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Review

Environmental Concerns Related to Existing and Planned Technical Installations in the Baltic Sea

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Abstract

This paper describes the selection of the most important technical installations already operating or planned in the Baltic Sea. It highlights maritime regulations related to these installations and describes current practices utilized for the preparation of environmental impact assessments (EIA). It assumes that there is an adequate international legal system for protection of the Baltic natural environment. However, it points out some cases when this legal system does not sufficiently work, particularly during the process of EIA preparation.

Keywords: Baltic Sea, large-scale technical installations, transboundary environmental effects, maritime regulations

Introduction

The Baltic Sea is surrounded by nine countries that each carry out various economic activities in their marine areas. Besides the traditional maritime activities like transport and fisheries, other branches of industry also are being developed at sea, for example: transmission of electricity (underwater high voltage power cables), crude oil and gas extraction (platforms and pipelines) or electric power production (windmill farms).

At present, several large-scale technical projects are completed or planned in their national Exclusive Economical Zones (EEZ). Until now, technical installations in the Baltic Sea have not posed any serious environmental problems; however, the growing number of the new controversial projects, like the large number of windmill farms or the "Nord Stream" gas pipeline, raise serious concerns about environmental effects.

These types of installations are the subject of international and national regulations. A question arises whether the existing international legal system is sufficient for the protection of the Baltic Sea environment and whether the existing practices effectively prevent environmentally harmful installations.

Having atempted to seek an answer to the above questions, we described the most important existing and planned installations in the Baltic Sea and critically reviewed environmental concerns related to the planning, construction and operation of these installations.

International Regulations Related to Installations in the Baltic Sea

The most important regulations preventing the Baltic Sea from the introduction of environmentally harmfull installations are the Helsinki and Espoo Conventions.

Helsinki Convention

The present version of the Helsinki Convention [1] was signed in 1992 by all nine Baltic Countries and the

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EU. The Convention contains 38 articles, 7 Annexes and a large number of Recommendations related to the practical implementation of the protection of the Baltic Sea marine environment. Article No. 7 of the Helsinki Convention requires preparation of an Environmental Impact Assessment (EIA) for setting large-scale and/or transboundary constructions. This includes the requirement to provide full information on environmental effects, notification, international consultation and the need to undertake the joint activities of the Baltic countries.

The Helsinki Commission also has developed and adopted a number of recommendations, such as the one related to installations affecting the Baltic Sea (Recommendation No. 17/3: *Information and consultation with regard to construction of new installations affecting the Baltic Sea*, HELCOM, 1996). HELCOM is also elaborating *Guidelines* for the preparation of EIA (*HELCOM Guidelines on EIA*). Besides Recommendation 17/3, the following Recommendations should be addressed: Recommendation 15/5 related to establishment of the Baltic Sea Protected Areas (BSPAs), Recommendation 19/1 related to extraction and redistribution of bottom sediments within the Baltic Sea and Recommendation 21/4 related to the protection of marine endangered biotopes of the Baltic Sea.

Espoo Convention

The Espoo Convention on Environmental Impact Assessment in a Transboundary Context (1991) [2] has been signed and ratified by all Baltic countries except Russia. The Espoo Convention entered into force in 1997. It sets out the obligations of the Contracting Parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of the states to notify and consult one another on all major projects under consideration that are likely to have significant adverse environmental impact across borders.

This convention applies also to the large-diameter oil and gas pipelines and requires:

- Information about planned activity which may affect the environment in neighbouring countries,
- Preparation and distribution of documentation relevant to the affected countries and EIA preparation and announcment,
- Participation of the affected countries in EIA preparation.

Until now, some transboundary constructions, such as windmill farms (including Polish farms), bridges, ports and port installations, renovation and enlargement of nuclear power plants, extraction of sand and gravel, (also from Polish EEZ), gas pipeline project between Russia and Germany as well as the gas pipeline project between Denmark and Poland have announced to the Espoo Convention.

In relation to the Baltic Sea area, besides the Helsinki and Espoo Conventions, other international regulations should also be taken into account:

- International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) [3] might be applicable in the case of oil extraction and transport,
- United Nations Law of the Sea (UNCLOS, 1982) [4] that regulates the legal status of marine areas and indicates that national regulations should be respected,
- Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, 1998 [5], which makes obligatory the transparent information by investors to transparent on environmental hazards of the installation and how environmental problems will be minimized,
- The Ramsar Convention on Wetlands, 1971 [6] is applicable in the case of installations in coastal lagoons and wetlands,
- EU Directives: HABITAT Directive [7], BIRD Directive [8] oblige non-destructive activities in ecologically valuable areas,
- EIA Directive 2003/35/EU [9] requests environmental impact assessment.

Taking into account the number of regulations and relevant environmental concerns covered by them, we assume that these regulations, if respected, should be sufficient to prevent the Baltic Sea from harmful activities and installations.

Selected Examples of Existing Installations Affecting the Baltic Sea versus Environmental Impact Assessments

Environmental Impact Assessments (EIAs), required under the HELCOM and Espoo Conventions are discussed here with regard to selected examples: communication bridge "Öresund Link" (website: osb.oeresundsbron.dk) – the longest bridge in the Baltic Sea, Polish "SwePol Link" (website: www.swepollink.se) – the longest submarine high voltage electricity transmission line, Polish oil extraction rigs and the Leningrad/Petersburg Flood Barrier.

Öresund Link

During the planning phase, as well as during the construction phase of this link, relevant information was provided to HELCOM, ICES, Baltic Countries and non-governmental organizations (NGOs). There were many international consultations related to the preparation of a comprehensive EIA and a large number of corrections were proposed by experts representing marine sciences. As suggested by ornithologists, the original proposal of the bridge crossing Saltholm Island (which is a bird sanctuary) was rejected and the investors decided to build an artificial island instead, known as the "Peperholm" (Fig. 1). As proposed by the hydrologists, the compensate trenches were dug in the seabed to prevent the obstruction of water exchange between the North Sea and the Baltic

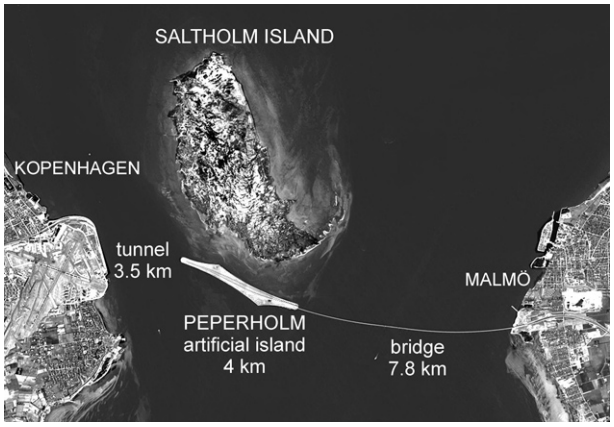

Fig. 1. "Oresund Link" connecting Denmark (Copenhagen) and Sweden (Malmö). Picture based on satellite image (http://maps.google.com).

Sea through the Öresund Straight. All construction works were designed in a manner ensuring the minimal mobilization of sediments (in order to minimize light limitation to the benthic vegetation). During the construction phase environmental monitoring was carried out and the results were published regularly in a special bulletin.

The authors are of the opinion that this construction as well as EIA preparation process were carried out in a model way.

SwePol Link

An underwater cable system (245 km long) for electricity transfer, using direct current (HVDC) of high voltage (600 megawatts), was built between Sweden and Poland in 1999-2000.

This is another positive example of transboundary investment completed according to the regulations on marine environmental protection. As a result of the local community protests at Mielno commune near Koszalin (middle part of Polish Pomerania), the cable location was shifted from a tourist area to a coastal military area (near Ustka). The "landing" of the cable across the coastal dunes and the beach was performed through a steel pipe located ten meters below the dune surface. Due to this mode of construction, the coastal belt was not disturbed.

Complying with the protests of the local communities in Sweden, the use of a one-cable solution (with electrodes) was abandoned, and a two-cable solution (main and return) was adopted. Therefore, the necessity for electrode installation on the seabed disappeared. Additionally, under a proposal by Polish consultants, the route of the cable-system was shifted in order to avoid crossing the environmentally valuable stony-boulder bottom reefs of the Słupsk Bank (Fig. 2). These corrections resulted in an increase of costs of investment by several millions of dollars (however, this expense was still small in relation to the entire cost of the investment). The construction of

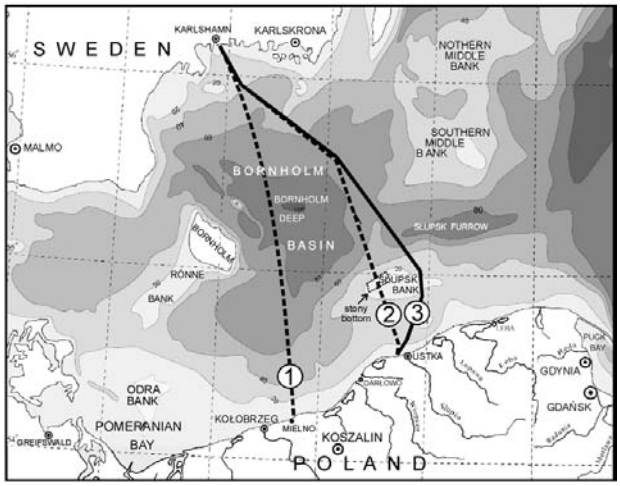

Fig. 2. Changes of *SwePol Link* routs due to protests of local communities and nature conservation issues (line number 3-route indicates accepted route).

the HVDC link is now recognized as an environmentally friendly solution addressing both the needs of industry and environmental security [10].

Both Poland and Sweden were providing the Helsinki Commission (HELCOM) as well as NGOs with the essential information and requested documentation.

Oil and Gas Exploitation Rigs

Oil and gas in the Baltic Sea are extracted in the Polish exclusive economical zone (EEZ) and most recently in the Russian (Kaliningrad) EEZ. In the Polish EEZ the extraction concession has been granted to the "Petrobaltic" company (official website: www.petrobaltic.pl).

After oil extraction started, Poland failed to submit a report on environmental effects of oil extraction to HELCOM. As a result, Greenpeace (which was an observer to HELCOM) organized a seagoing expedition against a Polish oil rig and "captured" it with the intention to stop "suspected" extraction. At the platform, Greenpeace did not find any proof against good environmental practices. However, Poland has paid a rather high fine for its failure. Besides the costs of "recapturing" the platform, several articles appeared in various national and international newspapers having claimed that Poland was "killing" the Baltic Sea.

Leningrad/Petersburg Flood Barrier

The "Leningrad Dam" (in Russian: "*Leningradskaya Damba*") – is the name of the dam that was in use in the 1980s. The current name is the "*Petersburg flood barrier*" or the "*Saint Petersburg Flood Prevention Facility Complex*." Due to degradation of the environment of Neva Bay and the lack of funds, the construction of the flood barrier was stopped in 1988-2003. Currently its development has

resumed. The barrier complex measures 25.4 km (22.2 km over the water area and the remaining part is the road through Kotlin Island (Fig. 3).

This large-scale construction is almost unknown to the wider public (including HELCOM and national experts). It is an interstate Russian construction, therefore it is not a subject to the Espoo Convention. However, due to the large-scale dredging activities it would be liable to fulfill HELCOM Recommendation 19/1. However, over the past few years several scientific articles have been published concerning the negative effects of this construction [11, 12]. It was only in 2002 when the Environmental Impact Assessment for this dam was published [13]. Some issues still need to be addressed, though. It is not clear whether all the effects of construction (e.g. effects of large scale sand reshuffling) have been taken into consideration.

Selected Examples of Planned Installations in the Baltic Sea

Offshore Windmill Farms

A few offshore windmill farms already operate along the Danish and German coasts, some others are under construction. In addition, numerous wind farms are in the planning phase. Despite the fact that windmill farms are not a source of chemical or biological pollution, they remain controversial because they can pose other environmental problems: the possibility of bird collisions, emission of noise and vibration (both to atmosphere and water), possible disruption of fish migration and fish spawning periods, alterations of sea currents and obstruction to marine traffic. In coastal areas, changes of natural landscape to "industrial landscape" may be a serious concern for local communities.

In the Polish Exclusive Economical Zone, several windmill farms have been planned (Fig. 4). However, no final decisions about the installation have yet passed.

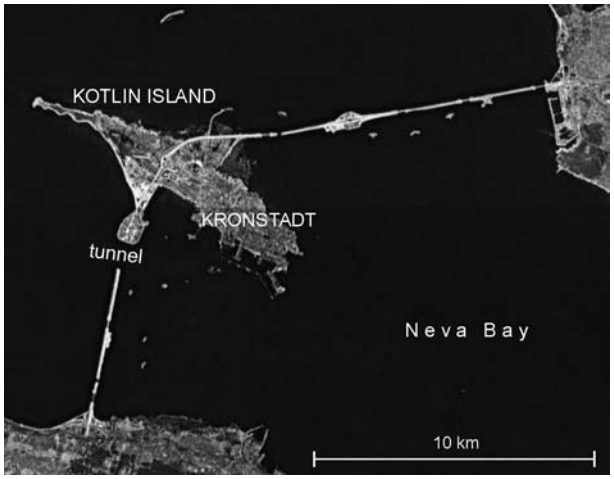

Fig. 3. Satellite image of the St. Petersburg flood barrier (based on the www portal http://maps.google.com).

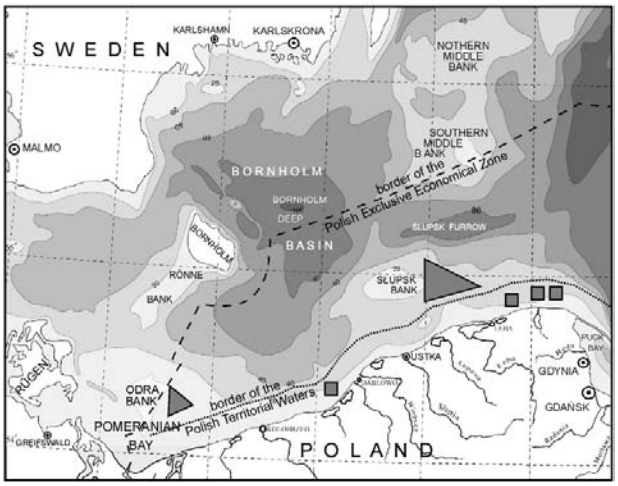

Fig. 4. Planned windmill farms in the Polish Exclusive Economical Zone [14].

Upon accoplishment of the above investments, some important changes in goods and services as well as in management of the Polish EEZ will occur.

Until now, windmill farms have been in use for a relatively short period of time, so there is not sufficient empirical evidence on the impacts of wind energy farms on the marine environment. Hence, the environmental impact assessment for the Baltic Sea windmill farms is based on theoretical considerations only.

Large Pipelines

The pipeline network on the seabed of the North Sea and the Norwegian Sea is dense and has been operating for several decades. A variety of companies exploit/own them. The technical supervision in these seas is well managed and very advanced, as opposed to the Baltic Sea, where there is no experience.

As mentioned in the introduction, two large pipelines are planned in the Baltic Sea, namely:

- The "Baltic Pipe" to connect the Polish and Western Europe pipeline network (Fig. 5),
- The "Nord Stream pipeline" to connect Russian gas extraction areas with the German gas system (Fig. 6a and 6b).

The "Baltic Pipe" is scheduled to connect the Polish and Danish shorelines, a distance of ca. 230 km. A steel pipe with external diameter of 672 mm is planned to be the core of the construction. To compensate buoyancy forces, the concrete cover is going to be layered on the pipe, so a real size will be greater [15]. Currently, the construction schedule, as well as detailed route and technical solutions are unknown. Yet, the environmental and technical conditions for minimization of environmental loses have been published [15, 16].

The best known and most publicized new pipeline project is the controversial Nord Stream gas transmission line

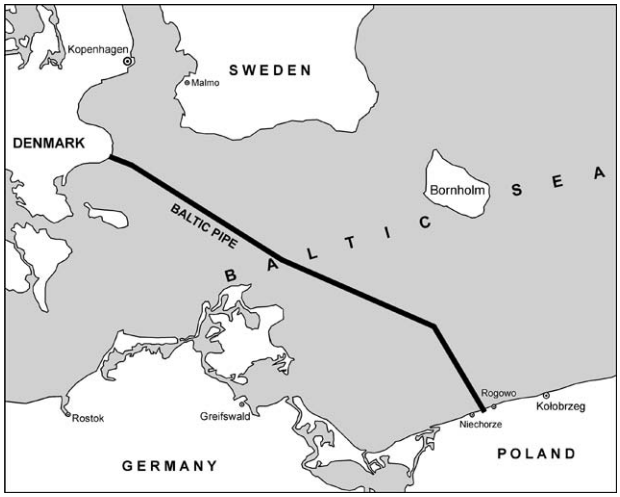

Fig. 5. The planned route of the Baltic Pipe [15, 16].

(already under construction on land), linking Russia and Germany. In fact, it is going to consist of two large diameter (1220 mm) gas pipelines joined together and extremely long (1200 km). The Nord Stream pipeline will have a very high (yearly) transmission capacity – up to 55 billion cubic meters (while the Baltic Pipe yearly capacity is estimated at only 8 billion cubic meters). The pipeline is designed to enter the sea in the Gulf of Finland and then to go along the Baltic Sea from Russian EEZ through Finnish, Swedish, Danish to German EEZs (Fig. 6a and Fig, 6b).

There are many questions in regard to the environmental security of this construction. The most obvious questions are related to:

- effects of construction on bottom organisms and habitats,
- possible impact on the Baltic Sea sensitive habitats, including Natura 2000 areas (Fig. 6a),
- possible contact with chemical weapons dumped in the Baltic Sea (also located along the pipeline route – Fig. 6b),
- release of hazardous substances deposited in sediments,
- effects of possible pipeline breakage.

It is worth mentioning that this is the first large-diameter pipeline construction in the Baltic Sea. The Baltic countries do not have such an experience as the North Sea and/or Gulf of Mexico countries which already have a dense pipeline system and monitoring network [17]. The significant length of the Nord Stream gas pipe poses a number of technical and safety problems.

Discussion

There are a series reasons to believe that density of large technical installations in the Baltic Sea may dangerously grow in the near future so that new environmental concerns will appear.

Some large-scale technical installations in the Baltic Sea (e.g. "Öresund Bridge", "Baltic Cable" and "Swe-Pol Link") have already been operating for several years, and they have not shown negative environmental effects. We assume that this result was achieved thanks to the well prepared and transparent process of EIA. During EIA preparation process for these installations, several positive changes prior to original plans were incorporated.

In case of windmill farms, numerous installations in diferent national EEZ are planned. Until now, the whole planning process of windmill farms has not been sufficiently transparent. Also, large windmill farms, even if installed in the national Exclusive Economical Zones, should be notified to both HELCOM and Espoo Conventions.

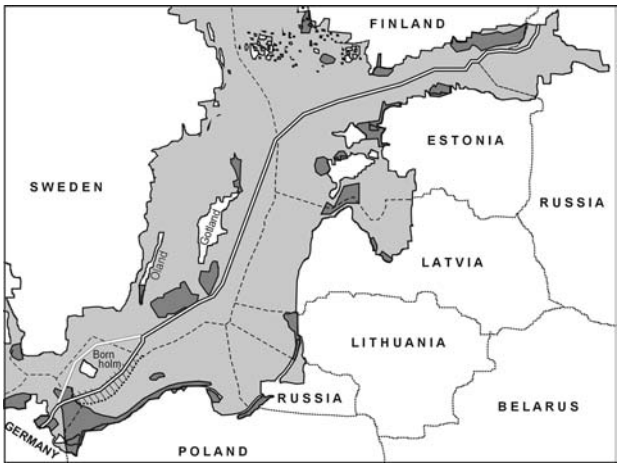

Fig. 6a. The route of the Nord Stream pipeline vs. Natura 2000 largest areas. Dotted lines indicate borders of Exclusive Economical Zones of the Baltic states. White line north of Bornholm indicates updated (at the end of 2007) route of the Nord Stream pipeline which is going to avoid the Polish-Danish controversial zone (stripy area).

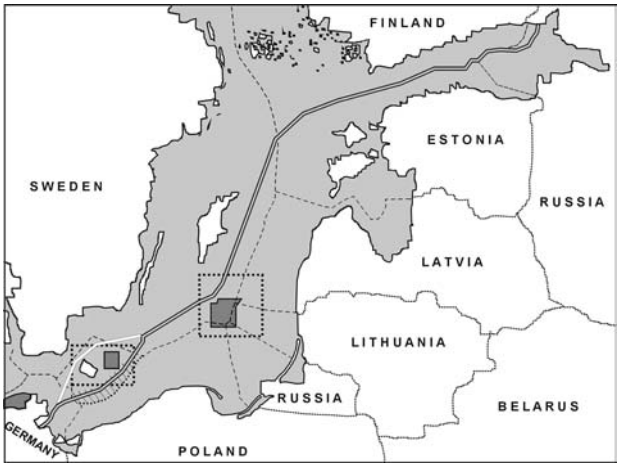

Fig. 6b. The route of the Nord Stream pipeline with warfare gas dumping sites (grey areas) and areas of high risk of gas ammunition occurrence (dotted lines).

In the case of the Nord Stream pipeline, besides environmental concerns economical, political and military issues should also be discussed. The Nord Stream pipeline is needed for energy supply safety and lowering energy costs in Western Europe. However, it is obvious that the choice of much more expensive transfer routes via the Baltic Sea (5 billion EUR) (www.nord-stream.com) instead of a cheaper solution via land (1.5 billion EUR) [18] was decided for political reasons. In fact, the Nord Stream project is already causing political tensions [19]. There is an open ongoing process of EIA preparation for the Nord Stream pipeline (www.nord-stream.com). This EIA is only related to the Espoo Convention and it is not sufficiently clear if Helsinki Convention and HELCOM recommendations will be fulfilled as well. Information provided by the Nord Stream in December 2006 to HELCOM Heads of Delegations (HODs) 20, 21] reached HELCOM national (political) delegates. Until now, EIA on the planned Nord Stream construction has not reached HELCOM HABITAT and/or HELCOM MONAS. The nongovernmental organization *World Wide Fund for Nature* (WWF) have requested information about EIA (at HELCOM HABITAT in 2005 [22], 2006 [23]) and 2007 [24]). We believe that this EIA, altogether with EIAs for other planned new large scale installations within the Baltic Sea area should be reported to the HELCOM as well.

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 our opinion, in some cases there is lack of relevant studies on the effects of the existing and planned installations. These studies should be undertaken before construction, during construction and during the exploitation/operation period. Even some years after construction, regular and specific monitoring is usually necessary. At present, due to the lack of research, it is difficult to estimate the effects on the entire Baltic ecosystem (e.g effects of habitat alterations and on biodiversity) of the existing constructions.

Until now the EIAs are carried out for individual investments. However, we would like to stress that the growing number of technical installations in the Baltic Sea, and particularly facing the considerable number of construction plans, leads us to the conclusion that it will be necessary to assess the combined effects of these installations.

A financial evaluation of particular marine areas does not exist in the Baltic Sea so far. Marine areas (similarly to terrestrial areas) should not be absolutely free of costs for setting new constructions, particularly when large areas (e.g. in case for windmill farms) will be excluded from previous traditional activities.

Being aware that in the future some of the present large installations will turn into bulky "rubble" (particularly in the case of windmill parks), it is legitimate to ask who is going to remove these constructions from the sea after their service terminates?

Conclusions

There is no serious environmental reason to stop installation of new technical constructions in the Baltic Sea. However, such technical activity should be done according to international agreements, under adequate environmental practices and with the involvement of scientists and ensuring public awareness.

We assume that there already are adequate international agreements for the protection of the marine environment against possible negative environmental effects of technical installations. There are relevant global conventions: MARPOL 1974/78, UNCLOS 1982, Espoo 1991; regional conventions: HELCOM 1974/92 as well as a number of specific EU Directives, such as Habitat, Bird and EIA Directives.

Complying with the above environmental requirements is usually combined with extra costs and extra time. Not surprisingly, due to hard environmental requirements investors may try to "simplify" existing legal and environmental obligations. Therefore, the Baltic scientists, NGOs and the public have a responsibility to verify whether the existing legal obligations are respected and fulfilled (a quick and non-transparent process may lead to environmentally harmful solutions).

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