CHALMERS

Vision: A sustainable transport society!

What will the sustainable transport society of the
future look like?

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FOREWORD

What will transport look like in tomorrow's sustainable society?

CPM held a backcasting seminar in Gothenburg on 13 September 2005. The aim was to gather ideas on how the transport industry and other transport-intensive companies should operate to enable them to function and gain market advantages in a future sustainable society.

The intention of the first seminar was that ideas should be completely open and unbiased, so that this brainstorming would enable us to visualise what the transport system and society might be like in the future when we have achieved sustainability.

The second stage of the backcasting process will be implemented at the next seminar at the end of September 2005. This will involve developing specific initiatives, based on the visions from the first seminar, to help companies make strategic decisions on how to work towards a sustainable transport system.

Vision: a sustainable transport society!

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1   PREREQUISITES

The backcasting seminar held in Gothenburg on 13 September 2005 produced a number of good ideas on what the sustainable transport society of the future may be like.

1.1   Contributors/partners

The seminar was conducted by Ulrika Lundqvist with an introductory methodology review by John Holmberg, both from the Department of Physical Resource Theory, Chalmers. Those participating in the seminar and contributing ideas were:

Company	Contact person
ABB	Jan-Olov Lundow
Akzo Nobel AB	Anna-Lena Palm
Bombardier Transportation	Jessica Lagerstedt, Christina Larsson
CPM/Transek AB	Magnus Blinge
ITT Flygt AB	Ingemo Fahlstedt
SCA Hygiene Products	Helen Jacobsson
Schenker (student interns)	Vendela Zachrisson, Elke Christoph

1.2   Continuing work

The following sections outline 4 different visions of a sustainable future society. We don't have any specific time frame, but, based on purely scientific reasoning, humanity must adapt its way of life and its activities to a significantly more resource-efficient and environmentally-compatible system in the long term in order to avoid ecological collapse. This includes sustainable transport systems.

The 4 visions are thus based on the open discussions that took place at the first of the backcasting seminars on 13 September. These visions may seem more or less probable to different people, and naturally social structures other than the 4 described here could become reality. The only thing we can say with certainty about the future is that we cannot predict in detail what is in store. Consequently, it is important to keep an open mind and work actively in some way towards the visions that we have collectively produced as possible future scenarios.

For CPM's company, the next stage of the process involves selecting strategies for the various scenarios. What practical steps must be taken to ensure that progress towards sustainability and towards the scenario predicted represents market advantages for the company? What events in the world, "triggers", must you keep a lookout for as indications that progress is heading in a direction that implies a certain scenario is becoming a reality? Should you be proactive and operate in a way that advances a certain desirable (for the company) scenario or should you opt for a passive role and merely flexibly adapt to it?

Companies therefore have a maximum choice of 8 ways to proceed towards 4 future scenarios, as well as choosing either a proactive or a passive strategy. Naturally you can choose to be active in one scenario and passive in another. Companies can also choose to exclude one or more scenarios in order to concentrate resources on the scenario considered to be most probable and cover this more thoroughly.

The next seminar in the backcasting exercise will thus involve the following activities:
1) Discussing what the transport system will be like in detail for the various future scenarios.
2) What events in the world can be regarded as "triggers" for the various scenarios? e.g. possibly sharply increased transport costs => local markets; UN is given greater power and strong criticism of multinational companies in the world => human ecological preferences.
3) What constitutes an active decision to guide progress in one direction or another?
4) What constitutes an active decision to follow trends in one direction or another?

Subsequent work involves companies choosing strategies and defining the active steps that must be taken in their respective strategies. This process can partly be done collectively at an additional seminar arranged by CPM or internally at the various companies. CPM will make available resources required to support the companies in the process.

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2 THE FOUR DIRECTIONS

The backcasting seminar involved brainstorming on possible directions that the sustainable transport society of the future might be expected to take. The four different directions are described in Figure 1.

Figure 1: The four directions of the sustainable transport society of the future

Human-ecological preferences

Global markets

Local markets

Environmental-technical
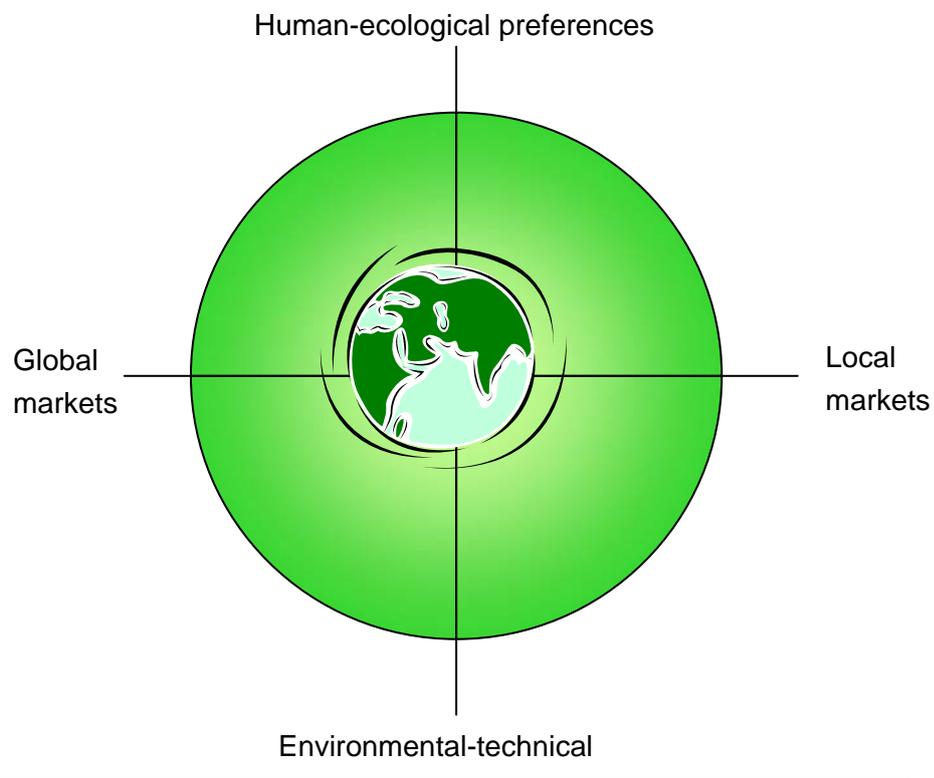
The four directions are described below in more detail. They are described based on human-ecological or environmental-technical social styles with either a local or global market.

The term "human ecology" here refers to a view of life that prioritises humans and nature ahead of material standards, where you observe the interaction between humans and their total environment from an overall perspective. It is not primarily the multinational companies' profit interests and material standards that shape the society, but the fact that individuals should have time for their own development and mixing with other people.

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The environmental-technical society is more about finding technical solutions to problems that arise along the way. You know where you want to get to and you find your way there. If operations do not comply with the requirements for sustainability, you work things out by finding development options that eliminate the obstacles that arose. Enterprise, profit opportunities and market forces are very important cornerstones of an environmental-technical society. Here, progress is rapid and the pace is fast. Efficient production and transport systems have given people high material standards.

In order to describe the various kinds of societies and the role of the transport industry, the structure of people's values, politics, the market and, naturally, transport in each relevant social system have been classified.

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3   HUMAN-ECOLOGICAL PREFERENCES

The human-ecological society focuses on nature and humans. Life and its requirements come ahead of technology and market forces.

3.1   Local perspective
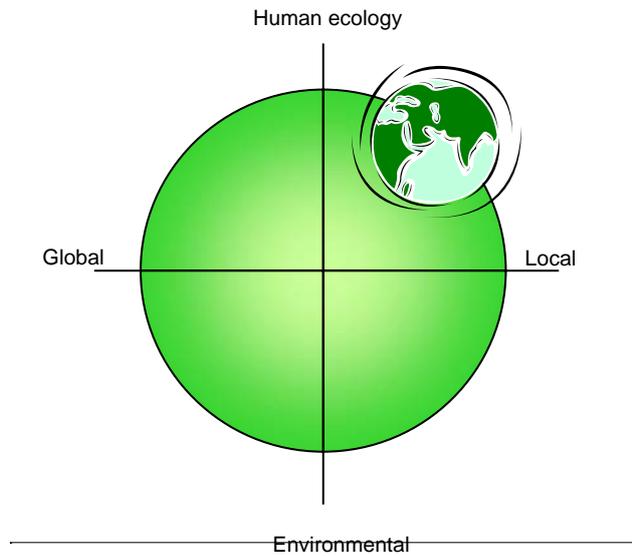
Values

In a society that prioritises the local market and the local population, there is less interchange with the surrounding world. Family and nation are more important than humanity and the international community. Belief in your own ability and unique solutions is strengthened. It is more natural to take responsibility and deal with all waste or residual products yourself, and if you have damaged something or work within an industry that has a negative impact on society, you must take full responsibility for this. Within this type of society the lifestyle is a kind of "everyone knows everyone" existence, which facilitates communication between companies and between customers and companies.

Politics and the environment

In this kind of society, the direct consequences of local environmental impact are clear. Discharge of hazardous substances into soil and water are

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important environmental issues, together with local flora and fauna. Global environmental issues are less important, and anything that is not noted in the local community is not taken as seriously.

Market

In a human-ecological local-market-based society, people prefer to use goods and services that have been produced nearby. They choose to use resources available in the vicinity rather than the global alternatives. Import duty and high fees for transport yield benefits for local producers. Recycling is an important part of maintaining resources. More small traders find a place on the market because customers do not opt for products from multinational large companies. Improved communication generates conditions for collaboration and niches that may involve more efficient transport.

Transport

In terms of transport, this social structure involves little long-distance transport. Only such things that are absolutely indispensable are bought in from the surrounding world. This in turn reduces demand for really large vehicles. As local environmental impact is highest on the agenda, you certainly strive to some extent to reduce dangerous emissions, but noise and barrier effects are equally important issues.

In a local society, vehicles will be developed to be aesthetic, make little noise, take up minimal space, provide a high level of road safety and be constructed from local resources. Local fuel will be used as far as possible. In combination with efforts towards recycling, the population will endeavour to make use of large methane emissions from rice cultivation, bogs and cattle farming, etc. Individual solutions are encouraged. In line with a target of fewer accidents and changed status image, propulsion of vehicles will be simplified and perhaps even automated. The objective of both goods and passenger transport is purely and simply to arrive, not to travel fast and dangerously. It may be that the length of the transport route is not optimised as a consequence of the infrastructure being moved for local requirements and aesthetic values as well as wanting to be able to see attractive scenery while driving rather than tearing along on motorways. The load factor for vehicles along with improved communication creating excellent potential for

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joint transport. Transport services may be optimised in terms of time on the same grounds. The external costs are internalised through increased awareness of environmental problems and a greater sense of responsibility.

Keywords for transport services in this kind of society are:
- Awareness of the environmental impact of transport services
- Noise and barrier effects are highly valued
- Improved communication and more collaboration
- Local resources are a priority
- Safer and more automated vehicles
- Environmental zones in towns – local environmental issues are a priority

In this kind of society, sustainability is achieved through forward thinking.

3.2   Global perspective
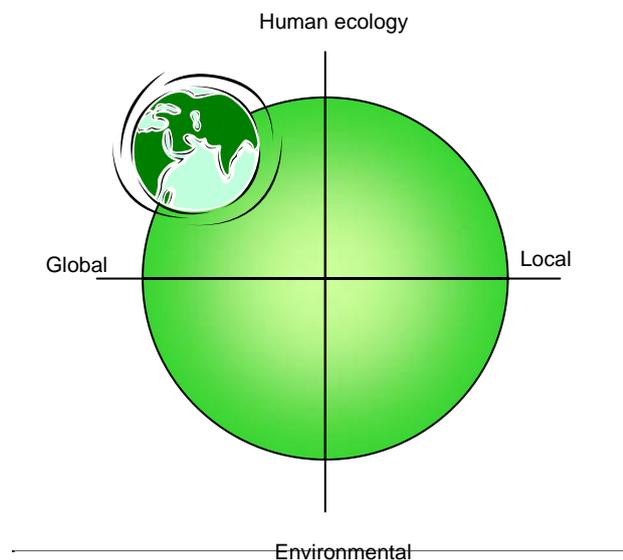
Values

In a global society with a human-ecological attitude to the surrounding world, everyone's well-being and brotherly feelings are important issues.

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Group sentiment and the "we" mentality are more important than the individual's needs and problems. Common outlooks are based on awareness and long-term thinking. Individual countries are less important than international coordination agencies. Communication, training and information are extremely important in this kind of society. Media has an educational role, so that results and consequences of operations around the world are recorded and clarified for everyone.

Politics and the environment

The fight against poverty, the greenhouse effect and natural disasters affect everyone. A high proportion of GNP goes in aid. Priority environmental issues are global issues concerning how to limit the effects of previous generations' emissions of greenhouse gases, what to do about global dispersion of toxic substances, overcrowding at sea and in the air, as well as widespread water, land and energy shortages. In order to introduce legislation into companies, systems of trade in emission rights, as well as trade in welfare rights, have been initiated on a large scale. Welfare rights guide companies towards using collective agreements and having active working environment programmes. The terms of these rights are being tightened up with the aim of achieving constant improvements in this field.

Market

The market operates long term and globally due to the belief that this reduces the business risks. You aim for cooperation between local producers and international distributors so that those who are best suited to produce an item are encouraged to do so. People are very aware of how their choices affect the surrounding world, and fair trade is more or less a matter of course. People are interested in experiences and social relations rather than things and would rather buy occasional high-quality items than numerous cheap items. Handicrafts and natural materials are primarily used.

Transport

Transport in this kind of society is global and fairly extensive in terms of transported quantities. However, there are common, standardised systems so that efficiency gains are achieved and transport work per unit is low. In

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principle, all vehicles must be able to utilise the infrastructure of the entire world within their type of transport, e.g. you should be able to drive an electric locomotive all the way from Deje in Värmland to Chiang Mai in Thailand. Travel is mainly by public transport, and intermodality is employed to a great extent for goods transport. The option of separate types of transport for passenger traffic and goods has been allowed with a view to streamlining. Emissions from transport services are highly regulated through legislation and international agreements and protocols. Energy supply is global and a lot comes from solar energy. Deserts in high-temperature regions are used for energy collection for onward distribution throughout the world. This energy is also used for transport. Sailing ships are used for freight in sensitive areas that would otherwise be inaccessible routes.

Focus on solving environmental problems largely involves alternative fuel and energy efficiency.

Keywords for transport services in this kind of society are:
- Cooperation yields efficiency
- CSR
- Standardisation and common systems
- Quality ahead of quantity
- Global environmental problems are a priority
- Openness, education, awareness

Long-term sustainability is achieved through regulation and legal requirements together with strong consumer pressure.

4 ENVIRONMENTAL-TECHNICAL PREFERENCES

In the environmental-technical society it is important to gain high returns on invested capital. This is a society with a fast pace and rapid technical development.

4.1 Local perspective
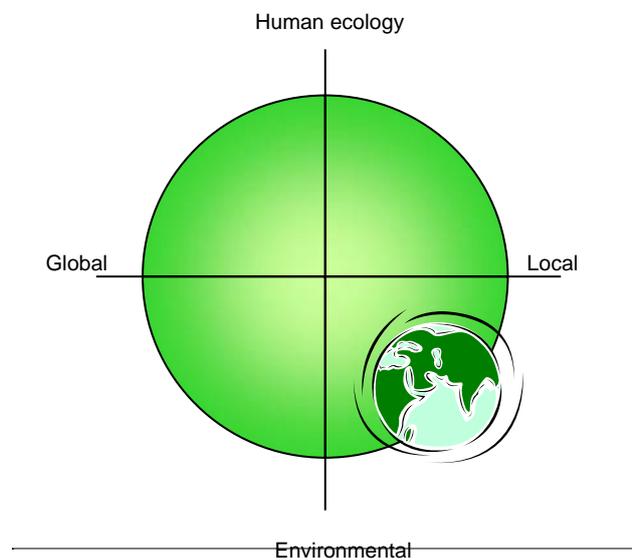
Values

It is a society where local comes ahead of global. In combination with a strong and fast-moving market, it results in very large and dense cities without much exchange between them. Local resources are utilised and recycling of materials and energy is a priority. Together with rapid environmental-technical development, this contributes to new innovative local solutions to environmental problems being found. Everyone must be able to have their lifestyle without being hampered by it causing environmental problems. If obstacles arise, they are resolved by a new technical solution.

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Politics and the environment

This kind of society focuses on local environmental problems, but there is greater concentration on the quantifiable factors. Consequently, emissions and noise are important factors, while aesthetics and natural areas have a lower priority. Legislation is minimal; the major advances in environmental adaptation are the result of market forces.

Market

In a society based on technical solutions where market forces determine the conditions for people's existence, rapid development and high returns are priorities. The pace is fast and the goods flows large. A high level of consumption and standard of living is desirable. In order to support the local market, high trade duties are set up with the surrounding world. People are educated and aware of environmental impact and make demands on companies for good environmental efforts. Consequently, a great deal of money is put into environmental technology, resulting in constant new developments.

Transport

Because the human factor is the principal cause of traffic accidents, driverless vehicles are developed; all the accidents are costing too much. With no driver it is quicker, safer and more cost-effective.

Transport services in this society are highly efficient and in tough competition. All dimensions of the city are used – even vertically and timewise. Wagons for goods travel together with passenger traffic on girder tracks that utilise the elevation of the cities. Pedestrian streets may be used by transport vehicles at night. Belief in technical solutions for achieving a sustainable society results in engine technology, after-treatment, fuel grades and new material being developed. Vehicles are lighter to enable reduced energy consumption. Vehicles are also emission-free in principle, partly due to the fact that many vehicles are electric, so energy is expensive. Locally accessible energy sources or fuel are used – solar energy, wind power, biogas, etc. Any discharge generated is collected and dealt with.

Brakes, tyres and road surfacing, etc. use new sustainable materials with a high level of environmental compatibility. Restrictions on trade with the

surrounding world mean that long-distance transport services are few, but any there are are highly efficient and safe. New ballast systems have been developed to ensure reduced dispersion of foreign organisms. As a result of the local perspective, reverse logistics is common, i.e. taking charge of recyclable material.

Keywords for transport services in this kind of society are:
- Cost effectiveness
- Ingenuity and technical development
- Fast pace and high level of awareness
- Individual choices must be facilitated
- High consumption = high standard of living
- Local resources are a priority
- Transport services utilise all dimensions

Environmental problems are solved with technical solutions after they have arisen. There is more work on after-treatment than preventive activities.

4.2   Global perspective
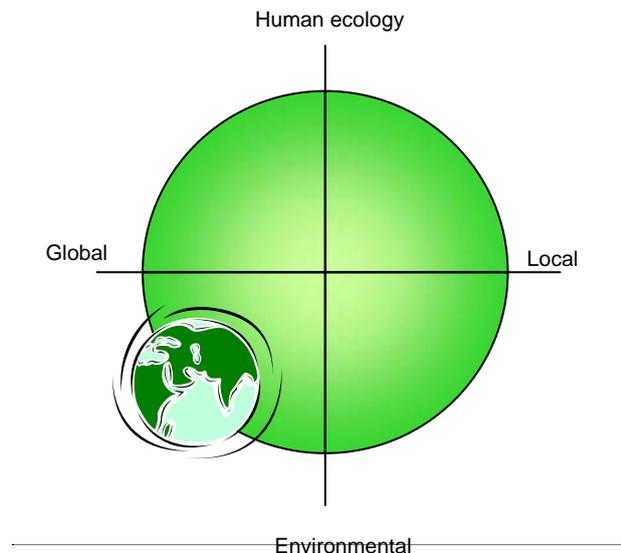
Values

The global society with an environmental-technical approach is a high-tech cost-effective society. Individual choice must be provide for and any negative consequences of this resolved afterwards. The general spirit is a "me" mentality and a strong belief in humanity's ability to find solutions to problems.

Politics and the environment

International centres for global sustainability solutions are established and maintained well. These centres regulate emissions and environmental impact from international phenomena, e.g. transport. Regulation is through market agreements rather than legislation.

Market

In this society, problems are solved by the most cost-effective solutions in the most financially-defensible locations. Advanced solar cell technology is put into practice in regions with high insolation, and the fusion issue has been resolved. If sustainability is not applied, the operation cannot gain a profit. Strong environmental awareness and cost-consciousness governs this. Everyone is aware how costly environmental pollution is and how ineffective it is to fix problems well after the fact.

The market employs a quarterly economy, and high consumption is a prerequisite for everyone's welfare. The resources judged to be most suitable for the purpose are used, regardless of where on the planet they are to be found. There are no trade barriers; competition must generate quality.

As the market focuses on the individual's wishes and needs, the products are more interesting than the sale. Therefore a great deal of trade is electronic, via the Internet. Products are modular to a great extent. These modules are mass-produced for a global market, but the end products are designed and assembled at local facilities. People are also more interested in travel, and experiences and service than in things. Therefore transport services for goods have been reduced and passenger transport services increased.

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Transport

ITS is used to a huge extent so that transport services can be controlled and managed in principle from a different continent. Demanding customer requirements for information on purchases mean that transparent transport-specific environmental data is easily accessible. Emissions from vehicles are continuously measured during actual operation by a meter in the vehicle. Load factor and route length are also measured with a high degree of detail. In order to further optimise driving distances and transport times, fuel supply systems that can be utilised on the road are used, e.g. through the induction effect. Barrier effects and noise are avoided through technical solutions such as quieter tyres, new asphalt mixtures and advanced tunnel systems for motorways. In the environmental-technical era, more unconventional solutions that function as part of the chain in their particular circumstances are also developed. These include air balloons, zeppelins, etc.

Keywords for transport services in this kind of society are:
- Cooperation over large distances
- Rapid and efficient
- Everyone uses everyone's system
- Consumer-guided technical development
- Vehicle and infrastructure-oriented investment

Long-term sustainability is achieved through international cooperation in solving problems that have arisen.

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5 COMPARISONS BETWEEN THE DIRECTIONS

To obtain a picture of how the different directions operate, a few comparisons can be made to illustrate how the various societies solve a specific problem. Different types of solutions are found depending on the approach selected. There are naturally countless variations to these comparisons, but it still gives a hint on varying outlooks.

Example 1: When something happens, e.g. a major spillage or a large-scale traffic accident, the different societies react in different ways.

Human ecology, local	Human ecology, global	Environmental technology, local	Environmental technology, global
Everyone in the vicinity joins in and helps to clean up/provide support	UN, Red Cross and/or WWF join in and investigate	Four different companies offer the company/ organisation that caused the accident assistance	The company has its own resources, possibly on another continent, to take care of the problem.

Example 2: When you realise that you must grapple with a new global environmental problem.

Human ecology, local	Human ecology, global	Environmental technology, local	Environmental technology, global
You introduce restrictions and prevent use of the substance/ activities in question	International conferences produce agreements on reduced use/ barred dispersion	You develop purification tools	International industry cooperation develops standards for new equipment/new vehicles

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