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Accidental Versus Operational Oil Spills from Shipping in the Baltic Sea: Risk Governance and Management Strategies

Björn Hassler

Abstract Marine governance of oil transportation is complex. Due to difficulties in effectively monitoring procedures on vessels en voyage, incentives to save costs by not following established regulations on issues such as cleaning of tanks, crew size, and safe navigation may be substantial. The issue of problem structure is placed in focus, that is, to what degree the specific characteristics and complexity of intentional versus accidental oil spill risks affect institutional responses. It is shown that whereas the risk of accidental oil spills primarily has been met by technical requirements on the vessels in combination with Port State control, attempts have been made to curb intentional pollution by for example increased surveillance and smart governance mechanisms such as the No-Special-Fee system. It is suggested that environmental safety could be improved by increased use of smart governance mechanisms tightly adapted to key actors' incentives to alter behavior in preferable directions.

Keywords Baltic Sea · Environmental hazard · Marine governance · Oil spill · Oil transportation · Risk

INTRODUCTION

The volume of oil being transported on the Baltic Sea has more than doubled during the last 10 years and today amounts to approximately 170 million tonnes a year (HELCOM 2009). The present trend is that the vessels are becoming larger (up to 100,000–150,000 tonnes), which means that if a major accident takes place the amount of oil released could be vast. It has been estimated that the total volume of oil being transported in this region will increase by 40% until 2015 (HELCOM 2009). Oil spills pose considerable threats to the ecological integrity of the Baltic Sea (National Research Council 2002). The steeply increasing export from Russian ports in the St. Petersburg region is an important reason behind the continued relevance of this environmental hazard, despite the improved safety of modern tankers. Apart from accidental oil spills, considerable volumes of oil enter the sea when operators choose to clean tanker tanks or flush machine rooms during voyage without taking proper care of the oily wastes created. This form of intentional pollution is not allowed according to international conventions, but is quite frequent nevertheless. The major reason behind intentional oil pollution is for operators to save time and money.

Governance of marine transportations is a highly complex area where the principle of the freedom of the high seas in combination with the inherent difficulties in monitoring operators' behavior may create strong incentives for free riding and emergence of substantial implementation gaps. A comparative approach is adopted in this article, contrasting accidental with intentional oil spills. Whereas large-scale spills often cause dramatic local ecological and economic effects, long-term consequences from operational oil pollution are more difficult to assess, but could very well be more harmful in the long run. In aggregate, the two sources have been of approximately the same magnitude during the last decades.

The issue of how "problem structure"—the specific peculiarities of the environmental hazard at hand—may influence risk governance is placed in focus in this study. It is shown that institutional responses vary depending on if they have evolved because of accidental or operational oil spill hazards. Furthermore, it is argued that there are quite rational reasons why these differences have emerged. It is suggested that we could learn how to improve environmental safety by trying to understand how the structure of specific problem

areas interact with actors' interests and results in more or less effective and efficient governance outcomes.

THEORY: REGIME ANALYSIS AND PROBLEM STRUCTURE

Most of the theoretical interest when it comes to (a) increase our understanding of existing international collaboration on environmental matters and (b) improve effectiveness in management has been focused on regime analysis (Young 1999; Helm and Sprinz 2000; Miles et al. 2001; Hovi et al. 2003; Underdal and Young 2004; Mitchell 2006). The underlying driving mechanism in the regime approach is the presumed existence of a game with mixed interests such as an iterated Prisoners' dilemma (Keohane 1984), that is, the actors are aware that they could all benefit from cooperation. However, notwithstanding the potential benefits from cooperation there is always a temptation to free-ride in mixed motives games, that is, to benefit from others' cooperation while not contributing oneself. Within this framework successful collaboration between independent states on environmental issues could be illuminated, as well as instances where collaboration brake-down and free-riding effectively stops rational risk reduction schemes.

Quite recently, some of the focus has turned away from studying the effectiveness of individual regimes, conventions, and institutions and has instead been directed towards interaction between different regimes (Stokke 2001; Oberthür and Gehring 2006a, b). International conventions at the same governance level (horizontal interaction) may directly or indirectly influence their respective effectiveness. For example, stricter regulations on crew working conditions on marine vessels may very well improve environmental safety, even though this was not the primary objective. In other cases, the interaction can be negative such as when the establishment of protected marine areas makes routes longer, and thereby increases air emissions from the vessels. But interaction may also be vertical, where conventions at different governance levels affect each other. Clearly, what is decided upon at the global level within the IMO framework affects decisions at lower levels, such as at the European Union level, the regional Baltic Sea level (HELCOM), and the national level within individual countries. For over-all governance to be effective and efficient there has to be a high degree of congruence between regulations and practices at different levels.[1]

Common to most regime analytic approaches is (a) a clear focus on structures (i.e., the construction of the conventions as such), (b) the almost exclusive focus on nation-states as actors, and (c) a relatively restricted interest in the particular features of the problem at hand (problem structure).[2] Without depreciating the importance of structures and nation-states as prime actors, the theoretical focus in the article is directed towards questions related to how the particularities of the problem at hand—problem structure—affect strategies adopted by the actors, and therefore, collaboration on improved environmental safety in regard to accidental and intentional oil pollution, respectively.

It seems reasonable to assume that the different countries around the Baltic Sea have slightly different agendas and make slightly different priorities, given that these actors are assumed—as a simplification—to primarily be driven by utility-maximizing preferences (Hassler 2008). They all share an interest in protecting the marine environment, archipelagoes, and coastlines. However, the strength of this interest can be presumed to vary among countries, the reason being differences in coast lengths, having ecologically sensitive archipelagoes and generally being differently vulnerable to potential oil spills in the major transportation routes from ports in the Gulf of Finland towards the Danish Belt and the North Sea.

In a similar vein, the economic interest could be expected to vary as well, knowing that Russia is one of the world's largest exporters of oil, whereas no other Baltic Sea countries export any oil whatsoever. In other words, assuming that national interests in this area at least partly is a function of factors related to vulnerability to oil spills and economic interests it is reasonable to expect that the way national interest plays out affects countries' motivations to invest in increased environmental safety and to lobby for stricter regulations. As will be shown below, these expectations are to a considerable extent confirmed when observing the positions taken and initiatives undertaken by the different Baltic Sea States.

Problem structure is closely related to the issue of national interests discussed above. In fact, the reason why problem structure is important in understanding marine governance is that the bio-geophysical characteristics of the problem at hand directly affect national interests, and thereby what kind of institutional solutions that emerge. Monitoring of a country's territorial waters, for example, is of direct interest to that particular country as a way of reducing risks of suffering from intentional oil pollution or from accidental spills. Getting stricter technical safety requirements on vessels such as double hulls or separated

[1] Decisions taken at lower levels can certainly also affect regulations at higher levels, such as when Sweden and Finland convinced the other Baltic Sea Countries, except Russia, to approach IMO and ask for a classification of the complete Baltic Sea as a so-called PSSA (Particularly Sensitive Sea Area) (Uggla 2007).

[2] However, there are exceptions to the relative neglect of problem structure, see for example Mitchell (2006) and Underdal (2002).

ballast tanks, on the other hand, is not obtainable for any single country, but needs to be regulated globally within the IMO framework.[3] The probably most important factor determining institutional outcomes in marine governance—as in most other domains of international regulation—is to what extent costs and benefits from improved safety is collective in nature, and if it is not collective but attributable to individual actors, how costs and benefits are distributed (Victor 2006).

As noted above when discussing the regime approach, the fundamental dilemma underlying most areas of international environmental collaboration is that of a mixed motive game. This means that potential mutual gains from collaboration are a first requirement for cooperation to emerge at all, but it is a poor predictor of whether actors actually will choose to engage in collaborative activities. When benefits are collective and costs private (i.e., born by an individual actor), effective governance is hard to achieve. Improved environmental safety from better built vessels is a collective good in the sense that the uncertainty of who will suffer from a major accident is sufficiently large to make all coastal states concerned. This may seem to imply that all coastal states would choose to contribute to the objectives of having safer fleets.

Unfortunately, the collective nature of the benefits from safer ships creates temptations to free-ride by hoping that others will bear the costs for more expensive constructions and retrofitting. International conventions may be signed and ratified, but when benefits are collective and costs private, implementation typically lags far behind (Knudsen and Hassler 2011). The argument could very well be made, that the most important reason behind the modernization of large parts of the oil transportation fleet is due to the role of two private sets of actors; Classification Societies and P&I Clubs (marine insurance companies). The Classification Societies undertake inspections and certify that new vessels comply with existing IMO regulations. They moreover inspect vessels after major retrofitting. The owners of the vessels need to have the certificate from a respected Classification Society to get a not too expensive insurance from the P&I Club.[4] The documentation the operator gets from the Classification Society is moreover important in relation to its customers, to show that the transportation is handled in safe and environmentally appropriate way, as is the compilation and dissemination of data on marine traffic, new regulations and technical innovations undertaken by the societies. The outcome is a comparably effective quasi-public governance of the technical standards of oil tankers.[5]

The theoretical reasoning above on actor incentives and problem structure will now be used to analyze safety initiatives affecting marine governance in the Baltic Sea. It will be shown that both factors have affected what kind of initiatives that have been taken in regard to accidental and intentional oil spills, respectively (Fig. 1). But before that, an empirical account on the respective problem structures of accidental and intentional oil spill hazards is given.

DISTINGUISHING BETWEEN ACCIDENTAL AND INTENTIONAL OIL SPILL PROBLEM STRUCTURES

Despite the similarities between accidental and intentional oil spills, institutional responses have been quite different and have been rather unevenly successful. Accidental risks have first and foremost been met with sharpened requirements on vessel construction and on-board safety installations such as double hulls, separated ballast tanks (SBL) and improved navigation equipment. The regulation in this area has, by most observers, been seen as rather successful in terms of reducing risks for major accidental spills (Mitchell 1994; Hassler 2010; Knudsen and Hassler 2011). At the regional Baltic Sea level several other initiatives both to reduce accident risks and to make remedial action more effective and efficient have been taken.[6] Traffic separation schemes and designation of protected areas have been institutionalized to reduce collision risks and to protect ecologically sensitive areas within the PSSA (Particularly Sensitive Sea Area) initiative. The so-called HELCOM AIS (Automatic Identification System) is a land-born system covering vessels' movements in the complete Baltic Sea in real time that was made operational in July 2005. This system makes it possible not only to monitor vessels' movements, but also to reconstruct events that subsequently led to incidents or accidents. Initiatives at unilateral and national levels have moreover been taken to, for example, collaborate on updating of hydrographical surveys in order to make navigation safer, increase the use of pilotage and to adopt a regional perspective when designating ports of refuge. In terms of remedial action preparation, several initiatives have been taken to pool sub-

[3] However, a big enough country may sometimes be able to adopt unilateral measures, such as when the US began requiring all new vessels frequenting its ports to have double hulls in the 1990s.

[4] Certificates are typically required by the authorities in the Flag State (where the vessel is registered), but as the effectiveness of Flag State monitoring varies considerably, operators may be tempted to strategically choose to register vessels in less ambitious states (e.g., in so called Open registries or Flags of convenience).

[5] However, today there are more than 50 Classification Societies around, and their degree of competence and ambition levels do vary to considerable extents.

[6] It should be noted that some of these initiatives have been undertaken under the auspices of IMO, even though they have regional or sub regional application.

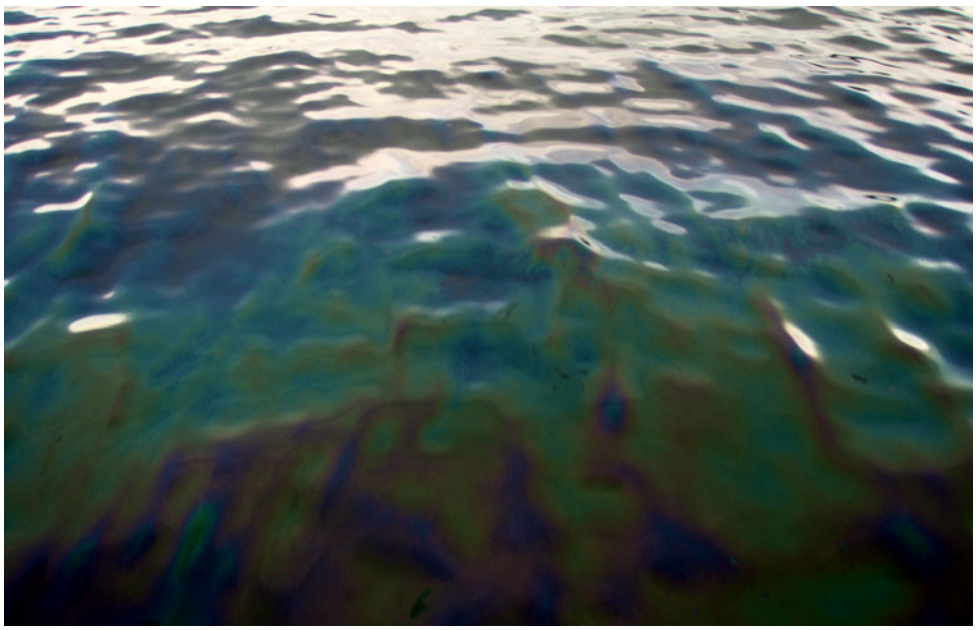

Fig. 1 Oil spills in the Baltic Sea are of two kinds; accidental and intentional. The former can cause havoc to local ecosystems and seriously harm economic interests, whereas the latter may cause long-term damages that are difficult to assess (Photo: Mattias Rust/Azote)

regional capability to respond to larger oil spills, to collaborate on Coast Guard training in case of an accident and to improve local cleaning-up capability (Hassler 2008). These initiatives have typically been coordinated by HELCOM (the Helsinki Commission).

However, recent studies indicate that despite the over-all improvements in vessel construction and on-board safety installations, significant safety areas of concern remain. The three most important such areas are related to (a) Flag state control (FLC), (b) Port state control (PSC), and (c) Human factor errors (HFE). It will be argued that these three areas moreover are substantially related to each other which means that if the objective is to improve overall marine safety, neither of them can be addressed in isolation.

According to the UNCLOS (United Nation Convention on the Law of the Sea) the Flag state has the prime responsibility to make certain that vessels flying its flag abide by agreed upon international regulations (International Chamber of Shipping 2006), even though this obligation may be delegated to other actors. However, it is quite clear that not all Flag states are equally ambitious and capable when it comes to required control measures. So-called Flags of convenience has been a recurring phenomenon, and it is clear that FSC is not sufficient to ascertain compliance of international marine conventions.

Partly as a response to the institutional weaknesses of FSC, attempts have been made to make Port state control more effective. At first, PSC was intended as a form of backup to FSC, but has lately become one of the most important institutional safety mechanisms. It is the responsibility of the Port state to inspect visiting vessels according to rather precise regulations in relevant IMO (International Maritime Organization) conventions (IMO 2010). PSC is today organized in a system of regional Memoranda of Understandings (MoUs) regimes, of which the Paris MoU covers Europe and the North Atlantic.[7] This regionalization of PSC has been actively supported by IMO (IMO 2003). However, recent research indicates that even though PSC is a key component in improving marine safety, problem areas still exist (Bloor et al. 2004; DeSombre 2006; Knapp and Franses 2007). For example, it has been noted that inspection procedures are far from identical in all regional regimes, and less than a 25% of the visiting vessels are in fact inspected. The effectiveness and efficiency in individual countries and ports within the same regional regime moreover seem to vary considerably.

Turning finally to accidental oil spill risks and Human factor errors, it seems quite clear that this category has become more relevant lately, at least in relative terms. While technological safety standards have improved significantly and institutional mechanisms in many cases have been increasingly adapted to real-world conditions, training of lower level crew, on-board staffing praxis and compliance with, e.g., ILO (International Labour Organization) conventions continue to be problematic. The globalization of maritime trade and the creation of almost a single market for seafarers have been followed by extensive

[7] Memoranda of Understanding or MoUs have been signed covering all of the world's oceans: Europe and the north Atlantic (Paris MoU); Asia and the Pacific (Tokyo MoU); Latin America (Acuerdo de Viña del Mar); Caribbean (Caribbean MoU); West and Central Africa (Abuja MoU); the Black Sea region (Black Sea MoU); the Mediterranean (Mediterranean MoU); the Indian Ocean (Indian Ocean MoU); and the Riyadh MoU.

international regulation, but compliance is varied and multi-faceted (Obando-Rojas et al. 2004). According to the latest (2008) statistics on vessel accidents in the Baltic Sea compiled by HELCOM almost half (47%) were caused by human errors, whereas, for example, technical factors caused 13% of the accidents (HELCOM 2008). Data from HELCOM confirms a similar distribution of accident causes in previous years (Knudsen and Hassler 2011). Despite the uncertainty of this data because of lack of information on many single events and presumed under-reporting, few doubt that HFE is one of the most important—if not the most important—causes to contemporary marine accidents.

Turning now to intentional spills, reduction of these has been rather successful and the number of spills detected from aerial surveillance has decreased during the last 20 years. The majority of the known spills have been rather small in terms of volume. In 2009, approximately 96% of the spills were smaller than 1 m^3, and the total volume of detected spills was about 40 m^3. In 2008, the corresponding figures for 2008 were 87% less than 1 and 64 m^3 in total (HELCOM 2009). According to data from HELCOM the observed spills were on average around 400–500 per year in the 1990s, whereas this number has decreased to around 300 per year during the 2000s. Notably, this reduction has taken place in parallel with intensified number of surveillance flight hours and increased traffic density (HELCOM 2010).

The most common causes behind intentional oil spills are the cleaning of tanks at sea, flushing of machine rooms without taking proper care of spill water and similar actions. Because of the significant costs attached to staying in port, some operators prefer not to use port facilities for taking care of oily residues, despite the fact that such facilities today are operational in most significant ports.

At the global IMO level, several measures have been taken to reduce intentional oil spills. For example, so-called Crude Oil Washing (COW) has been made mandatory for new vessels under the International Convention for the Prevention of Pollution by Ships (MARPOL 73/78). Together with Load on Top procedures where the oily mixtures created by cleaning the tanks with hot water are allowed to separate during voyage back after having delivered the oil so that only the (relatively clean) water could be released into the sea later on, COW has reduced intentional oil spills considerably (Mitchell 1994). Tankers are moreover required to have machine room filters installed, automatically stopping emission of spill water if the oil content becomes too high. At the regional Baltic Sea level the so-called HELCOM No–Special–Fee system has been put into action as a smart governance enforcement component. Under the No-Special-Fee system major ports in the Baltic Sea are (a) required to have facilities to take proper care of oily residuals from tankers and (b) not allowed to charge operators extra fees for using these facilities. This means that the marginal cost to operators for cleaning tanks in port rather than at sea is zero.[8] Therefore, the incentives to intentionally pollute at sea are weakened. Initiatives at sub regional levels have moreover been taken to improve Coast Guard collaboration on enforcement as well as on remedial action in case of observed oil spill (Hassler 2008).

However, two problematic aspects related to intentional oil spills have been (a) the persistent difficulties of convicting polluting vessel operators and (b) the presumed substantial number of undetected spills taking place at times and in regions where surveillance is less effective. The freedom of the High seas has a long tradition and is furthermore formalized in international conventions. Although this general non-intrusive approach towards maritime regulation probably is a precondition for efficient and reliable marine transportations, it does make enforcement of regulations on operational procedures problematic.

A coastal state has few possibilities to take legal action when illegal pollution is suspected, also when foreign vessels pass through its territorial waters. When the vessel sails in this country's Exclusive Economic Zone (EEZ), legal opportunities to amass evidence of possible rule violations that may lead to conviction are even more restricted. First, a suspected oil spill observed by satellite surveillance has to be confirmed by aerial, and often afterwards also with surface inspections.[9] Aerial surveillance plays a key role in monitoring, but as it is undertaken under national responsibility, ambition, and capability vary considerably between the Baltic Sea countries.[10] According to HELCOM statistics (2010), Sweden carried out more than half the reported amount of flight surveillance hours. The three countries Sweden, Germany, and Poland together represented almost 80% of the total flight hours. In similarity with earlier years, Russia did not report any flight hours at all.[11] It should furthermore be noted that only a fraction of the aerial surveillance is done during nighttime.[12] Considering the well-known fact that darkness, bad weather and choosing geographical areas where aerial oil

[8] However, it should be noted that even though the port fee is not affected, the prolonged stay at port certainly is costly to the operator, which has made the No-Special-Fee system less effective than what was hoped for.

[9] The satellite surveillance is carried out via *CleanSeaNet,* administered by EMSA (European Maritime Safety Agency).

[10] Aerial surveillance is to some extent coordinated by HELCOM, but is nevertheless carried out by national authorities.

[11] The last year Russia reported surveillance flight hours to HELCOM was 1992 (HELCOM 2010).

[12] The reported fraction of flight hours in darkness was in 2008 14% and in 2009 15%, and was only carried out at all by six of the nine Baltic Sea countries (HELCOM 2010).

spill surveillance is known to be lax reduces the risk of being spotted, it is a reasonable assumption that operators carefully choose where and when to, e.g., clean tanks at sea. This means that the number of unrecorded spills probably is substantial.

Finally, despite technical improvements such as HELCOM AIS, STW (SeaTrack Web oil drift forecasting system), and satellite monitoring, the identity of the polluter is only established in a miniscule fraction of the detected illegal spills. In 2009, this fraction equaled 4.5% (HELCOM 2009).[13]

ANALYSIS

Marine governance may roughly be divided into four empirical areas:

- Precaution/Vessel design (e.g., double hulls, protected areas and traffic separation)
- Monitoring (e.g., surface, aerial and satellite surveillance, Port state control)
- Enforcement (e.g., Flag state control, No-Special-Fee system and Coast Guard patrols)
- Remedial action (e.g., pooling of equipment in case of large spills and joint exercises to combat oil pollution)

These four categories are not mutually exclusive. For example, precaution/vessel design items may be primarily directed towards reducing accidental risks, while also having some effects in terms of enforcement. However, as the main focus here is not placed on exhaustive assessments of outcomes stemming from different undertakings, but rather on what incentives certain actors have to undertake specific initiatives, this is not problematic. According to the theoretical perspective described above, actors are not assumed to choose strategies that are optimal in terms of improved governance as such, but rather to promote individual interests, which may or may not be in line what would be considered as optimal from a collective standpoint.

From a spatial perspective, marine governance may moreover be divided into three interrelated levels:

- Global (e.g., IMO, ILO)
- Regional (e.g., EU, HELCOM)
- National (including sub national actors such as municipalities and port authorities)

The most important reason to distinguish between spatial governance levels is related to differences in distributions of costs and benefits from improved marine safety in combination with actors' capacity and competence to take effective action. For example, a Coastal state is more likely to undertake investments or to lobby for international regulation that improve local safety if it is highly vulnerable to oil spills, and even more so if it could make others contribute and share the cost burden.

Looking at concrete measures to improve marine environmental safety related to accidental oil spill the prime governance axis is formed between global regulation and national implementation, whereas the regional components are comparably few (Table 1). The latter consist of the HELCOM AIS system, a regionally adapted land-based system allowing real-time monitoring of all large vessels, sub-regional pooling of oil spill combating gear and regional Port state control regimes (MoUs). It could be argued that the HELCOM AIS became operational largely due to a limited number of dedicated countries (Hassler 2010). Therefore, it has distinct backgrounds in national interests, despite being a regional mechanism. Similarly, the pooling of oil spill combating gear is mainly a result of individual countries' perceived vulnerability. The regional MoUs, finally, do not have their primary roots in regional collaboration, but rather in attempts to bring implementation of global IMO conventions closer to specific regions and Port state authorities. Taken together, these three components consequently do not indicate a strong governance structure at the regional level. Table 1 shows that governance of accidental oil spills mainly is global-national in nature and especially targets precaution/vessel design.[14] The regional Helsinki Convention is adapted to IMO regulations. P&I clubs and Classification Societies are important in their capacity to motivate operators to order vessels designed according to high safety standards.

Despite significant efforts to improve Flag state performance, governance is here not effective. Therefore, focus has shifted towards making Port State controls more stringent.

The national level is the key arena in enforcement and remedial action. Port State Control serves as a vital component in enforcing global conventions. If vessels or crews do not follow regulations, port authorities may detain the vessel. Comparing with operational oil spills, the situation is somewhat different (Table 2).

As for accidental oil spill prevention, important governance components connected with intentional oil spill hazards are found at the global level. However, rather than giving primary attention to vessel design in combination with measures targeting operational activities (e.g., traffic separation and designation of protected areas), focus is here

[13] Together with HELCOM STW, the HELCOM AIS can be used to track observed oil spills and give indications on the possible identity of the polluter.

[14] The data presented in Tables 1 and 2 are described in more detail, including original sources, in Hassler (2010).

Table 1 Marine safety measures undertaken with reference to risks for accidental oil pollution

Precaution/Vessel design	Monitoring	Enforcement	Remedial action
Global			
Navigation equip.	–	P&I Clubs	–
Double hulls		Classification societies	
Traffic separation[a]			
Protected areas[b]			
Regional			
Automatic Identification System (AIS)	–	–	Pooling of sub regional equip.
Regional MoUs			
National			
Hydrographical surveys	–	Flag state responsibility	Towing equip.
Pilotage			Oil skimmers and boom equip.
Ports of refuge[c]			Coast Guard
Port state control[d]			Municipalities

[a] Through the classification of the Baltic Sea (except for Russian territorial waters) as a PSSA (particularly Sensitive Sea Area)

[b] Classification according to IMO regulations

[c] Global conventions (MARPOL 73/78) and regional (Helsinki Convention) only refers to Ports of refuge in very vague terms (Hassler 2008)

[d] Port state procedures are regulated in among others MARPOL 73/78, but are undertaken by national authorities according with national legislation, in line with ratified conventions

Table 2 Marine safety measures undertaken with reference to intentional oil pollution

Precaution/Vessel design	Monitoring	Enforcement	Remedial action
Global			
SBT (Separated Ballast tanks)	–		–
COW (Crude Oil Washing)			
Regional			
Automatic Identification System (AIS)	Joint aerial surveillance[a]	No-Special-Fee system[b]	Joint Coast Guard training[c]
Regional MoUs			
National			
Port state control	Aerial/Surface monitoring	Flag state responsibility	Municipalities
		Coast Guard	

[a] Regional and sub regional monitoring coordinated by HELCOM

[b] Classified as "Enforcement" because the system, was designed by HELCOM to improve compliance (i.e., no intentional oil spills)

[c] Yearly exercises coordinated by HELCOM

set on the former exclusively. SBT and COW have both been incorporated into the international regulatory corpus in order to reduce the amount of oily waste produced. But since operators may have strong economic incentives to get rid of wastes en voyage, national monitoring and enforcement (e.g., Port state inspections and Coast Guard monitoring) have been perceived as vital by most observers. The major problem is here to make monitoring and enforcement sufficiently effective to actually deter operators from intentionally polluting the sea.

The importance of the national level is somewhat less pronounced when it comes to intentional pollution compared with accidental oil spill governance. The regional components, on the other hand are more frequent when it comes to intentional spills. The traditional way has been to monitor vessels to collect evidence of rule violations. However, bringing intentionally polluters to court has proven difficult. Technical improvements (e.g., HELCOM AIS) and regional/sub-regional collaboration on aerial surveillance have improved monitoring, but inadequate economic incentives, varying national judicial systems and the international principle of the "Free high seas"—have resulted in meager governance improvements when it comes to enforcement. Therefore, *smart governance* components such as the No-Special-Fee system have been invented to realign private and collective interests.

The No-Special-Fee system targets the economic incentives of the operators. As cleaning of tanks is included in the port fees operators pay, marginal costs for appropriate handling of oily sludge are zero. Incentives to flush tanks at sea are thus reduced. However, since they need to spend more time in port, the effective cost is probably still perceived to be non-negligible by most operators.

DISCUSSION

The problem structures of accidental and intentional oil pollution are complex. There are governance components that are of similar character as well as there are distinct dissimilarities. Arguably the two most important fundamental dilemmas concern on one hand the inherent difficulties in regulating marine operational behaviors and on the other incongruence between individual and collective interests (including free riding incentives). Both are intimately linked to problem structure and actor interests. Being a globalized industry, marine transportations have to be regulated at the highest, international level in order to establish equal conditions for all involved actors. However, what is important is not so much the wording of the conventions, as what actually happens at sea, that is, the operation of marine activities. It is the choices made by operators at sea that are most important in relation to marine safety, but this is also the most difficult part to effectively govern. This means that when operational activities cannot be adequately controlled, ways have to be found to induce actors to abide by existing regulations and recommendations, that is, to voluntarily reduce the gap between what is individually rational and what is collectively most favorable.

It is clear that monitoring is not effective when the goal is to stop intentional pollution. The Baltic Sea example shows that regional attempts have been made to coordinate monitoring, differences in national interests and capability results in varying surveillance intensity, which in turn invites actors to strategically choose if, when or where to pollute. Effective means to replace non-functioning monitoring schemes and Flag state responsibility with stricter rules on vessel construction and more effective Port state control have not been as successful in relation to intentional spills as when it comes to accidental hazards. However, the reduction of intentional spills the HELCOM data nevertheless seems to indicate probably is more due to the modernization and upgrading of the tanker fleet than to joint surveillance and monitoring. As long as actual surveillance of territorial waters and EEZs is determined by the priorities made by national governments and these governments have varying incentives to take action, differences in monitoring and enforcement will prevail.

Interesting changes are taking place in Baltic Sea marine governance patterns, though, of which two are of particular relevance. First, there seems to be an increasing interest in trying to find ways to alter operators' incentives. The most apparent example of this movement is the No-Special-Fee System, where operators are not charged extra for leaving oily wastes in port. This example of smart governance is promising, but there are clear indications of weaknesses of implementation (port authorities that continue to charge extra for taking care of vessel sludge or not making sure that adequate waste facilities are offered on the one hand, and vessel operators on the other that continue to cut corners and clean tanks at sea to save valuable time). Stricter monitoring will most likely not substantially improve the effectiveness of this system, because of the arguments given above. Instead, a more promising way ahead could be to look even closer at individual actors' incentive patterns and try to find institutional and politically viable mechanisms to induce better compliance. For example, if it is recognized that some countries have stronger interests than others in the reduction of intentional spills because of factors such as having longer coastlines, more valuable and sensitive archipelagoes, particularly environmentally concerned electorates or simply have more resources, side-payment schemes could be useful instruments. More concretely, this could mean that those countries choose to assist less concerned countries in collaborative projects, financially or with know-how, not so much as a kind of foreign aid as a way to realize mutual benefits. To the extent that these side-payment schemes are difficult to get acceptance for politically, the setting up of a regional fund—possibly within the HELCOM framework—might be considered where varying contribution levels could be made to reflect differences in vulnerability and concern.[15]

Second and partly related to the argument on side-payments above, the relatively large number of initiatives to reduce accidental risks and to improve remedial action shown in Table 1 should be noted. In contrast to improvements in vessel construction and on-board installations that are collective goods in the sense that it is very difficult to know beforehand who will benefit from them as long as accidents cannot be predicted, all the items at the national governance level in Table 1 have the potential to bring tangible benefits to nearby countries. Investing in areas such as improved pilotage, designation of strategically located ports of refuge, updates of hydrographical surveys, towing equipment and local clean-up capability all benefit the investing country the most, albeit probably being beneficial also to neighboring countries. Sometimes there seems to be a tendency to perceive the problem structure of marine transportations to be more homogenous

[15] This line of thought is explored further in Hassler (2006).

than it actually is, and to more or less take it for granted that a genuine collective action problematique permeates all governance aspects. Whenever investments bring private benefits to the investor of sufficient sizes that exceed investment costs, rational actors can be assumed to take action. Giving too much un-reflected credence to the collective nature of marine safety may result in underinvestment in areas where it in fact would be rational for individual—or small groups of—countries to invest for improved safety.

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REFERENCES

Bloor, M., R. Datta, Y. Gilinskiy, and T. Horlick-Jones. 2004. Unicorn among the Cedars: On the possibility of effective "smart regulation" of the globalized shipping industry. *Social & Legal Studies* 15(4): 534–551.

DeSombre, E.R. 2006. *Flagging Standards: Globalization and Environmental, Safety and Labor Regulations at Sea*. Cambridge, MA: MIT Press.

Hassler, B. 2006. Miljösamarbete i Östersjöregionen. In *FORMAS fokuserar*—Östersjön, ed. Birgitta Johansson. Stockholm: Formas.

Hassler, B. 2008. Individual incentives, collective action, and institutional cooperation—Sweden and the case of Baltic Sea oil transports. *Journal of Environmental Policy and Planning* 10(4): 339–358.

Hassler, B. 2010. Global regimes, regional adaptation; environmental safety in Baltic Sea oil transportation. *Maritime Policy and Management* 37(5): 489–505.

HELCOM. 2008. *Report on shipping accidents in the Baltic Sea area for the year 2008*. Helsinki: The Helsinki Commission.

HELCOM. 2009. *Annual 2008 HELCOM report on illegal discharges observed during aerial surveillance*. Helsinki: The Helsinki Commission.

HELCOM. 2010. *Annual 2009 HELCOM report on illegal discharges observed during aerial surveillance*. Helsinki: the Helsinki Commission.

Helm, K., and D.F. Sprinz. 2000. Measuring the effectiveness of international environmental regimes. *Journal of Conflict Resolution* 44(5): 630–652.

Hovi, J., D.F. Sprinz, and A. Underdal. 2003. The Oslo-Potsdam solution to measuring regime effectiveness: Critique, response, and the road ahead. *Global Environment Politics* (August):3.

IMO. 2003. *Port State Control—An Update of IMO's Work in 2003*. London: International Maritime Organization.

IMO. 2010. *Port State Control.* London: International Maritime Organization. http://www.imo.org/Facilitation/mainframe.asp?topic_id=159. Accessed 2010-07-01.

International Chamber of Shipping. 2006. *Shipping Industry Guidelines on Flag State Performance*, 2nd ed. London: Maritime International Secretariat Services Limited.

Keohane, R.O. 1984. *After Hegemony—Cooperation and Discord in the World Political Economy*. Princeton, New Jersey: Princeton University Press.

Knapp, S., and P.H. Franses. 2007. A global view on port state control—Econometric analysis of the differences across port state control regimes. *Maritime Policy and Management* 34(5): 453–483.

Knudsen, O.F., and B. Hassler. 2011. IMO legislation and its implementation: Accident risk, vessel deficiencies and national administrative. *Marine Policy* 35: 201–207.

Miles, E.L., A. Underdal, S. Andresen, J. Wettestad, J.B. Skjærseth, and E.M. Carlin. 2001. *Explaining Regime Effectiveness: Confronting Theory with Evidence*. Cambridge, MA: MIT Press.

Mitchell, R.B. 1994. *Intentional Oil Pollution at Sea: Environmental Policy and Treaty Compliance*. Cambridge, MA: MIT Press.

Mitchell, R.B. 2006. Problem Structure, Institutional Design, and the Relative Effectiveness of International Environmental Agreements. *Global Environmental Politics* 6(3): 72–89.

National Research Council. 2002. *Oil in the Sea III: Inputs, Fates and Effects*. Washington: The National Academic Press.

Obando-Rojas, B., I. Welsh, M. Bloor, A.D. Lane, V. Badigannavar, and M. Maguire. 2004. The political economy of fraud in a globalised industry: The case of seafarers' certifications. *Sociological Review* 52: 295–313.

Oberthür, S., and T. Gehring (eds.). 2006a. *Institutional Interaction in Global Environmental Governance: Synergy and Conflict Among International and EU Policies*. Cambridge, MA: MIT Press.

Oberthür, S., and T. Gehring (eds.). 2006b. Conceptual Foundations of Institutional Interaction. In *Institutional Interaction in Global Environmental Governance: Synergy and Conflict among International and EU Policies*, ed. S. Oberthür, and G. Thomas, 19–51. Cambridge, MA: MIT Press.

Stokke, O.S. 2001. *The Interplay of International Regimes: Putting Effectiveness Theory to Work*. FNI Report 14/2001. Lysaker: Fridtjof Nansen Institute.

Uggla, Y. 2007. Environmental protection and the freedom of the high seas: The Baltic Sea as a PSSA from a Swedish perspective. *Marine Policy* 31: 251–257.

Underdal, A. 2002. One Question, Two Answers. In *Environmental Regime Effectiveness: Confronting Theory with Evidence*, ed. E. L. Miles, S. Andrésen, J. Wettestad, J. B. Skjærseth, and E. M. Carlin, 3–45. Cambridge, MA: MIT Press.

Underdal, A., and O.R. Young (eds.). 2004. *Regime Consequences: Methodological Challenges and Research Strategies*. Dordrecht: Kluwer.

Victor, D.G. 2006. Toward effective international cooperation on climate change: Numbers, interests and institutions. *Global Environmental Politics* 6(3): 90–103.

Young, O.R. (ed.). 1999. *The Effectiveness of International Environmental Regimes: Causal Connections and Behavioral Mechanisms*. Cambridge, MA: The MIT Press.

AUTHOR BIOGRAPHY

Björn Hassler (✉) is an Associate Professor in Environmental Science at Södertörn University in Stockholm, Sweden. His research interests include environmental policy, especially regional collaboration on environmental safety in the Baltic Sea region.

Address: Department of Life Sciences, Södertörn University, 141 89, Huddinge, Sweden.

e-mail: bjorn.hassler@sh.se