



Summer Course on Sustainability, River Basin Management and Climate Change in the Baltic Sea Region

Dealing with the challenge of climate change in the Baltic Sea Region: promoting regional sustainable development

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Introduction

1. . Climate change – true or false? p. 4
2. Climate trends p. 4
3. Impacts of climate change p. 5
4. Adapting to new conditions..... p. 6

Conclusion

References

Appendix

Introduction

The man is a part of the environment in which he lives and for millennia incessantly he is acting. Till the half of XIX century balance in man-environment system was maintained. People cooperated with nature, which gave them food and a space to live.

Since industrial revolution changes in the environment become very intense. Growing industry based on natural resources came into cities causing a very fast development of them. Traditional industry was energy-intensive. Consumption of coal increased displacing wood. As a result a slow process of CO₂ accumulation in the atmosphere got started. Increasing amounts of pollutants in the air, especially greenhouse gases, results in global warming.

It is not obvious whether the man is responsible for the phenomenon of global warming, however climate changes are proven scientifically. The most popular point of view, created largely by public media, is that climate change under the influence of human activity.

Climate change is perceptible now. We observe shorter, milder winters, experience a higher frequency of extreme events (floods, droughts, storms etc.). Additionally, a rapid economical growth leads slowly to depletion of natural resources of the environment. Transforming the natural landscape in some cases results in upsetting the natural balance. Scientists agree that the environmental costs of supplying ourselves with energy etc. are incomparably high. The scale of changes is enormous, effects are omnipresent, challenges connected with them still bigger. Fortunately it's not too late.

Scholars are conscious of changes of air while the awareness of the society is little, often fragmentary. Societies are still learning a new way of reacting to climate changes. We are seeking the new way of solving arising problems.

The global warming is a complex problem not only because of not entirely bright genesis but also on account of diversified and precarious effects. The global warming is becoming not only an environmental problem. Environmental problems turn into problems of the economic, social and the most importantly ethical nature. Having an influence on societies inhabiting the globe, climate changes are becoming significant also for policies of individual states.

Countries have got diversified goals, thus it's difficult to reach a global climate agreement. This can be seen from the very beginning i.e. since the Kyoto Protocol, when these agreement was not ratified by the biggest polluters – The Republic of China and United States of America.

The Baltic Sea as a part of global ecosystem is also a subject to various global influence such as increased emissions of greenhouse gases. The Baltic Sea constitute an important economical, social and cultural value for millions of people living in its basin. Therefore a lot of changes of Baltic Sea and their consequences, which has already been observed, and those which can take place, must exactly be examined.

Baltic Sea Region is extremely involved in activities related to climate changes. A number of programs aimed at adaptation and mitigation to global warming arises there. These actions are a part of a broader agenda - the promotion of sustainable development. The scientific community more and more clearly is stressing the need of drawing up and implementing the strategy based on the idea of sustainable development.

Sustainable development is a broad concept. It requires integration of many areas, both science and practice. Social education is the key to sustainability. We can't forget we are still only a part of complex environmental system. We can't control climate sensitivity but we can control our activity. All of us have a responsibility to do something about it. We cannot be ignorants because this fact relates to us and our descendants. Anyway, we need to care about our common future. The action we take today will determinate the wellbeing of future populations.

1. Climate change – true or false?

Climate changes are a very controversial problem. In scientific environment opinions are divided. There are scientists who claim that global warming exists and it's definitely man-made phenomenon. Some believe in global tendency to warm but they can't say that human are responsible for that fact. Global warming is not about pollution. There are also scientists who argue that climate changes are a natural process and we can talk about something like warm-cool cycles (when warmer periods happens after cooler periods in concrete time boundaries). Thus, global warming doesn't exist. It's just business. New, great political scene. The climate has always changed. And, in the end, there is completely different standpoint – global warming doesn't exist but earth has a tendency to cool. Global cooling could be far worse. Certainly, in the future an example of the latest severe frosts in Europe will serve as an argument for global cooling.

To sum up the main problem in climate changes is uncertainty. That means we don't exactly know what we are standing on. We need to act in order to avoid negative impacts. But we need to prepare for various possible future scenarios, not only this most probable.

2. Climate trends

Intergovernmental Panel on Climate Change (IPCC) published four reports so far. All of them definitely proved the existence of the global warming and had a big influence on understanding of climate changes. Activity of the man was being blamed for climate changes, especially exaggerated transmitting greenhouse gasses as a result of burning fossil fuels and massive deforestation.

Meanwhile, the global population is growing as well as its energy needs. Now in the world lives almost 7 billions of people. We can observe a sharp increase of air pollutants. Over the last decade average emissions had been higher than the highest IPCC projection. As a result air temperature rises faster and faster. In the last century it grew about 0,74°C, whereas from the end of 70. about 0,4 °C. Average global warming at the end of XXI century is estimated for 2,5 up to 4,1°C. Scientists show scenarios of future climate changes. (Fig. 1).

Baltic belongs to the most studied sea areas in the world. Extensive research shows Baltic Sea region is very vulnerable for climate change. Annual air temperature during period 1871-2006 definitely increased but it varied in the different parts of the region – from 1°C in the northern areas to 0,7° C in the south. An alarming fact is that warming in the Baltic Sea

area is a little stronger than average warming all over the globe (0,75° C). This tendency is

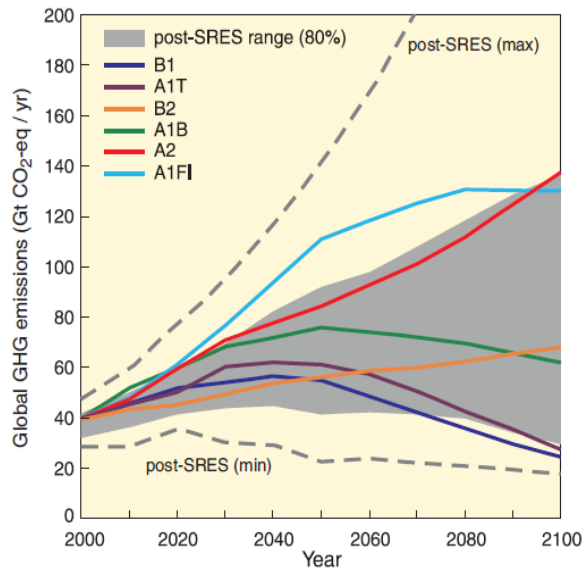


Fig.1 – Global GHG emissions in the absence of additional climate policies. (IPCC, 2007)

going to continue in the nearest time. Scientist predict continuous increasing trend of temperature up to the year 2100. It is said about rise by 4-6° C in the northern part of the basin (Sweden, Finland, a part of Russia) and 3-5° C in the southern part (Poland, Germany). As a result of rising air temperature, water temperature can also increase by about 2-4°C.

Climate change in the region is indicated by: reduction of thermal winter and increase in the frequency of thaws during winter, declining thickness of the ice

cover and decreasing duration of the ice season in rivers and open sea (by 14–44 days during the 20th century, diversified in the different parts of region).

Climate change in regional scale is similar to those in global. Therefore projections of future climate changes are based on scenarios for the entire earth. Although predictions show that temperature will still rise during the 21st century, some scientists suggest climate change will stop the Gulf Stream and lead to a new ice age to the Baltic Sea region. What would be then? It seems to be even worse scenario than global warming.

3. Impacts of climate change

Warming is already under way. What effects can we expect? We can distinguish several groups of future consequences: environmental effects, social effects, economical effects and political effects. Some of them are included in tab. 1.

Climate changes can indeed modify the hydrological cycle and the available water resources, through intensifying of extreme meteorological and hydrological phenomena. The higher air temperature can cause hastening the hydrological cycle and the process of evaporating can be more intense. It will cause reduction of water resources (including soil water).

The fall in aquatic resources in the summer period, while plants demand for water is the greatest, would restrict the approachability of water for ecosystems. It would create the essential barrier of their development or, in extreme cases, changes in the incidence of many species of plants.

Positive effects frequently will be alternating with negative effects. Especially terrestrial ecosystems could benefit from longer growing period. In the same time the risk of damages by insects, fungal pests and other stresses are more likely. Shipping would benefit because of ice-free conditions on seas while populations of many endemic sea species is threatened – they're dependent on ice surfaces in order to reproduce.

Global snow cover is melting resulting in rising sea level. Along with increased storm frequency and their intensity will lead to intensify erosion, flooding the lower-lying areas and damages in the coastal infrastructure. Resorts, major ports, and houses of people living there are at risk.

Economical and social consequences could be quite severe. Climate changes means rising risk to all sectors of society – public health, food production, water supply etc. Sterns' Report (2006) indicate a threat of lowering GDP on average about 20 % and even more in overpopulated regions. We can suspect social problems resulting from the lack of livelihood and poverty and forced migration because of coastal flooding[SR s. 14]. Due to droughts, millions of people will lose access to water. In combination with population growth in less developed countries it would lead to increasing water stress and increasing frequency of water conflicts.

In many areas, global warming will be reflected negatively on the quality of human life. We can expect growth of malnutrition and negative health effects, including an increased number of allergies. Heightening number of heat days could be the notable nuisance especially for older people. What more seasonal species connected with warmer climates will drive in more areas, spreading the diseases all over the world. It's a big risk for public health.

Thee most susceptible – the poorest countries and the poorest part of the population – they will suffer damage first and in the large degree, although the least they contributed to climatic changes.

4. Adaptation to the new climate conditions

Climate changes have been noticed by humans and now they are evaluated and monitored. Global warming turns out to be a harmful threat to human wellbeing. What is surprising people are not aware climate changes and future consequences of them. But the worse is that local stakeholders and decision makers know a little too. In many cases media are the main source of information to them. The problem is that information which are widely widespread through television, radio or press are in general fragmentary or excessively simplified.

The conference in Rio defined XXI century as a century of sustainable development and pointed out those global ecological problems. Is it possible to solve existing problems and build sustainable world today if we don't know what actually we are struggling with and what to do?

Avoiding climate changes which will take place isn't already possible. We can however protect our societies and the economy from their consequences – for example by informing, planning, planting more immune plants or building the fail-safe infrastructure. Our measures should be taken to slower environmental impact. But we need to act quickly because symptoms of global warming are already observed. Without proper human action world is going to become unsustainable system. So what to do?

To achieve sustainable development we need three main actions:

1. more scientific studies (data acquisition, evaluation, prediction),
2. improvement of human awareness in the region (education),
3. implementation of achievements in the documentary (very strict law).

Education should be the base for other purposes. To meet climate challenges we're facing every inhabitant of a globe needs to understand what he should to co tackle climate change and how important sustainable development is. Addressing the problems posed by sustainable development is possible only by understanding the interactions between humans and the environment. Integrated understanding of environmental problems in the global scale requires interdisciplinary action and join involvement of society, economies and politicians. A big number of courses, conferences, work groups and forums are essential. These initiatives could be a place for exchanging experiences, information, fears and proposals concerning past, current and future purposes in the matter of climate changes. We need to employ people into concrete action!

In the Baltic Sea Region The Baltic University Programme (BUP) is an example of fantastic educational undertaking. Programme is being coordinated by a Secretariat at Uppsala University in Sweden and it is about networking of more than 200 universities and institutes of higher learning in 14 countries in the BSR. It focuses on the matters of sustainable development, environmental protection and democracy. Programme provides research, information and education in recalled areas. It is based on both students and teachers constant learning. There are organized courses, conferences, meetings and many other initiatives. BUP create also a rich learning environment - from booklets to books, videos and seminars.

Integrated studies are also needed. More scientific experiments would be a base for future action. They will provide data on the changing circumstances and postulate possible solutions which can be then implemented into a law. An example of integrated scientific studies in the BSR could be CLISAP ("Integrated Climate System Analysis and Prediction"). It's a Cluster of Excellence of the University of Hamburg. At the KlimaCampus meteorologists, oceanographers and ecologists cooperate with social and economic experts.

Another regional projects aimed at mitigation of climate changes and sustainable development could be: BALTEX, BSAP, ASTRA, BaltCICA, WATERPRAXIS, BaltSeaPlan and many others. Many of them are a part of broader programme – Baltic Sea Region Programme 2007-2013. (Tab. 2)

Beside scientific research support for the implementation of national, EU and many global initiatives to reduce emissions of greenhouse gases is necessary. First joint action in the BSR - Helsinki Covention took place in 1974. Now, thirty six years later, Almost all countries in the region, except Russia, are members EU the role of EU's policy is more crucial than before. It also means that constant dialogue between countries in essential. Now The European Union (EU) objective is to limit global warming to no more than 2°C above the temperature in pre-industrial times. EU requires carbon emission trading system to eliminate the amount of CO₂ releasing to the air and to promote green technologies in the region.

Good description of property rights is also needed. World and it's environment is joint property. Most of natural goods are common for people on the earth. That means all of us manage them, all of us has a part of them and all of us should be responsible for them! Problem occurs when we take a part but we don't feel responsible. Would we come to our senses if the law punished us severely for abuses?

Conclusion

It depends on you and me what world we leave to the next generations. Even if we don't know what will happen for sure, it is possible to take positive actions on the basis of information we have gathered so far. We should prepare for any possible future scenarios. That is why more research, data and information is required. But the most important is the willingness to do something, to think globally and act locally.

There are still many things to do. We need to find a common ground in problematic issues like carbon trading. We need to act. We need to change our minds. But the most we need - to live in a new, better world, with renewable resources and non-devastated environment. In the world which will provide a decent life to our descendants. That is what we want – sustainable future.

References

Anders Stigebrandt, Bo G. Gustafsson, Response of the Baltic Sea to climate change—theory and observations, *Journal of Sea Research* 49 (2003).

BALTEX Assessment of Climate Change for the Baltic Sea Basin - The BACC Project – Chapter Summaries. (Available at: http://www.baltex-research.eu/BACC/material/IBS_No35_BACC.pdf)

Climate Change Assessment for the Baltic Sea, Basin, EOS, *Transactions American Geophysical Union*, vol. 89, no. 17.

Danish adaptation to future climate, Danish Energy Agency, Copenhagen 2008.

HELCOM, 2007, Climate Change in the Baltic Sea Area – HELCOM Thematic Assessment in 2007, *Balt. Sea Environ. Proc.* No. 111.

IPCC, 2007: Climate Change 2007: Synthesis Report. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland.

J. Kaskinen. (2007). Climate change and the futures of Baltic Sea, *Baltic Rim Economies*, European Institute, Bimonthly Review 3-2007.

Leal W., Mannke F., Towards policies and adaptation strategies to climate change in the Baltic Sea region – outputs of the ASTRA project, *Boreal Environment Research* 14, Helsinki 2009.

M. Gutry-Korycka, T. Markowski (ed.), Sustainable Livelihood in Changing Earth System, *Biulletin KPZK PAN*, vol. CXXIV, Warsaw 2009.

STERN REVIEW: The Economics of Climate Change. Short Summary.
(available at: http://www.hm-treasury.gov.uk/d/stern_shortsummary_polish.pdf)

Kiirikki M., Effects of Climate Change on Eutrophication in the Northern Baltic Sea, WWF, Sweden.

<http://www.baltcica.org/>

<http://www.baltseaplan.eu/>

<http://www.balticuniv.uu.se/>

<http://www.clisap.de/start.151.0.html?&L=1>

http://eu.baltic.net/The_Baltic_Sea_Region_Programme_2007_2013.2.html?

http://www.helcom.fi/BSAP/en_GB/intro/

<http://www.waterpraxis.net/>

Appendix

Tab. 1 - The sectors most influenced by climate change (*Danish adaptation to future climate, 2008*).

Sector	Changes
Coastal management	Risk of erosion and flooding. In coastal towns the risk of flooding will increase. Rising sea levels and more storms damage coastlines and dykes.
Buildings and infrastructure	Heavy downpours can flood basements and affect installations such as sewers, roads, bridges, tunnels etc. Warmer summers and wet winters may pose problems for indoor climates. Stronger storms may affect houses and bridges.
Water supply	Changes in precipitation affect the possibilities for water extraction.
Energy supply	Need for less heating in winter and more cooling in summer.
Agriculture and forestry	Longer and warmer growing seasons provide opportunity for increased production, but also increase the need for fertilizer, pesticides and irrigation. This may add to environmental problems such as oxygen depletion. Not all trees will be stable in the future climate.
Fisheries	Changes in the combination of fish species in the sea.
Nature management	Animal and plant species are weakened if they do not adapt to changes in climate. Risk of unwanted invasive animal and plant species.
Land use planning	Because of higher sea levels and increased precipitation some areas become wetter with a resulting higher risk of flooding.
Health	Heat waves may result in an increase in illness and deaths. Warmer climate may bring more pollen and this may lead to more people suffering from allergies. Warmer climate may mean new and changed risks of infection. Warmer and more humid weather may lead to more indoor-climate problems, including more problems with moisture damage, mould and dust mites.
Rescue preparedness	Storms, storm surges, downpours, drought, and wild fires cause an increased need for rescue preparedness.
Insurance	Sudden downpours and storms may cause more expensive insurance against weather impacts and cause changes in insurance terms.

Tab. 2 - Regional projects aimed at mitigation of climate changes and sustainable development
(own study).

<p>BALTEX</p>	<p>(Baltic Sea Experiment). It's interdisciplinary, multinational project, called shortly BACC (BALTEX Assessment of Climate Change for the Baltic Sea Basin). It is first systematic scientific effort taken in the purpose of assessing climate changes in the European region. The aims of BALTEX are: understanding and predicting weather, climate and global change in the Baltic Sea Region. It was worked out by 84 scientists from 13 countries near the Baltic Sea. BACC includes both – scientific and environmental policy makers point of view. It links historical and current facts with projections of future climate changes.</p> <p>The most important part is about possible impact that climate changes may cause, on terrestrial, freshwater and marine ecosystems of the Baltic Sea Basin.</p> <p>Baltic Marine Environment Protection Commission (HELCOM) took the advantage of the report, treating it as a base to the new publication – HELCOM Thematic Assessment 2007 on Climate Change in the Baltic Sea Area.</p>
<p>BSAP</p>	<p>(The Baltic Sea Action Plan) – Programme created by The Helsinki Commission (HELCOM) to bring back a good ecological status of the Baltic Sea by 2021. BSAP objectives are: protection of the marine environment from various sources of pollution (especially nutrients to decrease eutrophication) and establishment of cooperation between governments of baltic countries (Denmark, Estonia, the European Community, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden) in the matter of marine pollution. Plan includes limits of phosphorus emission – reduction of loads by 65% in the Proper Baltic and by the Gulf of Finland.</p>
<p>ASTRA</p>	<p>It's a project funded by INTERREG IIIB Program. It is implemented under the leadership of The Geological Survey of Finland. Project comprise participants from different regions around the Baltic Sea. The main objective is to develop international approach to the issue of climate change and mitigation of it's effects. ASTRA included scientific opinions etc. which are necessary to evaluate impacts on society, economy and environment of the region. ASTRA focuses on practical purposes – implementing a matter of climate change into policies. The impact of climate changes plays an important role in the spatial and economic development of regions. Therefore it is important issue in context of sustainable development too.</p> <p>Project concentrate on opportunities arising from spatial planning mechanisms. The aim was to develop universal scenarios adequate to needs. Obtained information were supposed to serve as a base for future policy. It is required in order to adapt to the changing environmental condition.</p> <p>Policy document provides an overview on the perception and handling of climate change impacts in the BSR.</p>
<p>BaltCICA</p>	<p>Project which idea is to deal with very close problems that climate change cause in the Baltic Sea Region. Because of presence of many larger cities near coastal areas the region is especially sensitive to climate change. Water availability and quality are endangered by rising sea level, changes in precipitation and flood patterns.</p> <p>Using the help of local and regional partners The BaltCICA project is trying to prepare regions to handle with climate change. There are using the examples of climate change generated with COSMO-CLM model to make relevant planning authorities and stakeholders aware of problem. Cost and benefits of adaptation are presented in Case studies and their results support local, regional and international approaches in the Baltic Sea Region.</p>
<p>WATERPRAXIS</p>	<p>Partly funded by the Interreg IVB Baltic Sea Region Programme 2007-2013 WATERPRAXIS is the project which is designed to improve the status of Baltic Sea. Eutrophication caused by nutrient loads is one of the biggest problems. But measures as envisaged in the EU Water Framework Directive is deficient to implement the river basin restoration. Thus the project is focused on assisting the implementation of river basin management plans into practice in the region. The project partnership consists of research organizations, universities, local authorities and NGOs from Denmark, Finland, Germany,</p>

	<p>Latvia, Lithuania, Poland, Sweden and Russia. WATERPRAXIS is based on the Interreg IIB project "Watersketch" (2004-2007). WATERPRAXIS is concerned with identify long-term solutions and pilot investments. They develop water management practices and prepare water protection action plans and measures for selected pilot sites around Baltic Sea Region.</p>
<p>BaltSeaPlan</p>	<p>Project concern a problem of limited sea space for different human activities such as shipping, fishery, mineral extraction etc. The aim is to manage human activities by implementation of Maritime Spatial Planning to achieve sustainable development in coastal and marine areas. BaltSeaPlan wants to support all countries from The Baltic Sea Region in turning marine spatial plans into reality.</p>