still lie in urban living.[xiii]

4. Conclusions

Predicting the future or building up hypothesis is always very difficult. The current trends towards urbanization and digitalization is changing our perception of the society constantly. In the situation where oil prices are fluctuating and people are getting more and more aware of the environment living in, it is in the foreseeable future to limit the number of travel time and the energy used in it. Does it result on people staying home is yet to be seen.

References

[i] Greenhouse Gas Reduction Strategies in the Transport Sector. Preliminary Report. OECD/ITF, 2008

[ii] Reducing Particulate Emissions in Traffic and Transport.
Views and Conclusions from the FINE Particles – Technology, Environment and Health Technology Programme. Tekes.

[iii] http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-08-082/EN/KS-SF-08-082-EN.PDF

[iv] Green Paper: Towards a new culture for urban mobility, COM(2007) 551 final

[v] Europeans' attitudes towards climate change. Report 2008. European Parliament

[vi] Energy, transport and environment indicators. 2005 edition. Data 1992-2002. Eurostat. L-2920 Luxembourg

[vii] Internet World Stats. http://www.internetworldstats.com/stats.htm

[viii] E-Communications Household Survey 2008. European Commission. Publication 2008.

[ix] European Foundation for the Improvement of Living and Working Conditions. Fourth European Working Conditions Survey. 2007.
http://www.eurofound.europa.eu/ewco/surveys/ewcs2005/results.htm.

[x] The Effect of Telecommuting on Suburbanization: Empirical Evidence. The Journal of Analysis & Policy. Kala Seetharam Sridhar and Varadharajan Sridhar. 2003 33:1

[xi] Europe on the move - Mobility, environment, safety, competitiveness. 2007.

[xii] Attitudes of European citizens towards the environment. Report 2008. European Commission.

[xiii] LIFE in the city - Innovative solutions for Europe's urban environment *LIFE ("The Financial Instrument for the Environment")* is a programme launched by the European Commission and coordinated by the Environment Directorate-General (LIFE Unit - BU-9 02/1). 2006

file:///E:/wiki/Foreca%20Consulting%20Presentation.pdf

14. NEW IDEAS

NOTE! This is a new site for any new ideas that may emerge during the work in-between the innovation seminars.

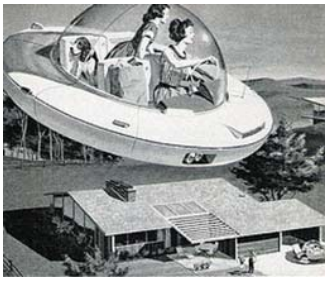
1. Innovation: Propeller hat with weather and life sensors using Galileo system: Example: Combine Vaisala and Polar products (Finland)

2. Do what-if analyses!

Examples on traffic

What if in future:

- cars hover above the road?



- international road traffic is banned because accelerating climate change (travel goes net!)

- enough energy is not available to continue traffic-as-usual?

- immigration impacts mean multilingual HMI's? (HMI=human-machine-interface)

3. Data fusion of vast amount of location information gathered from all vehicles (busses, taxes, private persons) in real time and displayed as maps see MIT's Real Time Rome, see for example

http://senseable.mit.edu/realtimerome/

Annex 2 Guidelines for Participants

2nd innovation seminar Dubrovnik 14-15 May 2009

Guidance to Participants

Dear all,

According to the WP resource allocation in DoW means that each coming participant should invest at least 3-4 days in studying the material (Read-Me's) sent in advance.

This is necessary since it is of outmost importance that the participants are well-prepared when they come to the seminar. Otherwise we all risk the success of the seminar.

The purpose of the seminar is to create radical ideas for the futures worlds in 2030. We will go through 4 sessions (see the attached agenda). The expected outcome of the seminar should consist of present understanding of the existing ideas and pilots (from the 1st innovation seminar) and radical innovations for road traffic products and services for the alternative worlds in 2030. This is a typical futures workshop goal. Therefore we need to have an understanding of the possible worlds in 2030 (this is called: scanning of the operational environment). Three futures scenarios are highlighted and these will form our framework for 2030. These scenarios are hand-picked from a vast number of global scenario exercises as researched and documented by the globally renown Millennium Project network.

Please take time to read the 2INNOSEM SCENARIO MATERIAL (it also contains a supporting literature that can be found in the net). Especially important are Heiko Apel's and Elina Hiltunen's articles.

Also, please collect ideas around your personal networks in advance – these are valuable stepping stones for the brainstorming sessions!

Here is a brief list of how to approach the innovation seminar (as stated in deliverable D5.1 chapter 1.3).

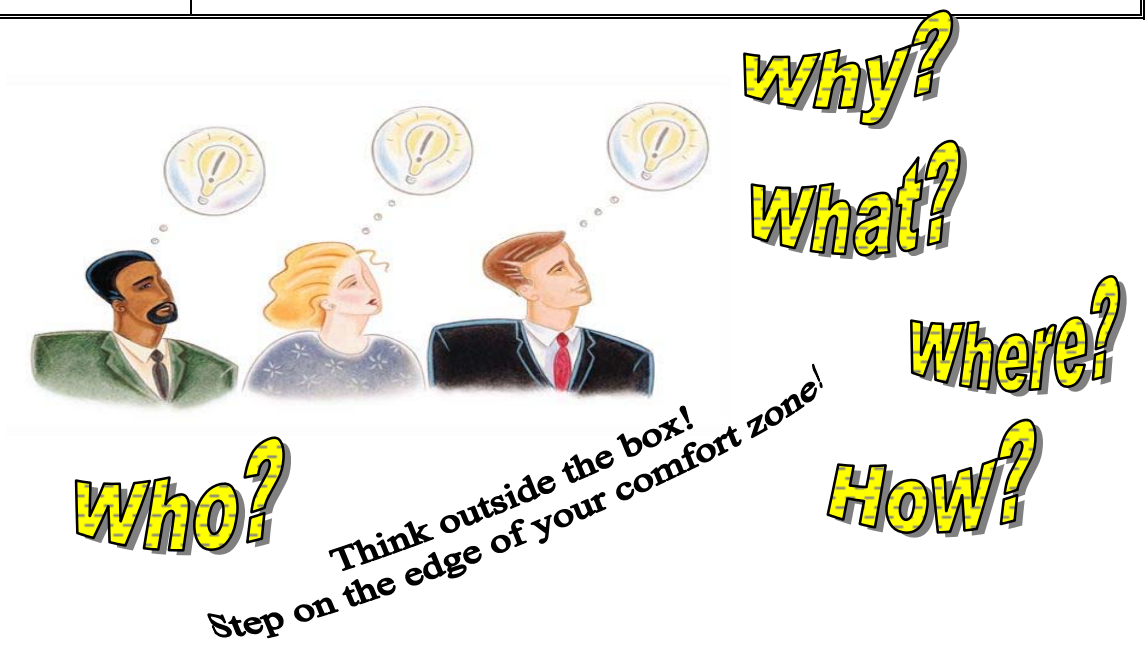
- Remember there is no right or wrong!
- Don't be practical!
- Criticising others' ideas is not allowed, taking advantage of them is encouraged!
- Don't avoid ambiguity!
- Feel free to err!
- Think outside the box!
- Insist that the ideas are "ours"!
- Be honest in your comments and encourage others to debate!
- Remember that you represent only yourself!

The basic material sent to you today will also include:
Agenda of seminar and explanations, summary lists of the state of the art of the existing ideas and pilots (these will be discussed in session 2), summary of ideawikis (from roadidea website) and scenario material for brainstorming sessions.

All material will be uploaded to roadidea web-site shortly. For more information, see the material in the roadidea web site: Deliverables D5.1 and D.52 and discussions in the innovation wikis.

The method used in the seminar is called Futures Workshop. It consists of brainstorming, grouping and evaluation as follows:

Brainstorming	Ideas are created by individuals and groups. First individual ideas are presented (some of these may be pre-planned) then ideas are discussed and new ideas will arise from "riding" on existing ones.
Grouping	Ideas are grouped - if ideas are close to each others these can be combined. Grouping may bring forth new ideas.
Evaluation	Evaluating ideas means giving them "hearts" according to individual preferences. The process may be deliberative.



SESSION	Tools and Materials	Activity	Results
Session 2	guidance to participants, guidelines for group leaders, felt-top pens, post-its, flip papers	3 groups, each group chaired by two TC-members	additional info on existing ideas and pilots, work plan for 2009-2010
Session 3	scenario material, predefined grouping for session 4	outdoors gathering. free grouping: small groups around each TC-member, update the group selection	scenarios, basic assumptions and wild cards discussed, grouping finalised for session 4
Session 4	scenario material, felt-top pens, post-its, flip papers, larger post-its	brainstorming in three groups, one for each alternative word	short-listing 5 best ideas for each world
Evaluation	hearts, table for evaluation aspects, pens	two brainstorming cycles around the total 15 ideas	5 best ideas defined, Table of Innovation Aspects filled

Annex 3 Guidance for Group Leaders

Guidelines for group leaders V1.1 4.5.2009

Session 2 State of the art of the existing ideas and pilots
Group leaders : Rene & Auli (1), Jörg & Lulu(2), Jörgen & Pirkko(3)

Step 1: Presentation and discussion on the existing ideas and pilots in 3 groups (Ideas 1, Ideas 2 and Pilots).The aim of the discussion is to describe the state of the art, the development needs, the problems and opportunities, and possible user target groups. Also, any new ideas will be collected and discussed in the end. Finally, decision on work in 2009-2010 with each existing idea and pilot is made in groups and written on flip papers by group leaders.

One of the leaders can act as chair and the other may concentrate on documenting – and the tasks can be interchanged when necessary. The material needed includes: Idea and pilot summaries as Tables 1, 2 and 3 in A3 format attached to the wall. One flip-paper is attached nearby for comments. Documenting should include:
- changes in the tables
- additional information
- work to be done in 2009-2010 for each idea
- evaluating each idea using evaluation table if possible

Material needed: felt-top pens and flip papers

Step 2: Groups gather in plenary and group leaders present the results. Plenary is chaired by Matti. Flip papers are photographed.

Pub Session

Step 2**:** Free grouping, each group will be lead by TC-members: Jörgen Bogren, Jörg Dubbert, Armi Vilkman, Lulu Hyvätti, Rene Kelpin, Auli Keskinen, Hanne Lindqvist, Pertti Nurmi, Matti Roine and Pirkko Saarikivi (depending on the number of groups)

Discussion on Worlds 1, 2 and 3, basic assumptions and wild cards (see Scenario Material document). Group leader will chair the discussion by presenting the three scenarios, basic assumptions and wild cards, which will be discussed in the group. Each member will select the working group for session 4 (use the predefined table: Groups Session 4). The group leader will make notes on the results of the discussion. Group notes will be handed over to Pirkko/Auli/Lulu before dissolving for the day.

Free Radicals Session 4
3 Groups, group leaders: Pirkko & Rene(1), Jörgen & Lulu(2), Jörg & Auli(3)

Step 1: Three groups are formed as dedicated to the three alternative worlds 2,3 and 4. The members are predefined but the In the Pub session grouping can have been changed.

The groups collect ideas for Roadidea products and services to 2030 by the brainstorming method. All ideas are written WITH CAPITAL LETTERS and FELT-TIP PENS on POST-ITS (three colours, one for each world) on flip papers, then grouped and named by group leaders through discussion (the name is also written on a post-it). What-if analyses may be run as well.

At the end, the group leaders will discuss a short list of 5 best ideas with members and attach them on separate flip papers (of each world), further explanations are added if feasible using larger post-its.

One of the leaders may concentrate on chairing the session, the other may concentrate in supporting the creative mindset of people – and the tasks can be interchanged when necessary. The material will include: post-its (three colors, one for each world), felt-top pens, flip papers and larger post-its.

During the brainstorming it is possible that the work will not continue as expected. Then the group leaders should encourage the group members to think about the pre-discussed wild cards and try to figure out the consequences to road traffic information products and services or make what-if analyses using questions such as:

What will the road traffic be like in 2030?
What fuel will be used?
What are the most important information needs of public transport?
Will there be separate public transport and private traffic?
What will be the role and development of mobile equipment and services?
What effect will the climate change have on transport on land?
Will there be major shifts in transport modes?
What if the international traffic and/or international trade are banned?
What if the business travel is banned?
What if cars will hover over the road instead of travelling on it?
What if the Chinese car industry becomes dominant?

Evaluation of Ideas and Their Innovation Aspects

15 short-list ideas are evaluated in two cycles:

first cycle: people circle around the room, discuss the ideas, add comments and new aspects if possible, and form their overall opinion of the ideas.

second cycle: people circle around the room attaching hearts to those ideas they like by giving 3 hearts to excellent ones, 2 to good ones, and 1 to satisfactory ones. Each person has 15 hearts to give. Hearts are then counted and short-list of 5 best ideas is formed. Photos are take from all flip papers.

In addition, the best 5 ideas are evaluated by using the Table of Evaluation Aspects

Material needed:
- post-its for additional comments in first cycle
- felt-top pens
- 15 hearts

Table: Summary of sessions

SESSION	Tools and Materials	Activity	Results
Session 2	guidance to participants, guidelines for group leaders, felt-top pens, post-its, flip papers	3 groups, each group chaired by twoTC-members	additional info on existing ideas and pilots, work plan for 2009-2010
Session 3	scenario material, predefined grouping for session 4	outdoors gathering. free grouping: small groups around each tc-member, update the group selection	scenarios, basic assumptions and wild cards discussed, grouping finalised for session 4
Session 4	scenario material, felt-top pens, post-its, flip papers, larger post-its	brainstorming in three groups, one for each alternative word	short-listing 5 best ideas for each world
Evaluation	hearts, table for evaluation aspects, pens	two brainstorming cycles around the total 15 ideas	5 best ideas defined, Table of Innovation Aspects filled

Annex 4 Scenario Material of Four Alternative Worlds in 2030

2INNOSEM **Draft v 0.1 22.4.2009**

Scenario Material

Contents

Introduction

In this document there are the alternative worlds for the innovation seminar explained. The scenarios is the result of global networked Delphoi research work executed by the Millennium Project. The Millennium Project is the most renowned and globally rewarded knowledge base creator on alternative futures images, trends and signals. The project was started by the American Council to the United Nation's University in 1997. Ten years later it moved over to work under WFUNA. The work of the project is continuously based on a wide global network of thousands of experts in all disciplines. More detailed information of this global futures knowledge creator can be found in www.millennium-project.org. Finland through its Futures Research Centre is one of the most active nodes of the network representing Nordic countries.

The four scenarios describe four different worlds for 2030. The first scenario is deemed as impossible since it would mean that the world would continue "business-as-usual" and that is a disaster scenario, which will not be taken into account. It is, however, interesting and educative to study, what can happen if the global community will not improve its ways. (Please note, that the scenarios are written in present tense as imagining actually living at that time.)

1. What are Weak Signals aka Wild Cards? From Hiltunen (2007)

It is clear that not only trends are meaningful in foresight studies, but also the unexpected happenings, their probabilities and possible impacts for the future must also be considered. The Weak Signals Analysis is often incorporated in every futures search seminar.
What is a weak signal and what is the purpose of weak signal research? In organisational dynamics, a weak signal is:

- an idea or trend that will affect how we do business, what business we do, and the environment in which we will work
- new and surprising from the signal receiver's vantage point (although others may already perceive it sometimes difficult to track down amid other noise and signals
- a threat or opportunity to your organisation
- often scoffed at by people who "know"
- usually has a substantial lag time before it will mature and become mainstream
- therefore represents an opportunity to learn, grow and evolve.

Weak signals mean today's information that can foretell the changes in the future. This information might sound funny or strange and it can cause confusion, because it offers a totally new way of thinking or idea or innovation. As time passes, it might come out that weak signals were the first signs or symptoms of a big change, even megatrends. However, weak signals are not always clues about big changes.

They might simply be information about strange things that have happened. A practical example of weak signals is an article about some new technical innovation in a magazine.

Once you perceive a weak signal and understand it, a whole host of other signals may become visible. These comprise the complete ecosystem of ideas and trends that will support each other in the journey from dream to manifestation. No weak signal ever rises to dominance by itself, but is accompanied by shifts in political, economic, technological, and social thought and invention.

2. What are Scenarios? From EUR 20478 (2002)

A scenario is a story with plausible cause and effect links that connects a future condition with the present, while illustrating key decisions, events, and consequences throughout the narrative.

The critical point is that scenario methods should enable us to build internally consistent pictures of future possibilities that are useful for envisaging the implications of uncertain developments and examining the scope for action.

Scenarios consist of visions of future states and paths of development, organised in a systematic way as texts, charts, etc. The term may be used to identify either the "history of the future" – a sequence of events and trends – or an "image of the future" – an account of circumstances at a particular point in the future. It is usual in Foresight

exercises to work with "multiple scenarios", so as to allow for alternative courses of development to be taken into account. However, Foresight exercises may also make use of "aspirational scenario" approaches, where a substantial effort is made to elaborate on a vision of a desirable and feasible course of development.

Scenarios are tools for synthesis of various elements being considered in the course of Foresight; for structuring thinking. They also allow us to be surer that the visions have been developed and articulated in internally consistent and systematically comparative ways. They can be used for purposes of presentation of visions of the future and of specific possibilities in dramatic and comprehensible ways. A scenario should shed light on current action in view of possible (and more or less desirable) futures. Some commentators have remarked that since scenario development requires that we understand the system under study and can identify critical trends, issues, and possible events, we really are using the approach to find out more about the present, not just to envisage the future.

Scenarios are pictures of future possibilities, typically composed of a mixture of quantifiable and non-quantifiable components, which are arranged as sequences of events or trend developments in the case of a "future history". Scenarios may be presented in discursive, narrative ways, and illustrated with snippets of fiction and imitation newspaper stories, etc. This can be particularly useful for presentational purposes. But for analytic purposes, to compare scenarios and check their consistency and comprehensiveness, it is very helpful to prepare scenarios in the form of tables and similar systematic frameworks.

Examining how each scenario looks (or how each point in the development of a scenario looks), in terms of the same set of elements, provides a basic check for the scenario development process.

It is common to work with a relatively small number of alternative scenarios – three to five is most usual for any sort of detailed exploration. The alternatives must be chosen to reflect important developments, and to contrast with each other sufficiently to give a good sense of the range of future options, the sorts of events that might transpire. Another criterion for selection is plausibility, though it has to be recognised that what is plausible is very contingent on one's perspectives and worldviews, and it is well worthwhile to examine some "wild cards" (weak signals) and remote possibilities – even if these are not eventually at the core of the scenarios developed.

3. Literature

All articles in the list can be found in the net

Apel, Heino (2004), Future Workshop,
http://www.die-bonn.de/esprid/dokumente/doc-2004/apel04_02.pdf

Coffman, Bryan S (1997), Weak Signal® Research, MG Taylor Corporation,
http://www.mgtaylor.com/mgtaylor/jotm/winter97/wsrintro.htm

EU Directorate-General for Research (2002), Practical Guide to Regional Foresight in the UNITED KINGDOM, EUR 20478, Brussels, 2002,http://foretech.online.bg/docs/CGRF.pdf

Future Search Network (2007), Future Search Methodology, 4700 Wissahickon Ave, Suite 126 Philadelphia PA 19144,
http://www.futuresearch.net/method/methodology/index.cfm

Gell-Mann, Murray (1995), Introduction. Complexity, Vol. 1, no.1, John Wiley et Sons, http://www.scribd.com/doc/7887206/COMPLEXITY-by-Murray-Gell-Mann

Glenn, Jerome C & Gordon, Theodore J (2003), Futures Research Methodology, V2.0, Millennium Project WFUNA,
http://www.millennium-project.org/millennium/FRM-v2.html

Glenn, Jerome & Gordon, Theodore (2008), State of the Future 2008, WFUNA Millennium Project, Annual Report, Chapter 3.6, www.millennium-project.org

Hiltunen, Elina (2007), Where Do Future-oriented People Find Weak Signals? FFRC eBook 2/2007. Finland Futures Research Centre, Turku School of Economics. 40 s. http://www.tse.fi/FI/yksikot/erillislaitokset/tutu/Documents/ publications/eTutu_2007-2.pdf

INNOVATION (2007),
http://www.1000ventures.com/business_guide/im_knowledge_idea.html#IP

Keskinen, Auli & Aaltonen, Mika & Mitleton-Kelly, Eve (2003), Organisational Complexity. Foreword by Stuart Kauffman. FFRC Publications, 6/2003, Finland Futures Research Centre, Turku School of Economics, Helsinki, 81 p.
http://www.tse.fi/FI/yksikot/erillislaitokset/tutu/Documents/publications/tutu_2003-6.pdf

Mitleton-Kelly, Eve (2007), Addressing Apparently Intractable Problems: In-depth Analysis to Understand Multiple Underlying Conditions in a Problem Space, International Conference on Complex Systems, Oct 28 – Nov 2, 2007, Boston, MA, http://knowledgetoday.org/wiki/index.php/ICCS07/137

4. Basic Assumptions and Wild Cards for 2030

Basic Assumptions 2030 (similar to Megatrends)	**Wild Cards aka Weak Signals 2030**
Galileo system or some such available People on earth 8-10 Billion: 5 B in cities, 3-4 B rural Climate change situation worse Economic slow down and great variances Ecological immigration worse and global	Pandemics Sweet water scarcity Superconducting in low temperatures solved Bioterrorism Nuclear disaster Life on an exoplanet

5. Four World Scenarios for 2030 From Glenn & Gordon (2008)

Four Global Scenarios based on Energy to 2030
Source: Glenn, Jerome & Gordon, Theodore (2008), *State of the Future 2008*, WFUNA Millennium Project, Annual Report, Chapter 3.6, www.millennium-project.org

Summary produced by Auli Keskinen

Scenario 1: The Skeptic NOTE! This scenario will not be used in the seminar!
Scenario 2: Environmental Backlash
Scenario 3: Technology Pushes Off the Limits
Scenario 4: Political Turmoil

Scenarios in Brief - Alternative Worlds in 2030

Scenario 1: Business as Usual—The Skeptic Moderate growth in technological breakthroughs Moderate environmental movement impacts Moderate economic growth Moderate changes in geopolitics and war/peace/terrorism	**Scenario 2. Environmental Backlash** Moderate growth in technological breakthroughs High environmental movement impacts Moderate economic growth Moderate changes in geopolitics and war/peace/ terrorism
Scenario 3: High-tech Economy – Technology Pushes Off the Limits High growth in technological breakthroughs Low environmental movement impacts High economic growth Few changes in geopolitics and war/peace/terrorism	**Scenario 4. Political Turmoil** Moderate growth in technological breakthroughs Low environmental movement impacts Moderate/low economic growth Major changes in geopolitics and war/peace/terrorism

Scenario 1: Business as Usual - The Skeptic - Not Discussed

- Moderate growth in technological breakthroughs
- Moderate environmental movement impacts
- Moderate economic growth
- Moderate changes in geopolitics and war/peace/terrorism

In short, with some exceptions, most past trends have continued to our time. The shifts that have occurred seem to have a random quality and are applauded or despised largely on the basis of politics, ethnicity, or nationality. One trend, however—continuing energy demand growth—has reached a crescendo, and most people in the world are now feeling its consequences.

The world's current energy situation and the bad decisions that got us here certainly qualify as a colossal, global blunder, as important as any in history. The data on energy reserves, prices, and alternatives have been largely known for decades, apparent alternative solutions were on the table, the outcome of doing little or nothing was relatively easy to forecast, and yet forces were in play that led to the failure to act decisively.

Should the countries of the world have known that oil-consuming countries would be held hostage to the suppliers? Back in the first decade of the new century, Iranian leaders spelled it out directly and forcefully: they said they would use oil supply as a weapon to avoid sanctions designed to force them to put aside plans to develop nuclear weapons.

There were some inspired moments. In 2006, President George W. Bush announced an energy plan that was to have greatly lowered US dependence on imported oil by 2025. One might have guessed that OPEC members would react badly, since their source of income and political bargaining chip was being challenged. But they needn't have worried; it didn't happen. Why? Because the industrial countries' commitment to oil was too strong.

Another massive plan was jointly proposed in 2009 by another US President and by the British, German, and Japanese Prime Ministers. They announced a program patterned after the Apollo space program but with renewable energy as the focus. They called the program "The New Fire." This time it struck a spark; it excited nations, science laboratories, industrialists—even those in the petroleum business—because many people had come to believe that the time of peak oil was probably close at hand and, more important, that the plan was serious.

Program introduction: "We propose a 10-year global goal of developing energy sources and systems that will reduce the world's rate of consumption of petroleum by half without increasing pollution, a goal that is easily measurable. The program is vast and involves many industries and nations. Over its 10-year span it will devise new energy sources and infrastructures. It will create non-exportable jobs in all countries that are part of the program. It will stimulate our economy and the economies of cooperating nations."

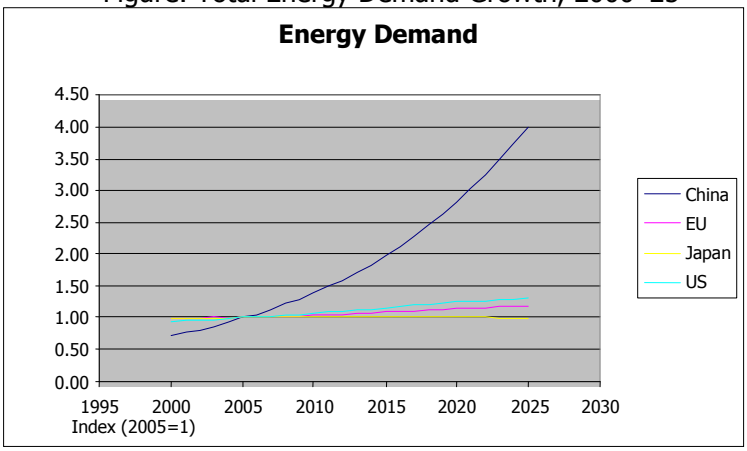
The excitement kindled by the New Fire program did not result in a globally unified effort as had been hoped but rather piecemeal projects that added up to less than the sum of their parts. Special interests prevailed.

One lobby was pushing for an advanced fission nuclear reactor generation program, but the safe storage of nuclear materials still stymied the engineers. Some projects were imaginative, such as seawater agriculture along the desert coastlines of the world — planting salt-loving plants on beaches of areas like Somalia in order to make biofuels competitive, provide additional carbon sinks, and stabilize coastal erosion. Solar-derived space energy, or space solar power, was generally seen as pie in the sky and way too expensive in any event; even the experts now predict that is still two or three decades in the future. Terrestrial solar cells have been improving in efficiency but are not yet nearly efficient or cheap enough to be in wide use.

When people today wonder how the world has developed as it has, most often they point to many culprits: corruption, greed, irresponsible environmental extremism, short-term profit-taking and policymaking, the oil companies, life-style excesses, failure of imagination, and a lack of understanding that resources are, after all, finite.

There were other signals, well above the horizon, that the big energy-consuming countries were being manipulated by the producers and that there was trouble ahead. The western consuming countries, in particular, could have seen the obvious and anticipated the outcome. Consequently, they, and to a greater or lesser degree all oil consumers, are hostages now.

Figure. Total Energy Demand Growth, 2000–25



Source: The Millennium Project based on data from the International Futures model of the University of Denver.

The environmentalists had their say—at least to a small degree. They focused on legislation and international treaties while the pollution continued merrily along. Oh, a few policies were changed. Carbon trading became a game, with loads of experts and their computer models leading the way. The Corporate Average Fuel Economy standard was beefed up almost everywhere. Other policy changes included subsidizing renewable sources while taxing fossil sources, stiffer efficiency regulations, support for "telework," elimination of import tariffs for ethanol and other biofuels, and charging automobile owners for access to city centers.

Further, the markets were relied on to encourage development of renewable fuels, but the effects that are now all too obvious were minor, like pouring a glass of water in the ocean. (And speaking about oceans, their levels are now clearly on the rise.)

In 2015, there came a time when the higher oil prices had an effect, when oil prices went above $100 per barrel and when the rate of discovery of new reserves was continuing to fall behind production rates. At that point, the old complacency was eroded. People drove less, bought less, worried more, and were cold in the winter. Water problems plagued many countries in the world. Jobs were lost and rhetoric could not hide the fact that most consuming countries were hostage.

A new form of transportation has emerged. Some of these cars look like small Rolls Royces, others like Ferraris. Since 2010, in many countries there has been a small industry making specialized golf carts; their users, mostly elderly people, love them. Many towns have created a special infrastructure for these vehicles, expanded bicycle paths in effect, that allow the carts to travel from the outlying residential centers to the town in safety. Certainly, they are slow, 40 mph peak, but they are very efficient since most run on batteries.

A few of the carts are powered by small internal combustion engines that only sip fuel. Their use began in communities where the affluent elderly tended to concentrate. They provided reliable, short-distance transportation.

The vehicles abound in the suburbs of sufficiently affluent cities, particularly where the towns have provided special roads and paths. If we count the number of people over 65 who have incomes above $100,000 as our market segment, we find that there are 10 of these cars per 100 people, a very significant slice. They take many forms: replicas of classic cars (car companies sell intellectual property rights to the shapes), modernistic and fantastic varieties, and rolling jokes like the Titanic version complete with smoke stacks. People buy them complete or go to small businesses that customize the factory platforms.

It is true that population growth rate has slowed around the world, and in 2020 the world has just shy of 7.5 billion people or so, up by about 25% since 2000. Nonetheless, government spending for weapons, wars, rebuilding countries in which they warred, and subsequent peacekeeping bled national treasuries and deficits soared. Anti-terrorism vigilance has also been very expensive. Mother Nature didn't help either. For whatever reason—some say it's climate change— earthquakes, hurricanes, and pandemic scares seemed all too frequent.

China's demand for oil now, in 2030, exceeds that of the US and the EU; in fact, it accounts for 30% of the growth in oil demand since 2000. China, by 2010, was the world's largest consumer of many commodities: aluminum, copper, steel, and coal. What fueled this huge increase in oil demand? High economic growth was responsible, to be sure, but more important the primary mode of Chinese private transportation changed from bicycle to automobile. In 2000, the country had only 10 motor vehicles per 1,000 people, compared with 765 in the US. By 2020, that figure was 200 motor vehicles per 1,000 people in China, and most industry analysts forecast more growth to come.

As important as the Chinese domestic market was to the country, it was their export market that changed the face of the world and the world's energy situation. China's economic policies favored the development of the automobile industry. In 2000, Chinese

automobile manufacturers produced more than 2 million vehicles; sales volume was up by 14%; automobile manufacturing was the path to the future.

In 2020, the Chinese sedan car design has evolved to a true all-electric vehicle. This year, China produced over half a million units; all other countries together produced another half-million. Electric cars made great sense in China; the technology was well understood and it was seen as a way that the country's coal could be used (via generation of base-load electricity) to provide mobility and minimize pollution in urban centers.

Most large cities banned entry of vehicles that burned gasoline or diesel fuels, so the move to electric propulsion was welcomed around the world. Many countries gave tax credits to purchasers of electric vehicles. The export market was waiting for the Chinese electric cars. Consequence: despite their attempts to survive by introducing new engines (for example, Stirling engines), old-line automobile companies failed, and oil companies consolidated.

Overall, global energy use has grown by over 36% since 2005. Conventional oil supply has grown at a much slower pace (17%), so it is losing its market share. However, note that oil from tar sands has grown rapidly and now supplies over 2% of the world's total.

Conventional coal has also grown more slowly than the total (15%) and hence has lost share, although the new coal processes such as liquefaction and gasification have grown rapidly and now make up about 3% of the total. Not only has natural gas grown greatly, but it is now contributing an amount of energy that is of the same magnitude as coal and oil. Nuclear (fission) and hydro continue to supply significant amounts, about 5% of the total. All of the other so-called promising renewables are still waiting in the wings.

The EU, with its huge agricultural production of sugar and grain, converted a major portion of its surplus into fuels (Germany and France led in the production of bio-fuels). And to boost the possibility of a European biofuels industry, the EU introduced protective tariffs on imported ethanol. The European countries opposing genetic modification included Austria, France, Portugal, Greece, Denmark, and Luxembourg. With the emphasis on ethanol, world food supply became imbalanced and hunger increased. There were brave experiments that attempted to use marginal lands and brackish water for the production of alcohol crops, but these added only marginally to the acreage. It seemed that the world could not have both adequate food and expanded production of alcohol grains. It was indeed business as usual.

Terrorism is still a major concern. Some analysts think the anti-oil mission of the terrorists is to cause democratic governments and secular economies to fail so that fundamentalist governments can take their place in some oil-producing nations. Some people have even suggested that, through terrorism, the terrorists themselves believe they can become rich by taking over oil resources.

Terrorists hatched a plan. In great secrecy, in a dozen places, biochemists loyal to their cause were directed to produce self-replicating micro-organisms designed to contaminate oil with contagious human pathogens.

So, yes, it's easy to be a skeptic. We've heard it all before. What people miss most about the old days is vacations in distant places, freedom to drive what they wanted and where they wanted, having a government they could believe in, that tells the truth—if indeed

anyone knows what truth is any more—and stability. Today there is too much pessimistic thinking about energy. Reserves have grown in the past when depletion was forecast, and now many people in the industry say it will happen again. As for developing new energy systems, with effort and fortitude the world powers can solve the problem; they can do anything they want to do. But the World Soccer Games are on TV now, so let's worry about all this tomorrow.

Scenario 2. Environmental Backlash

- Moderate growth in technological breakthroughs
- High environmental movement impacts
- Moderate economic growth
- Moderate changes in geopolitics and war/peace/ terrorism

The catastrophic nuclear accident in 2011 that polluted the Indian Ocean with radioactive waste galvanized the brewing environmental movement with a new dynamic force around the world. Pro-environment politicians were elected, and the G8 hammered out an agreement to create and implement the Global-Local Energy-Environment Marshall Plan (GLEEM Plan) with an Apollo-like mandate to fix the energy situation and reduce climate change.

The environmental backlash had been gathering momentum for years—both from nature and from environmentalists. From the 1970s onward, forecasts of climate change and its impacts have proved to understate what actually occurred. In the last 10 years, major areas of tundra have melted, releasing huge amounts of methane, a gas 22 times more dangerous for the climate than CO2. Nature's backlash was felt most directly via increasing droughts, flooding, hurricanes, tornadoes, new diseases, fires, sandstorms, falling crop yields, and social unrest among millions of environmental refugees from dying rivers and lakes. During the past 10 years East Africa experienced massive famine, killing 20 million. Many fishing industries around the world are gone. The water tables have fallen dramatically in India and China over the last 20 years, leaving dry wells for hundreds of miles in many locations, forcing millions to flee to already congested cities, where tensions explode into riots.

Increasing demand for meat accelerated the industrialization of livestock production, with its massive concentrations of animals and their wastes, which led to the Pig Flu pandemic of 2012 that killed more than 25 million people. Less dramatic but also quite devastating is the slow-motion march of desertification in Asia, Africa, North and South America, and the Middle East. Hundreds of species of marine life have been exterminated due to increased acidification of the oceans from CO2 deposition. The changing climate increased drought and fires in some areas and floods in others. It altered insect migrations, which carried mutated viruses that caused new epidemics; it shifted crop yields to more northern and southern latitudes, causing parts of Siberia and Canada to become a viable breadbasket; and it meant glaciers in high mountains disappeared, leading to water problems in major mountain-valley regions around the world.

The backlash from nature that makes scientists most worried is the beginning submergence of the Gulf Stream in the North Atlantic by freshwater runoff from the Greenland icecap. This will reduce the ability of warm ocean currents to flow along

Europe's coasts, giving it the same weather as Canada before its recent climate changes. If Europe cools, its ability to feed itself will also be reduced, increasing food costs around the word.

The environmentalists' backlash cut a broad swath across the array of industrial powers. There were strategic lawsuits, high-profile public confrontations, protocols to environmental treaties that used biosensors and satellite data for better detection of environmental crimes, tougher national regulations (mostly in Europe), inflammatory Internet blogs, and violent attacks on the key offices of fossil fuel industries. Although the horrific 2011 disaster caused the environmental movement and public attention to cross a fundamental threshold, knowing that environmental viability for life support was no longer assured, the world's dependence on fossil fuels continued.

Since the growth in nuclear energy was essentially stopped by the environmental movement by the mid-1970s, and the 2011 catastrophe killed all future plans to build new nuclear power plants, the fossil fuel industry became the next logical target. Their mission was to change the world's energy sources to non-nuclear, non-fossil fuels for base-load electricity and transportation power. - Today the Gulf Stream has shifted enough that it brings less heat north, making Europe colder. It was difficult to believe—climate change made Europe slowly warmer, and then made it cooler, bankrupting farmers, increasing heating costs, and depressing not only some economies but also the spirits of many Europeans who now expect to eventually have a climate more similar to Canada's.

The daily reports of new impacts from the radioactive material seeping into the Indian Ocean got so many people enraged that coordinating attacks and setting priorities for targets became irrelevant. The radiation pollution from the accident spread along the populated continent of India and neighboring areas, causing bitter political disputes between the states.

The new environmental movement took many forms. "Green Smart" emerged as a loose network of architects and engineers that became a force in urban planning and alternative communities around the world and made inroads in rural agriculture. "Save Gaia" radicals hit oil pipelines in the Middle East and the United States with assaults that disrupted supply by 5% for a month, and they carried out a series of cyber attacks on oil and car companies' financial systems. In the middle were "moderate radicals" and university students who marched on the United Nations, the World Bank, parliaments, newsrooms, and corporate headquarters of leading energy companies around the world.

On the legal front in North America, Friends of the Earth and Greenpeace achieved a precedent-setting victory in the ExxonMobil lawsuit on climate change; like the previous judgments against the tobacco industry, the ExxonMobil verdict shocked the business world. That was the key event that let the fossil fuel industry know that the rules of the game had changed forever.

ExxonMobil was convicted of causing up to 4% of the economic losses due to global warming and had to pay this amount to the Global R&D Fund established by the G8's GLEEM Plan for alternative energy systems. It nearly bankrupted the company, but corporate leaders negotiated payment terms while integrating environmentalists into their diversification planning, and the company may well survive. Business executives in other major oil and automobile companies scrambled to create crash programs to drastically reduce their greenhouse gas emissions and fit into the plan. This paved the

way for the post-Kyoto international agreement to reduce greenhouse gas emissions to 1970 levels.

Environmentalists were brought in to work with company engineers to help their businesses become greener. Some diversified into alternative energy sources. Some became extensively involved in training and education to show how to be more energy-efficient and to change cultural attitudes. They also worked with politicians to standardize and internationalize carbon taxes, road taxes, product labeling, and other incentives and taxes to allow the market to adjust to the new conditions.

Some energy executives and environmentalists just could not work together, making their efforts a complete waste of time. Some others who were merely paying lip service to environmental concerns got caught up the excitement of re-educating their markets about clean, more-efficient and more-profitable businesses alternatives. Public education for cultural change is exciting. The burst of corporate innovations encouraged governments to create environmental taxation and emission trading systems to ensure a level playing field for business. Governments began to expedite the process of getting innovations to market and streamlined the permits within a comprehensive framework.

The environmental backlash helped make brainpower, determination, altruism, and honesty more fashionable in the energy industry than the previous mindset of corporate loyalty and short-term bottom-line thinking. Luxury businesses worked with Green Smart and other environmental groups to make top-quality products that were energy-efficient, environmentally friendly, and educationally significant.

New rules mandating stronger fuel flexibility in cars in Brazil also resulted in a large, new biofuels industry gasifying parts of the sugarcane plant previously unused (and other plants) to produce "Fischer-Tropsch" liquids, which allowed Brazil to export most of its ethanol to other nations by 2015 and to become "the new Saudi Arabia" of the Green Era.
Nevertheless, increasing oil prices, the nuclear accident, and a range of environmental backlashes created recessions and depressions around the world. Countries that decided to cut oil dependency avoided many of these economic problems. Sweden moved from being 77% dependent on oil for its energy in 1970 to 32% in 2005 and zero by 2020.

Iceland hopes by 2050 to power all its cars and boats with hydrogen made from electricity drawn mostly from its geothermal resources. By 2011 Brazil powered 80% of its transport fleet with ethanol derived mainly from sugarcane and is now nearly free of oil requirements for transportation. Sugarcane is the best cultivated plant for capturing CO2.

The Eminent Scientists Group appointed by the UN Secretary General created the definitions of terms, standards, and measurements that proved necessary for effective political and economic polices. These common measures helped the establishment and implementation of environmental tax incentives. - With these changes in policy and technology, and with an increasingly informed global market, businesses competed to show their "environmental correctness."

The Green Smart label has become the most sought-after product endorsement due to its strict environmental standards and public relations plan that lists the best to the worst companies and countries in the world. Companies had little choice but to be rated by these standards. Highly energy-efficient companies with excellent environmental impact

audits received some tax advantages and attracted more investments and international market access than those that did not get favourable reports. They were also nearly immune from health, safety, and environmental lawsuits, which attracted even more investors to buy their stocks.

The successes of George Soros in the development of the transition economies, Ted Turner in the United Nations, and Bill Gates in international health programs laid the foundation for many wealthy individuals to support the GLEEM Plan.

Smaller investors also had a way to participate financially in the environmental backlash by investing in international funds such as the Green Brick (composed of the top 10 Green Smart companies in Brazil, Russia, India, China, and Korea) and GreenMap (composed of the most promising companies, regardless of location, that are producing the technologies within the GLEEM road map).

The GLEEM Plan's R&D helped further novel technologies that served as non-fossil, non-nuclear fuels or significantly improved the efficiency of their use. The key funding categories were energy for transportation in developing countries; universal access to electricity; carbon capture, separation, storage, and reuse; and the gap between R&D and commercialization.

Carbon trading has been practiced by the majority of the top 50 emitting countries since 2010; funds from this activity are used both for local environment-energy projects and for the Global R&D fund.

Government incentives helped stimulate retrofits in such green technologies as photovoltaic roofing tiles and walls for buildings, better use of natural light for heating as well as saving electricity, more-efficient windows, and liquid crystal display lighting (solid state lighting that puts the right photon at the right place at the right time in the right colour and with the desired intensity) that is 10 times more efficient than conventional lighting. Even shading over parking garages in India and China is being replaced by photovoltaic nanotech sheeting to produce extra income for parking lot owners. Cars and trucks have been retrofitted for different fuels. Rooftops from Egypt to Ecuador are getting solarpanels.

The development and recycling of non-fossil environmentally friendly materials for repair of roads and highways is beginning to reduce the need for asphalt. First-generation photovoltaics are being replaced with advanced nanomaterials that absorb solar energy more efficiently. Wherever feasible, nanotubes are replacing transmission wire in much of the world to conduct electricity more efficiently. This has had the same effect as producing a new source of energy without greenhouse gases or nuclear waste.

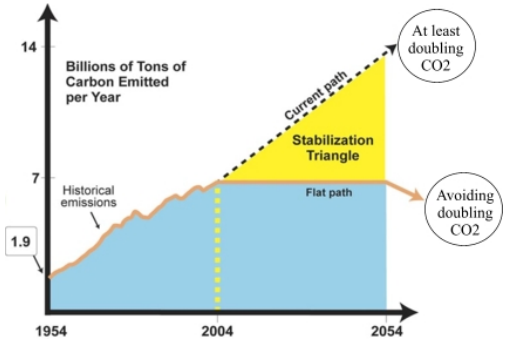
Many cars built since 2015 remove CO2 from exhaust gases by chemical absorption with solvents. Businesses that retrofit their previously built cars with this new carbon capture equipment are growing around the world—and fast!

Energy storage was dramatically improved by replacing old batteries with those using a range of nanotube applications. These new "nanobatteries" plus the three-dimensional computer chips with nanotubes have drastically cut the computer drain on the electric grids that just 15 years ago accounted for nearly 20% of electric usage in high-tech areas of the world.

Genetically engineered synthetic life that can create hydrogen and biofuels like ethanol and methanol has been developed. This marked the historic transition from reading genetic code to writing it. Genetic codes were specifically written from data banks of genetic information that produced life forms that now create hydrogen and ethanol in the presence of sunlight in a manner similar to how plants produce oxygen. Bio-hydrogen factories are beginning to produce large enough volumes to begin to be a source of reliable fuel for transportation. Although scaling up has been difficult, this approach could one day be a major source of hydrogen.

In response to the G8's GLEEM Plan, the major oil companies and automobile industry leaders met with environmental leaders and scientists to work out a road map to cut carbon emissions dramatically. This included bio-hydrogen, electric cars, biofuels, and many ways to improve efficiencies. Even several years before the Plan, BP led the oil industry to the attempt to stabilize carbon dioxide in the atmosphere (back in 2003, the transport sector accounted for about 27% of U.S. GHG emissions).

Figure 2-7: CO_2 Emissions Forecast



Source: Princeton University Press Release

Others did not take this seriously, since it would mean either building 4,900 nuclear plants around the world to replace a sufficient number of fossil-fuel-burning power plants or increasing the use of solar power by an impossibly large amount. Still, three years later, when the nuclear accident took the nuclear solution off the table, the oil industries realized that fundamental changes were necessary.

When it was realized that less than 6% of the U.S. land mass could produce enough biomass to supply that country with its oil and natural gas needs, it became a national security issue in the U.S. Congress, which passed the biomass energy bill. Granted, there was not the accompanying reliable water necessary to produce all that biomass, but the bill spurred the R&D that helped the world make enough fundamental changes so that today 19% of all new cars use biofuels.

Biodiesel fuel production got an early boost when the EU mandated that 5.7% of its diesel fuel be biodiesel by 2012. Biofuel production has now replaced 10% of petroleum usage. Biofuels have become a new form of wealth for previously impoverished rural areas of the world.

Although this prevents further damage, it does not solve the problem of climate change. Additional ways had to be found to sequester the excessive global warming gases. Green Smart engineers have been testing nanotechnology applications to exhaust systems to

reduce CO2 emissions. The use of nanotech on the surface of buildings to strip carbon from the air is a source for future molecular manufacturing applications. Massive tree plantings have helped, but they have only reduced the growth rate of carbon in the atmosphere without turning it around. However, the uses of advanced composites, ceramics, nanotubes, plastics, and lightweight-steel have more than doubled the efficiency of cars and trucks, which has reduced emissions proportionally.

Electric cars are more acceptable now that nanomaterial batteries improved the weight-storage ratio. They account for 15.4% of all cars sold in 2020. As a result, China's long-term strategy to be the world's leader in electric cars has paid off, and China now sells over a million cars a year. China accounts for over 50% of all new electric cars sold in the world. Granted, the majority of them are sold within the country, but their success has gone a long way toward changing world opinion about that nation's earlier air and water polluting practices.

Hybrids are still the most popular, accounting for 31.7% of all new cars sold in 2020. Their owners can now plug them in at night to get the previously unused power in the electric grids to recharge their cars. Hence, electric plug-in hybrid cars with flexible fuels acquired the "Green Smart" image along with the Chinese electric cars. Pure electric cars were exempt from road taxes, congestion charges, and other similar state fees. Some cities—Paris, São Paulo, Tokyo, and Mexico City—have been offering free parking for electric cars for several years now, while most major cities have significant areas that are closed to private vehicle traffic. Where this is being done, the picture of urban-cloaking congestion is beginning to fade.

The use of natural gas in cars has not grown significantly because such vehicles do not address the issue of CO2 production in a manner that is significantly better than gasoline-powered cars. And, like oil, natural gas would also run out one day.

New uses of nanotubes, ceramics, and plastics reduced the weight of cars and trucks, which in turn lowered the amount of carbon emissions per mile traveled. - Fuel cell cars with methanol in the tank, electric cars, and advanced Stirling engines are expected to reduce this even further. - Gasoline vehicles still account for 26.5% of all those sold around the world in 2020.

The need for new electric production has grown dramatically due to increasing population and wealth, more electric cars, new desalination plants, and the closing of nuclear power plants (over 300 of the 443 nuclear power plants and the 25 under construction around the world in 2005 have been decommissioned by 2020). Even with the 20.7% improvement in total energy efficiency over the past 15 years, the demand cannot be fully met. Electricity is rationed in China, India, and intermittently in many other countries. There are 1.2 billion people without reliable access to electricity today.

Farmers around the world added extra income from wind energy, which had little negative effect on agricultural output. Nearly half of Denmark's electricity comes from wind. Offshore wind supplies a growing proportion of the rest of Europe's electricity. Even the United States gets much of its electricity from the winds of North Dakota, Kansas, and Texas. Five years ago the construction of great ocean wind farms began in earnest; these farms are expected to account for at least 5% of world electric production by 2030. As the world has moved to ubiquitous computing and communications, the need for local and portable energy has grown dramatically. Mini methanol-fueled fuel

cells now power most wearable and portable electronic and photonic appliances. There are also fashionable nano-solar accessories added to clothing and bags.

The first commercial orbital solar electric satellite and receiving antenna on Earth feeding electricity to the terrestrial grids is expected to go online by 2030. Income potential should be enormous, and private industries want to participate with government investments. An agreement was reached.

Surprising support for the idea of wireless energy transmission via satellite came from African countries of the Sahel. They had little invested in energy plants and lobbied the World Energy Organization members to invest in wireless energy transmission from their desert solar photovoltaics to satellite relay systems. Telerobotic assembly in Earth orbit has begun; the initial test of a solar satellite in orbit is scheduled for next year. The design objective is for 90% efficiency in the wireless energy transmission from orbit to Earth. Japan has announced that if the consortium breaks down, it is prepared to continue building orbital solar power satellites on its own for commercial operations by 2040, potentially making it a major suppler for electric grids around the world.

In the meantime, coal is still the main energy source for electric power generation today, and much important work to reduce its pollution and emissions has been done and is continuing. Nevertheless, the global momentum is now irreversibly moving toward non-fossil renewable power generation sources, completing the more-efficient electric grids around the world, and getting inexpensive electricity to the billion people who still do not have access. There is also an evolving decentralized network for energy, which provides local energy for increasing numbers of people.

Telework, work-at-home, and flexi-time have finally become acceptable for many information and knowledge workers around the world, saving energy, increasing productivity, and allowing families to raise their children more easily.

The initial successes of China's sustainable communities and Finland's Information Society Initiative for international development (which put small computer transceivers in the hands of millions of poor people around the world by 2012) helped trigger the World Bank-Linux-MIT-Google work smart economic development programs in many developing regions as well as richer megacities. This helped reduce the growing demand on urban public and private transportation systems, which are still congested—but less so—in part due to the price of oil, which still hovers around $123 per barrel in 2020.

The "return to the future" movement was in part caused by intolerable urban congestion. Green Smart engineers and energy-environment NGOs worked with private and public land developers to create high-tech environmentally sustainable communities in different settings around the world. These communities were designed for foot, bicycle, and electric vehicle transportation, reduced material consumerism, increased knowledge and esthetic consumerism, and included sylvan spaces throughout the built environment. Often these communities were built for fewer than 2,000 people.

In the desert interiors like the Sahara, 10-mile-long robotically managed closed-environment agricultural tubes, interspersed with nanotech photovoltaic strips, are beginning to produce sufficient food for Africa and exports to Asia. Surplus energy from the strips is planned to be exported by microwave to Earth orbital relay satellites and on to electric grids on the ground.

The price of meat, eggs, and milk began to increase dramatically around 2012 as the amount of land and animal feed required to meet world demand for animal protein could not be met. Simultaneously, the increasing urban demand for meat led to dense concentrations of animal production, and mutating pathogens in their wastes were found to cause a number of new diseases among livestock and humans.

Continual global disease threats were killing consumer confidence and the livestock sector. Alternatives had to be found. Public and private investments in the Netherlands began the new meat revolution. The amount of energy, land, water, fodder, and time to produce meat via animals had been called one of the greatest environmental and energy wastes in civilization. Thanks to the Dutch initiative, stem cells are now taken from the umbilical cord blood of cows, goats, and pigs to grow muscle tissue without the need to grow the entire animal. This has substantially reduced the threats of disease and bioterrorism, as well as the requirements for land, water, and energy. Even some vegetarians see this as a moral alternative to the conventional animal factories.

The Meta Internet is working smoothly, providing energy-environmental data that are married with an integrated global scholarly and scientific knowledge base that is far more user-friendly today. It has increased the speed of problem-solving in all fields by providing a logically structured framework into which existing and newly acquired knowledge is placed and assimilated for examination, discussion, and extension by scientists and scholars worldwide and for a full range of educational applications and public access. Academic and business interests collaborated to create a sophisticated body of principles and techniques for knowledge visualization and the use of artificial intelligence to make it possible to navigate rapidly around the cumulative knowledge of the world.

The promise of the information and knowledge economies to reduce the energy requirements for transportation is beginning to be felt around the world. The price of ICT interfaces has become so low by 2020 that many people in poorer regions of the world are now given free connections as part of employment benefits, rights of citizenship, insurance policies, marketing programs, and credit systems. This accelerated the diffusion of access to the Meta Internet within poorer countries.

The big promise of nanotechnology to decrease manufacturing unit costs, requiring a smaller volume of materials and energy usage and hence lowering the environmental impact and increasing productivity, is just now on the horizon. In the meantime, over one-third of our transportation needs are still met by petroleum. The oil producers also continue to supply the needs of aviation, plastic, and pharmaceutical industries for the foreseeable future.

Table 2-2: Types of Vehicles Sold in 2020

New vehicles Sold in 2020	Percentage of sales in 2020
Hybrid	31.7
Gasoline	26.5
Biofuels	19.0
Electricity	15.4
Hydrogen	9.5

Source: Millennium Project Global Energy Delphi Round 1.

Scenario 3: High-tech Economy – Technology Pushes Off the Limits

- High growth in technological breakthroughs
- Low environmental movement impacts
- High economic growth
- Few changes in geopolitics and war/peace/terrorism

In 2030, population has grown to 7.5 billion people, the global economy is approaching $80 trillion, and the wireless Internet 4.0 is now connecting almost half of humanity. Synergies among nanotechnology, biotechnology, information technology, and cognitive science (commonly known as NBIC technologies) have dramatically improved the human condition by increasing the availability of energy, food, and water and by connecting people and information anywhere, anytime. The positive effects are to increase collective intelligence and to create value and efficiency while lowering costs.

The acceleration of technological development has opened the door to continuous and rapid worldwide economic growth and has in fact allowed the world to achieve energy sustainability using many different energy sources. The NBIC technologies are proving to be the key to a very bright future, in which machines increasingly work so efficiently that the cost of goods continues to plummet and tremendous wealth is created faster and faster for everybody. All basic necessities, as well as intellectual and physical luxuries, can be accessible to even the poorest societies, thanks to a political system that has managed to keep world peace.

Space exploration, artificial intelligence, and robotics are close to a takeoff point that some experts refer to as a technological "singularity." Meanwhile, Moore's Law continues to hold, and computers continuously become faster and more powerful. Quantum computing, 3D circuits, and subatomic particles have given new life to Moore's Law. It is expected that sometime soon the largest computers will have more transistors than humans have neurons in their brains. At that moment, artificial intelligence might overtake human intelligence, as some scientists suggest. That could be the beginning of an incredible scientific development, when humans can be transformed into more advanced life forms: trans-humans and post-humans. In fact, already some cyborgs and clones are becoming accepted and normal in some societies, and their numbers are increasing faster than those of the so-called "naturals". Biological evolution, which is slow and erratic, will be overtaken by technological evolution, which is faster and directed. Humans will never be the same, and all thanks to the great new energy mix.

Predictably enough, technological change, discovery of new resources, and resource substitution have been the three key energy drivers in the twenty-first century. There may be other drivers playing an important role, like the move toward virtual presence replacing real presence and the demise of irresponsible environmental fanatics, but they have had a smaller effect up to now.

The best way to eliminate the addiction to foreign oil was by accelerating breakthroughs in advanced energy technologies. Since 2001, the US had spent nearly $10 billion to develop cleaner, cheaper, and more reliable alternative energy sources. The plan was to accelerate breakthroughs in how homes and businesses used energy and in how automobiles were powered. There were programs to improve cars, make cleaner coal-burning power plants, convert coal into a gas and store its carbon dioxide emissions

underground, and develop more efficient use of wind, solar cells, ethanol, and batteries for hybrid cars, and so on. The new subsidies for coal, wind, solar, nuclear and ethanol were intended to diversify energy sources, first in the US and then in the rest of the planet. Since the US used roughly a quarter of all the energy produced in the world at that time, these programs ultimately had a profound impact on the future of energy around the world.

The new US President gave the 2020 State of the Union address. The first female president of the U.S., underlined the great progress made in terms of energy independence and energy diversification in the country. Although the promises of neither the hydrogen economy nor nuclear fusion have yet been fulfilled, the US is almost energy-self-sufficient thanks to advances in biotechnology and nanotechnology. In fact, biofuels now account for over 20% of US vehicle combustibles and long-life, automatically rechargeable nanobatteries are all the rage in electric, flexifuel, and hybrid cars. In addition, tailor-made artificial bacteria using photoelectrosynthesis are becoming a surprisingly reliable and novel source of electricity production in new power plants.

Similar advances have been pioneered in other major countries, and Europe particularly emphasized a massive conversion program for old power plants. On average, the world energy intensity per unit of GDP has steadily decreased, even though our energy consumption is still increasing, and major new technological changes like the extension of new uses of the electrical "vector" on everyday life are still expected. The continuous progress of energy efficiency has been due to the steady accumulation of incremental improvements in energy efficiency throughout the entire economy. It has also been driven by the steady rise in the real price of energy, which has resulted in structural changes in societies, such as denser housing, reduced travel, and manufacturing closer to the point of sale.

Thanks to the consistent strength and cooperation generated by continuous trade and investment flows, and barring wars and catastrophes, the world economy is also headed for more growth in the next few decades. Energy efficiency is increasing and less energy is needed to produce more, particularly now that so many nations are moving from industrial to post-industrial societies.

Oil has maintained an annual growth slightly below 2%, just below the average world energy growth. In fact, there is still plenty of oil yet to be produced: the first trillion barrels of oil were produced by 2000, and the second trillion will be produced before 2030. Nonetheless, there are still close to 4 trillion additional barrels of oil in the earth, including regular conventional oil, deep-water oil, super-deep oil, enhanced oil recovery (EOR), Arctic oil, heavy oil, and oil shales.

The worldwide best-selling book of 2019 was *Life After Oil* by Daniel Yergin, author of *The Prize* and founder of Cambridge Energy Research Associates (CERA). In his latest book, Yergin wrote about all the new possibilities for energy generation in a world where gas is overtaking oil as the main energy supply, and where new sources of energy will also soon be overtaking gas and eventually substituting for most fossil fuel production in the planet.

Yergin argued again that the world will never really run out of oil, but that it will be replaced by other cleaner, cheaper, and more abundant energy sources. He reminded us of the five previous times when many "experts" thought that oil was being exhausted: in the 1880s, after the first World War, after the second World War, in the 1970s with the

first oil shock, and in the early 2000s with all the talk about an approaching global Hubbert peak (just like a previous Hubbert peak in the US during the 1970s).

By 2020, gas production has indeed caught up with oil production. The supply of gas doubled between 2000 and 2020, and it overtook coal production in 2016. Now, according to most forecasts, other energy sources will also catch up in the 2030s with gas and oil, which are both declining relatively. Even though there has never been any continuous shortage of coal, oil, or gas, except for small local production problems sometimes caused by political disruptions or weather factors, the era of fossil fuels does seem to be reaching its zenith and might end in the next few decades. Indeed, other energy sources, including some not considered today, will apparently be the dominant sector in the US by 2040.

Outside fossil fuels, nuclear energy has increased marginally, and its share in the total generation of electricity has dropped by almost half, even though the third-generation fission plants might eventually regain some terrain. Several nuclear reactors have been decommissioned in Europe, and new nuclear plants have been concentrated in very few countries.

Furthermore, nuclear fusion has not yet been successful. The ITER tokamak fusion reactor built in southern France by an international consortium (founded by China, Europe, India, Japan, South Korea, Russia, and the US) carried out its first plasma operations in 2018, with a budget overrun of 80% and two years behind schedule. But it is estimated that much more research in plasma physics is needed before electricity-producing fusion power plants might become fully operational in a decade or two.

Worldwide averages, despite the enormous regional disparities, are over 20% electricity generation from renewable sources: hydroelectricity, wind energy, and solar power each with close to 5%, followed with less than 1% by geothermal and tidal power. The rest is now provided by new biofuel sources, both natural and artificial. Renewables have been and will be the sector growing the fastest, led by new sources like biofuels. Traditional biomass consumption will fall with development and urbanization, but it will be replaced by other renewables, which will supply new urban energy needs. In addition, biofuels have had an enormous growth from close to 0% of total consumption in 2000 to almost 5% worldwide in 2020.

Buckminster Fuller spoke of playing not "war games" but "world games" to bring peace and prosperity to every nation on Earth. Electrification has brought development to the poorest parts of the world and the continuous acceleration of growth to a globalized world. This created a virtuous cycle of energy increase and economic development. Furthermore, new technologies and better materials also improve transmission line efficiencies and reduce the cost of connecting renewable energy sources to the grid. Radically new automated grid management systems combining new chips, new sensors, actuators, and communications, and new algorithms make it possible to juggle the supply and demand for electricity more effectively across time, which is essential to getting full use from renewable energy sources, intelligent appliances, and car batteries.

Another major piece of news in the energy industry has been the impressive growth of many forms of bioenergy, which originally started with bioalcohols in the 1970s and biodiesels in the 1990s. Bioalcohol, commonly just called ethanol for its main chemical component, has grown from almost nothing in 1980 to 20 billion liters in 2000 and almost 200 billion liters in 2020—that is, close to 20% of the total car gasoline market in

the world today. Similarly, biodiesel has grown from about zero in 1990 to 1 billion liters in 2000 and around 30 billion liters in 2020, which is almost 2% of the total diesel consumption in the world.

The bioalcohol or ethanol industry started in Brazil after the oil shock in the 1970s. It had a first successful phase during the 1980s with the introduction of the first ethanol engines, but it slowly decayed in the 1990s with the decrease of oil prices. However, it had a major revival in the early 2000s with the appearance of the first flexible fuel cars. The flexifuel engines could use gasoline, ethanol, or any mixture of the two. In addition, by the time the first flexifuel cars appeared all gasoline sold in Brazil contained 20–25% alcohol, and it had an equivalent price to gasoline per mileage driven. Ethanol and flexifuel cars allowed Brazil to stop importing gasoline and start exporting bioalcohols in 2005. By 2010, all new cars sold in Brazil had flexifuel engines, and ethanol became one of the major Brazilian exports, mostly to Japan and other Asian countries.

The US started a similar program in the 1990s but one based on corn, first in Minnesota and other Corn Belt midwestern states. Minnesota had 10% ethanol in all its gasoline and 20% was required by law beginning in 2013. Soon other states followed. In Europe, E85 fuel (a mixture of 85% ethanol and 15% gasoline by volume, also sometimes called bioalcohol BA85) was doing well in Sweden and quickly spread through much of Europe. However, higher costs in Europe and the unavailability of more land have impeded any faster replacement of gasoline. Biodiesel started in Europe where there was an important fleet of diesel vehicles and it could be produced from a variety of sources—from soybeans to rapeseed to algae.

India started a very successful pilot plan in 2006 to produce 10 million liters of biodiesel on 8,000 hectares of marginal wasteland with *Jatropha curcas*, a nonedible oil crop that is drought-resistant. The experiment was so successful that BP and the New Delhi–based Tata Energy Research Institute (TERI) started commercial production in 2016 after increasing the yield per hectare by 400% thanks to biotechnology. The biodiesel fuel program started as a cheap alternative fuel to the typical Indian three-wheeled diesel motor rickshaw, and the fuel now is beginning to be exported. There is a limit to such exports, however, since India has little marginal land and it needs its arable land for food production. Biofuels based on cellulosic ethanol, which is made of more abundant and less expensive biomass using a variety of bacteria, yeast, and enzymatic processes, is now proving very successful in many countries.

Transportation (by land, air, or sea) still consumes about 20% of the total energy supplied worldwide and about 60% of the oil produced. That is why the advance of biofuels has been so important, particularly with car ownership rising tremendously around the world.

Thanks to its rapid growth, China has positioned itself as the most efficient producer of the most efficient cars on the planet. China now produces over 10 million cars per year, almost as many as Europe, Japan or the US. Nonetheless, the Chinese ones are the most energy-efficient with miles per gallon ratings of over 100. China copied the flexifuel cars from Brazil and combined them with the hybrid cars from Japan (gasoline-electric vehicles, which use gasoline and electric batteries to power internal-combustion engines and the electric motors) to create hybrid flexifuel cars that also run on electrical energy with nanobatteries.

The US passed Corporate Average Fuel Economy (CAFE) regulations in 1975 and slowly increased the standards for normal engines to achieve 25 mpg by 2000, when the first Japanese hybrid cars by Toyota reached 50 mpg (and all Toyota cars sold after 2012 were hybrid, getting 60 mpg or more). Brazilian cars of the early 2000s added the possibility of combining different fuels in variable mixtures, since the engines had internal control mechanisms to adjust their functioning to changing fuel conditions, while the first European commercial electric cars transformed chemical energy stored on the vehicle in batteries.

In 2015, the Chinese created the first sophisticated electrical engines with nanobatteries for hybrid cars with flexifuel engines. These "electric-flex-hybrid" cars have now become a major export from China, and GM (Guangzhou Motors, the main manufacturer in Guangdong province) expects to keep developing better batteries, thanks to the continuous breakthroughs in nanotechnology, to reach 120 mpg by 2022. (And some experts also plan to incorporate fuel cells into these cars once their costs come down enough.) The new cars are not only cheaper but also run on any possible combination of biofuels and electricity. This reduces fuel emissions substantially since the cars can also be plugged in anywhere along the energy Internet, and they are readily and cheaply reparable (for example, construction is modular so that items such as batteries can be fully recycled as well as reused in other of vehicles). The new Chinese electric-flex-hybrids are revolutionizing the world in the 2020s even more than the Ford Model T changed the US in the 1910s.

The present energy and transportation revolutions also include creating biofuels directly from living cells—not from long-dead fossil fuels or from recently harvested sugarcane or palm oil, but from real living cells. In fact, generating and using energy is what life is all about. Every child today knows that plants transform carbon dioxide and water into carbohydrates and oxygen. Since biomass originates from plant and algal photosynthesis, both terrestrial plants and water microalgae are appropriate targets for increasing biomass energy production.

Plants do it, most algae do it too, and even some very simple bacteria can fix carbon dioxide and water to produce carbohydrates and oxygen under the influence of light. In fact, many simple cells can do photosynthesis and similar biochemical processes. Making hydrocarbons is one of the simplest biological processes. Hydrocarbons are not complicated molecules with thousands of atoms and a number of elements, like proteins and enzymes; they are just small molecules with two of the most common elements on Earth: hydrogen and carbon. Surprisingly, it took many scientists and many years to artificially create the first commercial hydrocarbons from living carbohydrates and not from fossil fuels.

Clostridium C. acetobutylicum is a commercially valuable bacterium, sometimes called the Weizmann Organism after Chaim Weizmann, who in 1916 helped discover how *C. acetobutylicum* cultures could be used to produce acetone, butanol, and ethanol from starch using the ABE (Acetone, Butanol, Ethanol) process to satisfy such industrial purposes as gunpowder and TNT production. *C. acetobutylicum* also produces acetic acid (vinegar), butyric acid (a vomitous smelling substance), carbon dioxide, and hydrogen. These technologies are proving so successful that they are now being used to start factories that use cellular processes to create efficient organisms to digest heavy oil and get more of the residuals.

Mohan Kapoor called his new bacterium *Petroleum artificiali* and started a marketing test in November 2019. It is expected that his bacterium that "eats" carbon dioxide and "drinks" water under light, 24 hours a day, in order to "excrete" hydrocarbons will truly revolutionize the world. Not only will it produce hydrocarbons continuously, but it will also capture carbon dioxide and generate free oxygen and energy. If there are no major problems, production of new fuel excreted by *P. artificiali* will become financially viable in 2021 and will take care of the carbon sequestration problem.

More recently, the new bacteria can be compared with the biologically engineered Chinese chicken wings grown directly from chicken stem cells in 2014 without the need to actually reproduce a whole chicken to be killed later for its wings and other body parts or with the Japanese Kobe beef produced genetically from premium cow cells in 2015 without having to grow cattle to be later slaughtered. The "chickenless" Chinese chicken wings and the "cowless" Japanese Kobe beef are also over 10 times cheaper to produce and totally avoid any risks of animal problems, including avian flu or mad cow disease, and they eliminate the methane production and waste streams from beef production.

The other important cells for current energy production are the fuel cells that convert biofuels into electrical energy. Fuel cells have very high efficiencies in converting chemical energy to electrical energy, since they not constrained by the maximum Carnot cycle efficiency, as combustion engines are. A combustible fuel reacts with oxygen in a fuel cell to transform chemical energy into electricity with efficiencies of more than 60% today, as compared with only 40% at the start of the century.

Fuel cells are being used almost everywhere, in homes, industries, cars, and even rockets. They can also use many types of fuels, from pure hydrogen to landfill waste gas, in order to produce electricity. If pure hydrogen is "burnt" with oxygen, then water is the only emission. In addition, the vehicular cost of using hydrogen with fuel cells has come down from 8¢ per mile in 2000 to 3¢ per mile in 2020, but that is still 50% more than the cost of fuel for hybrid flexi-fuel internal combustion engines. - Ethanol is an excellent combustible, since hydrogen-rich fuels like methanol or ethanol (methane hydrate, natural gas, gasoline, diesel, and even gasified coal), just produce heat and water, plus some carbon dioxide depending on the hydrocarbon molecular weight.

Hydrogen is the most abundant element on Earth. It is the basic component of water, not to mention virtually every fuel ever used by humankind—wood, oil, coal, and natural gas—all of which are made of hydrocarbons. Pure hydrogen, however, does not occur naturally: hydrogen must be harvested using electrical or chemical processes, which have their own hidden environmental consequences; hydrogen is only an energy carrier and it has to be produced from water or hydrocarbons. Obviously, using renewable resources to power those processes could vastly reduce the environmental footprint of hydrogen production; at present, however, producing hydrogen for fuel costs several times more than conventional fuels do.

Since the start of this century, Iceland has made a major effort to become the first "hydrogen economy" in the world, and its advances by 2020 are notable. Nonetheless, this is the special case of a country with overabundant and readily available hydroelectric and geothermal energy that can be used to produce hydrogen as a carrier or storage of energy for later use. The hydrogen produced in Iceland is mostly for transportation, since for other activities it is more convenient to create electricity directly, without intermediaries (just like making Japanese Kobe beef without the intermediate step of the cow). The hydrogen for cars is later used by the fuel cell to transform its chemical

energy into electric and mechanical energy to drive the car. Iceland, a country with excess energy, has chosen to electrolyze water and began exporting the hydrogen contained in high-pressure tanks, and in the form of metal hydrides, since hydrogen is released from the hydrides with just a bit of heat.

Hydrogen has not yet become the main energy commodity, as dreamed of by many in the early 2000s, because it is still costly to produce, dangerous to store safely, difficult to transport, and tricky to distribute, and its volumetric energy density is much lower than that of other liquid fuels like ethanol or gasoline (although not in the form of metal hydrides). Safety would be another problem and a major worry; it would take many years to accomplish the logistics and infrastructure changes required to move from standard liquid fuels to hydrogen. The best idea here seems to be the "hydrogen battery," a block of metal hydride storing hydrogen at densities higher than liquid hydrogen. When a hydrogen powered car needs a fill-up, the "gas stations" of the hydrogen era would simply exchange the hydrogen batteries, probably automatically.

Continuous research is being carried out to increase the efficiency and reduce the costs of the so-called hydrogen economy. Even the use of advanced fission nuclear plants is still considered to electrolyze water and produce hydrogen.

Likewise, R&D on high-temperature solar dissociation of water to make hydrogen has progressed, but awaits solution of other difficulties. The theoretical potential of hydrogen as a clean energy carrier is certainly incredible, but it is not economically competitive since it is not freely available. For cars, the sustainable economy of the future may well use some mix of electric batteries, heat batteries, and methanol, instead of hydrogen, as primary energy carriers (at least for as long as it costs more to produce than to use hydrogen).

A combined European, Japanese, and US manned mission landed on moon in 2017. A moon base called *Luna 1* was started in 2019, and Nikolai Sevastyanov, Honorary President of RKK Energiya, just announced plans to begin mining the moon to bring helium 3 (He 3) to Earth in the Russian Kliper spacecraft. According to Sevastyanov, there is enough helium in the Moon to power all human needs for at least a century.

A Type I civilization is one that is able to harness all the power available on a single planet (in our case, Earth has an available power of 174×10^{15} W). A Type II civilization is one that is capable of harnessing all the power available from a single star (approximately 386×10^{24} W for our sun), while a Type III civilization would be able to harness all the power available from a single galaxy (approximately 5×10^{36} W for the Milky Way, but this figure is extremely variable since galaxies vary widely in size). A Type IV civilization will have control of the energy output of a galactic supercluster (approximately 10^{46} W), and a Type V civilization will control the energy of the entire universe (approximately 10^{56} W).

According to Kardashev, our civilization is still at Type 0, but it might reach Type I in the twenty-second century. In the year 2030, we know that we still have available a variety of resources to create a diversified energy matrix depending not on one single energy source but on a mixture of alternatives, at least during this critical transition period.

Earth, the sun, the galaxy, and the universe have more than enough energy resources to power our civilization for the next decades, centuries, and millennia. With the proper technology, it is basically a matter of costs and priorities. Converting the energy

resources into available supplies can be done, but it will certainly take massive investments and lots of imagination, creativity, science, and engineering. Methane hydrate mining, hydrogen and helium, nuclear fusion, solar energy capture, mass-energy conversion, and antimatter fuel generation are all eventually possible. Our civilization is still in its infancy, and barring any wild cards, geopolitical crises, environmental disasters, or extraterrestrial contacts, technology will keep pushing off the limits to growth.

Scenario 4. Political Turmoil

- Moderate growth in technological breakthroughs
- Low environmental movement impacts
- Moderate/low economic growth
- Major changes in geopolitics and war/peace/terrorism

The failure of nation-states and international organizations to make serious decisions is making them irrelevant. Political conflicts over oil are increasing. Transnational organized crime syndicates—with nearly three times more money than that of all the 2020 military budgets combined—play out their power struggles through governments, corporations, and even NGOs. Systems of all kinds—from medical records to financial transfers—have become so complex that individuals are bewildered and even "experts" are lost. Media empires have unwittingly countered much of the moral underpinnings of society with an "anything the market wants" attitude.

The health and retirement costs of the aging populations around the world have forced many governments to cut benefits for all ages, which has led to increasing protests and general strikes. Selfish individualism seems to be replacing communal values, making international law meaningless. Global climate change continues. Terrorism has increased because too many see the governing systems as unjust, and international cooperation is breaking down. Migrations of the poor to the rich areas spark riots and expose the horrific income gaps. There is a real fear that the world is slowly being taken over by high-tech warlords, as growing numbers of economic and environmental refugees roam Earth.

The most dramatic of the recent migrations are the Afro-Indo-China water migrations into Europe and North America, which have triggered a series of ethnic and racial conflicts with no end in sight. The EU and NATO create political stability in Europe only for short periods of time until the next eruption occurs. The U.S. economy was so weakened by the costs of wars in Iraq, Afghanistan, and generally against terrorism that it was difficult for it to play a role in reducing conflicts around the world. The EU was not able to reach agreements on strategies to replace the U.S. roles. UN peacekeeping forces were overstretched and underfunded. As a result the world seems to be in a perpetual state of stagflation.

Three twinned dirty bombs were detonated, one each in Europe, Asia, and North America. Twenty-six of the world's major oil extraction sites, 13 refineries, 100 supply depots, and three shipping lane choke-points were hit with conventional explosives within several minutes of each other around the world. This reduced oil supplies by 20% for almost a year. On the same day, 19 terrorist-martyrs, who had previously ingested individual disease packages, infected passengers in the busiest airports of Europe, Asia,

and North America. The price of gasoline quintupled overnight, spot prices were never more volatile, long-term contracts for oil were abrogated, trading in carbon rights was suspended, electricity and gas disruptions multiplied, many banks closed, and transportation-dependent supplies were missing, closing factories and causing food shortages around the world, which was now in the grip of fear and suspicion.

This terror act brought many of the world's airlines, medical systems, and tourist industries to their knees and the global economy to a depression, from which we have now recovered — but only to a series of recessions and periods of hyper-inflation. Economies have turned inward, politics have become more nationalistic, and religion less ecumenical. Ad hoc demonstrations against incompetent governments erupted around the world, which went into the depression with increased poverty. Within six months the increased inflation caused some banking systems to collapse, unemployment rates to double, and businesses to migrate from emerging markets to advanced countries.

The disruption of the Pan European pipeline that delivered oil to Europe from the Caspian Sea area and Russia placed Europe in a very tight supply situation for about six months. During this time gasoline rationing was instituted. There were frequent electricity brownouts across Europe as a result of the shutdown of the natural gas pipeline that ran from Turkmenistan to Europe through Azerbaijan, Georgia, and Turkey.

A worldwide social contract was signed, which brought into being the emergency international and trans-institutional plan to respond to collapses due to future terror attacks, which included ubiquitous sensors, computers, satellites, and a massive worldwide intelligence campaign to determine intentions, at the individual level, to enable preemption.

Even before the terror act, world leaders knew there was increasing political alienation, widening income gaps, a growing number of failed states, falling water tables, spreading new diseases, rationing of commodities, and skyrocketing energy prices. Yet they failed to act to make a difference.

Oil-related political hot spots occurred in the Caucasus, China, Japan, the Arctic, Nigeria, the Persian/Arab Gulf, Russia, Venezuela, and Antarctica, where demand had finally shattered any semblance of accord on preserving the natural heritage. Here's a brief overview on what happened in some of these areas.

Climate change continues to melt the polar ice. Huge resources have become more and more accessible in the Arctic, where a quarter of the world's undiscovered oil and gas are estimated to reside. Norway, Denmark (through Greenland), Russia, Canada, and the United States are competing for access. The dispute revolves around the different methods of determining maritime frontiers. The median line method, supported by Canada and Denmark, would divide the Arctic Sea between countries according to their length

of nearest coastline. This would give Denmark the Pole itself but Canada would gain as well. The sector method would take the North Pole as the center and draw lines south along longitudes. This would penalize Canada, but Norway and Russia would gain.

The daily struggle of 30 million AIDS orphans without love or mercy turned so many in Africa to crime networks that roving gangs eventually made political stability impossible in many countries. Water shortages across much of India and China had induced

migrations of people in unsettled conditions, and migrations of the poor to the richer areas have caused civil strife around the world, which continued the political turmoil.

Russia built dozens of nuclear reactors for several reasons. By building these plants, the country further developed a technology that it thought might someday be exportable. In addition, excess electricity production would allow Russia to supply nations previously in the Soviet Union, bringing them further into Russia's economic orbit. The Russian plan, now largely accomplished, was to build about 40 new nuclear reactors in order to increase the share of nuclear energy in the nation's energy balance to 25%. Although many experts forecast that a means for safe storage of nuclear waste is likely by 2030, the increasing opportunities to hijack radioactive waste during transport are still a worry. Europe still relies heavily on the exported Russian gas and hence has a interest in trying to keep Russia politically stable, which may not be possible. Therefore, the EU sought to diversify its energy supply by developing coal gasification technology, wind, solar, and other forms of renewable energy sources. Nevertheless, the importance of the Russian gas led the EU to political compromises in the UN and in trade agreements that might not have been necessary in other circumstances. Europe is still trying to formulate a common energy policy that will help assure continuing and stable supply.

North American R&D funding has tripled and some progress has been made in the development of solar cells, water-energy efficient agriculture, and new organisms that use life processes to produce crops that can be converted to fuels. There is also some experimentation with "synthetic" organisms that will permit the extraction of residual petroleum from wells previously thought to be depleted. The development of large-scale portable generators by the U.S. military has led to an acceleration of diffusion of points of generation. Military technology also provided new kinds of batteries for a range of battery-powered devices, including the electric car.

Other investments focused on high-efficiency water purification processes, in the hope that the region might at some future time export water in trade deals for oil. The R&D program also concentrated on the development of new catalysts to lower the energy requirements of electrolysis, a step toward a hydrogen economy.

Efforts to create serious international governance structures that require compromise and give-and-take negotiations have largely failed over the past 20 years. Ethnic groups and countries are looking out for their own interests. The global economy has not yet grown back to its pre-2011 size. Many have turned inward, focusing more on local affairs and with increasing reliance on religion for security.

An electronic iron curtain has come down between the knowledge-able and the knowledge-less. The decay of family and social values, corruption, and trans-national crime seem to have become the governing elements in the system. Many people have withdrawn into the personal, private, cyberspace world. Not enough seem to care about the environment or their neighbours. One wonders if the world has entered a new kind of World War III.

Annex 5 Final Implemented Agenda

Agenda for ROADIDEA 2nd Innovation Seminar, 14 – 15 May 2009, Hotel Neptun, Dubrovnik

Day 14 May	**Sessions**	**Session form**	**Content**
9.00 – 12.00 Chair Pirkko S. *Incl. 20 min coffee break*	**Session 1 Introduction**	plenary	- Pirkko Saarikivi: Seminar introduction - Risto Kulmala: "Intelligent vehicle and infrastructure systems -eSafety and EasyWay" - Ivan Fencl: "How to make transport in the future more safe?" - Peter Jesty: "Introduction to the European ITS Framework (FRAME) Architecture" - Jaime Martens: "Ideas in environmental sensor development for road and traffic administration" - Pekka Kumpula: "Sustainable and user-centric innovations" - Auli Keskinen: Seminar sessions introductions
12.30 – 13.30	**Lunch**		**briefing with group leaders 12.30-12.45** Jörgen Bogren, Jörg Dubbert, Armi Vilkman, Lulu Hyvätti, Rene Kelpin, Auli Keskinen, Hanne Lindqvist, Pertti Nurmi, Matti Roine, Pirkko Saarikivi
13.30 – 15.45 Chair Matti R. *Incl. 20 min coffee break*	**Session 2 State of the art of the existing ideas and pilots**	3 groups & plenary	Presentation and discussion on the existing ideas and pilots. Listings of further actions for years 2009 - 2010 Plenary summary
15.45-16.15 Chair Auli K.	**Session 3 introduction to pub session**	plenary	Introduction to Free Radicals session Presentation of the three pre-selected futures scenarios: World 1, World 2 and World 3 World1=green, World2=yellow, World3=orange, group leaders= pink
16.15 - 18.00	**Pub Session preparation for session 4**	free grouping (groups of 4-5 people) *outdoors*	Free Radicals session start: Free group discussion on futures scenarios, basic assumptions and wild cards. Choosing the group membership for session 4. Invited TC members as group leaders. At the end, material to Pirkko, Lulu, Auli (revising the groups for session 4, basic assumptions and wild cards)
20.00	**Dinner**		**19.00 start**
Day 15 May			
9.00 – 12.00 *coffee available*	**Session 4 Free Radicals**	3 groups	Brainstorming group sessions under Road Traffic in Europe in 2030 - Information Products and Services in three different futures worlds Notice groups! two leaders per group. Grouping, naming, short-listing of 5 best ideas in each world. Each idea on separate flip-paper,
12.00 – 13.00	**Lunch**		
13.00 – 14.30	**Evaluation of Innovation Aspects**	plenary	15 short-listed ideas: one supplementary cycle (add and study), one evaluation cycle (give hearts - 3, 2 and 1 -), ideas evaluated using "evaluation table" (group leaders), calculate hearts: short-list of 5
14.30- 15.00	**Evaluation table**	evaluator group	Evaluation of innovation aspects using evaluation table with chief evaluator
15.00 - 15.45 Chair Pirkko S.	**Summary Session**	plenary	Results of the seminar- 5 best ideas are presented. Closing of seminar, further actions for 2009-2010

Annex 6 Grouping for Sessions 2 and 4

Groups in State of the art of existing ideas and pilots 7.5.2009

Group	1 IDEAS Table 1	2 IDEAS Table 2	3 Pilots
Group leaders	Rene Kelpin Auli Keskinen	Jörg Dubbert Lulu Hyvätti	Jörgen Bogren Pirkko Saarikivi
Members	Gustaf Axelson Torbjörn Gustavsson Ilkka Juga Jaime J. Martens Hanne Lindqvist Andrea Rossa Marcus Wigan	Ivan Fencl Péter Holló Risto Kulmala Markus Mehlin Pablo Luque Matti Roine Risto Öörni	Emilio Davila-Gonzalez Peter Jesty Pekka Kumpula Menno Mimpen Michal Najman Nebojša Subanović
IDEA team members (others)	Armi Vilkman Đurđica Marković (Antje Parnitzke)	Pertti Nurmi Pär Ekström Igor Grabec	Marjo Hippi Markku Luoto Francesco Domenichini

Project Roles:

Coordinator: Pirkko Saarikivi
Financial Manager: Lulu Hyvätti
Innovation Manager: Auli Keskinen
Technical Coordinator: Matti Roine
Evaluation Manager: Jörg Dubbert

Invited Guest/Chief Evaluator: Pekka Kumpula, S.E.O.S Design Ltd, Finland

Invited Guests:

Ivan Fencl	Consultant, Czech Rep.
Peter Jesty	Coordinator E-FRAME Project, Czech Rep.
Risto Kulmala	VTT, Finland
Pablo Luque	Universidad de Oviedo, Spain
Jaime J. Martens	Msnt GmbH, Spain/Germany
Markus Mehlin	DLR, Germany
Menno Mimpen	MeteoConsult/ MeteoGroup, The Netherlands
Michal Najman	Meteopress, s.r.o,.Czech Rep.

Groups Session 4: Free Radicals 11.5.2009

This is the preliminary grouping which is updated during the Pub Session!

2030 World	**Group 1** **World 2** **Environmental Backlash**	**Group 2** **World 3** **High-tech Economy – Technology Pushes Off the Limits**	**Group 3** **World 4** **Political Turmoil**
Content	- Moderate growth in technological breakthroughs - High environmental movement impacts - Moderate economic growth - Moderate changes in geopolitics and war/ peace/ terrorism	- High growth in technological breakthroughs - Low environmental movement impacts - High economic growth - Few changes in geopolitics and war/peace/terrorism	- Moderate growth in technological breakthroughs - Low environmental movement impacts - Moderate/low economic growth - Major changes in geopolitics and war/peace/ terrorism
Group leaders	Rene Kelpin Pirkko Saarikivi	Jörgen Bogren Lulu Hyvätti	Jörg Dubbert Auli Keskinen
Other members	Gustaf Axelson Ivan Fencl Marjo Hippi Ilkka Juga Hanne Lindqvist Đurđica Marković Menno Mimpen Matti Roine Risto Öörni	Francesco Domenichini Igor Grabec Péter Holló Risto Kulmala Pablo Luque Jaime J. Martens Michal Najman Andrea Rossa Armi Vilkman	Pär Ekström Torbjörn Gustavsson Peter Jesty Pekka Kumpula Markku Luoto Markus Mehlin Pertti Nurmi Nebojsa Subanovic Marcus Wigan

Basic Assumptions 2030 (as Megatrends)	**Wild Cards aka Weak Signals 2030**
Galileo system or some such available People on earth 8-10 Billion: 5 B in cities, 3-4 B rural Climate change situation worse Economic slow down and great variances Ecological immigration worse and global	Pandemics Sweet water scarcity Superconducting in low temperatures solved Bioterrorism Nuclear disaster Life on an exoplanet

Annex 7 Summary of Existing Ideas and Pilots

2nd Innovation Seminar, May 2009 4.6.2009 V 0.2
Results of Session 2: discussion on the state of the art of existing ideas and pilots

Summary table of work to be done for the existing ideas and pilots

IDEAS	Cross-border weather alerts, location based systems	Mobile phones as sensors, mobile sensor data acquisition	MyRoute mobile pocket guide, route selection information while planning	MyTravel Toilet Tom-tom, updating info while travelling	In-vehicle information on speed, traffic and road condition	EUROADMAP weather databases; sponsor-based business model
To be done in 2009	Collaboration between Sweden and Finland continues Other parallel projects explained, e.g. METEORISK (Alpine collabo-ration project), www.meteoalarm.eu, Viking, Projects of SIRWEC partners	Finland and Germany situation will be covered 2009 (Armi Vilkman from Destia, Rene Kelpin from DLR) Many companies covering this at the moment, but overview will be given anyway.	Proposal for system operational architecture can be studied (WP4)	Proposal for system operational architecture can be studied (WP4)	12 month report on current situation	WP2 will continue data source investigation, collaboration between WP3 and WP2 are needed.

IDEAS	PULP FRICTION friction models; rwis & weather & maintenanc e	EYEAR Road eye; friction data collection & trans-mission	Traffic forecast models	PORT port-related traffic modelling see PORT pilot	FREE-DATA free geospatial and weather data	RTFM better & tailored user interfaces; regard personal needs	STAY-HOME effects of staying home instead of travelling
To be done in 2009	Pilot will continue, lot of work there, see Friction pilot	Close follow-up of other parallel projects See also Pulp Friction	Study if possible other pilots in the future Destia vs. SemconCaran of how to present Gothenburg Pilot	possible further studies?	Basic study done and docu-mented (also EU), no future actions	Follow-up of current parallel projects	Basic study done and docu-mented, no future actions

PILOTS	Friction	Gothenburg	Fog	Port
To be done in 2009	Testing improvements Future need, salt effects on the road …. model has great potential for future development Mobile interface in the future possible Is there a possibility to measure light in the future	**1**: The code source problem needs to be solved 2: Operational problems need to be solved (who is doing what, who pays?) "Innovative aspect in this is how to open an platform for developers (Destia) maybe an extranet service, but it is impossible that the platform owner is doing the developing work." eFRAME project results can be used in further planning	**T**arget: Hourly charts, first result in November Internet, mobile phones or maybe automatic SMS messages in 2009 More development with algorithm and the problems, forecasting model development later Combined signals studied	Difficulties to get data Progress is slow but sure; is long time idea that will be developed in the future, good changes for future project

GROUP WORK RESULTS OF SESSION 2
STATE OF THE ART OF EXISTING IDEAS AND PILOTS

GROUP 1 and GROUP 2 : IDEAS

CROSS BORDER WEATHER ALERTS
Connected with EUROADMAP
To be done in 2009:
Collaboration between Sweden and Finland continues
Other parallel projects explained, e.g. METEORISK (Alpine collaboration project), www.meteoalarm.eu, Viking, Projects of SIRWEC partners

MOBILE PHONES AS SENSOR
Destia's responsibility, problems with privacy and tele-operator costs (they want to earn money).
To be done in 2009:
Finland and Germany situation will be covered 2009 (Armi Vilkman from Destia, Rene Kelpin from DLR)
Many companies covering this at the moment, but overview will be given anyway.

MYROUTE and MYTRAVEL
To be done in 2009:
Proposal for system operational architecture can be studied (WP4)

IN-VEHICLE INFO
New ways to bring info to car needed. Especially HMI must be taken into account such as special needs of disabled and elderly, and security issues which will certainly be ever growing demand for future
To be done in 2009: 12 month report on current situation

EUROADMAP
Existing parallel application: BalticRoads (collaboration with Finland and the Baltic States)

To be done in 2009: WP2 will continue data source investigation, collaboration between WP3 and WP2 are needed.

PULP FRICTION
Was an idea and is now a pilot, and is a new innovation, possible future applications
To be done in 2009: Pilot will continue, lot of work there, see pilot

EYEAR
Much work done currently in other studies
Lots of similar activities within the car manufacturing industry.
Close resemblance with Pulp Friction project
To be done in 2009: Close follow-up of other parallel projects

TRAFFIC FORECAST MODELS
Data for pilot delivered
Findings and discussions see Gothenburg Pilot
To be done in 2009: Study if possible other pilots in the future
Destia vs. SemconCaran of how to present Gothenburg Pilot

PORT
Positive response from end-users
Recession has influenced continuation, but still parties interested
Is a theoretical study
To be done in 2009: possible further studies?

FREEDATA
Lot of work going in in Europe and
Coordinator Pirkko Saarikivi has delivered a paper for EU officials
Free data is necessary for new innovations, but seems not to be realisable in near future

RTFM
A short study has been conducted and documented
Too general in scope
Presently lots of projects involved in Europe and globally
To be done in 2009: Follow-up of current parallel projects

STAY HOME
Many parallel studies currently conducted
To be done in 2009: Basic study done and documented, no future actions

GROUP 3 PILOTS

PULP FRICTION
Pilot is going on quite well, measurements done this winter.
Comparisons with Volvo and other measurements, measuring campaign successful.
Pilot will be tested and proved.
Future needs: salt effects on the road
…. model has great potential for future development
Mobile interface in the future possible, mobile phone is tested in autumn 2009

Is there a possibility to use dispersion of light to measure friction in the future?
To be done in 2009: Testing improvements

GOTHENBURG PILOT
Problems: bottleneck in using model code, and is related to math-lab-code
Collaboration of SemconCaran with Logica and Destia is needed
Model is unused because of data problems, Logica is providing model
Taxis: "rain-effect" has increased due to aging drivers
To be done in 2009:
1: The code source problem needs to be solved
2: Operational problems need to be solved (who is doing what, who pays?)
"Innovative aspect in this is how to open an platform for developers (Destia) maybe an extranet service, but it is impossible that the platform owner is doing the developing work."
eFRAME project results can be used in further planning

FOG PILOT
Is detecting and sensing and presenting fog warnings. Deriving info from different spectra and combined surface based sources.
Algorithm is working fine, some problems have emerged.
To be done in 2009: Target: Hourly charts, first result in November
Internet, mobile phones or maybe automatic SMS messages in 2009
More development with algorithm and the problems, forecasting model development later
Combined signals studied

PORT PILOT
Container traffic in Hamburg port is increasing (so far 100% in 8 years!)
Road network capacity must be optimised with models: Road traffic, logistics process
First the processes must be analysed, needs research of data, difficulties to get data, especially private data. Monitoring processes are needed as well.
To be done in 2009: Progress is slow but sure; is long time idea that will be developed in the future, good changes for future project

Results of the questionnaire on state of the art of existing ideas and pilots, 2009

Summary Existing Ideas Table 1. State of the art at M16

IDEA	Cross-border weather alerts, location based systems	Mobile phones as sensors, mobile sensor data acquisition	MyRoute mobile pocket guide, route selection information while planning	MyTravel Toilet Tom-tom, updating info while travelling	In-vehicle information on speed, traffic and road condition	EUROADMAP weather databases; sponsor-based business model
State of the art	Setting the cooperation with national meteorolo-gical institutes	Nokia's mobile millennium most famous case (more info *) also existing systems in many places in Europe	Elaboration of the vital elements for realisation	Elabora-tion of the vital elements for realisation	Existing services (navigators as old and mobile phones as new media)	Idea new, First trial with FCD made in Track&Trade, All technologies available
Vision	Localized on trip alerts about difficult weather conditions	Pre and on-trip traffic information service	Customized pre and on-trip travel/traffic information service	Custo-mized on trip informatio n service	On-trip driver supporting systems / information	Provision of different level aggregated weather data for tailor-made purposes, Weather content provision for third party service providers
Obstacles, legal problems	Data quality differs in different countries	Privacy issues (customer must sign an agreement to be with the service)	Collecting data from vehicle sensors and sending to Central database could have some legal problems	Database, Roadmap, Subscrip-tion model	Legal issues drive for safe use of different media	Unknown weather data availability in Europe, Unknown charges and license fees, Format differences
Data availability	Data exist, but local accuracy (forecast area) differs	Existing systems	Raw known data can't be used directly – data fusion or integration is necessary as well as value adding aggregation	Categori-sation by position, purpose, size, working time	Data has variable accuracy in different areas (best info on main roads, town areas most difficult to cover)	Partly known and good, partly bad or completely unknown
Exploitability	For private and profes-sional users	For private and professional users (traffic management)	Transport field, urban planning, economics, policymakers, consultants dealing with mobility issues, authorities dealing with traffic flow, traffic information to (local) governments.	Mostly for private users	For private and HGV drivers	Good: Availability of weather content without own know-how and data
Business opportunities	One important data feed (value depends on accuracy / locali-sation)	One new form of traffic raw data to be used in different services	Private sector and businesses	As a part of some other Tom-Tom services	As part of other services	Unknown, to be investigated by survey
Primary target customers	For private car and HGV drivers	For private and professional users (traffic management)	Mobile companies, authorities	Private users	For private and HGV drivers	ITS-service providers, road authorities, fleet dispatcher, content providers, newspaper

Secondary target customers	-	-	Private users	-	-	Everybody who is interested in weather (nowcast & forecast) as supplementary data for own applications
Will do in 2009	Further development	Further development	Further development	Further development	Further development	First step: Investigation of European weather data availability
Discussed, applied in which WP?	WP4, WP7, WP8	WP4, WP7, WP8	WP4, WP7, WP8	WP4, WP7, WP8	WP4, WP3, WP7, WP8,	WP2, WP4, WP7, WP8
IDEA teams	Vilkman, Destia	Vilkman, Destia	Markovic Parnitske	Markovic Parnitske	Vilkman, Destia	Kelpin, Dubbert Leviäkangas
* more info		http://www.traffic.berkeley. edu				

Summary Existing Ideas Table 2. State of the art at M16

IDEA	PULP FRICTION friction models; rwis & weather & maintenance	EYEAR Road eye; friction data collection & transmission	Traffic forecast models	PORT port-related traffic modelling see PORT pilot	FREEDATA free geospatial and weather data	RTFM better & tailored user interfaces; regard personal needs	STAYHOME effects of staying home instead of travelling
State of the art	To make better estimation of the prevailing and forecasted road weather	Driver assistance systems and on-board equipment for cars exists. It is also possible to send collected data to a central server via digital radio communication. Floating-car data detection is resolved as a technical solution, C2C communication is subject of current research	Non-para-metric fore-casting program developed	There is information about the container ship movement in the port. - It is known how many containers are brought and picked up by container vessels. Also the container destinations/ origins in the hinterland are known. There are also figures about road traffic on the access roads to/from the port.	Same as a year ago, though the situation of road weather station data is worse than expected	Report on innovation Wiki, several ongoing studies in FP7 projects	Report on innovation Wiki, several ongoing studies in FP7 projects
Vision	To predict friction	The idea is to collect data about friction by measurements in the car and to transfer it to a centre in order to enable a service to road users which warns of black ice and slippery roads. The car is used as a probe. Several equipped cars enable the service. A central server processes collected friction data. A map display is generated. Warning messages to other vehicles are generated and distributed by radio. The method could be enhanced by communication between vehicles.	To install the internet and phones flow fore-casting model	A model is required which predicts the incoming and outgoing container trucks at a terminal gate in a certain time span depending on the knowledge on the pattern of the container ship arrivals / departures.	Very slow improve-ment unless strong intervention from the Com-mission	Inter-faces acces-sible for more people	Traffic con gestions reduced, pollution reduced, more efficient use of time

Obstacles, legal problems	The quality of the forecasted friction is unclear	To equip enough vehicles, to access to CAN-bus of different vehicle types, to create and sell respective on-board units, to track car and keep privacy, to enable maintenance of the system, to find a service provider and a business model, service more relevant and requested in the northern countries	No	Data is available in the hands of private service providers who might want give it only against payments, private service providers might want to negotiate if other service platforms/ providers come into the game, container transport data is private and confidential	National legislation, heterogeneit y of data sources	Different protocol, different logistics, no co-herent regulations	Logical problems, not many industries available
Data avail-ability	RWIS data available (hosted by Finnish Road Administra-tion). Also, FMI's road weather model data available.	Data must be generated by special floating cars, respective sensors need to be installed.	Depen-ding on the country	The procurement and assessment of data needs time. It cannot yet be determined whether the available data is useful and whether other data is needed	Same as year ago	Varied sources, difficult to com-pare	Projections difficult to verify, no testable sources available to this study
Exploit-ability	To make better estimation of the prevailing and forecasted road weather	Service useful as a complement to available traffic information services	Public, private compa-nies and agencies	A process model is needed asap which determines the inter-dependencies in the transport of containers	Suffers from data problems	Mass market potential, highly possible if new products inno-vated	Limited exploi-tability prospects
Business oppor-tunities	Not actual business product. Mainly aimed for the public sector (at first). Later possible to create products for drivers.	An option for private service providers to include additional content	Servicing of the model will be a part of business	Only a concept is possible	Limited in Europe due to poor data access	Growing industry development driven new innovations constantly on the market, (Nokia, Siemens etc.)	For software companies, teleoperators
Primary target custo-mers	Meteorologi sts and road mainte-nance personnel at first. Later probably products for drivers, too.	Car drivers	Public users, transpor-tation compa-nies govern-mental agencies	Port authorities, authorities responsible for road traffic management	All transport users and profes-sionals	End users (elderly people, disabled, foreigners	General public, ITC workers
Secon-dary target custo-mers	-	Traffic information service providers, Traffic managers	-	Transport companies, traffic information service providers	Operators (tele, web etc.)	Tele-operators, software development companies, phone rental companies	Community officials

Will do in 2009	Studying the friction phenomena and its correlation to weather parameters . Model developme nt based on the studies.	No	Provisio-nally?	Only a concept is possible (theoretical pilot)	Input as requested by VTT to D4.3	Report finished, new innovation cycle may bring new info	Report finished, new innovation cycle may bring new info
Discussed or app-lied in which WP?	WP3, WP4, WP7, WP8	WP4, WP7, WP8	WP3, WP4, WP7, WP8	WP3, WP4, WP7, WP8	WP1, WP2, WP8	WP1, WP8	WP1, WP8
IDEA teams	Hippi Gustavsson	Dubbert Nurmi	Grabec Ekström	Dubbert	Saarikivi Hyvätti	Saarikivi Hyvätti	Saarikivi Hyvätti

Summary Existing Pilots **Table 3. State of the art at M16**

PILOTS	Friction	Gothenburg	Fog	Port
To be done in 2009	Testing improvements Future need, salt effects on the road …. model has great potential for future development Mobile interface in the future possible Is there a possibility to measure light in the future	1: The code source problem needs to be solved 2: Operational problems need to be solved (who is doing what, who pays?) "Innovative aspect in this is how to open an platform for developers (Destia) maybe an extranet service, but it is impossible that the platform owner is doing the developing work." eFRAME project results can be used in further planning	Target: Hourly charts, first result in November Internet, mobile phones or maybe automatic SMS messages in 2009 More development with algorithm and the problems, forecasting model development later Combined signals studied	Difficulties to get data Progress is slow but sure; is long time idea that will be developed in the future, good changes for future project

Annex 8 Results of Free Radicals Session

Results of Free Radicals Session V0.2 10.6.2009

Summary Table and Evaluation of Free Radicals

IDEA	Evaluation points (hearts)	Ranking
Semi-public transport	**55**	**1**
DYNAMOBI	**52**	**2**
No-man driving	**43**	**3**
Waste to energy	**42**	**4**
TRAWORK	**41**	**5**
LEGO-block transport	**39**	**(6)**
Industrial Transport	**31**	**(7)**
Free energy	**29**	**(8)**
HVI interface	**23**	**(9)**
TAR-TRANS	**18**	**(10)**
Location-based services	**17**	**(11)**
New transportation technologies	**13**	**(12)**
Megatrends of environmental backlash	**11**	**(13)**
General ICT conditions	**6**	**(14)**
Conditions of political turmoil	**-**	**-**

Presentation of the Innovation Material Collected in the Session

During the session the four alternative worlds for 2030 were discussed in three groups: one group for each world. First, the conditions of different future worlds were discussed, then in addition some wild cards were also found, as are presented below.

Conditions of different future worlds in 2030

World 2 Environmental Backlash

Megatrends Evaluation: (evaluation: 11 points - not used in final comparison)

- High energy prices -> smaller and lighter cars -> lower speed limits (price>10 e/litre fuel)
- Personalised emission trading based mobility management & service systems
- Megacities
- Population getting older - health care and well-being services increasingly needed
- "Mummy-mobile" specially designed for elderly needs - may also stimulate technological breakthroughs
- "Slower" holiday travelling (no more weekend trips done by airplane)
- More rural, local transport - public & private
- Agri-products with 0-km distance (below 50 km area) available all over (now in Italy)

Addition in 1st cycle: more bikes with small electric motor for uphill ride - recharged downhill

World 3: High-tech economy - Technology push

Wild Cards:

- Virtual reality
- Cluster living - no need for car
- Flexibility at work and traffic - home office means less traffic - tax reduction could promote this, changing of influences to traffic - working time, holidays
- CEBRA - central brain ref. "Matrix"
- Tax incentives (Society's - stick and carrot)

World 4: Political Turmoil

Conditions of operational environment

- Bankrupt states will disrupt long distance travel
- Separate personal luggage & people, city public transport services
- No unlimited globe trotting
- "War" effort takes about 20% of 1st world GDP
- Lower investment in major public transport due to terrorism vulnerability and events
- Oil price > 100 e/barrel
- Run out of uranium in 2050 confirmed
- WTO does not exist - regionalism rules
- People move out of cities
- EU will be one of the "imperiums" and behave accordingly
- Higher oil price, more efficient cards, small impact on mobility
- Smaller cars needed
- People don't care about CO2
- Government will enforce personal carbon budgets
- Power imbalances will ensure high mobility only for powerful groups

What-if Analysis:

- Oil lobby stops development of new technologies?
- Economic power goes to China
- Fusion power comes on stream
- Deregulation of traffic services
- No more GPS?
- Money vs. religion - which one rules? Money & religion always have been going together

Wild cards:

- Key low volume material becomes unavailable - e.g. rare earth!
- Russia will join the EU
- Global supply chains will be forcefully maintained by major powers (and used as political leverage)
- No war zones - No US - No NATO

Free Radicals Session Ideas

There were 13 best ideas evaluated in the two brainstorming cycles: 1st cycle: studying the results of the group work and giving comments, 2nd cycle: giving hearts for best ideas (3 to excellent, 2 to good, 1 to potential).

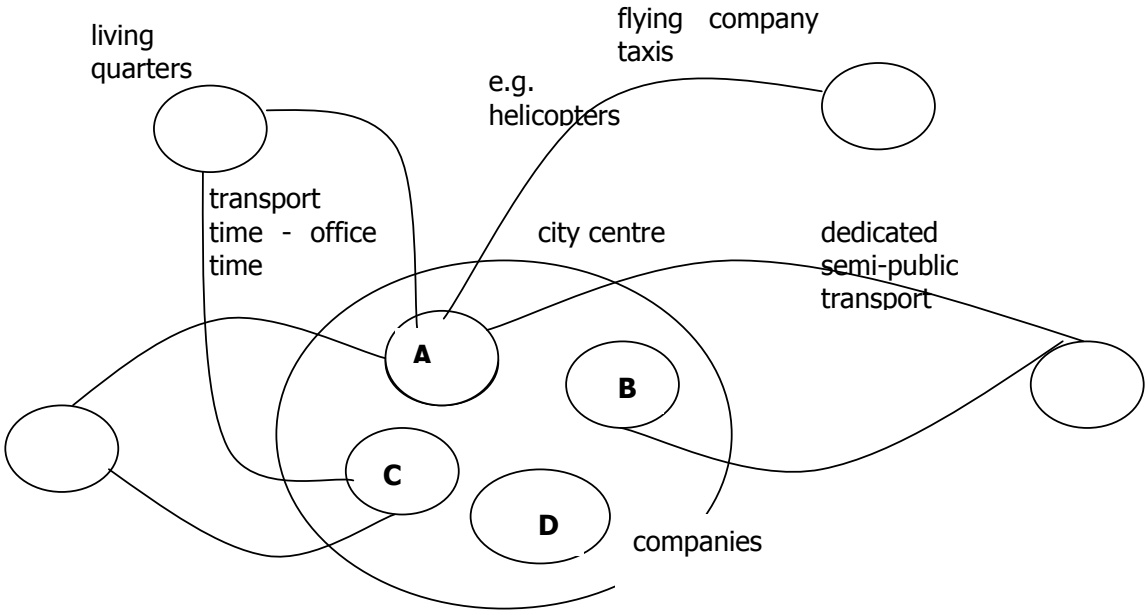
World 2: Environmental Backlash

1. Semi-Public Transport
Evaluation: 55 points - 1.

- Best travel services are in public transport units
- Personal cars are not allowed for fancy nomadic devices, buses, trains and car-pool vans have all fancy services
- Service production & support systems of advanced private public transport services
- Security and safety services
- 3 dimensional (taxi) traffic navigation
- Radar-based collision avoidance systems
- Level of automation in public transport? (trams without a driver?)
- Flying taxis
- Car sharing based on electronic vehicles
- Accurate travel(time) information to make best choice
- Personal travel device service (rent) on (large) public transport stations
- Some kind of relaxing system as service

Addition in 1st cycle: Comfort on-demand at a price!

Figure: Semi-public transport MIS (management and information system)
3 dimensional vision



2. Waste to Energy
Evaluation: 42 points - 4.

- (Human bio-waste used as energy for cars)
- Bio-waste into packed tubes -> can be used as an energy source later
- Biogas (& methane -> car) from waste
- Bio-waste collection service - tax refunds included!
- Stand-alone bus "fuelling" from bio-waste
- Biomass power plants -> car battery charging in-house -> independent energy demand & supply cycle
- Dense network of fuel stations with different fuels including changeable accumulators (batteries); possibility to leave your waste for bio-energy production

Addition in 1st cycle: Geobacteria harnessed to produce electricity

3. Industrial Transport
Evaluation: 31 points

- Railways connection among logistic centre plus other transport modes
- Food production: Europe & Megacities
- Location-aware web commerce applications (shipping costs included in price comparison)
- Get rid of unnecessary transport! Who defines the level?
- Emissions minimised for freight transport = always use the least emissive way
- Support local production -> without taxes!
- Equally levelled production costs all over the world!
- Production effectiveness competition & rewarding
- "Big Brother" system to follow your transport emissions -> includes carrots: tax reductions, includes sticks: more taxes, for private and industrial transport
- Integrated market needs based on logics services system
- Clearing house for knowledge exchange
- Real-time intermodal logistic services, booking & payment systems & service EU - wide
- New system of goods distribution in megacities + green vehicles
- Network of logistic centres around megacities

Addition in 1st cycle: Pay-as-you-transport

4. TRAWORK
Evaluation: 41 points - 5.

- Virtual offices - office on demand!
- Travelling on offices - working on transport
- Office on demand rental company
- Travelling on office organisers
- Service: shopping while working
- Targeted transport service for companies (working during journey)
- Fluent "rent a vehicle" and taxi services
- WAN everywhere (web services)

- Daily activities & travelling management and optimisation services
- Dynamic incident-based network traffic management & services system
- New business models needed

Addition in 1st cycle: Traffic forecasting during incident duration with impacts

World 3: High-tech economy - Technology push

5. FREE ENERGY
Evaluation: 29 points

- Plugless and cordless electric charging
- Personal equipment generating electricity - personal energy trading (a person as a company selling excess energy)
- Low cost energy - >compressed air as driving force
- Solar panel roofs & windows in cars
- Friction used as energy in roads
- Money in electricity
- Low energy "plants"
- Wireless electric distribution (N-TESCA , end of 19 CT)?

Addition in 1st cycle:
Flying car-> gets in a very strict and complicate law of air transport
Rather "emission"-free energy (there is no free lunch)
Solar building material - > SOLAR BRICK?

6. No-man driving
Evaluation: 43 points - 3.

- Autonomous driving - semiautonomous (?), who is driving? - travel time is radically shorter
- Horse-intelligence to the car (rf to horse power)
- Speed control, reaction test in car, driving wheel as heart beat monitor - > other life indicators, thus avoid bad drivers: drunken, old, sick, young
- Speed control: cameras, black box, "outside" signals to speed regulation, behaviour control, witness, driving in the background all the time and recommending breaks, mandatory overnights etc.

Addition in 1st cycle:
Increasing the perception of risk with acoustic design of vehicle sna acoustic risk indication features
Avoid also adverse and bad weather driving
Intelligent road condition monitoring
Liability

7. DYNAMOBI Dynamic mobility
Evaluation: 52 points - 2.

- Cooperative dynamic navigation
- Integrated traffic system: car/train/airplane/bike/taxi/boat
- Real-time network status model plus dynamic speed limits
- Intelligent control of traffic field
- Intelligent and efficient logistics
- Info (integrated), alerts of changes
- Ticket booking and paying
- Continuous rerouting on multimodal journey

The keywords for DYNAMOBI are:
- navigation: guides the user to his/her destination
- easy to use: user just points at the target in digital map or gives the name by keyboard or speech
- multimodal: includes all transport modes, also walking, cycling, rollerblading, skiing etc
- scalable: from a town or city to a country to continent to the globe,
- modular: utilising local and regional traffic network models in a grid
- dynamic: the models react to incidents and congestion immediately, predicting their duration and impact on the network (recurring congestion nationally built in)
- cooperative: users with the system get individual guidance, which will depend on how the other users are behaving and following the guidance so that in case of too many rerouting to the same route, a part is guided to the next alternative, etc etc (relying on users being positioned when needed or prompted by user query)
- full-service: also travel related booking and payment is included

8. LEGO-BLOCK TRANSPORT
Evaluation: 39 points

- Intelligent structure - modularity - lego-block car parts (cabin, engine, wheels)
- Super light weight vehicle cheap or as status expensive
- Car trains
- Wind shade for better aerodynamics of cars
- Small sizing as trend - slot time plan -> route, high speed travel possible, lower fuel consumption

9. TAR-TRANS
Evaluation: 18 points

- Hovering traffic in the air
- High speed highways -> 300 km/h, stops every ?
- New type of roads, 2-layers, weather shields
- Nanosurfacing - no ice, no snow
- Dedicated lanes for small cars
- Traffic goes underground
- Cooperative guidance on lanes

Additions in 1st cycle:
Revised traffic rules?
What is nanosurfacing? New surface materials which can not freeze

World 4: Political Turmoil

10. General ICT-conditions
Evaluation: 6 points

- Internet is physically regional, but overrunning systems exist
- Accessibility must be ensured
- Cheap mobile services needed
- No cheap airlines, less business travel, EU research expensive

11. LOCATION-BASED SERVICES
Evaluation: 17 points

- Security applications: personal logistics services, esp. goods, separate personal luggage and people - >city public transport services needed
- Security applications: Monitoring protection devise , tracking people, child travel tracking system, automatic luggage management

Addition in 1st cycle: privacy?

12. HVI Interface Human-vehicle
Evaluation: 23 points

- Tracking people and vehicles -> connected travel
- Vehicle autopilot - but not owned by individuals, autonomous vehicles but not central control
- HMI interface for elderly: Car-toilet seat
- Tackle inability to undertake travel/communication that are desired
- Filter ITS while driving (GIDS project)

13. New transportation technologies
Evaluation: 13 points

- Car + train: 1) cars travel as train, 2) cars are onboard train for long travel, low range vehicles

Additions in 1st cycle: Smaller cars!
Higher oil price, more efficient cars needed, small impact on mobility

Annex 9 Evaluation Table

Table for Evaluation of Innovation Aspects V 0.3 11.5.2009

Evaluation of each short-listed Free Radical Idea as the last exercise of 2nd innovation seminar lead by group leaders. Tick the appropriate box.

Name of Idea					
Innovation Aspects	**Factor Value**				
New or innovative/existence of a new element 0=the idea exists and is on the market already, 1= similar services on the market but idea has some new aspects, 2= completely new idea not known to be implemented, 3= completely new idea not known to be developed anywhere, 4= revolutionary and radical new idea	0	1	2	3	4
Relation to the state-of-the-art 0=no added value, 1= unclear added value, 2=minor added value, 3=large added value, 4=revolutionary	0	1	2	3	4
Scale and potential impact of the idea 0=no foreseen impact, 1=small scale innovation, small impact, 2=small scale innovation, large impact, 3=large scale innovation, small impact, 4=large scale innovation, large impact	0	1	2	3	4
Potential for multiple use 0= does not solve known problems, 1=solutions for a single problem, 2=solutions for a few deployment cases, 3=solutions for many similar deployment cases, 4= revolutionary new solution with multitude of potential deployment sectors	0	1	2	3	4
Relevance to global policy objectives 0=no clear contribution or idea politically not accepted, 1=low contribution, 2=average contribution with usual impact, 3=clear strong contribution to sustainable development, strong impact, 4= revolutionary new concept solving key problems in society	0	1	2	3	4
Feasibility of the concept/obstacle to implementation 0=idea hard to implement in general, 1=idea hard to implement in the short run, 2=idea can be implemented with an average effort and risk, 3=idea easy to implement, 4=industry will compete on this idea for quick implementation	0	1	2	3	4
Relevance for business generation 0=no business opportunity foreseen, 1=unclear business case, some potential maybe in the future, 2=clear business case today, but small market, 3= clear business case, large market, 4=killer application, large market	0	1	2	3	4
Public interest 0=no public interest in the idea, 1= some public interest, 2=clear public interest, but no business case, 3= clear public interest with business case, 4= public will go wild with this idea	0	1	2	3	4
Comments					

Annex 10 Participants

Pirkko Saarikivi	Foreca Consulting Ltd
Lulu Hyvätti	Foreca Consulting Ltd
Auli Keskinen	Foreca Consulting Ltd
Matti Roine	VTT
Risto Öörni	VTT
Pertti Nurmi	FMI
Marjo Hippi	FMI
Ilkka Juga	FMI
Armi Vilkman	Destia
Hanne Lindqvist	Destia
Jörgen Bogren	Klimator AB
Torbjörn Gustavsson	Klimator AB
Marcus Wigan	Demis B.V.
Rene Kelpin	DLR
Markus Mehlin	DLR
Gustaf Axelson	DLR
Jörg Dubbert	Pöyry Infra Traffic GmbH
Andrea Rossa	ARPAV
Francesco Domenichini	ARPAV
Péter Holló	Road Safety Engineering Bureau
Nebojša Subanović	Meteo-Info
Đurđica Marković	Meteo-Info
Pär Ekström	Caran AB
Igor Grabec	AMANOVA d.o.o
Markku Luoto	Logica

Invited Guests:

Pekka Kumpula	S.E.O.S Design Oy
Pablo Luque	Universidad de Oviedo
Michal Najman	Meteopress, s.r.o.
Peter Jesty	Peter Jesty Consulting Ltd/ Coordinator E-FRAME Project
Risto Kulmala	VTT
Jaime J. Martens	Msnt GmbH
Ivan Fencl	Consultant
Menno Mimpen	Meteo Consult