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ICZM climate change along the Baltic Green Belt

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Abstract

Since 1995, concern about the state of Europe's coastline has led to a number of EU initiatives, striving to improve conditions through the concept of integrated coastal zone management (ICZM). ICZM attempts to balance the needs of development with protection of the very resources that sustain livelihood along the coasts. It also takes into account the public's concern about the deteriorating environmental, socio-economic and cultural state of the coastline, on a regional scale as well as all over Europe. In the EU context the coastal zone is interpreted as the resulting environment from the coexistence of two margins, namely the terrestrial edge of the continent and coastal water as the littoral section of shelf seas. Together they constitute an entity which needs a specific methodological approach for dedicated planning and management. ICZM is thus an approach to sustainable development following defined management principles designed for regions in the coastal areas of Europe. In this article, we explain the concept of ICZM, set it in context with the Baltic Green Belt, and point out to implications of climate change for ICZM in the Baltic Green Belt area. In the end, we give an outline of ICZM in the Baltic Green Belt.

"Our coastal zones are facing serious problems of habitat destruction, water contamination, coastal erosion and resource depletion. This depletion of the limited resources of the coastal zone (including the limited physical space) is leading to increasingly frequent conflict between uses, such as between aquaculture and tourism. Coastal zones also suffer from serious socio-economic and cultural problems, such as weakening of the social fabric, marginalization, unemployment and destruction of property by erosion. Given the coast's critical value and its potential, these problems must be solved."

European Commission, 2002 (2002/413/EC)

1 Integrated Coastal Zone Management (ICZM)

Why is ICZM relevant to the Baltic Green Belt? Within the European Green Belt, the Baltic Green Belt is the only longer stretch covering a coastal zone. The European Green Belt initiative and ICZM follow the same goals and principles (cf. (2002/413/EC and IUCN 2005), namely, to achieve sustainable development, to conserve both nature and cultural heritage, to implement development activities primarily on local scales, and to involve stakeholders throughout the development process. The political support for ICZM has led to a substantial knowledge base concerning both data and practical experience (Figure 1). Few examples of ICZM projects exist that fulfill all criteria of ICZM, but many demonstrate partial implementation. By means of political and scientific documents as well as through case studies, ICZM gives the methodological background for a successful integration of the European Green Belt in the Baltic Sea coastal area. For the Baltic Green Belt such ICZM approaches are needed

- because ICZM constitutes the accepted framework for sustainable development of the coasts
- because it can help to conserve the valuable natural habitats and cultural heritage of this formerly secluded coastal region

- because it can help to ensure a prospering and long-lasting socio-economic development

a) Selected reports relevant to ICZM in the Baltic

Pickaver, A.(2003): Integrated Coastal Zone Management in the Baltic States - State of the Art Report. EUCC - The Coastal Union, Leiden

EEA (2006): The changing faces of Europe's coastal areas, report 6/2006, European Environmental Agency, ISBN 92-9167-842-2

Rupprecht Consult (2006): Evaluation of Integrated Coastal Zone Management (ICZM) in Europe

Gilbert, C. (2008): State of the coast of the South East Baltic, ISBN 978-83-85780-91-5

b) ICZM case studies

EUCC-Baltic data base: 100 ICZM projects & case studies in the Baltic
http://baltic.eucc-d.de

Our Coast data base: 350 reviewed ICZM Case Studies all over Europe,
ec.europa.eu/environment/iczm/ourcoast.html

Trilatal Wadden Sea Secretariat: best practice, transnational UNESCO World Heritage since 2009:
www.waddensea-secretariat.org

Figure 1: ICZM resources for the Baltic.

Why is ICZM necessary? The coastal zone is undergoing rapid changes resulting from the expansion of human activities in the hinterland, at the coastline and offshore. Generally speaking, both demographic and economic factors drive the development in coastal regions and put numerous pressures on the coastal system. To a certain extent pressure also comes from natural forces such as coastal morphodynamics, storm floods etc. In order to cope with these effects the European Environmental Agency (EEA 2000) brought up the DPSIR concept which is considered the background and basis for ICZM.

The DPSIR concept (Figure 2) shows **drivers**, e.g. increase in seaside building and economic activities, produce serious **pressures** such as pollution and overfishing. In consequence these pressures change the **state** of the environment, typically in a negative direction, and **impact** both ecosystems and socio-economic conditions. These impacts call for short-term and long-term responses, e.g. enhanced nature conservation measures, improved environmental legislation, monitoring, regulation and control mechanisms, e.g. formulated as regional management plans. Ideally, the responses will then feed back to the starting point and change the driving factors, so as to interrupt the trend of coastal deterioration. Among the responses, ICZM is a key tool to address most of all relevant issues of the DPSIR framework.

How is ICZM implemented? ICZM, being an iterative process of considerable duration, starts out with an **initiation** phase, usually in the form of the definition of the region of concern followed by a DPSIR analysis and an analysis of the stakeholders concerned. Based on the DPSIR, the stakeholders get involved in a participative **planning** process, followed by **implementation** of the management measures formulated during planning. The implementation as well as its outcomes are **monitored and evaluated** in order to restart the process by adapting the management plan. The Baltic Green Belt project serves to initiate ICZM processes on the local level (pilots) and the transnational levels (overall Baltic Green Belt). One example of a participative planning process involving various stakeholders is the restoration of Rostocker Heide on the German coast, persued by the local branch of Friends of the Earth (BUND Mecklenburg-Western Pomerania).

The overall area to be covered by the transnational ICZM process within the Baltic Green Belt is not yet defined. The total coastline including bays, lagoons and islands is more than 7,500 km long (Pickaver 2003). As the definition for the European Green Belt given by Schlumprecht and Ludwig (2009) does not cover all islands along the Baltic Green Belt and is thus not in line with the idea of an ICZM region, we propose to refine it in the following manner:

„The area of the Baltic Green Belt is defined in space as a buffer zone of 25 km (50 km in the Fennoscandian area) on each side of the former Iron Curtain with the inner 5 km constituting the core zone. Formally, the seaward boundary of the NUT3 administrative districts shall serve as the line of

the Iron Curtain. Additionally, all islands and inner coastal waters reaching beyond the buffer zone are included." Within this overall area, each pilot activity within the Green Belt defines its own area of concern in a manner suiting the spatial scales of the problems and processes addressed.

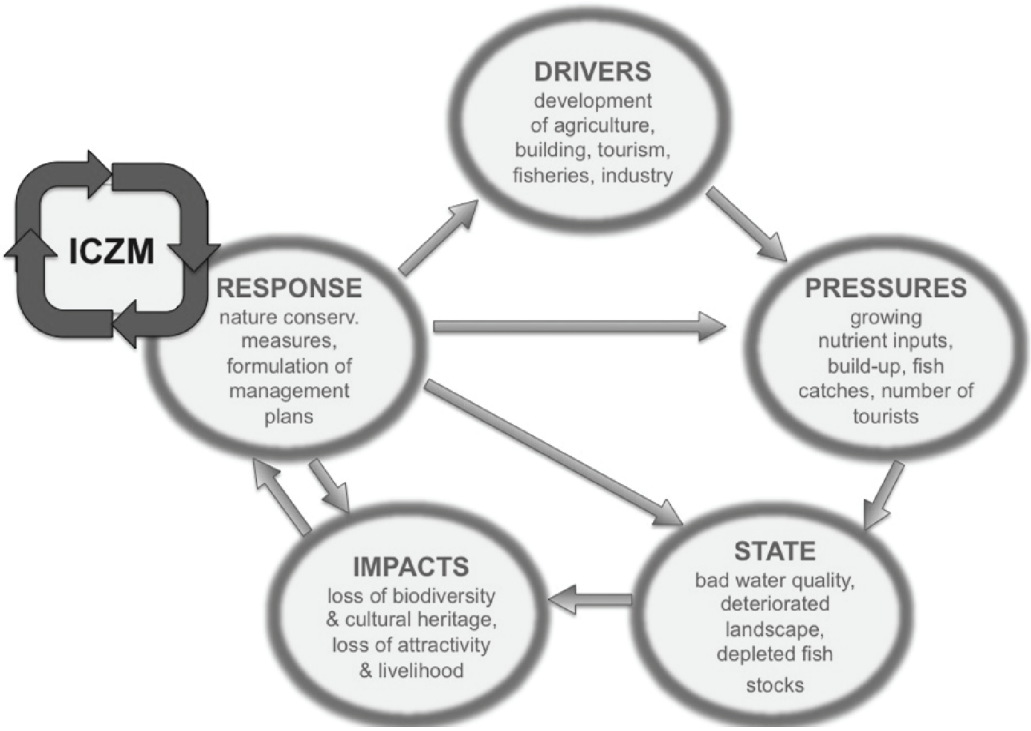

Figure 2: DPSIR approach for the Baltic Green Belt.

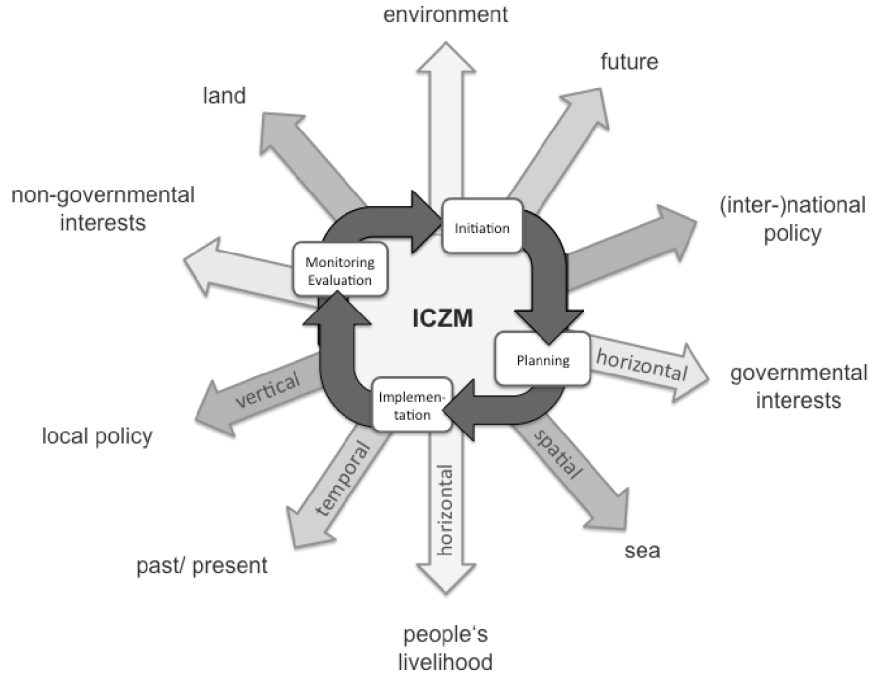

Figure 3: The four phases of the ICZM process (inner circle) and the most important levels of integration with respect to the Baltic Green Belt.

What needs to be integrated? For the successful implementation of ICZM, it is crucial to internalise the different levels of integration that must be persued throughout the iterations of the ICZM processes (Figure 3).

Spatial integration requires to take into account effects of neighbouring (or even remote) areas have on each other. Those stakeholders fostering development activities shall particularly integrate coastal waters and terrestrial areas, coastal and hinterland areas, neighbouring administrative districts and transnational cross-border areas. An example of spatial integration in the Baltic Green Belt project is the integration of land and sea in the pilot „Sustainable Farming in Poland". The Green Federation GAJA offers training and consultation about ecological farming methods to farmers in order to reduce nutrient inputs to the Baltic coastal waters.

Horizontal and vertical integration aims at the involvement of different sectors (horizontal) and different administrative levels (vertical) by addressing all stakeholders important to realising the ICZM goals, in this case, realising the European Green Belt vision. It is crucial to identify those economical sectors that are suitable for a combination with nature conservation in order to assure for people's livelihoods. On the Estonian Island of Vormsi, for example, nature conservation is brought in line with small scale tourism, extensive agriculture, and traditional handicraft in one of the pilots of the Baltic Green Belt project. The integration process also encompasses to include stakeholders from both governmental and non-governmental backgrounds. For example, in Lithuania, the environmental NGO Zvejone collaborates closely with the administration of the governmental Seaside Regional Park to maintain and develop the park as a protected area. On the international level, the structures of the European Green Belt consisting of a Brussels based coordinator, regional coordinators, national focal points and project partners in different constellations are well set up to fulfill this goal. With respect to the vertical integration within the transnational ICZM process, it is important to introduce the Baltic Green Belt idea to policies from the local to the international levels. The vision needs to be lobbied for in order to formally include it in national and local political documents. The German Green Belt has demonstrated how to achieve this and what for.

Temporal integration is often ignored in designing ICZM concepts. However, in the Baltic Green Belt context the temporal integration element is a central issue, as it holds both chances and challenges for the region. Due to the restricted access and limited economic activities before 1990, the coastal values are up to now nearly undisturbed in many areas. At the same time, pressures on the environment, resulting from 20 years of enhanced agriculture, fisheries, industry, tourism etc. since the fall of the Iron Curtain, are building up rapidly. Now, in the years and decades to come, impacts from climate change will have to be considered with respect to their short-term and long-term effects on coastal ecosystems and economies. Within the Baltic Green Belt project, Lauku Celotajs gives a good example of integrating over time. The Latvian NGO develops environmentally friendly tourism products based on military heritage from Soviet times to assure for soft tourism in the years to come.

2 Climate Change: scenarios, impacts and challenges

Which climate change impacts are to be expected in the Baltic Sea Region? It is widely recognised by both science and policy, that climate change driven by man will be inevitable in the 21st century (IPCC 2007). In a recent study of the Joint Research Centre of the EU (PESETA study, Ciscar et al. 2009) the socio-economic effects of climate change in Europe were analyzed.

Irrespective of some obvious advantages of Northern Europe seen in the PESETA study, it is necessary to analyse the possible chances and challenges resulting from regional trends in climate change in greater detail. This was done in a comprehensive and detailed Assessment of Climate Change for the Baltic Sea Basin, the so-called BACC report where modelling of regional climate plays a major role (BACC Author team 2008). E.g. the COSMO-CLM model (or CCLM) is a non-hydrostatic unified weather forecast and regional climate model developed by the COnsortium for

SMall scale MOdelling (COSMO) and the Climate Limited-area Modelling Community (CLM). The COSMO model as well as other approaches for regional climate modeling in Europe by now have a rather high spatial resolution (< 20 km). Therefore, the modelling results may be used with decent confidence for impact assessments. Key outputs have been adopted into the 4th IPCC assessment report on climate change and are currently used for more detailed analyses of climate change.

Model-based **Baltic climate scenarios** until 2100 reveal pronounced changes in the basic climate features.

- general warming trend lies well above global average → 4 - 6°C;
- warming trend speeds up during 2nd half of 21st century
- warming is stronger during winter (up to 10°) than summer
- considerable increase in precipitation (except in the southernmost areas)
- seasonally, winter will be wetter everywhere, summers drier in the South
- in increase in stronger winds is likely, mainly in winter
- ice cover decreases both in extent and duration
- river discharge likely to increase significantly during winter, decrease during summer (in the South);

Table 1: Climate change scenario outcomes for the Baltic (compiled from BACC Author team 2008).

Climate change scenario outcomes for the Baltic

	Southern Baltic Sea Region		Northern Baltic Sea Region	
Parameter	Winter	Summer	Winter	Summer
Air temperature	++	+	+++	+
Precipitation	+	-	+	o
Wind speed	++	+	++	+
River discharge	+	-	++	+
Ice cover	-	n.n.	- -	n.n.

LEGEND

++ / - - ... strong effect
+ / - ... Moderate
+ ... effect
- ... increase
o ... decrease
no change

Table 1 summarizes the key findings, providing indication of dominant trends for both the Northern and the Southern Baltic Region, which are somewhat different. In essence, a warming above global average is to be expected, becoming particularly pronounced in the northern half of the Baltic Sea region (BSR). The warming trend, accompanied by significant changes in precipitation and perhaps also in wind patterns will bring about changes and impacts in the environment, affecting marine, littoral and terrestrial ecosystems.

Baltic ecologic & environmental scenarios

The following changes and processes are to be expected as a result from climate change trends as indicated above:

- decrease in salinity of (mainly central) Baltic Sea
- changes in marine species composition and shift in vertical & horizontal species distribution
- temperature – sensitive species likely to migrate / disappear (e.g. cod)
- increased production & survival rate of „warm“ species (herring, sprat)
- invasion of foreign species may disturb ecosystem balance

- increase in nutrient influx & eutrophication from higher river discharge
- increase in plancton growth and bacterial blooms (e.g. toxic cyanobacteria)
- increase in SLR in the South, with rising sea level „migrating“ North.

The consequences of these environmental scenarios are manifold. While there is a rather clear picture for the BSR as a whole, little is known about the specific consequences to be expected in the narrow coastal strip. More detailed facts can be expected from regional projects, such as

BALTEX: The Baltic Sea Experiment (www.baltex-research.eu)

AMBER: Assessment and Modelling of Baltic Ecosystem Response

(www.io-warnemuende.de/amber.html)

BaltCICA: Climate Change: Impacts, Costs and Adaption in the Baltic Sea Region (www.baltcica.org)

Baltic Climate: Baltic Challenges & Chances for local & regional development generated by Climate Change (www.balticclimate.org)

Some environmental ecological system's adjustments are seen to have a positive effect while others will probably trigger negative impacts for the Baltic region. Current knowledge suggests that the following **socio-economic trends** are likely to be expected:

- increase in coastal flooding due to enhanced SLR and storminess;
- loss of land areas and beaches due to flooding and erosion processes;
- increase in costs for coastal protection and beach management measures;
- improvement of tourism & recreation conditions due to warmer temperatures;
- possible prolongation of the summer tourism season;
- possible decrease of water quality from eutrophication & bacterial blooms;
- improvement of sea traffic (in the North) because of the spatial and temporal reduction sea ice;
- improvement of some coastal habitats & nature reserve areas while others will undergo deterioration.

In the PESETA study (Ciscar et al. 2009) the socio-economic effects of climate change in Europe were studied comparatively across 5 regions in Europe: Southern Europe; Central Europe South; Central Europe North, British Isles and Northern Europe. Four climate change scenarios from moderate (+2.5°C) to strong (+5.4°C) were analyzed for four climate-sensitive sectors in these regions: agriculture, tourism, river floods and coastal systems. The results reveal that climate changes affects European locations in a very different manner. The main PESETA findings can be summarized as follows:

- all regions except Northern Europe will suffer socially and economically from climate change;
- The higher the temperatures, the higher will be the losses in annual welfare for the regional populations;
- tourism is the only sector that is likely to see positive effects in four of the five regions (exception: southern Europe);
- coastal systems will be affected negatively in all five regions of Europe;
- Northern Europe is seen to be gaining welfare in all but one sector: coastal systems.

- Thus, coastal systems is the sector most severely affected across Europe due to the expected impacts of accelerated sea level rise.

It must be stated here, however, that only some (= the southern) parts of Northern Europe will suffer from negative effects of rising sea level. As the central and northern areas of the Baltic Region are still undergoing post-glacial isostatic uplift, these areas might rather see a drop in sea level than a rise. Thus, these shores are facing small or no risks from sea level rise while they might be affected by enhanced erosion due to a reduction of the sea ice cover.

What are the implications of climate change impacts for the Baltic Green Belt? Summarising, the findings from both the PESETA study and the BACC report, the Baltic Green Belt region is not threatened negatively by climate change impacts to the same degree as other European regions. Some benefits can be expected, mainly in the tourism and the transport sector. On the other hand, significant environmental alterations might render sensitive coastal and marine ecosystems even more vulnerable.

ICZM strategies to cope with climate change?

As recent outputs of INTERREG IVB BSR projects such as BALTICA; BALTADAPT and others show a dual strategy ought to be followed: adaptation to observed or expected climate change trends & impacts is crucial while mitigation efforts need to be sustained. A few examples for steps & measures to be taken in the Baltic Green Belt Region are:

- reduce Green House Gas emissions (locally and regionally);
- avoid hazardous or negative impacts as far as possible (e.g. flooding, eutrophication);
- utilize positive effects wherever possible (extended season, new habitats);
- strive for environmentally-friendly development of the coast, by using the existing BGB potential!!
- built up a Green/climate friendly image (e.g. eco-tourism; regional products);
- build alliances between adjacent sectors, communities and people;
- stay away from “risky grounds” (e.g. establish no-building zone at coastline);
- get local population, NGOs etc. involved in participatory planning & decision-making.

As ICZM unites both top-down and bottom-up approaches, an improvement of existing governance schemes will be necessary to support the coastal management efforts that have been stimulated through various transnational INTERREG BSR projects. Parallel to these activities work by the UNESCO (2006) documents how mechanisms of ICOM (Integrated Coastal and Ocean Management) can be put into effect so as to substantiate the efficient handling clime-related and other problems in the coastal zone (Tab. 2).

Table 2: Governance mechanisms and measures to support ICZM / ICOM (UNESCO 2006)

Goal	Indicator	Measurements
Ensuring the coordination and coherence of administrative actors and policies	Functions of administrative actors related to the coast	- ICOM functions of administrative actors clearly defined by legislation or administrative acts - New agencies for ICOM established and responsibility assigned
	Coordinating mechanism	- Existence and functioning of a coordinating mechanism for ICOM - Outcomes of the coordination process
	Legislation	- Existence of legislation on coastal and marine resources - Adequacy of the ICOM legislation
	Environmental assessment	- Use of EIA and SEA procedures and modifications to coastal projects - Use of CCA procedures in coastal tourism development
	Conflict resolution mechanism	- Agreed procedures and mechanisms for conflict resolution - Changes in the proportions of conflicts successfully mitigated, resolved or prevented - Overall change in the number of conflicts
Ensuring the quality and effectiveness of management	Integrated management plans	- Existence, characteristics and status of ICOM plans - Extent (percentage) of coastline covered by ICOM plans
	Active management	- Level of implementation of ICOM plans, actions and projects, including infrastructure building - Procedures, legal tools, and monitoring and sanctioning applied for enforcement of ICOM plans/actions - Level of enforcement of, or compliance with, ICOM plans
	Monitoring and evaluation	- Existence of an operational monitoring and evaluation system with related indicators - Consideration of results into ICOM initiatives - Adjustments made to ICOM initiatives

3 Outline of ICZM in the Baltic Green Belt

The vision for ICZM in the Baltic Green Belt stems from the European Green Belt: „to create the backbone of an ecological network, running from the Barents to the Black Sea that is a global symbol for transboundary cooperation in nature conservation and sustainable development“ (www.europeangreenbelt.org). Within the BSRP project Baltic Green Belt, stakeholders from different backgrounds have joined to initiate ICZM processes on the local level – e.g. on Vormsi island, in Slitere National Park, and the Lithuanian Seaside Regional Park - to contribute to an ICZM process on the transnational level. Starting from the activities planned within the lifetime of the Baltic Green Belt project, more stakeholders from different sectors should be gradually included while passing through

iterative management cycles. The scope of the activities should be broadened to bridging the water line wherever possible, and close cooperation between NGOs, GOs, science and economy should be seeked for. With respect to climate change, the ICZM challenge for the Baltic Green Belt is twofold: On the one hand to utilise the chances of climate change for regional economical development, in particular sustainable tourism, while on the other hand limiting and balancing ecological changes in order to avoid loss of habitats or degradation of the quality of coastal waters, flora and fauna.

References

2002/413/EC: Recommendation of the European Parliament and of the Council of 30 May 2002 concerning the implementation of Integrated Coastal Zone Management in Europe

BACC Author Team (2008): Assessment of Climate Change for the Baltic Sea Basin (BACC report), ISBN 978-3-540-72785-9. 473 pp

Ciscar, J.C., Iglesias, A., Feyen, L., Goodess, C.M., Szabó, L., Christensen, O.B., Nicholls, R., Amelung, B., Watkiss, P., Bosello, F., Dankers, R., Garrote, L., Hunt, A., Horrocks, L., Moneo, M., Moreno, A., Pye, S., Quiroga, S., van Regemorter, D., Richards, J., Roson, R. & Soria, A. (2009): Climate change impacts in Europe. Final report of the PESETA research project, EUR Number: 24093 EN, (http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=2879)

EEA (2000): Marine and Coastal Environment. Annual topic update 1999. Topic Report 11/2000, EEA, Copenhagen.(http://www.eea.europa.eu/publications/signals-2000/page002.html)

EEA (2006): The changing faces of Europe's coastal areas, European Environment Agency (www.eea.europa.eu), Report 6/2006. (http://www.eucc-d.de/infos/eea_report_6_2006.pdf)

IUCN (2005): Programme of Work for the European Green Belt 2005. In: Terry, A., Ullrich, K. and Riecken, U. (2006): The Green Belt of Europe – From vision to reality. (www.europeangreenbelt.org/download/pow.pdf)

Pickaver, A. (2003): Integrated Coastal Zone Management in the Baltic States- State of the Art Report. Background for Coastal Planning and Management in the Baltic Sea Region. EUCC - The Coastal Union.

Schlumprecht & Ludwig (2009): Maps and data in the Green Belt – a GIS project. In: Wrbka et al. (Hrsg.): The European Green Belt – Borders.Wilderness.Future. ISBN 978-3-85474-209-8

UNESCO (2006): A Handbook for measuring the progress and outcomes of integrated coastal and ocean management. 228 pp

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