Realizing a Common Vision for a Baltic Sea Eco-region

Report from
a Research Symposium on
Sustainable Development Patterns

BALTIC 21

The Baltic University
A Regional University Network

Realizing a Common Vision for a Baltic Sea Eco-region

Report from a Research Symposium on Sustainable Development Patterns

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Contents

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Preface

The Baltic Sea Region (BSR) was the first region in the world to adopt common regional goals for sustainable development. As such, long-term strategies, regional cohesion, cross-sectoral cooperation, democracy, and transparency are some of the key pillars which have come to characterise our Region's framework for achieving these goals. With such wide-reaching issues to address, it is perhaps not surprising that Baltic 21 then strives to involve as many stakeholders as possible and also constructively apply a multidisciplinary approach. At each step of the way, we try to develop new and useful initiatives to move the process of sustainable development forward, while taking into account the interests and needs of various regional actors. In line with this framework, one of Baltic 21's latest initiatives was the Research Symposium entitled "Realising a common vision of a Baltic Sea Eco-region: Research Symposium on Sustainable Development Patterns," which took place on 27-29 October 2005 at the Immanuel Kant State University of Russia in Kaliningrad. In this introductory section to the Symposium Proceedings, I would like to provide a brief overview of the political background for and rational as to why the decision was taken to organise the Research Symposium.

At the 5th Baltic Sea States Summit in June 2004 in Estonia, Baltic 21 proposed to the Heads of Government of the Baltic Sea countries that they would commit themselves to realising the vision of an Eco-region, where "Eco" stands for both "economy" and "ecology" and the social dimension is understood to be strongly integrated as well. While underlining the importance of incorporating the principles of sustainable development into policy-making by all relevant stakeholders, the Heads of Government responded positively to Baltic 21's proposal, and expressed their interest in the concept of making the BSR an Eco-region for sustainable development.

Following on the conclusions from the same Summit, the Baltic 21 Senior Officials Group (SOG) decided to base its newly recognised Eco-region mandate on 4 specific Strategy Guidelines, designed to address the emerging challenges to regional sustainable development and to transform the BSR into an Eco-region. Among these Guidelines, the idea to organise the Research Symposium was founded specifically on Baltic 21's endeavour to implement Guideline 1, which aims to "support the CBSS and its processes in the pursuit of sustainable development" by promoting the integration of sustainable development into regional policy-making. Accordingly, it was agreed that one way in which Baltic 21 could work to achieve this was through establishing a firm scientific base for the development of our policy recommendations.

From a broad perspective, it is Baltic 21's goal to establish the BSR as a frontrunner in both regional and global efforts to move the process of sustainable development forward. To achieve such a goal, I believe that it is necessary to have numerous and flexible tools which we can use to take innovative and ambitious action. Thus, the need for decision-makers to base regional policies on forward-looking, state-of-the-art, scientific, and research-based policy advice is both clear and certain. For Baltic 21, the Research Symposium was meant to constitute a step in this direction, and was also considered to be an effective way to initiate a series of future steps. At the same time, it also strove to provide inspiration to the formation of a permanent BSR sustainable development research network mechanism, which is currently being discussed within Baltic 21.

In terms of selecting the location of the Research Symposium, there was a consensus within Baltic 21 about the strategic need to involve Russian stakeholders, and that a practical way to achieve this, was to hold the Symposium in Kaliningrad. This decision can also be understood in terms of Baltic 21's broader effort to involve Russia more deeply in Baltic 21's activities and in BSR regional cooperation for sustainable development, as well as to contribute to the EU-Russia partnership envisioned by the four Common Spaces agreed upon by Russia and the EU at the St Petersburg Summit in May 2003. Referring to the EU-Russia Moscow Summit in May 2005, it is relevant to note that among the Road Maps adopted for implementing the Common Spaces, the Road Map for the Common Economic Space (CES) spelled out a number of joint EU-Russia objectives in the fields of environmental protection, transport, energy, agriculture, forestry and fisheries. Quite clearly, Baltic 21 viewed the organisation of the Research Symposium as an opportunity to play a role in implementing the CES.

In closing, and on behalf of Baltic 21, I would like to recognise the contribution made by the Baltic University Programme in developing the Symposium programme and also in coordinating the development of these proceedings. Additionally, I would like to express my gratitude to the Immanuel Kant State University of Russia, for hosting and providing on-site logistical support to the Symposium. And finally, I would also like to thank the participants for their contributions to the Symposium and to these proceedings.

Marek Maciejowski
Baltic 21 Secretariat, Stockholm

Introduction

Sustainable development (SD) is getting increasing political attention all over the world, but perhaps particularly so in Northern Europe and in the European Union. The 2005 report on political measures to support ecological sustainability, a global overview, which since three years is published annually from Yale and Colombia Universities in the USA, points to the Nordic countries as leading in pursuing SD policies. It is also clear from the report that the three Baltic States are around position 15-20, giving the Baltic Sea region (BSR) as such a favourable place in a global perspective, although Poland, the Russian Federation, and Belarus in lagging behind.

Still there is a long way to go before we can talk about the Baltic Sea region as sustainable or even approaching sustainability. Which are the most prominent obstacles to sustainability and which are the most problematic developmental trends? These were issues addressed by a research symposium organised by the Baltic University Programme in cooperation with Baltic 21, in Kaliningrad, Russia, in October 2005. Participants in the symposium were researchers from universities and research institutions around the Baltic Sea region, dealing with SD. Sustainability science as such is interdisciplinary, which was demonstrated by the background of the participants, the reports and the discussion. Political science, social sciences, natural sciences and technologies were all represented.

Academic research has not been a prominent participant in the public debate on sustainable development in the Baltic 21 context. This has left the door open for subjective judgements. Many issues, which various groups today indicate as key questions for sustainability, may be peripheral, while others are more serious than most appreciate. Research may contribute by being more objective and therefore support better-founded policies for SD. The symposium that this small publication reports from is one initiative to achieve that. It will hopefully be followed by others.

The question addressed is so wide that a focus had to be chosen to make the discussions meaningful. Thus four broad areas were addressed specifically as problematic from the view of the development in the region. The areas chosen were:

- governance and policies for SD.
- demography, public health and urbanisation.
- mobility, transport and traffic.
- energy policy and energy supply.

These areas would probably be very similar or identical for most industrialised regions in the world, although the way to treat the dilemmas of course is specific for the region. The justification for choosing these four areas is perhaps not always obvious. Other possible areas would have been e.g. rural development and agriculture, industrial development, protection of biodiversity just to mention some which also have attracted large attention and efforts in the last few years. Thus a few lines of explanations are needed.

Governance for sustainability is basic for all other actions. Without proper policies, legal frameworks and economic incentives, all other efforts to promote sustainability are difficult or impossible. At the same time it is clear that much policy frameworks in the

BSR countries are insufficient to achieve real steps forward. Economic growth is in the forefront and all other political agendas are evaluated against this background. For real steps forward sustainability needs to be the measuring stick against which all other policies should be assessed. Governance is also where ethical dimensions of sustainable development need to be translated into practical policies. Many ask themselves: sustainability for whom? Is SD policies a power play where some suffers, where others gain? This is a voice heard most often in the so-called new democracies where many consider they have been poor long enough. Now they have the right to a good life. The complex of issues of governance is a key concern to address if we want to understand how to go on.

Global population as well as the population in Europe and the BSR has been increasing since the 1700s. This growth has now come to an end. It has to since sustainability is not possible with unlimited increase of anything, especially not population. However the transition from a rising to a stable population is difficult. The proportion of elderly will increase, and rules for retirement may have to be adjusted. The number of sick and elderly care-requiring inhabitants will be very difficult to manage. We have an ageing society, and it has to be addressed. The dilemma of a rapidly changing demographic structure also includes public health changes, depopulation in rural areas and swelling cities. At the same time decreasing population numbers, low life expectancy and public health is one of the largest problems in Central and Eastern Europe.

Over the last 100 years the average distance travelled by a person in Sweden (as in the rest of Western Europe) has increased from less than a kilometre to about 45 km per day. Increased mobility has provided the individual with many advantages: He/she may see family and friends regularly; enjoy public life, travel, and reach services and better job opportunities. To this so-called voluntary mobility comes forced mobility, e.g. commuting. Mobility still increases steeply, more than economy. "Modern society pretends that space does not exist", as Joachim Spangenberg phrased it during the symposium. However the enormous traffic which it leads to is not sustainable at all. Urban and regional planning pays a high price, and resource consumption is enormous especially of the non-renewable oil. There seems to be a consensus that the mobility challenge is one of the most difficult for sustainability.

Industrialism arrived to the Baltic Sea region in the end of the 19th century and with it a society which fundamentally depends on fossil fuels, such as coal, oil and gas. This dependency is still there to an extent of close to 90 % (depending on how one makes the statistics) in the area east of the Baltic Sea. The western part of the region is around 50 % fossil fuel dependent. Our societies have not only made themselves dependent on oil, we have when burning the oil polluted the global atmosphere with green house gases threatening our climate, acidified tens of thousands of lakes and rivers, and polluted large areas with heavy metals. Sustainability is not possible with non-renewable resources and the fossils have to be left behind. Since energy is basic to very many functions in our society finding alternatives is basic. Many have pointed to energy management as the key issue for approaching a sustainable society. However the Baltic Sea region has unusually good conditions to address this issue and find alternatives to the oil dependency.

The symposium also brought up issues of how to understand and monitor sustainability. Is it possible to improve the measures used? Is it possible to use modern modelling techniques to address policy choices? Several research groups in the region work on such questions and a better methodology and data for sustainability research will eventually be available, and also be relevant for the policy domain.

All participants of the symposium were encouraged to conclude with policy recommendations, and several of the contributions do have very clear recommendations. Still it should be underlined that research is not politics and it would be wrong to expect that researchers would come with mature policy recommendation. The reader is encouraged to conclude for him/herself what is the best policy to improve our future, which after all is the meaning of sustainable development – efforts to create a long term good society for all future inhabitants in the beautiful corner of planet earth called the Baltic Sea region.

Uppsala, March 2006

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Photo on right page:
Signature of the memorandum of understanding between the EC and the UNEP on global efforts for the environment. In September 2004 Klaus Töpfer, Executive Director of the United Nations Environment Programme (UNEP) and Margot Wallström, Member of the EC in charge of Environment signed a memorandum to reinforce policy dialogue and collaboration at all levels between UNEP and the European Commission. (© European Commission).

PART I

GOVERNANCE OF SUSTAINABLE DEVELOPMENT

Governance for sustainability is basic for all other actions. Without proper policies, legal frameworks and economic incentives, all other efforts to promote sustainability are difficult or impossible. At the same time it is clear that much policy frameworks in the BSR countries are insufficient to achieve real steps forward. Economic growth is in the forefront and other political agendas are evaluated against this background. For real steps forward sustainability needs to be the measuring stick against which all other policies should be assessed. Governance is also where ethical dimensions of sustainable development need to be translated into practical policies. Many ask themselves: sustainability for whom? Is SD policies a power play where some suffers, where others gain? This is a voice heard most often in the so-called new democracies where many consider they have been poor long enough. Now they have the right to a good life. The complex issues of governance is a key concern to address if we want to understand how to go on.

Sustainable Development
a challenge to governance

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Introduction

Throughout the European Union, all countries have declared their willingness to develop and implement sustainability strategies. Some have started to do so shortly after the UNCED conference in Rio 1992, others in the preparation phase for the WSSD in Johannesburg 2002. In the mean time, all but two countries either have national sustainability strategies (NSDS) in place, or are in the process of implementing them. Now has come the time to share these experiences and jointly learn from them, to facilitate effective transition strategies towards sustainability. However, given the cultural diversity of EU member states (which is an asset not to be dismissed), there is no such thing as best practices, which can be identified once for all times and then applied all over the place. Instead of trying to derive "one size fits all" approaches, mutual learning means gathering inspiration for national strategies, which share many (not all) objectives, but are operationalised based on different situations, legal systems and political histories.

Still far to go…

As the assessments of the NSDS by the EU Commission (EU 2006) and the Council of Europe (Council of Europe, 2005) have shown, none of them has yet managed to make sustainable development the core orientation of national politics in day to day decision making (as opposed to policy declarations on the EU and the national level). In other words: successfully mainstreaming sustainability policy or, the ultimate objective, establishing it as the frame of reference for all other policies and politics, has not been achieved anywhere so far. This holds true despite the fact that:

- some member states have already revised their strategies once or several times, having accumulated a body of experience on implementation, evaluation and reformulation of NSDSs (like the UK), while others have contributed by developing and testing innovative ideas (like France for peer reviews, Austria for expert assessments or Finland for high level participation).
- internationally, the situation is quite the same: while e.g. Brazil, Russia, India, China, and South Africa (the BRICS countries) have a number of inspiring projects, these do not represent mainstream development.

This sobering insight deserves a closer look for the reasons, in order to get sustainable development out of its political niche and exploit its full potential for delivering

improved quality of life to Europe and its citizens, and beyond. So why has sustainable development not become mainstream, despite all international agreements and declarations? From the analyst's point of view, there are two rather obvious reasons, one referring to the lack of agency due to prevailing institutional orientations, the other to the capability deficit of existing institutional mechanisms in handling the rather complex issue of sustainable development.

First, although the principle of sustainable development is widely acknowledged as a basic orientation, its governance implications contradict the "Zeitgeist": Sustainable development strategies require better, not necessarily less government, a sharing of tasks between state, civil society and the business sector, long term perspectives instead of short term activism, and a vision instead of pragmatism (when the term is used as an euphemism to describe an approach of ad hoc muddling through).

Secondly, sustainable development is probably the most demanding policy concept ever developed and promoted. It encompasses all domains of policies and demands no less than a revolution in thinking, a new view on old problems and approaches (which might confirm some older perceptions and solutions, but will for sure question others). This implies a need for new mechanisms of governance, tailored to meet the enhanced quality demands arising from the sustainable development concept, i.e. for a sustainability oriented reform policy strategy.

The Challenge

There are essentially only two governance challeges in sutainable development. We call them here:

- delimitation in space and time (Figure 1), and
- comprehensive policy integration (Figure 2).

The former (delimitation) reflects the sustainability imperative of intra- and intergenerational justice, including to accept responsibility for ones own past and future actions and for their impacts from the local to the global level. The latter (integration) points to the fact that, for sustainability policies, the traditional separation between dif-

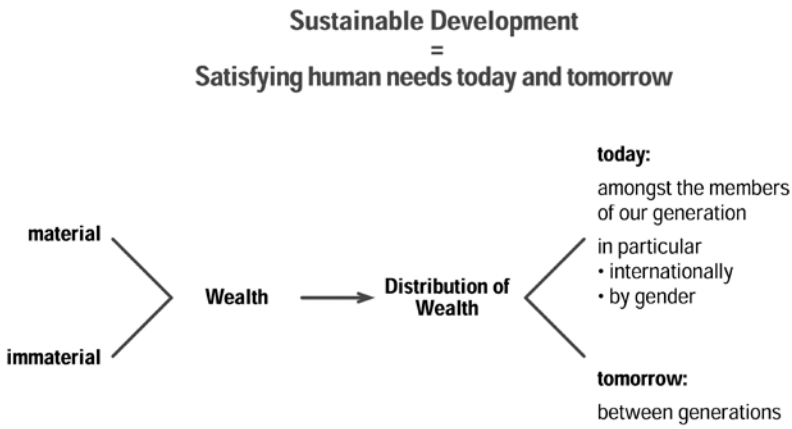

Figure 1. Delimitation in space (local and global) and time (past and future).

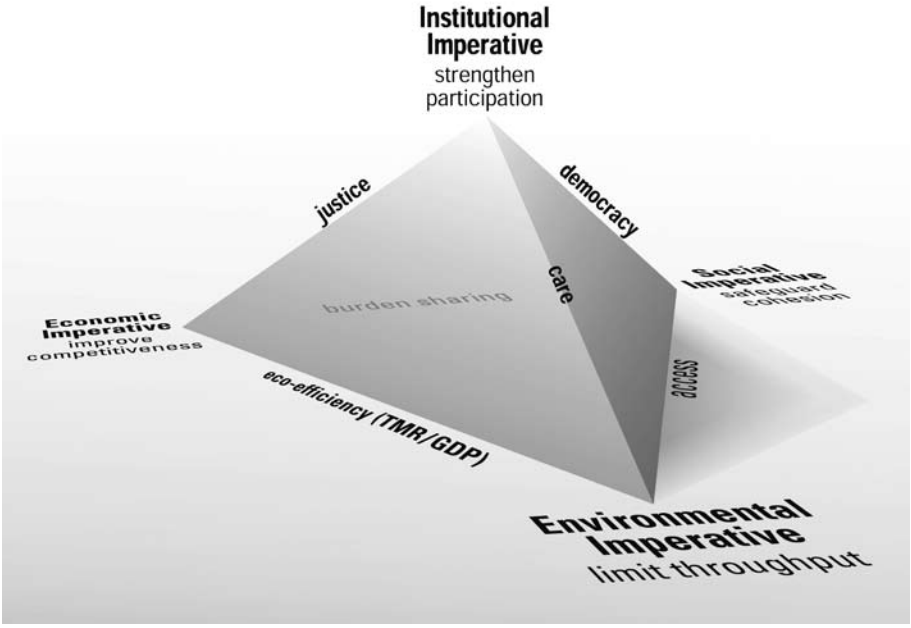

Figure 2. The Prism of sustainability, a policy integration tool.

ferent resorts and policies is dysfunctional, that compatibility (if not synergies) must be given, and that in order to develop integrated policies, orientations must be available, and the focus must be on the interlinkages, even more so than on individual policy domains.

Although the obstacles have been more or less clearly identified, a solution how to overcome them has not yet emerged. Given this situation, sharing of experience is ever more impor-tant, and the EU provides an excellent basis for doing so.

One first lesson from the international experience is that whereas both, delimitation and integration need new ways of thinking and putting things into context, at least policy integration can be effectively supported by appropriate institutional framing. For instance, the cooperation of all departments, ministries, agencies etc., necessary to comprehensively deal with unsustainable trends across the board, can best be achieved if the NSDS process is initiated, permanently supported and publicised by the highest level of decision making (President, Prime Minister, Chancellor). Furthermore, experience shows that to enhance effectiveness, there should be one co-ordination mechanism on the political level (sustainability cabinet, etc.) and one on the administrative level. The latter can be located within the prime minister's office, thus enhancing its political weight, but this is not a precondition for successful work as long as it is authorised by the top level in a visible and effective manner.

In the guidebook "Mutual Improvement and Learning on National Sustainable Development Strategies" we (SERI, IEEP) developed for DG ENV, we suggested to achieve this through a pressure-policy-matrix (Figure 3), linking the sustainability pressures identified in the EU SDS with the ministerial portfolios in the respective country (IEEP/SERI 2006). A draft could be provided by the administrative unit in charge of sustainability coordination, and then be adopted by a broad meeting of all relevant administrative units.

Policy Areas Core set of issues	Agriculture and Fisheries	Energy	Transport	Development	Economics and Industry (incl. trade)	Finance (incl. taxation)	Forei Affai
1. Economic development, sustained and sustainable growth	Sustainable agriculture	Energy efficiency	Transport intensity	Growth and fair distribution of its burdens and benefits	Competition and fraud control	Incentives for re-investing profits	Partne peace: operat agree
2. Poverty & social exclusion	Employ-ment, average income per cap	No energy poverty	Affordable accessibility for non-car owners	Poverty reduction, food self sufficiency	Full employment	Income distribution	
3. Ageing of society			Safeguarding elderly mobility		Regulating working conditions	Secure pensions	Immig
4. Public health	Healthy diets	Clean household energy	Reduce accidents and pollution	Sanitation, clean water supply	Affordable pharma-ceuticals	Incentives for healthy jobs and lifestyles	Peace
5. Climate change and Energy	Use of waste energy, energy plants	Energy sector energy efficiency	Stabilise transport emissions and volumes	Support for decentralised and non-fossil energy supply	GHG emission trends, energy intensity trends	Energy taxation	Energ supply securi
6. Consumption and production patterns	Resource intensity of food production	Energy intensity of production and consumption	Transport intensity of consumer goods (like food miles)	Sufficient and secure supply of safe food and drinking water	Resource intensity of production, standard of living	Disposable income and minimum income	
…	…	…	…	…	…	…	…

Figure 3. Pressure-Policy-Matrix, excerpt.

Once successfully completed, such a matrix clearly demonstrates the need for cooperation (one trend being influenced by several agents' policies), and the need to have a broader view regarding the respective administrative unit's responsibility, given the diversity of unsustainable trends it could and therefore should influence under an integrative policy approach. These two insights, if taken seriously, would lead to changes in the mode of work from a primarily single criterion approach to multi criteria assessments. This change – after a time for becoming a routine – will also significantly contribute to good, effective and efficient government.

For instance, the growth dilemma

What policy integration means in reality can briefly be illustrated using the example of economic growth. The European Council has called for "sustained and sustainable growth" as part of the Lisbon strategy, but while sustained growth is easy to detect, what is sustainable growth? In an integrated view, it must be a kind of growth which is in line with social and environmental concerns and thus considered desirable by the public at large. Specifically, this means it must not increase the burden on the environment, which as a "quick and dirty" estimate is the case as long as the resource productivity rises faster than the growth rate. Socially, for most countries of Europe it should create employment, i.e. be higher than the increase of production per capita. The latter sets a minimum, the former a maximum for growth to be sustainable. However, both criteria are open to political influence, be it RTD expenditures and innovation support to accelerate resource productivity increases and thus increase the maximum, or working time reductions to decrease the minimum criterion for sustainable growth. Thus integration provides benchmarks and necessitates action in other policy domains in order to derive a comprehensive overall strategy.

NSDS evaluation

As the above example has shown, policy integration is dependent on establishing cross-sectoral discourses, exchanging experiences and leading to a sharing of tasks. This is even more the case when it comes to the evaluation and further development of sustainability strategies. In these cases, the discourse must be extended to include other stakeholders, and it should take into account the available international experience.

As there is no such thing as a best practice, but rather a kaleidoscope of experiences how national sustainability strategies can be developed and why they have not been effectively enforced, mutual learning between relevant agents, in particular between governments, can help to take a significant step forward. In this sense, the diversity of national experiences makes Europe a kind of unique real-time sustainability laboratory.

Learning processes begin on the national level (with local input where available), with a reflection about the strategy implementation and its impacts so far, and with stakeholder discourses on the experience made. The exchange of perceptions and experience should be systematically pursued:

- inside government and
- inside the administration.

However, since sustainability cannot be achieved without the active involvement of major groups and regional/local government, and as international experience can provide fresh ideas which help to overcome national difficulties, the discourse should also take place:

- between public authorities and civil society stakeholders, and
- between all stakeholders and external peers from other countries.

Participation is not only essential for effective governance, but also addresses the spatial delimitation by involving actors whose work is dedicated to the local level, but also to international solidarity. As a welcome side effect, civil society participation keeps the potential abuse of agenda setting power by authorities in check.

The final step of the learning exercise suggested here is a peer review process with international participation. France and the countries participating in its review (Belgium, UK, Mauritius, Ghana) all report about excellent experiences. Based on this experience and interviews with the participants, we have proposed to involve at least four peer countries, from the EU, the South and the EU Neighbourhood (IEEP/SERI 2006). This spectrum of potential peers would also help to integrate the delimitation objective into the review processes. Furthermore, this kind of collaboration can also be seen as a confidence building effort, much needed in the EU-Neighborhood Policy to improve the relationship with Russia and the Mahgreb countries.

With the measurers suggested, the major challenges have been institutionally addressed, except for the intergenerational justice, described as safeguarding the freedom of choice of future generations by the Brundtland Commission. As they are not yet present, they cannot take the floor in participatory process. There have been foundations and associations for the defence of the rights of future generations which could be invited to such processes to represent the future generations' interests, but at a second glance they seem to represent current interests of their own rather than future ones. However, the more transparent the processes, the less will the neglect of future generations – and thus the future of our countries – go unnoticed.

Outlook

According to the European Commission, the plan is to support two peer reviews per year, by covering 50% of the costs up to 100,000 (EC 2006). Parallel to the launch of the revised EUSDS.

The opportunity to have EU support, while organising a strategy review on the national level according to the national conditions and priorities is an opportunity not to be missed. Instru-ments like the Pressure-Policy-Matrix and the additional background in the EU-sponsored guidebook provide additional help in a process which hopefully will lead to a member state driven convergence of national and European sustainability strategies. This might also help to make the NSDS a key policy tool, for the sake of the member states and the people of Europe.

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The Baltic Sea region
Developing towards and away from Democracy

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Democratic Development: An Overview

The political scene in the Baltic Sea Region has been dramatic ever since the fall of the Berlin Wall and the succeding collapse of the Soviet Union. The years after 2000 is no exception. From a democratic point of view, we have reason to both be joyous and worried over what is happening in this part of the world. The positive developments are to a large extent related to the influence of the European Union who has stepped forward as a very important democratisation actor also in countries such as Ukraine. The negative are instead determined by historical, cultural and communist-time legacies. Therefore the democratic developments in the region could be analysed as a continous struggle between europeanization influences and historic-cultural legacies which we certainly has not witnessed the end of.

How safe is democracy fifteen years after the revolutions that shook Europe? In the overall region of Central European and former Soviet Union approximately half (13) of the countries are today democracies. The other half is split into two. One group of countries that is on their way of becoming democratic but still suffer from frequent violations of human rights (7) and another group (7) that is clearly authoritarian. In the last group we find Belarus and Russia, two countries that also are part of the Baltic Sea Region.

The Baltic States and Poland: The EU Accession

Let me however start with the good news. Estonia, Latvia, Lithuania and Poland became new members of the EU on the 1st of May 2004. Since they all are parts of the Baltic Sea Region this immediately contributed to strengthening the region's weight within the Union. Likewise, and more importantly from a democratic perspective, the long, painstaking EU accession process has no doubt despite its draw-backs positively affected state capacity, the respect and protection of minority rights and the democratic forces in these states (Mungiu-Pippidi, 2005, Pridham, 2005). In fact, it is hard to believe that these countries could have moved so fast in reforming the state had the EU membership been a major incentive. The "carrot" that a membership in the EU constitutes has been shown to make a real difference in motivating countries to reform and subject to norms which are actually being imposed from outside; otherwise democratisation from outside has often proved to be quite difficult. "Transitions with an EU prospect seem to be the best: they lead to democracy and prosperity earlier and with fewer uncertainties and risks than any others known so far" (Mungiu-Pippidi, 2005, 16). No one denies that the demands

Democracy and sustainability

One aspect of SD is the institutional dimension, sometimes judged on equal basis as the well established ecological, economic and social dimensions. This refers to the institutions needed to develop and maintain sustainability in a society. One key aspect is democracy. It is not only central to basic values such as human rights, and political participation, but all experience also tells us that a non-democratic society over exploits natural resources, pollute the environment, and does not use rule of law for balancing economic vs public interest. In particular the communist authoritarian states in the eastern Baltic Sea region have a very bad track record on these points. The democratic development is thus seen as a difficult and crucial aspect of a sustainable Baltic Sea region.

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and the conditionality exercised by the Commission on the candidate countries have been quite tough and sometimes aimed for goals for the former communist countries that exceed the state of affairs in the old memberstates. But still the incentives for reforming that are embedded in the benefits of a membership have urged the four Baltic Sea Region countries to continue reforms over the years.

That does not mean that the accession process has generated only positive effects or that the three Baltic states and Poland now have transformed into what political scientists call effective democracies; liberal democracies with strong civil societies, elites that act with integrity and respect for political equality (cf. Welzel, 2003). Clearly, they fulfil the criteria of being what is called formal or electoral democracies (Welzel, 2003, Diamond, 1999). According to the annual measurement by the organisation Freedom House of how well civil and political liberties are being protected, the four are all today (2006) classified as free ranking 1 in each of the categories of civil and political liberties which is the highest. Latvia has since the last survey even improved on civil liberties.

However, Estonia and in particular Latvia are still faced with critique regarding their citizenship policies towards the russian-speaking minorities who in Latvia constitutes some thirty-five percent and in Estonia around thirty percent. Numerous persons within these groups are either in lack of any citizenship or, as is mostly the case in Estonia, they are Russian citizens. The jus sanguinis that both Estonia and Latvia chose as the basic principle of citizenship continues to exclude persons from becoming citizens who were actually born in the two states. In particular Estonia has however subjected to the international pressure and 'softened' its legislation in several ways. Latvia has acted tough and articulated more openly the nation's right to decide by itself.

The persistent problem of state capture-tendencies and political corruption in Latvia is yet another example of governance failures. Through data published by the World Bank we know that Latvia in contrast to its Baltic neighbours ever since the early years of independence has struggled with severe corruption, not least on the elite level. Certainly, Lithuania in the recent years has been shaken by some serious scandals and 'affairs', the most sensational of them the one involving the then president Rolandas Paksas who was forced to resign. However, Latvia's problems are of a much

more systematic kind. Central are the close ties between business groups, interests and the political parties that continue to be heavily sponsored by private money. Party financing over the state budget has not been introduced in Latvia, and would not be popular among the economic elite since it would mean a reduction of their channels to political influence. But the control of corruption consequently continues to stay low in Latvia while for example Estonia is a clear fore-runner in this aspect.

Recent developments in Poland also give rise to some worry. Poland, who generally was considered just before accession to be the most successful of the candidate countries with respect to economic growth and restructuring has become more politically unstable and in particular the level of corruption has risen. Even though the country's governance capabilities have been detrimentally affected, there is no reason to believe that the democratic system is under any threat. Furthermore, Poland is now through its membership in the EU incorporated in a co-operation which would prevent severe demoratic crises.

The EU logic generates both in the old and new memberstates an "executive bias"in the sense that decision-making becomes more concentrated to the executive level, primarily because the Council of Ministers has such a pivotal position. That has lead to a power shift in many member states in favour of the executive. In short, the parliaments have tended to be powerwise side-stepped while the governmental level has increased in importance. National parliaments in both old and new memberstates of course formally takes part in the decision-making processes related to the EU- level but their role is more formal and confirmative than truly influential. From a democratic perspective such a development raise concerns if we are dealing with parliamentary democracies. But while the old member states usually have a long period of stable democracy behind them which is beneficial in handling challenges to democratic rule, in the case of the new post communist member states the executive bias logic set in at a time when democratic institutions were in the process of forming which makes the whole system more vulnerable. It has been shown that at some instances during the lenghty accession process the parliaments were basically left out while the governments were the sole actors (Raik, 2003). Being new-born parliamentary democracies, fears have been articulated regarding the detrimental effects on the power of the parliaments and thus indirectly the power of the people.

Ukraine and the orange revolution

We have reason to assess the developments since november 2004 in Ukraine positively. Doubtless, the orange revolution and the shift in the presidential office that followed suit is the most democratically important event in the region during the last years since Ukraine is such a geopolitically strategic country, close to both Russia and Poland and with a number of inhabitants that comes close to fifty million. The increasing level of freedom, not least for the media, is shown by the fact that Ukraine has been re-categorised by the Freedom House as now free, from earlier being among the semi-authoritarian states in the partly free-group. The mobilisation of mass audiences during the dramatic weeks in november and december 2004 clearly demonstrated that there existed a much stronger civic culture in Ukraine than the recurrent election of the over time increasingly notorius and corrupt Leonid Kuchma as president indicated. That a political culture safeguarding human rights and fair elections is in place is of decisive importance in order for the 'revolution' to stabilise into democratic rule. Ukraine however needs support in that process from the West and far and foremost from the EU. Presently, the country is the

playground of intensive attempts from Russia to re-establish the close ties from before december 2004. Since Russia has relapsed into increasing authoritarianism, the political consequences of such a rapprochement, which is not unthinkable, could prove to be fatal. Unfortunately, EU is not at this point interested in approaching Ukraine as a potential candidate country. Aside from a factor such as a general enlargement "fatigue" after 2004, one quite crucial constraint for an enlargement towards Ukraine is the very low popular support in old member states such as Germany and France. The European Neighbourhood Policy (ENP) certainly includes Ukraine which means cooperation agreements and a strive from the EU to stabilise the country politically and economically. What the pro-western part of the Ukrainian elite needs is however a more open and enthusiastic attitude on behalf of a future membership for Ukraine in order to strengthen their positions.

Even if the orange revolution has brought more freedom and a re-newed interest in interacting with the West, Ukraine still struggles with severe governance problems. Like Latvia but just to a much larger extent, Ukrainian politics is dominated by business interests and oligarchs who finance and even establish political parties in order to influence. There has been which is also in a sense true for Russia, an institutional incapacity to separate the elite and establish a more pluralistic power structure. Ideological cleavages in party politics are practically lacking: politics is played out over personal conflicts. Disappointment has been articulated after the installation of the 'orange' government under Yulia Tymoshenko with respect to persistent corruption, and the government thus was fired in september, leading to frosty relations between two of the three dominating political personalities, Tymoshenko and the president Yuschenko. The third one, Viktor Yanokovich who in the 2004 presidential elections finally saw himself defeated by Yushenko, is now the party leader of 'Party of Regions' and working for less central power and greater control for the regions as a means to strenghtening the power of industrial oligarachs in the east of Ukraine.

Towards Stable Dictatorships?

Belarus and Russia are the two countries in the region that have not moved forward democratically but instead have continued to slide backward. For Belarus this development started already with what was a free and fair election of Alexander Lukashenka in 1994, a former Soviet manager who immediately started to consolidate presidential power through various constitutional reforms. In that sense, the Belarussian development resembles that of Ukraine, where elected president in 1994 Leonid Kuchma also embarked on an endevour to strenghten his own power as well as that of his followers. In Ukraine's case people however put an unexpected end to the misuse of power. For Belarus, the cultural preconditions for such a mobilization and reaction do not appear as beneficial. The opposition is weakly organised, and there are few civil society organisations that are active. Surveys have shown that there existed a stronger support for democratic values in Ukraine long before 2004 than in Belarus. Today, Belarus is labelled "Europe's last dictatorship" and even though the EU neighbourhood policy includes also Belarus, the authoritarian regime prevents any contacts from EU:s side. Thus, Belarus is isolated from European and Western influences while the ties to Russia and to the Putin-regime remains strong. How then should we assess the possibilities for a second democratic transition to take place in Belarus?

Internally, there is not much that speaks in favour of a 'revolution' of a similar kind as those in Georgia, Ukraine and Kirgisistan. At the same time, we need not forget the

Figure 1. The orange revolution in Ukraine paved the way for increased democratization and fair elections in the country. Kiev. Independence square in December 2004 (Photo: Andriy Kyrchiv).

context effects and the importance of 'political learning'. The fact that demoratic upheavals have taken place successfully in the region is an independent factor in itself and could well be more determinant than what has so far been believed. Not least the development in Ukraine can serve as an inspiratation to the oppositional forces.

Finally, the dominant power in the region, Russia, has successively been turning away from democratic rule. Today the country is no longer considered to be demoratic or 'partly free' which it was during the 1990s. It is now in the category of authoritarian states and has introduced limitations on political rights, freedom of the press and just lately on the right of civil society organisations financed from abroad to work freely. There is an arbitrary tendency to Russian rule that is shown most vividely in the affair with the arresting and conviction of the former oil-oligarach Michail Chodorkovsky who the regime suspected of having political ambitions. Rule of law is not respected. Why then, we could ask, are Russia and Belarus not able or not interested in building and preserving democratic regimes when for example a country like Ukraine with similar historical legacies has managed to move ahead? There are no easily found explanations. For one thing, Russia and Belarus do not have any democratic experience to rely on; Belarus do not even have any period of independent statehood to look back on. In that respect, the country is quite similar to Ukraine. But where Ukraine's western parts have been closely connected to Poland and thus open for European influences, the same thing is not true for Belarus. Furthermore, Russia carries with it a political cultural tradition of strong leaders and unlimited power. President Putin has been accused of picking up that role although stepwise and with some manoevering to please the international community. But again, the Russian mass audiences may be more 'democratic' and supportive of an open-minded leadership than we know of. Surveys tell us so which in the end might be a hopeful sign.

Russia's authoritarian regime, if not yet a one-man dictatorship as in Belarus, is the greatest de-stabilising factor in the region. If the country also will perceive of EU:s presence in conflicting terms since it comes much closer to Russia's own borders than before the 2004 accession, it could mean an escalating "Cold War" breaking out between Russia and the EU. Russia has many, many interests to secure in the region, economically and politically, and that is a geopolitical reality that for example countries like Ukraine and also Belarus never can ignore. In the end, what we see building up and affecting also the Baltic Sea region is not a clash of civilizations but well a clash of liberal versus non-liberal regimes.

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Photo on right page:
The main square of the old city of Prague. (© European Community).

PART II

DEMOGRAPHY, PUBLIC HEALTH AND HABITAT

Global population as well as the population in Europe and the BSR has been increasing since the 1700s. This growth has now come to an end. It has to since sustainability is not possible with unlimited increase of anything, especially not population. However the transition from a rising to a stable population is difficult. The proportion of elderly will increase, and rules for retirement may have to be adjusted. The number of sick and care-requiring elderly inhabitants will be very difficult to manage. We have an ageing society, and it has to be addressed. The dilemma of a rapidly changing demographic structure also includes public health changes, depopulation in rural areas and swelling cities. At the same time decreasing population numbers, low life expectancy and public health is one of the largest problems in Central and Eastern Europe.

Economic and Demographic development Trends in the Baltic Sea Region at the Turn of the Millennium

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Nordregio, Stockholm and Helsinki, Sweden and Finland

Introduction[1]

Entering the 21st century the Baltic Sea Region is undergoing major structural changes as globalization has taken a firm grip of both its eastern and western parts alike. In political terms the most tumultuous times in the recent history of the region are probably now over, but from an economic and demographic point of view there are signs of great turbulence.

Cities and urban areas in the Baltic Sea Region are the main engines of its development. The concentration of economic activity, corporate decision-making, labour, foreign direct investment, knowledge, and innovation to its metropolitan regions is substantial. As such, the demographic magnetism of larger cities is also considerable, while rural areas in general and peripheral areas in particular remain in the shadow.

Spatial polarisation increasingly predominates across virtually all fields of the society. The negative consequences of these trends are primarily experienced in small and peripherally located settlements that lack the necessary levers to actively take part in the international division of labour. Moreover, many of the Baltic Sea Region countries are relatively small in economic terms and are thus simply unable to compete on a par with the major European economies, let alone globally. On this background the concentration of economic activities to larger city regions reflects an adjustment to a new spatial organization better suited for competitiveness in the increasingly international economy.

A region with great internal structural differences

The Baltic Sea Region (BSR) covers a vast area. As with any other large meso-region of Europe, the BSR's urban system is not an integrated whole, but is rather a peculiar mix of eleven national systems where to varying degrees transnationally interlinked relationships act as linkages between the various subsystems.

Taken as a single economic meso-region the BSR is neither large nor prosperous in comparison to the European core. The total Gross Domestic Product per capita in the BSR (excluding Belarus) when adjusted for differences in purchasing power amounts to

[1] This article is primarily based on Hanell & Neubauer (2005).

an estimated 28% below the EU25 average in 2002. On the national level though the internal differences regarding GDP per capita ranges from more than 50% above the EU average in Norway down to less than 50% below in Latvia and the Russian parts of the BSR.

On the regional level the internal differences are even greater as the BSR hosts many of the wealthiest regions in Europe as well as several of the poorest ones, with the Oslo region having a GDP per capita well over double the EU25 average while the corresponding levels in the Pskov and Kaliningrad oblasts are only about 15-20% of the EU (Figure 1). The relative disparity within countries is clearly largest in BSR Germany, as the east-west distinction remains sharp. Overall regional polarisation is also substantial in Latvia, Estonia and BSR Russia, while it is marginal in Sweden and Denmark and also small in Norway. Comparing the total regional disparities of GDP per capita between 1995 and 2002[2] they have increased in all countries save for the Russian parts of the region.

Despite the varying points of departure, economic growth has been exceptionally high across all of the BSR. During the ten-year period 1995-2004 almost all BSR economies saw a faster economic growth rate than the European Union on average, with the BSR parts of Germany and Russia being the only significant exceptions. Belarus has seen the fastest growth rate at times reaching two digit levels on an annual basis. The Baltic States have also seen fast-paced development, while Poland and the Nordic countries have witnessed more moderate growth rates. The countries with the highest growth of GDP are thus the ones with the lowest level of GDP/capita. Thus, while the economic differences within countries have increased the differences between countries have decreased.

Cities as engines of development

Cities and urban areas are without doubt the main engines of economic development in the BSR. The concentration of economic activity, corporate decision-making, labour, foreign direct investment, knowledge and innovation to the metropolitan areas in the BSR is substantial. The nine capital regions of the BSR (plus Hamburg and St Petersburg) account for more than a third of the region's entire production value, although they contain only a fifth of its population.

Disregarding the obvious national differences, city size then remains an important factor in explaining new job creation. In general, the larger the city, the more favourable has been the development of its employment. In the BSR as a whole, rural areas have in general performed slightly worse than the cities they surround with regard to new job creation. This holds true for most areas of the BSR indicating that the process of concentration of employment opportunities to urban areas continues unabated.

Branch-wise data on employment change provides further insight as to the current transition process in the BSR. Although the area is diverse some common traits can be observed. Primary production is by and large now being dismantled in the region, while manufacturing is also on the decline. The main source of new employment, measured in absolute terms, comes from the rising number of jobs in the service sector. Although little comparable data exists to corroborate the fact, much of the increase in the service industries probably stems from increases in private services rather than in public ones. Capital and other large city regions have, in general, seen the most rapid employment growth. The

[2] Norway and the Russian BSR 1995-2000

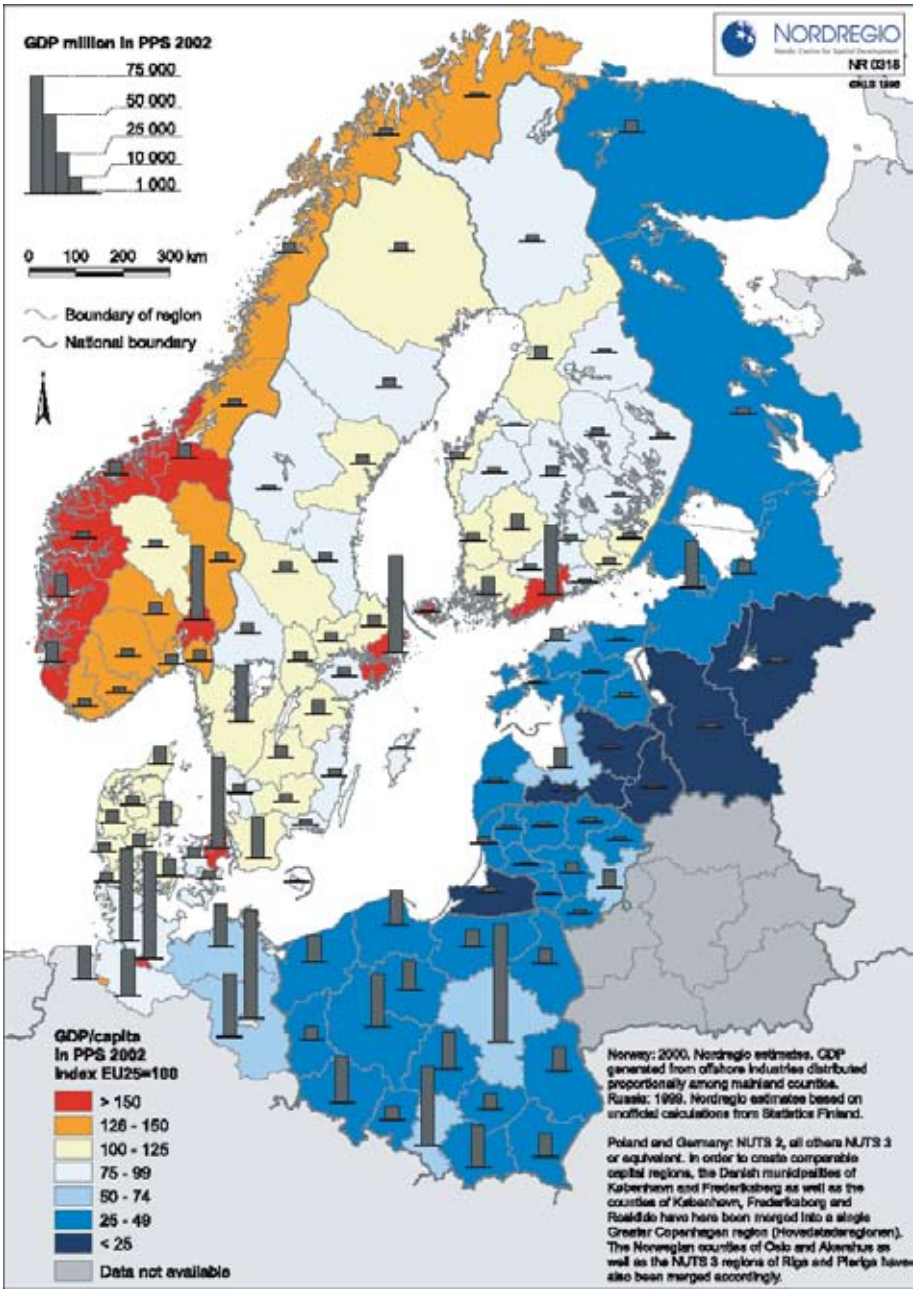

Figure 1. GDP per capita in PPS in the BSR 2002. Index EU25=100. (Source: Eurostat and Nordregio estimates)

twelve metropolitan regions alone account for approximately one third of the total BSR increase in service sector employment.

There thus seems to be an ongoing process of labour reorganisation in the BSR where agricultural jobs lost in peripheral regions and manufacturing ones in industrial regions are being replaced by service sector jobs in metropolitan areas and other large cities. Particularly Poland and Lithuania are highly affected by this process and unemployment rates in several regions in those countries reached over 20% in 2001. This transition process cannot but help to reinforce the ongoing shifts in the settlement structure of the region. Moreover, in countries – such as Poland or Belarus – that have both a large rural population and a relatively underdeveloped service sector, the likelihood of increased future rural-urban migration seems greater.

Demographic shifts within the BSR urban system

Since the early 1990s the population structure of the BSR has undergone a number of significant changes. A major decline occurred in the eastern BSR population in the years directly following the dismantling of the planning economies, with the new millennium continuing to witness changes in the east that are still negative (Figure 2).

In the Nordic countries the opposite situation prevails, as Finland, Norway and Sweden have witnessed a constant population increase throughout the post-war era. With a brief exception period in the early 1980s, this also holds true for Denmark. Due to high birth rates overriding substantial emigration the population of Poland has also increased steadily throughout the post-war era up to the turn of the millennium, when for the first time the Polish population began to show a tendency towards decline.

The east-west difference in population development becomes clearer when looking at the largest cities. Most of the major cities in the former east, from Berlin to St Petersburg (with Minsk being an obvious exception), experienced quite substantial decreases in population. The western counterparts, from Hamburg to Helsinki, had strong increases. Basically all the largest cities, both east and west, are surrounded by smaller cities with rapid population growth, however.

The Baltic States and the BSR parts of Russia display an overall population decline in urban and rural areas alike (Figure 3). Apart from Lithuania, the decline has been faster in towns than in the countryside.

In Norway and Denmark again the opposite situation prevails as both urban and rural areas exhibit rapid growth rates. In Norway, which contrary to Denmark is still in its urbanisation phase, growth has been substantially faster in cities than in rural areas, whereas Denmark shows a more balanced growth.

Finland and Sweden, and to a lesser extent Belarus, display the textbook urbanisation pattern with rapid urban growth and equally rapid rural decline. In Belarus the rural "exodus" is admittedly substantial, but it is completely overshadowed by the highly negative natural population balance in these areas. In some rural areas of eastern Belarus this decline has exceeded the rate of 2% on average every year. The contrary situation prevails in Poland and in the German parts of the BSR – as rural areas are gaining and urban areas are loosing population.

This general overview of population change could easily be misinterpreted when it comes to the role of metropolitan areas in the east compared to the west. Even though the single largest absolute decline in BSR urban population has taken place in St Petersburg, as the city's population decreased by approximately 140,000 persons over the period in question, the pattern in the east is completely different when it comes to migra-

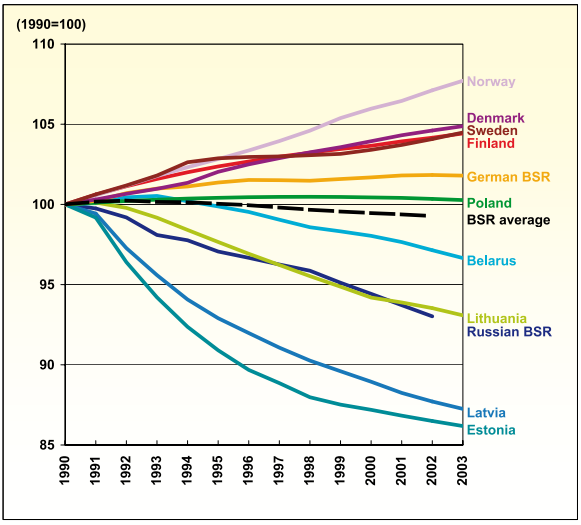

Figure 2. Population development in the BSR 1990-2003 (end of year). Source: Eurostat, National Statistical Institutes, Nordregio estimates.

tion. From Figure 4 it is clear that, despite of some exceptions – primarily Berlin and the Baltic capitals – the attraction of metropolitan areas is not a western phenomena.

Instead there is a general trend towards declining fertility levels (and partly also high mortality rates) causing major natural population decrease as the number of deaths exceeded the number of births in two thirds of all cities in the BSR during 1995-2001, especially on the eastern side of the Baltic Sea. The total fertility rates in several BSR countries belong to the lowest in the world (UN Statistics) and they have been falling more or less constantly during the last half of the 20th century (Figure 5), partly due to changing family structures and increasing female labour force participation (Leeson 2002). In line with the general pattern in Europe none of the BSR countries have total fertility rates above the reproduction level of 2.1 children per woman.

At the same time the population is on average becoming older and older with life expectancies at birth rising over the last 50 years in all BSR nations – in Poland and Finland by more than 10 years. There are great differences within the region though and perhaps more alarming between men and women as shown in Figure 6. The higher life expectancy for women than men is a universal phenomenon, but the difference between the two sexes is much greater in the Baltic States, Russia and Belarus where the difference is 11-12 years, than in the Nordic countries and Germany where the difference is only 5-7 years. Poland lies in between with about 8 years difference.

Looking at the development over time, two important trends are discernible. First of all, the difference between men and women is, with a few exceptions, increasing in the countries where this difference is greater to start with, i.e. the former Soviet Republics. In the Nordic countries and Germany (and recently also Poland and Lithuania) there is a converging trend between men and women over the last 20-30 years.

Secondly, and perhaps more worrying, life expectancy is actually falling drastically in Russia and Belarus, for men in particular. In a 40-year perspective this is also the case for men in the Baltic States after a dramatic drop in the early 1990´s. The causes behind this, much more in depth discussed in the SCOHOST paper following, are to a large extent related to alcohol, violence and other social factors (see for example DaVanzo, J & Grammich, C (2001)).

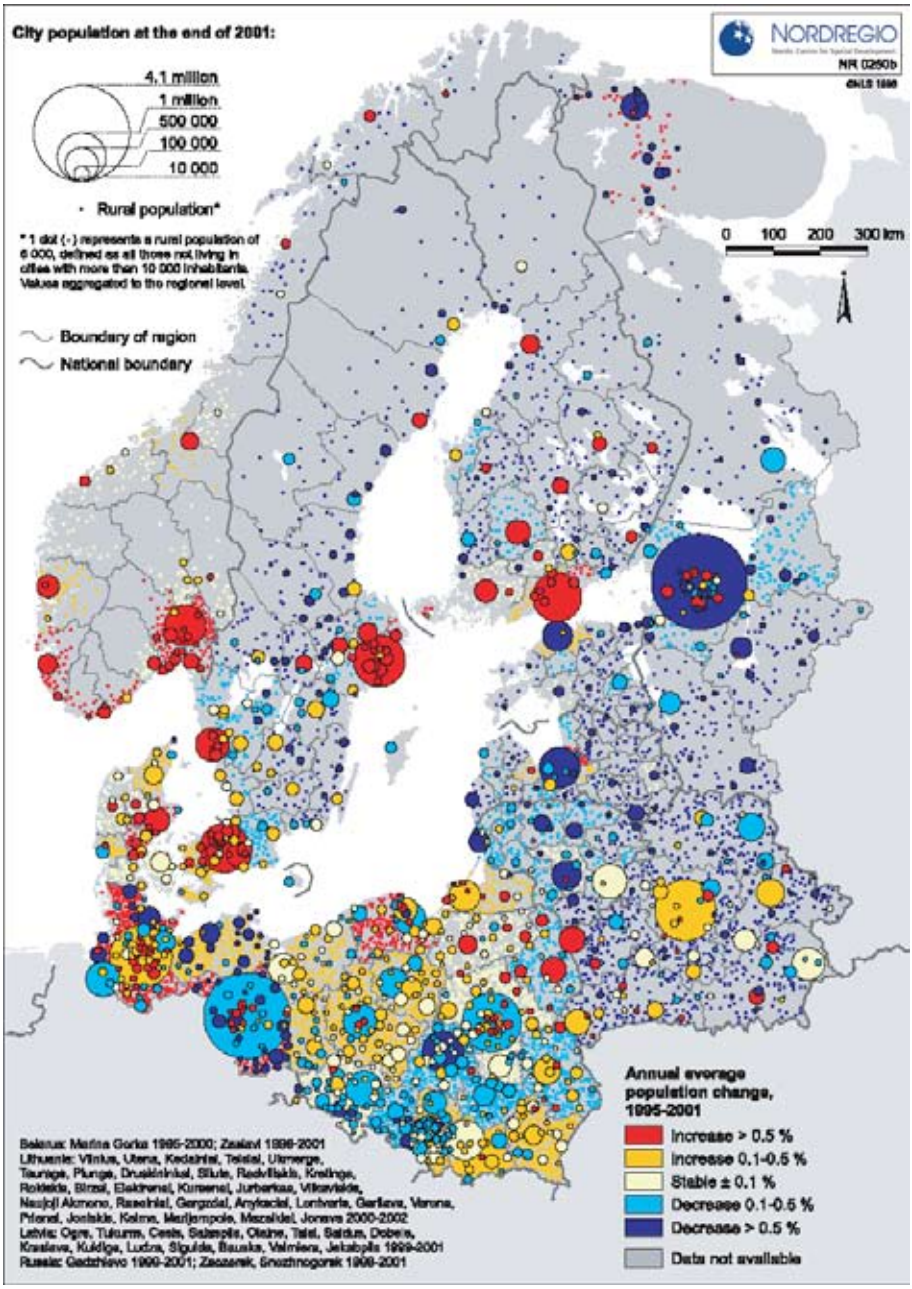

Figure 3. Population development in cities and rural areas in the BSR 1996-2001.
Source: National Statistical Institutes, Nordregio estimates.

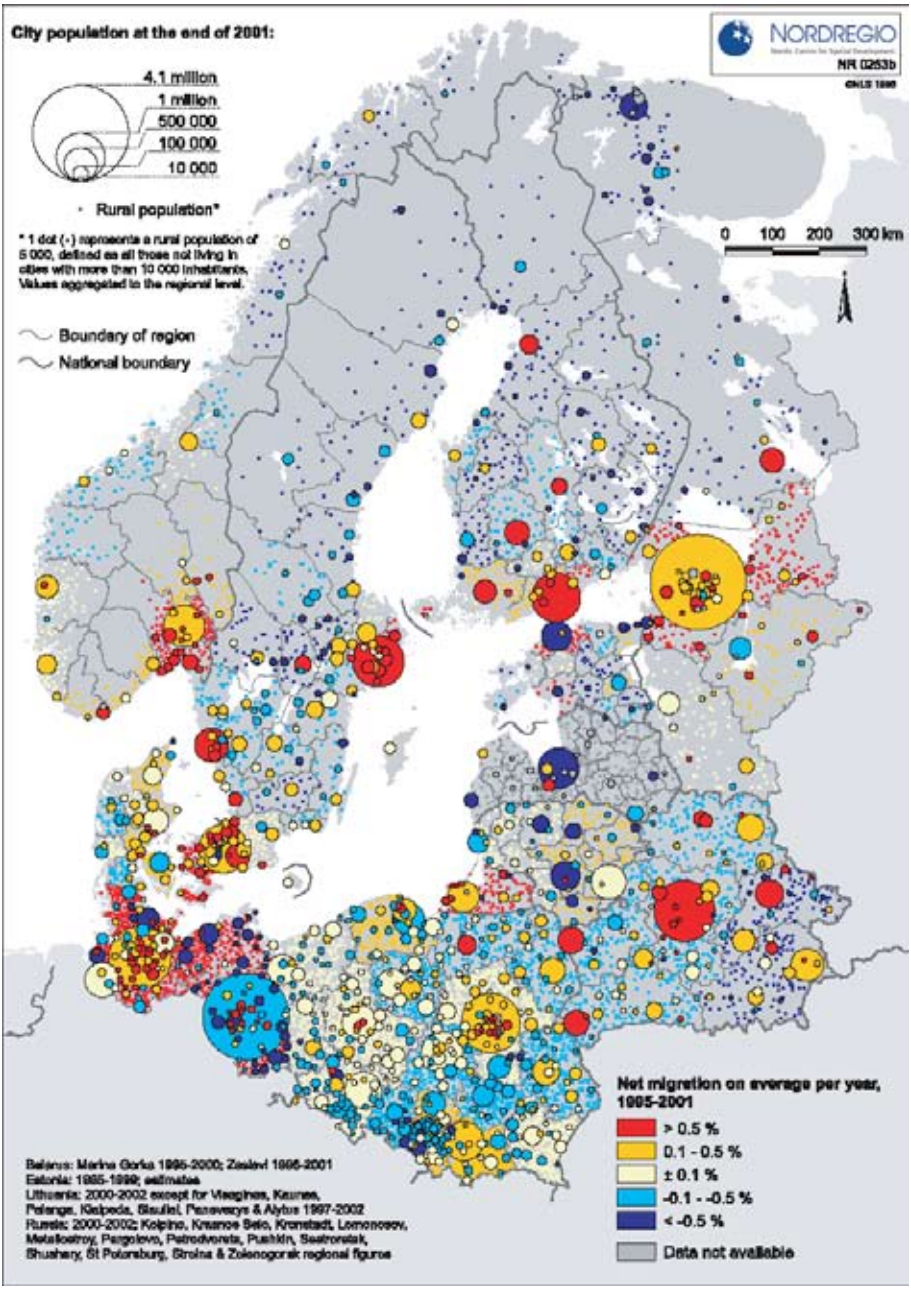

Figure 4. Net migration in cities and rural areas in the BSR 1996-2001.
Source: National Statistical Institutes, Nordregio estimates.

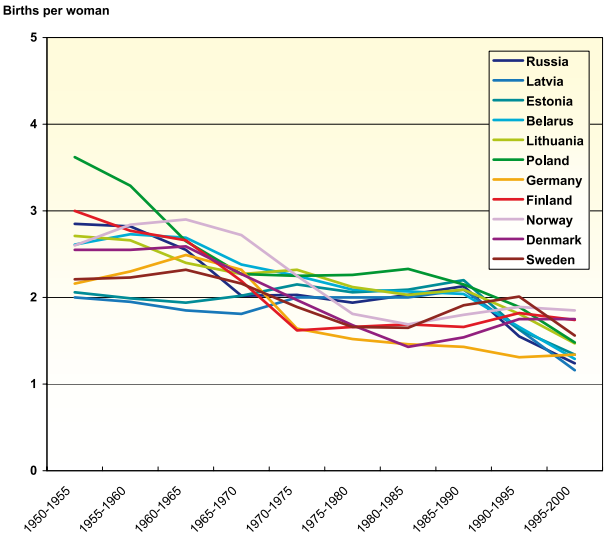

Figure 5. Total fertility rates in the BSR countries (national level) 1950-2000. Source: UN.

Challenges for the future

There are a couple of important development trends with implications for the challenges faced by policy makers. The economic growth in the Baltic Sea Region has been high during the last ten years. But while there has been economic convergence between countries the differences within countries have increased. There is a general concentration of both economic activities and people to larger cities while smaller towns and rural areas, particularly in peripheral locations, are going through negative changes. Thus there are domestic polarization trends in some form going on in almost every country in the BSR causing different policy challenges depending on the growth or decline of particular areas.

For a long period of time total fertility rates, i.e. the rate at which women give birth, have been falling and are currently below the reproduction level of 2.1 children per woman in all BSR countries. At the same time there is a general ageing trend in large parts of the BSR, primarily in the west. In the eastern areas on the other hand, there is a completely different situation with decreasing life expectancy, especially for men.

Whether these trends are sustainable or not depends on the definition of sustainability. The spatial organization of human activities and settlement structures has always been in constant change. What might seem like a natural status quo is more likely a lack of perspective on longer-term trends in society. The same thing could be said about the population ageing. The life expectancy in Sweden, for example, has increased by 2.5-3 years for more or less every ten-year period during the last 150 years. What in the long term cannot be sustainable though is a continuing decrease in fertility. The only way for the population to remain constant or grow is then for immigration to increase.

Sustainable or not, there are certainly policy challenges in the current development. One of the major challenges for society to handle is the question of how the dependent population shall be supported by the working population, i.e. how the welfare levels in society shall be maintained or developed. Among others there is a strong geographic as

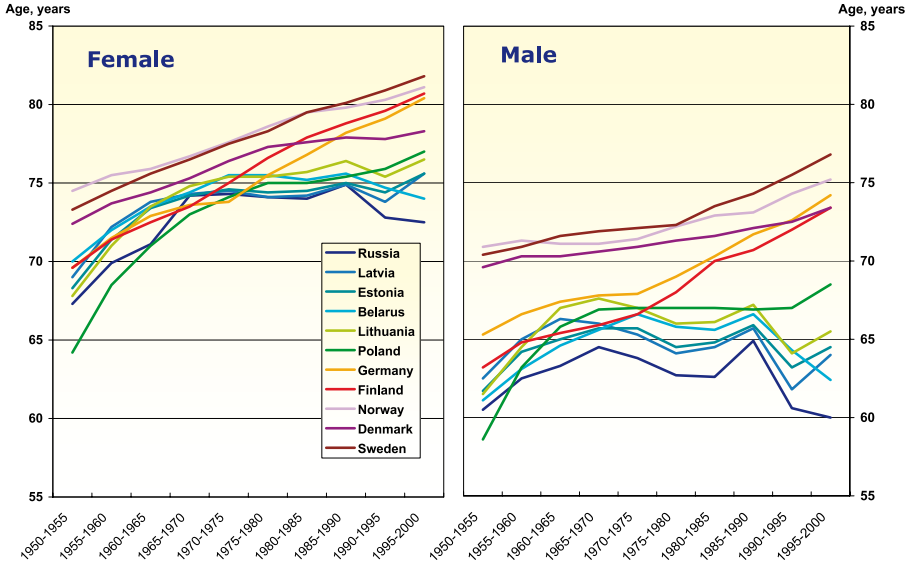

Figure 6. Life expectancy at birth in the BSR countries (national level) 1950-2000. Source: UN.

well as a generation dimension to this. Depopulating regions will either become more dependent on growth regions for a politically controlled transfer of resources, or become more dependent on their own regionally based capacity to produce the desired welfare level. Some form of balance between these two alternatives is probably most likely for most countries since there are to some extent conflicting goals in preserving the current structure and adjusting to the demands of the modern international economy, in which the metropolitan regions are the engines of growth and need to be developed further in order to maintain national competitiveness.

The economic structure of metropolitan cities as well as of most other large cities is dominated by the service sector. In the western BSR, services account for the lion's share of both employment and production. In many large cities in the eastern parts of the region manufacturing constitutes the main source of economic activity, the most extreme case being Belarus, where in the 24 main urban centres of the country more than two thirds of the workforce is employed in manufacturing. However, cities such as Tampere and Lahti in Finland or Bremen in Germany demonstrate that this is not exclusively an eastern affair. The question then is whether these cities will in the long run maintain this structure, or whether the economy will be transformed in favour of non-material production. Current trends in most eastern BSR countries indicate that the latter seems to be the case.

The statement that an ageing population is at all a problem could be questioned since people living longer imply something fundamentally positive. The problems that do come with an ageing population vary within the region. In the Nordic countries it is largely a question about how to take care of the coming retirements but also a growing share of the oldest elderly (80+). In the former Soviet Union the ageing process has a stronger gender dimension with high male mortality in low ages affecting the size of the working age population. There is also a general tendency in the eastern parts that

the population over 60 years is growing but not the 80+ population as in the Nordic countries.

An ageing population becomes a problem when it leads to a higher share of the total population not working. The decreasing fertility levels are therefore potentially a major future problem since the future working age population will be smaller than today unless this decrease is countered by immigration. Though immigration can be a solution to problems of labour shortage in the short term exclusive reliance on it in a more long-term perspective has been questioned, especially when ageing is viewed merely as a quantitative problem (ESPON 1.1.4).

The alternatives, if the welfare levels are to be maintained, are either for the domestic population to work more, i.e. more persons working or longer hours of work, or to produce with higher value. The only BSR countries to currently lie above the Lisbon target of an employment rate of 70% are Denmark, Norway and Sweden. At the other end of the scale however we have Poland, where only 51% of the population aged 15-64 years are employed. The other countries fall in between these extremes, but all eastern BSR countries remain below the EU25 average. The current structural transformation process in the east will probably need to develop further before stabilizing employment rates can be expected. A higher utilization of the workforce seems crucial for the production system to keep up with the rising demands for welfare. This could also imply higher retirement ages, something quite natural considering the rising life expectancy.

What remains if the welfare levels are not to be compromised and the amount of work will not increase is obviously higher efficiency, new products that meet the demands more accurately and other ways of increasing value without extracting more resources of human and physical kind. Most likely a combination will be preferable but the latter seems to be the only way for a really long-term sustainable increase of welfare levels.

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Unhealthy Societies?
Health Stagnation and growing Health Inequalities are not consistent with Sustainable Development

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Health stagnation and health crises in the formerly communist states of Europe

The collapse of the Soviet system was caused by its own inherent problems, which began to worsen in particular during the 1968-1984 period of stagnation and repression. Contributing to its fall was the "pull" of Western democracy and economic wealth, the images of which took a strong hold over the populations in the communist world. However the hopes of these peoples for western-style democracy, open society and economic growth have been met with great difficulty and sacrifice, and sometimes not at all.

The ruthlessness of the transition, especially in Russia, has made this very costly in social terms, and in particular in relation to health, a point often missed, ignored or played down by certain western observers, many of whom were involved as expert advisors to transition governments. Åslund, in an ambitious attempt to summarize the post-communist transformation (2001, p.304-318) concluded that "we cannot establish that average living standards have actually fallen during transition", that "the social trauma is greatly exaggerated" and that "the health problems of Russian males seem primarily related to their psychology". In contrast, other observers who base their conclusions on available empirical data find that the Russian transition is "a failed transition" (Stieglitz 2002. p151), that poverty increased in all transition countries at least temporarily, and that the mortality crises of post-communist societies are closely tied to social upheaval and change during the transition (Cornia and Paniccia 2000). The health crises in the post-communist world, especially those in the former Soviet Union, are intimately linked to its troublesome social and political transformation as well as to its history (Figure 1). Leinsalu (2004) has provided us with a detailed study of Estonia, which clearly shows this to be the case for that country.

The attempts to steer post-communist societies towards democracy and market economy have been least successful in Belarus where they are constantly obstructed, and

in Moldova and the Central Asian Republics. Russia itself experienced a more dynamic development, but the 1990s nevertheless brought a stark fall in GDP immediately after the collapse of the old system and rapidly growing superinflation in 1992, which wiped out savings for many. Unemployment increased, but the practice of not paying wages in time (or paying reduced wages) allowed many to keep a job contract. Nevertheless, poverty increased massively, especially among men and women of working age; there was a simultaneous emergence of mass poverty and extreme wealth in Russian society (Gustafsson and Nivorozhkina 2004). At the end of the 1990s income inequality in Russia was larger than that in USA, approaching Latin American levels. The 1998 rouble crisis hit the Russian economy hard, but from 1999 there is again a strong annual per capita growth, largely driven by oil exports, and benefiting above all a small segment of the Russian population.

Health trends in Russia

However, if we instead look at Russian health trends, there is not much cause for optimism. Mortality has been increasing in the long term since before 1970; more recently year by year in 1998-2003 in spite of recent economic growth. The latter phenomenon deserves special attention because it exemplifies the complex relation between macroeconomic indicators and health trends. Life expectancy in 2003 was 3 years lower than in 1970; in 2003 Russian men lagged 17 years and women 10 years behind the EU average. Life expectancy figures are only one indication of the scale of the Russian health problem.

The long term rise in mortality in Russia, as well as its short term fluctuations, are driven by circulatory disease and violent deaths, the mortality from which causes is at least twice as high as the EU average. In 2001 the death risk for a middle-aged Russian man was twice that of his Czech comrade. The Russian government has no particular policy to ameliorate the situation. Tamara Men and colleagues (2003) calculated that an extra 2.5-3 million deaths occurred among Russian working-age men and women in the ten year period 1992-2001, compared to what would have been the case if 1991 mortality levels had applied. Looking in the same manner at suicide, the excess mortality from that cause in the same period correspond to the population of the entire city of Novgorod. By any standards these are very high numbers. For comparison, the severe Ukrainian/North Caucasian famine of 1930-33 caused seven million deaths, according to Robert Conquest. To claim that the 1992-2001 excess mortality is a result of "the psychology of Russian men" or that the "social costs are exaggerated" is either cynical or ignorant.

Demographic prognoses suggest that the Russian population will decrease in the future; however the focus of Russian authorities has been on falling fertility rather than on rising mortality. In contrast Western development agencies, Swedish SIDA among them, have been concerned with health and mortality issues, but their focus is primarily on tuberculosis, HIV and other contagious disease. So far these have had a very small impact on the health of the population, with less than one percent of deaths from all such causes combined. However, this could possibly change in the future if the present trend of fast rising HIV-infections continue. Up to now, this trend has been driven by intravenous drug use; hence the tendency among the public to consider this as a problem that concerns only a minority. Alcohol is perceived as a bigger problem and has indeed had a more profound impact on mortality trends, but is hardly taken very seriously politically. Whatever aspect of the public health problem we focus

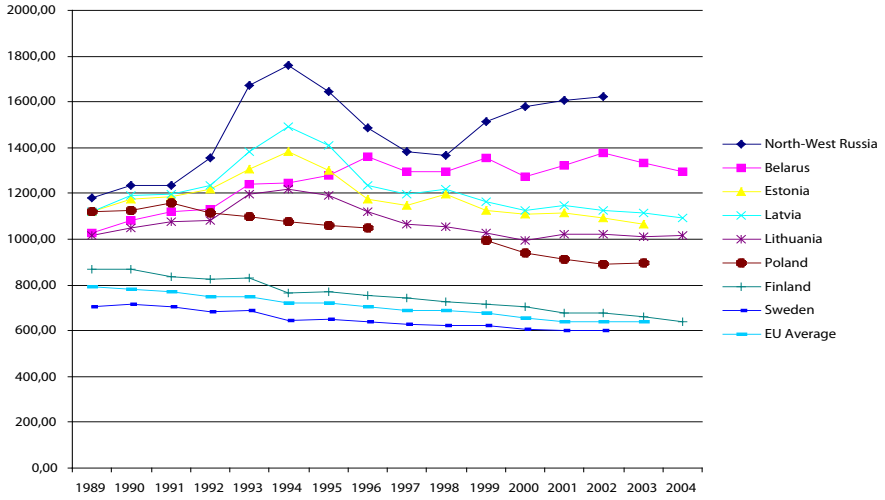

Figure 1. Standardized death rate (SDR) for all causes of death in the countries of the Baltic Sea region, 1989-2004 (per 100,000).

on, it seems quite clear that protection of the health of the population has not been one of the priorities of the government, of the Duma or of the regional authorities. But will the problem go away by itself?

Five fundamental and interrelated characteristics of contemporary Russian society are important for health and well-being, namely mass poverty, poor social cohesion, high levels of violence, high prevalence of health damaging behaviours (in particular binge drinking of alcohol) and strained family relations. Our perspective is that history as well as recent developments combine to cause problems in the present. Comparison of Russia with developments in new EU member states is informative.

Health consequences of the transition

The transition process has been considerably less traumatic in certain other transition countries, notably East Germany, the Czech Republic and Poland. This is not to say it has been smooth. Income inequality is growing across the post-communist world, but much less so in Central Europe than in the former Soviet Union (Stieglitz 2002, p260). In general the negative impact of the collapse of the social systems in Poland, the Czech Republic and East Germany was more short term. It was more readily absorbed by emerging economic growth and by trade and labour market opportunity. East Germany saw a massive growth of unemployment, but this was ameliorated by generous unemployment benefits. The magnitude of the health impact of the transition in East Germany and Poland is indicated by a one year fall in life expectancy for men in both countries and a somewhat smaller fall for women (Nolte et al 2000, Zatonski 1998), compared to Russia´s seven year fall for men and three year fall for women. After this immediate impact East Germany has started to catch up with former West Germany, and East Germany and Poland with Western Europe in general. Circulatory disease mortality (a sensitive indicator of social change) as well as total mortality have fallen sharply from 1992 in both countries, but faster in the former GDR. Thus "the East/West health divide" inside Germany was narrowing towards the end of the 1990s.

Suicide – an "epidemic" in the Baltic Sea region countries

The suicide rate in the Soviet Union during the 1980s was high in an international comparison. In Russia proper, it was at world-leading levels. Despite of this, it increased further by 40-60% in the period of 1989-1994, and again in Russia after 1998. The figures in 2001 were as follows:

Lithuania	43.7 per 100,000 persons and year (highest in Europe),
Russia	37.9 per 100,000 persons and year (next highest)
Latvia	28.6 per 100,000 persons and year (4th highest)
Estonia	28.1 per 100,000 persons and year (6th highest)
Finland	23.2 per 100,000 persons and year
Sverige	13.4 per 100,000 persons and year

The causes of the high suicide rate in transition countries are believed to include rapid social change, combined with high alcohol consumption and general hopelessness in segments of the population. These figures correspond to some 3,000 lost lives per year in the three Baltic countries alone.

Judging from this and assuming that the worst phase of the transition has passed in Poland, the Czech Republic, Slovakia, Hungary and Slovenia, there seems to be a fair chance that the health gap between these countries and the countries of western Europe will narrow during the next ten years, provided that governments make it a conscious policy to achieve such a narrowing.

Of particular interest are Estonia, Latvia and Lithuania. For decades they did follow mortality trends in Russia closely. This was true during the stagnation crisis in the 1970s, during perestroika when health improved rapidly, and during the shock therapy crisis of the first years of the new social system. In terms of life expectancy 1994 was the worst year for Russia, as well as for Estonia, Latvia and Lithuania. From 1994 mortality trends in all the Baltic states and in Russia, for both men and women, became more favourable. Life expectancy improved from that year until 1998. This was taken as a sign of a positive adjustment to new circumstances (Figure 2).

But in August 1998 the economic crisis known as the "Asian Flu", spreading from Thailand and the Asian "tiger economies", hit Russia and the value of the rouble collapsed, triggering immediate social and economic unrest. Life expectancy in Russia fell again after 1998, largely driven by a new rise in circulatory disease and accidents. In sharp contrast with this, all three Baltic Republics have continued to improve their life expectancy figures, although modestly, since 1998. The Asian flu hit their economies too, but its impact was less and health improvements continued. This break between the close paths of Russia and the Baltic states is quite significant. It shows the vulnerability of the Russian population to externally imposed shocks, while it seems that all three Baltic states have now managed to build up a minimum of control against such impact.

Therefore it is clear that the countries in Central and Eastern Europe are moving forward along different paths. Those countries that are already in the EU have seen a more favourable health development than countries such as Russia, Ukraine, Belarus

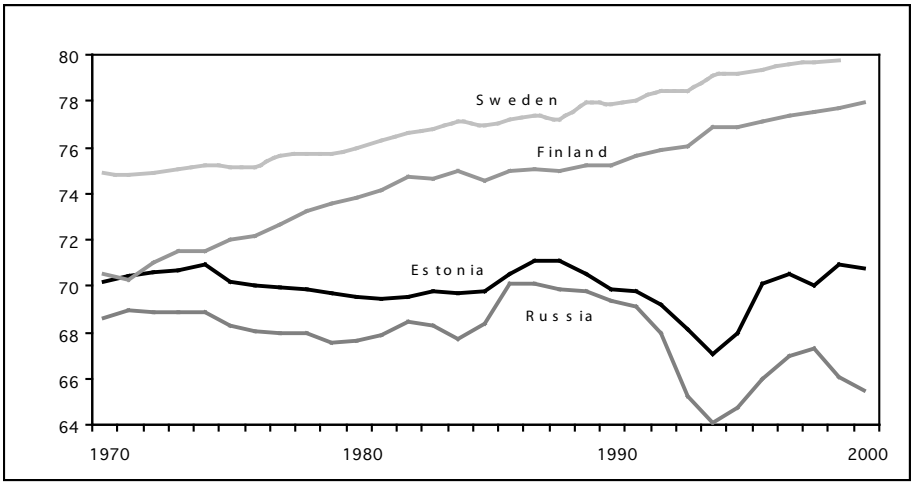

Figure 2. Life expectancy at birth in Sweden, Finland, Estonia and Russia in the period 1970-2000. Men and women are combined. After 1990 Russia is significantly falling behind. Note the effect of increased mortality after 1998 despite strong economic growth. (Source: WHO Database, Statistical Office of Estonia).

and Moldova. It seems that the realignment from one sphere of influence to another has already paid off also in terms of health.

Health inequalities in Eastern Baltic Region are large and growing

While health inequalities in Western Europe were well described, less was known about health inequalities in Eastern Europe before the collapse of the communist system. Patterns of social stratification were a particularly sensitive issue in these officially 'classless' societies, and studies into social differences, including those in health and mortality, were suppressed in communist countries. However, there is evidence that health inequalities in Eastern Europe at the end of the 1980 were at least as large as in the West, probably even larger.

Moreover, rapid social changes in Eastern Europe in the early 1990s were accompanied by increasing inequalities in mortality. The extent of these changes was different in different countries. In some countries, like Czech Republic, health improvements were observed for all educational groups, although larger for the higher educated, causing therefore only a slight widening of the educational gap. For some other countries, like Russia, Estonia and Lithuania the mortality rates increased for lower educated while they decreased for higher educated, causing a growing social gap in life expectancy (Shkolnikov et al 2006). In Estonia, for example, in 2000, male graduates aged 25 could expect to live 13.1 years longer than corresponding men with lowest education; among women the difference was 8.6 years (Figure 3).

Differences in life expectancy between ethnic Estonians and Russians in Estonia also increased from 1989 to 2000. The difference grows from 0.4 years to 6.1 years among men and from 0.6 years to 3.5 years among women. In 2000, Russians had a higher mortality than Estonians in all age groups, and for almost all causes of death. The largest differences were found for some alcohol-related causes of death in 2000. Neighbouring Russian regions in Russia itself, such as the oblasts of Leningrad and Pskov, seem to have performed even worse in terms of life expectancy. As Russia and Estonia diverge in health trends the position of the Russian minority in Estonia becomes of great interest.

Political and economic upheaval, linked to increasing poverty and alcohol consumption, can be considered as major determinants of the widening health gap within Russia and within the Baltic states. However, historical processes shaped decades before recent reforms contribute importantly to the poor levels of health and to the large health inequalities in post-Soviet societies. History, for instance, have had a large impact on social relations.

Social cohesion

Russian and other post-communist societies share the experience of suppression of civil society, resulting in either a weak "hour-glass society" (Russia) or a civil society that grows strong in adversity to the existing system (Poland). Further, if there is a weak civil society the family may be the only resort to fall back on. Thus, a weakening of family relations, as was probably the case in many transition countries during the 1990s, may have severe consequences for behaviour, well-being and health.

In the spring of 2004, our research group conducted an interview survey with 1200 randomly selected Moscow residents (Moscow Health Survey 2004) in collaboration with the Institute of Social and Economic Studies of Population (ISESP), Russian Academy of Sciences. We were especially interested to find out about living conditions, attitudes and health. Levels of trust in other people were also examined, and we specifically asked about the extent to which they trusted different types of institutions, such as the president and the police.

The results of the study show that trust in general was low. More than half of the interviewees thought that 'one cannot be careful enough when dealing with other people'. Only one fifth of Moscow citizens agreed with the statement that 'one can trust most people'. As illustrated in Figure 4, trust in most societal institutions was also very low. The president along with the Orthodox Church, were the institutions most trusted.

In other words, Moscow citizens, often tend to distrust one another other as well as the democratic institutions of Russian society. Trust is concentrated in the president and the Church, and is largely missing in other institutions. Will it be possible for a

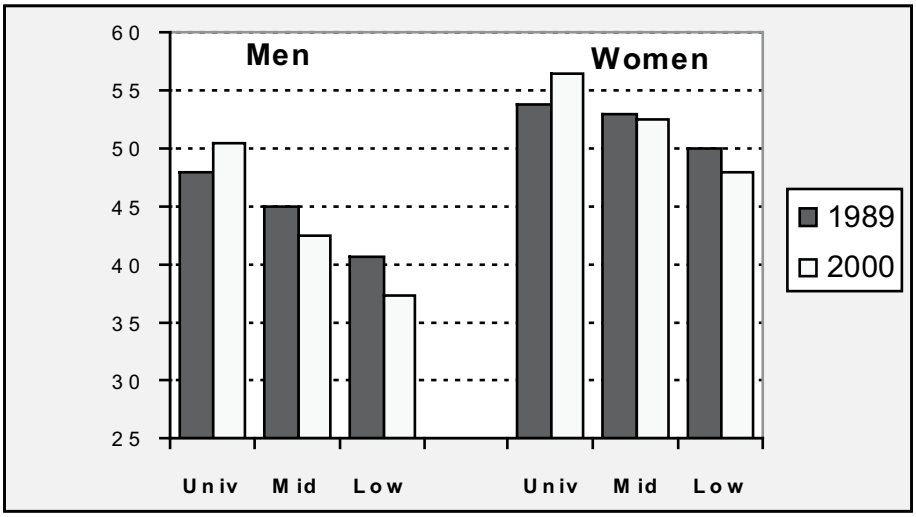

Figure 3. Average life-expectancy (years left to live) at age 25 by educational level in Estonia from 1989 to 2000.

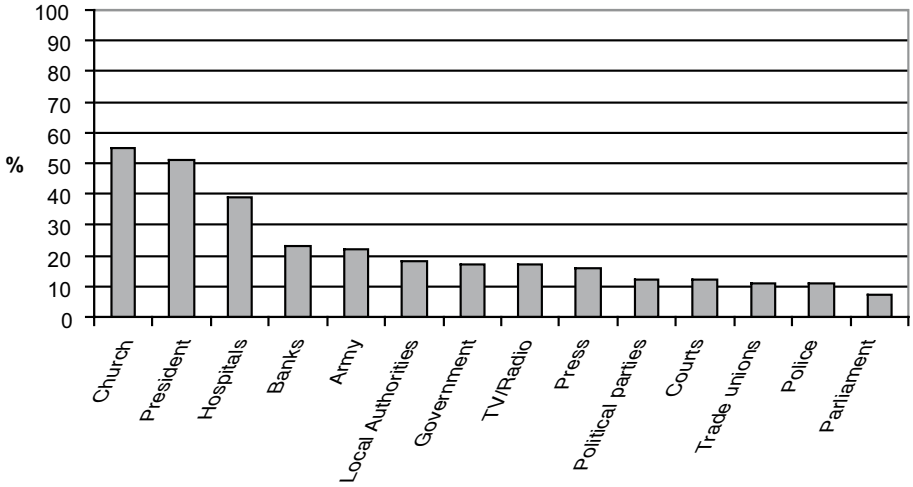

Figure 4. Proportion who reports trust in institutions among respondents over 18 years in Moscow, spring 2004 (Source: Moscow Health Survey 2004).

nascent democracy to survive in a country where only a small minority trusts the parliament and other social institutions?

It has been argued that social capital in Russia tends to be based on informal social networks, such as family and friends. More formal types of social capital, such as membership in voluntary associations, are said to be less common (e.g. Rose 1998; Marsh 2000). However, our study shows that a quarter of those resident in Moscow are members of at least one voluntary association. This type of social capital has a significant effect on self-rated health. Friendship ties (for instance, so-called blat networks) seem more important than family ties for health. However, the most important aspect for health of civil society and of social ties may be their potential to mobilize influence on local, regional and national polices.

Policies for health

The issue of alcohol policy is particularly relevant in this Region. It is difficult to estimate alcohol consumption levels, since a large amount of alcohol production and sales are not reported. Combing estimates of recorded and unrecorded alcohol consumption (WHO 2004) gives the estimates of Table 1. The burden of alcohol-related disease is heavier in the new EU member states than in the old. Alcohol policies in the post-communist countries of Europe have followed a roller-coaster path since 1985 when Gorbachev´s anti-alcohol campaign took off, only to be followed six years later by free flow of cheap alcohol at all hours of the day, as the ideology of shock deregulation of the markets predominated during the first phase of transition. Recently a tendency to regulate alcohol markets in order to protect public health has grown stronger (Reitan 2003). We assume that the old and the new members of EU will have a mutual impact on each other's alcohol policies; this is already visible in taxation. However, only a truly European effort, that is an effort including Russia, Belarus and Ukraine, will be effective in controlling alcohol-related harm across Europe. Could the Baltic Sea Region pave the way for such a development?

Alcohol policies are not the only polices that are necessary. Economic policies to integrate all segments of the populations in this region are even more fundamental. To influence social determinants of health is a task for all ministries in a government, those dealing with housing, employment and schools as well as those dealing with medical care or collecting taxes. The key question is to understand that investment in health gives both humanitarian and economic rewards. Ignoring the present health problems will undermine all efforts to achieve social and economic progress.

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The need for Radical Sustainable Urban Development in the Baltic Sea Region

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Urban growth and rural depopulation behind the Global Change crisis

Two migratory trends today dominate in the Baltic Sea Region, as well as on the global scale. As urban areas are growing, rural areas become demounted and depopulated. As a result there is a double strain on the life support systems of cities and regions (Andersson et al. 2003).

The environmental costs of these demographic changes are huge. They may be expressed as lost productive soil, as acidified forests, or as a loss of Baltic Sea productivity. Equally they may be translated into the monetary cost of building sewage treatment plants, or in the more general currency of increased ecological footprints. Today the footprints, the life-support areas of cities, are about 1000x the areas of the cities themselves (Folke et al. 1997). The footprint in turn corresponds to a rapidly increasing material flow. They also correspond to energy flows, where only a minor part is renewable energy. All these changes constitute a negative contribution to a Global Change crisis, which instead badly need to be curbed.

Today we need a radical but realistic goal and action plan for all cities in the region. But this is lacking. Instead of significant improvements we have only marginal changes in technology, and only small-scale introduction of renewable energy. The lack of changes in human settlements structure conserves, and even worsens the situation (Paterson, 1997).

An important reason for the status quo is lack of trust between stake-holders. Politicians, researchers, company-owners and households would need to co-operate in an action plan for a sustainable future, but have – everyone by themselves – reasonable and legitimate reasons not to get involved. Short-term restrictions occupy their capacity for change. Politicians need to succeed politically within their mandate periods; companies prioritize their share-holders interests; researchers need to produce results within three years; and the common public need to survive economically and socially within tight time boundaries in everyday life situations. The will to act may be there, but all actors need some assurance of success to contribute significantly to the sustainable development of their city. They can hardly be expected to confide in the other actors in

a short-term program for radical change. Long-term survival reasons are not enough, without measures to improve trust.

A radically improved city can be achieved with a combination of measures

An action program is needed for positive changes to happen: to intorduce renewable energy, lower environmental costs, decrease the ecological footprints, and dematerialise our societies. In this paper I will describe an action program for radical change for the cities in the Baltic Sea region. The model I propose is called the factor five flow city (Berg, 2005). Such a city has decreased many of its physical resource flows to 20% of the present – without compromising the basic qualities of cities and regions. The proposed city still has room for encounters, safe and stimulating public spaces, excellence in education and science, and can develop sensuous and attractive cityscapes.

With emphasis on physical resources, a factor five flow city e.g.:

- uses only 20% of the fossil fuels of today's average consumption.
- has only 20% of the nutrient losses of average Baltic Sea Region cities.
- has reduced transport net CO_2-exhaust with 80% compared to present.
- has a five time longer 'active coastline' (interface) between built and green structures.
- produces the same social, organisational and cultural resources with only a fifth of the ecosystems life support area.

The development to a new resource-efficient city can only be achieved through a combination of a number of measures. The transition to a solar energy society, where more services and goods are produced with less non-renewable energy (and overall less energy used), is one important component. The introduction of renewable energy requires, however, determination, governmental action, local community action and technological patience. Dematerialisation means that the same services are provided with less material need. This is also a time-demanding process, however determined we are. Anyone who has been working with planning knows that reorganising even very limited parts of urban areas can take many decades, at least until the new or renewed areas have had time to stabilise. Although human values in principle may change over night in practice real action will often require either a rare paradigm shift or at least that a whole cohort (an age interval group or generation) with new values start to take over broadly in society's decision making.

The Baltic Sea region window of opportunity

The Baltic Sea Region has a unique potential to achieve a factor five flow city development. If we combine economic viability, human health indices and environmental performance this region is one of the top ranking regions of the world. Reasons for this is a long-term and fairly mature understanding of the complex and contextually imprinted concept sustainability particularly in the Nordic (including Germany) countries (Andersson et al. 2003).

The former USSR or Soviet influenced countries (including Russia herself) have other advantages. These include a dismounted Soviet time resource-craving industry, fairly resilient cities and city life patterns with comparatively low-energy demanding public transport and service networks, comparatively low rate of motoring and material

Figure 1. The major travel Node in Freiburg with integrated and designed bicycle, bus, tram and train infrastructure. Freiburg has many remarkable examples of combined dematerialisation, renewable energy, city structure (focus on integrated public transport, settlement structure, service structure and green structure), technical innovations (solar cells, bike rental based on IT-supported logistics) and a lean attractive lifestyle (it is attractive to bike, walk and using the tram/train system).

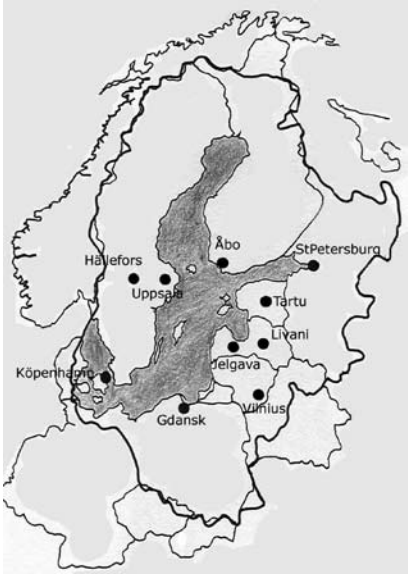
consumption, and a valuable city heritage. But the trends are rapidly moving away from these post-Soviet situations in the east and south to zonated cities, with a rapid invasion of cars, sky-rocketing consumption and an affluent "western" life-style is clearly in sight. Can we learn to discover this threat in time? Can we see the great opportunities to rebuild a new 'lean and prosperous' region populated with factor-five-flow cities? And could such examples maybe also contribute in slowing down the fast urbanisation and the rapid depopulation of rural towns and areas, in the rest of the region and even in other parts of the world?

The power of visions for uniting urban stakeholders

The normally slow processes of change may occur much faster if they are simultaneously united by a common vision. A combination and co-ordination (Hallsmith, 2003) of measures are thus needed, to achieve a radical change to implement the factor five flow concept in Baltic Sea Region Cities.

During 2003 the International Gas Union (IGU) arranged a planning competition, which attracted 9 world cities. The winning contribution of Vancouver, Canada (Moffat, 2003) was a radical vision, the citiesPLUS proposal. By adopting a scenario-horizon of 100 years, many short-term interlocking positions between stake-holders could be overridden. It was, according to the winning team, "surprisingly easy" to work with century perspectives. This allowed them to build networks of confidence between different official, company, research and public stakeholders. This trust could then be taken to the now-situation. It is presently used for already starting to implement the

Figure 2. Ten selected cities in the Baltic University Programme Network proposed to develop 50-year factor five flow city visions.



sustainability plan for the Greater Vancouver region. The success of Vancouver should be very promising for the Baltic Sea Region. Here we have during 15 years built up a great network of universities, cities and knowledge components about the region, about the cultures and about a great number of sustainability issues in the countries. It would be fairly easy but also obviously very interesting for many cities in the region to perform a similar long-term study as in the IGU contest.

One of the foundations of the Baltic University Program is to contribute to a peaceful development and trust between countries in the Region. Visions about Baltic Sea region cities, Factor five flow city visions or others, may contribute to build a trust between different stake-holders, which in turn would make it easier to launch processes of change even in the short-term perspective. Examples of practical tools and processes to make and use such visions, gathering different stake-holders, was described 30 years ago by Christopher Alexander (1977). Modern examples for inducing visionary processes comprise the work of David Engwicht for Australian cities (Engwicht, 1992), Gwendolyn Hallsmith for selected cities and towns all over the world (Hallsmith, 2003), the European Sustainable City project (Gaffron et al. 2005) and the winning Canadian International Gas Union Competition proposal on Sustainability Planning (Moffat, 2003) mentioned above.

Seven resiliently managed and co-ordinated resources characterise sustainable human habitats

The United Nations Habitat conference Habitat II, held in Istanbul 1996, represented a milestone in the understanding of sustainable urban development. In a number of statements and articles seven dimensions of sustainable habitation were discussed. These dimensions were further problematised and organised into resources as described below (Table 1), in several research projects on local communities and in higher education at our department (Berg, 2004; 2002). The Factor Five Flow city visions are expected to problematise all seven dimensions and their interlinkages also for whole city and regional levels.

The Habitat II conference highlighted the key role of the local area for global sustainability (UNCHS, 1996). Since then a number of authors have emphasised the community level as an important arena for impacting global change in a positive direction (Berg, 2004; Falkheden, 1999; Nelischer and Burcher, 1997; Etzioni 1993).

Researchers from the universities of Uppsala have proposed a study on 10 Baltic Sea region cities, gathering a complete set of stake-holders to produce a 50 years visions based on current comprehensive plans of the chosen cities. The cities would then serve as models of change for other cities in the region. This would be similar to the citiesPLUS proposal, which is now adopted in many other cities and local regions all over Canada. A part of the strategy is to produce a whole Baltic Sea region which is more sustainable by building it 'from within', from its component cities. Similarly the city plans can be more nuanced if its different townscape types are considered. By developing the local areas in different townscape types according to their special features or characteristics, a more efficient sustainability plan for the entire city can be created (Berg, 2006; 2004). This idea of building the city – from within – is one of the basic ideas of the Habitat agenda (UNCHS, 1996).

Policy recommendations

It is here recommended that Baltic Sea States will:

- Induce long-term visionary projects in selected and interested cities for a radical revision of their sustainability performance to become Factor five Flow Cityies.
- Policies in the visionary stage should include combined measures to stimulate dematerialisation, introduction of renewable energy, city structural changes and life-style adjustments. In order to formulate the components for this, interdepartmental policy and planner groups need to co-operate with interdisciplinary planning researcher groups.

Figure 3. Sustainable Local Communities with socially resilient neighbourhoods can contribute to a more sustainable city.

Table 1. Seven community resources derived from The Habitat agenda (UNCHS, 1998). The concept of community can represent entire municipalities or local areas.

Resource Category	Examples
Physical Resources	Clean water, air, energy, matter and soil available as basic life support to the residents of the community.
Economic Resources	Houses, roads, tools, knowledge and informal economic services of importance to the residents in the community.
Biological Resources	Species, biotopes and ecosystems in natural and cultural landscapes within or closely connected to the community.
Organisational Resources	Plans, orders, laws, infrastructures, services and informal rules connected to the community.
Social Resources	Relationships and local co-operation within the community. Low moving rates within the community. Health status and skills of inhabitants in the community.
Aesthetic Resources	Sensous (visual, auditory, olfactory, tactile and kinesthetical) impressions, influencing individuals' mood and atmosphere in a community.
Cultural Resources	Knowledge of older and younger history and cultural patterns. Existence of fine arts, traditions and ceremonies, in or of significance to the community

- It is crucial that as many interested stake-holders as possible are participating in the visionary work. Without such involvement the process will probably take more time.
- After the long-term visions have been formulated by a collegium of stake-holders – the emergent trust that can be expected to rise from such long-term scenario work, should be used also for short-term implementation of sustainability strategies.
- In order to make comprehensive plans of cities more efficient with regard to their sustainability performance, an inventory of local areas' strengths and weaknesses should be assessed in selected cities and towns and result in local area sustainability strategies. This will help build the sustainable city "from within".

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Photo on right page:
Car traffic in the Baltic Sea region is increasing rapidly. This leads to increased use of fossil resources, carbon dioxide emission, air pollution, congestion and problems in urban planning. (© European Community).

PART III

MOBILITY, TRANSPORT AND TRAFFIC

Over the last 100 years the average distance travelled by a person in Sweden (as in the rest of Western Europe) has increased from less than a kilometre to about 45 km per day. Increased mobility has provided the individual with many advantages: He/she may see family and friends regularly; enjoy public life, travel, and reach services and better job opportunities. To this so-called voluntary mobility comes forced mobility, e.g. commuting. Mobility still increases steeply, more than economy. "Modern society pretends that space does not exist", as Joachim Spangenberg phrased it during the symposium. However the enormous traffic which it leads to is not sustainable at all. Urban and regional planning pays a high price, and resource consumption is enormous especially of the non-renewable oil. There seems to be a consensus that the mobility challenge is one of the most difficult for sustainability.

Policy Measures for Sustainable Urban Transport

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The challenge of growing mobility

The growth of traffic is today dramatic in the Baltic Sea region. For both transport of people and of goods the development is going in a non-sustainable direction. Despite proud statements from the officials in the European Union Commission to develop public traffic and transports on rail, car and lorry traffic becomes an increasingly larger part of the transport system.

In Sweden, for instance, the transportation of people has increased 25% over the last 25 years. On the average people make three shorter trips daily, mostly by car, which add up to some 40-50 km/day.

The increasing traffic is a result of growing economies and more material welfare. The growing traffic in turn is itself also producing growing economies and more material welfare. Such a self-reinforcing system with positive feedback is not sustainable in the long run and it is necessary to take action to control it. While other sectors in the economy have reduced its energy use and emissions, it has increased in the transport sector. The transport sector today contributes about 40% of the CO_2 emissions in Sweden. About 70% of this is due to road traffic.

There are many strong interests in the society connected to the traffic system. This article will discuss what can be achieved in the cities and towns, the municipalities in the Baltic Sea region, to approach a more sustainable traffic system.

The total transport system can be discussed either as an issue of the movement of people or transport of goods, or in terms of distances. Distance-wise transports, for either people or goods, may be subdivided in six broad categories as follows

1.	Trans-continental	>2000 km	around the world
2.	Trans-national	1000-2000 km	between countries
3.	National	250-1000 km	between cities
4.	Regional	40-250 km	around the city
5.	Local	5-40 km	between parts of the city
6.	Sub-local	0-5 km	inside parts of the city

It is obvious that a reasonable agenda for a local transport policy concerns the last three, regional, local and sub-local transport systems. This is the main interest of the discussion here.

Strategies to reduce traffic

The strategies to reduce traffic will be seen from five principle perspectives. They will result in actions in five steps, where it is important to go from top to down. The steps are the following:

1. Reduce the need of travelling.
2. If travelling is necessary, the journeys should be made to best place according distance and possibilities to travel in a sustainable way.
3. When the best place is chosen, the best transport mode should be used.
4. When the best transport mode is chosen, the best vehicle should be used.
5. When the best vehicle is chosen, it should be driven in a sustainable way.

All strategies have to take in consideration that municipalities are competing with each other. Every city tries to attract people and business by offering an efficient infrastructure and possibilities for transport. It is important to identify what kind of need there is for transports. A large logistic-oriented company needs efficient transport solutions, while a human power orientated consultant company rather needs efficient IT-communication, attractive workplaces and an attractive city as a whole to live in. The city may therefore, in that sense, be planned in a zoning system, where the transport oriented companies will get good access to the national and international transport system, while others can be located in more densely built areas, not so favourable for car traffic.

Some cities are focusing on transport intensive solutions, which they believe are crucial. In the Baltic Sea region much efforts are made to place their own municipality in ”the middle of the world” to attract new business. There is anyhow no guarantee that a good geographical position is enough. On the contrary it is sometimes not necessary at all. Regions and even countries, which are very much in the hinterlands and far away from the main transport corridors, can be economically very successful, for instance Ireland and Iceland.

Thus there is one category of strategies, which may be described as the ‘large city’ working with transport oriented solutions on the world market, while another group of strategies are aiming towards a ‘small city’, to improve the quality of life for inhabitants and visitors.

In the small city the methods, which are discussed here, can be implemented very systematically. The small city strategy is not only resulting in a more sustainable city from a narrow environmental point of view. It is also giving much better quality of life and more attractive cities to live in and for people to visit. To attract new business to the city is not anymore only about offering good investments solutions. It is also important to create an attractive city where the enterprises can offer co-workers a good place to live in.

Tools to implement strategies

Even if the possibilities for the municipalities are limited, because of the very complex situation of interests and stakeholders in the system, some important political tools are available to implement the five steps strategy. These are shortly described below for each of the five steps.

Reduce the need of travel. The urban areas can be organised to decrease distances by reducing urban sprawl. The city should be multifunctional in a way that many visit points are close to where people live. Look at streets as a design element in the city rather then transport corridors!

Go to the best place. Create places with good accessibility for sustainable transport modes. The municipality should develop the urban areas in a way that the need for one or even two cars in the household get minimised. It could be done by prioritising new multifunctional areas close to the city centre or along important corridors of the public transport system.

Use the best transport mode. The municipality should have a strategy to change the modal split away from car dependency. It can be done by giving good conditions for the alternatives by supporting an effective public transport system, a network of good bicycle lanes, but also measures for a more efficient use of private cars: congestion charging if necessary, parking policy, speed limits, encouraging car sharing. By reducing the allowed speed for cars and prioritising bikes and public transport in crossings the alternatives are getting more competitive and increase the possibilities that more sustainable vehicles will be preferred.

Use the best vehicle and fuel. The municipality is running many vehicles in the system. By purchasing the best environmentally friendly technique the municipality support energy-efficient and/or alternative vehicles to get a market. It can also be done by giving advantages for environmental vehicles e.g. in the parking system. In the cities biogas can be produced from waste, and used as fuel.

Drive in a sustainable way. Too much energy is used, too much noise, accidents and pollution are produced because of poor driving technique. Many trips are made by vehicles, which are managed directly or indirectly by municipality institutions. Produce systems, which are using the vehicles in a sustainable way. New techniques, e.g. for transporting elderly and disabled, allow a much more cost effective use of the vehicles and less empty cars and buses.

Methods to influence policies

To fulfil the five steps described municipalities have a full orchestra of different methods to influence the development in a chosen direction. The examples given below are mainly taken from policies, discussions and actions in the municipality of Örebro in Sweden (about 125 000 inhabitants) but can be used in municipalities all over the Baltic Sea region.

Land use planning

Organise the urban area in a way, which make it possible to reduce transports needs and make transport modes more sustainable. Prioritise parking for bikes instead of cars in the city centre. Create service close to large residential areas.

Examples: New residential and multifunctional areas are built close to the city centre. The maximum distance from the city centre for the main new infrastructure should be about 5 km, which will make it easy to reach by bike. The grid of streets is made as in the pre-car period to reduce the need to drive car long distances. Food shopping should be as close to residential areas as possible. In the central part of the city a very large number of parking places for bikes are organised.

Produce sustainable infrastructure

Use the public investments in a sustainable way. Build more bicycle lanes, tracks to trams and buses and less roads for cars. Use existing infrastructure more efficient instead of building new. Support alternative fuel stations.

Examples: The infrastructure investments are concentrated to get good conditions for logistic orientated business and otherwise create a non-car orientated systems with an excellent grid of bicycle lanes and an effective public transport system. Investments, which support alternative fuels, are encouraged. The permitted maximum speed of cars is reduced to 30 km/h in many parts of the urban area. Implement local rules in the traffic systems, which prioritise a more sustainable traffic in the everyday traffic situation. The accessibility for cars are reduced by building a multitude of bicycle lanes. The rules in the traffic give pedestrians and bikers good shelter. Try to influence the regional road planning for more cost effective investments.

Public procurement

Use the economical power in the municipality as a good purchaser that is demanding environmental behaviour from its contractors.

Examples: The municipality has a large part in the transport sector by running residential areas, public service, infrastructure, etc. In the management of this they use and choose sustainable solutions and put demands on the contractors that that should act in environmentally responsible when making business with the municipality. A public procurement (purchase) policy is implemented.

Public awareness

Campaign about participation in creating a more sustainable traffic system. Campaign for environmental lifestyles.

Examples: Campaigns are made all the time to get more bikers, to more customers to public transport. Environmental goals have been approved. Develop bicycle renting system to increase the total supply of bicycles. Give status to peoples who are using public transport and bikes. The leadership of the city, who takes the bus or bike to work, are good examples.

Public transport

Participate in running a successful public transport system.

Examples: The municipality subsidise through tax money the public transport system. Develop transport systems which fill the needs for different travellers; high speed, safe, comfortable etc. Give priority to the public transport vehicles by separate lanes and give green lights quicker in crossing, are components in agreements when purchasing public traffic.

Distribution of goods

Be engaged in the distribution of goods. Participate in the development of collected distribution.

Examples: The municipality has a project, which tries to change the distribution of goods in the city to a common distribution system. Create environmental zones in some parts of the city.

More efficient use of vehicles

Engage in developing car sharing systems and other methods to have more transport per vehicle.

Examples: The municipality-owned housing company runs a car sharing system. Offer education to all drivers in eco-driving. Demands on contractors to use sustainable transport systems and vehicles. Give status to peoples who are using public transport and bikes. The leadership of the city takes the bus or bike to work and are good examples. Give privileges to cars, which are environmental friendly by e.g. cheaper parking, more access to parking.

Final comments

All these tools and method are of course dependent of the willingness from the leadership of the municipality. If there exist a will, there are possibilities to change the direction of the society, as we know form experience in many places around the world. In many cases the steps are small but if small steps are produced in the same direction the results will be accountable. Implement actions, which are supported by the majority e.g. after surveys. In Swedish cities like Malmö, Linköping, Sundsvall and Örebro all surveys have shown that people want a less car-friendly city centre.

This aim of the article to give a short, condensed description of the existing tools for the development of a more sustainable urban transport system, has made it slightly propaganda-like. Of course it is recognised that the range of political strategies municipalities may use is limited, and they differ from country to country, due to economical power, political leadership, and the legal situation. But still, in general they can be used for many of the ordinary medium-sized Baltic Sea region municipalities. The metropolitan areas have more specific needs, and their large and dense population is a source of more complex problems. But this also give possibilities for e.g. an effective, sustainable and even and cost effective public transport system.

Towards Environmentally Sustainable Transport

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Introduction

Transportation has become an important dimension of the concept of sustainability, and equally sustainability is expected to become the prime focus of transport policies in the coming decades. The transportation sector is often subsidized by the society, especially through the construction and maintenance of infrastructure. The total cost of transportation, notably its environmental damage, is generally not paid by the users (Rodrigue, 2006).

The relationships between transport and the environment are multidimensional. An understanding of the reciprocal influence between transport and environment as well as the integrated assessment of the environmental impact of traffic and the transport infrastructure is an important task for the scientific community, especially in order to assist policy making (COST 350, 2006).

Environmental Consequences of Mobility

The environmental consequences of transport and traffic are multidimensional. The most important impacts are the following.

Air Quality. The transport sector, especially road and air transport, contributes to air pollution, acidification and climate change through emissions of carbon monoxide (CO), carbon dioxide (CO_2), nitrogen oxides (NO_X), hydrocarbons (HC), particulate matter (PM), heavy metals, and volatile organic compounds (VOC). These pollutants are released during the combustion of fossil fuels, the primary energy source for transport.

Secondary air pollutants are substances created in chemical reactions of the primary pollutants. Most importantly, NOx and HC in the presence of sunlight create ozone (O_3). Ozone is the main component of photochemical smog and a major air pollutant in urban areas in temperate regions.

Noise. Noise is probably the most obvious impact of the transport sector. Excessive noise levels (65dB(A) and higher) is damaging to public health. It contributes to high blood pressure and cardiovascular diseases (OECD, 2001). In the OECD countries, around 30% of the population is exposed to noise levels higher than 55dB(A). Continuous exposure to noise can lead to weakening of the auditory system and sleeping disorders. Noise has also negative affects also on wildlife.

Water quality. The contribution of sea transport to the pollution of rivers, seas and oceans is considerable. International sea traffic is difficult to regulate, and this impact is

Figure 1. Bike or car? Too much car traffic makes biking almost impossible. But biking is a very sustainble means of transport suitable for many cities the the reigon and need to be promoted, e.g. though bike path (Photo: the European Community).

only recently addressed by international legislation. Considerable progress has been made in a number of areas such as legislation on ballast water, the management of waste, and reducing oil spills. Still the environmental burden on sea transport is considerable. As the comprehensiveness of legislation increases the more the transport industry is forced to adapt. For example the dredging of ports to deepen channels in order to keep pace with the growth of vessels size, places a growing financial burden on port authorities, as the environmental constraints increase.

Space intrusion. Increased demand for transport places an enormous pressure for new infrastructures. Many of these, such as airports and ports, require very large areas of land for their own internal operations and for the required access transport links, which have to be built. A fundamental question is: can the environment and society afford to provide sites of the scale required by the transport industry?

Transport and Energy Consumption

The transportation sector is heavily dependent on the use of petroleum fuels. Only in OECD countries, the use of fossil fuels for transport increased by more than 45% from 1980 to 1997 and is expected to continue growing (OECD, 2001). Alternative fuels in the form of non-crude oil resources are drawing considerable attention as a result of shrinking oil reserves, increasing petroleum costs and the need to reduce the emission of pollutants.

The concept of ecological footprint developed by Rees and Wackernagel in the early 1990s (Wackernagel and Rees, 1996) summarises the environmental impact of an activity in a single measure, ha). The ecological footprint of fuels is considerable. It consists of three main components; the area needed for energy production; the area needed to sequester emissions of greenhouse gases; and the area needed for the safe deposit of nitrogen and sulphur (Holden and Hoyer, 2005).

Table 1. Comparing energy efficiency between fuels using the concept of energy chain.

Energy chain	Ecological footprint compared to the reference energy chain (%)*
The hydropower-based energy chains	75% reduction
The natural-gas-based energy chains	45–75% reduction
The raw-oil-based energy chains	15–30% reduction
The biomass (wood)-based energy chains	0–50% increase

* The reference energy chain refers to energy chain no. 3 (raw oil–petrol–conventional power train in 2010).

Using conventional technology, the potential for reducing the ecological footprint of fuels by 2010 is substantial; 22% reduction can be achieved for petrol cars and more than 35% for diesel-fuelled cars. Compared to a reference process (conventional raw-oil-based petrol used in an internal combustion engine, called "energy chain no. 3") the energy chains of fuels have very different ecological footprints. It seems that differences between the groups of fuels are more important, than within each group (Table 1).

The question is which are the alternatives? Hydropower has a very small ecological footprint, but is not a global resource with sufficient volumes to support the ever-increasing transport system. Natural gas has a small footprint and is plentiful enough, at least for several decades, but it is not a renewable energy resource, and it does not fulfil the long-term requirements of a sustainable energy system. Biomass is globally available in large volumes and is a renewable resource. Its large-scale use, however, would lead to an unacceptable increase in our global ecological footprint.

Therefore, it seems that several measures are needed to address this dilemma. We need a combination of different resources, substitution to less environmentally harmful fuels, and reduced transportation to meet long-term sustainability objectives. To monitor this process properly the methods to estimate the ecological footprint of fuels should also be improved.

Urban Transport and policy measures

The worldwide increase in urban mobility since 1960 has been the direct result of increased affluence and the following greater accessibility to private motor vehicles, as well as population growth. Cameron and coworkers (2004), who investigated the causes of increased urban traffic in world cities between 1960 and 1990, concludes that population growth, urban sprawl, increased car ownership, and decreased vehicle occupancy are the key factors causing the steep rise in urban vehicle kilometres (vkm).

There is very wide range of policy instruments available to those responsible for developing transport strategies for urban areas. One recent study identified some 60 types of instrument, and this excluded those relating specifically to vehicle technology (May and Matthews, 2001). Common elements of urban transport strategies include reduction of car use; improvement in public transport; improvement in the performance of other modes; improvements in the performance of the road network; and improvement in the performance of vehicles (Nakamura et al. 2004).

Reducing the need to travel. The demands on the transport system are reduced if people make fewer or shorter journeys, or both. Fewer journeys may reduce economic and social activities; however some journeys can be replaced by telecommunication, as an alternative to travel.

Reducing car use. Car use leads to larger costs of pollution, noise, congestion and accidents per person-km than other modes of transport. Reduction of car use will thus lead to a reduction in the overall traffic level, and hence to improvements in transport efficiency, better environment, liveable streets and - if the alternative modes are not significantly less safe - improved safety.

Improving public transport. Improvements in the coverage and quality of public transport provide an alternative to the car. It will in addition be a benefit for those who anyway depend on public transport.

Improving other modes. The same argument holds for walking and biking, which are the two modes available to everyone, who does not have a mobility handicap. Walking and biking also have the advantage of being non-polluting and not consuming any energy. Each one is limited in its range, but a large proportion of trips by car cover distances, which equally well could be done on foot or by bicycle.

It is unlikely that improvements in freight traffic would lead to any modal change, although improved logistics would reduce freight traffic.

Improving the road network. Whether or not the need to travel, and travel by car, is reduced, there will be a need for remaining travellers to use the road network, and there are clear arguments for enabling them to do so efficiently. Improvements can include increases in capacity to allow the management demand for road use to be met more effectively, reallocation of road space between competing uses, and reduction of road space in areas which would most benefit the environment.

Improving the performance of vehicles. Whatever the level of use of cars and public transport vehicles, there is a case for making them safer, quieter, less polluting and more fuel-efficient. Technology instruments introduce improved vehicles designs, which include new motive power, improved emission, noise and safety standards.

Transport of Goods

From the environmental point of view, the main concern in transport of goods is to avoid transports and to shift transports from road back to more environmentally friendly means like rail or waterways, as this strategy offers the main potential of a sustainable reduction of the environmental impacts from road transport. Other possibilities to reduce the negative effects from transportation include technical improvement of the transport systems as well as advanced alternative propulsion.

Through the years, traffic planning has been divided into sectors in most countries. This has led to a lack of coherence, customer information and future planning. The individual sub-sectors have been working independently of each other and often been competing between themselves. Furthermore, the individual sectors in Europe have been nationally based, and thus further disintegrated. The result has been a lack of integration and synergy between the different methods of transport, as well as transport across the borders. This has caused considerable customer irritation as well as extensive social and business economic losses (Future Transport of Goods, 2002).

Politically, there is a gradual understanding of the necessity to establish a general holistic traffic planning which runs across sectors and is based on cross-sector junctions. This requires an entirely new political thinking on traffic. International connections between transport by road, ship, rail and air must be created. Here inter-modality is the prerequisite for it to work. Intermodality creates synergy and coherence between the different means of transport and between the standards of the various countries.

A new intermodal transport structure may create coherence and growth within transport of goods. A prerequisite that intermodality will work efficiently is that international standards are established. These standards should apply across all sectors so that loading between the individual transport methods and between the individual countries can take place. Efficient intermodal junctions require technical standardisations as well as administrative simplifications.

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Road Safety Challenges for the Baltic Sea Region

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Road accidents in the Baltic region

Ever greater mobility comes at high price. Every year 1.2 million people are killed worldwide as a result of road accidents and up to 50 million are injured. Sadly, many of the victims are children. In the countries with borders on the Baltic Sea some 50,000 people were killed in road accidents in 2004 (Table 1). Within the European Union, the Nordic countries show the highest road safety performance. The countries of Central and Eastern Europe still have a long way to go in order to reach similar safety levels.

Pedestrians and cyclists are particularly vulnerable groups in the road traffic. As far as pedestrians are concerned, there is a significant difference between the Nordic countries and the other countries. For the Nordic countries, 10-15 per cent of the annual road fatalities are pedestrians, whereas they account for more than 30 per cent of the annual fatalities in the other countries (Table 2). Thus pedestrians form a key target group for policies and measures to improve the road safety situation, especially in Central and Eastern Europe. Approximately 10 per cent of the fatalities are cyclists.

Road accidents cause considerable economic losses to society due to costs for medical treatment, material losses and loss of production. In Sweden, it is estimated that road accidents cause an annual loss of about one per cent of GDP, whereas the figure for the whole EU is about 2 per cent of GDP. In Poland, the annual loss has been estimated at 5 billion Euros, which is well over 3 per cent of the country's GDP.

Table 1. Number of deaths in the road traffic in the Baltic region, 2004

Country	Total number of casualties	Casualties per 100,000 inhabitants	Trends 2004-2003
Denmark	369	6,82	-14.6%
Finland	375	7,21	-1.1%
Sweden	480	5,33	-9.3%
Estonia	170	12,07	+3.7%
Latvia	516	22,13	+4.7%
Lithuania	752	20,84	+6.1%
Poland	5,712	14,79	+1.3%
Russian Federation	34,506	29,78	-3.1%

Table 2. Numbers killed by road-use category (%), 2001

Country	Pedestrians	Cyclists
Denmark	11.4	13.0
Finland	14.3	13.6
Sweden	14.9	7.4
Estonia	30.2	9.0
Latvia	36.0	7.7
Lithuania	35.8	13.3
Poland	33.7	11.0
Russian Federation	44.2	2.1

Risk factors

In most accidents on the road, speed is an important risk factor. High speed contributes to the number of accidents, and the severity of injuries is also speed related. The Transport Research Laboratory in the UK has shown that a reduction of the average speed by 3 km/h would save 5,000-6,000 lives in the EU area. Furthermore, the number of accidents would be reduced by 120,000-140,000 and about 20 billion Euros would be saved.

The consumption of alcohol and drugs is another important risk factor. In the European Union, drinking and driving is responsible for more than 10,000 deaths each year. In Sweden, there are at least 15,000 drivers in everyday traffic who are the under the influence of alcohol. Increased alcohol consumption in society tends to aggravate this problem.

Failure to wear a seat belt or crash helmet is yet another major risk factor in road accidents. If the rates of seat belt use could be increased everywhere, up to the best international rates, many thousands of lives would be saved each year.

Many serious road accidents involve long-distance trucks. A collision between car and a truck often leads to fatalities or serious injuries. The number of long-distance trucks has been growing at a high rate in the past decade, especially in Central and Eastern Europe.

It should be emphasized that the risk factors described above are not easily combined to get an aggregate figure. Instead they interact in very complex ways.

Road safety policy at the EU-level

Road safety has emerged as a new policy area for the European Union. The domains of EU action within the road safety area are the following:

* User behaviour (campaigns, enforcement)
* Vehicle safety: passive safety (damage prevention) and active safety (accident prevention)
* Road infrastructure safety
* Professional driving and commercial transport

The EU uses a defined set of instruments for its road safety policy:

* Legislation
* Best practice guidelines

”VISION ZERO” – A SWEDISH APPROACH

Vision Zero constitutes the basis for road safety policy in Sweden since 1997. It embodies a set of principles for designing road safety policy. The most important principles of Vision Zero can be stated as follows:

- The level of violence that humans can sustain without getting killed or seriously injured constitutes the basic design parameter for the road transport system. This means that no accident should expose those involved to an amount of biomechanical energy that exceeds the threshold for sustaining a serious injury.
- Vehicle speed is the most important regulating factor for road traffic.
- The designers of roads and vehicles are responsible for designing roads and vehicles so as to comply as closely as possible with the injury design parameter.
- Road users are responsible for complying with the rules for using the road system set by the system designers.
- If road users fail to comply with the rules set by the system designers, the system designers are required to take further action in order to counteract people being killed.

* Research and studies
* Financial support to projects
* Road accident data and information

An important platform for EU road safety policy is the European Road Safety Programme for the period 2003-2010. The programme aims at halving the number of deaths by the year 2010 compared to the level of 2000. It emphasizes that road safety is a shared responsibility. Thus, it is a challenge for national and local government, the private sector as well as for the citizens and non-governmental organisations.
The aims of the action programme are the following:

1. Encourage road users to improve their behaviour - in particular through measures to achieve better compliance with existing legislation, basic and continuous training for private and professional drivers and efforts to combat dangerous practises.
2. Make vehicles safer, in particular through technical harmonisation and support for technical progress.
3. Improve road infrastructure, in particular by defining best practices and disseminating them at local level, and by eliminating accident black spots.

Road safety policy at the national level

At the national level, the government and/or the parliament could approve a national road safety programme that addresses the following three elements:

1. Safety measures in the infrastructure (roads and streets)
2. Safe behaviour of the road users (drivers, pedestrians, cyclists etc.)
3. Safe vehicles

Preferably, a national target for how many lives should be saved should accompany the road safety programme. In addition, sub-targets could be adopted. For instance, seat belt wearing or the use of bicycle helmet should increase by x % until the year x.

Figure 1. Car accidents in the European Union is the major cause of death for ages 15-40
Photo: © European Community.

An effective road safety strategy should aim at policies and measures that will reduce the speed. Swedish researchers have concluded that a 10-20% reduction of the speed can reduce fatalities by almost 50%. There are four important measures that can be taken to reduce the speed:

1. Reduced speed limits, especially at roads with many accidents
2. Speed control by the police
3. Automatic cameras for speed control, especially at roads with many accidents.[1]
4. Fines for excessive speed. The fines have to be sufficiently high in order to provide incentive for drivers to comply with the speed limitations.

A new solution that has been developed in Sweden in the past few years is to separate the road lanes by means of a barrier. These barriers make it impossible to overtake other cars. Thus, collision accidents are completely avoided. It should be emphasized that it is a cost-effective solution that saves many lives. The Swedish experience shows that it is much cheaper to save a life in this way than by building a new motorway.

A general bicycle helmet law will save the life and health of many cyclists. Until now, only three countries in the world have a bicycle helmet law: Finland, Australia and New Zealand. In Sweden there is a bicycle law for children up to the age of 15.

Road safety policy at the local level

At the local level, it is important that priorities and targets are laid out in a municipal programme for road safety. It is important that such a programme be communicated to all relevant actors at the local level.

[1] This is a quite new technology, which is being used more and more in Sweden. It is a very cost-effective measure to reduce accidents.

Table 3. Possible actions by different stakeholders to increase seat belt use
Source: European Commission (2003).

Private sector	• *innovation and initiatives* • *development and marketing of more efficient restraint systems* • *reduced insurance premiums for users of equipped vehicles* • *campaign at company level for the workforce*
Regional/local level	• *police enforcement* • *seat belt information in schools*
National level	• *implementation of EU rules* • *setting national compliance objectives* • *securing compliance through resources for police enforcement* • *targeted national information* • *monitoring of seat belt use* • *encouraging set belt use policies in the public and private sectors*
European Union	• *rules on the mandatory fitting and use of equipment* • *performance standards for safety belts and restraints* • *a framework and support for campaigns to support seat belt use* • *monitoring the incorporation of Community legislation by the member states into their national law*

Possible measures for a municipal road safety programme include the following:

- Reduction of the speed limits to 40 or 30 km/h in urban areas. In 2005, 30 km/h was introduced in Stockholm. After that, the number of injuries went down by 10-20%.
- Traffic control (separation of pedestrians and cyclists).
- Establishment of safe pedestrian crossings.
- Speed reduction devices at ”black spots” or ”black areas” in cities. The Swedish city Göteborg has invested in a number of speed reduction measures since 1990. Today it has the best road safety performance of all cities in Sweden. The number of fatalities and seriously injured persons has been reduced by 60% in a decade.
- Construction of roundabouts. Roundabouts (1) reduce the number of serious accidents, (2) calm down the traffic and improve the flow of traffic, which in its turn reduces the emission of carbon dioxide and (3) reduce maintenance costs compared to traffic-light solutions.
- Urban planning and traffic planning.
- The establishment of mobility centres that can help citizens to find solutions to travel without increasing the number of private cars.
- Car-free areas in city centres. This is not only beneficial for road safety but also for the urban air quality. In many instances car-free areas attract more tourists and are beneficial for local business.

Perhaps the most important driving force for improved road safety at the local level is the power of the good example. Once a good example is set, other cities tend to become interested in the solution.

A challenge for all stakeholders of the road transport system

Improved road safety requires measures on all levels - local, regional, national and supranational (EU) (Table 3). It is also important that these levels interact, from the govern-

ment to all parts of the private sector. Action to promote the wearing of seat belts is a good example of the interdependence of different road safety measures and stakeholders.

Conclusions

Road safety is an increasingly important policy area for the European Union and the countries in the Baltic region. It is particularly important to focus on the safety for pedestrians and cyclists, who are the most vulnerable groups in the road traffic. Programmes for road safety are needed at national, regional and local levels of policy-making. Reduced speed is the single most important factor for a successful road safety policy. It has been estimated that 10-20 km/h less speed could reduce the number of fatalities by approximately 50%. There are a number of win-win situations between road safety, environmental protection and economic benefits. Policies aiming at a sustainable transport system should indeed take into account the road safety dimension.

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Photo on right side:
Many power stations are old and new investments must be decided for the future. The development of the energy sector must take into account the environmental commitments of the European Union in Kyoto. (© European Commission).

PART IV

ENERGY POLICY AND ENERGY SUPPLY

Industrialism arrived to the Baltic Sea region in the end of the 19th century and with it a society which fundamentally depends on fossil fuels, such as coal, oil and gas. This dependency is still there to an extent of close to 90% (depending on how one makes the statistics) in the area east of the Baltic Sea. The western part of the region is around 50% fossil fuel dependent. Our societies have not only made themselves dependent on oil, we have when burning the oil polluted the global atmosphere with green house gases threatening our climate, acidified tens of thousands of lakes and rivers, and polluted large areas with heavy metals. Sustainability is not possible with non-renewable resources and the fossils have to be left behind. Since energy is basic to very many functions in our society finding alternatives is crucial. Many have pointed to energy management as the key issue for approaching a sustainable society. However the Baltic Sea region has unusually good conditions to address this issue and find alternatives to the oil dependency.

Fossil fuels – how long will they last?
Exploring the evidence of peak oil production

Kjell Aleklett
Uppsala Hydrocarbon Depletion Study Group, Uppsala University and Association for the Study of Peak Oil and Gas

Fossil fuels, oil, gas and coal, constitute the major energy source in the Baltic Sea region, as it does in the whole world. Our societies are dependent on them. We might even say that we are addicted to fossil fuels. We know that the reserves are finite, but it is hard to accept that there will be a time when we must use less then today. Very few is aware of the fact that we very soon have to change habits.

The known global reserves of crude oil are around 800 billion barrels. Some quote a higher number but we must put a question mark on some of the reported reserves. A problem we are facing when it comes to production is that the majority of remaining oil can be found in old oilfields and it is not possible to tap an old field in the same speed as when they were young. A yearly production of 30 billion barrels might be possible to sustain for some more years, but very soon, probably around year 2010, we will see a permanent decline in the production of oil. Three quarter of the oil reserves can be found in the Middle East and the northern part of Africa. The proven reserves of natural gas amount to less than 200 trillion cubic meters. Again more than 50% is in the Middle East. Coal reserves are larger and come up to just less than 1000 billion tonnes.

The Baltic Sea region, excluding Russia, is a fossil fuel importing area. We are, however, close to two major exporting areas. One is the North Sea where oil now is declining but gas will continue to be exported for a long time. The other area is the Russia which also partly belongs to the Baltic Sea region. For energy security of the region it is important that we find suitable projects for collaboration with Russia.

But even if these reserves exist and will extract for a long time, oil and gas in a slightly longer perspective will come to an end soon. The period with plenty of oil will not be longer than some 100 years – the exact length depends on how we count. It is a short moment in the development in human civilisation. We are just now close to the mid point in this development. The point in time when half the oil resources have been used up is expected to coincide roughly with the time when production will start to go down. This is called Peak Oil and depending on change in demand it can be just now or come within 5 to 10 years.

Oil and economy

Oil is important for the world economy. Oil consumption is fairly well proportional to average income or the GDP of the country. In developing countries there are a one-to-one correlation between the increase of GDP and increase of consumption of oil. During the

last 5 years China has had an increase of GDP with 8,2% and an increase of consumption of oil with 8,5%. The global problem that we now face is that there is not enough oil in the world for increasing GDP in the poorest countries.

Since the decline in the consumption in the 1970:s and 1980:s there have been an increasing demand with on average 1,6%. Using this trend the International Energy Agency, IEA, and US Energy Information Administration have predicted oil consumption for years ahead. Today the global demand is 84 million barrels per day and the forecast for 2030 is between 115 to 123 mbpd with increases between 1,4% and 1,6%.

In mature economies oil use and GDP do not follow each other as closely, and we talk about de-coupling. It is clear that the tight connection between oil demand and GDP is typical for early industrialisation. A de-coupling has been observed in western economies since the 1970s. However this economic growth without oil, is offset by the so-called rebound effect, that is total growth is much larger than decoupling, so oil demand is still increasing in absolute terms. In the European Union Sweden is the country where decoupling has been most pronounced, very much due to the expansion of nuclear power in the 1970s and 1980s.

How much oil will we find?

First we have to point out that there are different kinds of oil. The lighters and best oil is called crude oil. So far we have used 1000 billion barrels, have 800 billion barrels in the reserves and we might find another 200 billion barrels in the future. Heavy oil is found in big quantities in Venezuela and as oil sand in Canada. Production of heavy oil is an industry production that needs a lot of energy. A 30-year increase of the production can bring it up to 10-15 mbpd, this volume cannot offset Peak Oil.

It is perhaps not so easy to get a grip on these large numbers so let us simplify by assuming that we have a number of champagne bottles with oil, each one containing 100 Giga barrels, Gb, equal to the reserves in Iraq. If we pour this into four glasses, each glass (25 Gb) constitutes one year's global consumption as it was in year 2000. The bottle is thus enough for 4 years global consumption. Today the yearly consumption has increased to 30 Gb so it would not be enough even for the four years.

Looking into the history we may say that the world has so far consumed 10 bottles. The reserves that IEA reports are 10 bottles. Within the Association for the Study of Peak Oil and Gas, ASPO, we believe that this figure is a slight overestimation and that in reality there are only about 8 bottles. These uncertainties are due to the fact that oil companies are not always open about their findings. There are business reasons to sometimes exaggerate figures.

What about expected future discoveries of crude oil? According to IEA we need to find another 13 bottles the coming 25 years, 7 is new oilfields and 6 from enhanced recovery. Our studies suggest strongly that this is not realistic. We may expect only about two additional bottles from new discovery and the 6 might be just another 2 bottles. Today we know quite well in what kind of geological settings one may find fossil oil and gas. We thus do not expect great new surprises. In fact discoveries that should change the picture we have today fundamentally need to be very large indeed. This makes the present view even more credible.

The development of oil discoveries is very well described, as is the production. Plotting this two development on the same diagram gives a very clear picture that at some point there will be a serious lack of oil and the world demand will be far from satisfied.

Discoveries in the past and in the future

The classic scientist in the area of oil exploration is M. King Hubbert (1903-1989). He studied discovery and production trends in USA. The discoveries peaked in 1935 and by extrapolating the decline rate that he saw in 1956 he could predict that the USA oil production would peak around 1970. It turned out that peak production occurred in 1971 and production has since then declined. In Norway we had a peak in discoveries in the late 1970:s and the peak production occurred in 2003. Figure 1 shows the global discovery curve and the peak in the 1960:s. According to King Hubbert the consumption should peak around 1998. However, the taps was closed in the Middle East in the 70:s and 80:s and the normal Hubbert curve cannot be applied. Applying a decline rate model and accepting the fact that we cannot consume more than we have found there will be a peak in the production around year 2010. Figure 2 shows the 2005 scenario for crude oil divided into the regions USA, Europe, Russia, Middle East, Deep water, Polar Oil and the Rest of the world. We have also added the production of heavy oil as well as NGL, Natural Gas Liquids (NGL is gasses that at normal pressure are liquid).

The Russian oil fields

The situation in Russia is especially interesting for the Baltic Sea region. Russian oil production peaked in the 1980:s and collapsed when Soviet Union was dismantled. Modern technology in the old fields has brought up the production, but it will never come back to the rate it had during the 1980:s. According to IEA there might be a constant production around 10 mbpd, but our depletion model indicate that this might be an optimistic scenario. The available data suggests that there are still some 60 Gb to extract. We will in addition see an increase in the production in Kazakhstan and Azerbaijan but this production will be exported via pipelines through Turkey and to ports in the Black See, and not reach the BSR.

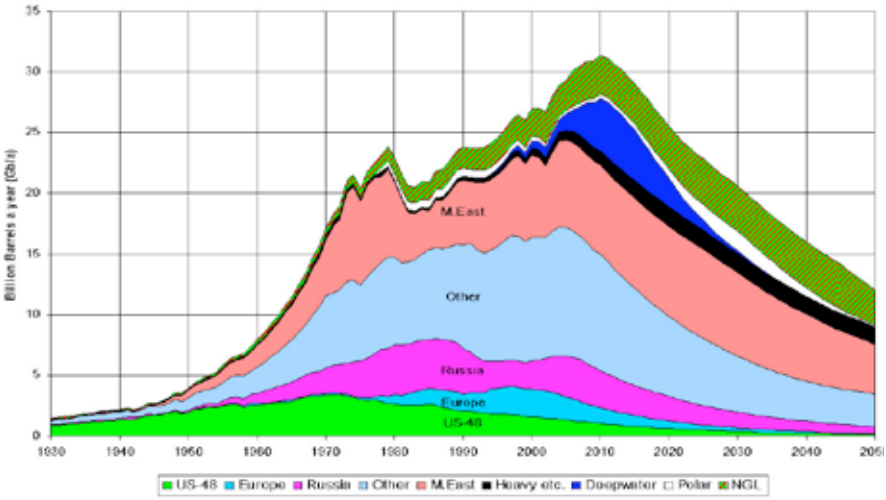

Figure 1. Peak oil. The ASPO 2005 base secenario for oil production divided between the major producers. (ASPO = Association for the Study of Peak Oil). The diagram predicts that peak oil will occur at about 2010.

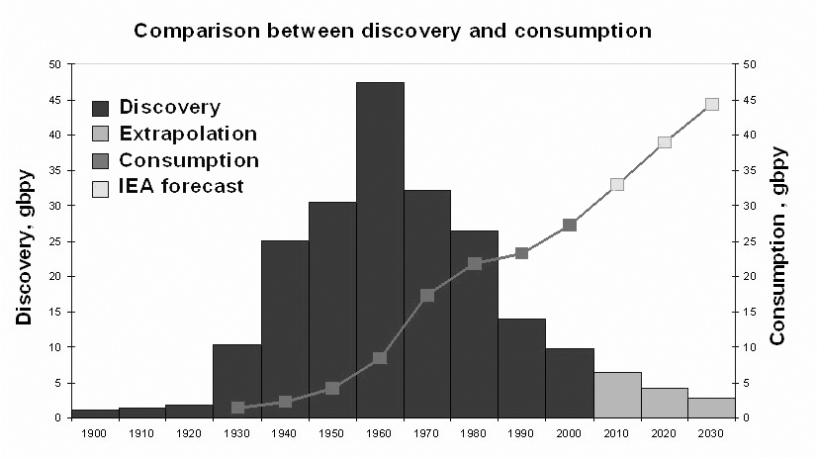

Figure 2. Discovery and Consumption scenario.

The Middle East oil and total global production

As mentioned the IEA scenario is that in 2010 the world will produce 90 million barrels per day oil, in 2020 107 million barrels and in 2030 it has increased to 120 million barrels per day. If this production is summed from now till 2030 we will consume 900 Gb of oil (9 champagne bottles!).

But does this much oil even exist and is it possible to increase the production? The prediction builds on an estimation of the productive capacity of the countries in the Middle East. Most of the Middle East oil is found in the so-called Oil Triangle, oilfields in Iraq, Iran, Kuwait, Saudi Arabia and the Emirates. This area accounts for 60% of all known oil reserves. According to the Cheney 2001 US Energy Policy document, in 2020 around 54-67% of the world production need to come from this area. However Sheik Sadad Al Husseini, just retired vice-president of the Saudi oil company Aramco, says that "the American governments forecast for future oil supplies is a dangerous overestimate."

Saudi Arabia and the Russian Federation are today the two largest oil exporting countries in the world, followed by another 20 smaller exporters. It is obvious that if we should continue to use oil on the level we do today we need to find new oil fields. Exxon Mobile estimates that for 2015 eight out of ten barrels of oil need to come from new oil fields. However this would require that another 10 Saudi Arabias are discovered. Of course it will not happen. A more sober view of future oil production is that we can count on some production from new fields, but mostly on development of existing reserves and some so-called non-conventional sources.

Oil future and ASPO

The present knowledge of existing oil reserves can be summarised in the now well-known peak oil diagram, which has been published by ASPO since more than five years. (ASPO started in 2001)

The Association for the Study of Peak Oil and gas (www. peakoil.net) was formed in 2001 to study an area that so far had been the monopoly of the oil business, and not enough critically examined by independent researchers. ASPO is a network of scientists affiliated with European institutions and universities having an interest in determining

the date and impact of the peak and decline of the world's production of oil and gas, due to resource constraints. The mission of ASPO is to

1. Define and evaluate the worlds endowment of oil and gas
2. Model depletion taking due account of demand, economics, technology and politics
3. Raise awareness of the serious consequences for Mankind

Reasons to reduce fossil fuel dependency in the Baltic Sea region

The Baltic Sea region will need, as all regions in the world, to decrease their dependency of oil. However at present some of the countries in the region rather increase their fossil fuel dependency, although it changes character.

Since long time back the use of black coal is decreasing. Coal mines became uneconomic 20 years ago in the west, and we have seen a wave of closing coal mines from Wales to Germany and into Poland. Probably we should expect the same to happen next in Ukraine. In parallel we see an increase in the use of natural gas. Additional large gas pipelines are planned for Russian gas to be exported to Central Europe. In the Nordic countries, especially Sweden, the plans for a new gas infrastructure have been much questioned.

But there are more reasons to decrease the use of oil and gas. One is that the price of oil and gas will increase, even steeply, as the demand will not be met by production. The price of oil will not decrease in the future and we can probably expect an increase in the future. The price of natural gas has normally followed the price of oil, but it might be that we in the future will see a steeper increase as we now can see in USA.

The other concern is safety. The fact that someone else controls the basic energy supply to a country is of course unsafe and may in the worst case lead to conflict and blackmailing, and if not, costly negotiations if only one side in practice decide on the conditions. This was illustrated the last few months when Russia increased the price of gas delivered to Ukraine several fold. The final agreement between the two countries was influenced by the fact that Russia is dependent on Ukraine for its Black Sea fleet harbour. Without such a component in the negotiations it may have ended differently. It is of course noted that Ukraine is a transit country for gas delivered to Central Europe from Russia and also the supply in Germany was decreased during the conflict.

A third reason for reducing fossil fuel dependency is the need to reduce greenhouse gas emissions. This reduction is at present part of the Climate convention as detailed in the Kyoto protocol, which requires partner countries to reduce greenhouse gases by 8%, counted from the 1990 level, to years 20108-2012. Now the European Union, is the partner in the protocol, and EU has distributed its total agreed reduction between its member states. The decrease is much less difficult for the eastern part of the Baltic Sea region, since a dramatic de-industrialisation has taken place during the 1990s.

Policy recommendations

All countries in the region need to reduce fossil dependency. Counted only from the availability of oil this would be about 2% yearly. However, additional factors will probably make this reduction insufficient. Kyoto protocol requirements, and even more so expected rather drastic post-Kyoto agreements to reduce greenhouse gas emissions, is likely to be much larger. Further, souring prices and safety concerns are expected to push this development even more.

Table 10.1. Overview of Allowances and Kyoto targets across member states. Under the Kyoto Protocol, the EU15 has to reduce its collective greenhouse gas emissions by 8% below 1990 levels during 2008-2012. This target is shared among the 15 Member States under a legally binding burden-sharing agreement (Council Decision 2002/358/EC of 25 April 2002). The majority of the Member States that joined the EU on 1 May 2004 have individual targets under the Kyoto Protocol with the exception of Cyprus and Malta, which have no targets. (Figures do not take into account any opt-ins and opt-outs of installations in accordance with Article 24 and 27 of Directive 2003/87/EC.)

Member State	CO_2 allowances in mio. tonnes	**Share in EU allowances**	**Installations covered**	**Registry functional**	**Kyoto target**
Czech Republic	292.8	4.4 %	435	No	-8%
Denmark	100.5	1.5 %	378	Yes	-21%*
Estonia	56.85	0.9 %	43	No	-8%
Finland	136.5	2.1 %	535	Yes	0%*
Germany	1,497.0	22.8 %	1,849	Yes	-21%*
Hungary	93.8	1.4 %	261	No	-6%
Latvia	13.7	0.2 %	95	No	-8%
Lithuania	36.8	0.6 %	93	No	-8%
Poland	717.3	10.9 %	1,166	No	-6%
Slovak Republic	91.5	1.4 %	209	No	-8%
Slovenia	26.3	0.4 %	98	No	-8%
Sweden	68.7	1.1 %	499	Yes	+4%
Total	6,572	100.0 %	11,428		

Sweden has taken a lead by declaring that the country intends to be fossil fuel free by 2020. This corresponds to an annual decrease by some 7%. As the fossil fuel component in the Swedish energy budget is only 35% it is not too unrealistic. It will be much tougher for the countries in the east where fossil dependency is larger, and the total energy budget is smaller. Still this development is essential for sustainability and needs to be seriously considered for all countries in the region.

Renewable Energy Resources

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Sustainable energy sources

Energy resources can be described as renewable and non-renewable. Renewable energy sources are those which are continually being replaced. If an energy resource is being used faster than it can be replaced e g, coal, oil or natural gas which takes millions of years to form, then it will eventually run out. The global oil production peak is about now, and no new discoveries or oil wars will be able to alter the overall trend. Therefore, it's vital for our survival to visualize a change in sources of energy and also in the long run an alternative lifestyle.

Previously sustainable energy was mainly concerned with availability relative to the rate of use. Today, when considering sustainable development other aspects are equally important such as environmental effects, the production of waste, safety and maximising the options available to future generations. Also, there is a clearly growing concern about how we address energy needs on a sustainable basis due to global warming from human enhancement of the greenhouse effect. As the world's population and material standard is increasing in developing countries and will continue to grow for at least several decades, energy demand is likely to increase even faster.

Several different renewable sources of energy exist:

- Bioenergy: biomass
- Biofuels: biogas; bio diesel, ethanol, DME
- Waste
- Small-scale hydropower
- Wind energy
- Wave energy
- Solar energy: heat, electricity, fuel
- Others: e.g. geothermal energy

The first three types of energy (biomass, biofuels, waste) are dependant on different processes as combustion or digestion and burning. The second group (hydropower, wind and wave energy) are all dependant on the climate, as well as solar energy. Wind and solar energy are diffuse, intermittent, and unreliable by nature of their occurrence. Geothermal energy will not be discussed here as it is mainly a carrier of energy.

All sustainable energy sources are area dependant as their productivity is based on area. Construction of the plant or technical construction as well as the growing of e.g. forest residues or energy forest, straw, grain etc. all take space. Higher productivity per area is reached with wind, wave, hydropower and solar panel fields, while lower productivity per area is reached with biomass.

Bioenergy

Bioenergy commonly consists of:

- Biomass or wood fuels - wood, forest residues, pellets, briquettes
- Black liquor - by-product from pulp industry
- Agricultural crops - straw, *Salix*, grain
- Peat

Regarding the usage of different bioenergy sources in Sweden, 54% comes from biomass or wood fuels, 39% from black liquor, 3% from agricultural crops and 4% from peat (2004).

In Europe the largest users of bioenergy are Sweden, Finland, Austria, Denmark and Germany. France is the largest user in Europe of mainly wood in small-scale usage. In the rest of the world, New Zeeland is in first place, with USA as second with their pellets heating of approximately 400,000 homes and China in third place, where the market is growing quickly especially regarding heating and bioelectricity.

If there are any emissions during the conversion process and the emissions from combustion, their size is smaller than from fossil fuels. Bioenergy does not contribute to the greenhouse effect. Combustion of bioenergy does not emit sulphur, which fossil fuels do. The size of nitrogen oxide (NO_X) emissions are of a similar size as those from fossil fuels.

The European Environment Agency is assessing how much biomass Europe can use for energy generation without harming the environment. Extending biomass use to produce bioenergy cuts greenhouse gas emissions and meets renewable energy targets. However, biomass production may create additional environmental pressures, such as on biodiversity, soil and water resources. Preliminary results suggest that there is a sufficient biomass potential in the EU-25 to support ambitious renewable energy targets in an environmentally responsible way. The European Union has set ambitious 2010-targets for the share of renewable energies in total energy and electricity consumption and for biofuels. Biomass can be used to produce electricity, heat and transport fuels, and currently accounts for about two thirds of renewable energy production in the EU. It will have to contribute even more in order to achieve the 2010 targets. The European Commission estimates that reaching the target of a 12% share of renewables in total energy consumption requires around 130 Mtoe (1) of biomass (in the pre-2004 EU-15; EC, 2004).

Biofuels

Several options exist today regarding biofuels:

- Ethanol
- Biodiesel e.g. RME (rape methyl ester)
- Biogas
- Methanol
- DME – dimethyl ether

Ethanol is commonly used today in many places as fuel for cars, busses and trucks. It is also mixed with gasoline and sold in several countries as a more environmental option. RME can be used in diesel motors and is mainly used today by busses. Biogas is used mainly by different municipalities for busses, cars and trucks. DME is a liquefied petroleum gas (LPG) like synthetic fuel that is produced through gasification of various renewable substances or fossil fuel and catalyzed to produce DME. Black liquor can be

used in this process. DME is a gas that becomes a liquid under low pressure and has excellent characteristics as a compression ignition fuel.

Brazil is currently the world's largest producer of ethanol. Approximately 26% of the cars in Brazil are running on ethanol and a large amount of their ethanol is exported.

There are three types of biogas. Thermic gasification is considered to have the largest potential. Digestion is the second type and biogas production from landfills such as methane from garbage dumps is the third type.

Biogas can be utilized in different ways:

1) burned in a conventional gas boiler and used as heat for nearby buildings including farmhouses;
2) burned in a gas engine to generate electricity. Combined heat and power (CHP) systems, where heat can be removed in the first instance to maintain the digester temperature and surplus energy used for other purposes. A larger scale CHP plant can supply larger housing complexes or industry, or supply electricity to the grid;
3) upgraded to gas grid quality and used in vehicles. Different techniques for separation of carbon dioxide (CO_2) and hydrogen sulphide from biogas (water absorption and molecular sieves for CO_2 removal combined with activated carbon for removal of hydrogen sulphide).

Waste

To be able to utilize waste as a renewable energy source, increased sorting, collection and transport of the waste is necessary and a precondition. Depositing or tipping of waste is a practice that eventually will be phased out. Already within EU a ban on depositing exists combined with a deposit tax. From these waste deposits, it is possible to extract methane gas. Biological treatment is also a method for extracting energy from waste but the technology is considered to be rather expensive and the energy efficiency is low. Combustion of waste dominates and is the most effective treatment. It is usually used for district heating and therefore a well established network of district heating is an advantage. Combustion is likely to expand due to the ban on depositing waste. The possibilities of introducing a combustion tax are currently being discussed and will, if

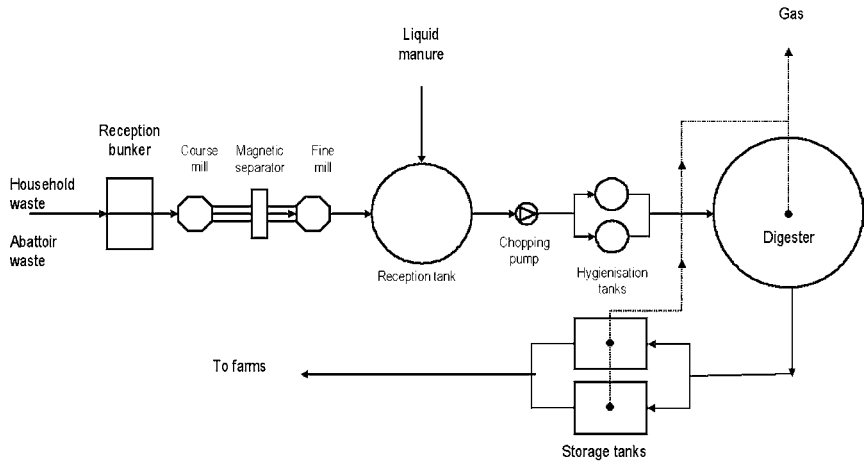

Figure 1. A principle flow diagram of a biogas plant

introduced, reduce the potential. The EU environmental legislation has tough environmental requirements for combustion plants which technically are easier to meet in larger and consequently fewer plants instead of many small plants. This could be a drawback for countries that are sparsely populated and have a small population.

There is a large difference in energy efficiency between the different ways of utilising waste. Digestion can produce 0,8 MWh per tonne, while combustion is much more effective and can produce 3 MWh per tonne.

Wind, wave and water

Small-scale hydropower has been difficult to utilize so far due to low electricity prices, environmental legislation, environmental lobbying, taxes, problems for producers to finance the constructions, as well as due to current politics. In the future, integrated systems solutions, reduced production costs by technical development of system solutions, and better conditions regarding legislation, taxes, risk capital and politics are needed to promote hydropower.

In a historical sense, hydropower has spared the environment from acidic emissions and their consequences for soil and water. At the same time, it has lead to a reduction of biotopes and biodiversity. Large focus has in this area been given to fish.

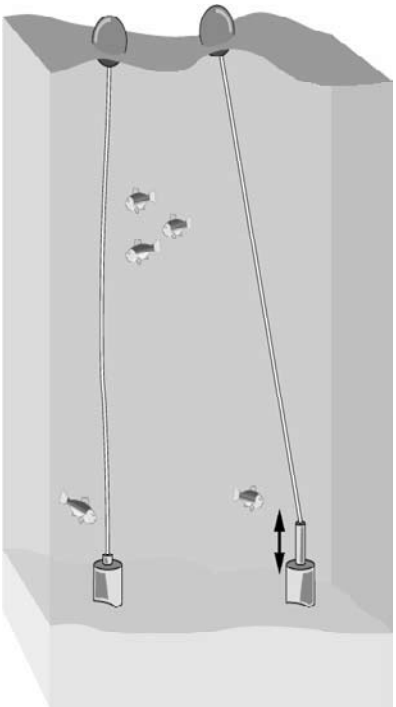

Figure 2. Two wave power plants in operation. The red buoy follows the motion of the water surface and runs the linear generator, which is placed on the ocean seabed. Ångström Laboratory, Uppsala University.

Wind energy is renewable and technically available for production of electricity. Situated in the right place and with a suitable construction, wind energy will be an important complement to the electricity production system. Wind is the fastest-growing source of electricity in many countries counted from a low base and there is a scope for further expansion. The technical development is fast and new applications in ocean and mountain based wind energy are of importance, as the wind conditions are especially favourable there. The production of wind energy is dependant on geographic conditions, as well as on environmental concerns.

Danish and German equipment dominate the market. The production of wind energy is dependant of national energy policy. It can also be difficult to find risk capital for investments in wind power.

Wind energy is dependant on other energy sources to be able to be utilized effectively. Wind power stations are a part of a larger energy system. This is due to the fact that wind energy can not be stored and must be combined with other storable energy resources. The wind energy component in an energy system can be maximum 10%. Today's solutions are not optimal and there still is room for technical development and innovations.

Figure 3. Solar panel field in Kungälv, Sweden. 10 000 m^2 delivers 4 million kWh heat per year to district heating.

Wave energy has a large potential and is an unexploited source of renewable energy. For ocean waves, the degree of utilization is relatively high and therefore wave power has a good economical potential. The challenge when developing wave energy, lies in the relatively slow motion of the water and the very high peak energy density. Wave energy is created in a similar way as wind energy. It is also dependant on weather but waves continue for a longer time period even after windy periods have ended.

The principle of wave energy is to use the difference in height between wave top and wave bottom. A buoy, floating on the water surface follows the motion of the wave. The buoy is connected to a hull, which can move vertically on a pillar. Permanent magnets are mounted on the surface of the hull. Outside the hull is the stator, which contains coil windings. The pillar and stator are put together on a concrete foundation, which stands on the bottom of the ocean. The hull and the assembled magnets are called rotor or piston, and a linear generator.

Solar energy

The sun has shined for more than 4 billion years and is calculated to continue to shine for at least 6 billion more years. The little part of the sun's energy that reaches the earth's surface is almost 10,000 times larger than the amount of energy that humanity uses today as fossil fuel. With the help of new technologies, sunshine can be converted directly to electricity and heat without being transformed through biomass, wind or waterfalls.

It is solar energy and the natural greenhouse effect that creates a temperature on earth that makes it possible for organisms to live on earth. It is also solar energy that brings the energy that most living organisms on earth live from by photosynthesis. This also applies to humankind that has always eaten stored solar energy as food and who has also during the past 100,000 years used stored solar energy as wood fuel.

Only 0,06% of the suns energy that reaches earth is transformed by photosynthesis and used by earth's vegetation as energy in biomass. Less than 1% of solar energy is transformed to wind. The potential for direct use of solar energy is enormous compared to biomass and wind energy. The world's total reserves of oil and gas and of uranium for today's type of nuclear reactors correspond to the solar radiation that reaches the earths surface during a few days. The global coal reserves represent the energy amount present in a few weeks of solar radiation.

There is a strong technical development and growth for the utilisation of solar energy. Solar collectors produce heat such as for tap water in houses and heating of swimming pools. Glazed solar collectors are relatively common in Germany, Turkey, Japan, Austria,

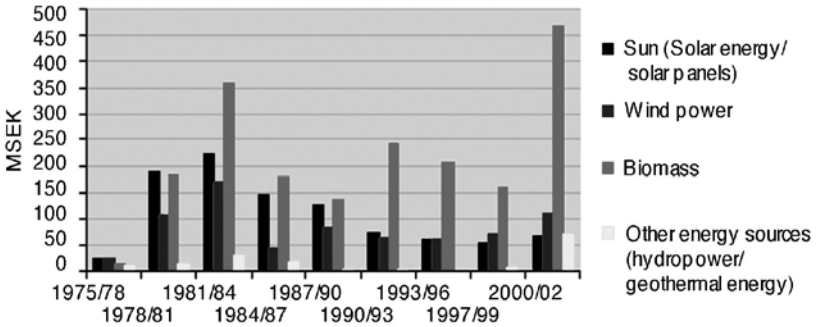

Figure 4. Research, development & demonstration on renewable energy in Sweden 1975-2002.

Israel and Greece (1-2 m^2/inhabitant). The largest potential for solar collectors is in cold countries as they can be used to both heat water and buildings. Solar cells produce electricity which is important for electricity production without mains connection, batteries and transformers and also for fuel.

Flat, glazed solar collectors consist of an absorber that transforms solar radiation to heat. The absorber has a selective surface that gives high absorption for solar radiation and low emittance of heat radiation. The absorber is covered with glass to reduce convection losses and to protect the absorber's surface against wear. Heat energy is transferred by a medium (air or water with glycol).

- Air: direct usage of hot air or the heat can be stored in the building construction
- Water: main purpose to heat water or store heat in water

Different solar collector systems exist. Hot water systems: a solar panel is connected to a water heater with a built-in solar heat coil. Combination systems: solar heat is combined with other types of energy, e.g. pellets or wood furnace. Heat is stored in an accumulator tank. Solar panel field: many solar collectors are connected together to deliver heat for district heating.

Solar cells are profitable in places that lack electricity grids. They convert photons to electrons. They consist of photovoltaic (photo = light, voltaic = electricity) cells or modules (a group of cells electrically connected & packaged in one frame) that convert sunlight directly into electricity, batteries and charging regulators or inverters.

Electricity certificate, a tool to stimulate renewable electricity

Electricity Certificates system is one system to encourage development of renewable energy. Systems with certificates exist today in Sweden, the Netherlands, Great Britain and Italy. Here the Swedish system will be described.

Producers of renewable electricity receive an electricity certificate for every produced MWh renewable electricity. The cost of the certificate is 200 SEK (≈ 20 Euro), while the electricity price is 250 SEK (≈ 25 Euro) and the fuel cost of producing the same amount of energy is 150 SEK (≈ 15 Euro). These certificates are sold to electricity consumers, who are requested by law to buy certificates for a certain part of their electricity use (quota). For the moment the quota is less than 10% of the total energy use.

The producers of renewable electricity receive in this way extra resources for investments in increased production capacity, development of new technology and production

of renewable electricity. The electricity certificates are sold and bought at a common market place. Every year the quota renewable electricity that the electricity consumers must buy increases. This increases the request for renewable electricity. The goal is to increase the annual electricity production from renewable sources with 10 TWh to the year 2010 compared to the level in the year 2002. To reach this goal the quota will increase every year.

In reality this has meant that 17 billion SEK has been or is intended to be used by district heating companies in Sweden for production of renewable energy and 4 billion SEK for forest industry as a result of the Electricity Certificates since they were introduced in May 2003 until 2010. From the 1st January 2007 Sweden intends to have a common Electricity Certificates system with Norway.

Sweden's sustainable energy policy

Sweden has been one of the countries that has invested substantial financing in research, development and demonstration on renewable energy. As can been seen in figure 4 most financing has been used for biomass. This is also the area where the development has been enormous during the past years. In December 2004 the number of houses that were heated by biomass was for the first time in modern time larger than the number that was heated by oil.

The development of energy supply in Sweden during the years 1970 – 2003 (Figure 5) shows that approximately 1/3 of the energy supply is renewable (hydro power, biofuels, waste heat for heat pumps- and geothermal pumps). Still another 1/3 comes from nuclear power (whereof 2/3 are losses) and the remaining 1/3 is from fossil fuels, with a large dominance for oil. The situation in 1970 was completely different with a large total dominance of fossil fuels (77%) and only smaller amounts of hydropower and bio fuels.

As today the largest issue regarding energy and environment is the climate issue and greenhouse gas effect, it is very important to quickly change Sweden's and the rest of the world's large dependency on fossil fuels and replace them with renewable energy and

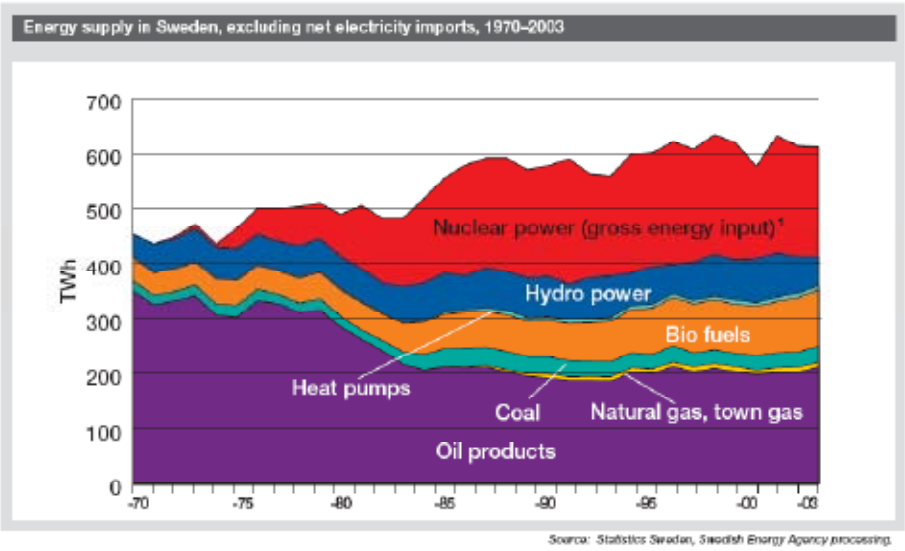

Figure 5. Energy supply in Sweden 1970 – 2003. Net electricity imports is excluded.

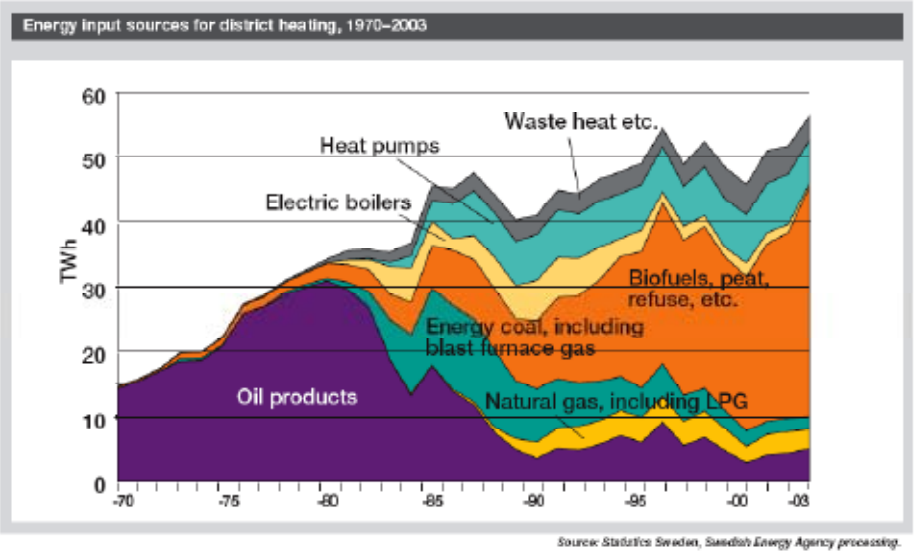

Figure 6. Energy input sources for district heating 1970-2000. The largest proportion of district heating in Sweden, 62%, is bioenergy.

fuel. The Kyoto protocol is one important step in that direction. Another good reason for changing to renewable energy sources is that oil is a limited non-renewable resource and peak oil is a current threat.

80% of the world's energy resource is still based on fossil fuels. Sweden has since 1982 doubled their production of biomass from approximately 50 to more than 100 TWh (about half of what oil supplies). EU:s goal for the transport sector and fuels is 5,75% renewable fuels in 2010. In Sweden the usage of fuels was 77 TWh in 2003, whereof more that 98% came from fossil fuels. Ethanol represented 1,27 TWh, RME 0,05 TWh and biogas 0,11 TWh. Since then the import of ethanol from Brazil has increased and substitutes about 5% of the gasoline in low level mixtures.

The Swedish government decided in October 2005 that Sweden will be the first country in the world to break the dependency on fossil fuels by the year 2020. The Prime Minister is currently leading a commission with this task.

A calculation and estimation of an energy budget for Sweden in 2020 (Table 1) could show that if Sweden will use the same amount of energy in 2020 as today and a maximum estimate is made for the renewable energy sources, it still could mean that 125 TWh must be taken care of by increased efficiency. At the same time nuclear power is not included in this estimation, as there is a governmental decision to close down nuclear power plants in the future. An interesting question is if this is possible at all?

The Swedish Farmers' Association Energy Scenario 2020

The Swedish Farmer's Association (LRF) presented in February 2005 an energy scenario for 2020. Due to the background of an increased global demand for energy, especially from the Asian economies, peak oil and increasing oil prices, as well as an increasing dependency on imported oil as a political and economical risk factor, as well as the greenhouse gas effect, LRF points out the key role that agriculture and forestry has in the change to renewable energy. This key role concerns the interest of an energy

Table 1. Estimated approximate energy budget for Sweden in 2020.

Total use today	400 TWh
Hydropower	65 TWh
Biomass	200 TWh
Wind	10 TWh
Solar, wave, etc	10 TWh
Increased efficiency	125 TWh

Table 2. Potential of renewable energy (TWh)

	Today	**Potential 2010**	**Potential 2020**
Forestry and forest industry by-products	89	105-120	115-130
Agriculture and food industry	1	5	22
Waste	5	10	14
Peat	3	6	10
Wind power	1	5	10
Small scale hydro power	2	3	4
Total	101	135-150	175-190

Table 3. Long term potential from agriculture (TWh)

	Today	**2020**
Straw	ca 0.5	7
Biogas from agriculture, food industry	ca 0.05	3
Salix	ca 0.2	4
Grain for heat production	ca 0.1	2
Ethanol from grain and sugar beets	ca 0.3	5
Rapeseed for RME	ca 0.02	1

producer, a user of energy and from the environmental side. Also considerable interest from society is noted.

The calculated potential is shown in table 2 and the long term potential from agriculture is broken down to the different sources in table 3.

In the calculations an oil price of approximately $50 per barrel was used but in the future rising prices will affect this and lead to greater potentials for alternative renewable energy sources and increased efforts to find substitutes. Prices of $80-120 per barrel or even higher could be anticipated in the future.

A short term research and development priority was listed in the scenario:

Energy systems and energy supply on the farm level

- Energy efficiency
- Heat & CHP production (grain, straw, biogas…)
- Solar heating as a complement to biomass

Energy crops /Biomass resources for the heating market

- Straw; equipment, logistics & market potential
- Grain; sintering, corrosion, emissions, logistics
- Salix (willow); advice strategies for increasing cultivation & profitability
- Reed canary grass; market, economy, management
- Hemp; technology, market, economy, legal framework

Energy crops for biofuels

- Crops/varieties for ethanol, RME & biogas
- Reduce cultivation- & machinery costs for crop production
- Optimal bi-product value

"The farmer as an energy contractor and supplier"

- Business management models for co-operations
- "Key to success" transfer

Renewable energy policy for the Baltic Sea Region

Several different policies have already been mentioned in this document such as for the EU regarding biomass and renewable fuels and renewable energy for Sweden. When considering a proposal for a renewable energy policy for the Baltic Sea Region, certain components should be included:

- Replace fossil fuels with renewable energy;
- Increase efficiency in all energy use (energy savings);
- National policies must promote renewables;
- Agriculture and forestry should be self-sufficient & a deliverer of energy (new job opportunities);
- Solar energy should be a large, perhaps the largest source for heat & electricity;
- Potential of wave, water & wind energy should be fully utilized;

It is always an interesting question how far one can reach with the different renewable energy sources. Research and development will be intensified and new solutions will certainly be discovered. Time is a very important factor here and the level of expectations will increase in a longer time frame compared to a shorter time frame.

Another important issue to take consideration to is how efficient the renewable energy resources are in comparison to oil. Fossil fuel gives a large net energy value as they have been concentrated and processed during millions of years and are today the energy base for modern society. If different energy sources are compared in an emergy analysis (calculation and valuing of both natures unpaid work and humans paid work which are both valued on the same scale, see Odum 1996), it soon becomes clear that renewable energy has difficulties in competing with fossil fuels.

All the same, we don't have a choice, fossil fuels must be replaced. Technical development, energy savings and such national and regional policies must be highly prioritised to solve the energy dilemma for the future.

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Projects for an Energy efficient Society

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The European Solar Building Exhibition

Most old buildings in Germany are not very energy efficient. There is thus room for considerable improvements. During the last 20 years the heating energy demand for new buildings has halved from 150 to 80 kWh/m^{2}a (kWh/m^{2}a = annual amount of heating per m^2 usable floor area). This should be compared to the current German Heat Protection Regulation (EnEV 2002) of 100 kWh/m^{2}a (including PE-Heating), which is an internationally recognised standard, equivalent to e.g. the Swedish Construction Standard (SBN). But it is possible to be even more efficient. There are thus considerably energy gains to be made in the building sector. The figures mentioned here are even higher as primary energy demand for the buildings, especially for electricity in Germany.

In 2003 the ZEBAU GmbH joined a number of European stakeholders to created in 2005 the European Solar Building Exhibition, an international building exhibition project for solar and low energy housing. The project was funded by the ALTENER-programme of the European Commission. Twelve European cities developed innovative concepts for bioclimatic urban redevelopment, forward-looking new developments, passive housing and the integration of renewable energy sources. The intention in Germany was to build either so-called very low energy houses with 40 kWh/m^{2}a or passive energy houses. Passive energy houses are properly speaking houses without a conventional heating system, but more often it is understood as a building with heating requirements of 15 kWh/m^{2}a or less.

The aim of the Solar Building Exhibition Hamburg 2005 was to show how houses with particularly low energy requirements and high quota of renewable energy supply can be built in Germany. The two construction areas selected were Hamburg-Heimfeld and Hamburg-Wilhelmsburg, Either passive houses or very low energy houses were constructed. An external quality control was organised with the help of Hamburg Building Authority in order to achieve, if possible, a faultless higher standard in comparison with ordinary new buildings. The control of the energy planning and construction was originally made by the Technical University of Hamburg-Harburg and since the beginning 2005 the Detmold Low Energy Institute, while the inspection of the construction work was made by the Low Energy Institute.

Passive energy houses

A passive house is a building in which a comfortable interior climate can be maintained nearly without active heating and cooling systems. The house heats and cools itself, hence ”passive”.

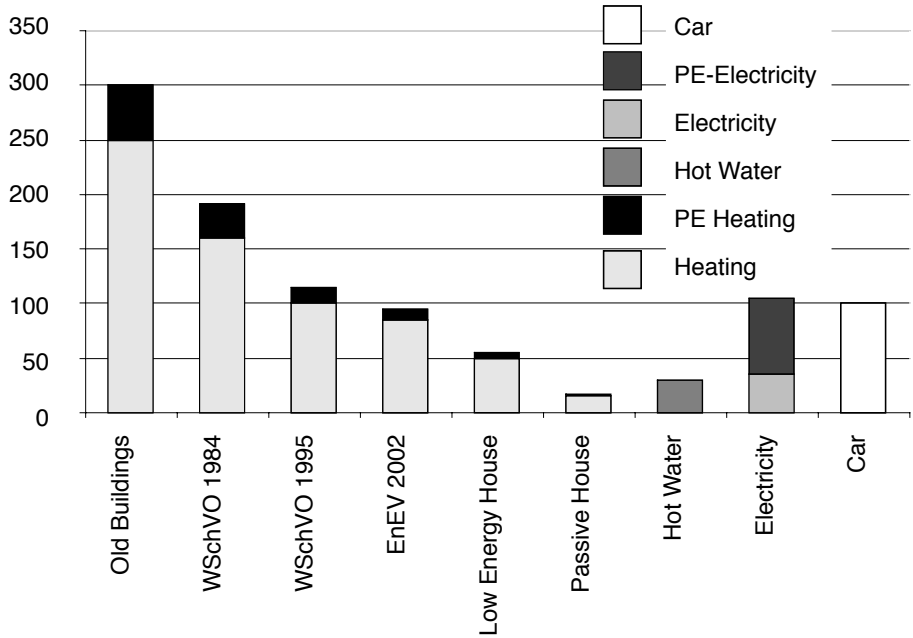

Figure 1. Comparison of Energy Ratings of German homes. WSchVO = German Heat Protection Regulation. EnEV = Current German Heat Protection Regulation.

According to European standards a passive house is a house, whose need for heating, i.e. annual amount of heating, is not higher than 15 kilowatt hours per square meter and annum (kWh/m^{2}a). In a 150 m^2 house this amounts to 2250 kWh/a and corresponds to 225 liters of oil or m^3 gas. Warm water consumption, the electricity consumption as well as losses in heat production and distribution are not included in the energy balance. With this as a starting point, additional energy requirements may be completely covered using renewable energy sources. The combined primary energy consumption of living area of a European passive house may not exceed 120 kWh/m^{2}a for heat, hot water and household electricity.

The current Passive House standard was developed for Northern (heating load dominated) climates and indeed most existing passive houses are found in Austria, Germany, northern France, Sweden and Switzerland.

The combined energy consumption of a passive house is less than the average new European home requires for household electricity and hot water alone. The combined end energy consumed by a passive house is therefore less than a quarter of the energy consumed by the average new construction that complies with applicable national energy regulations.

The heating demand for a passive energy house is calculated using the PHPP software (passive house project package, Dr. Wolfgang Feist, Passive House Institute, Darmstadt). The following factors are included in the calculation:

- Heat losses over the building cover (control areas and heat bridges),
- Heat losses through ventilation subtracting heat recovery by a heat exchanger and the containment of the building.

Figure 2. Multiple family dwellings passive house

- Heat recovery through passive solar heating through windows,
- Heat recovery from people, equipment, hot water, etc.

This method of calculation is used e.g. when applying for loans for construction.

Very low energy houses

A very low energy house, also called a KfW-40-house, should fulfil the following requirements:

1) The specific transmission heat loss must be at least 45% lower than the upper limit of the German Energy Economy Establishment (EnEV) standard valid for the building. The calculation of the need for heating for a KfW-40 house is carried out according EnEV software. Ventilation losses as well as solar and internal recoveries are not taken into account in this case. The heat losses can consequently only be reduced by improving the insulation of the building, or by using smaller windows, or windows with lower U values, and the reduction of heat bridges. Heat losses indicate primarily this "construction heat protection" and can only be taken as an indicator for the general energy saving.
2) The primary energy consumption may not exceed 40 kWh per m^2 of the usable floor area and year. This includes heating, hot water and electricity, all losses during transformation and distribution, and added the contribution of other sources such as active solar technologies. The demand for a low primary energy use can be met by a low request for heating, as in the case of the passive house, or by particularly efficient or renewable energy supply.

The requirements of the KfW-40 houses originate from the promotional program "ecological construction" of the Kreditanstalt für Wiederaufbau (KfW) (Credit

Figure 3. Passive house insulation with 20 cm core insulation.

Institution for Reconstruction in Berlin, www.kfw.de), which provides reduced construction loans for particularly energy-saving houses.

The calculation of energy demand should be made according to the EnEV software, not those of the PHPP. This is important, since the need for heating a KfW-40 house can vary greatly. Depending on house technology and kind of fuel, it can approximate a passive house or also be considerably higher.

The minimum insulation standard of a KfW-40 house is still considerably less than for a passive house. Solar profits and efficient ventilation are relatively unimportant for the KfW-40 house. The primary energy consumption requests can be most often be achieved by using renewable energy sources, such as pellet furnaces. This was frequently the case at the exhibition. The costs connected with that can make heating costs three or four times higher than for a passive house, despite a low level of primary energy consumption.

Total energy supply in built area

The buildings of the Solar Building Exhibition Hamburg 2005 were, on the average, well insulated, well sealed and equipped with ventilation units, mostly with efficient heat recovery. The need for heating and expected consumption of heating energy were therefore considerably lower than in normal new houses, built according to the minimum requirements of the EnEV. The living comfort is noticeably higher. The demand KfW-40 or passive houses nevertheless does not seem optimal in retrospect. Particularly the KfW-

40 house, despite its popularity, is rather a suboptimum. Particularly those, who hope for very low heating costs similar to those a passive house, will be disappointed.

In Heimfeld the houses were supplied with three central pellet heating bolers, used for three common heating systems. One system was supported by thermal solar panels. The electricity need for the area was partly met by two big photovoltaic plants.

In Wilhelmsburg many houses were heated by pellet furnaces or heat pumps, each supported by thermal solar panels. The electricity was supplied from several smaller photovoltaic panels.

On both sites renewable energies are used for heating and hot water generation. Energy for hot water and heating was provided from solar collectors, wood pellets or heat pumps provide. Photovoltaic systems generate the electricity.

How to build a passive energy house

To meet the current Passive House standard, the construction of the houses meet certain general principles, here briefly explained:

Highly insulated building shell and compact form. All components of the exterior shell of the house are insulated to achieve a U-value that does not exceed 0.15 W/(m^{2}K) (0.026 Btu/h/ft^2/°F) which typically corresponds to 20-40 cm of insulation.

Southern orientation and shade considerations. Passive use of solar energy is a significant factor in passive house design. Shading is absolutely necessary in all climates with high levels of solar radiation.

Highly insulated windows. Windows are constructed of low-e triple glazing (U-value of 0.75 W/m^{2}K and a solar transmission factor of 50%) and highly insulated frames (U-value of 0.8 W/m^{2}K).

Elimination of thermal bridges. By suitable application of insulation, linear thermal transmittance is reduced to below 0.01 W/mK (exterior dimensions).

Air-tight building shell. Air leakage through unsealed joints must be less than 0.6 times the house volume per hour at 50 Pa. This should be controlled with a blower door test.

The house has forced ventilation with exhaust air heat recovery.

If comfortable indoor climate conditions differ greatly from outdoor conditions, it is always recommendable to use a ventilation system with heat recovery (or vice versa with cold recovery) to maintain a high indoor air quality without the need of huge heating or cooling demands in accordance with ISO 7730 for a definition of "comfortable indoor climate".

Passive houses have a continuous supply of fresh air, optimized to ensure comfort of those living in the house. The flow is regulated to deliver precisely the quantity required for excellent indoor air quality. A high performance heat exchanger (efficiency > 80%) is used to transfer the heat contained in the vented indoor air to the incoming fresh air. The two air flows are not mixed. On particularly cold days, the supply air can receive supplementary heating when required. Additional fresh air preheating in a subsoil heat exchanger is possible, which further reduces the need for supplementary air heating. Fresh air may be brought into the house through underground ducts that exchange heat with the soil. This preheats fresh air to a temperature above 5°C (41°F), even on cold winter days.

Finally it should be added that the building companies contracted to build the area agreed to refrain from using fossil fuels. Likewise, fossil fuels were abandoned on the exhibition sites of Heimfeld and Wilhelmsburg. Thus no gas and oil is used.

Figure 4. Solar Collectors.

Passive houses are not very expensive

The shift from conventional energy demands to solutions described here is not necessarily very expensive. It is sufficient to minimize energy use with simple systems from conventional sources. The passive house is the most energy efficient standard with only 10% additional construction costs in Germany and a very good combination with renewable energy supply.

There is always the chance to find your individual energy standard using the principles of the passive house idea.

But never forget, if you build your energy efficient building 20 km away from your office and there is no chance to use public transport, the energy demand for the car is as high as PE-electricity.

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Photo on right page.
The Baltic Sea region from satellite © Nasa. Credit Provided by the SeaWiFS Project, NASA/Goddard Space Flight Center, and ORBIMAGE (http://visibleearth.nasa.gov/view_rec.php?id=1223).

PART V

ANALYSIS AND COMMENTS

A synthesis of the developmental trends in the Baltic Sea region requires that the topic of sustainable development is understood on a systems level. How are the different aspects connected to each other? Which is the most efficient way to achieve an improvement? And the measuring dilemma: Is it possible to give a figure indicating how sustainable the region is? Do we know in which direction we are heading? Scientists have only preliminary answers to these questions. Still we know enough to make a general comment on the state of the Baltic Sea region. Even if we are far from sustainability, the region is in the forefront in the efforts to formulate proper policies to go in the right direction. To improve we need more research.

Assessing Sustainability in the Baltic Sea region

Can it be done?

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The importance of numbers

In order to steer the Baltic Sea region, or for that matter any region, country or smaller area, towards sustainability we need to know in which direction to go. A general direction is possible to indicate. Some obvious un-sustainability trends should be avoided, and to point these out has been a major task of this publication. A more precise policy for sustainability however needs also a more precise measure of sustainability and means to monitor it. We need to know more exactly how much sustainability would increase (or un-sustainability decrease) with a certain change. This question has been recognised early on and since the 1970s research to develop improved methods has been ongoing. Especially in the field of ecological economics a number of measures have been proposed, such as ecological space, ecological footprints, eco-points etc. Below I will review some of these and point out possibilities to use them in a systematic work for improving the situation in the Baltic Sea region or in general.

The prevailing ways to understand sustainability depend much on the original definitions of the Brundtland Commission emphasizing intergenerational equity, and the Rio Conference underlining that economic, social and environmental aspects all have to be considered. Even if these positions are fully accepted they have not been easy to make operational or quantitative. Here I will argue that it is more useful to discuss SD as an issue of limited resources and good resource management. Resources can be defined both for nature and for society. To study how the two interact is a core issue in SD.

Studying the limits

In the 1972 book on *Limits to Growth* (Meadows et al, 1972) the (un)sustainability of the world was demonstrated as the development of five parameters. These included population, pollution, resources, and production. The study used systems analysis to define how the different parameters depended on each other and thus together 'formed a system'. It was e.g. obvious that a larger population needed more resources to feed itself, and that gave rise to more pollution, which in turn decreased production. It is also clear that the planet is limited and resources were not infinite. The study attempted to in a more precise way study those limits. In the 2004 publication *Limits to Growth – a 30 Years Update* (Meadows et al, 2004) the same study was made with better methods,

better data and more experience. Eleven parameters were studied (Figure 1) this time. The conclusions, sorry to say, are largely the same.

The systems analysis and a systems understanding of a community or any other social system is a key method for connecting the different resources and actors to each other. Systems analysis allows us to see how the environmental, economical and social aspects of a society are interlinked. A study of sustainability in the Baltic Sea region would include as important components the study of resources, their limitations and use, and their inter-linkages using a systems analysis approach.

Finland's Futures Studies Centre in Turku is using systems analysis to study sustainability and how different proposed policies would influence it (Karlsson, S. 2005). Statistical data, which would allow the development of the models to be used, are today available in several research centres. The study and evaluation of sustainability policies both on a national basis and on a regional one would in principle be possible.

The *Limits to Growth* only looked at so-called global parameters. There are of course many different kinds of limits which may be approached or passed, and these should be studied to support concrete work on sustainability. Looking only at the ecological dimension regional limits include e.g. eutrophication of the Baltic Sea, acidification of lakes and forests, as well as the pollution with various chemicals. Probably it would be possible to study a number of biological as well as societal parameters in this way.

Footprints and ecosystems services

A few general measures of sustainability has been proposed and developed over the last 10-15 years. Best know are those that allow us to add up all figures into a single measure, may it be hectares, or kg or money.

The ecological footprint method was suggested by Wackernagle and Rees (Wackernagel et al. 1996). Here all actions in a society are converted into a single measure: the surface area needed to provide the ecological services, which makes the actions possible. It is intuitively easy to understand how this is done for food, which requires a certain area to be grown, or for fibres such as paper, which need a certain area for the forest used. The footprint can however be calculated for any action which has a material flow connected to it, e.g. transport or electricity. The ecological footprint can be compared to the existing active surface area of the planet or some selected part such as a country or e.g. the Baltic Sea region. We may thus with this measure in principle say if we are sustainable or how far away we are from that.

The global footprints network publishes yearly estimates of the footprint of the world and all countries. The latest data are cited in table 1 demonstrates that the countries in the Baltic Sea region have large footprints compared to what is on an average available for each person on the globe, 1.8 ha, it is 3-4 times too much. The resource use in the region is thus large and we are not at all sustainable. This way to calculate the footprint and its comparing with the global average is not uncontroversial. We may say that we have more area per capita in the BSR and thus only uses what is available to us. In fact several of the countries stay within their nationally available footprint. There may also be more areas available than what this statistics tell us since it may not properly include marine areas, which are very important in this region with the hundreds of thousands of lakes.

A more principal difficulty is that we do not know from these data where the footprints are. Is it in our countries or do we import it from far away? If we know exactly

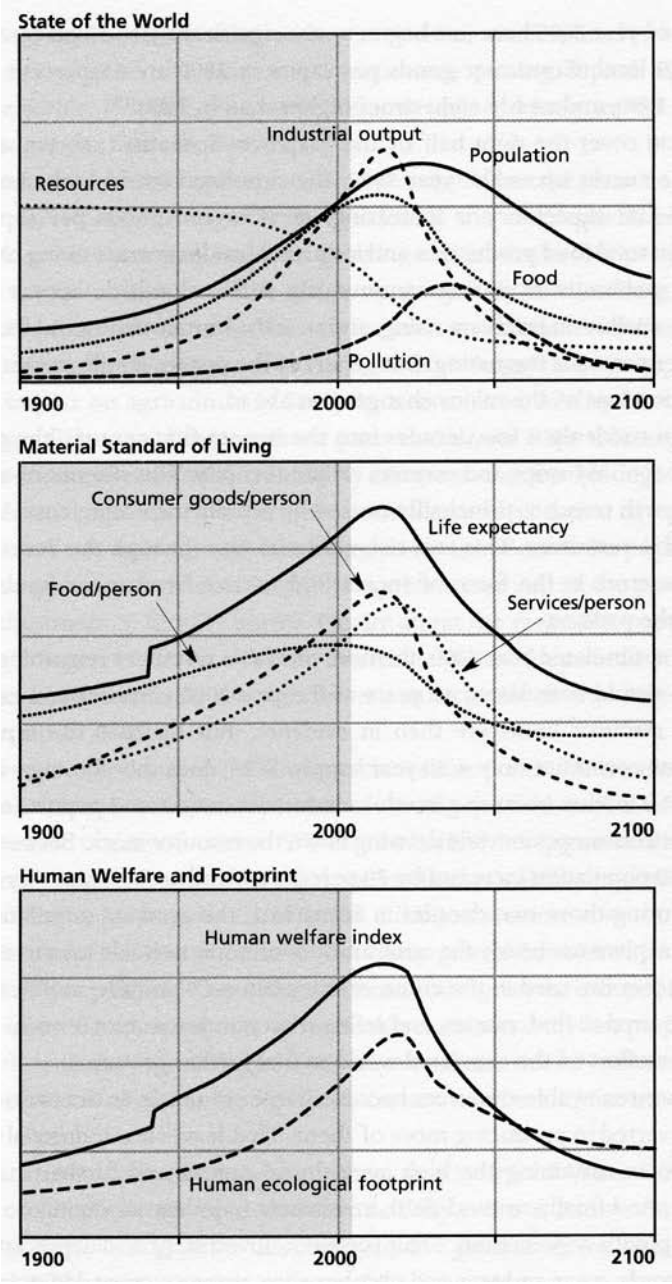

Figure 1. Limits to growth. The basic scenario. The world society proceeds in a traditional manner without any major deviation from the policies pursued during most of the twentieth century. Population and production increase until growth is halted by increasingly inaccessible nonrenewable resources. Even more investment is required to maintain resource flows. Finally, lack of investment funds in other sectors of the economy lead to declining output of both industrial goods and services. As they fall, food and health services are reduced, decreasing life expectancy and raising average death rates. (From Limits to Growth – The 30-Year Update, Medaows et al, 2004).

Table 1. Ecological footprint and biocapacity of the Baltic Sea region countries (Source: Global Footprint Network http://www.footprintnetwork.org/).
* Built-up land is included in both Total Footprint and Total Biocapacity (by definition, Footprint and Biocapacity are equal for built-up land).
** Negative numbers indicate an Ecological Deficit, positive numbers an Ecological Reserve Numbers may not always add due to rounding.
World total population includes countries not listed in table.
Table includes all countries with populations greater than 1 million for which sufficient data are available for Ecological Footprint calculations.

	Population	**Area**	**Total Ecological Footprint**	**Total food. fiber. and timber Footprint**	**Total energy Footprint**	**Built-up land**	**Total Biocapacity***	**Ecological Deficit or Reserve****
	(millions)	*million ha*	*(ha/person)*	*(ha/person)*	*(ha/person)*	*(ha/person)*	*(ha/person)*	*(ha/person)*
WORLD	6 225.0		2.2	0.9	1.2	0.1	1.8	-0.4
Belarus	9,9	20,8	3.1	1.5	1.5	0.1	3.3	0.2
Czech Republic	10,2	7,9	4.9	1.8	3.0	0.1	2.7	-2.2
Denmark	5,4	4,3	5.3	2.2	2.9	0.2	3.4	-1.9
Estonia	1,3	4,5	5.9	2.5	3.2	0.1	5.7	-0.1
Finland	5,2	33,8	6.8	3.2	3.6	0.1	12.3	5.4
Germany	82,4	35,7	4.4	1.4	2.8	0.2	1.8	-2.6
Latvia	2,3	6,5	3.4	2.5	0.8	0.1	6.8	3.3
Lithuania	3,5	6,5	4.2	2.2	1.9	0.1	4.1	-0.1
Norway	4,5	32,4	5.9	3.1	2.7	0.1	7.0	1.1
Poland	38,6	31,3	3.3	1.4	1.9	0.1	2.0	-1.3
Russia	144,1	1,710,0	4.4	1.4	2.9	0.1	7.0	2.6
Slovakia	5,4	4,9	3.4	1.0	2.2	0.1	2.9	-0.4
Sweden	8,9	45,2	5.5	2.8	2.5	0.2	9.8	4.3
Ukraine	48,9	60,4	2.9	1.2	1.7	0.1	2.0	-0.9

where an area we use for a certain service it would be easier to deal with a specific issue, and formulate a policy to improve it.

A general study on the ecosystems upon which human society depends were organised by the United Nations during 2001-2005. The results were published in the 2005 Millennium ecosystems assessment, a serious effort to find out what is the capacity of the planet to provide ecosystem services. The general conclusion is that they are decreasing. This is valid also for the Baltic Sea region as pointed out by the study of a number of areas in the region.

Material flows

Material Flows Analysis, MFA, calculating Total Material Flows, was developed extensively at the Wuppertal Institute by the team of Friedrich Schmidt-Bleek in the 1990s. Again the resources required for a certain action can be calculated as MIPS (Material Intensity Per Service unit) and expressed in kg. It is often a measure that more clearly describes the actual environmental impact of an action and points to what is best to change in order to improve it. It is measure quite useful in management work.

The general conclusion from the MFA work is alarming. We use up about 60 tonnes of material resources per person and capita in the region per year. This corresponds to all that is going on in the society, infrastructure development, transport, housing etc. Most of it is waste, that is, it does never end up in the society as useful material at all. For about one tonne of useful products we require about 30 tonnes of material. The resource efficiency in our societies is thus low, very low.

This material flows is much more than what in the longer term is available. It is thus unsustainable. Exactly how much it needs to be decrease is discussed. The book *Factor Four – Doubling Wealth, Halving Resource Use*, published in the 1997 by Weiszäcker and the Lovins, indicated that on the planet as a whole the resource flow need to be halved. But, if the efficiency were increase two-fold we would lose nothing. However if this is valid on the global level the industrial countries need to reduce much more as they use much more, if everyone should have an equal share. The Factor 10 concept, Developed by Friedrich Schmidt Bleek, suggests that in industrial societies material flows need to decrease with almost ten times to create a sustainable and just world.

Is this realistic? In many instances it is as research has shown, but probably not everywhere. We may point to two basic circumstances that need to be improved. One is the inefficiency of industrial methods of manufacturing and resource management. Secondly the management of waste is disastrous in our societies as a very large chare of resource flow in our societies are linear. We thus need to improve reuse, recycling, etc. The Johannesburg 2002 World Conference stressed the importance of sustainable production and consumption. *The European Commission Directive of Integrated Product Policy*, IPP, has this in focus, and develops to an important policy instrument in this sector.

Resources management as a new avenue

A more positive way to assess sustainability is to monitor resources. In a Baltic University project on local sustainability intended to produce practical strategies for cities and towns three kinds of resources were studied. The material flows resources (energy, water, waste etc); surface area/urban space (used for built environment, greenery and traffic and transport); and human resources (work, education, social care, third sector development etc). All

these three resources could be monitored using indicators, and strategies to develop them could be identified (BUUF website 2006).

To this short list we may add resources studied in other projects. Institutional resources is one important category in a society, which is identifiable to an extent similar to the three mentioned above. This includes democratic institutions, as well as political processes basic to the function of a society. Cultural, aesthetical and spiritual resources are others. Social capital may be included in the category of social and communicative resources. It is unclear to what extent we need to make a list of resources very long or if it is sufficient to identify fewer key resources. Per G Berg (Per Berg, 2002) suggests that sustainability of a society may be discussed in a complete enough manner using seven categories of resources.

The difficulties with the resource approach is that it is not obvious which values we need to assign to the resources for sustainability, that is the establishing the target values for sustainability. This will have to be the result of experiences. However the quantification of some of the resources, such as physical and biological resources, follows from studies of footprints and Material flows. Others such as communicative or institutional resources need to be established from future experiences.

Sustainability Indicators

Practical sustainability work has up to now relied on indicators to make it quantitative. Indicators are measures assigned to anything that is considered relevant for a certain activity. Thus the European Sustainable Cities and Towns campaign made a survey of local sustainability indicators and got 300 proposals. Of these 10 were selected to be core indicators and 5 compulsory for the cities in the network. The first indicator, most important, was the answer to the question "Do you like to live in your city?" The appreciation of the citizens is of key importance for the long term survival of a city. In the Baltic 21 sectors sustainability work is used for following if the policy goals are approached and the actions are fulfilled.

Indicators are of key importance for a practical work but how much do they tell us about sustainability? In the BUUF project 60 indicators were developed by a scientific advisory council. Although an effort was made to assign sustainability targets for them it was possible only for a few. Instead of absolute targets thus relative targets are used in so–called benchmarking. In this process many cities were compared and the best values are used as temporary targets. When these refer to e.g. crime, income and health it is obvious that it is difficult to have absolute targets, while experience tells us what is realistic.

Japan for Sustainability has used the indicators method for a quantitative evaluation. JFS has chosen 20 headline indicators for sustainability in four areas (Nature, Economy, Society and Well-being) and made the first numerical evaluation of national sustainability for Japan. Results show a score of 33.5 for 2005 in relation to a hypothetical perfect score of 100 projected for 2050, down about 19% from 41.3 points for 1990. The overall analysis of the estimation shows that sustainability in Japan has rather declined than improved, though some of indicators have shown improvement (see links).

Inclusive wealth

Is it possible to evaluate the resources a country possesses in conventional terms that is capital expressed in current money? The Global Domestic Product, GDP, or Global

Is sustainable development a science?

The concept of Sustainable Development was introduced already in the early 18th century as a consequence of the catastrophic over-utilisation of forests in Europe. Germany and Sweden was part of this development; later it touched also England. To find out how society and nature may coexist harmoniously is thus since long a well-known dilemma. Over the 20th century this dilemma has become acute due to the dramatic expansion of human society and its use of resources. Over the hundred year period 1900 to 2000 the global population increased by a factor of four – from 1.5 billion to 6 billion – the use of resources and total GDP with a factor of about 14, industrial production and the exploitation of flowing natural resources with a factor of about 40 (J. McNeill, Something new under the sun). Use of resources is, especially in its early stages, directly linked to environmental impact, and both of these in turn linked to the quality of human life.

It is obvious that resource use cannot continue in this way. We are already into an "overshoot" – using more than what is in the longer term available. If everyone lived like westerners we would need six planets. Development needs to take another path. It needs to be sustainable.

The modern quest for sustainability started with the publication of Limits to Growth (LTG) in 1972. LTG pointed to a future collapse if the present development continues unchanged. Its publication coincided with the Stockholm UN Conference and the modern environmental protection movement. From the start it was recognised that environment was linked to societal issues, such as poverty and democracy, formulated by the two late prime ministers Indira Gandhi and Olof Palme in Stockholm. Soon after the Stockholm conference the concept Sustainable development was discussed in the World Council of Churches context as an issue of ethics and the human dilemma on the spiritual level. The IUCN Ethics Working Group expressed this clearly in the World Conservation Plan published in 1980. The concept was made a global concern by the publication of Our Common Future in 1987. Also then the ethical dimension was clearly expressed. The UN conference in Rio on environment and development in 1992 finally put Sustainable Development firmly on the global agenda.

Both theoretical and applied aspects of sustainability have developed during this whole period. Even if we today see the first research institutions of sustainability science the field still has serious shortcomings. There is no consensus on how to monitor and measure sustainability, how to formulate a theory, and how to work with it in practice and implement it. A first series of answers to these questions do exist, but we need to deepen the understanding and practice of sustainability and bring the field to a new and deeper level.

It is interesting to compare with medical research. It is also a systems science – it deals with understanding of the human body and soul – diseases are also difficult to diagnose and it is not clear how to specify what is wrong. Medicine is also a science where ethical aspects are important, and where the application, the practice, is essential. Still nobody would use these shortcomings for denying the importance of medical research and its practice. We need to have the same attitude to sustainability.

National Product, GNP, measures have serious shortcomings. GDP is basically a sum of all monetary transfers in an economy, for good or bad reason, it does not reflect sustainability. Ecological economics have since long developed measures to evaluate natural capitals, such as productive capacity or fields, forests, and fisheries, of such as ecosystems services, of natural wealth appreciated for reasons such as beauty and diversity. This is better and has been used over the years to evaluate e.g. the value of the total ecosystems services of the planet (33 trillion US dollars), larger than the total manmade capital. However also these measures have been criticized for not reflecting a measure of sustainability. Two other measures have recently been suggested as a more relevant. Inclusive wealth intends to measure the sum of natural capital, human capital, human knowledge, manufactured capital, human welfare, or "all critical capital stocks in a society".

Above we have mostly been dealing with limited resources and how they are over utilised. Would it not be better to look at how resources may be built up through a good national strategy? Recently one measure, which reflects that, has been proposed. This is the inclusive wealth concept developed in a large international team of economicsts. In the *Inclusive Wealth and Accounting Prices* (IWAP) research project at the Bejer Institute of Ecological Economics of the Swedish Academy of Sciences the concept is used to test whether it would be possible to estimate accounting prices for ecological systems in Stockholm County (The Stockholm County project). The methods developed for estimating the accounting prices can later be applied to large-scale systems, in order to assess the sustainability of the joint economic - natural systems.

Several others are developing similar methods. In 2005 the World Bank published their *Where Is the Wealth of Nations?* Measuring Capital for the 21st Century, which reports from a several years study of developing and industrial nations all over the world. Similar attempts are ongoing also in other research centres.

Conclusion

Expressed in few words sustainability may be seen as the harmonious coexistence of society and nature. Here we refer to three parts: society, nature and the relationship between the two. Several sustainability aspects refer exclusively to society, such as institutional sustainability, others only to nature, such as biodiversity. However the key discussion today is how society exploits nature far more than it can sustain; this is the issue of the limits. Thus a number of activities in our society are largely un-sustainable and need to change (develop). We may point to industrial production, transport, community development, agriculture etc. Sustainability may be applied in terms of the management of a series of limited resources. If these resources are correctly assessed and it is understood how they are connected to each other proper sustainability strategies for resource management may be developed.

Many solutions exist. If policy would be more focused on the solution of the sustainability problems we would be able to go far. It is important to include researcher to develop proper methods to support that process. The academic world of the Baltic Sea region has good possibilities to contribute.

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Where Is the Wealth of Nations?: Measuring Capital for the 21st Century, The World Bank, 2005, Washington DC, USA

Links

Millennium Ecosystems Assessment
http://www.millenniumassessment.org/
Global Footprint Network
http://www.footprintnetwork.org/
Wuppertal Institute
http://www.wupperinst.org/
Factor 10 Institute
http://www.factor10-institute.org/
The Baltic University Urban Forum (BUUF) project
http://www.balticuniv.uu.se/buuf
Japan for Sustainability
http://www.japanfs.org/en/view/result.html
Stockholm County Project –Beijer Institute for Ecological Economics
http;//www.webforum.com.IWAP/home/indexc.asp?sid=768&mid=1

The Road to Regional Sustainability

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Any clear-eyed sustainability analysis of regional issues, trends, and possibilities – anywhere in the industrialized world – tends to come to three fundamental conclusions:

1. Sustainable development, because it involves a holistic and systemic view and requires extensive collaboration among diverse actors, is very complicated;
2. We are far from the goal of reshaping our societies to be economically and socially strong while also protecting and stewarding the natural systems on which we all depend; and
3. Some progress is being made, but the pace of change is still far too slow, given the pace at which certain critical problems are emerging and worsening.

The Baltic Sea Region is both typical and, in some ways, a rather extreme example of this general tendency. Our level of complication (that is, problematic complexity) is among the highest in the world, owing to manifold cultural and other differences, crowded into a relatively small geographic space. We occasionally receive dramatic signals about our distance from sustainability, in the form of massive algae blooms or pollution events in our largest common resource, the Baltic Sea itself. And we have ample trend data about both our problems and the pace of change in addressing them, thanks to highly developed national and international data sets.

In short, we have a long way to go to sustainability, and we know it.

This view can be seen either as realistic or as pessimistic, but it is grounded in data and a reasonable evaluation of current trends. When the data is good enough and the analysts are highly experienced – as is the case in this well-considered analysis of the Baltic Sea Region – this view is also credible, and it is an indispensable input to the policy making process. The conclusions in these Proceedings are built upon our best understanding of the facts, and the facts are always a good starting point: at the very least, they provide an initial basis for consensus that is low on controversy.

But this "realistic/pessimistic" view of what is currently happening is also, I propose, only half the picture. And it is in the other half of that picture – the half that concerns choices and changes still to be made – that most of the reasons for optimism are to be found.

Trend is not destiny

Use of the phrase "sustainable development" in the research community tends to focus, very appropriately, on the first of those two words: "sustainable". As noted in these Proceedings and in numerous other sources, a number of important trends in the Baltic Sea Region are not desirable, and probably not technically sustainable (in either the biophysical or socio-economic sense, or both) in the long term. For example, no one in the region wishes to see life expectancy in Russia continue to decline; the decline must

stop sometime, or aspects of that society will begin to collapse. Similarly, nearly everyone who focuses on the issue of regional demographics is worried about the implications of increasing urbanization and decreasing population in agricultural areas and smaller towns. As more and more people move to the cities and fewer people work the land, those cities – which become more dependent on increasingly long-distance flows of food, fiber, and energy – become more and more vulnerable to resource disruptions. Nations as a whole become less resilient.

Such region-specific issues are worrisome, as is the region's special vulnerability to more global phenomena such as climate change. But as the early sustainability philosopher René Dubos noted, "Trend is not destiny." A simple extrapolation rarely predicts the future with long-term accuracy, because people – from high-level government decision makers to ordinary citizens – do respond to trends. They change course. Indeed changing course is at the essence of sustainable development.

Development is, after all, simply a generic word referring to change in the form and function of contemporary human societies. Development is occurring all the time, and it is the product of current decisions as well the systemic (and often automatic) mechanisms that are themselves the product of decisions taken in previous years, or even previous eras. Sustainability is a relatively new way of understanding whether specific kinds of development are desirable or undesirable and, at the extremes, whether they are leading toward ideal conditions or toward eventual collapse. When current developments are judged to be unsustainable, change is the only reasonable alternative.

The reader of these Proceedings should therefore take the information presented here, and consider two essential questions: given what we know now, given what has been occurring in the Baltic Sea Region to date, given where we are currently headed, what must change? And how do we change it?

Some answers to those essential questions are also to be found in these Proceedings – for example, proven approaches for reducing unnecessary transport or improving the efficiency of cities – but by no means all. These Proceedings lay the foundation for much additional work on options and solutions. And in most cases, the question of "how to change" contains an enormously important strategic, socio-economic, and political dimension that is not a question of research and analysis. It is a question of capacity and implementation.

The capacity to create regional change for sustainable development depends on the presence of at least five critical factors:

1. A clear, guiding vision of what sustainability means for that region, including well-defined criteria or principles by which to assess progress toward that vision
2. Available policy models, technologies, and other innovations that move development trends in more desirable directions, together with an innovation process that responds to current results, emerging needs, and the quest for continuous performance improvement
3. Political will and other forms of social leadership (in business and civil society) to initiate change, drive it forward, and take the necessary risks to push change over the inevitable mounds of resistance that arise;
4. Systems to support continuous social learning and the rapid diffusion of knowledge and experience among all the relevant actors in the region; and
5. Effective platforms for collaboration and consensus building across national, cultural, and sectoral boundaries.

A world leader in the potential for sustainable development

Here is where we find reasons for hope, as well as a challenge. The Baltic Sea Region stands head and shoulders above many other regions in the world, at least in terms of its theoretical capacity for concerted and accelerated change toward a more sustainable development path.

We have:

1. The original Baltic 21 consensus and vision, enhanced by the emerging strategic vision of the "Baltic Sea Eco-region," as well as a high concentration of globally-recognized sustainability experts and institutions who can help define the realization pathways for that vision in specific terms. (Here I would be particularly remiss in not mentioning the Earth Charter, a global consensus document on common principles for sustainable development that is emerging as a guide or reference point similar in function to the Universal Declaration on Human Rights. The global Earth Charter Initiative, whose international headquarters has recently been relocated to Stockholm, could become a strong support to the realization of the regional Baltic 21 vision.)
2. A wide variety of best practices (both policy and technical) already working at smaller scale. Many of these are world-famous outside our region, but still not well known, or well-enough appreciated, within it. They range from innovative industrial parks to transportation policies to eco-tourism schemes. These can be scaled up and/or spread throughout the region in a more strategic fashion. We also have an extraordinary concentration of research and development capacity to generate new innovation on a continuous basis; this could be harnessed more strategically to the emerging Eco-region vision, with potentially powerful results.
3. A world-leading history of political and other forms of public commitment to the sustainable development agenda, including most significantly – regarding the regional level – the Baltic 21 process itself.
4. A variety of well-functioning educational, planning, industrial, and other networks for sharing information around the region, such as the Baltic University Programme (for university-level teaching and learning), the Union of Baltic Cities (for policy and practice in municipalities), and the Baltic 21 Institute (a virtual process for information sharing in industry).
5. Several very mature platforms for regional collaboration and bridge-building, including the CBSS, the Helsinki Commission, VASAB, and of course Baltic 21, to name just a few.

The only "missing ingredient" in this recipe – or rather the only ingredient of which we need a great deal more – is action.

We need to take much better advantage of these extraordinary assets to advance sustainable development in our region. Lack of implementation in this arena is usually blamed on lack of resources; but resources – that is, investments of money, time, and political capital – follow when the specific requirements are well spelled out, and where the case for a return on those investments is convincing.

Our continuing challenge in the Baltic Sea region is to make the roadmap to a sustainable future more clear, to make the case for sustainable development more attractive, and to make the alternative – a future of diminishing options and increasingly serious problems – more clearly understood. Success in this regard will require translating our vision, the research data on both the problems, and the best available insights regarding

current or potential solutions into three ”currencies” that have a greater capacity for persuasion: money, political capital, and perceived quality of life.

Unsustainable development is always costly, in financial terms, in human health and happiness terms, or both. And when such losses are known, or even simply suspected, the impact on political capital is immediate. But herein lies an opportunity, for when the costs are properly understood, the benefits of more sustainable options also become more apparent, and more attractive, in all three of these ”currencies”. Next steps in the sustainability research agenda for this region need to include work on making those translations, in ways that are both methodologically credible and compelling for use in communication with the media, decision makers, and the general public.

The following are some recommendations for moving the results of these Proceedings – and other recent policy and research work that meets the spirit of Baltic 21 – forward in more concrete, action-oriented terms. The recommendations are presented with some trepidation claims to priority, since all such lists are subjective and, at best, a strategic ”judgment call”; policy analysis is inevitably the product of an author's perceptions and values. I have tried to present a list of actions that comprises a ”no regrets” approach; and as much as possible, the recommendations are framed in terms of an informal ”cost/benefit analysis” with regard to the ”currencies” mentioned above.

Policy priorities for moving toward a sustainable Baltic Sea Region

1. Systems-based science and policy research to understand regional-EU-global couplings, and their effects on emergent threats and opportunities

While it may strike some as politically timid to make research the number one priority, a multi-disciplinary, systems-based approach is actually politically courageous – and absolutely essential for addressing sustainability needs in this complex region. Recent controversies about the true cause of algae blooms in the Baltic Sea is just the most obvious and limited recent example of the ways in which our research continues to lag behind our intervention needs. Meanwhile, true sustainable progress in so many sectors is determined by how well we understand the complicated ways in which the region's diverse economies, social norms, and ecosystems interact.

Other recommendations below will depend for their success on our steadily increasing ability to understand, and to work within, these complex interactions. A clear example to emerge from the Baltic 21 strategic planning exercises of 2004 was the coupling between global trade regimes and culture changes, EU agricultural policy, and local-level depopulation of rural areas in many parts of the Baltic Sea Region. Without a fairly sophisticated understanding of these couplings, policy responses stand little chance of being effective.

Research of this kind tends to appear, politically, as a cost with little immediate benefit. But in a region that depends for its future economic growth primarily on the development of intellectual capital, the costs would be modest, the immediate benefits would be significant, and the long-term pay-offs – from more efficient and innovative solutions – potentially enormous.

2. Urgent attention to the problem of depopulation in the rural areas

Placing this priority second underscores point (1), instead of contradicting it. Some of the most challenging dynamics in our region – ranging from rapid urbanization to aging

populations to carbon dioxide emissions – have strong links to the loss of rural culture, rural economic diversity, the biophysical sustainability of rural land, and ultimately to the sustainability of key life systems in the Baltic Sea itself.

This author believes that conversion to sustainable agriculture patterns – and retention of smaller-scale agriculture, where it still exists – would be both a partial solution to this problem, and a partial result of other positive efforts such as expanding agro- and eco-tourism or "poly-centric" regional development. But the issue is classically knotty, because of the aforementioned links to global trade and cultural issues (e.g., young people are increasingly hungry for more urban and "global" experiences").

The depopulation of the rural regions around the Baltic may be our single greatest economic "leak", since it couples to brain drain out of the region, and results in the devaluation of abandoned and depreciating rural assets, missed investment opportunities, and increasing pressure on urban infrastructure which is itself developing in ways that will prove costly in the mid- to long-term. The trend also has security implications: a depopulated countryside is much more dependent on mechanical systems powered by fossil fuels which, if their availability were ever to be reduced, could leave the region scrambling to meet its most basic needs.

3. Continuous attention to climate threats and energy solutions

Having mentioned energy, one must immediately focus on our energy system, and on the climate system to which it now essentially coupled. Speculation about this region's vulnerability to climate change-related challenges – both short term such as flooding events, and long-term from changes in the ocean-atmosphere circulation systems – is no longer science fiction, but a matter of probabilities. The region has two needs in this regard: (1) continuous monitoring of emergent threats (and the probabilities and timelines attached to them), and (2) redoubled region-wide efforts to switch to a full suite of climate-neutral energy alternatives.

The advantages of (2) have already been proven in many ways, and particularly in terms of their significant positive impacts on the economies of Denmark, Germany, and Sweden. A clearer view of the costs likely to result from (1) should give additional economic and political impetus to this important industrial transformation.

4. Accelerated development and diffusion of sustainable transportation systems

While there is much that needs changed about the way our cities manage energy and resources, the most urgent priority is the transformation of mobility, and particularly urban mobility. Addressing this issue involves more than changing the engines in our cars or encouraging the use of busses; it involves many other social, cultural, technical, and planning changes as well. These proceedings are particularly strong on this point, and indeed, our region has great strengths to build on; but the pace of change is not keeping up with the increasing need.

To paint a more specific and exemplary picture here, and to link this to other points above: imagine a future where a great deal more of our citizens vacation in our region, instead of flying off to points south. Where creative, rural-based (or small-town-based) attractions employ more youth in satisfying jobs that link them to the rest of the world in exciting ways. Where the restaurants and hotels serve local, ecologically produced food and feature furnishings and accoutrements that show off local production. Where the ways of getting there, and the attractions themselves, are powered by climate neutral and clean energy systems.

All of this exists at small scales, in specific parts of our region; and it can all be greatly expanded, to the benefit of the region's economic future, cultural vitality, and natural stewardship.

5. Serious attention to advancing new models for high-value, low-throughput economic development

This last point builds on the example in point (4), but expands it to an overarching strategy that needs to be more strongly driven by common policies. Sustainability depends absolutely on the world's ability to satisfy its needs and continue its economic development, while drastically reducing the cost in terms of resource consumption and waste. Several nations in this region have been among the first to embrace forward-thinking economic concepts like "decoupling" (of GDP growth from resource consumption) and "dematerialization" (reducing physical throughputs per unit of economic value). In the realization of these concepts lies not just extraordinary economic savings and competitive advantage for our region; these concepts are also critical for the world as a whole. Our region is already looked to as a leader in this regard. We have the research and innovation capacity to make more rapid advances than the rest of the world, and to export that know-how to the world's fastest growing economies such as China and India. Success on this last point would truly turn us into an "Eco-Region," with a global "brand" and unassailable competitive position in this regard.

The reader will note that all five of these points link to each other in important, inter-dependent ways. I propose that together, they create the possibility for great synergies; and further, that achieving this vision of being an "Eco-Region" is perhaps the greatest challenge, and opportunity, that we face.

The central importance of vision

While there is no forward motion without some sense of pathway and destination, it is also the case that the imperatives of sustainability present us with an uncomfortable necessity: we must make a long, difficult journey toward an essentially unknown destination. There is much that we can do to increase both our understanding and our confidence regarding direction, in the short and long term. But there are many unknowns and unknowables, and uncertainty will be our constant companion.

Left untended, a sense of uncertainty about best routes forward and ultimate destinations can lead to paralysis. But stasis – lack of significant action or change in our direction – is, in contrast, rather certain to lead to a cascading series of disasters.

The only "cure" for uncertainty is vision. And here Baltic 21, as a region-scale initiative, has a particularly important role to play.

Regions typically have a strong sense of shared identity and common destiny, but weak governance structures. As a result, regional sustainable development initiatives depend for their success on vision, persuasion and consensus, rather than regulation or directive leadership. Vision is critical to the identity of regions, and so regional collaborations are often best positioned to promulgate a vision successfully – because it is the best tool they have. As Per Berg writes, "The normally slow processes of change may occur much faster if they simultaneously are united by a common vision."

Having a vision – imagining the outcomes we want, and never losing sight of them – is our region's most reliable method for seeing into the future. Vision is what makes our creation of a preferred future possible, by building a sense of trust and common

purpose across the diversity of our societies. Vision is the most essential motivating and sustaining factor for all the rest of the work that must be done.

Articulating, elaborating, and promoting the vision of the Baltic Sea region as a world-leading Eco-region is, therefore, the most important and powerful strategy for creating a sustainable future. Vision is the core task of leadership, at every level of society and in every sector. If the political, business, and civil sector leadership of the Baltic Sea region could strengthen its unity of purpose and intention on just this point, and clearly and loudly signal that sense of purpose, remarkable things would be enabled to happen.

These Proceedings are a major step forward in both describing that vision, and in giving us good reasons to develop it, to promote it, and to ultimately make it real.

Participating Institutions

Research institutions, which contributed to the research symposium on Sustainable Development Patterns – Realizing a Common Vision for a Baltic Sea Eco-region, Kaliningrad, 27-29 October 2005.

Organisers:
The Baltic University Programme, Uppsala University, Uppsala, Sweden
The Baltic 21 Secretariat, Stockholm, Sweden
Immanuel Kant State University of Russia, Kaliningrad

Research Institutions:
SERI (Sustainable Europe Research Institute), Bad Oeynhausen Cologne; SD Policy
ProSus Research Centre, Oslo University, Oslo; Governance
Nordregio Research Institute, Stockholm and Helsinki; Demography; urban and rural development
SCOHOST, Stockholm Centre on Health of Societies in Transition
Södertörn University College, Huddinge, Sweden
Institute of rural and urban studies, Swedish University of Agricultural Sciences, Uppsala; Urban and rural development
Environmental Engineering, Kaunas University of Technology, Kaunas; Environmental impacts of traffic
Uppsala Hydrocarbon Depletion Study Group, Uppsala University and
Association for the Study of Peak Oil and GasSwedish Bioenergy Association, Stockholm; Energy - Biomass
Finland's Futures Research Centre, Turku School of Economics and Trade, Turku/Tampere; Modelling regional development
Departement of Political Science, Uppsala University, Uppsala
Beijer Institute, KVA (Swedish Academy of Sciences), Stockholm/Department of Systems Ecology, Stockholm University; Ecosystem services, footprints (not present)
Centre for Baltic Sea region studies, Copenhagen University; Democracy development (not present)
Institute for Sustainable Development, Warsaw; transport (not present)

Others:
Cajoma Consulting, Uppsala; Traffic and accident prevention, traffic policy tools
The AtKisson Group (www.atkisson.com)
City of Örebro, Sweden
Zebau, Hamburg Harburg Technical University, Hamburg; Energy efficient buildings

Sustainable development is getting increasing political attention all over the world, but perhaps particularly so in Northern Europe and in the European Union. Still there is a long way to go before we can talk about the Baltic Sea region as sustainable or even approaching sustainability. Which are the most prominent obstacles to sustainability and which are the most problematic developmental trends? These were issues addressed by a research symposium organised by the Baltic University Programme in cooperation with Baltic 21, in Kaliningrad, Russia, in October 2005. Participants in the symposium were researchers from universities and research institutions around the Baltic Sea region. Research may contribute by being more objective and therefore support better-founded policies for SD. The symposium that this small publication reports from is one initiative to achieve that. It will hopefully be followed by others.

The question addressed is so wide that a focus had to be chosen to make the discussions meaningful. Thus four broad areas were addressed specifically as problematic from the view of the development in the region. The areas chosen were:

- governance and policies for SD.
- demography, public health and urbanisation.
- mobility, transport and traffic.
- energy policy and energy supply.

These topics are treated in a series of articles and summarised in a chapter on how to find the road towards sustainable development for the Baltic Sea region.

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