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The REMEDE Project: A useful framework for assessing non-market damages from oil spills?

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ABSTRACT

As vessel traffic in the Baltic increases, in particular oil transports from Russia to the international market, so too does the risk of oil spills which above the environmental impacts impose costs on society including direct costs, market costs and non-market costs (e.g., losses in welfare from a damaged environment not easily valued in a market). While financial compensation addresses direct and market costs, environmental compensation (compensatory restoration) offsets welfare declines from the loss of resources or the services they provide. Although a clear international system for recovering environmental restoration costs from oil spills is still un-established, the EU's Environmental Liability Directive (ELD) from 2007 introduces a number of useful terms and concepts that may be applicable in the Baltic context. The European Commission (EC) funded development of the REMEDE Toolkit to help Member States carry out the ELD requirements. The Toolkit provides a useful framework for assessing non-market costs associated with oil spill damages by defining the types of ecological losses suffered by the public and providing interdisciplinary methods for scaling resource-based compensation projects whose cost should be incurred by the responsible polluter(s). This paper suggests that the ELD concepts and REMEDE methods could be transferred to the Baltic to help authorities recover environmental restoration costs from responsible polluters. We illustrate application of REMEDE-like concepts and methods to oil spill damages in the context of US regulations and the UN Compensation Commission and discuss the legal acceptance of these methods. The fact that the ELD cannot legally be invoked to address an oil spill in Europe should not preclude a discussion about how these relatively new European legal concepts, including the REMEDE methodology, could be used to establish a more consistent, transparent, and replicable framework for damage assessment in the sensitive marine environment of the Baltic Sea.

JEL codes: Q38, Q51, Q53, Q57

Keywords: Equivalency Analysis, Baltic Sea, environmental valuation, Environmental Liability Directive, environmental compensation

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1. INTRODUCTION

Vessel traffic in the Baltic Sea has increased dramatically in recent years and an analysis by the Baltic Marine Environment Protection Committee shows that an increase in shipping traffic is correlated with an increase in accidents, some of which involve oil spills (HELCOM 2009). The volume of oil transported through the Baltic has doubled in the last 10 years due in large part to the new Russian ports of Primorsk, Vysotsk, and Ust-Luga, which are expected to contribute significantly to growth in the coming years. Increasing vessel size means a major accident could involve significant amounts of oil (Hassler 2011). The vast majority of oil is transported from east to west through the Gulf of Finland, the Baltic Proper and the Danish Straits. Countries threatened by oil spills from an accident are Russia, Finland, Estonia, Latvia, Lithuania, Sweden, Poland, Germany, and Denmark.

Oil spills impose large costs on society. For example, *direct costs* from accidents may include the market value of oil spilled, damage to the oil tanker, clean up expenditures, repairs to infrastructure, etc. These expenditures support activities that are unproductive for the economy -- compared to investments in education or health care or expanding a port -- and therefore represent high opportunity costs to society.

Second, there are *market costs* imposed on consumers and producers who are dependent on natural resources as inputs to production (e.g., commercial fisheries, tourism). Producers suffer profit losses while consumers suffer welfare losses from increased prices or reduced quality or access[1] to goods and services.

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[1] Market costs arising from an oil spill also depend on the availability of substitutes, i.e., if a tourist company can offer similar services in a nearby area unaffected by an oil spill then the losses from the spill are less than a scenario without available substitutes..

Finally, damage results in social welfare losses that are not valued in the market, i.e., *non-market costs*. These losses accrue when the public loses access to non-priced ecological resources (e.g., species) or the services provided by those resources (e.g., habitat for wildlife, recreational opportunities, scenic vistas, etc). The lack of a market does not, however, indicate a lack of value. Under the assumption that the public has a positive willingness-to-pay (WTP) for these types of resources and services, damages impose a social cost (see e.g. World Bank, 2005). While financial compensation addresses *direct* and *market costs*, resource-based environmental compensation (restoration) offsets welfare declines from the loss of resources or the services they provide. This paper identifies relevant categories of *non-market costs* and suggests concepts and methods to value these losses for the purpose of scaling environmental compensation.

Transport at sea plays an important economic role because it is a cost-effective mechanism for moving materials from points of extraction/production to points of consumption. However, from a societal point of view it is helpful to consider the trade-off between these benefits and the costs of possible oil spills. In a well-functioning market these trade-offs are made automatically due to the simultaneous interaction of well-informed consumers and producers. However, the transport market[2] is characterized by a market failure known as an *externality*.

An *externality* can be defined as an (unintended) positive or negative spill-over effect to a third party (e.g. the public) from producing or consuming a good, which is not accounted for in the market.[3] To ensure society's scarce resources are used efficiently, these negative externalities

[2] We define the transport market to include all vessels that transport oil in bulk or transfer other commodities. Although both vessels pose oil spill risks, the potential magnitude of economic damages from the former are considerably higher than for the latter.

[3] Noise from a concert or carbon emissions from steel production provide negative externalities. An individual's garden may provide positive externalities (improved scenery or increased property values).

should be *internalized* into firms' production decisions. The existence of externalities in the transport market justifies policy intervention with the aim of creating proper incentives for preventative measures. These may include operator regulations, fines, and/or requirements that polluters compensate for losses to firms (profits) and the public (welfare loss).

Policies that require compensation encourage firms to internalize external environmental costs. These policies are motivated by the polluter pays principle (PPP) articulated as part of the Rio Declaration (REDED 1992). It was also a driving factor behind the EU's Environmental Liability Directive (ELD 2007), which stated that "*According to the 'polluter-pays' principle, an operator causing environmental damage or creating an imminent threat of such damage should, in principle, bear the cost of the necessary preventive or remedial measures." (ELD, Paragraph 18)*

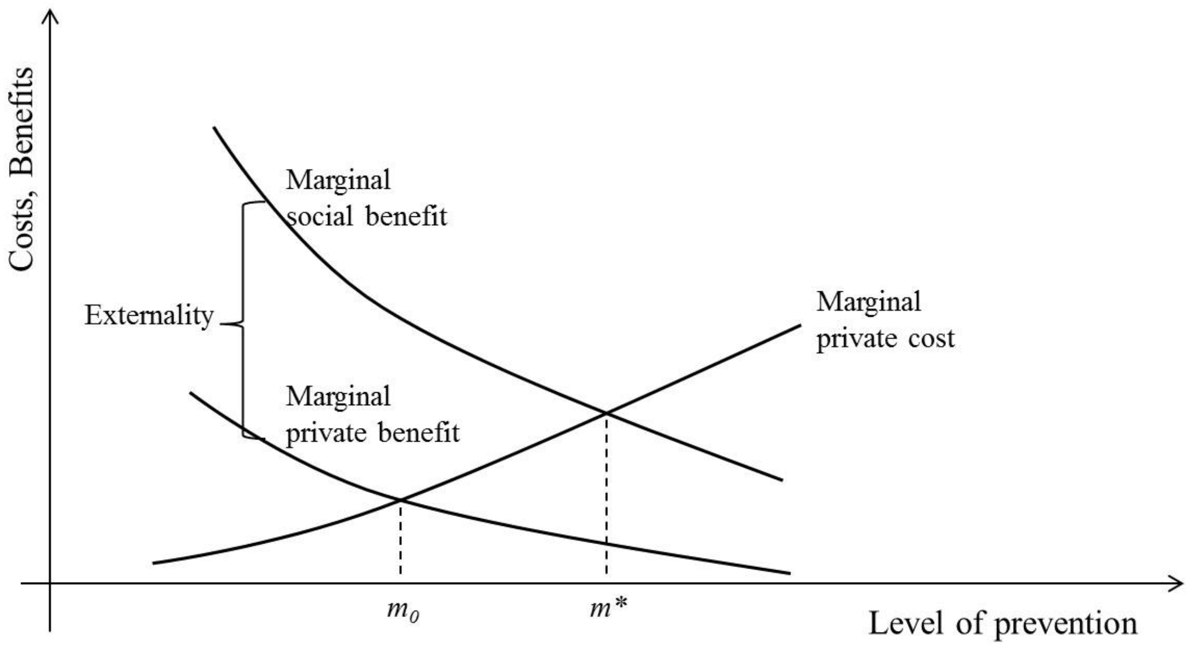
We argue that current management of the Baltic Sea through the HELCOM initiative "Baltic Sea Action Plan" (HELCOM 2007) and by the IMO classification of the Baltic Sea as a Particular Sensitive Sea Area (PSSA) does not adequately implement the PPP. Incentives for operators to take adequate preventative measures are limited due, in part, to the fact that current damage assessment procedures do not require polluters to compensate for all relevant social costs that arise from an oil spill, i.e., *direct, market,* and *non-market* (Sanctuary and Fejes 2006). This article suggests an oil spill damage assessment framework for identifying, measuring and valuing *non-market costs* based on the EC-funded REMEDE project (Lipton et al 2008). The suggested framework is similar to the one used under US Oil Pollution Act and has been used to support the UN Compensation Commission assessment of oil spill damage from the 1991 Gulf War (UNCCGC 2005). Our analysis suggests that despite uncertainty in the legal framework for recovery of environmental restoration costs from polluters in the Baltic (Tegeback et al 2010), the methods and tools are readily available to better address these non-market welfare losses. By failing to incorporate these methods into a credible damage assessment framework in the Baltic -- together with the necessary legal framework -- the public will continue to bear a disproportionate amount of costs from future oil spills in the form of un-repaired environmental damage.

Section 2 argues for economic efficiency based on internalization of environmental costs. Section 3 summarizes the REMEDE methodology that we feel would improve oil spill damage assessment in the Baltic. Section 4 illustrates the REMEDE-style approach using examples under US, UN, and EU regimes, and discusses legal acceptance of this approach. Section 5 concludes and provides policy and research suggestions.

2. COSTS, BENEFITS AND INCENTIVES OF SPILL PREVENTION MEASURES

How does a transport company decide on the optimal level of spill prevention, given that measures are costly but provide economic benefits? (note that benefits come in the form of *avoided costs* of spills, e.g., financial, environmental, health, etc). Figure 1 illustrates this decision from the microeconomic perspective of a transport firm. We assume that, on the margin, *costs of prevention increase as the level of prevention increases*, i.e., low-cost measures are taken first but more costly measures are required to reduce risk even further. However, marginal benefits to the operator *decrease as the level of prevention increases,* i.e., benefits initially accrue rapidly but taper off as additional preventative measures are taken. Thus, the private marginal cost curve slopes up, while the private marginal benefit curve slopes down.

Figure 1. Costs and benefits of spill prevention measures.



We assume that an operator makes a tradeoff between the costs and benefits of preventative measures and chooses the "optimal" level: at m_0 the benefit of increasing preventative measures by one unit is exactly equal to the cost of increasing preventative measures by one unit. Why not proceed to m^*? From the operator's perspective, m* implies that the financial cost of doing so is higher than the marginal benefit he expects (i.e., "*why should I pay for double-hulled ships if it increases my costs, but the expected marginal benefit to me is fairly small*?").

It would be better for society if the operator considers the marginal social benefit curve rather than his own marginal private benefit curve, as shown in Figure 1. That is, society prefers that the operator considers the benefits of *avoiding* all social impacts associated with an oil spill, including not only his loss of profits but others' loss of profits (*market costs*) and the public's loss of environmental resources/services (*non-market costs*).

Because the market itself does not make a socially optimal tradeoff, public policies are needed to internalize the externality shown in Figure 1 and move operators toward *m*,* thus reducing the risk of oil spills. These may include operational requirements for transport vessels[4] or policies that increase the marginal benefits of avoiding spills (i.e., require polluters to internalize these social costs).

We advocate more emphasis on policies that increase the private marginal benefit of spill prevention in the Baltic by ensuring that oil spill damage assessment procedures account for *direct, market,* and *non-market costs*. Hasselström & Söderqvist (2008) review studies on the costs of oil spill accidents in the Baltic and find that only one (Ahtiainen, 2007) considers *non-market costs*. In contrast, two cost models in the US take explicit account of both market and non-market costs arising from oil spills (Etkin 2004; Roach and Plater 2001).

The magnitude of *non-market costs* in proportion to total costs is unknown, although one study in the US suggests significant variation and an upward trend over time (1998 - 2001) of non-market costs, with an average of about $100 million per year (study included even non-oil damages, see Smith 2003).

Carson et al 2003 suggest that empirical evidence may support the theory that compensation requirements reduce future oil spills. They assert that the costly compensation required of Exxon following the 1989 Valdez oil spill may explain the subsequent reduction in the number of very large oil spills in the US compared to other countries during the 1990s. That is, shipping

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[4] Studies have shown that double hulls, separated ballast tanks, and certain navigation equipment can help reduce the risks of ship accidents in the Baltic (Mitchell 1994; Hassler 2010; Knudsen and Hassler 2011).

companies doing business in US waters presumably took new measures to avoid large oil spills, thus internalizing these previously external environmental costs.

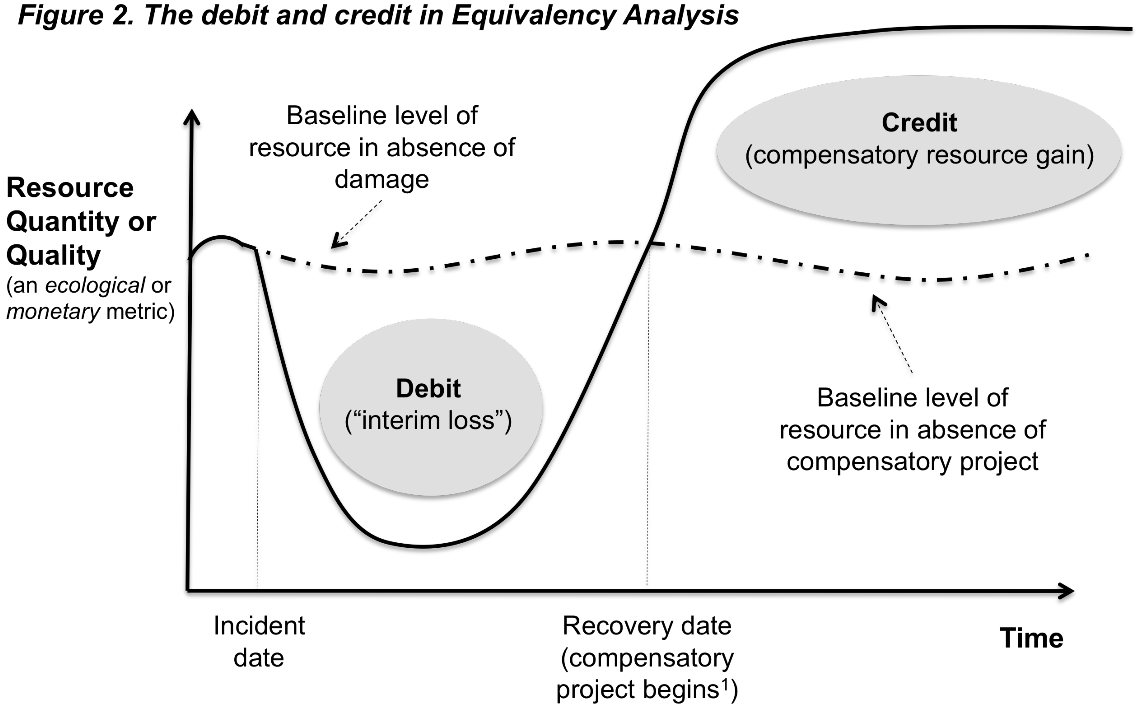
3. THE REMEDE TOOLKIT AND EQUIVALENCY ANALYSIS (EA)

The EU's ELD requires that environmental damage in the EU be restored (remediated) so that the affected environment returns to (or toward) its baseline condition and the public is compensated for the initial damage and the losses during the time it takes for the environment to recover (interim loss). To explain these relatively new legal concepts, the European Commission funded REMEDE, an interdisciplinary project to formalize an approach for assessing environmental damage called *Equivalency Analysis* (EA) in Toolkit (Lipton et al 2008). While EA is used frequently in the US (NOAA 1995), the aim of REMEDE was to adapt the EA approach to the European context. We argue that the REMEDE Toolkit and EA methodology provides a framework for damage assessment that can be replicated across oil spill events in the Baltic to ensure a transparent and consistent approach for assessing non-market costs.

EA determines how much compensation is required to offset welfare losses due to environmental damage by ensuring that the value of the environmental gain (credit) is "*equivalent*" to the value of the environmental loss (debit) over time, where value is a function of the length of time the resource is injured and the metric used (Figure 2). An interim loss (non-market loss) in social welfare accrues because a resource takes time to recover to its baseline level. The interim loss is the non-market portion of the externality shown in Figure 1 as it represents the loss to society due to the temporary loss of a resource that is not valued in a market. EA values the public's loss of access to a resource by scaling a resource-based restoration project as compensation such that the Figures' two shaded areas are equal over time.

The cost of the compensatory restoration project represents the non-market loss to society from environmental damage.

Figure 2. The debit and credit in Equivalency Analysis



[1] In theory, the credit may begin accruing *before*, *during*, or *after* the environmental loss (Figure 2 illustrates the *after* case) and may be on or off-site.

EA assumes that a reduction in the quality of a resource from an oil spill may be compensated through an increase in the quantity or quality of another resource. The credit (Figure 2) represents a quantifiable resource gain beyond a restoration site's current and future baseline condition. Without generating additional gains, losses are not compensated, leading to a "net loss" of social welfare. Examples of compensatory credits might be resource restoration, rehabilitation, enhancement, or re-creation. Alternatively, land conservation represents a credit if it prevents an anticipated environmental loss (e.g., development).

The concept of interim loss is applicable across a range of environmental damages, including short-lived impacts from oil spills to larger (sometimes permanent) impacts from hazardous releases. Even minor damages from oil releases may lead to interim losses if recovery times are protracted (e.g., due to insufficient or ineffective clean up.

The metric on the Y axis of both Figures -- i.e., the 'currency' used to scale restoration -- may be monetary or non-monetary (ecological) (Lipton et al 2008). Non-monetary scaling approaches such as Habitat Equivalency Analysis (HEA) and Resource Equivalency Analysis (REA) are often used to measure welfare impacts that arise from pure environmental loss (e.g., contaminated wetlands, loss of individuals in a population) and ensures equivalence using ecological metrics (e.g., acres of wetland, no. of birds). Monetary scaling (Value Equivalency Analysis) is often used to measure welfare impacts from the loss of services derived from those resources (e.g., beach use, sports fishing, wildlife viewing) and ensures equivalence with the help of on nonmarket valuation.

Nonmarket valuation includes a set of economic methods for assigning a monetary value to environmental loss and/or gain. For example, the Travel Cost (TC) method estimates the value of changes in an environmental resource by examining the costs individuals are willing to incur to travel to recreational sites. The Contingent Valuation (CV) method asks an individual to state the amount of money he/she would be willing to pay to avoid a hypothetical environmental loss and is collected through in-person or mail surveys (see Carson et al 2003). A Choice Experiment (CE) survey asks individuals to choose repeatedly between hypothetical scenarios of environmental loss or gain. These methods allow analysts to estimate the monetary value of environmental damage and subsequent restoration (Champ et al 2003) and play an increasingly important role in environmental policy-making in general (USEPA 2009; TEEB 2010) and damage assessment in particular, as discussed below.

4. USE OF REMEDE-STYLE APPROACHES

EA has been used to estimate *non-market costs* of oil spill damage under US and UN regimes and EU guidance suggests that EA can help assess various types of environmental damage. Below we summarize these examples and discuss the legal acceptance of EA across national and international regimes.

EA under the US Oil Spill Act - Athos Spill

In November 2004, the tanker Athos I suffered a hull puncture and released approximately 265,000 gallons of heavy crude oil into the Delaware River (NOAA 2007). In addition to financial compensation, the US OPA required assessment of non-market costs associated with damage to: (1) acres of shoreline (mudflats, marshes); (2) acres of aquatic habitat for sediment-dwelling biota; (3) wildlife (birds, mammals and reptiles); and (4) human use.

Lost human use included recreational fishing and crabbing, waterfowl hunting, and pleasure boating. The spill imposed losses on recreational users who either (1) stayed home (2) visited a substitute site or (3) visited the affected area but had a diminished experience. Monetary metrics were used to scale compensatory projects to offset these three categories of recreational losses. First, potential user groups were contacted to determine how often they visited the impacted stretch of river following the spill compared to visits in a normal year. Second, nonmarket valuation was used to value welfare impacts associated with the three categories of recreational loss. For example, the TC and CV methods were used to estimate recreational users' WTP to experience a typical fishing, hunting, and boating trip in a similar nearby region and these values were transferred to the damage site (see Rosenberger and Loomis 2001). A lost human use value from the spill was calculated by multiplying affected trips by the per trip values. Finally, these values were used to scale "... projects that enhance recreational opportunities on the Delaware

River, thus compensating lost value with future recreation benefits" (NOAA 2007). In addition to this monetary scaling approach for assessing recreational impacts, a non-monetary scaling approach was used to assess the other non-market costs (shoreline, aquatic habitat, and wildlife) for which compensation was required.

EA in the United Nations Compensation Commission (UNCC)

Following the 1991 Gulf War, Iraq was required to pay compensation for damages to natural resources resulting from intentional oil spills, pollutants from oil well fires, and other war activities (UNCCGC 2005). Six countries submitted claims for, among other things, environmental damages including "measures ... to clean and restore the environment" (ibid). For example, Kuwait claimed costs for compensatory restoration to offset the interim loss of resources due to the release of over 11 million barrels of oil on shoreline habitat, marine life and fishery resources. The UNCC Panel of Commissioners recommended payment of the compensation claim based on the costs of creating and maintaining a nature preserve to offset the loss of habitat services over time. The Panel concluded that the size and time period of protection for the preserve scaled using HEA would provide a reasonable gain in ecological services (credit) that were similar to those that were lost (debit). Kuwait also sought compensation for recreational beach losses which they quantified using a CV survey and suggested that the nature preserve would provide recreation opportunities of equal value. However, the Panel rejected this claim due to technical problems with the CV survey but acknowledged that recreation impacts were a legitimate claim.

The legal discussion between Iraq and the Panel provides interesting insight into the treatment of non-market costs. The Panel rejected arguments by Iraq that the interim loss of resources have no commercial value ("not traded in the market") and therefore are not financially assessable. Further, Iraq argued that international bodies such as the IOPC Fund have expressly rejected the use of "abstract and theoretical methodologies" and that awarding environmental restoration costs to claimants using EA would amount to re-writing international law. The UNCC ruled against Iraq, noting that international law does not prescribe or reject any specific methods for measuring damages and that an interim loss of resources is a valid damage claim as envisioned by the Security Council's Resolution 687. The Panel implicitly accepted the use of the EA method and *"does not consider that the exclusion of compensation for pure environmental damage in some international conventions on civil liability and compensation is a valid basis for asserting that international law, in general, prohibits compensation for such damage in all cases ..." (UNCCGC 2005 §58)*

EA in the European Union.

Although we are unaware of EA applications in the EU involving oil or other types of actual damage, the 2008 REMEDE project provides illustrative EA case studies (Lipton et al 2008). These case studies suggest the EA approach to assess, among other things, marine habitat loss from a chemical spill, bird habitat loss from construction of an oil pipeline, and water quality degradation from an orphaned mine. These case studies represent the types of environmental damages one might expect from an oil spill. Although not specifically tested in any EU court (to our knowledge), the REMEDE project methods were explicitly requested by the EC to develop defensible approaches for assessing non-market environmental damage, with a preference for non-monetary scaling (ELD Annex II 1.2.2). Besides the ELD, these methods and concepts are applied under the EU's Habitats Directive (see "interim loss" in EC 2007).

5. CONCLUSIONS AND SUGGESTIONS FOR POLICY AND RESEARCH

Given the increasing volume of vessel traffic and subsequent risk of oil spills in the Baltic Sea, this paper suggests a transparent and consistent framework for assessing *non-market costs* of oil spills based on the recently completed EC-funded REMEDE project. The EA method from the REMEDE project is frequently used to assess oil spill damages in the US and to support UN compensation claims. The interdisciplinary framework values environmental loss and scales restoration to ensure that the full social costs of oil spills are better incorporated into spill prevention decisions made by transport firms. Policies that better incorporate these *non-market costs* -- together with the *direct* and *market costs* -- into the social marginal benefits of spill prevention will address the market failure associated with the transport industry. Such policies will lead to more efficient use of society's scarce resources. Whether this damage assessment framework can be legally applied to the context of oil spills in the Baltic remains to be seen, but a framework based on the "interim loss" of resources greatly improves the discussion about how to address the mounting risk of oil spills in the sensitive environment of the Baltic Sea.

We suggest a number of policy and research actions:

-That existing policy frameworks, such as the Baltic Sea Action Plan, consider the full social costs of oil spills. We suggest EA as a potential method for assessing *non-market costs*.

-Further research should address whether subjecting polluters to ex post restoration costs, which are based on ex ante estimates using EA, will accurately capture the social externality that arises when oil spills damage a variety of ecosystem services.

-Future research should focus on reducing the uncertainties inherent in using non-monetary metrics to capture welfare losses associated with environmental change, especially given the ELD's preference for this scaling approach.

-The Swedish environmental code allows for compensation for non-market losses (MB kap 5§) but authorities appear reluctant to pursue a case because no precedent exists in the court system today. This perpetuates the status quo. We suggest that Swedish authorities lead by example and leverage this national legislation to recover *direct, market,* and *non-market costs* when assessing future environmental damages. If neighboring Baltic states follow suit, a more socially optimal level of spill prevention measures may prevail in the Baltic.

-Future studies should consider the incentive structure implied by compensation funds (government or insurance), which should strike a balance between ensuring public compensation for damage and creating the right incentives for polluters.

-In 2013 the EC will review the effectiveness of the ELD and suggest revisions. We suggest that the exemption for oil spills (ELD Art 4(2)) be re-considered. Consistent treatment of all types of environmental damage creates better incentives for damage prevention. We support a recent ELD evaluation that concluded: *"the coverage of the marine environment is incomplete. The ELD extends to coastal waters and the territorial sea as regards 'damage to water' (through the Water Framework Directive) and to protected marine species and Natura2000 sites within the jurisdiction of the Member States (extending to the exclusive economic zone and continental shelf where applicable), leaving a gap in the full remediation of damage to the marine environment.... Damage to the marine environment due to oil spills caused by oil drilling activities is therefore not fully addressed by the present ELD provisions". (EC 2010)*

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