

BALTADAPT STRATEGY for adaptation to climate change in the Baltic Sea Region

A proposal preparing the ground for political
endorsement throughout the Baltic Sea Region



Photo: Oskecs Marika

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1. INTRODUCTION

Climate adaptation is the process of adjustment to actual or expected climate and its effects, which seeks to moderate harm or exploit beneficial opportunities for societal and environmental systems. However, “adjustment” is not limited to avoidance of impacts by mainly technical solutions that allow a conservation of “status quo” conditions. In many circumstances, we will have to prepare for unavoidable changes, in spite of adaptation measures. Although we don’t know the magnitude of change, we can project possible future climates, based on physical principles and scenarios of greenhouse gas emissions. Consequently, adaptation needs to be based on adaptive management and focus on strengthening societal and ecological resilience to change. When changes with a significant environmental or societal impact have to be faced, adaptation can also consist of ensuring compensations elsewhere (by compensating lost ecosystems in other parts of the world or by being prepared for the migration of people). Adaptation can also entail ensuring that affected sectors or individuals are able to cope economically with climate-related losses, as well as ensuring preparedness, response and recovery from extreme weather events.

It is not only the climate that is changing. Therefore, it is important that climate adaptation is mainstreamed with adaptation to other foreseen environmental or societal changes. In the Baltic Sea Region (BSR), the demographic change, with an aging population, is one issue of specific concern.

The aim of the Baltadapt project¹ was to formulate a proposal for a BSR-wide Strategy for Adaptation to Climate Change and

Action Plan (AP) with recommended actions and proposed guidelines for climate change (CC) adaptation. These two documents aim to prepare the ground for a politically endorsed BSR-wide strategy and action plan on adaptation to CC. The documents are herein referred to as the Baltadapt Strategy and the Baltadapt AP in order to clarify that they are project outputs, not politically endorsed documents.

Recognising that national and local adaptation strategies, in most cases, are the key instruments for CC, a BSR-wide climate adaptation strategy should aim to be instrumental in mobilising joint action in areas of work requiring or significantly benefiting from coordinated response within the region. The added value of such macro-regional strategies was recently (June 2013) positively evaluated by the European Commission.²

Macro-regional cooperation within the BSR, regarding adaptation to CC, is specifically vital as:

- We share the Baltic Sea and its river basin, which means that adaptation or the lack of it might have consequences beyond national boundaries,
- There is a need for solidarity – to ensure that the most exposed and vulnerable regions, sectors, environments and individuals increase their adaptive capacity,
- We need to coordinate actions within sectors integrated through EU policies and the EU single market,
- There is a need for a “Common BSR voice” in international contexts to ensure that the specific vulnerability to CC of the Baltic Sea and its river basin is acknowledged in EU and international policies.

¹ www.baltadapt.eu/

² <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0468:FIN:EN:PDF>

The Baltadapt Strategy document is based on Baltadapt scientific reports related to gap-fit analyses on adaptation to CC research and policy design³, impact assessments⁴, vulnerability assessments⁵, stakeholder dialogues⁶ as well as on Baltadapt climate info bulletins⁷ on CC.

The development of the Baltadapt Strategy was driven by a consultation process among relevant policy makers and stakeholders during three policy fora (Berlin in April 2012, Stockholm in December 2012, and Tallinn in May 2013), stakeholder workshops on tourism (Warnemünde in May 2012) and agriculture (Norrköping in May 2012) and through consultations with DG CLIMA and DG REGIO (June 2011).

Although the Baltadapt project has had a focus on the Baltic Sea water body and its coastal zones, the proposed BSR-wide Climate Adaptation Strategy is recommended to cover other (land-based) relevant issues within the whole BSR.

Moving forward with implementation and sustainability of a strategy and action plan for climate adaptation in the BSR depends on subsequent political endorsement. The Baltadapt Strategy aims to prepare the ground for such political adoption. Once a strategy for climate adaptation in the BSR has been politically endorsed, recommended actions and proposed guidelines provided in the Baltadapt AP are foreseen as the foundation for the development and agreement of an Action Plan for Climate Adaptation among the BSR states. The AP will basically translate the strategy into possible implementation steps by defining measures that can ensure that the desirable future situation in the BSR materializes or draws nearer. Progress evaluations in the realisation of the goals will assist in identification of the main actions to focus on. However, the Strategy and AP need to be flexible, living documents. Consequently, in connection with monitoring of the realisation of the goals, there is a need for re-evaluations that reflect new knowledge, socio-economic development and stakeholder requests.



Photo: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Germany)

³ Baltadapt Report # 1: Bruneniece, 2012.

⁴ Baltadapt Report # 3: Dahl et al, 2012; Baltadapt Report # 4: Peltonen et al, 2012; Baltadapt Report # 5: Krämer et al, 2012; Baltadapt Report # 6: Kule et al, 2013.

⁵ Baltadapt Report # 7: Alberth et al, 2012; Baltadapt Report # 8: Hjerpe et al, 2013; Baltadapt Report # 9: Andersson et al, 2013.

⁶ Baltadapt Report # 10: Andersson et al, 2013; Baltadapt Report # 11: Alberth, 2012.

⁷ <http://climate-info.baltadapt.eu>



Katharina Reiche, Parliamentary State Secretary, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Germany) and Humberto Delgado-Rosa, Director, Directorate General for Climate Action, European Commission during the First Policy Forum in Berlin, Germany in April 2012.



2. CURRENT AND PROJECTED CLIMATE CHANGE IN THE BSR

INFO

Projected climate change in the Baltic Sea Region

DIRECT CHANGES:

- Temperature increase will already be significant in the coming few decades, with the largest changes in winter and in the north-eastern parts.
- Short-term temperature extremes will change more than long-term averages.
- Cold extremes will become unusual, while summertime hot extremes are expected to become more common.
- Winter precipitation is expected to increase in the whole region.
- Scenarios for summer precipitation are less certain, but indicate more precipitation in the north and small changes or a decrease in the south.
- More frequent occurrence of extreme precipitation events is expected, including in areas that may experience a decrease in mean precipitation.
- Intensification of extreme precipitation is noted for a wide range of accumulation times (e.g., hours, days, weeks).
- A majority of scenarios show an increase in average wind speed, but the uncertainty is large.
- Projected changes in wind extremes are quite uncertain, with a slight tendency towards increase in the south and decrease in the north.

INDIRECT CHANGES:

- A reduction in amounts of snow, duration of snow cover and occurrence of sea ice is predicted.
- The mean annual river flow is expected to increase in the northern parts of the basin, but might decrease in the southern parts. The total river discharge to the Baltic Sea is expected to increase, which might decrease the salinity.
- The general trends show increases in wintertime river flow coupled with somewhat lower and earlier springtime peak flows due to changes in snow cover.
- Sea levels will rise, especially in the southern part, since land lift will compensate for the rise in the north. In addition,

The future climate in the BSR is not known but may be projected by climate models. Scenarios show increasing annual and seasonal mean temperatures (Figure 1). The largest increases are obtained in the north-eastern part of the region and in winter, causing a strongly reduced snow cover. The scenarios also show more common and intensified hot temperature extremes and less cold temperature extremes. Precipitation is generally projected to increase, especially in winter (Figure 2). In summer, the predicted increase is more uncertain, with a possibility of no change or even a decrease in the southern part of the BSR. In addition, the projections show a general increase in precipitation extremes, i.e. more concentrated precipitation for short time periods, both on a time scale ranging from a few hours to a time scale of days or a few weeks. There is no clear picture of what may happen to wind storms in the future.

tion, the sea level is affected by local meteorological conditions that can cause extreme sea level rise and flooding. The frequency of such wind-induced events may change in the future, although predictions are uncertain.

- The wave climate in the Baltic Sea is changing as a result of large-scale atmospheric circulation. A few model simulations in the Baltic Sea show an increase in maximal wind speed and frequency of extreme events.

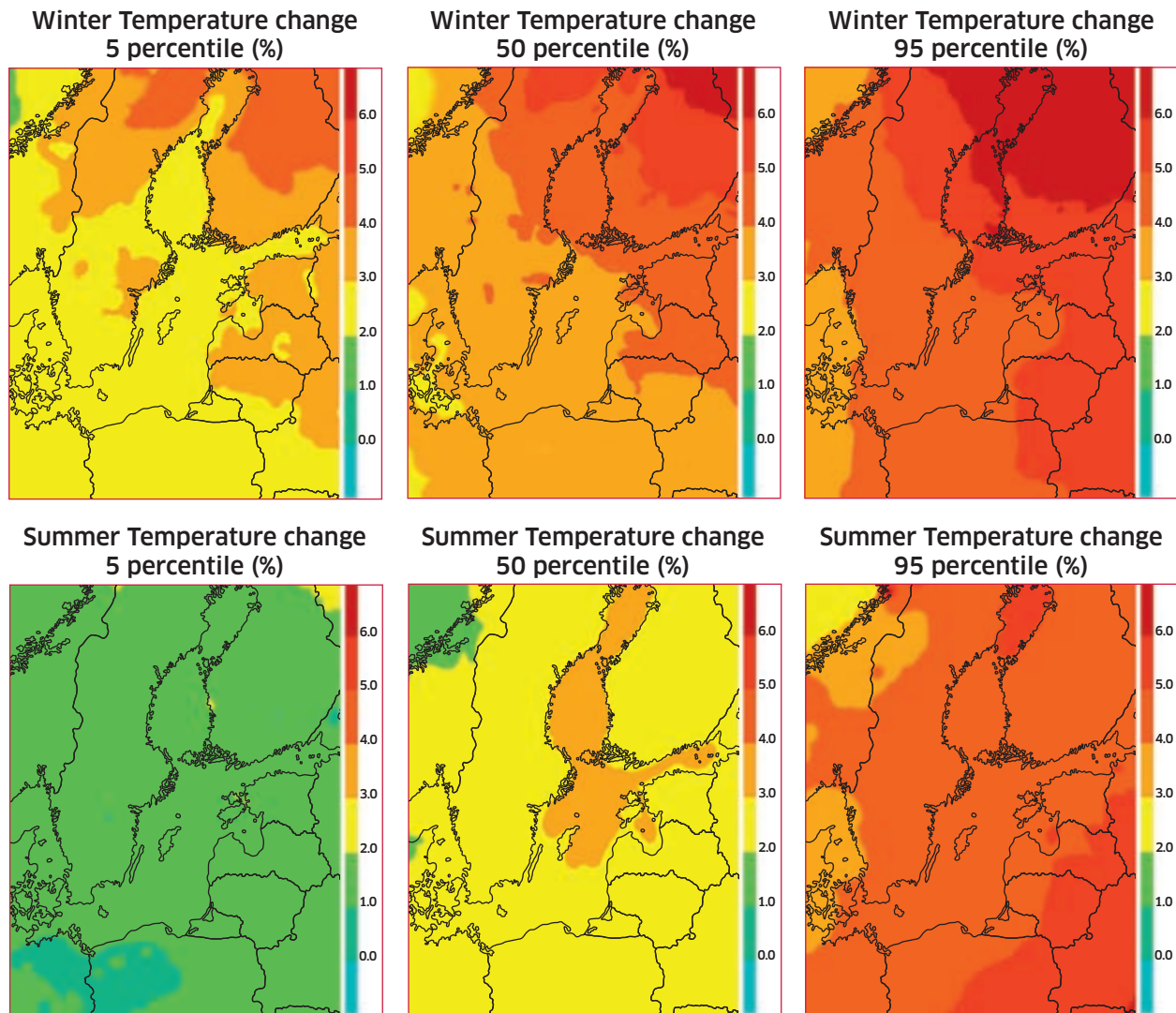


Figure 1 Scenarios of temperature change in the BSR ($^{\circ}\text{C}$) between 1961–1990 and 2071–2099 with IPCCs emission scenario A1B, representing intermediate increase of greenhouse gases. The maps show (from left to right) the smallest, medium and largest CC projected by 11 models. The upper row shows changes in winter and the lower row shows changes in summer. From Baltadapt Climate Info #1 (Bøssing Christensen and Kjellström, 2011).

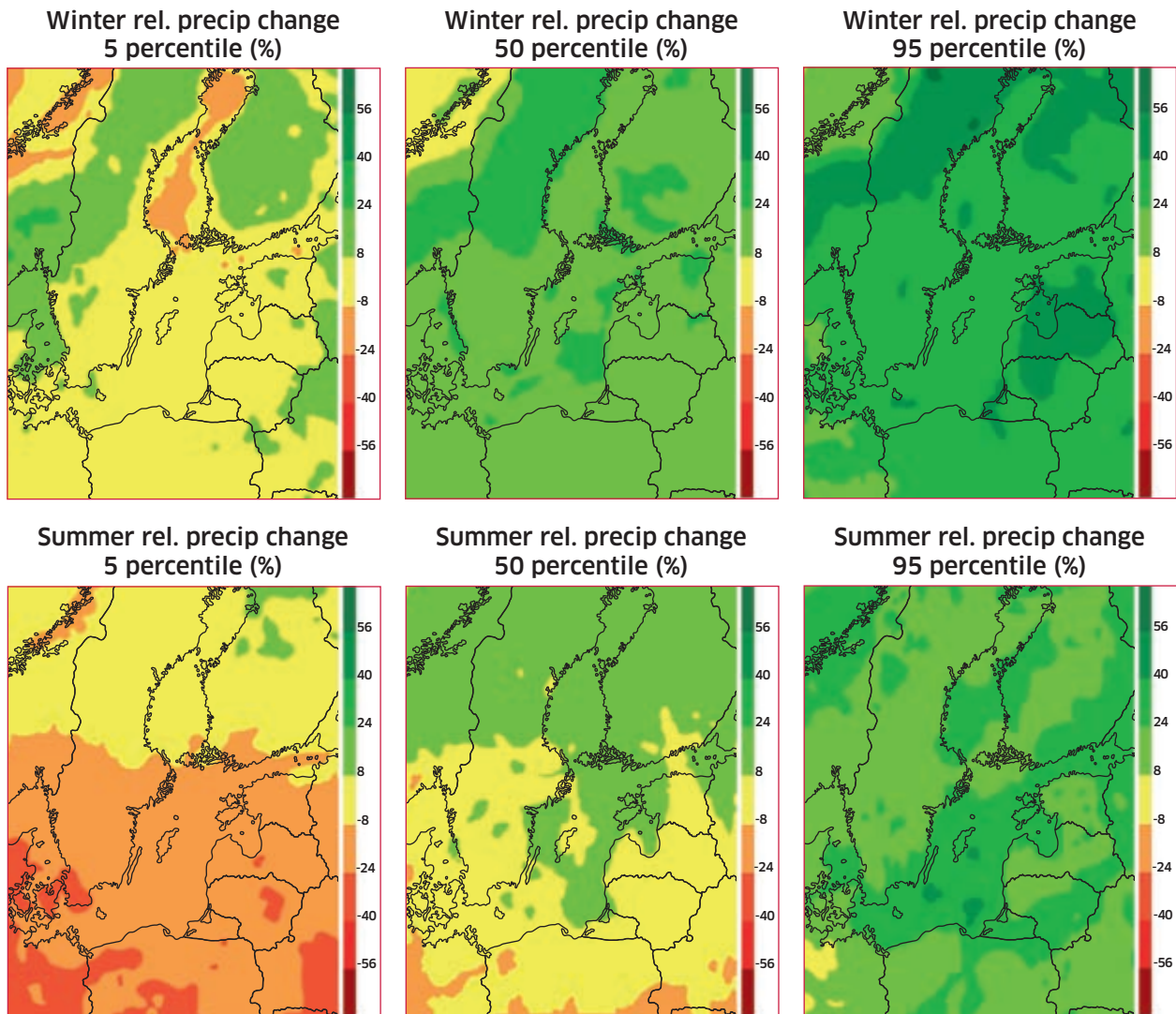


Figure 2 Simulated precipitation change in the BSR (%) between 1961–1990 and 2071–2099 with IPCCs emission scenario A1B, representing intermediate increase of greenhouse gases. The maps show (from left to right) the smallest, medium and largest change projected by 11 models. The upper row shows changes in winter and the lower row shows changes in summer. From Baltadapt Climate Info #2 ((Bøssing Christensen and Kjellström, 2011).

The info box on p. 11 summarises the projected change in climate with regard to air temperature, precipitation and wind as well as climate related physical parameters such as river discharge, sea levels, sea waves and sea ice in the BSR. More information is provided in the Baltadapt Climate Info Bulletins.⁸ Annex 1 provides a table with estimates of certainty and the expected time horizon until

significant CC can be detected, based on expert judgements by Baltadapt climate modelling experts.

⁸ <http://climate-info.baltadapt.eu>



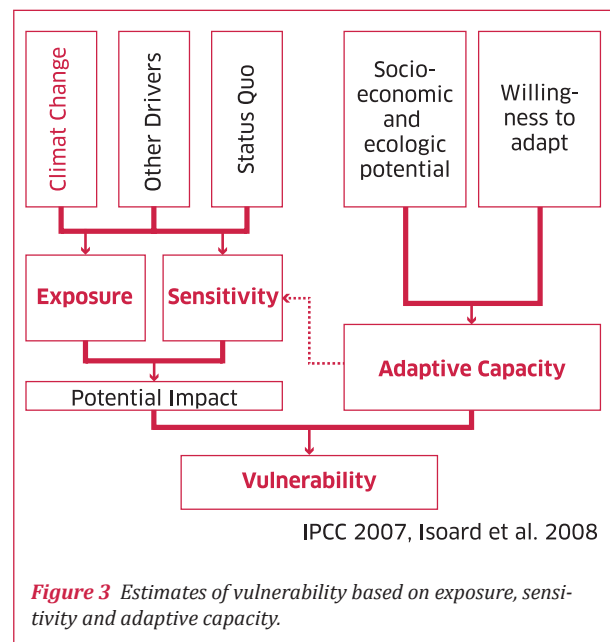
3. IMPACTS OF AND VULNERABILITY TO CLIMATE CHANGE IN THE BSR

The Baltic Sea and its drainage basin constitute a specific eco-region with limited water exchange and a projected warming that is higher than the global mean. The vulnerability to CC of its ecosystems is expected to be high, although uncertainties in climate scenarios lead to uncertainties in impact assessments. Major changes in the biodiversity of the Baltic Sea and its drainage basin are therefore expected. Socio-economic impacts are also foreseen to be considerable, with various degrees of impact and adaptive capacity among regions, sectors as well as among individuals, which calls for governance based on solidarity.

Climate related vulnerability is constantly changing, not only due to CC, but also due to the fact that other environmental and socio-economic factors are also continuously changing, locally, nationally and regionally.

Impacts and vulnerabilities are not limited to the biodiversity of the Baltic Sea but will also affect food supply, including fishery and agriculture, coastal infrastructure and tourism, which are the sectors focused on in the Baltadapt project. Other foreseen vulnerable sectors/issues highlighted in the EU White Paper include health and social issues, forestry, inland waters, production systems, as well as a wide range of infrastructure issues, e.g. linked to urban planning. A wide set of impact and vulnerability assessments for the BSR are thus called for. In this context, it has to be recognised that climate adaptation also has to consider indirect impacts for the BSR caused by CC in other parts of the world, which can have an impact both on world trade and security issues.

The Baltadapt Strategy is based on the integrated vulnerability concept of IPCC, which clarifies that exposure, sensitivity and adaptive capacity have to be included in assessments of vulnerability to CC (Figure 3).



“Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity”

IPCC 2007

At present,⁹ access to assessments of adaptive capacity and vulnerability across the BSR is low.

In climate adaptation cooperation across the BSR, it has to be noted that many identified impacts are influenced or interlinked with other changes (e.g. demographic, economic or environmental). Consequently, assessments of the need for adaptation need to be based on integrated analyses of change in a wider perspective than climate. It also needs to be emphasised that adaptation is needed not only to meet environmental, social and economic obstacles, but also to take advantage of opportunities that might come with CC, thereby increasing the prosperity of the region.

The following boxes present possible impacts on the sectors of focus within the Baltadapt project. More information is provided in Annex 2, as well as in the Baltadapt Impact Assessment Reports.¹⁰

INFO

Possible impacts - Biodiversity

Examples of obstacles:

- Loss of original flora and fauna,
- Increased discharge leading to increased nutrient transport to the sea,
- Nutrient losses in times of high rainfall intensity and flood-driven increase in eutrophication,
- Increased phosphorous loads in the southern parts leading to increased algae production and cyanobacteria blooms,
- Accelerated eutrophication leading to increased occurrence of anoxic sediments, which in turn leads to the loss of organisms living in the sea bottom,
- Increased eutrophication causing a change in the composition of algae belts from brown/red algae to filamentous green algae,
- Higher survival rates of invasive species transported from warmer seas (e.g. by ballast water),
- Changed population of sea birds and decrease in ringed seal populations, with secondary ecosystem impacts.

⁹ cf Baltadapt Report #7: Alberth et al, 2012.

¹⁰ <http://reports.baltadapt.eu>

Possible impacts - Food supply: fishery and agriculture

INFO

Examples of opportunities:

- Fishing of low value freshwater fish (e.g. common roach, *Rutilus rutilus*) for fodder, fertilising agent and biofuel, favouring of common roach as human food,
- Higher crop yields,
- Introduction of new crops and larger crop variety,
- Longer vegetation periods,
- Longer pasture grazing periods for cattle farming.

Examples of obstacles:

- Decline of cod populations due to decrease in salinity and oxygen conditions,
- Thinner and smaller herring and sprat sizes due to decline of cod populations, which induces competition between sprat and herring,
- Risk of higher survival rates of invasive species transported from warmer seas (e.g. by ballast water),
- More low value freshwater fish (e.g. common roach, *Rutilus rutilus*) due to lower salinity,
- Disappearance of species such as salmon, trout and whitefish
- Higher risk and introduction of new animal and plant pests and spread of weeds,
- High soil mineralisation with increased leaching of nutrients
- Ventilation problems in large pig farms,
- More problems with flooding, with increased need to keep the water within the landscape to avoid nutrient transport, while avoiding flooding on productive agricultural fields.

Possible impacts - Coastal infrastructure

INFO

Examples of opportunities:

- Less demand for heating,
- Less sea ice leading to decreased stress/damage to constructions and reduced sailing distances and shipping times for maritime transport.

Examples of obstacles:

- Damage to buildings due to increased growth of fungus and mould,
- Damage to coastal protection structures due to flooding caused by sea level rise.
- Loss of coastal territory and built up structures due to landslides and soil erosion,
- Damage to buildings and infrastructure due to the rise of sea and groundwater levels,
- Increased need for refrigeration in ports as well as cooling of buildings and public traffic systems,
- Increased need to safeguard summer water supplies,
- Dune movement due to vegetation damage in dry periods.

Possible impacts - Coastal tourism

Examples of opportunities:

- Increase in the number of tourists due to more favourable changes in the climate of the BSR compared to other regions,
- Prolonged tourism season,
- Increased opportunities for combinations with indoor sports and spa activities provided by increased amount of rainy days.

Examples of obstacles:

- Increased beach erosion and sedimentation of lakes and waterways,
- Flooding of southern BSR coasts with impacts on tourism infrastructure,
- Costs due to damage and loss of tourists caused by extreme weather (e.g., storms, drought, fires),
- Less opportunities for winter activities which depend on snow or ice.
- Biodiversity loss leading to lower value of touristic areas,
- Increases in algal blooming, jellyfish occurrence and bacterial outbreaks leading to decreases in the popularity or even the safety of coastal destinations,
- Health risks in times of heat waves due to spread of e.g. tick and mosquito borne diseases,
- Need to build protective dikes compromising the attractiveness of coastal views.





Photo: Ieva Brumeniece

4. THE RESPONSE: A STRATEGY FOR ADAPTATION TO CLIMATE CHANGE IN THE BSR

The overriding objective of the proposal for a BSR-wide CC Adaptation Strategy is a connected region with informed actors on and between all governance levels responding to CC in a way that ensures prosperity, competitiveness, as well as clean water and rich and healthy wildlife. This calls for adaptation integrated with risk handling and actions that promote resilience of environmental and societal systems.

The Baltadapt Strategy builds on strengthening multi-level governance on cooperation and information sharing via mainstreaming of climate adaptation in the Action Plan of the European Union Strategy for the Baltic Sea Region – EUSBSR¹¹, with the aim of triggering positive synergies and avoiding unintended negative impacts of adaptation between sectors.

Implementation of the Baltadapt Strategy aims to, whenever possible, utilise the existing frameworks and instruments. It enforces links to the EUSBSR Action Plan, as well as to the EU Strategy on Climate Adaptation, national and local climate adaptation strategies and action plans and other strategies that include climate adaptation components. It aims to assist stakeholders and policy makers

in the BSR in finding a common understanding of adaptation needs and implementing actions, with recognition of regional differences in natural and societal conditions. When in compliance with EU priorities and positions, partnership with non-EU countries should be encouraged. Cooperation between all governance levels in the BSR should be included in the implementation of the strategy, based on clustering and coordination of existing initiatives in a way that makes it possible to reach the goals of the Baltadapt Strategy.

The goals of the Baltadapt Strategy will thus all contribute to the implementation of local and national strategies as well as the EU Strategy on Climate Adaptation, including the integration of climate adaptation in broader policies or in other strategies by means of cross-border cooperation. For each of the goals of the Baltadapt Strategy there is corresponding information in the Baltadapt AP concerning recommended actions and guidelines.

The 11 goals of the Baltadapt Strategy with links to visions for the year 2020 and goals of the EU Strategy on Climate Adaptation, including references to the corresponding chapters in the Baltadapt AP are presented in the below box.

¹¹ <http://www.balticsea-region-strategy.eu/>

Eleven goals of the proposal for a BSR-wide Strategy for Adaptation to Climate Change, including visions for 2020 and links to the EU Strategy for Climate Adaptation and corresponding chapters in the Baltadapt AP

MACRO-REGIONAL GOAL	VISION (TO BE FULFILLED BY 2020)	RELATION TO ACTIONS AND GOALS IN THE EU STRATEGY FOR CLIMATE ADAPTATION (CF. SECTION 5.2).	CHAPTERS IN THE BALTADAPT AP
1. Raised awareness concerning the need for action at all governance levels	Awareness of CC and its potential impacts on society and the environment, as well as awareness of ways to adapt permeates macro-regional agreements, education and training collaborations, as well as cooperation between authorities, researchers and the business sector.	<i>Action 2:</i> Awareness-raising through LIFE funding (2013-2020) <i>Action 3:</i> Awareness-raising activities in cities on the basis of the model of the Covenant of Mayors initiative ¹² (2013/2014).	Building and sharing knowledge about climate change adaptation in the BSR
2. Shared macro-regional knowledge bases	A Baltic subsection of the European Climate Adaptation Platform Climate-ADAPT ¹³ includes common CC open source databases on exposure, impacts, vulnerabilities and adaptation measures, including handling of risks and uncertainties, estimates of costs and benefits and communication of "good practices".	<i>Action 5:</i> 'Climate-ADAPT to be developed into a one-stop shop' for adaptation information in Europe (2013/2014).	Building and sharing knowledge about climate change adaptation in the BSR
3. Research cooperation in order to identify and address knowledge gaps	BSR states and stakeholders have influenced Horizon 2020 programming and researchers have initiated and participated in Horizon 2020 research projects and other programmes that have addressed issues of high relevance for climate adaptation in the BSR.	<i>Action 4:</i> Knowledge gaps to be identified, fed into Horizon 2020 programming (2014-2020) and addressed, so that priority knowledge gaps identified in 2013 are closed by 2020.	Building and sharing knowledge about climate change adaptation in the BSR
4. Facilitated science-policy-business dialogues at and between all governance levels through the provision of web-based as well as "real life" meeting places	Authority and business decision makers have access to interactive visualisation-based tools for climate adaptation. These are part of a well-developed and frequently used combination of web-based and real-life meeting places for researchers, authorities and the business sector to be used for horizontal and vertical dialogues and decision-making.	<i>Action 4:</i> Horizon 2020 (2014–2020) will address the need for better interfaces between science, policymaking and business. The goal is, by 2020, to have access to communication tools that allow for available information on CC adaptation to be accessible to decision-makers, including Member States, local authorities and firms.	Connecting the BSR for climate change adaptation
5. Cooperation on disaster risk management to cope with increased risks due to CC	Access to operational warning system in the region for climate induced disasters (impacting, e.g., infrastructure, agriculture, health) available through common BSR systems or through cooperation between national warning system services in the region. A network including all BSR states cooperates on risk reduction, awareness raising, disaster response and recovery. Macro-regionally established insurance systems for economic losses during extreme events based on solidarity and risk reduction concepts.	<i>Action 1:</i> Cover aspects that are missing from existing adaptation strategies, including coherence with national disaster risk management plans. <i>Action 8:</i> Improve the market penetration of natural disaster insurance and unleash the full potential of insurance pricing and other financial products for risk awareness, prevention and mitigation and for long-term resilience in investments and business decisions (2014-2015). LIFE and Horizon 2020: Promotion of innovative technologies, including early warning systems.	Connecting the BSR for climate change adaptation

¹² www.covenantofmayors.eu/about/related-initiatives_en.html

¹³ <http://climate-adapt.eea.europa.eu/>

<p>6. Reviewed and mainstreamed policies in light of CC adaptation concerns</p>	<p>All BSR relevant policies are (based on research outcomes) integrated (mainstreamed) with climate adaptation in a manner that reflects the specific environmental and socio-economic conditions of the BSR within all relevant EUSBSR Action Plan Priority Areas (PA).</p> <p>Revision of EU Directives and macro-regional agreements (e.g. HELCOM) for management of nutrients, species habitats and the EU fishery policy has been carried out in a way that makes sense for the BSR, with consideration given to the specific conditions of the Baltic Sea.</p>	<p><i>Action 2:</i> LIFE funding available (2014–2020) for mainstreaming adaptation into urban land use planning, building layouts and natural resource management.</p> <p><i>Action 6:</i> Guidance provided on how to integrate adaptation under the Common Agricultural Policy and the Cohesion Policy.</p> <p><i>Action 7:</i> Industry-relevant standards in the area of energy, transport and climate-proofing of buildings. Assessment of need in 2013.</p> <p><i>Goal for 2020:</i> Adaptation considerations have been mainstreamed in a consistent and comprehensive way in key EU policies.</p>	<p>Mainstreaming climate change adaptation in the BSR</p>
<p>7. BSR cooperation with non-EU member states where it has been defined to be of mutual benefit</p>	<p>The involvement of non-EU BSR states (Russia, Belarus, Norway) in implementation of the strategy has made it possible to fulfil the goals in the whole BSR.</p>	<p>The EU's dialogue and cooperation with neighbouring countries on adaptation issues is channelled through the Enlargement and European Neighbourhood policies and EU development cooperation policy.</p>	<p>Connecting the BSR for climate change adaptation</p>
<p>8. Cooperation between states on the development of national strategies and action plans</p>	<p>National CC adaptation strategies are available in all BSR states. Exchange of information on the Baltic sub-section of Climate-ADAPT and other established forms of cooperation are used in the preparation and updating of national climate adaptation strategies and action plans.</p>	<p><i>Action 1:</i> Encourage all Member States to adopt comprehensive adaptation strategies.</p> <p>2014: An adaptation preparedness scoreboard, identifying key indicators for measuring Member States' level of readiness.</p> <p>2017: Assessment of whether action being taken in the Member States is sufficient. If insufficient, legally binding instruments will be proposed.</p>	<p>Connecting the BSR for climate change adaptation</p>
<p>9. Macro-regional cooperation within business sectors</p>	<p>BSR cooperation on adaptation to obstacles and implementation of business opportunities (e.g., in the agriculture, tourism, fisheries, energy and infrastructure sectors).</p>	<p><i>Action 6:</i> Facilitate the climate-proofing of the Common Agricultural Policy, the Cohesion Policy and the Common Fisheries Policy (CFP).</p> <p><i>Action 7:</i> Ensuring more resilient infrastructure. Revision of industry-relevant standards in the areas of energy, transport and buildings. Guidelines for project developers working on infrastructure and physical assets. Guidance for authorities and decision makers, civil society, private business and conservation practitioners for ecosystem-based approaches to adaptation.</p> <p><i>Action 8:</i> Improving market penetration of natural disaster insurance and unleashing the full potential of insurance pricing and other financial products for risk awareness prevention and mitigation and for long-term resilience in investment and business decisions (2014-2015).</p>	<p>Adapting the four Baltadapt sectors</p> <p>Mainstreaming climate change adaptation in the BSR</p>

¹⁴ http://ec.europa.eu/regional_policy/what/future/proposals_2014_2020_en.cfm

¹⁵ <http://ec.europa.eu/fisheries/cfp/>

<p>10. Macro-regional cooperation in order to ensure solidarity and funding of adaptation measures</p>	<p>Access is available to estimates of costs and benefits related to CC adaptation in different sectors in the Baltic section of Climate-ADAPT.</p> <p>Access is available to financing in the BSR that enables prioritisation of actions on adaptation to the most exposed and vulnerable parts of the region, as well as to the most vulnerable sectors and individuals.</p>	<p><i>Action 4:</i> Bridge the knowledge gap: one of the main identified gaps is information on damage and adaptation costs and benefits. Research included in Horizon 2020.</p> <p>The draft 2014-2020 Multi-annual Financial Framework (MFF) includes a proposal for increasing climate-related expenditure to at least 20% of the EU budget.</p> <p>CC adaptation is included in all relevant EU finance programs for 2014-2020, including both research and implementation oriented proposals.</p> <p>Priorities on adaptation in the ERDF and Cohesion Fund.</p> <p>Support from international financing institutions, such as the European Investment Bank and the European Bank for Reconstruction and Development.</p> <p>Climate-ADAPT will provide more information on potential sources of funding.</p>	<p>Financing climate change adaptation in the BSR</p>
<p>11. The BSR as a model region for macro-regional cooperation on CC adaptation</p>	<p>Building on the experiences from implementation of the Baltadapt Strategy, similar strategies are developed for other regions in the EU.</p>		

Dealing with uncertainty is vital for all 11 of the goals. The Baltadapt Strategy acknowledges that it is necessary to reduce uncertainty through improved access to monitored data, regional modelling and impact and vulnerability assessments including cost and benefit assessments. However, it is also necessary to integrate uncertainty in policy decisions through preparedness for a wide range of eventualities.

4.1. Recommendations for how to reach the goals through cooperation

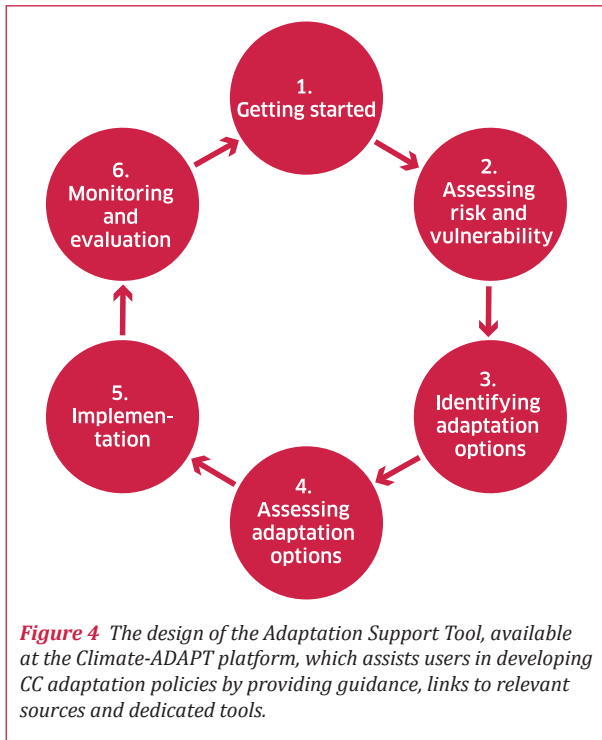
The added value of the Baltadapt Strategy, delivered through cooperation and information sharing throughout

the region can be achieved through the establishment and use of platforms for collaboration between the BSR states on CC adaptation at the macro-regional, national and local levels, with functional communications between the levels. Cooperation will thus need to be both horizontal¹⁶ and vertical.¹⁷ Rather than trying to grasp everything, it will be based on identification of concrete fields of actions, linked to the EUSBSR HAs and PAs that will demonstrate benefits for cross border cooperation.

In the implementation of the Baltadapt Strategy, the Adaptation Support Tool available on Climate-ADAPT will be used and feedback from the BSR region will be provided in order to further develop the tool. The tool assists users in developing CC adaptation policies by providing guidance, links to relevant sources and dedicated tools in six steps (Figure 4).

¹⁶ Horizontal coordination approaches aim to cut across different policy sectors in order to trigger synergies and avoid unforeseen negative trade-offs.

¹⁷ Vertical coordination aims to integrate across different levels of government in order to ensure that local, regional and national responsibilities and resources are well defined.



The Baltadapt Strategy calls for solidarity through actions that aim to reduce vulnerability and improve adaptive capacity where it is most needed. To make this possible, it is necessary to make BSR vulnerability assessments available, since they are, to a large degree, lacking at present.¹⁸ The Baltadapt Strategy calls for a combination of top-down (calculation of BSR-wide indexes) and bottom-up approaches (stressing local drivers and barriers) to fill this gap. With regard to bottom-up approaches, win-win solutions between sectors and with mitigation measures should be promoted. Pooling of resources through collaboration by several actors is also a way to facilitate financing.

As highlighted during the Baltadapt stakeholder dialogues,¹⁹ adaptation option appraisals based on e.g., cost-effectiveness analyses (CEA), cost-benefit analyses (CBA) or multi criteria analyses (MCA) are strong incentives for willingness to take action (thereby increasing the adaptive capacity). Impacts of non-action with high environmental or human welfare costs (not necessarily only in economic terms) should be prioritised in the implementation of the Baltadapt Strategy.

¹⁸ cf. Baltadapt Report # 7: Alberth et al., 2012.

¹⁹ Baltadapt Report # 10: Andersson et al., 2013.

An integrated approach to multiple stressors and with consideration to economic globalisation is necessary in order to ensure win-win solutions between various environmental and socio-economic goals both within and between sectors and to avoid unexpected negative impacts of climate adaptation. This calls for bridging between sectors and geographic levels of governance in a way that facilitates implementation of national and EU policies through BSR cooperation. The Baltadapt Strategy should thus work towards the creation of forums that enable integration of policies and knowledge across sectors and administrative levels. This is further elaborated in Baltadapt Report #9 (Hjerpe et al., 2013), in which guidelines on system vulnerability in the BSR are provided.

Several climate adaptation related issues in the BSR can only be efficiently handled through cooperation involving all states in the region. Partnership and cooperation with Russia and other non-EU states is therefore a significant added value.

Below, added values are presented relating to BSR cooperation on research and transfer of good practices, promotion of innovations, science-policy dialogues and disaster risk reduction.

4.1.1. Research and transfer of good practices

Projects that focus on cross-border issues may not receive support at the national level, due to other priority issues taking precedence, which demonstrates the need to ensure macro-regional funding.

The Baltadapt Strategy aims to promote a framework for BSR climate adaptation research and knowledge transfer by assisting in the development of new projects and giving momentum to existing transnational projects. In addition to projects with a main focus on climate adaptation, mainstreaming of climate adaptation in all BSR research projects where it is relevant is called for.

Interactive communication between research and policy is a prerequisite to ensure that climate adaptation research is relevant for policy making and implementation of adaptation measures. To achieve this, there is a need for

integration between e.g., social, economic, technical and environmental disciplines.

In addition to pure research projects, regional projects on climate adaptation that focus on transfer of “good practices” to other BSR jurisdictions should be promoted.

As discussed in Section 2, land-sea contrasts and mountains in the BSR are not captured well in global climate models. The Baltadapt Strategy recognises that the number of CC simulations covering the BSR is limited, especially when it comes to regional scenarios with a high spatial resolution. It does further stress that although there is relatively large amount of information available related to air temperature and precipitation, information on changes to other variables including snow and wind, is much more limited. Therefore, uncertainties in climate projections are higher in the BSR than in most other marine environments in the EU. A further limitation for work concerning CC modelling is the lack of good observational data in the area. As high-resolution CC information is required from the models there is a need for good observational data for model evaluation at those scales. The Baltadapt Strategy specifically highlights that in order to reduce uncertainties in impact assessments, research and cooperation are needed that aim to provide ensembles of climate scenarios and decadal forecasts down-scaled to geographical scales that are relevant for impact assessments. This research and cooperation should be encouraged to take place within the framework of the Horizon 2020 or the BONUS programmes.

4.1.2. Promotion of innovations

The goal of the EUSBSR is to move towards a low-carbon and climate resilient economy in the BSR by promoting sustainable growth, climate resilient investments and creation of new jobs. In this context, climate adaptation is, seen as an opportunity for enterprises to invest in innovations.

This concept is also one of the fundamentals of the EU Strategy on Adaptation to Climate Change, which places strong focus on climate adaptation options that are low-cost, have high value for the economy and the environment, and have multiple positive effects. Climate adaptation is expected to stimulate climate-resilient investments and

create new jobs, particularly in sectors such as construction, water management, insurance, agricultural technologies, ecosystem management and sustainable food.

The EU Open Data Strategy and proposed directive,²⁰ with harmonisation to common standards and protocols through the EU Infrastructure for Spatial Information in the European Community (INSPIRE) directive²¹ will enable the integration of large volumes of information collected by numerous public authorities and services in the BSR for subsequent re-use and redistribution for free or at marginal cost. This is expected to boost new opportunities for research as well as for innovations related to CC adaptation.

The Baltadapt Strategy promotes the opportunity for enterprises, in cooperation with policy makers and the scientific community, to develop innovative adaptation measures to be implemented in the BSR as well as exported to other regions, including e.g.:

- Methods for economic valuation of adaptation options,
- BSR wide networks for monitoring of climate parameters and impacts on e.g., ecosystems and health,
- Development of communication systems as well as innovations that increase the understanding of adaptation needs, e.g.,
 - Early warning systems for extreme weather events that are expected to occur more often due to CC, in order to reduce the vulnerability in various sectors (e.g., infrastructure, agriculture and health),
 - Agricultural technologies, including multifunctional agriculture such as ecological recycling agriculture (ERA) and sustainable food societies, ecosystem management, climate-proof infrastructures and water management,
 - Solutions to the challenges of CC from the insurance sector.

4.1.3. Science-policy dialogues

In order to support decisions, science-based information on CC, exposure, vulnerabilities, impacts and adaptation needs to be communicated in a way that accounts for the perspectives of macro-regional, national and local decision makers. To achieve this, information needs to be relevant,

²⁰ http://ec.europa.eu/information_society/policy/psi/docs/pdfs/directive_proposal/2012/open_data.pdf

²¹ http://europa.eu/legislation_summaries/environment/general_provisions/l28195_en.htm



accessible, transparent, and take proper account of associated uncertainties. In addition, to be relevant for policy decisions, climate-related issues need to be mainstreamed with other issues.

Increased science-policy-business interactions are needed to increase the policy-making and business sectors' awareness and understanding of climate related risks and options for adaptation. In addition, researchers' awareness of the perspectives of policy makers and others stakeholders needs to be strengthened. The media can contribute to increased awareness of the need for adaptation, e.g. linked to extreme weather events or by highlighting benefits, business opportunities and other gains from adaptation. In addition to authorities on all levels, the Baltadapt Strategy aims to encourage sector-specific networks and organisations, the education system and the media to include CC adaptation in their agendas.

The Baltadapt Strategy aims to ensure that decision makers have access to interactive visualisation-based tools and platforms for dialogues and decision-making related to climate adaptation. The tools and platforms could be a combination of web-based tools and real-life fora for dialogues.

4.1.4. Disaster risk reduction

An important part of BSR cooperation related to CC is the development of preparedness for handling increased risks related to extreme events, e.g. those induced by floods or storms. The Baltadapt Strategy promotes BSR activities in line with the UN Hyogo Declaration and Hyogo Framework for Action (HFA),²² including:

- Common efforts to reduce the risks of natural disasters,
- Common identification, evaluation and monitoring of risks as well as cooperation on early warning systems,
- Sharing knowledge, innovation and education to improve the safety and sustainability at all governance levels,
- Cooperation on reduction of underlying risk factors,
- Cooperation on strengthening preparedness for response and recovery at and between all governance levels.

In addition to the EU Strategy on Adaptation to Climate Change, there are a number of other EU-instruments that support climate-related disaster risk reduction which should be incorporated in BSR cooperation, including:

- METEOALARM: a harmonised real time warning system,²³
- The EU directive on assessment and management of flood risks.²⁴

Identification of gaps in currently existing common mechanisms is one of the first steps to take in this process, together with development of reference scenarios for risk assessment information. No less important, however, is the opportunity to share the know-how within the BSR. A common ground is a necessary prerequisite for building a BSR approach to prevention actions, which is in turn necessary to facilitate the rapidness and functionality of risk management operations in the event of cross-border or large scale disasters.

The EU Green paper on insurance against natural and man-made disasters²⁵ poses a number of questions concerning the adequacy and availability of appropriate disaster insurance. The Baltadapt Strategy aims to ensure that the BSR is active in the process of expanding the knowledge base, helping to promote insurance as a tool for disaster

²² www.preventionweb.net/english/

²³ www.meteoalarm.eu/

²⁴ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:288:0027:0034:en:pdf>

²⁵ http://ec.europa.eu/internal_market/insurance/consumer/natural-catastrophes/index_en.htm

management and thus contributing to a shift towards a general culture of disaster risk prevention and mitigation.

Finland, Norway, Germany and Sweden have established national platforms for disaster risk reduction in line with HFA 2005-2015, including CC adaptation.²⁶ These could be the basis for an extension towards BSR cooperation.

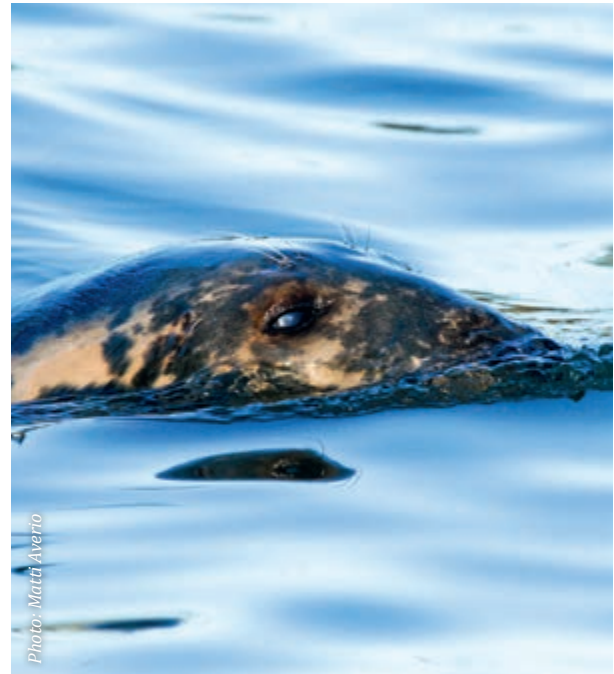
4.2. Specific Goals of the Strategy in sectors of specific macro-regional relevance

The biodiversity of the Baltic Sea and three socio-economic sectors (food supply, including fishery and agriculture, coastal infrastructure, and coastal tourism) were identified in the Baltadapt project as specifically beneficial to include in the Baltadapt Strategy. The selection of these four focus areas was based on the notion that climate adaptation within these areas can gain significantly from macro-regional cooperation because impacts are expected in major parts of the region often crossing boundaries between states or between land and sea. These focus areas also have main components that correspond to the objectives of the EUSBSR Action Plan.

Policies related to the biodiversity of the Baltic Sea are directly integrated with the fishery and agricultural sectors. They are also indirectly integrated with the coastal tourism sector since the Baltic Sea itself is its prime asset.

In order to consider such interrelationships, the Baltadapt Strategy calls for a shift away from sector-by-sector management towards integrated management of land, water and living resources in order to sustain Baltic Sea biodiversity and productivity in e.g., agriculture, fish stocks and tourism. The basis for implementing such a shift is an ecosystem approach based on multilevel governance that provides space for experimenting and spreading of social innovations at local and regional scales, as key elements for stimulating an adaptive capacity to deal with ecosystems and ecosystem services.

However, a politically endorsed climate adaptation strategy is not foreseen to be limited to the four specific goals of the Baltadapt project, but rather to be complemented with new goals during re-evaluations of the strategy. Such re-evaluations can partly be based on the methodology for prioritising issues of macro-regional interest presented in the tool in Annex 2 and in Baltadapt Report #10 (Andersson et al., 2013).



4.2.1. Marine biodiversity

Specific goal: Ensure that climate impacts on marine biodiversity and habitats, whenever possible, are limited by CC mainstreaming of environmental agreements and directives.

Agreed strategies to obtain a good ecological status of the Baltic Sea, as mandated by the EC Water Framework Directive²⁷ (WFD), the EC Marine Strategy Framework Directive²⁸ (MSFD), the EC Habitats Directive,²⁹ the Baltic Sea Action Plan³⁰ (BSAP) and national action plans, have to be implemented.

²⁶ www.preventionweb.net/english/hyogo/national/list/#F

²⁷ <http://ec.europa.eu/environment/water/water-framework/>

²⁸ http://ec.europa.eu/environment/marine/eu-coast-and-marine-policy/marine-strategy-framework-directive/index_en.htm

²⁹ <http://ec.europa.eu/environment/nature/legislation/habitatsdirective/>

³⁰ www.helcom.fi/BSAP/ActionPlan/en_GB/ActionPlan/

Possible adaptation towards good water quality of the Baltic Sea includes all kinds of nutrient reduction measures as suggested e.g. by the BSAP and WFD. No adaption measures are possible to sustain ecosystems affected by changing temperature and reduced salinity. In case of changing distribution of e.g. commercially important fish stocks, the adaptation has to be socio-economic.

The Baltadapt Strategy argues for identification of opportunities for climate-proofing the EC directives and the BSAP, with consideration to the specific conditions of the Baltic Sea. This can be exemplified by the fact that the habitat types labelled as “mudflats and sandflats not covered by seawater at low tide” in the Habitats Directive will decrease and eventually disappear with increasing sea level rise. According to the Habitats Directive one is obliged to keep or restore the area with the specified habitat. It is important that such issues be identified for the Baltic Sea and those directives revised to consider the impacts of CC.

The Baltadapt Strategy also highlights the fact that one of the few adaptation measures available to reduce the increase in eutrophication caused by CC are reductions in nutrient loads to the sea, which has links with the WFD and particularly with measures within the agricultural sector.

4.2.2. Food supply: fishery and agriculture

Specific goal: Ensure prosperity and competitiveness of fishery and agriculture sectors, while ensuring that the EUSBSR objective “Save the Sea”, with emphasis on its sub-objectives “Clear water” and “Rich and Healthy Wildlife”, are fulfilled and acknowledging the value of green infrastructures in climate adaptation.

The EC CFP regulates all aspects of fishing. Since the fish stock and fishery in the Baltic Sea are particularly sensitive to the impacts of CC, the Baltadapt Strategy calls for inclusion of an “adaptation tipping point approach” into fisheries management. A tipping point is crossed when changes caused by CC reach a magnitude such that the existing management strategy can no longer deliver the agreed objectives. Identification and characterisation of such tipping points or triggers as “warning signs” could help fisheries management take into account possible

CC impacts. An analysis aimed at identification of these tipping points should take an ecosystem approach, as CC can induce dramatic food-web and ecosystem changes that also affect the fish stocks in the Baltic Sea.

The choice of land use, crops, drainage and irrigation practices will have an impact on nutrient emissions to the sea. Land use and possibly also nutrient losses will also be influenced by climate mitigation policies, such as promotion of agricultural production of renewable energy. In this context, the combined consequences of policies related to climate (mitigation and adaptation) and environmental concerns (e.g. eutrophication) need to be understood and considered in order to keep measures aimed towards one goal from counteracting another.³¹ It should also be considered that green infrastructures not only mitigate CC by functioning as carbon traps, but also help to mitigate effects of flooding, heat and storms. Agriculture and forestry are therefore key areas to include in climate adaptation at the landscape scale. Possibilities of strengthening resilience in a changing climate with the help of ecological recycling agriculture also need to be considered.



Photo: Oskars Maile

³¹ cf Baltadapt Report #3: Dahl et al, 2012.

Since one of the only possible means of reducing the impacts of CC on eutrophication (and indirectly on biodiversity) is through reduction of nutrient loads from agriculture, a focus on agriculture in macro-regional cooperation is recommended. To make such cooperation attractive for the agricultural sector it is important that environmental concerns be handled in combination with concerns for adaptation to ensure the prosperity of the agricultural sector.

Excess of water due to more frequent occurrence of extreme precipitation events calls for improved drainage systems. However, adaptation should be carried out with an integrated landscape perspective, such that water is kept in the landscape to avoid downstream flooding and eutrophication, while at the same time avoiding flooding in productive agricultural fields. A goal of the Baltadapt Strategy is therefore the coordination and integration of agricultural, risk management and environmental policy actions, including adaptation to CC.

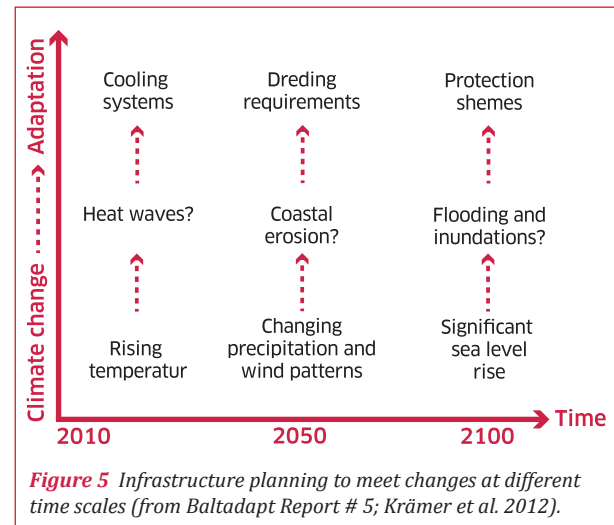
The threat of new pests and weeds due to CC, including the introduction of more southern crops highlights the need for surveillance systems to control and adapt to the spreading. The Baltadapt Strategy calls for a BSR system including cross-border learning about new diseases and pests as well as methods to mitigate their impact on crop yields. Another possible macro-regional point of cooperation is in the establishment of insurance systems for economic losses during extreme events, based on solidarity and risk reduction concepts. Insurance schemes could also be coordinated with a pest and animal disease monitoring system so that they benefit each other. These suggestions are further elaborated in Baltadapt Report #10 (Andersson et al., 2013).

4.2.3. Coastal infrastructure

Specific goal: Ensure that coastal infrastructure (including e.g., coastal protection, maritime traffic, ports and touristic infrastructure) sustains prosperity, competitiveness and connectivity, with acknowledgement of the value of green infrastructures in climate adaptation.

CC adaptation will require planning on different time scales from immediate actions related to cooling heat waves, to long term planning and construction in response to sea level rise (Figure 5). The Baltadapt

Strategy calls for political acknowledgement that a time frame for planning should determine whether decisions should be based on today's climate, near-future or distant-future climate projections.



The Baltadapt Strategy calls for BSR cooperation to ensure that CC adaptation is integrated with policies relevant to a set of issues, including trade and economic growth. It is also important that adaptation includes global perspectives, where e.g. impacts of CC on global trading and shipping are considered.

Not only does exposure differ regionally within the BSR, but also adaptive capacity. Consequently, the Baltadapt Strategy calls for actions to ensure that the whole region has an acceptable level of (a) funded coastal protection measures, (b) implementation of spatial planning instruments, (c) willingness to establish multifunctional use of coastal zones, (d) environmental awareness, and (e) flexible and innovative approaches.

4.2.4. Coastal tourism

Specific goal: Ensures prosperity and competitiveness of sustainable coastal tourism, with acknowledgement of the need to consider both economic and environmental concerns in order to ensure sustainability.

In order to motivate adaptive strategies in the tourism sector, it is important to provide information on damage

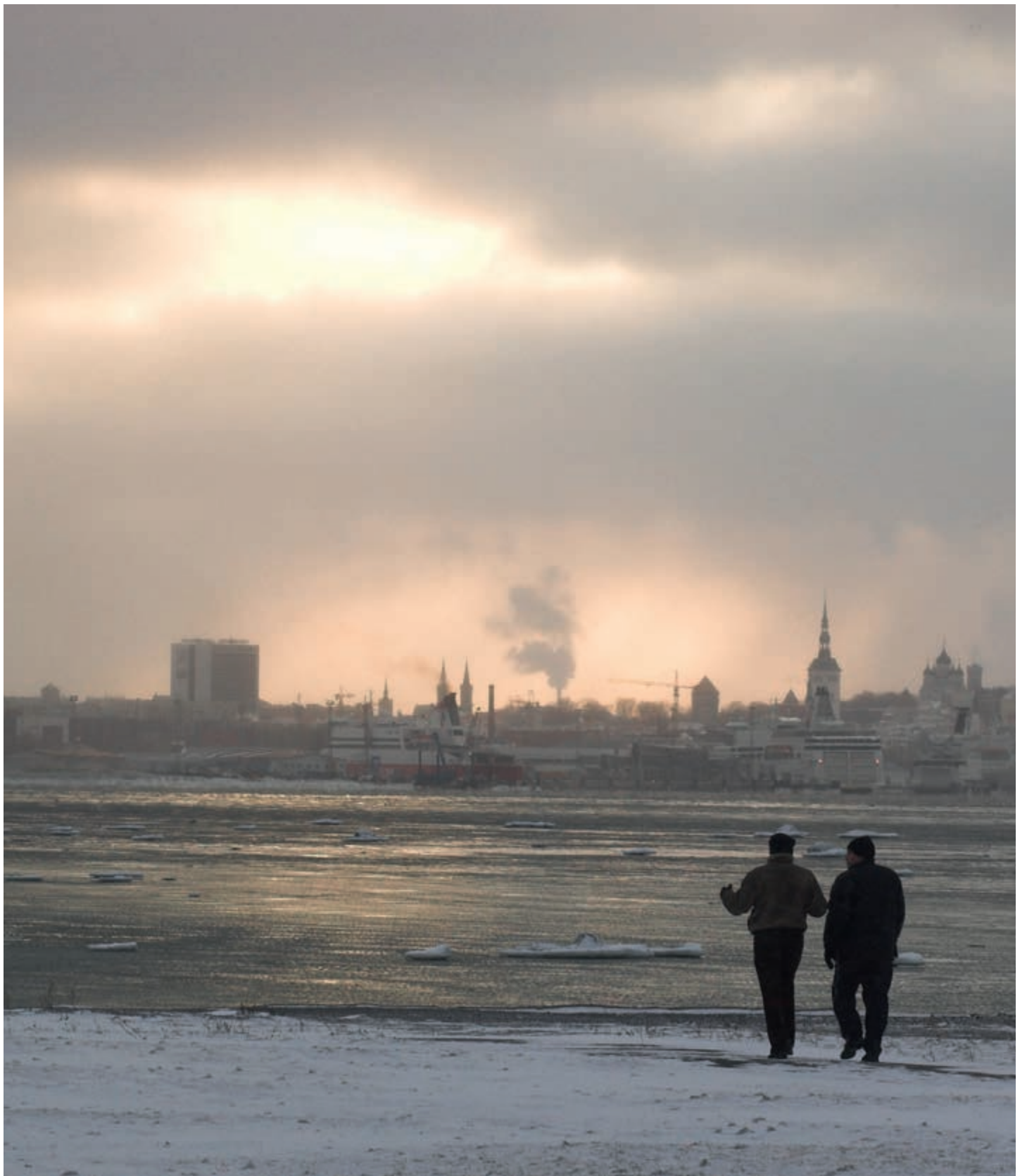
and adaptation costs and benefits. This could be based e.g. on identification of concrete investments or costs arising in recent years, such as beach cleaning equipment or repairs from major weather events that can be attributed to the effects of CC. Such analyses of concrete examples would motivate adaptive behaviour, if presented in terms of potential for avoided future costs.

However, the tourism industry in the BSR mainly consists of micro-entities, not even of small or medium size, with a planning horizon that only spans over a few seasons. Their opportunity to include CC adaptation in their own business models is low. Consequently, there is a need for new policies that increase adaptive capacity to meet opportunities as well as obstacles, such as increased insurance outlay or increased real estate costs if coastal areas become unsuitable for building, and smaller-scale annual recurring costs, such as mechanical beach clean-up, re-sedimentation and dredging.

In order to increase adaptive capacity of the tourism sector, the Baltadapt Strategy calls for the following:

- Increased cross-sectorial integration between the tourism sector and the transport and energy sectors, which are the two sectors from which tourism draws the most resources,
- Development and implementation of financial risk assessments,
- BSR wide systems to monitor and forecast major extreme weather and environmental events, and to present these results in terms of their impacts on the tourism industry; as well as monitoring systems to predict and inform about more localised and specific CC related problems, such as algal blooms,
- Training and preparing rescue services for increased occurrence of forest fires and floods, as well as regional or city emergency plans for evacuation of tourists in case of climate-related disaster events,
- Marketing of sustainable tourism to ensure that the potentially increased visitor load in the BSR will not proportionally increase the environmental impacts,
- Preparing visitor capacity assessments for islands and natural areas to determine the maximum number of tourists the given destination's environment can support.





5. POLICY FRAMEWORK

5.1. The EU Strategy on Climate Adaptation

A comprehensive EU Strategy on Adaptation to Climate Change was launched in April 2013 with the aim to increase Europe's resilience and reduce its vulnerability to the impacts of CC. It addresses the need for macro-regional cooperation as a way to encounter identified barriers to adaptation. The Commission promotes adaptation including cross-border management of floods and transboundary coastal management, and the establishment of vulnerability assessments and adaptation strategies, including those with a cross-border nature.

The Baltadapt Strategy – and the Baltadapt AP – aims to serve as a role model for the EU Strategy, with regard to facilitating the implementation of the EU Strategy through macro-regional cooperation. It provides a ground for solidarity through cross-border and cross-sectoral considerations.

The goals of the Baltadapt Strategy (see box in section 4) address the eight actions in the EU Strategy from a BSR macro-regional perspective:

Action 1: Encourage all Member States to adopt comprehensive adaptation strategies

BSR Response: Based on the Commission guidelines for formulating adaptation strategies, the Baltadapt Strategy promotes macro-regional cooperation to develop, implement and review national adaptation policies within the BSR, with emphasis on cross-border issues and macro-regional coherence with national disaster risk management plans.

Action 2: Provide LIFE funding to support capacity building and step up adaptation action in Europe (2013-2020)

BSR Response: The Baltadapt Strategy encourages implementation of macro-regional LIFE-funded activities for cross-border management of floods, fostering collaborative agreements based on the EU Floods Directive, as well as transboundary coastal management, mainstreaming of adaptation into urban land use planning, building layouts and natural resources management with emphasis on sustainable and resilient agricultural, forestry and tourism sectors. It also aims, with support from the Commission, to ensure access to vulnerability assessments and adaptation strategies, with focus on issues of a cross-border nature. Demonstration and transferability potential within the BSR should be promoted, as well as macro-regional cooperation on early-warning systems. The Baltadapt Strategy also calls for LIFE-funded awareness rising on adaptation.

Action 3: Introduce adaptation in the Covenant of Mayors framework (2013/2014)

BSR Response: The Baltadapt Strategy calls for macro-regional cooperation with regard to coastal cities' adaptation strategies following the Covenant of Mayors initiative.

Action 4: Bridge the knowledge gap

BSR Response: The Baltadapt Strategy addresses the identified weakness in coordination and cooperation. It encourages cooperation within the BSR to fill knowledge gaps identified by the Commission, including information on damage and adaptation costs and models as well as tools to support decision-making. It also aims to ensure

that BSR perspectives are considered in the programming of Horizon 2020 (2014–2020), including identification of needs for improved interfaces between science, policy making and business, as well as improved assessments of what global CC will mean for the BSR.

Action 5: Further develop Climate-ADAPT as the 'one-stop shop' for adaptation information in Europe

BSR Response: The Baltadapt Strategy addresses the need to further develop Climate-ADAPT through the development of a Baltic sub-section, built on interaction between national and local adaptation portals within the BSR. In line with the EU Strategy, special attention will be given to cost-benefit assessments of different policy experiences and to innovative funding, via closer interaction with regional and local authorities and financial institutions.

Action 6: Facilitate the climate-proofing of the Common Agricultural Policy (CAP), the Cohesion Policy and the Common Fisheries Policy (CFP).

BSR Response: The Baltadapt Strategy encourages macro-regional cooperation related to design, development and implementation of BSR relevant climate-proofing of CAP and CFP.

Action 7: Ensure more resilient infrastructure

BSR Response: The Baltadapt Strategy aims to ensure that a BSR focus is included in the EU Commission's revision of standardisations and provision of guidelines in the areas of energy, transport and buildings. Specific focus will be on promoting green infrastructure and ecosystem-based approaches to adaptation.

Action 8: Promote insurance and other financial products for resilient investment and business decisions

BSR Response: Based on the Green Paper on insurance against natural and man-made disasters adopted alongside the EU Climate Adaptation Strategy, the Baltadapt Strategy aims to encourage insurers in the BSR to improve the way they help manage CC risks.

5.2. Links to the EU Strategy for the Baltic Sea Region

The EUSBSR was adopted in 2009 as the first comprehensive EU Strategy to target a macro-region. The eight EUSBSR riparian states of Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden face several common challenges which are reflected in the jointly-agreed Action Plan of the EUSBSR. Many of these challenges are shared with non-EU BSR states (the Russian Federation, Belarus and Norway) and need a common platform to be addressed in cooperation.

The EUSBSR Action Plan calls for a Baltic Sea Region-wide CC adaptation strategy that provides a framework to strengthen cooperation and information sharing within the region. In the EUSBSR Action Plan, climate adaptation is included as a sub-objective of the goal "Increase prosperity". This highlights that adaptation is needed in order to gain from opportunities and meet obstacles related to CC. Not taking action can have devastating economic, social and environmental consequences. Although certain benefits can be gained already from adaptation to the present climate conditions, costs of climate adaptation are limited compared to the future costs of non-action today.

Furthermore, CC adaptation is one of the three main actions in the EUSBSR under the Horizontal Action (HA) "Sustainable Development". It is coordinated by the Council of the Baltic Sea States (CBSS) Secretariat, Unit Baltic 21 for Sustainable Development. CBSS is also coordinating activities related to CC mitigation. The Baltadapt project, wherein the Baltadapt Strategy was developed, is a flagship project included under the HA Sustainable Development. The proposal for a BSR-wide climate change adaptation strategy and action plan as presented by the Baltadapt project is an important milestone in the implementation of the HA Sustainable Development. It is also an important milestone in achieving the objectives of the EUSBSR of facilitating integrated cross-sectoral approaches to policy development and change in respective member states concerning CC adaptation, aligning funding and increasing macro-regional cooperation and knowledge-pooling in one of the most important fields of common concern in the BSR.

Climate adaptation is also mainstreamed within the EUSBSR Action Plan objective "Save the Sea", in the sub-objectives "Clear water" and "Rich and Healthy Wildlife", which also relate to CC pressures.

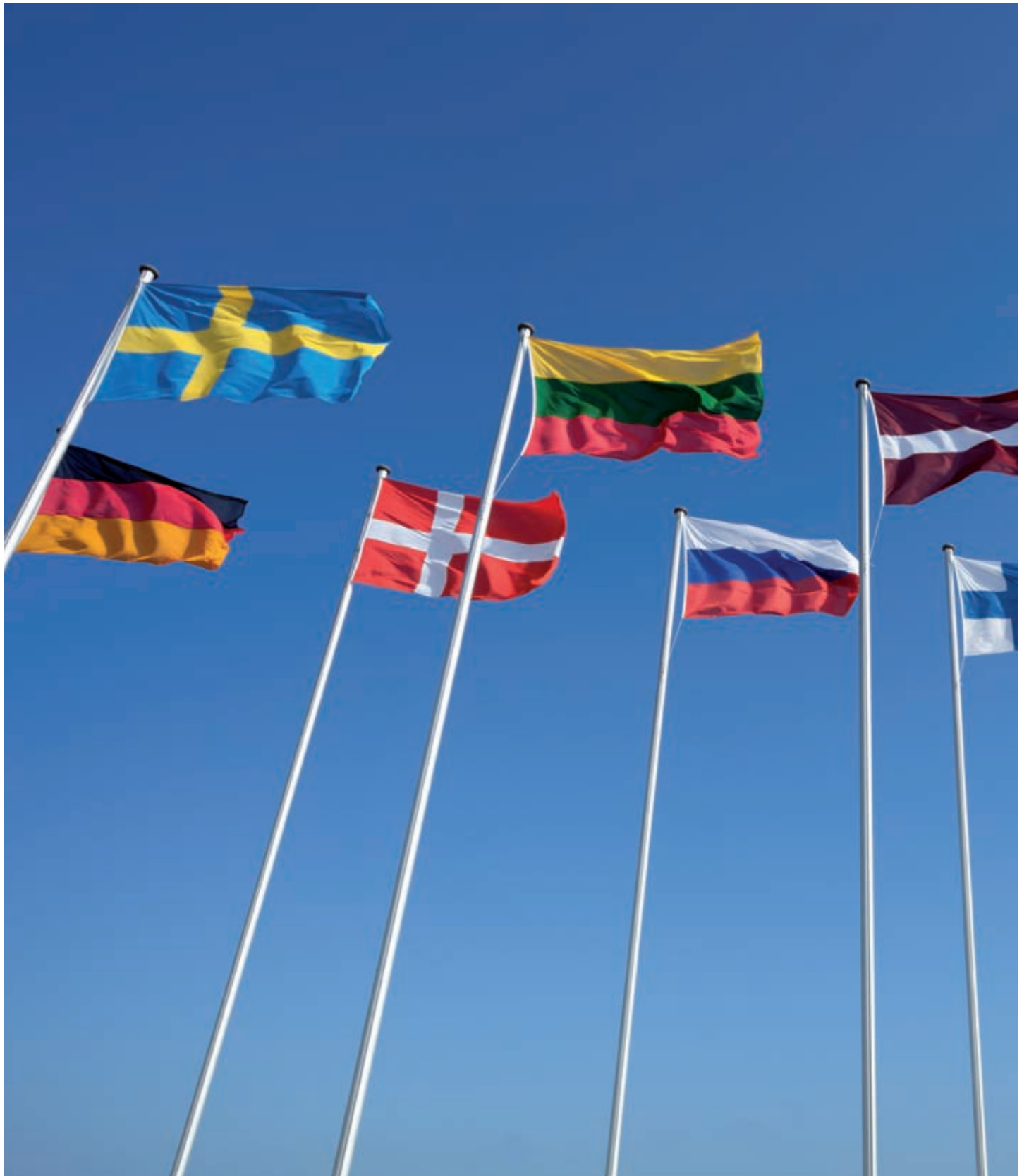
5.3. National Strategies in BSR countries

All EU countries are at different stages of preparing, developing and implementing national adaptation strategies. With regard to countries with a Baltic Sea coastline, some countries (Denmark, Finland, Germany) are currently implementing national strategies, whereas others (Estonia, Latvia) have not yet developed such strategies. Sweden has developed an integrated and coordinated cooperation between vulnerable sectors, but not a formal national strategy. Lithuania approved a National Climate Change Management Policy Strategy (mitigation and adaptation) in November 2012, and action plans will be approved in 2013. Macro-regional cooperation can be an impetus for the inclusion and implementation of regional priorities in national strategies and policies, thereby ensuring coherence between policies and actions at the national and transnational levels. Moreover, states that are yet to develop national strategies or that are re-evaluating existing strategies can benefit from the experiences, both positive and negative, of those that have already developed and adopted adaptation strategies/policies.

The Baltadapt Strategy specifically recognises that:

- National strategies for BSR states would benefit from pooled resources to identify priority sectors, major vulnerabilities and impacts and to create common databases,
- There is a need for bodies responsible for national strategies to meet regularly,
- Exchange of good practice examples should be encouraged,
- Macro-regional cooperation is needed to ensure inclusion in national strategies of issues where CC or climate adaptation in one state has consequences in other BSR states or for the Baltic Sea.





6. COORDINATORS AND IMPLEMENTERS OF THE STRATEGY

To ensure that a BSR Climate Adaptation Strategy is politically endorsed and that an Action Plan for Climate Adaptation is agreed on and jointly implemented by all BSR states, the Baltadapt Strategy recommends that CBSS establishes a transnational BSR Climate Change Adaptation Working Group (referred to as the WG in this document) with national representatives from all BSR states. They should represent governmental organisations responsible for national coordination of climate adaptation. In states where no national climate adaptation strategy is available yet, the Ministries that have the main responsibility for climate adaptation should appoint representatives. In order to ensure BSR-wide cooperation, it is recommended to include non-EU member states as members of the WG. The WG members are suggested to have the responsibility of communicating and coordinating with their national climate adaptation networks, including authorities, NGOs, the private sector and research, in order to be able to represent the climate adaptation agenda of the state at the macro-regional level.

Since climate adaptation is a HA in the EUSBSR Action Plan, the CBSS secretariat and the suggested WG need to communicate and coordinate with representatives from all relevant PAs and HAs of the EUSBSR Action Plan. CBSS should also ensure coordination with a wide network of relevant actors in the BSR who are active in CC adaptation work, including CBSS strategic partners and other pan-Baltic, sub-regional and local actors, to ensure a multi-level governance approach. It is suggested that the consistency between the BSR-wide Strategy for Adaptation to Climate Change and the EU Strategy on Adaptation to Climate Change be addressed through dialogues between CBSS, the WG, and the EU Climate Change Committee.

The main tasks of CBSS and the WG are suggested to be the following:

(1) Agree on the most relevant issues which support adaptation, by initiation of policy-science and multilevel governance dialogues related to climate adaptation and disaster risk reduction issues of common concern in the Baltic Sea Region, with specific consideration given to issues having cross-border implications.

The dialogues should involve a coherent, integrated, cross-cutting spectrum of potential implementers and facilitators of climate adaptation at all levels of governance. Although mainly based on existing networks (c.f. Sections 6.1 and 6.2), new cross-cutting meeting places for exchange between natural and social science, policy and the private sector, as well as between various levels of governance should be provided. Issues addressed could be related to adaptation to specific climate risks (e.g., flooding, sea level rise, heat and drought) and/or adaptation within specific focus areas (e.g., agriculture/forestry, tourism, coastal areas, health, infrastructure, disaster risk reduction, water management, marine environment, biodiversity or city planning). The Baltadapt prioritisation tool³² is recommended to help facilitate screening and priority setting, based on the identification of which impacts should be addressed through BSR cooperation. Activities should focus on the 11 goals of the Baltadapt Strategy (or on new goals in a politically endorsed strategy), with a focus on actions for which macro-regional cooperation provides clear added value to local and national strategies and action plans.

³² cf. Annex 3 and Baltadapt Report #10: Andersson et al., 2013.

(2) Promote actions based on recommendations emanating from these dialogues or other relevant initiatives.

CBSS and the WG should be responsible for promoting the inclusion of conclusions of the dialogues into relevant national and transnational policies in the BSR, with the aim to fulfil the visions of the BSR Strategy for Adaptation to Climate Change. They should also have the responsibility, through their national contact points in the EU Commission Climate Change Committee, to promote the consideration by the EU Strategy on Climate Adaptation of the specific needs of the BSR. CBSS and the WG should have a responsibility to advocate for macro-regional funding to stimulate opportunities and remove obstacles for climate adaptation related to issues of common concern in the BSR.

6.1. Implementers and facilitators

Implementers represent members of governance at all spatial levels (local, regional, national, macro-regional), including also the private and the research communities.

Knowledge brokers that facilitate knowledge exchange or sharing will have a specific role, with a mission to bridge the gap between policy/decision-makers (“what we do”) and researchers (“what we know”). Brokering is needed to communicate knowledge as well as to identify gaps of knowledge needed for policy decisions.

Actions that emanate from the dialogues coordinated by CBSS and the WG, either directly or e.g., after political endorsement or financing of projects, will be the core of the implementation of the BSR Strategy for Adaptation to Climate Change and its Action Plan.

The role of organisations that have the potential to be important actors for implementing or facilitating the implementation of the BSR Strategy for Adaptation to Climate Change are listed in Annex 4. The Baltadapt Strategy calls for specification of their roles and mainstreaming of climate adaptation into their activities, as

well as for identification of other relevant organisations to involve in the implementation of the BSR Climate Adaptation Strategy.

6.2. Funding of research, cooperation and investments

The **EUSBSR Seed Money Facility**³³ provides EU funding to prepare projects that contribute to one of the PAs or HAs of the EU Strategy for the BSR. Partners that receive seed money will draft a project plan that can be further developed into an application to any of the EU or national funding sources. The partners are expected to cooperate with the responsible EUSBSR PA and HA Coordinators. On behalf of the European Commission, Investitionsbank Schleswig-Holstein (IB.SH) manages the Seed Money Facility. IB.SH also operates the Joint Technical Secretariat and assists the Managing and Certifying Authorities of the EU-funded Baltic Sea Region Programme. Seed funding is part of the European Commission’s technical assistance budget for the EU Strategy for the Baltic Sea Region.

The **Baltic Sea Region Programme**³⁴ funds transnational cooperation in the BSR. A new funding period starts in 2014 and will continue until 2020. The programme specifically calls for links between CC, risk prevention and management, and competitiveness of small and medium size-enterprises, with focus on development of information and communication technologies. From the perspective of the BSR Strategy for Adaptation to Climate Change, it needs to be ensured that the CC component in the programme considers both mitigation and adaptation to CC.

The **LIFE Programme**³⁵ The Commission proposes to allocate EUR 3.2 billion over 2014–2020 to a new LIFE Programme for the Environment and Climate Action, including climate adaptation actions. Integrated projects will be promoted, aiming at implementation on a large territorial scale of environmental or climate strategies or action plans, and mobilising other EU, national and private funds. LIFE will, under certain conditions, enlarge its territorial scope to countries outside the EU, and adopt lighter

³³ <http://seed.eusbsr.eu/>

³⁴ <http://eu.baltic.net/>

³⁵ <http://ec.europa.eu/environment/life/about/beyond2013.htm>

procedures. Priority will be given to adaptation flagship projects that address key cross-sectoral, trans-regional and/or cross-border issues. Projects with demonstration and transferability potential will be encouraged, as will green infrastructure and ecosystem-based approaches to adaptation, as well as projects aiming to promote innovative adaptation technologies. This includes both hard and soft technologies, such as more resilient construction materials or early warning systems.

BONUS (Science for a better future of the BSR)³⁶ is a research funding programme that brings together the communities around marine, maritime, economic, and social research in order to address the major threats faced by the Baltic Sea system. The strategic objectives of BONUS (2011-2017) are to (1) understand the Baltic Sea ecosystem structure and functioning, (2) meet multifaceted challenges in linking the Baltic Sea with its coast and catchment, (3) enhance sustainable use of coastal and marine goods and services of the Baltic Sea, (4) improve society's capabilities to respond to current and future challenges directed to the Baltic Sea region, and (5) develop improved and innovative observation and data management systems, tools and methodologies for marine information needs in the BSR that enhance sustainable use of coastal and marine goods and services of the Baltic Sea. Climate adaptation needs to be integrated horizontally in order to achieve these objectives, which also calls for resources to reduce uncertainties in impact assessments through increased access to ensembles of regionally downscaled climate scenarios.

NEFCO (Nordic Environment Finance Cooperation) BSAP Fund³⁷ is a fund managed by NEFCO and the Nordic Investment Bank (NIB). The fund provides grants for technical assistance to projects that support the implementation of the BSAP. Recipients eligible for financing through the BSAP Fund include both public and private entities operating in the agricultural and wastewater treatment sectors, shipping and ports, as well as those working to reduce hazardous waste in the BSR. A key purpose of the fund is to facilitate and speed up the preparation of bankable projects. The Baltadapt Strategy recommends that "climate proofing" of the BSAP is included as one of the objectives to consider in provision of grants.

³⁶ www.bonusportal.org

³⁷ www.nefco.org/financing/bsap_fund

³⁸ www.ebrd.com

EBRD (European Bank for Reconstruction and Development)³⁷ is an international financial institution that supports projects from central Europe to central Asia, including the BSR states Estonia, Latvia, Lithuania, Poland and Russia. Owned by 63 countries, the EU and the European Investment Bank, the EBRD fosters transition towards open and democratic market economies through investment and technical cooperation. The Bank invests primarily in private sector clients whose needs cannot be fully met by the market, by providing loans, equity participation and guarantees to companies of all sizes and in a wide range of sectors. CC is included as an important component. Accordingly, a pioneering technical cooperation assignment was launched in 2009 to develop approaches for integrating climate risk management and adaptation into project appraisal and development. The Bank can build climate resilience into its investments through: "hard" adaptation measures, for example, physical modifications and additional infrastructure/technology, as well as through "soft" adaptation measures, e.g., adaptive management such as improved flood, hydrological monitoring, or emergency response plans.

Additional information on transnational financing opportunities for CC adaptation in the BSR is provided in the Baltadapt AP.



7. REFERENCES

Baltadapt Reports

Alberth, J. 2012: Review of Stakeholder Dialogues in Climate Adaptation Related Projects in the Baltic Sea Region. Baltadapt Report # 11. Danish Meteorological Institute, Copenhagen. www.baltadapt.eu.

Alberth, J.; Hjerpe, M. & Schauser, I. 2012: Conceptualization of Vulnerability and Review of Assessments around the Baltic Sea Region. Baltadapt Report # 7. Danish Meteorological Institute, Copenhagen. www.baltadapt.eu.

Altvater, S. & Stuke, F. 2013: Baltadapt Action Plan. Recommended actions and proposed guidelines for climate change adaptation in the Baltic Sea Region. Danish Meteorological Institute. Copenhagen. www.baltadapt.eu.

Andersson, L.; Alberth, J.; Van Riper, F., 2013: Baltadapt Stakeholder Dialogues - Stakeholder Input from the Tourism and Agricultural Sectors to the Baltadapt Strategy on Adaptation to Climate Change in the Baltic Sea Region. Baltadapt Report # 10. Danish Meteorological Institute, Copenhagen. www.baltadapt.eu.

Andersson, L; Hjerpe, M.; Alberth, J., 2013: The vulnerability assessment concept: A tool for prioritization of the most relevant issues for macro-regional cooperation. Baltadapt Report # 9. Danish Meteorological Institute, Copenhagen. www.baltadapt.eu.

Bruneniece, I. 2012: Gap-fit Analysis on Adaptation to Climate Change Research and Policy Design. Synthesis Report. Baltadapt Report # 1. Danish Meteorological Institute, Copenhagen. www.baltadapt.eu.

Dahl, K.; Josefson, A. B.; Göke, C., Aagaard Christensen, J. P.; Hansen, J.; Markager, S.; Rasmussen, M.B.; Dromph, K.; Tian, T.; Wan, Z.; Krämer, I; Viitasalo, M.; Kostamo, K.; Borenäs, K.; Bendtsen, J.; Springe, G.; Bonsdorff, E. 2012: Climate Change Impacts on Marine Biodiversity and Habitats in the Baltic Sea – and Possible Human Adaptations.

Baltadapt Report # 3. Danish Meteorological Institute, Copenhagen. www.baltadapt.eu.

Hjerpe, M.; Schauser, I.; Alberth, J. 2013: Guideline on the System Vulnerability. Analysis of the Baltic Sea Region Vulnerability to the Impact of Climate Change. Baltadapt Report # 8. Danish Meteorological Institute, Copenhagen. www.baltadapt.eu.

Krämer, I.; Borenäs, K.; Daschkeit, A.; Filies, Ch.; Haller, I.; Janßen, H.; Karstens, S.; Kule, L.; Lapinskis, J. & Varjopuro, R. 2012: Climate Change Impacts on Infrastructure in the Baltic Sea Region. Baltadapt Report # 5. Danish Meteorological Institute, Copenhagen. www.baltadapt.eu.

Peltonen, H.; Varjopuro, R. & Viitasalo, M. 2012: Climate Change Impacts on the Baltic Sea Fish Stocks and Fisheries. Review with a Focus on Central Baltic Herring, Sprat and Cod. Baltadapt Report # 4. Danish Meteorological Institute, Copenhagen. www.baltadapt.eu.

Baltadapt Climate Info Bulletins

Baltadapt Climate Info #1: Air Temperature (Bøssing Christensen, O., & Kjellström, E., 2011). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #2: Precipitation (Bøssing Christensen, O., & Kjellström, E., 2011). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #3: Wind Climate (Bøssing Christensen, O., & Kjellström, E., 2012). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #4: Sea Level Rise (Borenäs, K., 2011). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #5: Oxygen Content (Borenäs, K., 2011). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #6: Salinity (Borenäs, K., 2011). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #7: Water Temperature (Borenäs, K., 2011). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #8: Biodiversity and Habitats (Dahl, K., Frederiksen, M., Peltonen, H., Bonsdorff, E., 2012). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #9: Biological Production (Dahl, K., Peltonen, H., Viitasalo, M., Wan, Z (2012). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #10: Wind Waves (Dobrynin, M., Krarup Leth, O, 2011). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #11: River Discharge (Wallman, P., 2011). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #12: Nutrient Loads to the Baltic Sea (Wallman, P., 2011). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #13: Eutrophication (Borenäs, K., Krämer, I, 2011). <http://climate-info.baltadapt.eu>.

Baltadapt Climate Info #14: Sea Ice (Kjellström, 2013). <http://climate-info.baltadapt.eu>.

Other documents referred to

Commission of the European Communities, 2009. White Paper. Adapting to climate change: Towards a European framework for action. Brussels, COM (2009) 147 final

Commission of the European Communities. 2013. Action Plan for the European Union Strategy for the Baltic Sea Region. Brussels, SEC (2009) 712/2

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, 2011. Open data - an engine for innovation, growth and transparent governance. Brussels, 12.12.2011 COM (2011) 882 final

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, 2013. An EU

Strategy on adaptation to climate change. Brussels, 16.4.2013 COM (2013) 216 final

Council directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Official Journal of the European Communities. No L 206/7.

Directive 2000/60/EC of the European Parliament and of the Council .of 23 October 2000 establishing a framework for Community action in the field of water policy. Official Journal of the European Union.

Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE). Official Journal of the European Union.

Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks. Official Journal of the European Union.

Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive). Official Journal of the European Union.

European Commission, 2013. Green Paper on the insurance of natural and man-made disasters. Strasbourg, 16.4.2013 COM (2013) 213 final

European Commission, 2013. Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, concerning the added value of macro-regional strategies, Brussels 27.6.2013 COM(2013) 468 final

HELCOM Baltic Sea Action Plan, 2007. HELCOM Ministerial Meeting Krakow, Poland, 15 November 2007

IPCC, 2007, Climate Change 2007: Climate Change Impacts, Adaptation, and Vulnerability, Cambridge University Press, Cambridge.

Isoard, S., Grothmann, T. and Zebisch, M., 2008. Climate Change Impacts, Vulnerability and Adaptation: Theory and Concepts. Paper presented at the Workshop 'Climate Change Impacts and Adaptation in the European Alps: Focus Water.

ANNEX 1:

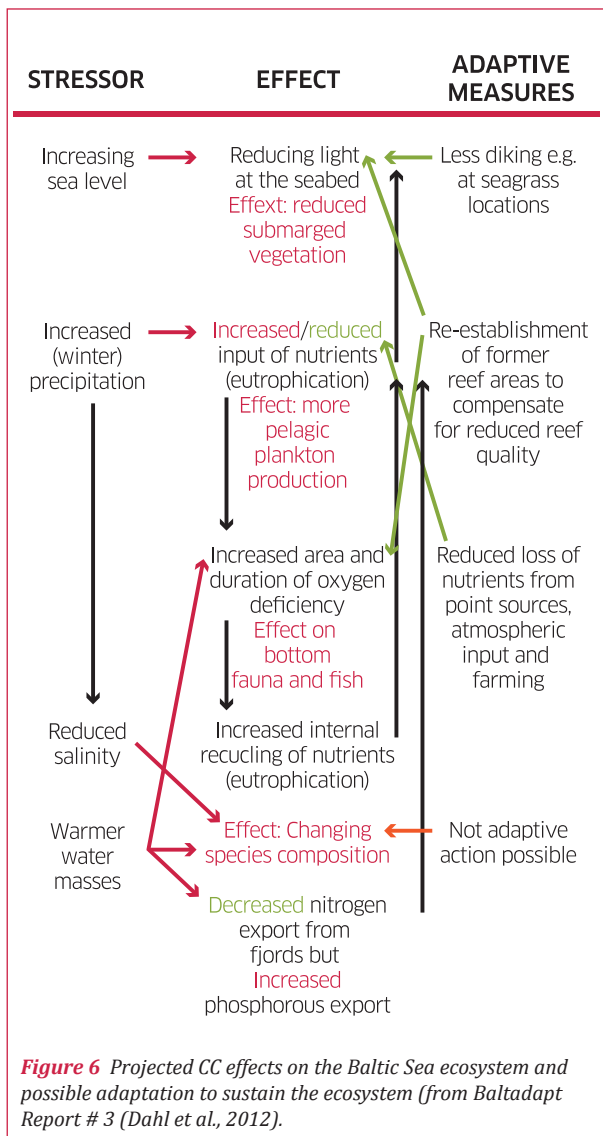
Certainty and time horizons for change

These estimates are based on Baltadapt climate and environmental modeller's judgements of certainty and expected time horizon until significant change can be detected. From Baltadapt Report #10 (Anderson et al., 2013). Year 0 refers to 2013.

CLIMATE VARIABLE:	CERTAINTY THAT CHANGE WILL OCCUR AND GEOGRAPHICAL COVERAGE	EXPECTED TIME HORIZON UNTIL SIGNIFICANT CC CAN BE DETECTED:
<i>Annual air temperature</i>	High certainty for the whole region.	0-20 years (already detectable)
<i>Warmer water in the sea</i>	High certainty in the whole region.	0-50 years (already detectable)
<i>Higher summer air temperatures with more heat waves</i>	High certainty for warmer summer, moderate certainty for more heat waves in the whole region.	Warmer summers: 0-50 years More heat waves: 50-100 years
<i>Rising sea level due to global sea level rise</i>	High certainty for change. However, the northern areas will not see a strong increase in sea level in the nearest century due to compensation by land uplift. In the south, the sea is already rising.	0-100 years or more (already detectable in southern parts)
<i>Reduced ice cover in the sea and along coasts and a shorter sea ice season</i>	High certainty for change. In southern areas there will very seldom be any ice in the future while in, e.g. the Bothnian Bay it will still exist.	10-50 years
<i>Changes in the frequency of freeze and thaw cycles</i>	High certainty that change will occur. No ice (and consequently no changes) in the southern areas, increase in the frequency of freeze and thaw cycles in the northern part of the region.	10-50 years
<i>Increase in extreme precipitation</i>	Moderate certainty that change will occur in the whole region.	10-100 years
<i>Increase in river discharge due to increased precipitation</i>	Moderate certainty that change will occur. Increases largest in the north and especially in winter. Summer discharge may decrease, especially in the south.	10-100 years
<i>Lower salinity in the sea</i>	Moderate certainty in the whole region.	10-100 years
<i>More severe dry spells in summer</i>	Certainty low in most of the region, but moderate in the southern parts.	10-100 years
<i>Increase in high wind speeds, storms and high waves in coastal and marine areas</i>	Low certainty that change will occur. Models do not agree on the direction of change or on where changes will occur. Some models indicate an increase in extremes over the Baltic Sea, others don't.	50-100 years
<i>Local, temporal sea level rise due to local wind induced storm surges</i>	Low certainty.	50-100 years

ANNEX 2:

Summary of impact assessments for the four Baltadapt focus sectors



Marine biodiversity and habitats

Substantial changes in the Baltic Sea ecosystem due to CC are expected in the coming 100 years (Baltadapt Report # 3 (Dahl et al., 2012) (Figure 6).

The sea will eventually (time span 10–100 years from now) become more brackish, warmer (already detectable) and sea level will rise (detectable already in the southern parts of the BSR, compensated by land uplift in the northern parts). Biological communities inhabiting the Baltic will change. Many Baltic Sea species are already living close to their physiological salinity tolerance. Relative abundance of species is changing, as the conditions increasingly favour freshwater species at the expense of marine species. Eutrophication might increase due to the expected CC related increase in nutrient loads from the drainage basin, unless political action and proper management measures are taken. Increased plankton production and further reduction in oxygen concentrations might cause even larger oxygen depleted sea bottom areas in the future.

Reduced light penetration caused by expected increased plankton biomasses accompanied by rising sea level in the south will have a negative effect on eelgrass meadows and seaweed forests on reefs and rocky shores. In the Northern Baltic the expected lack or decrease in ice cover over the winter season will affect e.g. populations of birds and ringed seal. Impacts on marine biodiversity are further elaborated in Baltadapt Report # 3 (Dahl et al, 2012).

Food supply - fishery and agriculture

The vulnerability of fish stocks in the Baltic Sea is high, since it is a species-poor ecosystem with limited opportunities for re-colonisation from other marine areas and

limited possibilities to “escape” CC by shifting distribution ranges northwards. Virtually all species live close to their environmental tolerance range. As a consequence of CC and impacts including lower salinity and warmer water, fewer species will be present, with more freshwater species at the expense of marine species. Consequently, CC combined with other concomitant human pressures induce substantial uncertainties for the future development of fish stocks, especially as responses to changes may be abrupt, which needs to be considered in the exploitation of fish resources. Impacts on fish stocks and fishery are further elaborated in Baltadapt Report # 4 (Peltonen et al., 2012).

With regard to agriculture production, CC might impose both opportunities and obstacles. An increase in temperature can bring opportunities for the agricultural sector, including prolonged vegetation periods and the opportunity to introduce new crop varieties. A problem to be solved, however, is avoiding introduction of new pests and weeds. The expected increase in both evapotranspiration and precipitation is, for most parts of the BSR, expected to create problems due to either too little or too much water.

In addition to CC, nutrient loss from agriculture acts as another driver of Baltic Sea eutrophication. The willingness to adapt with regard to this “other driver” is acknowledged through the BSAP agreements, in which BSR countries agreed on measures to reduce nutrient load to the Baltic Sea. Impacts on agricultural production and links between CC and nutrient loads from agriculture are further elaborated in Baltadapt Report #10 (Andersson et al., 2012).

Coastal infrastructure

Rising temperatures, decreasing sea ice cover, sea level rise, changing precipitation and possibly also (although highly uncertain) changed storm patterns can be expected to have a direct impact on coastal infrastructure, coastal protection, lighthouses, radio-locators and other navigation and defence related technical installations for communications, maritime traffic, ports and touristic infrastructure, as well as freshwater resources, waste water treatment, canalisation, roads, railways, cycle tracks, and energy supply (wind power, power plants and transformer stations). In addition, the coastal health

infrastructure needs to adapt to heat waves and other extreme weather events, as well as to the possibility of increased exposure to allergens and air-pollutants and hygiene problems related to food and water supply. The demand for enhanced medical infrastructure will be exacerbated by the predicted ageing of Western societies as a consequence of demographic change. CC impacts on coastal infrastructure are further elaborated in Baltadapt Report #5 (Krämer et al., 2012).

Coastal tourism

In a general sense CC can be seen as an opportunity for BSR coastal tourism, since the BSR will experience more pleasant summer temperatures than other regions, where temperatures will become too high. Secondly, more tourists can be expected due to the prolongation of the summer season.

As presented in Baltadapt Report #10 (Andersson et al., 2013) and Baltadapt Report #6 (Kule et al., 2013), CC in the BSR might, however, also include unpleasant components for tourists, including more days with heavy rains as well as heat waves. In addition, the impacts of the changing climate further affect the quality of two of the most valuable resources for summer tourism in the BSR, the beaches surrounding the Baltic Sea and the sea itself. CC has impacts on beach erosion, while increased eutrophication and biodiversity loss are also problems that can compromise touristic value of natural areas. Impacts on freshwater resources, e.g. through dry spells in summer or through saltwater intrusion into groundwater and other freshwater sources are also a threat to tourism. Impacts on health are especially critical since ageing of the population will also be reflected in the tourism sector. Specific health concerns for coastal tourism are associated with increases in toxic algal blooms, jellyfish occurrence and bacterial outbreaks, tick and mosquito-borne diseases. Health issues might decrease the popularity or even the safety of coastal tourism throughout the BSR.

ANNEX 3:

Prioritisation of issues to be focused on in macro-regional cooperation on climate adaptation

Prioritising of issues to be focused on in macro-regional cooperation on climate adaptation needs to be based on estimates of potential impacts and adaptive capacities (cf. Figure 3 in Section 3) in various parts of the BSR.

Macro-regional cooperation is especially important in adaptation to impacts for which (i) the certainty of change is high and the (ii) time horizon short (change already detected or projected in the near future). If this is the case and impacts are foreseen in large parts of the BSR (iii), and actors from most BSR states perceive that there will either be significant negative impact without CC adaptation or lack of positive impact if actions are not taken which take advantage of the possibilities (iv), the benefit from macro-regional cooperation is foreseen to be high. Visualisations of these four factors used for prioritisation of actions are provided in Baltadapt Report # 9 (Andersson et al. 2013).

In this section, the impacts with the highest ranking for agriculture, eutrophication/biodiversity, tourism and infrastructure are presented.

The highest rankings were obtained for impacts related to eutrophication/biodiversity and impacts related to agriculture. Since one of the only possible measures to reduce

the impacts of CC on eutrophication (and indirectly on biodiversity) is reduction of nutrient loads from agriculture, a focus on agriculture in macro-regional cooperation could thus be recommended based on the achieved rankings. To make such cooperation attractive for the agricultural sector it is important that environmental concerns be handled together with concerns for adaptation to ensure the prosperity of the agricultural sector.

With regard to the focus areas within Baltadapt (biodiversity of the Baltic Sea, coastal infrastructure, tourism and food supply including fishery and agriculture) the highest rankings for relevance to macro-regional cooperation were obtained for impacts related to eutrophication/biodiversity and impacts related to agriculture.

Below, impacts with a ranking of 3.5 or more (on a 0-5 scale) are shown for eutrophication/biodiversity and agriculture. Although raised as a concern within the agricultural sector, the increased risk for flooding only received a rating of 3.3. This was due to the fact that the certainty of more extreme precipitation is moderate, with no significant change detected yet (the predicted time span is of 10–100 years until a possible change can be expected). Note that for agriculture, both adaptation to take advantage of opportunities and adaptation to manage risks were identified.

EUTROPHICATION AND BIODIVERSITY				
IMPACT	CHANGING CLIMATE VARIABLE	CERTAINTY OF CHANGE OF CLIMATE VARIABLE	TIME HORIZON FOR CHANGE OF CLIMATE VARIABLE	RATING (AVERAGE OF CERTAINTY, TIME HORIZON, IMPORTANCE AND MACRO-REGIONAL COVERAGE)
<i>Increased cyanobacterial blooms</i>	Warmer water	High (whole region)	0-50 years (already detectable)	4.5
<i>Higher survival rates of invasive species</i>	Warmer water	High (whole region)	0-50 years (already detectable)	4.5

<i>Loss of original marine flora and fauna</i>	Oxygen deficits	High (whole region)	10-50 years	4.3
<i>Increased phosphorus loads in southern parts, possible decrease in northern parts (less ground frost)</i>	Higher air temperatures	High (whole region)	0-20 years (already detectable)	4.2
<i>Increased phosphorus loads in southern parts, possible decrease in northern parts (less ground frost)</i>	Higher air temperatures	High (whole region)	0-20 years (already detectable)	4.2
<i>Loss of communities of organisms that live on the sea bottom</i>	Oxygen deficits	High (whole region)	10-50 years	4.2
<i>Accelerated eutrophication, increased cyanobacterial blooms, harmful algae and loss of biodiversity</i>	Oxygen deficits	High (whole region)	10-50 years	4.0
<i>Accelerated eutrophication due to increased algae production when ice-free</i>	Reduced ice cover	High (still occurrence of ice in northern parts, never ice in southern parts)	10-50 years	3.6
<i>Changes towards species that are more tolerant to low oxygen concentrations</i>	Oxygen deficits	High (whole region)	10-50 years	3.6

AGRICULTURE				
IMPACT	CHANGING CLIMATE VARIABLE	CERTAINTY OF CHANGE OF CLIMATE VARIABLE	TIME HORIZON FOR CHANGE OF CLIMATE VARIABLE	RATING (AVERAGE OF CERTAINTY, TIME HORIZON, IMPORTANCE AND MACRO-REGIONAL COVERAGE)
<i>New pests affecting livestock and plants</i>	Higher air temperatures	High (whole region)	0-20 years (already detectable)	4.8
<i>Longer vegetation periods for agricultural production</i>	Higher air temperatures	High (whole region)	0-20 years (already detectable)	4.2
<i>Opportunities to introduce new agricultural crops</i>	Higher air temperatures	High (whole region)	0-20 years (already detectable)	4.1
<i>Changed growth and geographical distribution of weeds</i>	Higher air temperatures	High (whole region)	0-20 years (already detectable)	4.1
<i>Potential for higher crop yield</i>	Higher air temperatures	High (whole region)	0-20 years (already detectable)	3.9

Although a bit more limited than for the agricultural sector, for the fishery sector a number of factors of high relevance to macro-regional cooperation were also identified that might be used as indicators.

FISHERY				
IMPACT	CHANGING CLIMATE VARIABLE	CERTAINTY OF CHANGE OF CLIMATE VARIABLE	TIME HORIZON FOR CHANGE OF CLIMATE VARIABLE	RATING (AVERAGE OF CERTAINTY, TIME HORIZON, IMPORTANCE AND MACRO-REGIONAL COVERAGE)
<i>Decline of cod which also leads to thin and small herring and sprat</i>	Oxygen deficits	High (whole region)	10-50 years	4.2
<i>Fish production and value of catches will change</i>	Warmer water	High (whole region)	0-50 years (already detectable)	3.9
<i>Species such as salmon, trout and whitefish will disappear</i>	Warmer water	High (whole region)	0-50 years (already detectable)	3.9

The number of identified impacts with a high macro-regional cooperation ranking (above 3.5) was a bit more limited for tourism, but there are still a number of important adaptations possible to take advantages of opportunities and manage risks were identified. Note that most impacts

are opportunities. However, it should be noted that the tourism sector might suffer from negative impacts related to eutrophication and reduced biodiversity, as well as from infrastructure impacts caused by the expected flooding and beach erosion due to rising sea levels.

TOURISM				
IMPACT	CHANGING CLIMATE VARIABLE	CERTAINTY OF CHANGE OF CLIMATE VARIABLE	TIME HORIZON FOR CHANGE OF CLIMATE VARIABLE	RATING (AVERAGE OF CERTAINTY, TIME HORIZON, IMPORTANCE AND MACRO-REGIONAL COVERAGE)
<i>Higher health risks connected to swimming and water sports (cyanobacterial blooms, jelly fish, germs and amoebas in the water)</i>	Warmer water	High (whole region)	0-50 years (already detectable)	3.8
<i>Increased attractiveness of marine tourism destinations</i>	Higher air temperatures	High (whole region)	0-20 years (already detectable)	3.7
<i>More days with suitable temperatures for swimming and water sports</i>	Warmer water	High (whole region)	0-50 years (already detectable)	3.6
<i>Prolongation of coastal tourism</i>	Higher air temperatures	High (whole region)	0-20 years (already detectable)	3.5

Impacts with a high relevance for macro-regional cooperation related to coastal infrastructure were tied to rising sea levels; where adaptation to avoid flooding of coastal areas and beach erosion were identified as critical to address in the near future in the southern parts of the BSR.

INFRASTRUCTURE				
IMPACT	CHANGING CLIMATE VARIABLE	CERTAINTY OF CHANGE OF CLIMATE VARIABLE	TIME HORIZON FOR CHANGE OF CLIMATE VARIABLE	RATING (AVERAGE OF CERTAINTY, TIME HORIZON, IMPORTANCE AND MACRO-REGIONAL COVERAGE)
<i>More flooding of coastal areas</i>	Rising sea levels	High (whole region)	0-100 years (already detectable in southern parts, delay in northern parts due to compensating land lift)	3.8
<i>More coastal (beach) erosion</i>	Rising sea levels	High (whole region)	0-100 years (already detectable in southern parts, delay in northern parts due to compensating land lift)	3.5

Impacts with a ranking above 3.5 relating to infrastructure were tied to rising sea levels; where adaptation to avoid flooding of coastal areas and beach erosion were identified as critical to address in the near future in the southern parts of the BSR.

In summary, the tool was shown to be useful for illustrating the prioritisation of issues to be dealt with in macro-regional cooperation. In this specific application, all factors (certainty, time horizon, importance,

macro-regional coverage) were given equal weighing, indicating that impacts that already are detectable or that are expected to happen in the near future with a high degree of certainty are prioritized, if they also are perceived as having significant consequences for humans or for the environment and if they are expected to occur in several BSR countries. In other applications, the weighting of the four factors can be made differently if requested by decision makers or other stakeholders using the tool.

ANNEX 4:

Organisations that have the potential to be important actors in the implementation of the BSR Strategy for Adaptation to Climate Change

Intergovernmental international organisations

The **Council of the Baltic Sea States (CBSS)**³⁹ is a political forum for regional inter-governmental cooperation. The members of the council are Denmark, Estonia, Finland, Germany, Iceland, Latvia, Lithuania, Norway, Poland, Russia and Sweden as well as a representative from the European Commission. The role of the Council is to serve as a forum for guidance and overall coordination among the participating states on the CBSS long term priorities. The CBSS Secretariat Unit Baltic 21 is implementing the CBSS long-term priority Sustainable Development and Environment and will be responsible for the coordination and evaluation of the implementation of a BSR Strategy for Adaptation to Climate Change and its Action Plan, as leader of the EUSBSR HA Sustainable Development “

The **Nordic Council of Ministers**⁴⁰ consists of ministerial members from Denmark, Finland, Iceland, Norway, Sweden, the Faroe Islands, Greenland and Åland. Although only covering part of the BSR member states, the council has vast experience in macro-regional cooperation and is active in the implementation of the EUSBSR Action plan. It coordinates the activities related to bio-economy within the EUSBSR HA “Sustainable Development and Bio-Economy”, which provides the ground for cooperation in the fields of climate adaptation and bio-economy. Within the Nordic Council of Ministers Centre of Excellence initiative, the Nordic Council of Ministries funds the project Nordstar,⁴¹ which is developing a white paper on climate

adaptation for the Nordic countries and which has the potential to be extended to cover the whole BSR.

The **Helsinki Commission (HELCOM)**⁴² is the Baltic Marine Environment Protection Commission, an intergovernmental organisation including the nine coastal states of the Baltic Sea and the EU. It is responsible for coordinating the actions and activities of its contracting parties for ensuring the protection of the marine environment of the Baltic Sea. It implements the Helsinki Convention, the Baltic Sea Action Plan (BSAP) and HELCOM Recommendations. In addition, declarations of the meetings of HELCOM ministers and high-level representatives are being put into action. CC is a central question for HELCOM. From HELCOM’s perspective, adaptation means adjustment of the measures to protect the Baltic Sea marine environment so as to achieve the vision of a healthy Baltic Sea even in a changing climate. CC mainstreaming of the BSAP should be a central part of the BSR Strategy for Climate Change Adaptation.

Visions and Strategies around the Baltic Sea (VASAB)⁴³ is an intergovernmental multilateral cooperation in spatial planning and development of 11 countries of the BSR. It is guided by the Conference of Ministers responsible for spatial planning and development and steered by the Committee on Spatial Planning and Development of the Baltic Sea Region, composed of representatives of respective ministries and regional authorities. VASAB promotes participative spatial planning which aims to achieve sustainable balance between social, cultural, environmental and economic goals, including climate adaptation.

³⁹ www.cbss.org

⁴⁰ www.norden.org/en

⁴¹ www.nord-star.info

⁴² www.helcom.fi

⁴³ www.vasab.org

The **Baltic Sea Parliamentary Conference (BSPC)**⁴⁴ is a forum for political dialogue between parliamentarians in the BSR, aiming to raise awareness on issues of current political interest and relevance for the region. The BSPC Working Group on Energy and CC presented its final report in 2009. In 2011, a Working Group on Green Growth and Energy Efficiency Use was established, linking to possible CC adaptation measures. The BSPC Working Groups have the mandate to raise political focus on energy and CC on the national agendas of the Working Group members and to come up with recommendations for CBSS and the governments of the Baltic Sea Region.

Cooperation on the local and sub-regional levels

The **Union of the Baltic Cities (UBC)**⁴⁵ is a network for cooperation between cities in the BSR, with the aim to mobilise the shared potential for democratic, economic, social, cultural and environmentally sustainable development of the BSR. UBC has identified the following added value of a common macro-regional agenda:

- Focused, concentrated activities.
- Common and stronger regulation/instructions/recommendations.
- Possibility for cross-sectorial, cross-county cooperation and exchange of good practices (with differences and opportunities in efficient implementation of CC work highlighted).

The **Baltic Sea States Sub-regional Co-operation (BSSSC)**⁴⁶ is a political network for decentralised authorities (sub-regions) in the BSR. Its participants are regional authorities (level directly below the national level authorities) of the 10 Baltic Sea littoral states: Germany, Denmark, Finland, Sweden, Norway, Poland, Latvia, Lithuania, Estonia and Russia. It works under the umbrella of CBSS and shall contribute to a shared knowledge of government and good practices, which will be made available to regional and national authorities, the EU and other decision-making bodies. BSSSC is an important actor in

CC adaptation since adaptation is implemented at the local and sub-regional levels. BSSSC forms a well-suited entry point for increased cooperation on this issue at the sub-regional level and needs to mainstream climate adaptation in its agenda.

Cooperation including the business community

The **Baltic Development Forum (BDF)**⁴⁷ is focused on the business community and has the mission of positioning the BSR in the EU and on the global map by advancing the growth and competitive potential through partnerships between business, government and academia. It initiates and facilitates the creation of strategies, provides thematic analyses and offers a wide networking arena for high-level decision-makers. BDF has the potential to be a leading actor in the promotion of innovations that facilitate climate adaptation.

The **Baltic Sea Chambers of Commerce Association (BCCA)**⁴⁸ is a network open to Chambers of Commerce in the BSR. It promotes trade and business relationships across the region. Over the years this has been done through actions such as trade fairs, conferences and other forms of networking as well as through information and analyses. Trade and innovations related to climate adaptation should be promoted to be on the agenda of BCCA.

The **Baltic Sea Tourism Commission (BTC)**⁴⁹ is an international organisation for market-oriented tourism companies and organisations in the BSR. The goal is to increase the region's attractiveness through networking and collaborations. Adaptation to CC is foreseen to be a vital component in this work.

The **Baltic Sea Action Group (BSAG)**⁵⁰ works as a match-maker between organisations and specific problems of the Baltic Sea. It acts as an initiator and catalyst behind concrete acts aimed at tackling the complete range of threats to the Baltic Sea, such as eutrophication, threats imposed by hazardous substances and risks related to

⁴⁴ www.bspc.net

⁴⁵ www.ubc.net

⁴⁶ www.bsssc.com

⁴⁷ www.bdforum.org

⁴⁸ www.bcca.eu

⁴⁹ <http://balticsea.com>

⁵⁰ www.bsag.fi/en/

maritime activities. The work is based on constructive cooperation among and between all levels of society, including the highest political level in all the Baltic Sea countries, public authorities and the private sector. BSAG inspires the business world to get involved and utilise its innovative skills to solve the problems related to the state of the Baltic Sea. Results can be achieved through commitments to action, and the resulting sustainable and profitable business opportunities benefit also the commitment makers.

Non-governmental organisations

The **Baltic Sea NGO Network**⁵¹ brings together NGOs from different BSR states and from different areas of interest to share experiences, exchange information and improve their knowledge. They create partnerships and support transnational as well as inter-sectoral networks between NGOs from different BSR states. The network makes NGOs more visible and influences the democratic decision-making process at the national, regional and EU levels. Climate adaptation is relevant for several of the involved organisations.

Scientific/educational networks and knowledge brokering

The **Baltic Earth**⁵² will succeed the BALTEX programme, which has, for the past 20 years, been working towards an improved understanding of water, energy, nutrient and carbon cycles in light of climate change. Like BALTEX, it will be a network of scientists and institutions in the BSR, working together to tackle common research questions. Baltic Earth will play an active role in involving decision makers, for instance in cooperation with HELCOM, the intergovernmental Baltic Marine Environment Protection Commission and other stakeholders. Baltic Earth will organise working group meetings, scientific workshops and study conferences with dedicated stakeholder involvement. Another important task will be the production of scientific assessments regarding important scientific questions, identifying knowledge gaps and supporting the definition of new Grand Challenges for research. An

interdisciplinary discussion across borders and communication with stakeholders and the public about scientific questions and results will be important outreach aspects. Summer schools shall be organised on a regular basis as a contribution to a comprehensive education in Earth system sciences in order to support a new generation of researchers for whom interdisciplinary work is natural. Baltic Earth will thus play an important role in the implementation of the BSR Strategy, both with regard to research cooperation and science-policy dialogues.

The **Baltic Sea University Program (BUP)**⁵³ is a network of about 225 universities and other institutes of higher education throughout the BSR. Their aim is to support the key role that universities play in democratic, peaceful and sustainable development. This is achieved through development of university courses and participation in projects in cooperation with authorities, municipalities and others. Climate adaptation is already included in BUP activities, but could be even more integrated as a necessary part of the sustainable development concept.

⁵¹ www.balticseango.net

⁵² www.baltex-research.eu/balticearth/index.html

⁵³ www.balticuniv.uu.se

GLOSSARY

Baltadapt AP: Baltadapt Action Plan – recommended actions and proposed guidelines for climate change adaptation in the Baltic Sea Region

BSAP: The Baltic Sea Action Plan is an initiative from the Helsinki Commission (HELCOM). It addresses the major environmental issues that influence the Baltic marine environment. An agreement among the countries around the Baltic Sea specifies some actions to be taken to achieve a healthier Baltic Sea, e.g. better waste water treatment and changed agricultural practices.

BSR: The Baltic Sea Region includes the EU member states Denmark, Estonia, Finland, Latvia, Lithuania, Poland, Sweden and northern parts of Germany, as well as the neighbouring countries of Norway, the north-west regions of Russia and Belarus.

CC: Climate Change

CFP: the Common Fisheries Policy brings together a range of measures designed to achieve a thriving and sustainable European fishing industry.

EUSBSR: EU Strategy for the Baltic Sea Region. EUSBSR aims at reinforcing cooperation within the BSR in order to face several challenges by working together as well as promoting a more balanced development in the area. The Strategy also contributes to major EU policies and reinforces the integration within the area.
HA: Horizontal Action (in the EUSBSR).

INSPIRE: (Infrastructure for Spatial Information in Europe) is an initiative launched by the European Commission and developed in collaboration with Member States and accession countries. It aims at making available relevant, harmonized and quality geographic information to support formulation, implementation, monitoring and evaluation of Community policies with a territorial dimension or impact. INSPIRE intends to trigger the creation of a European spatial data infrastructure that delivers to the users integrated spatial information services linked by common standards and protocols.

IPCC: The Intergovernmental Panel on Climate Change (IPCC) is the leading international body for the assessment of climate change. The IPCC is a scientific body under the auspices of the United Nations (UN). It reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change.

MSFD: The EC Marine Strategy Framework Directive aims to protect the marine environment across Europe.
PA: Priority Area (in the EUSBSR).

WFD: The EC Water Framework Directive commits European Union member states to achieve good qualitative and quantitative status of all water bodies (including marine waters up to one nautical mile from shore) by 2015.

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