Polish J. of Environ. Stud. Vol. 19, No. 3 (2010), 553-563

Original Research

Ongoing Technical Activities and Conservation Measures in Maritime Spatial Planning within Polish Marine Areas

Eugeniusz Andrulewicz[1]*, Zbigniew Otremba[2], Katarzyna Kamińska[3]

[1]Department of Fisheries Oceanography and Marine Ecology, Sea Fisheries Institute in Gdynia, Kołłątaja 1, 81-332 Gdynia, Poland
[2]Department of Physics, Gdynia Maritime University, Morska 81-87, 81-225 Gdynia, Poland
[3]Fisheries Department, Ministry of Agriculture and Rural Development, Wspólna 30, 00-930 Warszawa, Poland

Received: 10 July 2009
Accepted: 30 November 2009

Abstract

This paper presents an overview of ongoing and planned technical developments and their impact in Polish Marine Areas versus nature conservation measures. Relevant information has been collected through the national contacts, through the screening of available environmental impact assessments (EIA), and from the authors' own experiences.

We indicate growing environmental pressures from the new technical installations while some environmental effects are not well understood. We also point out that there is not sufficient knowledge about environmental effects of new large-scale installations (particularly regarding wind power parks, pipelines, and some coastal structures).

We recognize potential conflicts with existing traditional activities (such as shipping and fishing) with planned new developments (such as wind farms and some coastal structures) and with the established protection measures (such as HELCOM BSPA and NATURA 2000 areas). Finally, we offer suggestions that should be useful in maritime spatial planning

Keywords: Baltic Sea, maritime spatial planning, large-scale technical installations, maritime regulations

Introduction

Traditional uses of the sea have been mainly limited to shipping and fishing which have stimulated construction of harbors, cargo terminals, and urban agglomerations in coastal areas. Relatively new uses of the sea include construction of traffic links (bridges and tunnels), construction of electricity transmission lines (HVDC power cables), extraction of mineral resources, and extraction and transmission of oil and gas (platforms and pipelines). The most recent development plans for the Baltic Sea include developments of new ports and oil terminals, installation of numerous wind farms for production of electricity, and construction of huge gas transmission lines.

Environmental impacts of these activities have been assessed recently by the HELCOM BIO Working Group [1] – activity undertaken with the aim of preparating the thematic assessment of Baltic Sea biodiversity as part of the implementation process of the so-called Baltic Sea Action Plan [2]. The Baltic Sea Action Plan also recommends

*e-mail: eugene@mir.gdynia.pl

developments for pan-Baltic Maritime Spatial Planning (MSP) in the Baltic Sea [3]. Within implementation of this recommendation, HELCOM has organized the Workshop on Broad Scale Maritime Spatial Planning in the Baltic Sea [4]. Similarly, the Baltic Sea Regional Advisory Council (BS RAC) has organized a Workshop on Maritime Spatial Planning with particular emphasis on fisheries [5].

Maritime Spatial Planning is a quickly developing process stemming in recent years from the intensification of maritime activities and demands for sea space. An important initiative for developing MSP has been undertaken by UNESCO [6], which has also developed and published MSP Guidelines [7]. Maritime Spatial Planning also is an important part of the EU Integrated Maritime Policy [8]. Furthermore, the EU has adopted the "Roadmap on Maritime Spatial Planning" to be able to achieve Common Principles for MSP at the EU level [9].

Some experience about spatial planning in the Baltic watershed area have been gathered already by the activity of pan-Baltic cooperation on spatial planning and development (Vision and Strategies around the Baltic Sea – VASAB 2010) [10]. Important developments have been conducted by the ongoing EU INTERREG – BALANCE project on marine landscapes in the Baltic Sea [11] and the INTERREG III B East West Window project [12].

Moreover, relevant Polish authorities also enlarged their national planning programs for the Polish Marine Areas. A pilot project on marine spatial planning has been prepared for the western part of the Gulf of Gdańsk [13].

Overview of the Polish Marine Areas

The Polish Marine Areas cover almost 32,000 km^2 of the southern Baltic Sea (Fig. 1). These areas include almost all typical morphological structures for the Baltic: deep basins, shallow banks, open bays and lagoons. There are no rocks and rocky structures. A very significant and Baltic-wide important morphological structure is the Słupsk Furrow (Fig. 1, b) that serves as the pass-way for salt water inflow from the Western Baltic (Bornholm Basin) to the Gotland Basin and the Gdańsk Deep. The Polish Baltic coast is mainly sandy spits and coastal lakes. About 30% of the coast are cliff structures. The whole coast is subjected to strong erosion that results in loss of up to 1 m land per year [14].

The whole Polish marine sector is regarded as a potential area for oil extraction, although it has been estimated that big oil resources shall not be expected. Some sand and gravel resources occur on the Słupsk Bank and on the southern part of the Middle Bank. Some heavy minerals (containing titanium) have been documented on the Odra Bank, but these resources are not significant and at best they can be classified as potential resources. Polish Marine Areas belong to productive commercial fishing areas of the southern Baltic Sea. Exploitation of these resources is managed and limited by the EU.

The whole area (particularly the Gulf of Gdańsk) is hiding numerous shipwrecks, therefore any bottom installations will require inspection for the presence of historical and culture heritages.

About 25% of the Polish Marine Areas are shallow (below 20 m) open areas with stable wind conditions, and therefore have great potential for production of wind-driven energy.

Ongoing Technical Activities

Apart from traditional activities such as maritime transport, fishing and tourism, there is a growing number of new developments. These are mainly construction works and the operation of different types of installations on the coast

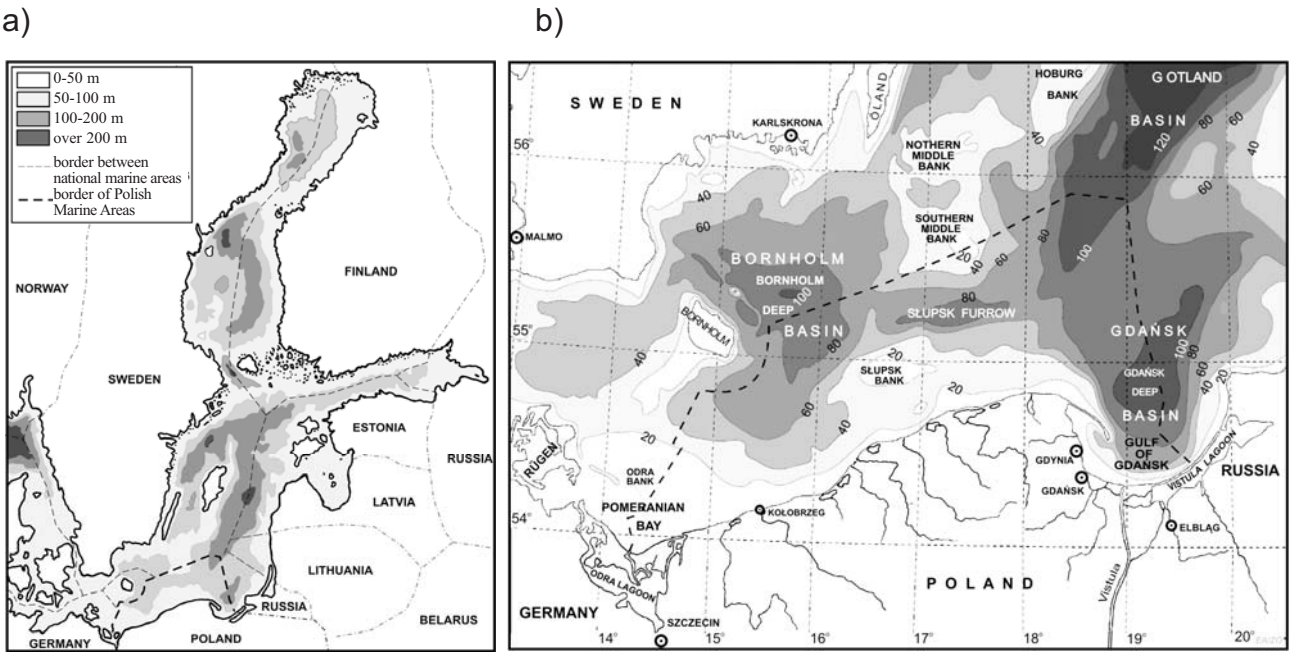

Fig. 1. a) Division of the Baltic Sea into national marine areas. b) Polish Marine Areas.

and in offshore areas: traffic links, power cables, oil platforms, oil and gas terminals, pipelines, wind farms, marinas and ports, and coastal protection activities. Environmental effects of these activities ("technical pressure") are not well recognized. These effects were usually assessed separately for every installation. Until recently, therefore, there was no overall picture of technical pressure available. An attempt to assess combined environmental effects in the Baltic Sea has been undertaken recently by HELCOM [1].

Maritime Transport and its Infrastructure

The dense network of ports and shipping routes is noteworthy in the Baltic Sea. According to the Baltic Ports Organization [15], fifty Baltic main ports are receiving about 400 million tons of cargo, 3.3 million containers, 60 million passengers, 200,000 port calls. At any time, about 2,000 ships are present in the Baltic. These present a picture of a "very busy" Baltic Sea (Fig. 2, a).

The main shipping routes in Poland are connected to existing large Baltic port complexes: Szczecin-Świnoujście and Gdańsk-Gdynia. Some shipping is connected to medium-size Baltic ports: Kołobrzeg, Darłowo, and Ustka (Fig. 2, b) and to fishery ports in Władysławowo, Hel, and others.

By common experience, we know that many ports are just small-scale environmental "hot spots" (due to unintentional oil spills, polluted sediments, poor sanitary conditions, noise, and mechanical stress). Therefore natural amenities of such places are obviously reduced. Background environmental conditions for most of the ports are unknown, and for this reason quantification of environmental effects is usually not possible.

Maritime transport as well as port operations are relatively well controlled. The HELCOM Aerial Surveillance Program operates in the open and coastal Baltic Sea. In ports, environmental safety is controlled by port authorities. Environmental safety of shipping is strictly regulated by MARPOL 73/78 and the IMO Maritime Environmental Protection Committee (MEPC). This might be the reason why until now there has been no large-scale oil pollution in the Baltic.

Exploitation of Living Resources

Commercial fishing in the Baltic is intensive. Present catches of fish are exceeding 1,500,000 tons/year [1]. Catches in the Polish Exclusive Zone (EEZ) areas are up to 200,000 tons/year [1]. The Southern Baltic has relatively high fishing yields (up to 200-300 kg/ha/year) as compare to the Northern part of the Baltic (Fig. 3, a).

Fishing pressure on the Baltic ecosystem, including the Polish EEZ (Fig. 2, b), is high [1]. Fishing not only impacts exploited fish stocks but also other components of the ecosystem, i.e. benthic invertebrates, marine mammals, seabirds, and abiotic environment. The ecosystem effect depends on the intensity of fishing (fishing effort) and applied fishing gears. In an offshore fishery, active, and passive fishing gears are used. In coastal areas and on shallow banks, mainly passive gears are used.

Commercial fishery in the Baltic countries (excluding Russia) is managed by the EU, based on International Council for the Exploration of the Sea (ICES) stock assessment and ICES scientific advisories. Fishing is under many restrictions: apart from the fishing quota, there are closed seasons, protected areas, and no-take zones. Fishing has to be preserved and continued on the basis of sustainable exploitation.

Plans for setting up new technical installations, particularly wind farms, will put fisheries under strong pressure.

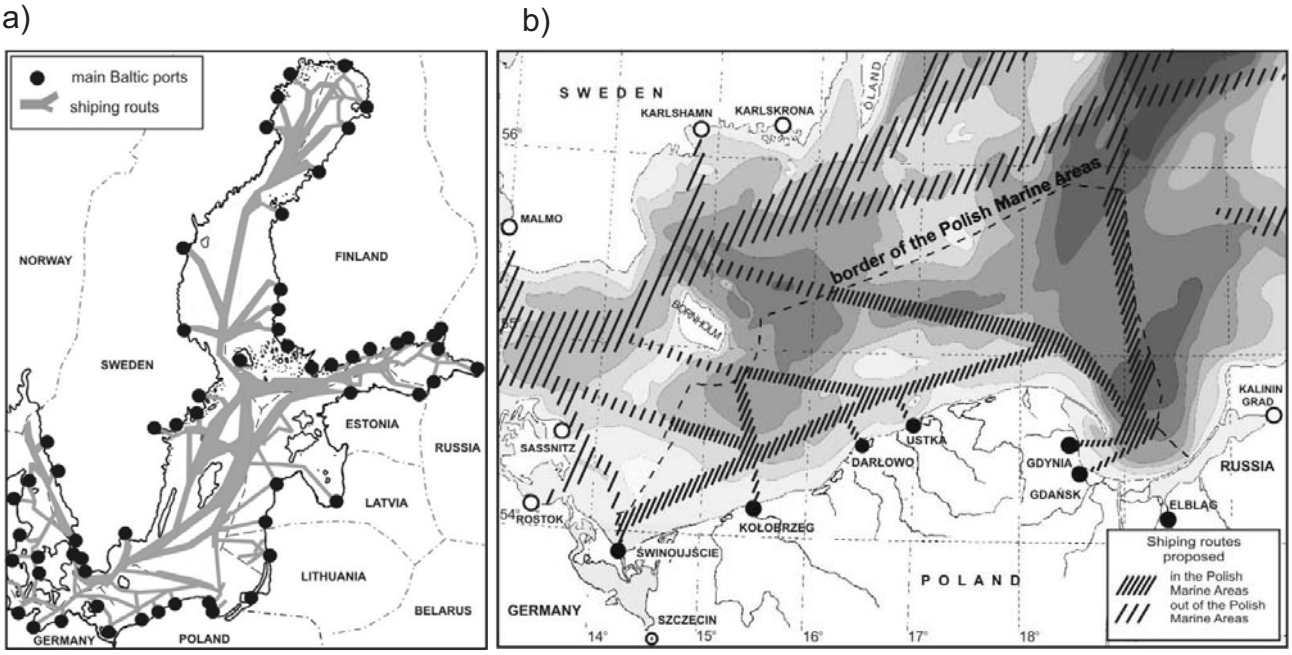

Fig. 2. a) Shipping routes and the main port infrastructure in the Baltic Sea. b) Shipping routes and the main port infrastructure in the Polish Marine Areas (pictures courtesy of HELCOM [1]).

Maritime spatial planning should consider fisheries and recognize the importance of preserving traditional fishing activities.

Exploitation of Mineral Resources

At present, most exploited mineral resources in the Baltic Sea are sand and gravel deposits. These resources occur mainly in some parts of coastal areas and on almost all shallow Baltic banks. Sand and gravel deposits have been and are exploited by all Baltic countries.

The southern Baltic has some documented crude oil resources, but it is estimated that Baltic resources are not rich. At present, exploration and exploitation of crude oil and gas deposits are performed with four drilling platforms: *Petrobaltic*, *Baltic Beta* and *PG-1* in Polish EEZ, and the new platform (*D-6*) in the Russian sector of Kaliningrad Oblast (extraction has started in 2006) (Fig. 4). In 2006 a Polish oil company produced about 1.9 million bbl/year.

Until now there has been no reported oil pollution related to oil and gas extraction. Environmental effects reported by the Petrobaltic extraction company are negligible. Nevertheless, it would be a good idea to design and run special environmental studies in the extraction area.

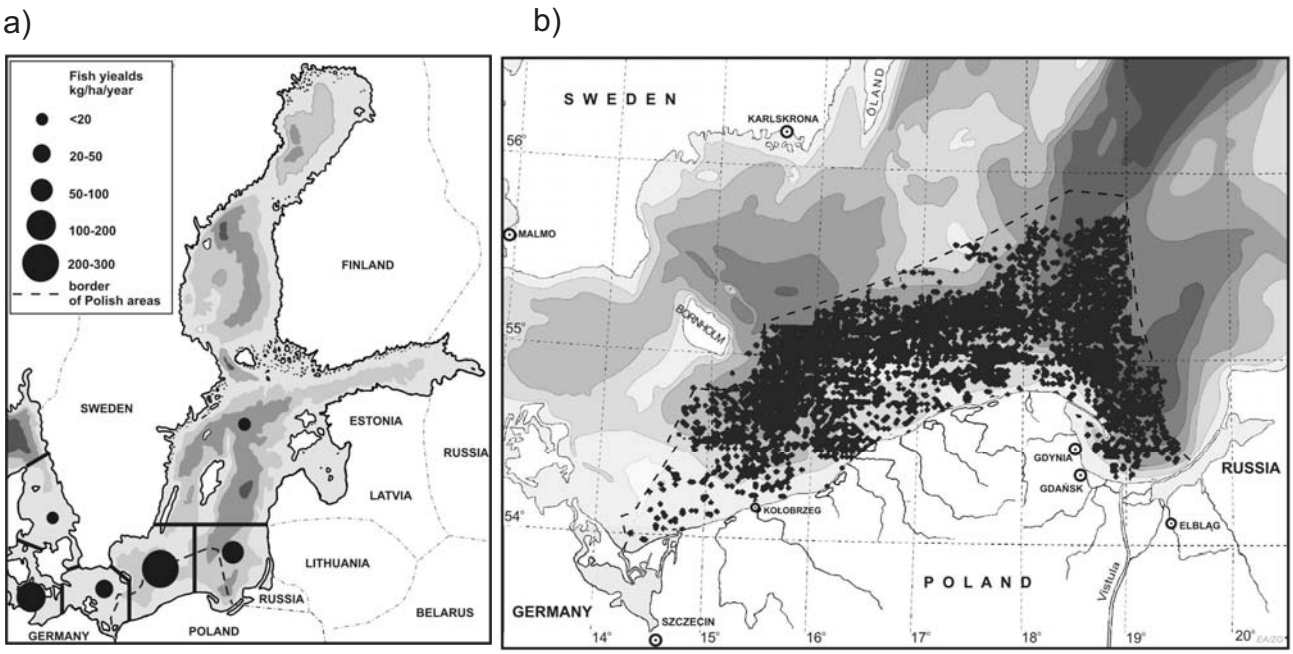

Fig. 3. a) Fish yields in the Baltic Sea (courtesy of HELCOM). b) Fishing in the Polish Marine Areas (example: Polish cod effort in 2002. One dot means one haul. After Sea Fisheries Institute in Gdynia).

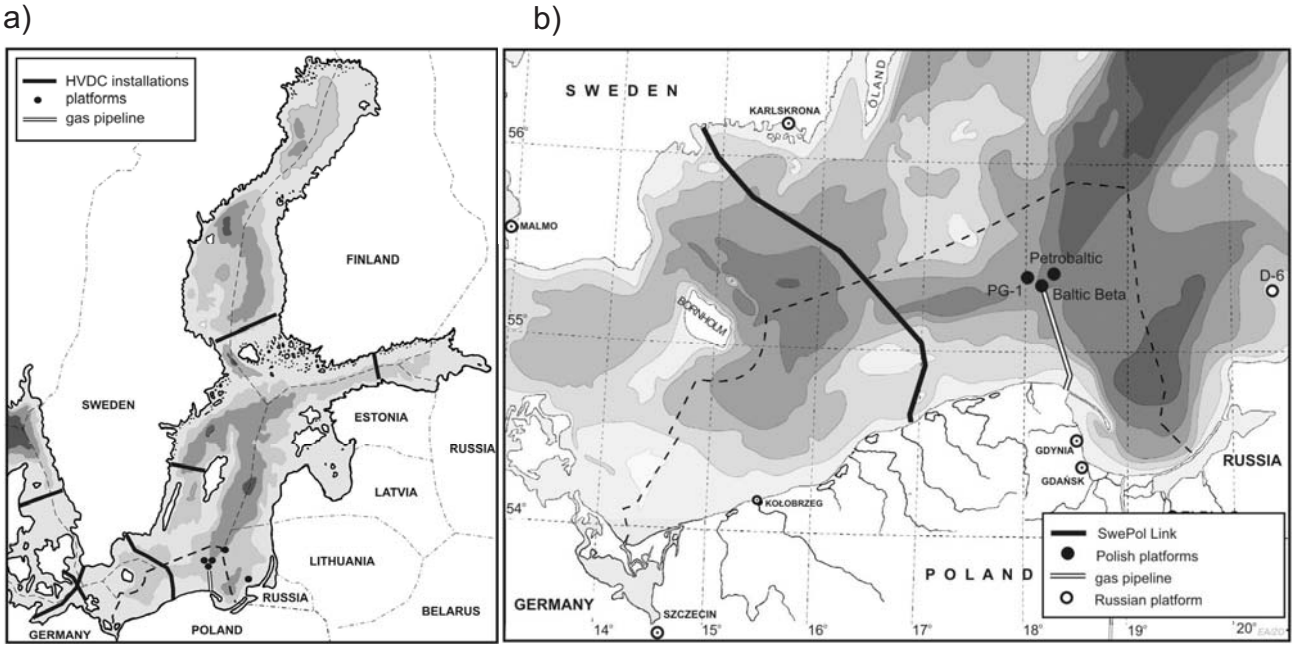

Fig. 4. a) Location of energy transmission lines in the Baltic Sea. b) The *SwePol Link* transmission line.

Extraction of mineral resources, including oil exploration and exploitation activities, will be continued. This has to be an important issue for the maritime spatial planners.

Electricity Transmission Lines

The present power transmission lines in the Baltic Sea consist of several High Voltage Direct Current (HVDC) cable lines (Fig. 4, a). An underwater cable system the *SwePol Link* (600 megawatts) connecting Poland and Sweden, is one of the longest cable connections in the world (245 km) (Fig. 4, b).

Various environmental effects and concerns are connected to the laying and functioning of underwater cable lines. One of these concerns is related to damage of bottom organisms during installation. Studies conducted on the *SwePol Link* prior to its installation (1999) and some years after construction (2001) demonstrated that bottom macrofauna recovered within two years [16]. Another concern is related to the magnetic field around HVDC cables that might affect fish migration. But some relevant research projects have not produced definitive results.

The Baltic, due to its specific, extended longitudinal shape, is particularly suitable for energy transfer between different Baltic countries, as well as between mainland and islands. Already there are plans to construct new transmission lines [1]. These projects are obvious components of maritime spatial planning.

Recreational Infrastructure

Recreational activities involve the installation of a variety of coastal and water sports infrastructures. The tourism infrastructure is permanently grows along the Baltic coast, as far as construction of new marinas, introducing more boats, and improving existing accommodation capacity is concerned [1].

Tourist activities depend on natural amenities of the coastal area and marine environment quality. Surprisingly, these activities usually affect natural values they are dependent on. Tourist pressure has never been assessed on the Baltic-wide scale. The very first attempt has been taken by HELCOM [1].

Most common recreational activities in Poland are related to sun and water bathing. These activities create high pressure on coastal dunes and beaches due to trampling, littering and noise [17]. Facilities for high tourist traffic are usually insufficient and the capacity of various tourist resorts is often excided many times. Yachting in Poland is relatively small as compared to Germany and Scandinavian countries, but in recent years we have observed rapid growth of motor boating, wind surfing, and diving activities.

Recreational activities may stay in some conflict with planned technical activities (development of wind farms, technical coastal protection, etc.) and nature conservation plans (pressure on valuable areas). For these reasons, recreational activities may be an important and difficult component of maritime spatial planning.

Extractions and Dumping

A number of other technical activities, such as extraction of sand and gravel dredging and dumping of dredge spoils, cause physical damage and disturb the seafloor. These activities are permitted by national and international legislation, but they must be conducted according to the best possible environmental practices [18] and according to HELCOM Recommendation 19/1 "Marine sediment extraction in the Baltic Sea." They should stay under national control and shall be reported to HELCOM expert groups (HELCOM MONAS and HELCOM HABITAT). Extraction in vulnerable areas shall be permitted only in the case of restrictions included in HELCOM guidelines. These restrictions are in place to allow recovery of seafloor organisms. Recovery of extraction fields and/or dumping sites may take years.

Extraction of sand and gravel is carried out in all Baltic countries and on average reaches a few million cubic meters [1] (in Sweden it has not been allowed since the construction of the Oeresund Bridge in 2000).

Extraction activities are also related to coastal protection against erosion. The southern part of the Baltic (Danish, German, Lithuanian, and Polish) is subject to strong coastal erosion and, as a result, to various technical protection measures. Coastal protection can disrupt coastal dynamics. Hard coastal protection measures usually drastically change the coastal landscape and living conditions in the construction area.

The harmful environmental impacts of sand and gravel extraction and dumping of dredged spoils usually causes increased turbidity, siltation, and resuspension of nutrients and harmful substances, as well as local destruction of bottom flora and fauna.

In Poland, extraction of sand is mainly carried out for the needs of beach and foreshore nourishment. This activity is mainly carried out along the open coast and therefore replenished sand is clean and does not create important turbidity effects. However, some beach nourishment activities are also carried out in lagoons and in this case introduce an important turbidity effect. Unfortunately, there are no relevant studies available.

The dumping of dredge material is allowed in the Baltic. Present disposal of dredged material in the Baltic countries reaches hundred of thousands of tons annually. However, there are cases exceeding a million tons per year [1]. Future disposals will depend on new construction and port maintenance projects. According to HELCOM guidelines, polluted sediments shall not be disposed of at sea [18].

These activities shall also be considered in marine spatial planning.

Planned Technical Installations

The amount of new construction (as well as technical pressures) in the Polish Marine Areas will grow rapidly. At present, for the Polish Marine Areas, we note the following plans:

- Development programs for ports and cargo terminals,
- Numerous wind power farms,
- A liquid natural gas (LNG) terminal,
- A new Elbląg city – Gulf of Gdańsk navigation route,
- A planned gas pipe connecting Denmark and Poland,
- A new electric power station in Gdańsk.

All these installations are in different phases of planning and there is no guarantee of their construction; however, they shall be included as a component of maritime and coastal spatial planning.

Development Programs for Ports and Cargo Terminals

The new political situation in the Baltic Region has raised new demands and opportunities for Baltic countries. The main kick-off for Baltic port development is creating self-sufficiency for the new Baltic countries and growing trade between Russia and the EU countries. Almost all Baltic ports are planning modernization and expansion. The largest projects, set in the eastern Baltic countries, involve modernization and construction of new terminals. Large development projects have been established for Primorsk and St. Petersburg in Russia; Ventspills, Riga, and Liepaja in Latvia; Klaipeda in Lithuania; Tallinn and Sillamae in Estonia and Gdańsk and Świnoujście in Poland.

Ports are places of increased risk of accidental pollution, as well as emissions of contaminants to the atmosphere and water. Port development programs under the present legal system require preparation of EIA as well as include the obligation to carry out relevant monitoring programs. All these developments will introduce significant locall disturbances to marine life. Some ports have developed in the vicinity of nature conservation areas and therefore could affect valuable biotopes an/or animal communities.

Maritime spatial planning should be helpful in selecting the best possible places/settings for the new constructions and in some cases should help solve or at least mitigate conflicts with nature conservation targets.

Installation of Wind Power Farms

A few wind power farms already operate along the Danish and German coasts; many more are planned (Fig. 5). Despite the fact that wind power farms are not a source of chemical or biological pollution, they remain controversial. They may cause such environmental effects as bird collisions, noise and vibration emission, possible disruption of fish migration and fish spawning periods, creation of electromagnetic fields, changing seabed conditions, and alterations of sea currents. Until now these have been mostly theoretical considerations. For sure, wind power farms will change original landscape/seascape to a new, industrialized landscape that might not be liked by tourists and local communities. Controversy exists regarding possible responses of fish and mammals to the noise, vibrations and electromagnetic fields.

Until now, wind power farms have been in use for a relatively short period of time, so there is insufficient empirical evidence regarding their impact on marine environments. Hence, present environmental impact assessments (EIA) for Baltic wind farms are based mostly on the theoretical considerations. Wind farms may create a suitable habitat for some invertebrates and macroalgae and may attract some fish species (the so-called "reef effect" of hard substrata). As a result, wind farms may enhance biodiversity within the given area.

LNG Terminal

A liquid natural gas terminal is planned to be constructed in Świnoujście. This construction will require accompanying

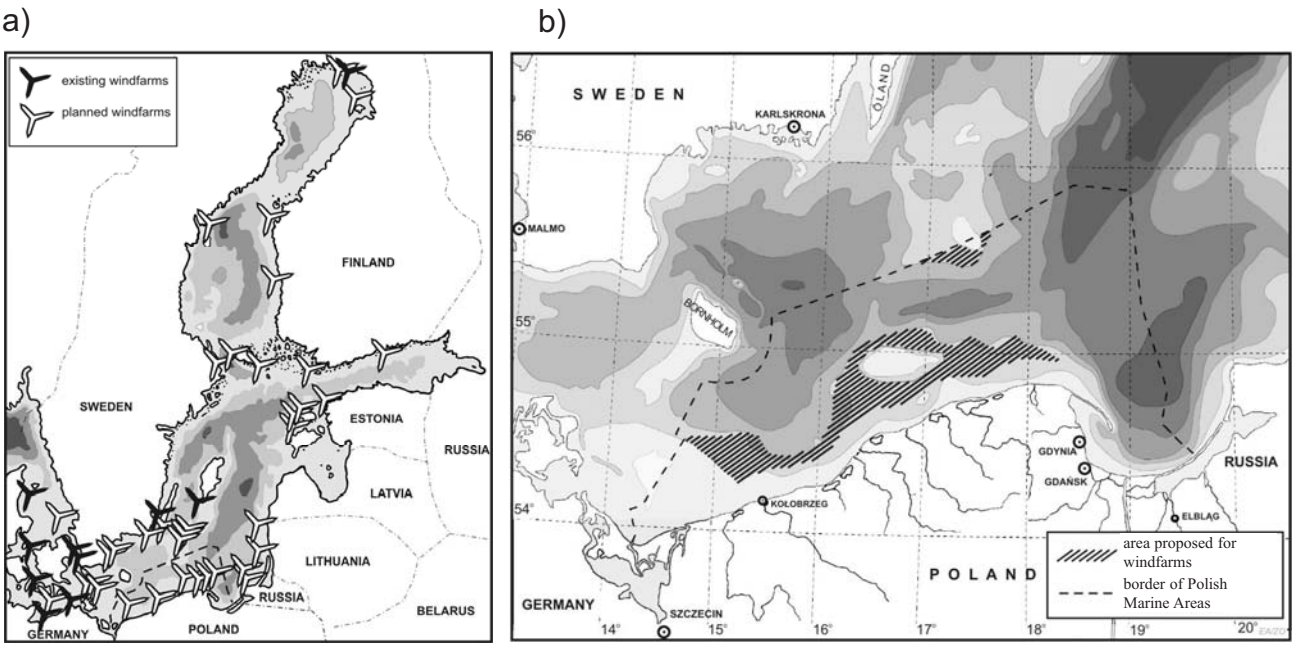

Fig. 5. a) Planned wind energy farms in the Baltic Sea. b) Areas considered for energy farm construction in Polish Marine Areas.

investments (deepening of existing navigation channel, construction of separate pier and technological platform). It also requires bilateral agreements between Poland and Germany on the navigation route to Świnoujście, as well as an environmental impact assessment (EIA) on transboundary effects (Espoo EIA).

Elbląg Port – Gulf of Gdańsk Navigational Route

A planned navigation channel for the city (port) of Elbląg will cross the Vistula Spit and run across Vistula Lagoon. However, this route, as well as other routes, is already in conflict with nature conservation measures taken for the Vistula Spit (HELCOM BSPA) and the Vistula Lagoon (NATURA 2000). Therefore, execution of this plan will need not only a transboundary agreement with Russia, but also will require permission from the EU. Spatial planning in this case should consider selection of the best possible crossing through the Vistula Spit, but also selection of the best possible new navigation routes in the Gulf of Gdansk and Vistula Lagoon.

Gas Transmission Lines

At present, only some small local pipelines exist in the Baltic. But two big pipelines are planned, namely: the "Nord Stream" to connect Russian gas extraction areas with the German gas system, and the "Baltic Pipe" to connect Poland and Denmark (with an extension to Norway) [19].

According to current information [20], the Nord Stream gas line will consists of two pipes, both 1,220 km long, 1,200 mm of external diameter that will operate under pressure of 220 atm and transmit 55 billion cubic meters of gas. The Baltic Pipe will consist of one pipe of ca. 230 km long, 672 mm of external diameter, which is scheduled to transmit 8 billion cubic meters of gas [21].

These pipelines fall under the Espoo Convention on transboundary environmental effects [22] and under political agreements of Baltic countries. Maritime Spatial Planning can be helpful in recognizing the interests of different sea users and nature conservation needs versus best possible routes for layering pipelines.

Electric Power Station

Due to electrical energy demand in the northern part of Poland, there is a need for construction of a new power station. This electric station will operate on coal using marine water as a cooling agent. Present plans are considering the area of Gdańsk.

Pressures from Construction Works and Large-Scale Installations

Environmental effects related to the introduction of new installations in the sea can be divided into two types of impact, namely:

- impacts during the construction phase,
- impacts during the operational phase.

Introducing new installations usually involves mechanical stress on the sea bottom, the creation of new physical fields, mobilizing deposited nutrients and chemical contaminants, partitioning of habitats, disruption of coastal dynamics (currents and sediment transport), and more (Fig. 6) [1, 19].

New construction may introduce new types of impacts, particularly in the case of introducing new physical fields (acoustic, electrical and magnetic ones). Effects of these fields or disruption of existing and natural fields on marine organisms are largely unknown.

Environmental pressure with regard to construction of new installations in the Baltic Sea has been recognized by the Helsinki Convention from its very beginning (HEL-

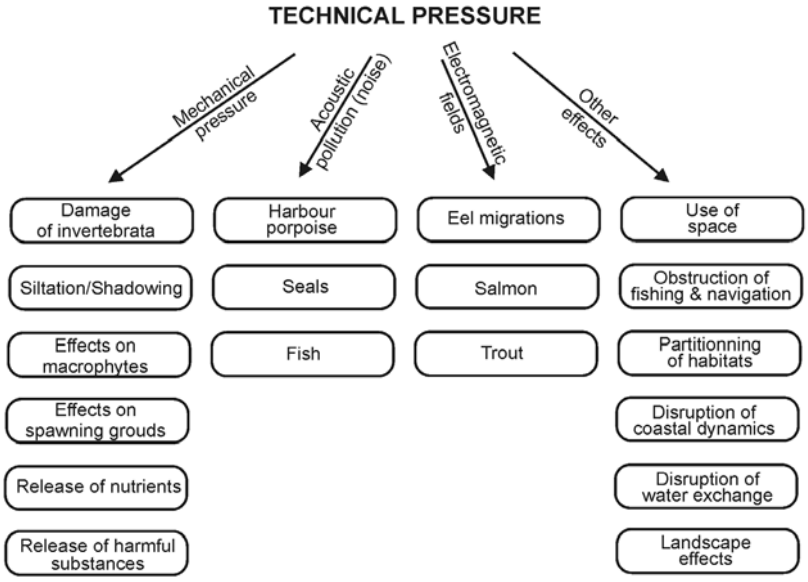

Fig. 6. Pressures of construction works.

COM 1974/1992). Special HELCOM Recommendation 17/3 has been issued for this purpose [23].

Unfortunately, present knowledge about the Baltic ecosystem in relation to the needs of the new technical installations is insufficient. There is not adequate habitat mapping and habitat classification. In many cases, there is lack of relevant knowledge on the effects of the existing and planned installations.

Nature Conservation Measures

Nature conservation areas in the Baltic Sea have been designated by HELCOM and the EU. According to the HELCOM database, currently ca. 6% of the Baltic Sea marine area is covered by the 89 Baltic Sea Protected Areas (BSPAs) (Fig. 7, a), with a total area of 22,569 km^2 [1]. The establishment of the BSPA network was based on HELCOM Recommendation 15/5 on a "System of Coastal and Marine Protected Areas." Poland has confirmed four BSPAs covering 1,299 km^2. These areas already have protection and management plans (Fig. 7, b) [24].

According to the EU, 10% of the marine areas in the Baltic Sea shall be designated protected areas. Poland has declared large parts – 5,676 km^2 (about 17% of its national marine sector) as protected NATURA 2000 areas under Habitats' and Birds' Directives (Council Directive 79/409/EEC and Council Directive 92/43/EEC). NATURA 2000 areas also include HELCOM BSPAs. Some of these areas are suitable for leisure activities, fishing, extraction of mineral resources, and wind farms.

Possible Conflicts

The main conflicts may appear between nature conservation (HELCOM BSPA and NATURA 2000) and new technical developments (wind farms, gas transmission lines, extraction of mineral resources, etc.), as well as between traditional users of the sea (transport, fishery, tourism, military) and new users. Conflicts may also arise among developers interested in exploitation of mineral resources, exploitation of living resources, and proposals for new large-scale installations. These conflicts stem from "spatial and temporal overlap of human activities and their objectives" and can be classified as conflicts "user vs. user" and "user vs. environment" (Douvere and Ehler [25]).

An example of possible conflicts are different proposals for use of offshore banks: Słupsk Bank and Odra Bank (Fig. 1, b). These banks have been declared protected areas (Fig. 8). These are fishing areas and at the same time there are plans for exploitation of mineral resources and construction of wind power parks. It is not clear how these conflicting proposals will be resolved. These circumstances only emphasize the need for maritime spatial planning.

Discussion

At present, knowledge about various aspects of technical pressures on marine ecosystems is still poor [26, 27]. Only some aspects, like the effects of bottom trawling (demersal fishery) and oil spills (maritime transport) may be regarded as sufficiently studied and understood. Some other pressures, even lasting for many years (effects of dredged spoils, extraction of sand and gravel, and coastal infrastructures), although in general quite well understood, usually require site-specific studies. However, most ecosystem effects related to new technical installations are not sufficiently understood. Integrated studies on these effects have not yet been developed [28].

Various aspects of technical pressure on the marine environment presented above, although related to the Polish Marine Areas, are relevant to the whole Baltic Sea.

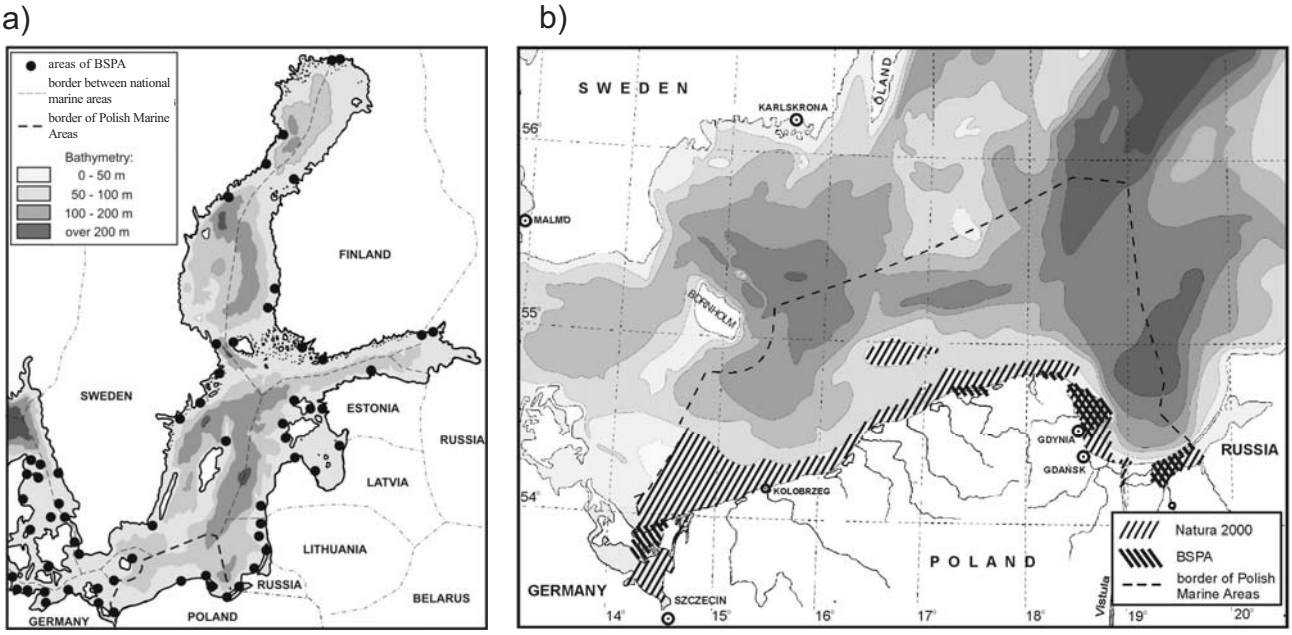

Fig. 7. a) Baltic System of Protected Areas (BSPA). b) Nature conservation areas in Polish Marine Areas.

Perhaps the Baltic Sea, which has been declared a Particularly Sensitive Sea Area (PSSA) [29], could be a suitable polygon for these kinds of studies. HELCOM, together with VASAB, can play a key role in coordination of pan-Baltic MSP, recognizing the need for including national stakeholders and national bodies involved in MSP.

Marine space should be treated as a national space resource, similar to living and/or mineral resources. Management of marine space can effectively be implemented only within the national marine areas [30, 31] and unified internationally for each marine region. This is now the focus of many Northern Hemisphere countries [32, 33]. In Canada, it is mainly developed as habitat management and seabed mapping [34]. U.S. advances concentrate on habitat mapping [35]. The North Sea countries received strong support from the OSPAR Commission for the development of marine spatial planning. OSPAR held a number of Workshops on marine spatial planning and management [36]. Some North Sea countries are already advanced in the MSP process [37-39]. Developments for the marine spatial planning in the Baltic are strongly supported by important international bodies (as described earlier in the "introduction"). However, MSP is still in the initial stage.

According to Douvere and Ehler [25], marine spatial planning should be done in two stages: the sectoral and cross-sectoral. The sectoral stage needs internal planning within the individual marine sectors. In the case of the fishery sector, all stakeholders should be involved such as fishery scientists, fishery advisory bodies, fishery organizations, and fishery inspections. A similar process should happen in other sectors, such as: mariculture, transport, tourism, exploitation of mineral resources, production of energy, energy transfer, etc. After elaborating individual sectoral interests, a cross-sectoral approach should start. At this stage also nature conservation and protection of historical and cultural heritage should be included in the process, similar to individual sectors. A cross-sectoral approach should deal with issues of different sectoral interests and solve possible conflicts. These should lead to the creation of integrated maritime policy, which should be subjected to public opinions and possible amendments.

In many cases of the small Baltic Sea there will be a need to deal with transborder problems. Some investments may affect neighboring countries, some other investments will simply be of bilateral or multilateral interest.

During preparation of marine spatial planning, existing guidelines and experience of other countries should be used. In the case of the Baltic it would be reasonable to appoint/select leading MSP coordinators. This role could be played by the Helsinki Commission together with Baltic Sea organisations experienced in marine spatial planning.

Conclusions

Rapid developments of maritime technology has strengthened human expansion to marine areas, resulting in a growing number of coastal and offshore technical developments. These developments remain controversial - they raise a serious concerns about environmental effects and will also stimulate competition for the seaspace. This may raise new conflicts, particularly between new developers

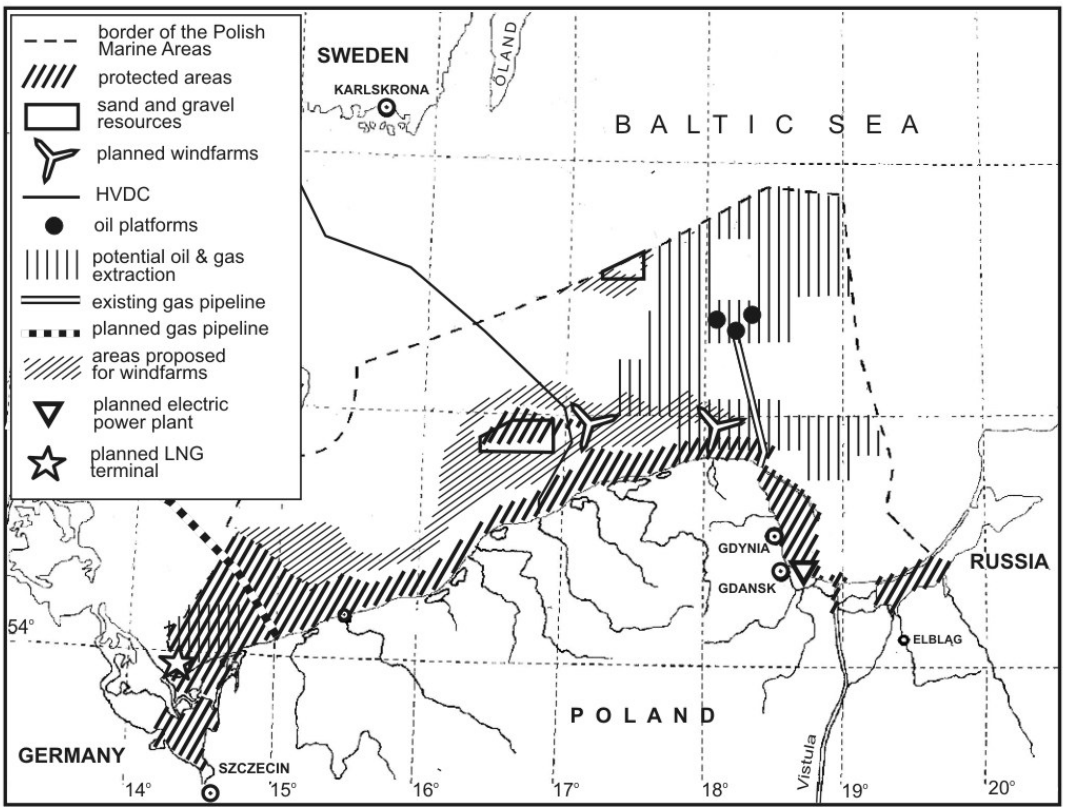

Fig. 8. Example of potential conflicts between present use, nature conservation, and planned developments in Polish Marine Areas.

and traditional users of the seaspace. As an effect, MSP is urgently needed.

MSP is only in the beginning stage. We assume that the first and basic step for MSP is the identification of already existing traditional activities and planned new developments and new activities. The planning process should also identify new environmental pressures.

The process should start on a large scale (top-down approach), establishing preconditions for different uses of the sea space and respecting an ecologically coherent network of marine protected areas.

A crucial issue for MSP is to involve all relevant parties in the planning process: scientists, administrators, conservationists, and stakeholders. Furthermore, an important issue is to establish clear vision, goals, and objectives for the exploitation of the national marine sectors in relation to the natural marine sub-regions.

MSP is particularly important for the Baltic Sea – a small and fragile ecosystem surrounded by nine well-developed countries that already realize and further plan intensive economic expansion at sea. The present knowledge about environmental effects of new large-scale installations (particularly windpower parks, pipelines and some coastal constructions) is not sufficient.

Acknowledgements

The authors wish to thank the referee for valuable comments, and Dr. Elżbieta Łysiak-Pastuszak (Institute of Meteorology and Water Management – Maritime Branch in Gdynia) and Mr. Andrzej Cieślak (Maritime Office in Gdynia) for their suggestions to improve this paper.

References

1. HELCOM 2009a. Biodiversity in the Baltic Sea - An Integrated Thematic Assessment on Biodiversity and Nature Conservation in the Baltic Sea, Baltic Sea Environ. Proc. No. 116b, **2009**.
2. HELCOM 2007a. HELCOM Baltic Sea Action Plan, **2007** (website: http://www.helcom.fi).
3. HELCOM 2007b. HELCOM RECOMMENDATION 28E/9, Development of Broad-Scale Marine Spatial Planning Principles in the Baltic Sea Area, **2007** (website: www.helcom.fi/Recommendations/en_GB/rec28E_9).
4. HELCOM 2009b. HELCOM Workshop on Broad Scale Marine Spatial Planning in the Baltic Sea, Helsinki, 27-29 January, **2009**.
5. BS RAC, 2009. Baltic Sea Regional Advisory Council (BS RAC). Workshop on Spatial Planning, Tallinn, 19-20 February **2009**.
6. UNESCO 2006. International Workshop on the use of marine spatial planning as a tool to implement ecosystem-based, sea use management, 8-10 November **2006**, (website: www.unesco-ioc-marinesp.be/msp_workshop_2006).
7. UNESCO Marine Spatial Planning Guidelines, **2009** (website: http://www.unesco-ioc-marinesp.be/marine_spatial_planning_msp).
8. EU COMMISSION. An Integrated Maritime Policy for the European Union, **2007** (website: http://ec.europa.eu/maritimeaffairs/subpage_en.html).
9. EU COMMISSION. Roadmap on Maritime Spatial Planning: Achieving Common Principles in the EU, **2008** (website: http://ec.europa.eu/maritimeaffairs/spatial_planning_en.html).
10. VASAB. Long-term perspective for the BSR, Vision and Strategies around the Baltic Sea 2010, **2009** (website: www.vasab.org/east-west-window/documents/Interim_Narrative_Report_EN_final.doc)
11. BALANCE. Towards Marine Landscapes in the Baltic Sea. BALANCE Interim Report No. 10, **2008** (website: balance-eu.org/xpdf/balance-interim-report-no-10.pdf)
12. CIEŚLAK A., ŚCIBOR K., STAŚKIEWICZ A. Compendium on Maritime Spatial Planning systems in the Baltic Sea Region countries, Rep. of the East-West Window Project (EU Grant – BSR INTERREG III B), pp. 81, **2009**, (website: www.vasab.org/east-west-window)
13. CIEŚLAK A. Spatial Planning of sea areas-Poland. HELCOM HABITAT 10/**2008**
14. DUBRAWSKI R., ZAWADZKA-KAHLAU E. [Ed.]. Perspectives of the Baltic Sea-coast Protection, Prace Instytutu Morskiego, **2006**, [In Polish].
15. BPO. Baltic Ports Organisation, **2008** (website: www.bpoports.com)
16. ANDRULEWICZ E., NAPIERSKA D., OTREMBA Z. The environmental effects of installation and functioning of submarine SwePol Link HVDC transmission line: a case study of the Polish Marine Area of the Baltic Sea, Jour. of Sea Res. **49**, 337, **2003**.
17. WĘSŁAWSKI J.M., URBAN-MALINGA B., KOTWICKI L., OPALIŃSKI K., SZYMELFENIG M., DUTKOWSKI M. Sandy Coastlines – are there Conflict Between Recreation and Natural Values?, Oceanological Studies, **XXIX**, (2), 5, **2006**.
18. HELCOM Guidelines for the Disposal of Dredged Material at Sea, **2007** (website: www.helcom.fi).
19. OTREMBA Z, ANDRULEWICZ E. Environmental Concerns Related to Existing and Planned Technical Installations in the Baltic Sea. Polish J. of Environ. Stud. **17**, (2), 173, **2008**.
20. NORD STREAM. Offshore Pipeline though the Baltic Sea, Nord Stream Espoo Report, **2009** (website: www.nord-stream.com/en).
21. EKOKONSULT. Environmental Impact Assessment of the Baltic Pipe versus requirements of the Helsinki Convention. Manuscript, **2001**, [In Polish].
22. ESPOO CONVENTION. Convention on Environmental Impact Assessment in a Transboundary Context, **1991**, (website: www.unece.org/env/eia).
23. HELCOM Recommendation 17/3. Information and Consultation with regard to construction of new installations affecting the Baltic Sea, **1996**, (website: www.helcom.fi/Recommendations/en_GB/rec17_3).
24. HELCOM. Nature Protection and Biodiversity Group (HELCOM HABITAT), Minutes of the Tenth Meetings, 5-9 May **2008** (website: www.helcom.fi).
25. DOUVERE F., EHLER C. Ecosystem-based marine spatial management: an Evolving paradigm for the management of coastal and marine places. Ocean Yearbook **23**, pp. 1-26, **2009** (website: www.unesco-ioc-marinesp.be/uploads/documentenbank/11479fdbaca3efc99f3a3d2bc77ea2b7.pdf).
26. DENGBOL D., WILSON D. Spatial planning on the North Sea; A case of cross-scale linkages. Marine Policy **32**, 189, **2008**.

27. DOUVERE F., EHLER C. The importance of Marine Spatial Planning in Advancing Ecosystem-based Sea Use Management. Special Issue Marine Policy **32**, 5, 758, **2008**.
28. HALPERN B. Managing cumulative impacts in ecosystem-based management through ocean zoning. Ocean and Coastal Management, **51**, 203, **2008**.
29. IMO Resolution A.982(24), Revised guidelines for the identification and designation of Particularly Sensitive Sea Areas (PSSAs), International Maritime Organization, **2006**, www.imo.org/includes/blastDataOnly.asp/data_id%3D14373/982.pdf
30. DOUVERE F., MAES A., VANHULLE A., SCHRIJVERS J. The role of spatial planning in sea use management: The Belgian Case. Marine Policy **31**, 182, **2007**.
31. PEEL D., LLOYD M. The social reconstruction of the marine environment: Towards Marine Spatial Planning? Town Planning Review **75**, 359, **2004**.
32. RUTHERFORD R.J., HERBERT G.J., COFFEN-SMOUNT S.S. Integrated ocean management and the collaborative planning process: the Eastern Scotian Shelf Integrated Management (ESSIM) initiative. Marine Policy **29**, 75, **2005**.
33. SORENSEN T.K., BLAESBJERG M., VESTREGAARD O. Marine spatial planning in the Nordic region: Perspectives, Challenges and Opportunities. ICES CM E: 46, **2008**.
34. RICEJ.C., PERAMAKI L., HOUSTON K. The Canadian national approach to implementing an ecosystem approach to integrated management. ICES CM, R: 16, **2007**.
35. NOJI T., FROMM S., FROMM S. Habitat sustainability modeling using the Kostylev approach in support of fisheries management. ICES CM, E: 23, **2008**.
36. NIXON E. Developments in national marine spatial planning systems within the OSPAR maritime area. ICES CM, E: 28, **2008**.
37. FOYN L., ROSVIK I. Lessons learnt from developing and implementing integrated management plans in Norwegian waters. ICES CM, E: 19, **2008**.
38. POMEROY R., DOUVERE F. The engagement of stakeholders in the marine spatial planning process. Marine Policy **32**, 816, **2008**.
39. FOCK H., SELL A., RICE J. Fisheries and marine spatial planning in German offshore waters – resolving spatial conflict issues. ICES CM, E: 18, **2008**.