

## **Strategies for sustainable development— experiences from a university cooperation in the Baltic Sea region**

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The 1990's have been a remarkable time for environmental protection in the world. Latin America staged the key event in this development, the Earth Summit in Rio de Janeiro in 1992. At this conference the concept of sustainable development was in focus and the basic document of its implementation, the Agenda 21, was agreed on among a majority of the nations of the world. Thereafter a series of initiative have followed and actions have been taken both on global, regional and local level all over the world.

This rapid development would not have been possible if not the Cold War had come to an end as the 1990's began. It obviously changed drastically the situation in the former socialist states as the Soviet Union was dissolved. The so called newly independent states, NIS, started to build democracy instead of totalitarianism, market economy instead of planned economy and environmental protection instead of ruthless exploitation of natural resources. But the end of the East-West confrontation had its effect all around the world, as a series of national and international conflicts, not the least in Central America, were addressed more constructively and many of them settled.

One result is an enormously increased international exchange and cooperation over the former barriers. In northern Europe the Scandinavian countries, not the least Sweden, created ties to the formerly closed eastern neighbours. New forms of cooperation engage governments, trade organizations, research, education, the health sector, agriculture, and include countless numbers of individual initiatives. The cooperation between universities resulted in hundreds of projects, encouraged by both national and European Union funding.

One of these projects is a network of universities, the Baltic University Programme, concerned with the developmental and environmental issues in the countries around the Baltic Sea, and the environmental situation of the Baltic Sea itself. This network has today developed into a group of 160 universities in 14 countries and at 70 places in the region (Fig 1.). The area of interest, defined from the outset, is the Baltic Sea basin, i.e. the drainage area of the Baltic Sea. This area is, when it comes to water management and environmental protection, a natural unit. It is not possible to improve the situation of our common water body without a cooperation between all those who influence it.

### **Common challenges for developing countries**

Is the situation in the Baltic region of relevance for what is going on here in Latin America or for that matter here in the Rio de la Plata basin? I believe it is, and for several reasons, but most of all for the fact that many developmental problems are the same in countries in a similar situation. In fact this was clearly demonstrated recently when the international masters program in environmental engineering and sustainable infrastructure at the Royal Institute of Technology in Stockholm looked for a good site for a study visits for their close to 70 engineers from all over the world, mostly from developing countries. Instead of going to the various sites in Sweden, as they did previously, they now spend a week in Latvia on the other side of the Baltic Sea. It is considered more relevant.

Latvia, as all the other NIS in the region, are now pursuing environmental improvements through investing in new plants, rebuilding infrastructure, developing their economic instruments for environmental investments and protection, and rewriting their environmental law. These tasks are the same in all "developing" countries.

A comparison between Latvia and Uruguay make the parallels even more obvious: both countries are so called middle income countries, both have a rather long academic tradition to

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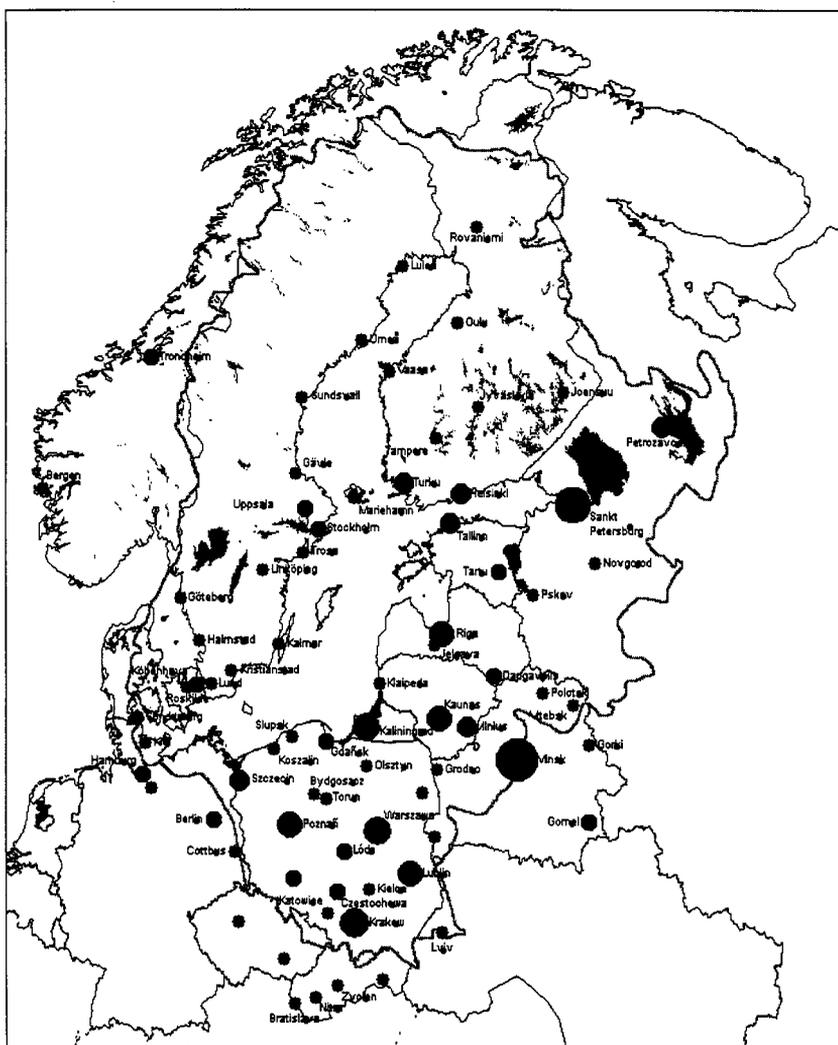


Fig 1

rely on, both have had natural resources grossly misused, both have disregarded their environment, and finally both recently came out of very difficult and paralysing political situations.

I will below attempt to make an overview of the priorities of the countries in transition in the Baltic region and how they tackle their problems. I will also review briefly the education we have developed within the Baltic University Programme to support the changes and provide needed competence to the society.

### **Sustainable development is the fundamental concept**

Sustainable Development, SD, and the Agenda 21 document have become key tools in this situation. It is often said that SD is a misnomer - the South wanted development and the North wanted sustainability and this was the compromise - and not a reasonable or even possible goal. But even if this might be an acceptable description of the political process leading up to the agreements in Rio it does not make SD less valid as a scientific concept.

A theoretical frame for SD, lucid enough to be useful in the implementation stage, has been proposed by John Holmberg at the Chalmers Institute of Technology (Table 1). His four principles of SD can all be applied immediately in environmental policy as will be exemplified below. They have been used repeatedly in reform programs at industries, municipalities etc. staged by the Natural Step foundation in Sweden.

In the Baltic region SD and Agenda 21 have had a large impact. In Sweden all of our 286 municipalities have a local Agenda 21 document, and a majority of them have created an organization to gradually implement it. Estonia is, to the best of my knowledge, the first country where SD was inscribed into the constitution. On the regional level it should be mentioned that the Baltic region is the first region in the world that are now creating a regional agenda 21. It is scheduled to be decided on by the member states in late summer.

The Baltic University Programme offered during 1997 for the first time a course in SD in the Baltic Region. During its first round 1.700 students at 68 universities followed the course with the aid of a series of ten booklets, a series of ten satellite broadcast TV programs, mostly showing good examples of sustainable practices in the region, and of course with the guidance of their local teachers. Cooperation between the universities, common computer and audio (and conventional) conferences, and the common material make us call the approach used "network education" rather than distance education.

Table 1. Four principles that operationalize the concept of sustainability as it was presented in the Brundtland report. They can be viewed as a more elaborate definition of sustainability and, as such, they can serve as a platform for discussions on sustainability issues, to be used in planning processes and in the formulation of policies at various levels of society. Practical experience from Swedish companies and municipalities (from J. Holmberg cited in *A Sustainable Baltic Region*, Booklet 3, chpt Towards sustainable materials management, Sten Karlsson)

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<u>Principle 1.</u>	Substances extracted from the lithosphere must not systematically accumulate in the ecosphere.
<u>Principle 2.</u>	Society-produced substances must not systematically accumulate in the ecosphere.
<u>Principle 3.</u>	The physical conditions for production and diversity within the ecosphere must not systematically be deteriorated.
<u>Principle 4.</u>	The use of resources must be efficient and just with respect to meeting human needs.

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### **Protection of water resources is a top priority**

What are the priorities in the environmental work pursued? Water, atmosphere, soil and biodiversity are all on the agenda in the Baltic region, in east and west, but typically water dominates especially in the eastern Baltic region? A tabulation (Table 2) of all environmental investments in Latvia in 1995 shows a typical picture. More than 90 % concerns protection of Sweden the first estimates, probably too low, for total costs for SO<sub>x</sub> precipitation is 2.5 billion SEK, or 300 million USD, yearly, caused through corrosions, decreased timber production etc.

Energy saving is again a win-win solution. And again it is important that the use of resources are being paid by those who use them. A pricing policy for energy is implemented slowly, and meters are being mounted in houses where they never existed. Families find out that it pays to seal windows when it is cold outside. It is of course crucial that one technically can regulate the temperature of radiators etc. A Swedish program for conversion of boilers to renewable energy resources is pointing to the possibility of making production of energy much more sustainable in the long term.

### **The limits of the environmental protection policy**

The focus on use of resources rather than pollution of the environment is typical for strategies of sustainable development. Man and environment interaction always had two legs - one is the extraction of resources from the environment, the other is the return of used natural resources to the environment, the fore end and the back end. A science of pollution concentrates on the back end and this has certain principle difficulties. The return flow typically contains hundreds of thousands of compounds some of them in very small amounts.

How to monitor this is a immense problem in itself and indeed environmental chemists did not manage this even if some major discoveries were made.

It is even more difficult to establish the biological effects of all these thousands of compounds. Even if rules of thumbs are available it is not possible to assure the non-toxicity of a compound to, say, humans even if it has been tested on another species. We will never be able to master the environmental problem if we only concentrate on the back end, the return

Table 2. Total expenditures in environment protection in Latvia in thousands Ls per year in years 1994, 1995. (conversion factors: 1 USD = 0.552 Ls; 1 ECU = 0.685 Ls). Source: Environment Protection indicators in the Republic of Latvia. State Committee for Statistics of the Republic of Latvia. Riga. Vol. 1995. Vol.1996. (cited from A Sustainable Baltic Region, Booklet 10, chpt Environmental Policy in Latvia by Arnolds Ubelis)

	Total expenditures	including						including expenditures for national parks
		protection of water resources	including payments to other organisations and enterprises	protection of air	protection of soil from pollution with waste	including payments to other organisations and enterprises	soil reclamation	
Total in Latvia 1994	6764.8	5592.2	2461.9	834.0	285.3	108.9	6.4	46.9
Total in Latvia 1995	12322.6	10198.9	3383.2	1789.9	297.3	160.4	27.4	59.1
Rural districts 1994	981.6	767.9	131.5	28.8	131.6	28.7	6.4	46.9
Districts 1995								
Riga 1994	3003.4	2618.1	1053.3	268.4	116.9	47.7	0.0	0.0
Riga 1995	3469.8	2850.8	1881.3	495.7	120/3	86.9	2.6	0.4

Table 3. Economic benefits and Environmental effect as water saving technology was implemented at five companies in Latvia. (cited from A Sustainable Baltic Region, Booklet 5, chpt Case studies of cleaner technologies and waste minimization, Joseph Strahl).

Company	Investment USD	Water reduction m <sup>3</sup> /year	Savings/year USD
Rigas autoelectrodevices plant	\$5 250	25 000	\$22 560
Lokomotiv	\$6 700	29 000	\$21 820
Arta-F	\$13 900	3 600	\$7 900
Rigas electromachines production plant	\$10 350	7 500	\$12 000
Rigas carriages production plant	\$12 300	3 000	\$4 000

flow, of the cycle of natural resources. At the same time as pollution through microscopic amounts of toxic compounds is a problem, the qualitative dimension is also problematic. Waste builds up in landfills, overloads lakes as waste water or change the whole atmosphere as carbon dioxide accumulates.

Alternative strategies focuses on recycling. Used resources are either recycled within society or returned to the environment in a form that can be accommodated by the biogeochemical cycles. Optimally only "natural" substances should be used or synthetic compounds that are biodegradable. Used materials is composted or burnt in incineration plants for energy purposes.

In industries entirely new production designs, cleaner technologies, are often needed. It may be illustrated by the leather industry and the tanning of hides. This sector uses today large amounts of chromium, which too often is let out into the environment. But alternative tanning methods exist. One factory in Sweden uses bark from an Eucalyptus tree instead of chromium. This method, ecological tanning, gives a high quality product and no environmentally toxic waste water. Price-wise it is a little more expensive than traditional tanning, but the method is still to be optimized.

An alternative to ecological methods is to design a closed process where process chemicals never leaves the factory, but is constantly recirculated to the production. This is today almost a reality for the pulp and paper industry, until recently a major polluter in northern Europe. Again this turns out to be a win-win solution. The investments required to reduce waste flows, not the least waste water flows, is good business.

In general one might say that all problems of environmental impact are connected with material flows. But this does not only refer to the kind but also the amounts of materials and chemicals. The figures of today's material budgets are staggering. Industrialized societies use some 40-80 tonnes solid materials per capita and year. To this should be added emissions to water resources, i.e. access to safe drinking water, treatment of waste water and to protect ground water, recipient lakes, rivers and the Baltic Sea. Reduction of emissions to the atmosphere, remediation of soil in contaminated sites, typically old military bases, and protection of biodiversity through the creation of nature reserves only account for a few percent of the investments.

One might believe that international organizations cover the large majority of costs for the investments. Although institutions like the World Bank, EBRD (European Bank for Reconstruction and Development), the Nordic Investment Fund and others are important the role of the national investments increase rapidly. Latvia, like Poland, have developed a National Environmental Fund. This fund is built up by fines and taxes for emissions and is used for advantageous loans for environmental investments. In Poland, the country with the best economy of the NIS, close to 90 % of environmental investments are covered nationally.

Investments in the water sector is dominated by the construction of waste water treatment plants in municipalities. The so called 800+ program financed by the World Bank and national resources, address waste water treatment all over Latvia. These treatment plants are mainly conventional, but there are also efforts to implement green technology, relying on the natural capacity of wetlands to reduce nutrients. Since eutrophication, caused mainly by waste water from households and agriculture, is the major threat to the Baltic Sea these efforts are all very important.

Water, like all natural resources, have been used carelessly in the NIS. Natural resources were during communist times taken for granted and exploited. To change the situation pricing of water, including measuring water consumption at the consumer, is now introduced. Even if pricing of water in households have to be introduced slowly not to ruin the already bad economy of the people it is still necessary. In fact the use of water per capita and day was, at the time of the systems change, almost three times as large in the east as it is in the west, although e.g. Sweden had much better access to water than e.g. Poland.

### **The search for win-win solutions**

Industries have approached the water issue in particular through waste minimization programs. These aim at managing resources properly. The philosophy is that resources should

leave the plant as products, not as waste! This is characteristic for the so called win-win solutions. The environment and the economy, the industry in this case, both gain. The good economy is illustrated by that fact that time for return of investments typically only is some 3-30 months (Table 3).

If access to good and safe water is important, so is clean air. Air pollution is mostly due to combustion of fossil fuels, and is tightly connected to energy production. Energy and water shows similar pictures when east and west are compared. The efficiency of energy use is much less in the east than in the west. At the same time Sweden, Norway and Finland have an almost unique access to good and renewable energy resources while the south-eastern Baltic basin has to rely on fossil fuels - coal, oil and gas, especially coal.

Burning of coal, oil and gas not only has a bad influence on air in the vicinity of the power plants or highways when it comes to traffic. It also has a regional environmental impact, such as acidification of waters due to SO<sub>x</sub> and NO<sub>x</sub> emissions. It also has a global impact through the carbon dioxide emissions and ensuing threat of global warming.

Very directly it also costs money. If the countries want to be able to pay for welfare improvements they can not afford to waste money on bad energy management. Above that the environmental costs should be added. They have been estimated in so called green budgets. In air and water. Material flows analysis are today available for e.g. Germany, the Netherlands, USA and Japan.

Material flows have been studied in particular by the Wuppertal institute in Germany. The conclusion, introduced by Friedrich Schmidt-Bleek, is that these flows must diminish on a world average by about two-fold in the long term to reach sustainability. A policy of equal access to resources requires that the industrialized world (20 % of the world) reduces its material flows by about a factor of ten in the long term. It may seem utopical but many examples on how to dematerialize services prove this to be possible. Factor 10 institutes have been created in Germany, Austria and Japan for example, and factor 10 as a long term policy is now discussed in the European Union and in several European countries.

### **Environmental policies and sustainability principles**

Environmental policy of the countries in the Baltic region is now rapidly going from policies of combating pollution to measures to secure sustainable management of natural resources and long term protection of biodiversity. Steps to diminish use of fossil fuels and to rely on renewable resources are still largely in the future.

It is worth to point out that environmental policy options can be matched to the four principles of sustainability in the Holmberg scheme. In short this may be summarized as follows:

- The principle of long term productivity of the biosphere - or the environment if one wants - is connected to nature protection. This is the oldest policy. The first measures of this kind is already one hundred years old with the first national parks. Today this policy addresses in particular protection of biodiversity.

- The principle of not letting man-made compounds accumulated in the biosphere corresponds to the policy of non-pollution. This is typical for the 1960's when the first chemicals, such as PCB and mercury compounds, were banned. Monitoring of environmentally dangerous chemicals were organized and legal action taken to keep reduce them. The so called end-of-pipe technologies were invented and implemented. Today more source-reduction methods are used.

- The third principle - not allowing compounds from the lithosphere accumulate in the biosphere - is connected to the policy of recycling. This is the present stage in Sweden and several other western societies. The return flow of in particular carbon as carbon dioxide, nitrogen as nutrients to surface waters, sulphur as acid rain etc. are adressed in this way. It will however not be enough until the carbon dioxide question is addressed seriously.

- The fourth principle, efficient and equitable use of natural resources, corresponds to the ecoefficient society, still far from where we are in the industrialized world. It is being addressed by the factor 10 proposal.

The four policy options are not meant to substitute for each other on a time scale. On the contrary they are all needed and are all connected. For example the extraction of copper from recycled copper (recycling policy) is about 500 times cheaper than taking it from the mines (efficient policy), it results in less pollution (non-polluting policy) and protection of areas where otherwise mining might occur (nature protection policy).

### A role for university cooperation - the Baltic University Programme

The efforts to develop a sustainable society require cooperation and contribution from all sectors of society. However universities have a special role in this picture. They teach the young generation which eventually will become the decision-makers in the society; they have the tools and means to find the new knowledge required; they have, as publicly funded institutions, a responsibility to provide basic information on societal changes to large sectors of society; and they certainly are well equipped to contribute to practical projects run by the state and local authorities as well as the private sector.

Table 4. Valuation of sulphur related damages (Million SEK yearly) in Sweden (cited from A Sustainable Baltic Region, Booklet 8, chpt Swedish National Green Budget).

Sector	Value of damage
Forest	550
Agricultural land	5
Freshwater	130
Corrosion	1885
Biodiversity	?
<b>Total</b>	<b>2.570</b>

In the Baltic region the Baltic University Programme is a network of universities that has addressed these issues and aims at supporting the universities in carrying out these roles. At present it is dominated by the production and implementation courses, although there is research cooperation, a rather large program to produce TV for the general public and finally a growing cooperation with municipalities on issues of sustainable development and environmental protection.

The Programme started 1991. The some 160 universities or other institutes of higher learning that presently take part in the programme include classical universities, as well as universities of technology, agriculture, culture, economics, pedagogic etc. All countries within or partly within the Baltic Sea drainage basin are represented: Finland, Estonia, Latvia, Lithuania, Russia, Belarus, Poland, Germany, Denmark, and Sweden and more marginally Ukraine, Slovakia, Czechia and Norway. A large network of researchers and teachers at the universities have developed consisting of some 1000 individuals. Most of these are active within environmental science but contributions from humanities and social sciences gain in importance. The Programme is financed mainly by Swedish Governmental funds for cooperation with Eastern and Central Europe within Sida and SI. The Programme has aimed at creating truly international university courses with relevance for the countries in the Baltic region. The courses are both produced by universities in several countries and followed by students in several countries. Satellite TV, used from 1991 to reach the participating students, have now been complemented with video- computer- and audio-conferencing. The courses are interdisciplinary, problem oriented and based on ongoing research at the participating universities. The language used is English. Translations are now being made, however, into Polish, Russian and Latvian languages of both booklets and TV productions.

### **A course on sustainable development**

The course *A Sustainable Baltic Region* is, first offered in spring 1997 when 1,700 students at 68 universities took part, deals with the long-term future of the region with an emphasis on resource management. Important issues are energy, material flows, economy and ethics. Four sectors in society are discussed: industry and manufacturing; agriculture and agricultural production; transport and traffic; and habitation and community development. A concluding section deals with implementation strategies and the Agenda 21 practices.

The course material consists of ten thematic books, of a total of some 500 pages authored by 70 experts. A TV series of ten 45 min programs produced by a consortium of 17 TV companies most of them national broadcasters, describes some 80 cases of good practices around the region. The TV series is broadcast in national versions to the general public as a reach-out activity of the Programme.

The course model is similar to that used in previous courses in the Programme. These deal with environmental issues and the development of societies, including democracy, minority issues and national security. The Baltic University Programme has up to today produced 28 publications encompassing a total of some 1200 pages. Three courses register close to 3.000 students yearly, or some 120 student groups.

Offering a course on sustainable development is a true challenge for any university and even more so for an individual teacher. Sustainable development is not an established academic discipline. There is no one who is an expert on all questions arising. To support the teachers in the BUP network we organize teachers seminars. These discuss how to use the material, how to build a network to teach a course, not the least to recruit colleagues at his or her own university but also outside, how to cooperate with practitioners especially at their own municipality, and finally how to address questions of sustainability.

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