SAFE, EFFICIENT VEHICLE SOLUTIONS

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Project within: A Strategic Project

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FFI

Content

FFI in short

FFI is a partnership between the Swedish government and automotive industry for joint funding of research, innovation and development concentrating on Climate & Environment and Safety. FFI has R&D activities worth approx. €100 million per year, of which half is governmental funding. The background to the investment is that development within road transportation and Swedish automotive industry has big impact for growth. FFI will contribute to the following main goals: Reducing the environmental impact of transport, reducing the number killed and injured in traffic and Strengthening international competitiveness. Currently there are five collaboration programs: **Vehicle Development, Transport Efficiency, Vehicle and Traffic Safety, Energy & Environment and Sustainable Production Technology.**

For more information: www.vinnova.se/ffi

1. Executive summary

The purpose of the SEVS2 project is to strengthen the Swedish automotive industries ability to analyze and address complex societal and technological challenges related to the transition to a sustainable mobility and transport system by 2030+. SEVS2 focuses on challenges in city environments where transportation is one part of the sustainable city solution. To study this has required the analysis of many different actors, mostly outside the automotive industry, since a transition of the road transport system requires the knowledge and active involvement of many different stakeholders. The analysis has focused on Gothenburg, as an example of a small western city, and also compared results to Shanghai, as an example of a growing Asian mega city.

The SEVS2 project has developed an analysis model explaining the key driving forces and how they influence future road transport. The driving force model has been used, together with the method and scenarios developed in SEVS1, to analyze a future city road transport system where electromobility is one of the main solutions for personal and goods transport.

The analysis has analyzed system consequences of electromobility and what is required for an effective transformation from today's transport system. A key characteristic of the SEVS2 project has been its focus on using already existing knowledge from a wide set of actors and integrate it into a form which is useful for the analysis of future road transport.

There are many different types of results from the project and some of the main results are:

- A method for how to effectively perform analysis of complex societal questions in a multidisciplinary team with many experts with very different background.
- A driving force model, which can be used to analyse the mechanisms which directly and indirectly influence the future transport system
- Four scenarios of different possible futures, which describes how the city and the transport system may develop when some uncertain, but influential, driving forces have different values.
- Analysis of which transport solutions are selected under different circumstances, starting from a user perspective but also including indirect factors in the rest of the society. This analysis has shown potential winning solutions, but also identified which factors are the main drivers and stoppers for different transport solutions.
- Analysis of electromobility as a solution for sustainable city transport, showing that electromobility only to a small part is a user question, but mainly is a solution to energy supply challenges and city environment. Therefore, its main driving forces and stoppers will be found in policy and the transport supply business.
- The project has also provided many insights on the strength and weaknesses of different solutions from a system perspective.

- The overall analysis has also lead to many useful insights about transformation of the society. These include some recommendations for how to think and analyse certain factors, to avoid some common errors we often do when analysing the future.

The project has been led by SAFER and SHC, both national Centres of Excellence, together with a wide set of partners from vehicle OEMs, academia, institutes and other business. The project was carried out during 2012-2013 and had a total budget of about 15 MSEK of which 50 % financed by FFI.

2. Background

There is a strong trend for development towards a sustainable society in general, and as a part of this the transport system is very much in focus. The transformation of the transport system has often been seen as mainly a matter of developing new vehicles and fuels under fairly well defined boundary conditions. However, the most important driving forces which influence this transition originate outside the transport system itself and are expected to change in the future. The speed at which different driving forces and boundary conditions develop is expected to be very different between different parts of the world. This will have a strong influence on the development of road transport and mobility solutions.

Researchers from many different disciplines have studied the development of the transport system from their different viewpoints, like for example energy and fuel supply, new vehicle technologies, safety, economy, city planning, customer's behavior, and communication technology. Thus, there is a lot of knowledge on how individual driving forces act, but none of these researchers can with great confidence answer how the resulting effect on the transport system will be, since the combined effect of all these different driving forces must first be understood. Due to the very different nature of the involved driving forces and the complex relationship between them there is a need for a synthesis work, building a common model including the key driving forces. The large number of involved experts and stakeholders also leads to a need for a structured method for how to effectively perform the analysis in multi-disciplinary teams.

The demand for sustainable transportation solutions will reshape not only the vehicles, but also business models, development & production processes, services, technologies, education, management, partnerships, supply chain. Many steps to be taken require coordinated action from several of the involved actors. Due to the very rapid changes taking place there is, therefore, a need to quickly initiate a dialog between key actors influencing the transport system. SEVS2 has been an important step towards addressing this need.

During 2009-2010 SEVS 1 addressed the question of how the future vehicle concepts would need to be designed in order to meet the requirements for safe and energy efficient transport. During this project the need for a more detailed model of driving forces, created by experts from many other disciplines were identified. SEVS2 is the natural extension of SEVS1, which takes the analysis one step further and focus more on analyzing the driving forces and how they influence future transport, and less on the vehicle solutions. SEVS2 has used the scenarios developed in SEVS1 as a tool to analyze electromobility as one of the main solution for the future transport system.

Several studies have contributed to a better understanding of future. While these studies provide excellent insights and describe the challenge and the opportunities in a very good way, they look more at possible breakthroughs in technology than at possible trend breaks which may occur in driving forces outside the transport system which may influence the transport system. It is SEVS phase 2´s intention to extend the work in these earlier studies by more fundamental research on a wide set of driving forces and processes and to use that knowledge to study electromobility for road based transport solutions. Shanghai and Gothenburg, two different types of cities have been selected as interesting future structures that need to be especially focused at in SEVS2.

3. Objective

The purpose of SEVS2 is to strengthen the Swedish automotive industry's ability to address complex societal and technological challenges, related to the transition to a sustainable mobility and transport system.

The direct contribution of the project lies mainly in:

- *Collecting and integrating global and local societal and technological driving forces into an analysis model*
- *Scenario analysis of electromobility as the main technological enabler of sustainable mobility and transportation solutions in cities. Descriptions of prerequisites and consequences in different scenarios.*
- *Analysis of transition challenges on a system level. Direction of challenges to other*
  stakeholders as well as initiating relevant research among SEVS partners.

Indirectly SEVS2 will also strengthen the ability to address complex transition challenges by

- *Establish methods for multi-stakeholders co-operation and analyses of complexity in a structured way.*

4. Project realization

The SEVS2 project was initiated by the so called "difficult questions" and future societal as well as technological challenges, formulated by AB Volvo, VCC and Scania. This was the basis for the partner invitation, the manning of different work packages (WP), competences and the prioritized use case selection.

The project was from the start divided into four main work packages; WP1 The Driving force Model, WP2 Scenario Analysis, WP3 Transition Guidelines, WP4 Project Management and managing Open Innovation. The overall methodology originated from Malmeken AB, but was further developed during the project process. Completely new methodologies were also invented or the combination of already existing e.g. the Sustainability assessment methodology.

General for the project and all work packages were that the project had an including process, over 50 workshops, with about 15-20 participants each time, working together and learning from each other as a multi-disciplinary team. During the process the project realized that some central competences were missing and in that case the project invited the expertise to join one or several workshops or seminars. The Driving Force Model can from now on be used as a tool to identify necessary competences, but the model did not exist when the SEVS2 project started.

The team building process has been very successful with people that respect each other, even though they belong to many different organizations and professions. Each individual participant has shared their knowledge as well as lack of knowledge, and the project climate characteristics have been openness, trust, fun and professionalism. The gender balance has been about 50 per cent male and 50 per cent females.

While performing the SEVS2 project the methodology how to handle complexity was developed and explored in parallel, and that has resulted in the handbook “The SEVS Way”. This handbook was not defined as an expected result in the application and is not yet completed because the project needs to verify the methodology with some semi external partners, before printing. The administration around this handbook and the SEVS homepage still remains to be solved.

Figure 1: The Handbook "The SEVS Way"

During the whole project there has been lot of struggles to man the management of each work package except from WP1. This has caused serious delays in the time scheduling.

5. Results and deliverables

5.1 Delivery to FFI-goals

The SEVS2 project is designed to address the overall challenge of creating attractive and profitable sustainable road transport solutions. In doing that, it will span across almost the whole FFI program and SEVS2 will address many of the targets for all the individual FFI-programs, with the exception of *Hållbar produktionsteknik*..

All the targets in the *Energy and Environment* program has been more or less included in the analysis within the project – Energy efficiency, reduced CO2 emissions, renewable fuels, reduced toxic emissions and noise. Especially the role of electromobility as a mean to reach these goals has been investigated.

SEVS2 has also contributed to reach the targets within the program for *Fordons- och Trafiksäkerhet* through including significantly increased safety as a driving force to be investigated.

SEVS2 has also contributed to reach one of the main targets of the program for *Fordonsutveckling*, since the developed model of driving forces has been use to find and analyze new vehicle and transport concepts from a system and society perspective. SEVS2 was also well matched with the program strategy of *Transporteffektivitet*, as SEVS aims was to take a holistic approach to cover the whole area described in the program strategy. As a consequence of this wide approach was that SEVS could not go into details in the whole area of this FFI-program, but did definitely provide a very useful overall study which will significantly contribute to understand how all the different parts in the program strategy together shape attractive overall solutions. SEVS2 has covered more or less all the *Övergripande effektmål* for the program and has also analyzed many of the *Effektmål*, like new business opportunities, new business models, increased capacity in existing structures and systems approach.

The individuals that have participated in the SEVS2 process have, by more than 50 (0,5 day - 1 day) common workshops and five seminars, broaden their perspectives and learned a lot about the complex transport system, both societal as well as technological, and by that directly and indirectly contributed to the overall goals that FFI addressed in the program.

5.2 Summary of the method: The SEVS Way

5.1.1. The challenge and the SEVS tools

The long term development of the transport system cannot be understood unless it is studied as a part of society, including many interactions with the rest of the society on the transport system and vice versa. Using such a society perspective is of growing importance since it seems that many of the strongest driving forces influencing the transport system will have their origin outside of the transport system itself, like resource scarcity, changing values and changed city planning. What makes it even more complex is that important effects on the transport system may often be side-effects of other changes in society and thus there is a large risk that we will not see them if the analysis is narrowed down too much.

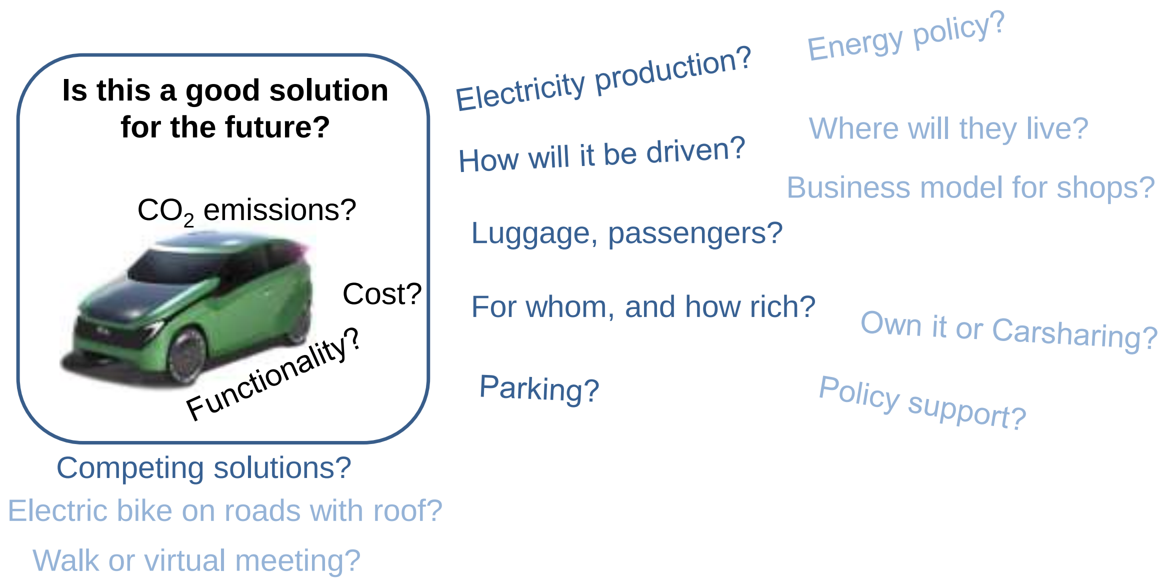


Figure Example of how a simple question about how good a vehicle is extends into questions about many aspects in the future society.

We are all rather bad at dealing with complex problems by just thinking about them on our own. We tend to base most of our conclusions on a very fuzzy mix of data from all types of sources, personal experience and feelings. So, when we want to analyse the future from a society perspective we have to use methods that help us reduce our reliance on personal feeling, and to sort out which data and which arguments are appropriate to use. A key feature of the SEVS method is that it is a tool that enables us to do this in an effective way. The core idea is to structure the way we address the questions and how we present information such that it is easy to analyse the questions in a stepwise and rational way.

The method is based on a few key elements:

- Gathering a multidisciplinary team of experts
- Building a driving force model to handle the complexity of the many driving forces which create the future society.

- Creating several scenarios providing concrete pictures of different possible outcomes in the future society.
- Analyse key decisions, like the selection of transport solution, based on Use-cases, Selection criteria and a list of Transport solutions.
- Sustainability Assessment – How to evaluate relative sustainable solutions

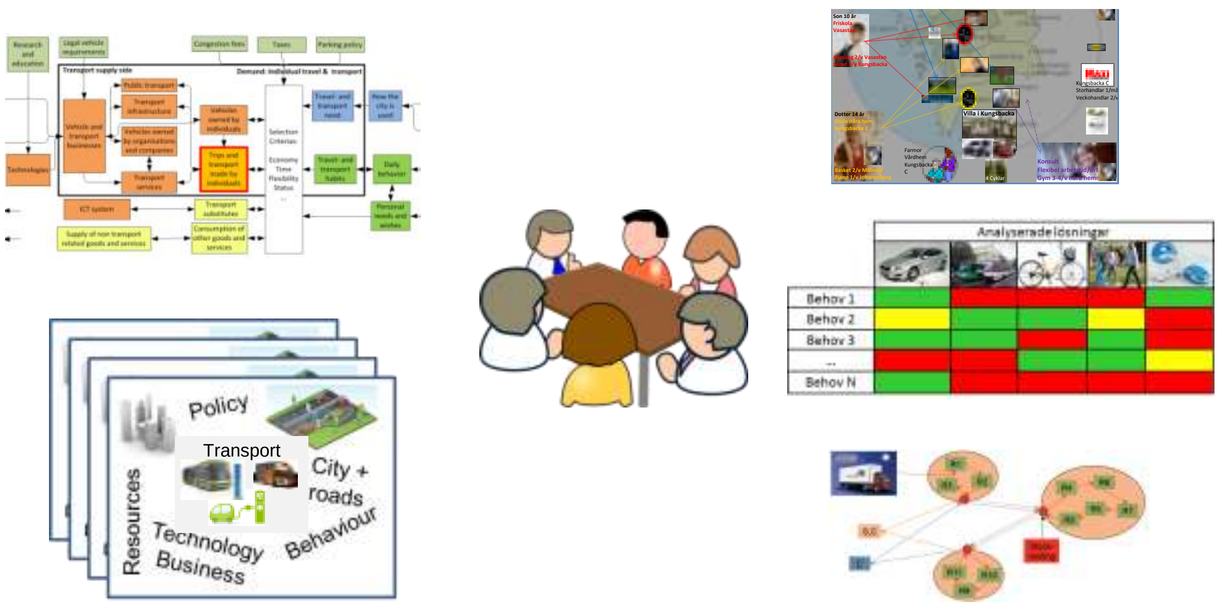


Figure Key elements of the SEVS method

5.1.2. Driving force model – explain what shapes the future

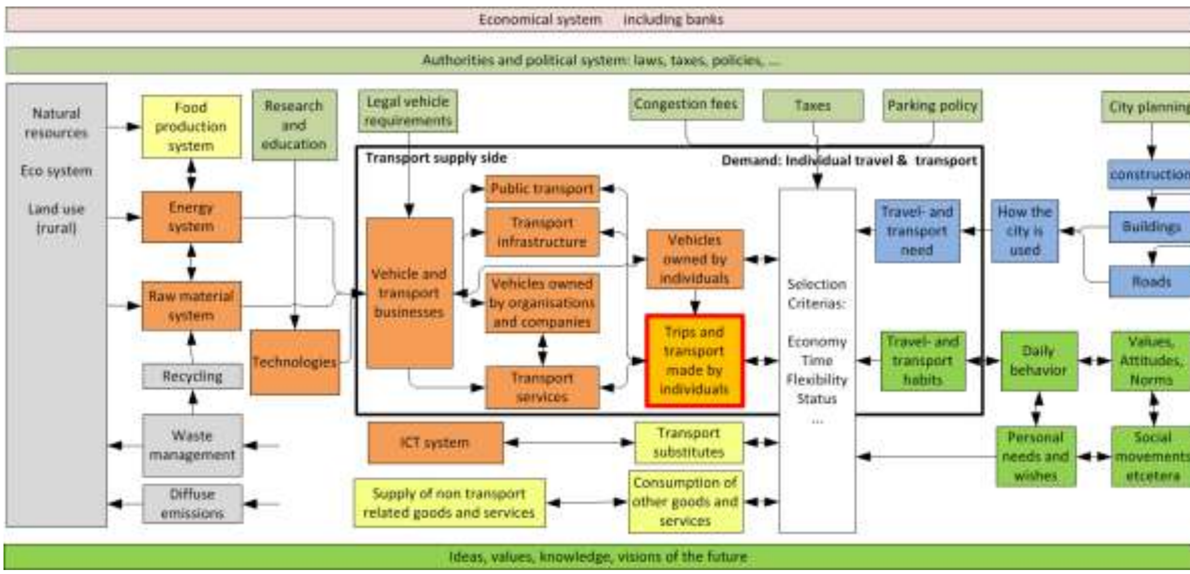
The driving force model is aimed to make us think in terms of real causes and effects, and bypass our personal feelings and intuitions that often tend to be biased by what we like to find. By not allowing the brain to jump to the conclusion, but breaking down the argumentation into smaller steps it becomes more clear what the relevant arguments are and what aspects should be considered in each step of the analysis.

The model is a visual representation of how the driving forces influence the transport system in both direct and indirect ways and how they interact with each other. It helps us discuss each driving force one by one and then integrating the analysis of different driving forces into a holistic understanding. The driving force model can be seen as a map, helping us to determine the route for our exploration and telling us what we should focus and ignore in each part of the exploration.

A large number of direct and indirect driving forces have been identified and these were organized into six groups to make the driving force model easier to understand:

- Political / Legal
- Economy

- Spatial: Land use, City structure
- Social: Values, ideas, behaviour
- Technological
- Environmental and Natural resources



5.1.3. Scenarios - Pictures of possible futures

The driving force model tells us which driving forces shape the future, but not how they will play out. To analyse the future we need to have an idea of what the "values" of the driving forces will be, and what future this points towards.

The project team did a ranking of the driving forces regarding how strongly they influence future transport and how certain we are on how they will develop. From this analysis we could see that there are critical uncertainties that are not possible to know how they will develop. This points towards an uncertain future, and the way to handle this is to define several scenarios to allow us to explore the consequences of the uncertainties.

Note that the created scenarios are not predictions of what will happen, but ways to explore possible outcomes, and they are selected to be rather extreme, such that the future is likely to fall within the areas which they span.

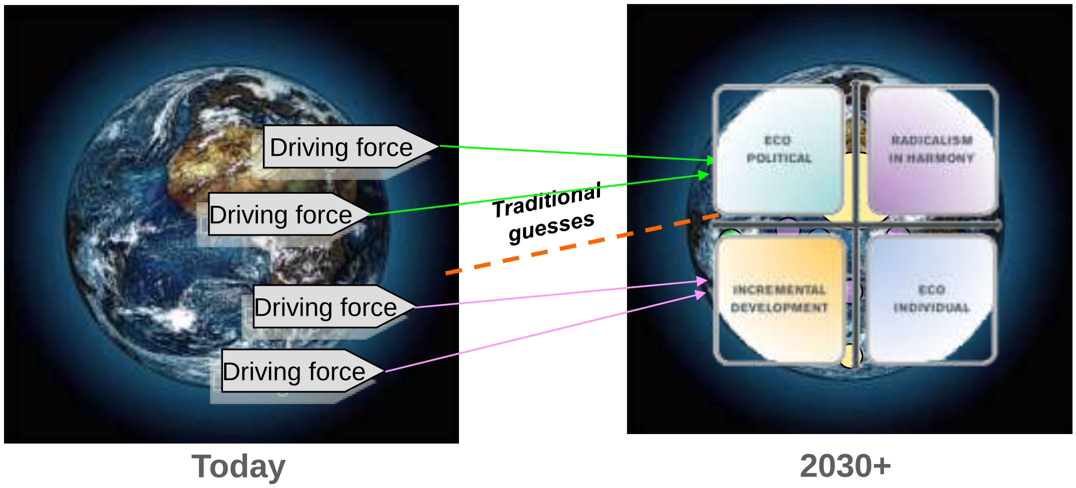


Figure The SEVS scenarios and how they are based on the driving forces

Many of the driving forces are rather certain and thus they will be the same for all scenarios while some will differ. The two main dimensions used to generate the SEVS scenarios are:

- *Proactive political system vs Reactive political system*
- *Radical change in transport patterns by lifestyle vs No change in transport patterns by lifestyle*

The scenarios are pictures of possible futures regarding the physical world and how people, companies and organisations behave in that particular future. They are also described as stories which enables the project participants to “get under the skin” of the actors in these different futures and minimizes the risk of analysing solutions using their personal experience of today’s world. Scenarios also give all participants a common platform for the discussion.

5.1.4. Multidisciplinary team

The Driving force model and the Scenarios cannot by themselves answer any questions, they are only very effective tools to address questions in a structured way. The actual analysis requires experts from the different areas which are analysed. Therefore, a project like SEVS must be carried out by a multidisciplinary team.

As these experts come from very different areas they often build their knowledge on different types of models and speak different scientific languages. Working in this kind of project therefore requires the ability to communicate your knowledge on a common language and to always be interested to use the knowledge from the others to see how it influence your own area.

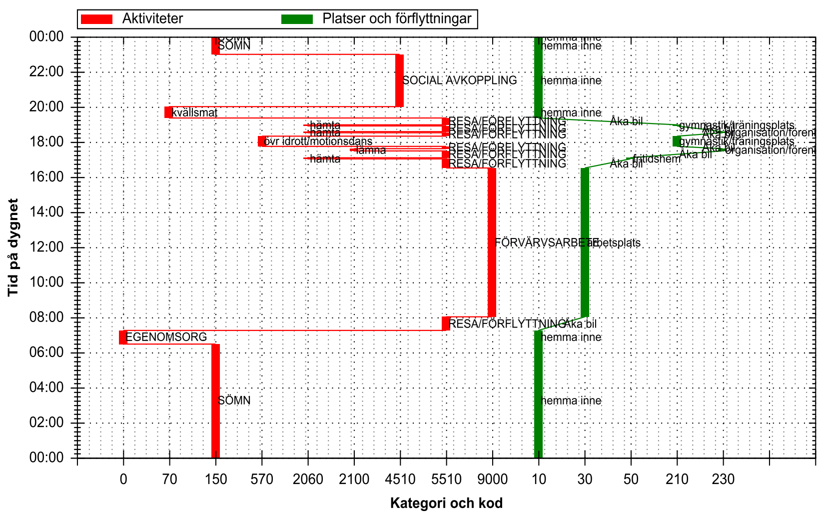
The keys to success is the project management philosophy (e.g managing open innovation/cross-organisational boundaries) and the attitude of the participants, and a cooperative process where the participants have many chances to discuss and reflect together on the results, such that the knowledge of each part has time to spread and be tested by the other participants. It is also important that some of the participants are more focussed on the integration of the overall knowledge rather than the detailed areas.

5.1.5. Transport analysis

A main task for SEVS has been to analyse transport for people and goods, with focus on electromobility. Each question to be analysed requires an initial study of the driving force model to look for key decisions and mechanism influencing the specific question, such that we can find a starting point for the analysis. In the main SEVS2 analysis the key actors are the ones choosing transport.

Using use-cases

To be able to find which transport solutions will be used it is vital to have a description of the transport needs of the investigated actors. For personal transport, activity based use case have been used. The use-case must cover not only the frequent transport needs, but also more extreme needs that may be the main reason for having to select a certain type of transport solution.



Geographic representation and activity based description of a use-case for personal transport. Diagram produced with DAILY LIFE Version2011 (2.6.0.0) © Kajsa Ellegård & Kersti Nordell in cooperation with Lena-Karin Erlandsson and Gunilla Liedberg

The use-case need to be expressed as/translated into functional requirements, describing factors which will influence the transport choice, such as start and end points, time available, number of passengers, luggage, special requirements like cooling of cargo, etc.

Selection criteria

The key to understanding a decision by an actor is to know the criteria the actor use for comparing the alternatives. Research on companies and peoples transport decisions reveal a lot about how they select, and from this we have described the selection criteria. It is not possible to give an exact answer to how people will choose, especially since people are often controlled more by habits than by rational decisions.

Prio	Personal transport	Goods transport
1	Time	cost
2	cost	reliability
3	convenience	time
…	Xxx, xxx, xxx	Frequency, flexibility, …

Transport solutions

The final input needed for the analysis of transport solutions is to make a list of solutions which shall be the candidates in the analysis. This list should theoretically include all possible transport solutions an actor will be able to select from in the future. But of course needs to be reduced to a manageable number of alternatives. Note that also transport substitutes should be included in the list of transport solutions, such that the analysis can also include changes which alter the transport need.

Analysis

Decisions about transport are not made at one single point in time. For example the decision to buy or sell a vehicle like a bike or a car will influence the coming decisions. To take this into account, in a simple way, we first analyse each trip on its own, assuming that we may have a car or a bike. Then we create different combinations of transport solutions that can meet 100 per cent of the functional requirements (trips) in the use-case. It is only using these total packages of transport solutions the total attractiveness can be compared. The total trips for the whole family also need to be analysed as it for instance is important to see if there is a need for no, one or two cars in the family.

It is also possible for the actor to change behaviour, in order to avoid or change the need for transport. This can, for instance, be to move to another area, change hobby or plan the activities of the day in a different way. Authorities, businesses and football clubs may also change their behaviour to influence the transport needs.

Finally all different combinations of transport solutions, with or without behavioural changes, are analysed based on the selection criteria for each scenario to find which transport solutions are judged to be winners in the different scenarios. The result do not only include “the winning” (most suitable) solutions, but also an analysis of for instance what factors had the strongest influence on the result, and which trips of the use-case which are most difficult to meet.

Find attractive combinations of solutions

Combination 1	X			X		+ change hobby
Combination 2		X		X	X	+ move

By studying several different families and their combined decisions, it is possible to value for example the possibility to offer effective public transportation. If behaviour changes are assumed by other actors, like shops or schools, it is also important to study how attractive these are for those actors to see if they are likely or not. It is not sufficient that the user wants a change in some services, the company supplying this service must also find it attractive to change.

Examples of conclusions draw in SEVS2 are:

- The transport solutions and society has developed in symbiosis;
  if one is changed the other will be influenced.
- Electromobility is not primarily driven by customer demand
- A plug-in hybrid is a strong candidate in all scenarios, for the investigated family, since it does not require behavioural changes.
- Goods transport is a more cost optimized system than passenger transport and, therefore, seems to be less affected by changed external conditions than passenger transport.

6. Dissemination and publications

6.1 Knowledge and results dissemination

Today (the 2014-03-31) the new IPCC report was presented, and it had a focus on effects of the ongoing climate change. And it was stated that the effects are ongoing on a national, European and global level and therefore there is a need of co-operation cross-borders to achieve sustainable cities and sustainable transport solutions. The SEVS project is a successful example of this kind of so called Tripple helix co-operation, on a holistic system level.

Other Activities:
During January and until March the 18th, SAFER/SEVS participated in the Horizon2020 application: **Transport - MG.5.1-2014. Transforming the use of conventionally fuelled vehicles in urban areas – "***Comparing innovative policies, measures and tools that will, inter alia, halve the use of conventionally fuelled vehicles in cities, while increasing accessibility of urban areas and improve air quality and road safety".*

The application is co-ordinated by Movéo and the name is TOMORROW; TOols and policy guidelines for new eco-friendly Mobility systems for tomorrow. There are 17 partners from triple helix that are joining this application; France, Italy, Poland, Portugal, United Kingdom, Germany and Sweden by SAFER and the SEVS project. From our region we also managed Trollhättan city and Kungsbacka city to join the application as "mirror cities". Step 2 will be taken in June 2014, if the application passes Step 1.

In the end of November 2013, Bisek suggested to apply for the European project Join Program Innovation. Thanks to the SAFER and SEVS collaboration platform we managed to apply to the program within 2 days "New Roads for a Societal Transformation of the Transport Sector in the face of Climate Change". We received a first confirmation in December that the application fulfilled all the formal requirements and that the application sketch will be evaluated. In February we received the decision and unfortunately the application was not accepted to continue the process.

The 22nd of January a workshop was arranged together with Trafikkontoret in Gothenburg. About 45 participants from TK, GR, Parkeringsbolaget, VT, SBK, Stadsdelsnämnderna, Kranskommunerna, Fastighetskontoret m fl. During the workshop the SEVS team had prepared "an analysis play" based upon "The SEVS Way". The participants were content with the process and the results.

6.2 Publications

The SEVS project has resulted in a number of sub-reports, PMs and other background material, as well as input to other reports. The content of Sub-reports are edited and compiled to form the "The SEVS way", a handbook that both serves as a guide for using the SEVS methods and models and a summary of the results of the analysis made by the project.

List of sub-reports

Name and content	ID: SEVS2-PM-xxx	Authors
The SEVS Way – an introduction	WPx-introduction-SEVSWay	Anders Grauers
The SEVS 2 Driving force model	WP1-DrivingforceModel	Anders Grauers
Driving Forces: Users values and behaviour	WP1_ Drivingforce-User-behaviour	Åsa Aretun, Cecilia Jakobsson Bergstad, Catherine Pescheux Svensson
Driving Forces: Freight Transport Buyers' Behaviour	WP1-Drivingforce-transport-buyers	Anna Mellin
Enhanced SEVS scenarios 2030+	WP1-Scenarios	Malin Andersson, Jonas Åkerman, Maria Grahn, Hans Arby
Transport analysis: Use Cases Personal Transport Gothenburg and Shanghai	WP2-UseCases-personaltransport	Åsa Aretun
Transport analysis: Analysis of Personal Transport	WP2-Personal-transport-analysis	Anders Grauers, Lars Greger et al
Transport analysis: Urban Freight Transport and Use Case Analysis in the Scenarios	WP2-UrbanFreight-all	Sönke Behrends, Ulf Ceder, Jenny Karlsson, Sofia Löfstrand, Anna Mellin
Safety Scenario assessment	WP2-Safety	Yngve Håland
Multi Criteria Sustainability Assessment	WP3-MCA-sustainalibity	Ulrika Lundqvist
SEVS 2 Conclusions	WP3-conclusions	Anders Grauers
Addressing the GOs and transition guidelines	WP3-Gos	Hans Arby
Managing Open Innovation – Questions, stakeholders and people	WP4-open-innovation-process	Else-Marie Malmek

List of some other background material:

Name and content	Authors
The city driving forces	Mikael Ivari
Trends in public transport (SWE)	Jan Gustafsson
Smart cities and IT	Mikael Haglund
Fuels and vehicle technologies and how these may differ in the four scenarios	Maria Grahn
Technology + business: 'How development in technology and business models influence the development of transportation	Sofia Löfstrand
Shanghai Trip report	Else-Marie Malmek et al
China Analysis Report	Else-Marie Malmek et al
Additional uses cases Personal Transport	Anders Grauers
SEVS 2 Transport analysis Game Setup	Anders Grauers, Hans Arby

The SEVS Project also contributed to other reports such as "Electro Mobility in Norway - Experiences and Opportunities with electric vehicles", TøI report 2013,

Parallel to the SEVS phase 2 the City of Gothenburg Urban Transport Administration developed the new Transport strategy. Participating in the SEVS phase 2 project and adopting the scenarios planning methodology from SEVS phase 1 contributed to a successful process.

7. Conclusions and future research

Conclusions

The SEVS2 project has the goal to analyse future transport in general terms rather than only answering specific questions. Therefore, there are several different levels of conclusions. This section provides an overview with examples of conclusions, The important results are not each individual conclusion by themselves, but how the exemplifies the way of analysing and understanding future transport systems both for electro-mobility in particular but also for development of sustainable transport in general.

An important disclaimer about the conclusions presented here is that the project has not had the goal to reach consensus on the questions we have analysed. This has been an important way of ensuring that we can have an open discussion despite the fact that we are partners with very different interests. The conclusions presented here are thus not the official standpoint of the project partners but an example of typical conclusions drawn by the project participants.

Below is a list of selected conclusions listed under different categories:

Driving forces

- A driving force model is a vital tool to be able to handle the very many different factors that influence the transport system systematically and not get lost in the complexity.
- We cannot expect the driving force model itself to predict what will happen, the system is far too complex for that to be possible. The model is typically used to explore which changes are most likely to happen or to test what would be required for a certain change to take place.

SEVS scenarios

- Scenarios are a key tool to be able to effectively analyse different solutions in a larger group as they provide a common background that can be used to test ideas and discuss different aspects.
- The business climate will look very different in the different scenarios. A market driven by private customers really demanding and paying for sustainable transport will open up for many inventive solutions on an individual, and often local, level. However, solutions requiring heavy investment in public infrastructure and changed legislation, like coordinated system across countries and continents will instead require a proactive and strong political system to be a main driving force.

Selection of transport solutions for people/goods

- A plug-in hybrid is a strong candidate in all scenarios for 2030, for the investigated Gothenburg family, since it does not require behavioural changes and only limited infrastructure support in form of a charger at home.
- The fuel cost is not a big part of city distribution cost, and therefore fuel efficiency is not as a critical factor for the transport supplier as for example the time required for distributing the goods. On the other hand, for long haul the fuel cost is a large part of the total transport cost. I.e. the solutions selected by the market for these two uses will most likely be very different as the fuel cost increase.

Conditions for electro-mobility

- Electromobility is not primarily driven by customer demand, and therefore cannot be understood well by only focus the user and their needs. Key driving forces for electromobility will come from policy and changes in the energy markets.
- Electromobility for private cars are still far from cost effective when compared to traditional petrol and diesel cars. It is not just a matter of waiting for some reductions from increasing volumes.

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Insights on how to understand future transport

- The transport solutions and society has developed in symbiosis; if one is changed the other will be influenced.
- One should be very careful to draw conclusions when analysing a solution only with the focus to achieve one objective. Solutions in the real world always have to be compromises between many conflicting requirements, and it is extremely rare that the realistic compromise end up at an extreme where one of the properties is maximized.

Further research

The SEVS 2 project has resulted in new knowledge, new insights, important conclusions and a set of tools for analyzing complex systems that can be used to tackle other sets of question. But another goal of SEVS 2 is to induce action and progress by addressing different issues to sectors or organizations that are best suited to handle them or make use of them.

These so called GOs comprise challenges, risks and possibilities on one side and stakeholders who need/want to address them on the other. The GOs are based on the results, conclusions and unanswered question from the previous steps of the process and they were identified during workshops and by separate analysis of the results. The compilation was made as part of Work Package 3, named Transition guidelines.

Examples of topics suitable for research (or demo) projects:

- Assess possible impact on the society by the introduction of game-changing technology (e. g. autonomous systems) and identify general characteristics of solutions that have a high probability of succeed and the conditions needed.
- Traffic safety issues: How will traffic safety be affected in cities with mixed traffic, if small, two- or three-wheelers, become popular, with an aging population – and which solutions
- Studying dynamic effects (including rebound effects, feedback loops, tipping points), of untested policy measures in urban areas as part of political science and urban development. For example: How should a zero emission zone be designed and what could the negative side effects be?
- There may be a need for large-scale demonstrations of electrical roads for example. In such projects, the SEVS results and tools can be used to broaden the scope beyond pure technical, environmental and economical factors. What is the strongest driving forces influencing decisions of key actors? Which solutions or combinations of solutions are most viable under different pre-requisites? What would it take for the concept demonstrated to take off?

Participating parties and contact person

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