Baltic Marine Environment
Protection Commission

15 January 2017

Contribution from the Baltic Marine Environment Protection Commission (HELCOM) to the Part I of the report of the Secretary-General on oceans and the law of the sea, pursuant to General Assembly draft resolution A/71/L.26, entitled "Oceans and the law of the sea"

Information on the topic entitled "The effects of climate change on oceans"

being the topic of focus of the eighteenth meeting of the Informal Consultative Process, which pursuant to paragraphs 336 and 339 of the draft resolution will be held in New York from 15 to 19 May 2017.

Introduction

As adaptation to climate change has been taken into account long term in HELCOM plans and measures, they are in major part integrated in HELCOM work and in the key components of assessing the marine environment. Examples include HELCOM Red List for species and habitats (consequences of climate change taken into account when assessing vulnerability) and HELCOM core indicators used

period. Evidently, there has been a warming trend in the sea water since the 1950s compared with the first half of the 20th century.

Nonetheless, non-natural influences on regional warming have been detected which currently cannot be explained by anything else than increased greenhouse gas concentrations.

The increase of CO2 concentrations in the atmosphere results in an increased absorption of dissolved CO2 in sea water and ocean acidification. For the central Baltic Sea, the increase in atmospheric CO2 since 1750 has had the potential to decrease the Baltic seawater pH by 0.14. Simultaneously, an increase of alkalinity in the central Baltic Sea has taken place, resulting in counteraction of acidification by about 3(ral Ba22sy)-3.4(2.3(t)-m3(ab)13.1m3(ab)543 0.6(s)-1.3(e)-3(i)10.65( )1033(ric)8.9(C)-(.(ric)l c1.cion tgwte rw theyio th Seao thi9-2(S)1.5(e)-33al hasacceeatesincethe1450asasesulr t

- Sea-surface salinity may decrease and the change may be largest in the region of the Danish Straits, and small in the northern and eastern Baltic, and the smallest in the Bothnian Bay.

- Surface sea level projections are associated with considerable uncertainty: mid-range scenarios project a 0.6 m and high-end scenarios a 1.1 m sea-level rise over this century.

- Acidification that stems from increased CO2 concentrations in the atmosphere has been slightly offset by an increase in alkalinity; the decrease of 0.15 pH units expected for marine systems from

Will the HELCOM Baltic Sea Action Plan[3] ensure a good environmental status in future climate?
According to scenarios for the western Baltic Sea, reductions of nutrient loads according to the HELCOM Baltic Sea Action Plan (BSAP) will result in a decrease in chlorophyll a concentrations and cyanobacteria and an increase in water transparency after a lag period. Close to the Oder River, in Ahlbeck, the simulations show that even if the loads are reduced according to BSAP requirements good status cannot be reached. In the Mecklenburg bight the reductions would result in reaching the good status only in 2030-2040. Therefore, a further spatial differentiation of eutrophication targets is important. It is important to focus on climate induced changes in the drainage area because changes in crops, including increases in those used as biofuels, runoff and overall land use will have impacts on coastal areas and the open sea.

Even with the full implementation of the BSAP, it is likely that oxygen levels in the deep main basin will decrease further even though there would be a slight decline in the anoxic and hypoxic area. The oxygen saturation maximum is lower in warmer water and a decrease of oxygen levels has an impact on other processes as well. Without drastic nutrient load abatements, hypoxic and anoxic areas are projected to increase. The BSAP will not result in a return to the environmental conditions of the pre-1960s.

The BSAP maximum allowable inputs, as currently set, are the sa(t)-6Cn in sur6(T)-3.2((at)-2.9(06(T)-3.t(y)3.(l(h)-0.8(e6

ensure platforms for policy or stakeholder-science dialogues, review policies and make the Baltic Sea region a model for regional adaptation. An action plan associated to the Strategy will contain actions that ought to be taken to adapt.

Local adaptation strategies may vary considerably depending on the socio-cultural and economic setting. In Germany, neighbouring coastal regions have applied highly varying approaches to coastal defence planning even though the information on future sea level rise available was the same for all. This accentuates the importance of understanding socio-cultural settings. Local actors are crucial for implementing actions.

(iv) any suggestions for further action in this regard to address the effects of climate change on the oceans. In that regard, the commitments of States in "The Future We

Specifying these more stringent and supplementary actions requires scientific knowledge as its basis.

PRECAUTIONARY APPROACH

Uncertainty is an inherent part of climate scenarios. Uncertainty increases when scaling up from greenhouse gas emissions, to projecting global and regional warming and further up to presenting

produce quantitative information on these aspects. Ensemble modelling and hierarchical modelling is needed in the future work of HELCOM, especially on the nutrient load reduction scheme revisions.

Impacts of climate change in the catchment should be better accounted for when planning nutrient reduction measures, e.g., changes in land use and agricultural practices.

Inclusion of atmospheric deposition of nutrients on the Baltic Sea Action Plan is expected to improve with the BSAP revision. In the future, deposition of nitrogen in the Baltic Sea may change due to climate change but this is a less well known issue and more information on it is needed.

Other human pressures should be decreased to mitigate the climate impacts on biodiversity

Human pressures are prevalent in all areas of the Baltic Sea, as has been demonstrated, e.g., by the HELCOM Initial Holistic Assessment (*2010; Second Assessment due to release in June 2017*). Climate 0 Tw 12 0 0 12 93.0226 Tw Lea, as h

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Ensemble modeling and hierarchical model approaches (incorporating models that address different spatial and temporal scales of complexity) should be an aim.

There is a need to be able to monitor climate induced changes in the ecosystem and therefore develop indicators for monitoring change and drivers of change. Better and sufficient monitoring to capture impacts of climate change should be ensured. Increased use of novel observation tools as well as mobile monitoring stations should be encouraged. The HELCOM monitoring and assessment programme should be able to answer the questions: is there a change and what is causing the change? Developing a methodology to assess the confidence of attributing the contribution of different drivers to the change, should also be a priority to support HELCOM monitoring and assessment activities.

Apply a multiple-stressor and holistic approach

HELCOM should increasingly aim at employing models which capture the multiple-stressor holistic approach in order to address various types of pressures which may act synergistically or antagonistically. These models should also be used to review and further develop targets for good environmental status in such a way that climate change and its impacts are taken into account. In some occasions it is possible that current targets cannot be reached due to climate change.

Research needs

Nutrient retention in the coastal zone is poorly understood. Bioavailability of nutrients varies between models. Sensitivities of the different models vary in their response to changing nutrient loads. Global climate models cannot be used to force scenarios. Further study of bioavailability of nutrients in a warmer climate is important.

The new IPCC assessment should be used for new scenario simulations. Salt water inflows should be addressed in more detail to resolve why there is a decrease in inflows in present climate and to better account for the smaller inflows in the models. Climate to land use to socio-economy interaction and feedbacks should be further studied. More cost-effective implementation of the BSAP could be done by optimizing nutrient ratios at a smaller scale. More plausible nutrient load scenarios consistent with large-scale socioeconomic developments are needed. Further knowledge of changes in the catchments is needed in order to enable efficient action in the catchment.

Impacts of climate change, especially changes in temperature, salinity, acidification etc. on underwater habitats and species, e.g. on their reproduction success needs to be investigated.

So far many climate related aspect have been identified at a qualitative level and there is a need to strive for research that enables quantification as far as possible.

Research on the impacts that climate change causes on hazardous substances and their effects should be paid more attention in the future.

Overall, HELCOM should encourage applied research.

It would be helpful to assess (1) the confidence of the likelihood that the ecosystem change will take place as a result of climate change; (2) the severity of the impact to the ecosystem and (3) the severity of the impact to man.

Communicate uncertainties

natural scientists should increasingly learn from social scientists how to be in dialogue with stakeholders. Positive developments should also be high-lighted.

Education of young people on the topics of climate change and marine environment is important.

Science should be communicated at an early stage and accompanied with uncertainties, ranges of knowledge and knowledge gaps. For decision-makers an early dialogue allows for timely consideration of feasibility of scientific findings and inclusion of stakeholders to the considerations. Cross-