Transboundary water management in the Vistula Lagoon – regulations, problems and conflicts.

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ABSTRACT

Laws, environmental and economic problems and conflicts in the Vistula Lagoon are discussed. Being one of the largest European inner marine basins it belongs to an EU member Poland and non EU Russia's Kaliningrad Oblast. The direct connection with the sea through the Baltiysk Strait is in the Russian part. The access through Vistula River branches is available to small vessels only, so the isolation of Polish part is a key problem. Despite a visa-waiver between the Kaliningrad Oblast and Pomeranian Province the navigation still requires a permit a month before the arrival. The Strait is also a source of saltwater transport into the lagoon and upstream the Pregola River, affecting fresh water intakes there.

The Polish and EU laws are consistent including the pan-Baltic treaties. The Russian law incorporates Baltic-wide conventions. Two different legal systems hamper effective management of water quality and fishery in the lagoon.

The Polish part pertains to two provinces. The northern Vistula Lagoon Spit offers nice sandy beaches. Fisheries and tourism are the remaining activities. The southern part faces very high unemployment, but both provinces seek little joint efforts; indifference between the Spit and the south continues.

The Polish part of the Lagoon is under NATURA 2000, restricting fishermen and developers' activities. Fishery loses resources due to the growing population of cormorants. The hottest problems are: eutrophication, overfishing and the absence of joint monitoring program.

There is a need for joint harmonization of economic plans, intentions and legislation on coastal zone management and nature preservation.

KEY WORDS: *Trans-boundary coastal and water management, Baltic Sea, borders and interfaces.*

INTRODUCTION

Vistula Lagoon, pol. Zalew Wiślany, rus. Калининградский залив (Figure 1), is one of the largest inner marine water basins in Europe and is the 2nd largest after Curonian Lagoon in the Baltic Sea.

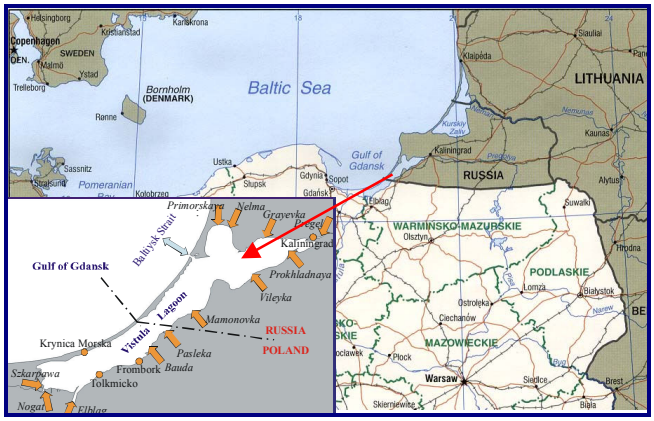

Figure 1. Location of the Vistula Lagoon.

It has an area of 838 km^2 and a drainage basin of 23,870 km^2. It is shared between Poland – an EU-member and Russia - a non-EU state, with 473 km^2 belonging to Russia and 365 to Poland. It has a single inlet, the Baltiysk Strait, located in the Russian part. The Lagoon exchanges water with the Gulf of Gdańsk through the Baltiysk Strait, which has a width of approximately 400 m, a length of two kilometres and an average depth of 8.8 m. A navigation canal leads from the Baltiysk Strait up to the harbour of Kaliningrad; this canal is twice as deep as the largest natural depression in the lagoon. Despite its relative narrowness, the canal plays an important role in transporting sea water from the Baltic Sea to the lagoon. The lagoon has an elongated shape running from south-west to north-east and a total length of 91 km. The average width of the lagoon is about 9 km; the widest stretch measures 13 km. The lagoon's coastline is about 270 km long, and the volume of water is about 2.3 km^3. It is a shallow coastal ecosystem. The average depth of the lagoon is 2.7 m, and the maximum natural depth is 5.2 m, close to the Baltiysk Strait (Figure 2). Vistula Lagoon is separated from the Baltic Sea by the Vistula Spit - a sandy, 55 km long peninsula forested to secure dunes stability.

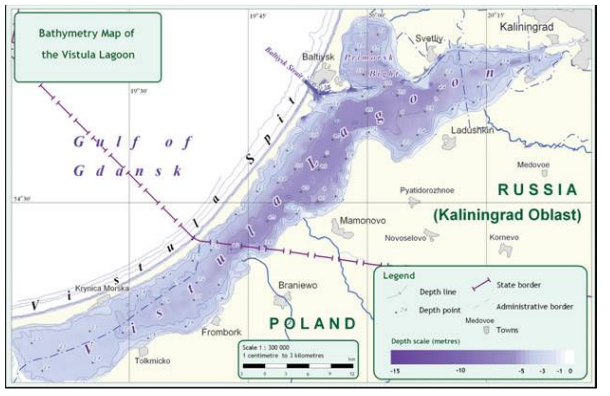

Figure 2. Bathymetry of the Vistula Lagoon (Chubarenko, 2008)

As regards salinity the lagoon is considered a transitional area. Average salinity (1950 -1965) for the eastern part of the lagoon (spring-autumn) is 2.5-4.3 PSU, for the central part 3.9-5.0 PSU, and for the southern part 1.0-3.4 PSU. This is the result of salt water inflows from the Baltic Sea that influence all aquatic areas of the lagoon, including the mouth of the Pregola River, the largest river in the catchment. At the Baltiysk Strait salinity may reach up to 7 PSU.

Eutrophication is one of the major issues in the lagoon. This water body is especially vulnerable to eutrophication due to the large drainage area and limited water exchange with the Baltic Sea. According to Kwiatkowski (1996), nitrogen and phosphorus are accumulated and released from silty bottom sediments. As a consequence of water mixing, the redistribution of labile inorganic nutrients from the upper layer of bottom sediments to the water column is almost continuous (Ezhova *et al*. 1999). Witek et al. (2010) assess, based on modelling results, that on an annual scale, between 15 and 20% of the deposited nitrogen and between 25 and 40% of phosphorus were "re-exported" to the water column due to re-suspension. Therefore, there is a high internal potential for continuous eutrophication. Kwiatkowski (1996) estimated that as much as 138,600 tons of nitrogen and 55,800 tons of phosphorus have accumulated in the 10 cm top sediment layer. Approximately 22% of the nitrogen and 35% of the phosphorus loads are exported to the Gulf of Gdansk (Kwiatkowski *et al*. 1996).

The Vistula Lagoon region is scarcely populated. Socio-economic development of settlements is rather low, division of the Lagoon between two countries doesn't facilitate mutual economic activities. The rate of unemployment is very high – almost 30% in many Polish lagoon communities. The statistics for Russian municipalities is better, but it doesn't incorporate concealed unemployment. The division of the Polish part into two Provinces (Pomerania - cap. Gdańsk and Warmia-Masuria, cap. Olsztyn) is another source of problems, because the former is one of the key economic engines of the Polish economy (agglomeration of the three cities of Gdańsk, Sopot and Gdynia with the largest ports in the Baltic Sea and the access to nice sandy open sea beaches on the Spit), whereas the latter is a basically rural region whose larger cities face an uphill struggle to retain their jobs and population. Both Provinces seem to see little common interests. In the Russian part the isolation of the Kaliningrad Region from the Russia proper is the key impediment for development of the Russian part.

TRANSBOUNDARY MANAGEMENT ISSUES AND PROBLEMS

Free Access to the Baltic Sea for Polish and EU Vessels

The existing Polish-Russian agreement (2009) allows the transportation within the lagoon only for Polish and Russian vessels. However, Polish vessels are required a long notice, which is not automatic and can be denied at any time. The agreement of 2009 doesn't allow the Vistula Lagoon to be a part of international traffic routes, as, for example, an international inland water way E70 connecting ports of Germany with the Baltic States. It also limits developments of international tourism at all small harbors of the lagoon. Inner region potential for water tourism is very law - number of yachts and boats are very limited, especially on Russian side. Currently, a local visa waiver scheme between the Kaliningrad Region and the Polish environs of the lagoon, including the Tri-City agglomeration of Gdańsk, Sopot and Gdynia and some counties and cities in Warmia-Masuria Province, has come into force. It has boosted trans-boundary trade, powered by mostly one-day visitors; it is estimated that almost 200 thousand Russian guests visited the Tri-City in 2012 (Radio Gdańsk FM news, Jan. 2013). Regrettably, the visa-waiver is only applicable for road traffic and the access through the Baltiysk Strait still requires a long notice (15 days), which is a serious impediment. This limitation of international traffic is more difficult for the Polish part of the lagoon. As a response - an idea is considered in Poland to construct a cross-cut through the Spit in order to create an access route that is situated entirely on EU territory. Preliminary analyses indicated four different locations of the cut - Skowronki, Nowy Świat, Przebrno, and Piaski, see Figure 3.

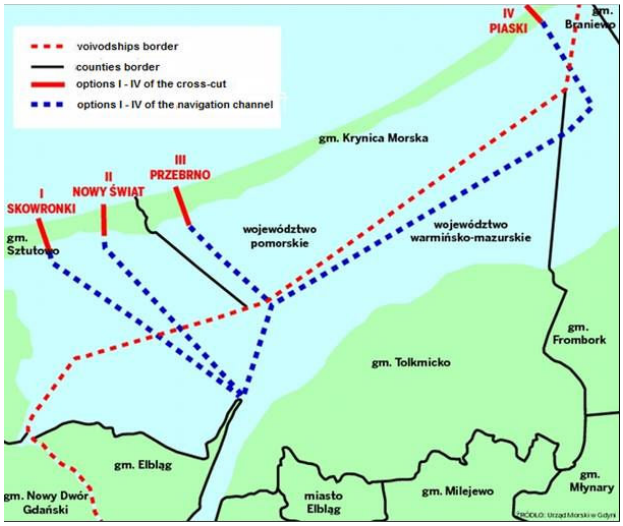

Figure 3. Possible cross-cut locations. Source: Maritime Office, Gdynia

Based on environmental impact assessment studies and some tentative economic analyses, Skowronki was identified as the most appropriate location. Still, ultimate decisions are a long time coming and the whole venture remains uncertain in economic terms. The most important issue is whether the Elbląg harbour can compete with large nearby ports in Gdańsk and Gdynia, see Figure 4. This question becomes urgent, because recently those harbours have received a motorway connection with mainland Poland and their logistic attraction has grown accordingly. The 2nd question is whether high construction costs for the cut, locks and the navigational channel (ca. M€ 100) will generate sufficient returns by servicing the target 100 m long and 20 m wide vessels with 4 m draught. It is quite likely that the harbours in Gdańsk and Gdynia could easily handle such surplus traffic at little or no extra cost. The 3rd question is related to a possible 'holistic' vision, i.e. the expansion of the passage from Vistula (Wisła) River through Szkarpawa branch - a shore parallel route from Wisła to Vistula Lagoon on Figure 4, that currently can accommodate vessels to 500 tonnes only. This would integrate the harbours in Gdańsk

and Elbląg into one large system, but the underlying costs may be prohibiting. Other questions are related to environmental issues, as the whole Polish part of the lagoon is a NATURA 2000 area and to possible conflicts, such as opposition of Spit residents, who fear of being isolated from the rest of Poland when the cross-cut is completed.

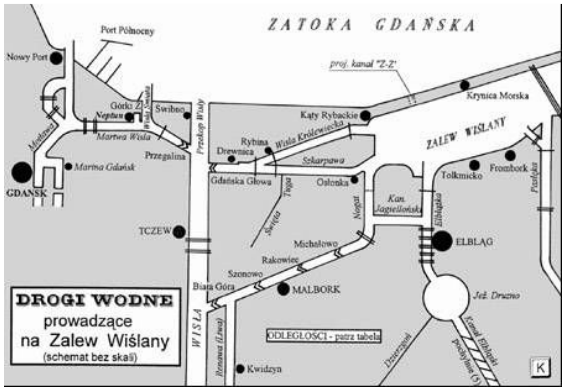

Figure 4. Waterways near Vistula Lagoon and nearby ports.

Source:
http://www.kulinski.zagle.pl/zw/02_zalew_wislany_charakterystyka_akwenu.htm

Legal Systems and Regulations: Successes and Deficiencies

Russia is the only non-EU Baltic Sea country. Therefore, one might expect difficulties for the effective management of basins, such as Vistula Lagoon, shared by an EU and non-EU country.

However, due to the vulnerability of the Baltic Sea to pollution, Baltic countries have developed a binding legal framework aimed first at alleviation of the pressing environmental problems and then at their ultimate successful management and control. This framework was elaborated within the HELCOM group and is called Baltic Sea Action Plan, BSAP, 2007. It was signed in 2007 by the Ministers of Environment of EU Baltic countries (except for the German Minister) and high level Representatives of the Russian Federation, Germany and EU. The most important provision stipulates achieving satisfactory water quality Baltic-wide by 2021. It basically means substantial reductions of the inputs of nutrients from both point (municipal) and diffuse (mostly rural) sources. To attain this goal numerous waste water treatment facilities must be built and launched; currently most cities and towns in the Polish part of the Lagoon catchment, including the largest cities of Olsztyn and Elbląg, purify their wastewaters to the levels stipulated by the Water Framework Directive (as EU member state) and BSAP (as signatory of HELCOM convention). Similar efforts have started in Russia as well, so pollution from the Russian part will also decrease sharply to meet the targets and timing set by Baltic Sea Action Plan. For example, waste water treatment facilities for the agglomeration of Kaliningrad (pop. 400 thousand) – should become operational by the end of 2013.

Apart from point sources the inputs of nutrients to the Baltic Sea originate from diffuse sources, mainly from fertilizers applied by the agricultural sector. Baltic Sea Action Plan sets thresholds of nutrient inputs for Baltic countries, discharged to various basins in that Sea. Poland and Russia agreed to their thresholds on nitrogen and phosphorus, so one can anticipate that also agricultural inputs off nutrients, including those discharged into Vistula Lagoon, will be taken under control.

Local problems, specific for Vistula Lagoon, are much more difficult to harmonize in legal terms. It is particularly vivid when considering the management of fish stocks in the Lagoon. Based on Psuty, 2012, the fisheries in the Polish part of Vistula Lagoon are regulated by a number of instruments, consistent with EU policies:

- fishing potential is limited by setting thresholds for the number of vessels, maximum number of fishing gear per vessel, length of net sets and fyke nets,
- designating minimum protected fish size and the associated minimum mesh size in gillnets,
- obligation to deploy protective sieves in the last chamber of fyke nets from 1st Jun. to 31st Dec.,
- limiting regions in which small-mesh gillnets (perch-roach nets) can be used,
- designating gear-free zones in waters known as mass fish migration corridors,
- designating spawning ground and river mouth protected areas,
- designating closed seasons for pike, pikeperch, bream, sea trout, salmon, and eel.

So far the main problem was the successful enforcement of these regulations and permanent overfishing. Unofficial market for mostly undersized fish was tolerated for many years. Fortunately, the enforcement of fishing regulations i.e. the curbing of professional and amateur poaching, has become much more stringent recently due to purchases of modern equipment, such as night vision devices and radars. Still, overfishing remains a non-trivial problem.

Many instruments regulating fisheries are used in the Russian part as well. However, they are not harmonized with those valid in the Polish part, so, despite general similarity, details like minimum mesh sizes or the timing of no-fishing periods vary. This reduces efficiency of efforts undertaken on both sides to achieve more sustainable fishing sector. The only harmonized instrument concerns the catch limits or Total Allowable Catch (TAC) for bream and pikeperch. These TAC-s are set by the Polish-Russian Joint Commission for the Vistula Lagoon Fisheries. The agreement on mutual cooperation regarding fisheries between the governments of the Republic of Poland and the Russian Federation which was entered into on 5 June 1995 renewed the obligation for both sides to meet annually under the auspices of the Polish-Russian Joint Commission for Fisheries. Very high political and administration level needed to establish this Commission and very narrow scope of its competences (2 species and only 1 parameter) highlight the greatest difficulty of harmonization of regulations in the Vistula Lagoon. For example, Polish fishermen raise the issue of permanent stocking of the Lagoon with juvenile eel and highlight joint efforts needed. Since this topic is excluded from the agenda of the Commission the stocking, paid for and executed solely by Poland, is frustratingly erratic for the fishermen. Extension of

competences of the Commission would facilitate development of sustainable fisheries in the Lagoon.

In brief, despite trans-EU character of the Vistula Lagoon, the Baltic-wide legal instruments (BSAP) facilitate significant improvements of environmental situation there. Radical upgrade of water quality in rivers discharging into the Lagoon and better condition of the lagoon are already great benefits for Poland and Russia. Being far away from pressing political agendas, local instruments, dedicated to the Lagoon itself, are much more difficult to introduce. A clear-cut example is the monitoring of physical and environmental parameters in the lagoon.

Inadequate and Deficient Monitoring of Physical and Environmental Parameters

One of key factors that impair sustainable management and planning in the lagoon is incompatible monitoring. Ecological parameters in rivers discharging to the lagoon in the Polish and Russian parts are monitored every year, from March to October one day a month. The bad thing is that selection of that day is entirely arbitrary. It is not in any way connected to monitoring of other areas (like Vistula Lagoon) or monitoring of the discharges of those rivers. Between November and February the data are generally missing – there is no monitoring, even though rivers are not covered with ice. Only two rivers on the Polish side are monitored from January till December (Pasłęka and Bauda) and in some cases twice a month (Pasłęka). Basing on such information it is not possible to determine if the measured concentrations are typical for the month or are just incidental and sometimes related to some accidental dumping of sewage or manure in the river basin areas. Also, information on winter nutrients' concentration is scarce which would be valuable for their assessment in periods when there is no vegetation. The lack of monitoring in winter months disables also a proper set up of water quality modelling tools. Therefore, all predictions developed on such a basis are uncertain and always produce errors.

Ecological parameters in the lagoon are monitored at 9 stations in the Polish and 9 in the Russian part. The number of stations could be considered satisfactory but the sampling periods and frequency is not good enough to make proper calibration and validation of hydrodynamic and ecological modelling tools. Another problem is the access to data. In Russian part different parameters are measured by different institutions devoted to different sectors, and the joint data base is still absent.

Discharges in rivers are regularly monitored only in some of them: Pasłęka, Bauda on the Polish side and Pregola, Mamonovka and Nelma on the Russian side. Other Polish rivers (Elbląg, Nogat, Szkarpawa) and a relatively big river – Prokhladnaya - on the Russian side are not monitored at all and information on their discharges has to be assessed basing on some indirect information. This situation prevents reliable assessment of riverine discharges and nutrient loads to the lagoon; all predictions of water hydrodynamics and water quality in the lagoon are not fully reliable.

Monitoring of the lagoon is not synchronized in time with the monitoring of rivers, as well as the monitoring of the Polish part of the lagoon and the rivers is not synchronized in time with monitoring of the Russian part of the lagoon and the rivers. Therefore, in this case "regular" means rather "repetitiously" but absolutely not synchronized in time and not necessarily on the same date every year, every month.

Meteorological parameters are monitored regularly but only on the south side of the lagoon in Poland and on the north side of the lagoon in Russia. The access to data is difficult due to high cost; this again seriously restricts the set up, calibration and validation of modelling tools applied for prediction of changes of hydrodynamic and ecological parameters in the lagoon.

Generally speaking, two fundamentally different systems of monitoring program are implemented at the Polish and the Russian sides of the Vistula Lagoon, i.e. the targeted and baseline monitoring respectively, see Chubarenko, 2007. Monitoring stations in the Polish part are mainly associated with cities and include anthropogenic influence, while stations in the Russian part are located outside possible anthropogenic sources and show mainly background or natural conditions.

Malfunctioning and incompatible monitoring programs may become in future a critical factor for the assessment of environmental improvements due to Baltic Sea Action Plan and local programs and initiatives. Improper functioning of the monitoring increases the likelihood of illegal discharges of pollution and reduces the risk of being sued/fined for breaching the environmental regulations.

LOCAL ISSUES AND PROBLEMS

Apart from transboundary problems the management of Vistula Lagoon faces also problems on national levels. In the Polish part it can be traced by screening the attitudes of both Provinces that share the lagoon area. The Pomerania Province has a center of gravity in the Tri-City agglomeration of Gdańsk, Sopot and Gdynia, having the total population of more than 1 million. Low unemployment in those cities (ca. 6%) indicates a rather favourable economic situation and fair average living standards. These circumstances attract young, skilled people who settle there. The Spit area also belongs to Pomerania; it has nice sandy beaches, which can sustain local population due to tourism and fishing. The number of Spit residents is a very small fraction of the entire population of Pomerania; they overwhelmingly focus on the sea and do not need the lagoon to support tourism along the Spit. Part of Pomerania bordering the lagoon constitute the low-lying, depression areas of Vistula River delta. They suffer from acute unemployment of almost 30% and are very sparsely populated, because of this grave situation. Thus, they cannot exert sufficient political pressure on the provincial authorities. As a result, this part of the Province seems to be ignored by them.

The Warmia-Masuria Province is even less lucky; major cities, that is the capital Olsztyn (pop. 176 thousand) and the city of Elbląg (pop. 124 thousand) face persisting double figure unemployment (ca. 15%). Provincial authorities pay most attention to the lake region, east of Olsztyn, where tourism abounds. There is little focus on south coast of the lagoon, predominantly because of eutrophication as well as NATURA 2000 status and the associated bureaucratic difficulties related to business activities. Thus, like in Pomerania, provincial authorities do not have the lagoon on their priority list.

Low priorities of the lagoon in both provincial governments result in their indifference toward joint cooperation. For Pomerania the lagoon will remain an eutrophicated basin, they tend to think that sediments there favour unpleasant water appearance in summer and that it will continue even

after radical improvement of water quality in the discharging rivers due to re-suspension of nutrients. On the other hand, easy access to the sea offers sufficient jobs for the Spit residents. Finally, areas of the Vistula River delta are the target of a very large and long-term, EU-sponsored revitalization program, implemented by the Regional Water Management Board in Gdańsk. It should be completed by 2030. Thus, the authorities of Pomerania believe they pursue a rational strategy for their Province and have little incentives to seek cooperation with the south coast to help the neighbouring Province. For Warmia-Masuria the situation is similar; water appearance in the lagoon will not change soon and NATURA 2000 restrictions discourage potential investors, so it is better to support development, where the investments can bring more immediate returns.

Possible cooperation could concentrate on lobbying with provincial authorities for the expansion of shuttle traffic across the lagoon between the Spit and southern communes. This could help revitalize dilapidated wharfs in most southern towns in order to encourage tourists, basically residing on the Spit, to visit the southern communes and stay there for a few days. Currently, a trip across the lagoon is rare (once a day along just one route), wrongly timed (the vessel is based on the Spit and returns there in the early afternoon, instead of the evening) and expensive; the price for two-way trip for a typical family (4 persons) is prohibiting. The improvement of this situation requires more active participation of local (commune) authorities; currently they remain overly passive, though.

The last issue is the colony of cormorants near Kąty Rybackie (north west corner of the lagoon in Figure 4). Almost extinct several decades ago, this is the largest colony of cormorants in Europe nowadays, see Figure 5.

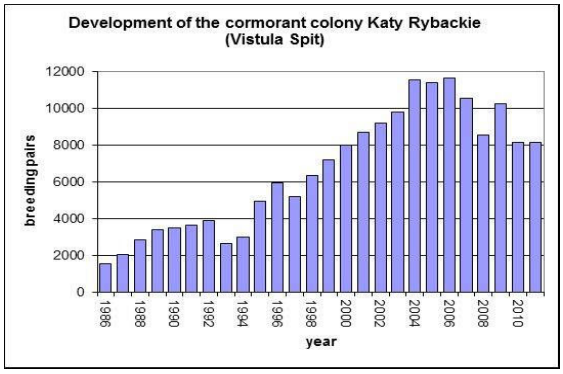

Figure 5. Development of Europe's largest cormorant colony on the Vistula Spit (Herrmann, et.al., 2011).

Although the number of breeding pairs slightly dropped in recent years, the cormorants are blamed for consuming huge amounts of predominantly juvenile fish and destroying local forests by their poisonous faeces. It appears that future management of the lagoon will require setting a threshold for the number of cormorants in that area.

CONCLUSIONS

The current condition of the Vistula Lagoon yields mixed feelings. On the one hand significant improvement of environmental state of that area has been achieved. This success can be attributed to gradual implementation of Baltic Sea Action Plan. Positive aspects also include the work of Joint Polish-Russian Fishing Commission, although its area of competences is narrow.

Negative aspects still linger on, though. The most important is dramatically high unemployment in settlements around the lagoon. One of the ideas to overcome this stalemate is to construct the cross-cut trough the Polish side of the Vistula Spit to boost the economy in the Polish part, particularly the city of Elbląg. However, this venture is economically vague, because the anticipated growth of traffic through Elbląg harbour can probably be easily handled by the existing harbours in Gdańsk and Gdynia.

Poor condition of the monitoring systems of physical and environmental parameters is not a very acute problem now, given substantial improvements of environmental condition of the lagoon in recent years. However, efforts must be undertaken to improve this situation to secure long-term sustainability of recently achieved environmental progress.

Cooperation on provincial level in the Polish part hardly exists. More active role of local authorities might contribute to changing that situation. Finally, future management of the lagoon will require setting a threshold for the number of cormorants living in that area.

ACKNOWLEDGEMENT

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