



Environmental values and threats to coastal areas and the Baltic Green Belt

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Abstract

The Baltic Green Belt contains special and valuable natural and cultural assets while also being affected and altered by multiple landscape uses. These are often compatible with the Green Belt assets and are sometimes even a prerequisite for their safeguarding. However, they may also arouse severe conflicts, permanently destroying Green Belt values or negatively altering habitat qualities.

1 Introduction

Land use in the Baltic Green Belt has changed dramatically since the fall of the iron curtain. The areas that had been partly or totally inaccessible for decades suddenly became easy to reach. The once dominant military land uses have been almost totally abandoned. Changes in society and the economic situation of many citizens have led to different recreational activities and building pressure along the shoreline. Agricultural use is changing, becoming more intensive or being given up on marginal agricultural land. But also the awareness for nature conservation and protection needs is growing.

The changes pose threats but also chances, and in this article we are going to examine some of the major values of the Baltic Green Belt as well as some development trends and landscape uses with their implications.

2 The special assets of the Baltic Green Belt

The Baltic Green Belt is a contiguous chain of habitats ranging from boreal to temperate Europe, running along the coastline of the Baltic Sea from Estonia to Germany. It forms a central part of the European Green Belt and is its newest section with concerted activities started in 2007 – 2009. The four decade era of the iron curtain is a main reason why such a wide collection of valuable habitats is still present in this area (Maack et al. 2011, Schmiedel et al. 2009, Sepp 2011, Wrška et al. 2009). Besides the natural assets, there are also unique historical monuments dating from the iron curtain period.

Nature and landscape

The natural assets of the Baltic Green Belt are very diverse. They include both land and sea habitats, which is unique in the whole European Green Belt. Of all Baltic Sea marine and coastal biotope complexes and subtypes (v. Nordheim & Boedeker 1998), only a single one (Fjords) does not occur in the Baltic Green Belt.

Very special and often of international importance are many of the shallow water areas, markedly the lagoons and offshore banks. They are home to characteristic underwater vegetation and benthos communities which vary considerably in their species composition from west to east and from open sea towards the lagoons, in line with the decreasing salinity of the water. These habitats are important feeding grounds for ducks and divers (Figure 1) and indispensable spawning areas for fishes like the Baltic herring (*Clupea harengus*) or garfish (*Belone belone*).

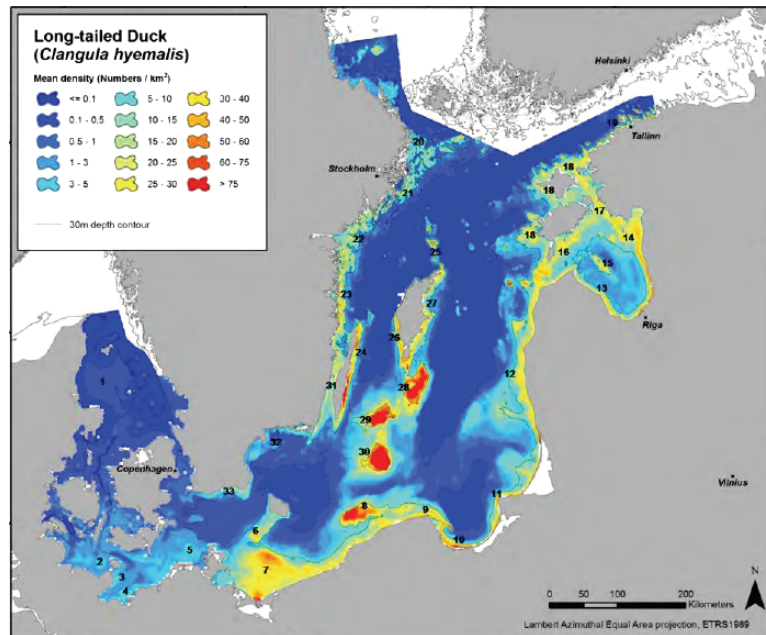


Figure 1: Like many other ducks and divers, wintering Long-tailed ducks (*Clangula hyemalis*) show a marked concentration in Baltic Green Belt shallow waters (Skov et al. 2011).

The coasts in the Baltic Green Belt are multifaceted, reaching from soft sandy shores to steep cliffs of varying geology. Cliff coasts interchange with low coasts frequently and on a small scale, depending on the effective water currents. Estonia shows an abundance of rocky shores, while most other coasts are made up of soft material. The southern shoreline from Lithuania to Germany has the special feature of large lagoons. Their extent and diversity is quite exceptional and of European importance (Niedermayer et al. 2011, Reinicke 2008).

Beaches, sea walls and dunes mediate to the land habitats. They show a great biodiversity with several species and subspecies unique to the Baltic Sea region. They easily lose this diversity in areas with prominent tourism activities or coastal protection measures, but on Latvia's west and Estonia's northeast coast or in the Słowiński and the two Curonian Spit national parks large unspoiled coastal habitats can still be found. Prominent dune complexes exist south of Liepāja (up to 34m high), on the Curonian Spit (67m) and west of Ļeba (42m). Extensive forelands with old wooded dune ridges, such as Cape Kolka in Latvia with 200 parallel dune chains or the Neudarß in Germany with more than 100 chains are evidence for milleniums of dune development and form diverse habitats of varying age.

The low coasts are often associated with periodically flooded brackish marshes. Many of them have been diked off and meliorated in previous decades, but thanks to the special border situation a lot have also survived. While some of them are under agricultural use as grazed meadows, others retain their natural state as brackish reed beds.

Freshwater peat bogs and periodically flooded riverside marshes are most intact in the eastern part of the Baltic Green Belt, with highlights e.g. in Kemeri national park. Among the woodland areas the extensive boreal forests around the Gulf of Finland, e.g. in Lahemaa national park, the world heritage beech woodland of Jasmund or the Rostocker Heide complex stand out.

Dry grassland habitats occur naturally on older dunes, cliffs and on rock and alvar outcrops, but also as secondary vegetation dependent on grazing or cutting. Depending on their substrate, the species composition is very diverse. They show an exceptional quality and value in the limestone-dominated area of Estonia's Väinameri region (Lotman 2004).

The Baltic Green Belt hosts a considerable amount of rare species, some of them endemic to the Baltic Sea region. Quite a few of these have the majority of their stocks in the Baltic Green Belt.

The Baltic Green Belt waters are the most important wintering ground of the European and western Siberian stocks of the Greater Scaup, *Aythya marila*, hosting an approximate 80,000 birds each winter (Mendel et al. 2008, Möller et al. 2009, Skov et al. 2011, Tomiałojć & Stawarczyk 2003). Other parts of the Baltic and other European seas do not seem to offer habitats of a comparable quality for this species. For plants, the Baltic Green Belt shows a marked concentration of species that are rare or endemic and of special conservation concern (Figure 2) (Berg 2004, Kull et al. 2002). For the preservation of a large number of taxa it is the most important area in the respective states, in the Baltic Sea region or even on global level.

Endemics of the Baltic Green Belt are e.g. the cinquefoil *Potentilla wismariensis* occurring only on the coastline between Wismar and Rostock (Gregor & Henker 2001), *Linaria loeselii* of the coast between Kołobrzeg and the Gulf of Riga (Gudžinskas 2008, Piękoś-Mirkowa & Mirek 2003) as well as several plants of Saaremaa and Hiiumaa Islands, notably the rattle *Rhinanthus osiliensis*, the orchid *Dactylorhiza praetermissa* ssp. *osiliensis* or the hawthorn *Crataegus osiliensis* (e.g. Kull et al. 2002, Schmiedel 2011). These (as well as a number of other taxa not specifically mentioned here) occur only in the Baltic Green Belt and nowhere else in the world. Their survival is therefore directly linked with successful Green Belt habitat protection. Many of the endemics seem to be in immediate danger of extinction (Henker et al. 2009, Tartu Ülikool 2012, Voigtländer & Henker 2005), but even those that seem to occur in sufficient numbers have only a very limited distribution encompassing only a few square kilometers at best. They are very susceptible to unfavourable habitat changes, even if these should only be of a very local nature.

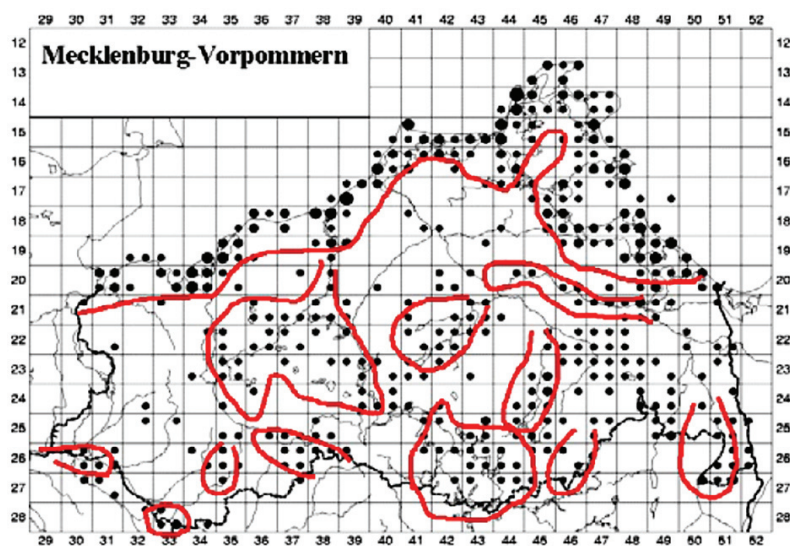


Figure 2: Distribution of vascular plant taxa with global (endemics and subendemics) or national protection responsibility in Mecklenburg-Vorpommern state in Germany. The size of dots indicates the number of species. The red lines enclose the most important areas for plant conservation. The strong concentration in the Baltic Green Belt (top of map) is apparent (Berg 2004).

Cultural highlights

Four decades of military dominance during iron curtain times have left a great number of military remains. Some of them even date from the 19th or early 20th century and were still used or re-used during the cold war. Many of these military structures serve as historical monuments or memorials today and some can be of considerable visitor interest (Lauku ceļotājs 2011, Sepp 2011). However, the historical value of many military remains in the Green Belt is still not recognized in common perception.

The most prominent marks of the former border situation are probably the remaining watchtowers. Many of these have been removed, the most dramatic losses having probably occurred in Germany, where only three coastal towers survive. While it is understandable that these structures may remind the older generation of unpleasant encounters, they offer a striking experience of what the former border situation was like and are thus of great historical significance.

3 Land uses and possible conflicts with Green Belt values

In the Baltic Green Belt, land uses do not only occur on land areas, but also encompass the many uses of the coastal waters. Human activity, use and exploitation of the whole area is manifold. The construction of infrastructure and the consumption of natural resources are the most striking impacts.

Housing construction and land development

Urban sprawl and recreational housing development have a great relevance in the Baltic Green Belt. Attractive seaside locations are very much sought after, which makes the Baltic Green Belt - unlike other parts of the European Green Belt - a center for settlements and residential expansion. A great pressure lies on the vicinity of the larger cities where extensive areas have been built up during the past two decades. While by far not all of the claimed spaces have been valuable natural areas, there are still many cases where recreation areas for the urban population or important natural sites have been neglected and spoilt.

Summer houses are being constructed in large numbers at many coastal locations, both adjacent to existing villages and in the open landscape. It is not at all an exception that they are built right into dune fields or other coastal habitats. Centers of recreational construction activities lie e.g. in Jūrmala and on Curonian and Vistula Spit in Kaliningrad region. Especially the Kaliningrad activities pose a severe threat to the Green Belt, since these take place in vast natural and sometimes even protected areas (Plath 2009). The construction activities in protected or particularly sensitive sites often violate official regulations and are regularly only made possible by corruption or unlawful acceptance of benefit (CCB 2008).

New housing developments – both residential and for tourism - are often undertaken on former military sites. While some of them are well suited, it must be kept in mind that large natural and formerly closed areas are often part of these locations and that they are regularly situated in a great distance to villages. Currently, state owned former military land is being sold for development on the Polish coast, seriously endangering unfragmented Green Belt habitats.

Traffic and traffic infrastructure

A rapid extension of the traffic network in the Green Belt began right after the fall of the iron curtain. Almost all activities concern road construction, both the opening and upgrading of former military driveways to public roads as well as the alignment of totally new infrastructure. The greatest overall density has probably been developed on the German coast, leaving only few unfragmented areas in that part of the Baltic Green Belt (LUNG 2008). A current project posing significant conflicts with Baltic Green Belt assets is the planned bridge from the Estonian mainland to Muhu Island which would create a fixed link to Saaremaa. Situated in an important migration route in Väinameri Important Bird Area, it poses a significant collision risk for birds and might also endanger the ringed seals in the area (Keerberg 2007). Growing car traffic can generally be an important mortality factor for a number of animal species, such as the European otter (*Lutra lutra*) (Körbel 1994).

Some former military airports are now being used for commercial aviation. Their importance for transportation is fairly limited though, the most frequented site being Heringsdorf (Usedom) with a few seasonal regular services. Peenemünde, likewise on Usedom Island, has a pretty conflicting location (resting and feeding bird flocks in adjacent shallow water), but due to low traffic the current actual disturbance to nature seems moderate.

Former military harbours have been transferred to civil use in many cases. Additionally, totally new harbours have been built, such as several large new ports on the Russian coast of the Gulf of Finland. In 2001, Primorsk port on the northern coast was the first to be completed. It concentrates on oil and oil products, just like several other complexes that are planned or under construction on the south coast, e.g. Batareinaja Bay or Lomonosov (Hänninen & Rytönen 2004). There have been conflicts with Green Belt natural heritage, including protected areas, in almost all cases and pre-construction consultation with local communities has been poor to non-existent (Pynnöniemi 2011, Trumbull & Bodrov 2009).

Ust-Luga on the southern coast of the Gulf of Finland is a totally new construction in a formerly unspoilt marsh and woodland area around the mouth of Luga River and probably poses the greatest conflicts with Green Belt heritage. It has large container and ferry facilities and is also planned to become a major port for coal and oil. Severe conflicts with nature protection are obvious and the damage to Green Belt assets is substantial also in neighbouring protected areas, e.g. Ostrov Seskar, Ostrov Malyy and Kurgalsky Peninsula (Scandiaconsult 2003, Trumbull & Bodrov 2009). Construction activities in the complex are still going on, although large areas are already in operation. Baltijsk in Kaliningrad region is also seeing a huge expansion of the port complex and a new deep water port may be built off Būtingė in Lithuania. A large liquid gas terminal is currently being constructed for Świnoujście port in former woodland on Wolin Island, and Rostock plans to almost double its port area. If realized as planned, this would destroy the last coastal marshes on the Warnow estuary and conflict with Rostocker Heide site conservation. There are numerous other port projects at many sites along the Baltic Green Belt, most of them enlargements of existing ports.

Recreational ports for yachts and similar vessels have been constructed mainly in Germany. A further substantial development with several totally new sites and an extensive enlargement of many existing ports is planned, despite an existing average summer utilization of only 25% (Planco 2004). Quite a few of the envisaged locations pose high conflicts with Green Belt assets while other sites are well in line with sustainable development policies. In most cases a final decision in favour or against construction has not been taken.

The growing oil tanker traffic through the Baltic Sea passes largely outside of Green Belt waters. Oilspills can, however, easily reach Green Belt habitats. Traffic to installations like Būtingė oil terminal poses a constant risk for the nearby shallow water and spawning areas (Vetemaa et al. 2009). In the often shallow waters of the Baltic Green Belt the risk of shipping accidents is apparent and many such calamities have happened in the past involving vessels of various sizes.

While many sea areas were closed for water sports, yachts or even general shipping during iron curtain times, they are now open and often under heavy use by vessels of different types and sizes. This means that many water areas that were previously virtually unaffected by water traffic are now prone to a more or less striking disturbance that may be problematic for resting or moulting water birds exhibiting flight distances of often more than one kilometer (Mendel et al. 2008). This applies especially to many waters on the Estonian west coast and in Germany's Western Pomerania region.

Recreation and tourism

The Baltic Green Belt has an outstanding importance for tourism. It is among the touristic top destinations of all Baltic Green Belt countries, usually being the topmost tourist area of the respective nation or state. Hotspots for tourism and recreation are Darss-Zingst peninsula, Rügen, Usedom and Wolin islands, the Gulf of Gdańsk and Gulf of Riga, as well as the Rostock, Tallinn and St. Petersburg metropolitan areas. While much of the tourism is focused on bathing and sunbathing on sandy beaches, the natural and cultural values are an important asset, especially for the more remote regions. Both tourism industry and tourists therefore benefit greatly from the Green Belt's attractions.

Numerous travel guides focusing on the natural values have been published, and even a few dealing specifically with the Baltic Green Belt (e.g. Cornelius 2009, Lauku ceļotājs 2011, 2012).

There are several excellent field examples of integrating both the natural and cultural/military assets into combined tourist destinations especially in Latvia and Estonia, for example by transforming former watchtowers into birdwatching platforms or reusing former military buildings as in-field information centers. Tourism can, however, also damage natural values, e.g. through trampling on beaches, dunes and sea walls (Schierding et al. 2011). This is a problem especially on the heavily used beaches in Germany and can be alleviated only by zoning measures concentrating tourism on some beaches and reducing impact on others.

Environmental problems like algal blooms, overfishing or oil spills have a significant negative effect on tourism. This extent varies significantly from region to region and ranges from irrelevant to quite important, just like the perception of the problems by the tourism industry (Hasselström 2008).

Agriculture and forestry

Agricultural land use is the major source of nutrient inputs in the Baltic Sea and thus also the main cause for the severe eutrophication that has changed not only the shallow water habitats of the Baltic Green Belt. Agriculture contributes 70-90% of the total anthropogenic diffuse losses of nitrogen and 60-80% of total phosphorus (Figure 3). The highest per-hectare emissions in the Baltic Green Belt area originate from agriculture in Germany (Andersen & Laamanen 2009, Knuuttila et al. 2011).

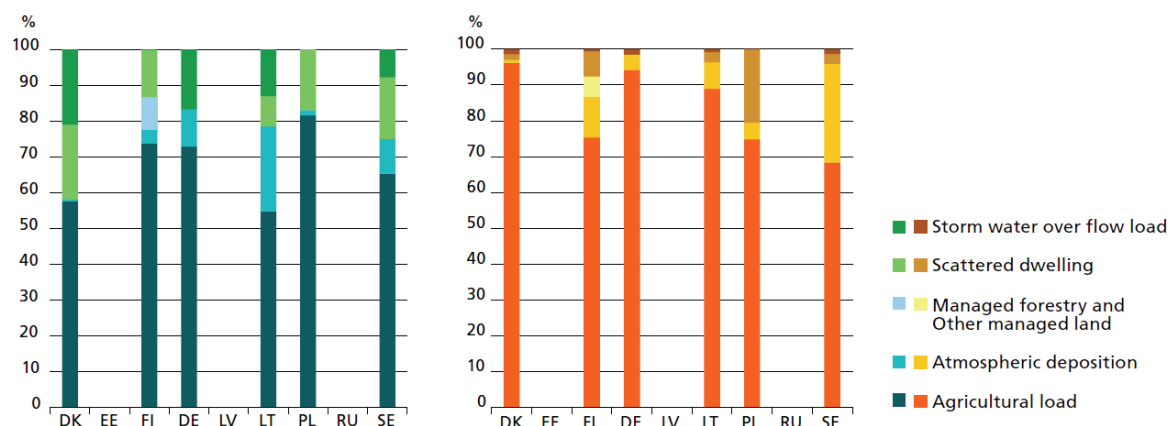


Figure 3: Anthropogenic diffuse phosphorus (left) and nitrogen (right) loads into the Baltic Sea by source (in %) and by country in 2006 (Knuuttila et al. 2011).

Agricultural land use in the Baltic Green Belt follows two opposite trends. Many areas show an intensification of agricultural land use, leading to higher fertilizer and pesticide treatments and a more industrialized method of land cultivation, including the removal of natural structures that hinder such cultivation measures. On the other hand, land use is being given up on marginal agricultural land. The resulting succession is sometimes unfavourable for valuable man-made habitats, especially dry and boggy grasslands. Efforts are being taken to encourage a continuation of land use in some of these areas, focused on nature conservation. A very comprehensive approach has been taken in the Vainameri region in western Estonia, where nature protection, agriculture, regional economy and local societies have been integrated into a regional policy aiming at the sustainable preservation of the natural assets (Kokovkin et al. 2005).

Industrial logging of formerly not or only lightly used woodlands is a danger especially to boreal forests around the Gulf of Finland and has taken place even in protected areas (Green World 2007). On the other hand, there are local efforts to install sustainable forestry regimes based e.g. on FSC standards and even establish some no-use areas inside and outside of national parks. Experiences from Rostocker Heide site show that this forestry is not less economic than traditional practices (Hansestadt Rostock 2011).

Fisheries

Fisheries have been a long time traditional use of many Green Belt waters, but as many fish stocks are today in a poorer shape as several decades ago and the same yield therefore requires considerably more nets, fishing intensity has usually gone up (Figure 4). This arouses increased problems with bycatch of birds and whales. Large losses of ducks, divers and some other birds occur especially around Vistula Spit in Lithuania, in the Gulf of Gdańsk and in the Oder mouth area (Koschinski & Stempel 2010, Meissner 2001, Žydelis 2009). Harbour porpoise bycatches are a special problem in Puck Bay and in many German open sea waters, e.g. around the Oder Bank. Puck Bay has therefore been blocked against porpoise entry by a chain of pingers (Sergot 2010). This, however, is a somewhat doubtful solution, since it keeps the porpoises out of their feeding grounds, and the actual effectiveness of the pingers is not known anyway.



Figure 4: Growing fishing intensity illustrated by the density and locations of set nets in Green Belt waters SE of Rügen Island (Institut für angewandte Ökologie 2007).

Due to overfishing, many of the fish populations of the shallow water areas have been severely altered, both in species composition and in age structure (Aps & Lassen 2010, Limburg et al. 2008). Especially target species like cod (*Gadus morhua*) or European perch (*Perca fluviatilis*) are drastically reduced in biomass and average age, not only by commercial fisheries, but also quite significantly by sport fishing (Ådjers et al. 2006, Bundesforschungsanstalt für Fischerei 2007). While no target fisheries exist on rare species like twaite shad (*Alosa fallax*) or Atlantic sturgeon (*Acipenser oxyrinchus*), their stocks can still be endangered by catches. Also affected are other organisms of the ecosystem, both directly (e.g. through habitat damage and direct kills produced by bottom trawling) and indirectly (e.g. changed predator-prey relationships due to the altered structure of the fish population). Approaches to relieve conflicts between fisheries and nature conservation in the Baltic Green Belt have been developed e.g. for Germany (Pusch & Pedersen 2010).

The construction of artificial reefs, as performed off the coasts of Mecklenburg, Poland and Estonia with special reference to fisheries, is not a solution to restore fish stocks and the ecosystem to a natural state. While they may be concentration points for fishes, these reefs are very different from the natural soft bottom communities and they may actually increase organic detritus accumulation and hypoxia in surrounding sand bottom areas (Zettler & Pollehne 2008).

Extraction of geological resources

Marine sand and gravel extraction is a major threat to the shallow water marine habitats of the Green Belt, since it destroys the complete sea bottom flora and fauna, leaving an either temporarily or permanently severely damaged habitat. Large sea bottom areas in the Green Belt are affected by these activities, e.g. in Germany, Poland and Russia (Herrmann et al. 1999, Sutton & Boyd 2009). All states along the Baltic Green Belt exploit marine aggregates both for beach nourishment and construction activities on land, to a minor extent also for the maintenance of dredged channels. There are no

regionalized statistics of the actual takes (they vary considerably anyway from year to year), but probably at least 1 million m³ are taken annually out of Baltic Green Belt waters in average, possibly a lot more. The total affected area is difficult to estimate, but due to the usually very limited extraction depth of up to 2 meters it must be extensive.

Offshore oil extraction with 13 producing wells is performed in Kravtsovskoye oilfield 22 km northwest of the Curonian Spit with substantial pollution risks for the world heritage site and national parks (Council of Europe 2005). Possibilities of future oil extraction are currently being investigated around Usedom Island (CEP 2011). The associated seismic investigations will probably have harmful effects on marine mammals in the area, especially harbour porpoises. The effects of oil shale mining in northeastern Estonia affect the Green Belt by changing e.g. level and composition of groundwater (Gavrilova et al. 2005).

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