

A Maritime Transport and The Environmental Risk

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Abstract-Economic reflections on the environment are relatively recent: The broader issues of management of scarce resources (oil) or renewable (fisheries) are an even more recent concern, but toward which the public is sensitized, as evidenced the rise of environmental concerns.

Although shipping is considered one of the means of transport that causes little harm to the environment, it may have important effects if standards are not observed or are not enforced.

Pollution is part of one of the main problems of the environment. All economic transactions; trade, production or consumption by generating mechanical effects of various types of waste: liquid, solid, gaseous are a veritable source of pollution.

When these operations generate waste, it is not without environmental impacts. We then speak of "pollution" when environmental assets are degraded and damaged. Economic evaluation of environmental assets, the weather calculation of damage in disaster which are natural origin or resulting from human activity of profits, and damage caused by the implementation of development projects ,have now an important place in public decision making.

Keywords –Risk; Tanker; Externality; Oil Pollution; Market Benefits; Environmental Regulation Insurance.

I. INTRODUCTION

The increasing globalization of the economy has been largely authorized by the maritime transport and its rapid evolution, both in the organizational and the technological change; such as transport prices.

While transportation activities are of great economic value, especially the transportation of energy products by sea, they also carry many negative effects on the environment: emissions of greenhouse gas, local air pollution, pollution water, damage to biodiversity due to pollution, habitat destruction, etc... The current situation is unsustainable and new policies are needed. It must in particular encouraging echnological advances especially for oil tankers in particular to improve energy efficiency.

II. ENVIRONMENTAL PERFORMANCES IN THE FIRM

Risk management related to energy industry has become increasingly complicated due to factors as government regulation, public policy, financial concerns, and the scarcity of energy resources. To answer these questions, the firms involved often implement risk management strategies of energy. Risk management of energy involves the process of identification, assessment and prioritization of risks associated with uncertainty in energy markets. The control of energy risk may provide insurance to large markets for firms such as producers of oil and gas, electricity suppliers and gas. It can also give confidence to insurance companies, banks, and producers who work with energy corporations.

The link between environmental performance and economic performance has been widely debated in the literature for the last ten to fifteen years.

One view is that improved environmental performance mainly causes extra costs for the firm and reduces profitability.

On the other hand, a controversy has been sustained that a best environmental performance would lead to cost savings and increase sales and thus improve economic performance. Theoretical and empirical researches have provided arguments for both positions and have not been conclusive so far.

We argue that not only the level of environmental performance, but also the type of environmental management with which a certain level is reached, affects the economic results. The firms should focus more on causal relationships of eco-efficiency, ie the effect of different approaches to environmental management on economic performance.

III. ECOLOGICAL DUMPING

Eco-dumping or environmental dumping is the fact to establish less constraining environmental regulations that apply in other countries in order to favor local businesses against their competitors located abroad.

One consequence of the globalization process is to enhance the interdependence between nations and disrupting the effectiveness of instruments of economic policy. Environmental policy illustrates the challenges of these changes.

In response to the increased mobility of capital on an international scale, enhancing the attractiveness of a country becomes an essential objective for all governments. However, reconciling this objective may come into conflict with the preservation of the environment and the appropriate policies. Firms are becoming increasingly mobile, environmental regulation of a country

is subject to the rule of competition in standards and taxation. In the case of local environmental damages, factor mobility is an additional constraint, but the management of the problem is always local or national authorities, as a classical arbitration, cost-benefit. The theoretical model of reference on the matter is that of Oates and Schwab (1988).

This model shows in particular that the mobility of firms encourages local authorities to conduct an efficient policy outcome of the arbitration between increased income allowed by capital inflows, and the costs caused to the local environment.

On the other side the management of environmental issues is becoming more complex in the case of global or transboundary pollution such as greenhouse gas emissions. In this case, in fact, free-riding behavior can lead to a leveling down of environmental standards, which may cause irreversible damage to the globe. Our regard in this development, that the management problem of pollution, presenting the character of global public good.

In the new global context, it is often criticized for South's environmental laxity, especially since the North would have an incentive to moderate its ambitions face the risk of delocalization of productive activities (Arsène RIEBER ThiAnh-Dao TRAN Rauscher, (1991). In the absence of harmonization negotiated on an international scale, the competition between states would lead to neutralize any ambition to environmental regulation. Eco-dumping in the South, would be responsible for the regulatory paralysis on an international scale.

From the standpoint of the economies of South these environmental constraints are often appreciated as major obstacles to industrialization and economic development.

The South, asks as well the North, on its degree of responsibility and participation in the management of a global public good. The North-South relations, through these conflicting assessments are as well confronted with new challenges of global governance.

This issue of environmental competition has obviously been the subject of several theoretical analyses. As a result of work of Grossman and Krueger (1993), a first set of models focused on the relationship between international trade, economic, and environment.

Originally, the work of Grossman and Krueger place in the context of the discussions which have taken place in the development of the North American Free Trade Agreement (NAFTA) some feared that the agreement is at the origin of the phenomenon of offshoring of U.S. firms to Mexico in response to such differences in environmental standards. Grossman and Krueger attacked this argument by focusing more generally on the fact that the development of regional agreements supports the preservation of the environment. In their view, the authors argue the predominance of what they call the effect of composition.

The argument of the composition effect shows the results of traditional theories of international trade: rich countries have a comparative advantage in the capital-intensive industries, which by definition are also the most polluting industries. In contrast, countries with relatively low incomes will specialize in sectors intensive in labor, by definition less polluting. Income differences reflect differences in environmental standards, rich countries apply stricter legislation, although, regional agreements, and more generally international trade will beat the origin of industrial redeployment, which is favorable to the environment.

Considering the pollution as a factor of additional output, Low and Yeats (1992) developed a radically different tautological argument. For these authors, the South has a comparative advantage in polluting activities precisely because of their legislation more conciliatory in the matter. The development of international trade, emphasizing the consequences of environmental competition, will be consistent with the theory of comparative advantage, responsible for environmental degradation. The model of Copeland and Taylor (1997) went to confront these two conflicting theories in the same theoretical model. The relationship, that international trade maintains with the environment results, then of the interaction between differences in factor endowments (abundance of labor in developing countries and an abundance of capital in developed countries) and income differences between countries, intended to create the incremental environmental standards.

Thus, in a north-south configuration, when the income differential is relatively small, differences in factor endowments determine international trade, so that, in agreement with the theory of Grossman and Krueger (1993), the problems of global pollution, will subside. Conversely, if the difference of income between the North and the South is relatively high, the industrial redeployment induced by international trade will be more sensitive to differences in environmental standards as differences in factor endowments. The result could be an aggravation of transboundary pollution.

The hypothesis of ecological dumping and its effects are not disentangled in the theoretical scope, it was necessary to subject it to empirical tests by questioning the relationship between the stringency of environmental regulations and the location of activities. Generally speaking, these empirical studies also lead to conflicting results. Thus, Copeland and Taylor (2003) and Jayadevappa and Chhatre (2000) in their literature review, fail to achieve a robust finding as to the theory of the attractiveness of the lowest environmental. A major reason explaining the ambiguity of the result is the scarcity of data on the issue of the environment and the difficulty of measuring the environmental constraints with the enterprises.

However, although the debates not really resolved, it appears nonetheless that a majority of studies confirm the idea that polluting industries tend to relocate to low-income countries (Birdsall and Wheeler, 1992, Lucas and al, 1992; Xing and Kolstad, 2002). However, although the debates not really resolved, it appears nonetheless that a majority of studies confirm the idea that polluting industries tend to relocate to low-income countries (Birdsall and Wheeler, 1992, Lucas and al, 1992; Xing and Kolstad, 2002). Levinson (1996) for its part, puts into perspective the importance of the debate by noting that the cost of abatement is only between 1% and 5% of cost in OECD countries. Given the magnitude of the phenomenon, firms remain in their choice of location relatively insensitive to environmental competition.

But this observation is nuanced by Copeland and Taylor (2003) who note that in the future, the importance of environmental regulations could increase. However, the argument of Levinson (1996) has the merit of reminding us that environmental costs are one of the elements that determine the choice of location of firms, other factors such as market size, transportation costs, factor endowments ... involved in the arbitration. Implemented at the macro level, his argument emphasizes that equilibrium distribution of activities resulting from the interaction of multiple contradictory forces. This statement must in its turn be taken into account in the theoretical scope.

IV. LEONTIEF TECHNOLOGY

Wassily Leontief's researches are organized around two main themes: the input-output analysis and international trade.

The input-output analysis is to measure the impact of interactions between sectors. It allows you to respond to a very simple question "What are the consequences for all economic sectors of a decision, which concerns only one a priori?". More specifically, the Leontief model allows for example assessing the impact of increased exports of a product throughout a national economy. The increased production of this product has indeed an impact on employment, industry, environment etc...

In parallel, Wassily Leontief also focused on the study of international trade. In 1953, he seeks in particular to validate the conclusions of the Heckscher-Ohlin-Samuelson

(HOS) by which countries export goods which use essentially the factor of production (capital or labor) which they are endowed with relatively abundant and import goods which, in contrast, require large quantities of the factor which they are relatively few filled.

To the general surprise, the United States, which appear as a relatively rich in capital, export goods which use labor input more abundant than the capital input.

This unexpected conclusion has been called the "Leontief paradox". We explained this paradox by the difference in production functions among countries by the sectorial protectionism (which weighs on the importation-intensive, labor), and by not taking into account of a third factor of production, natural resources, which may alter the statistical results.

The Leontief model is applicable to many situations, such as the war economy and the effects of output on the environment.

The report with the environment, here is the need to determine the instruments of economic policies that may encourage or compel polluters to produce a level of externalities that corresponds to the equilibrium and optimum. The instrument used is the environmental tax. Its main objective is to limit externalities (which depend on the production function $Y = f(K, L, E)$ where K represents capital, L labor and E natural resources), and to limit production. The only way to reduce the externality is to reduce production (that is to say that we are in presence of a Leontief technology for the use of input pollution), the tax may be paid either directly by the producer or the consumer, the essential point being to make people aware that the production of that good leads to the appearance of an externality. The tax hits mainly the producers and consumers for the Leontief technology. This technology is defined by the fact that it should always a fixed proportion of each factor to produce one unit of good.

V. RISK ASSESSMENT OF OIL MARITIME TRANSPORT

Managing risks associated with the energy industry is becoming increasingly complicated due to factors such as government regulations, public policy, financial concerns, and energy resource scarcity. In order to address these issues, impacted companies often implement energy risk management strategies. Energy risk management involves the process of pinpointing, evaluating, and prioritizing risks associated with uncertainty in the energy markets. Controlling energy risks can provide greater market assurance for companies like oil and gas producers, electric providers, and gas utilities. It can also give confidence to the insurance companies, banks, and manufacturers who work with these energy companies.

The operation of oil tankers represents a significant risk to the environment due to the severe consequences of oil spill. Tankers are the largest contributor by vessel type to worldwide spill volume.

The economic risk in oil shipment here is nautical risk (boarding, stranding), fire, explosion, hull breach, and the risk of pollution: the stronger risk aversion.

Legal risk is: based on the concept of responsibility and on the legislation coming into effect over the international plan, conventions, OPA..... Brussels conventions of 1969 and 1971 and the MARPOL convention.

Two conventions of Brussels determine the legal framework. Civil liability of the oil carrier corresponds to the convention of 29 November 1969; that asks him to compensate victims of pollution damage (108 million Euros). The second agreement signed on 18th December 1971 calls for the creation of an international fund for compensation against damage caused by hydrocarbons pollution (IOPC funds, FIPOL).

The MARPOL convention has bound -in its terms, starting from 05th April 2005, ship-owners to send decayed tankers over 25 years old to breakage.

The preliminary risk approach: developed at the beginning of the 1960s in the United States; it is the identification of risks by the definition of the means (prevention, protection and procedures.....).

It is to draw up a dashboard with all factors that affect overall safety of a ship carrying oil. This will particularly lead us towards the application of the rules relating to maritime navigation.

This preliminary approach to risk is also based on the lessons of history. The maritime accidents that happened yesterday can be tools and basic parametric models of the control panel defined above. Risk control must allow several objectives: first to enter the security aspects, identify risks then prescribe immediate corrective actions in the best conditions of efficiency, delay and cost...

However, in the case of marine oil transportation, we have stressed that it is a question of the coverage plan with two dependent risk sources. And the implementation of the oil vessel body risk may result in the risk of oil pollution of the seas and coasts. If the first risk is fully covered by regular insurance, the second is not.

VI. SOCIO-ECONOMIC LOSSES FACE ON OIL SPILL

Coastal and marine pollution after an oil spill concerns economic groups of users such as fishermen and hoteliers etc... and all who suffer of monetary losses.

Generally, the damage consists of loss of income and property offenses. These two issues require the intervention of a third party to resolve the dispute in a compensation order. Loss of income takes into account the forms of harm in various economic sectors such as fishing and tourism. When natural resources are affected, the economic sectors affected also need time to recover to the state after an oil spill. Economic losses in these sectors (EL) are the sum of revenues lost during the recovery period:

$$EL = \sum_{i=1}^{i=n} RL_i \sum_{k=0}^{k=p_i} ((1 - h_i(k)) \left(\frac{1}{1 + \omega} \right)^k$$

where RL is the annual income for the economic sector i , $h_i(k)$ the service provided by the percentage area affected in the same year i after the incident, ω the annual discount rate and p_i the period required of years for a full recovery.

The property damage (PD) can be estimated simply by adding all costs of repair or cleaning systems including vessels:

$$DP = \sum_{j=1}^{j=n} up_j \cdot Nu k_j$$

where up_j is the unit price of goods of type j and $Nu k_j$ the total abundance of damaged property of type j .

VII. OIL POLLUTION AND MARINE ENVIRONMENTAL LAW

How is the environment integrated in our market economy? The traditional approach, consisting of regulating the most possible, has shown its inability to solve environmental problems. A new approach, which is more flexible and more efficient in combining regulatory and economic instruments, should lead to improve both economic and ecological results to fight against pollution.

In the early 1970s, governments began to intervene in the field of environmental protection by using a regulatory arsenal and direct controls. Parallel to this legislative process, a new –economic- approach appeared. It came out from the theory of externalities, by which the phenomena of pollution and environmental degradation are due to the lack of an adequate pricing of environmental resources: if we give a full price for these assets, their users (especially polluters) will take the necessary measures to limit their consumption and deterioration, rather than wasting them when they are "free".

Therefore, it is convenient to first examine the theory of externalities, which is the basis for the economic approach to the fight against pollution. Then we'll see how this theory gives rise to economic instruments for environmental protection.

VIII. THE CONTRIBUTION OF THE THEORY OF EXTERNALITIES

We can define the externalities (or external effects) as follows: “an external effect occurs when a person's activities affect the functions of production or the welfare of others who have no direct control over that activity” (Kolm, 1971). »An external effect is an external economy or an external diseconomy whether it is favourable or not to the person who undergoes it “In the environmental economy, the negative externalities occur most often.

The externality characterizes a situation where the economic action of an agent provides advantages (positive externalities) or disadvantages (negative externalities) to one or many other agents, such interdependence finds no adjustment on the market.

A company that pollutes a river creates negative externalities to all residents and businesses located downstream of the pollutant firm. When a tanker empties its tanks in the international waters or when toxic smokes degrade the air quality, officials embarrass fishermen and inhabitants without spontaneously setting any price for such nuisances.

In case of externalities the price system ceases to carry on its function of information and incitement, it does not guide the agents towards more socially optimal decisions which may lead to various forms of inefficiency in the organization \ activities of production and consumption.

IX. THE MARKET FAILURE IN THE PRESENCE OF EXTERNALITIES

Generally, prices correctly measure the social values of a property that is the supplement or reduction of potential welfare for the community no matter what their production or use is by a particular agent. The price system is a kind of common denominator that summarizes all the interactions between agents and allows an assessment of collective welfare; competitive price system guides agents to an efficient use of available resources to the community.

There are, however, cases where prices do not play this role that the theory assigns to them, and where the costs and benefits differ from private costs and benefits to the community. These are situations where the decisions of consumers or producers of an agent directly affect the satisfaction or benefit of other agents without evaluating the market and make the agent pay or remunerate for this interaction: we talk of externalities.

In case of externalities, the price system ceases to hold office for information and incentives; it does not guide the agents towards more socially optimal decisions and results in various forms of inefficiency in the organization of activities, production, and consumption

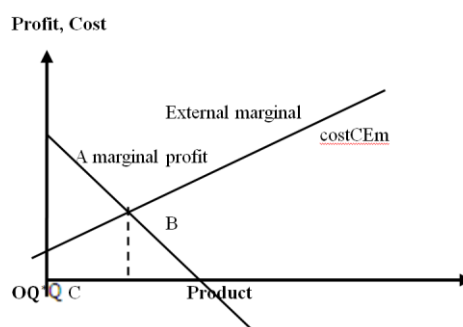
Those affected by the externality in the case of external economies, do not pay the price in return for the benefits they enjoy as if they are –in contrast- affected by the activity of the mover of the externality; they have no power to make restitution.

Production is optimal in the presence of externality because some costs are not taken into account. All social costs of an activity giving rise to external economies will not be supported by the responsible, and his activities will likely be extended.

X. SOLUTIONS AGAINST POLLUTION AS A NEGATIVE EXTERNALITY

Where any production generates a negative externality (e.g. the drilling platform that pollutes the sea or river, or the ship that discharges its waste tank), the social cost (to society) is higher than the private cost (to the producer). As the producer looks for maximum profit and considers only the private cost, he is led to choose a production volume which is greater than that which would correspond to the socially optimal.

Take the case of an offshore oil exploration company (the drilling platform) whose production activity is accompanied by emission of toxic gases (SO₂, for example) in the atmosphere, and is capable of draining wastes during the loading of oil on tankers. On the following graph, the horizontal axis represents the level of production of the platform and the vertical axis embodies the profits and costs of each level of production.



Line AC represents the marginal benefit of polluting drilling company. If we do not take account of environmental externalities (if the private welfare coincides with the well-being), the company maximizes its total profit in OC production

(beyond its marginal profit which is negative, as a result the total profit decreases). The maximum total benefit is then equal to the area OAC.

However, this platform and its activities involve a social cost to the community. We represent this by a straight external diseconomies reflecting increasing damage with increasing production levels, that is to say a growing marginal external cost (Cern). Determining the level of polluting production, which is socially optimal, is determined by maximizing the overall surplus of the company, defined by the profit of the company minus the cost caused by pollution.

The socially optimal level of production is equal to OQ^* denotes the point of equalization of CE and the marginal private benefit.

An important solution to the problem of environmental pollution is based on a conception of the kingly state. It advocates to the use of administrative regulations of activities causing externalities through taxation permissions. We shall introduce here the concept of Pigouvian taxes, named after the British economist Arthur C. Pigou (1877-1959) who first, proposed to tax externalities in the environmental field. It aims to internalise the external costs or damages that the firm imposes on society and -the environment.

The principle of the polluter-payer (PPP) oblige the generator of the externality to bear the social costs of its actions to realize an effective Pareto equilibrium. The administration should impose a tax on the externality in order to restore equality between costs social and private costs.

Ronald Coase, demonstrating that government intervention is not automatically required; he also highlights the true foundation of such an intervention. The state action is justified when the high number of partners and / or complexity of externalities involve entail transaction costs so that no mutually beneficial agreement and establishing the optimal allocation of resources cannot be spontaneously negotiated.

A. *The Taxes and Royalties*

We can straight away deduce, certain confusion, between the notion of tax and that of royalty.

In theory the tax, which is also called "environmental tax", is originally a pigouvian notion outlined above. It has an incentive and an internalized effect of external costs. Although it does not take cognizance of the price of pollution, the authority tries to give it one that can be adjusted to the reaction of agents.

As for royalty, it forces polluters to pay for environmental services that they use, such as waste disposal service. The royalty, above all, has a financial function, because the collected funds are more often affected to financing operations against pollution. However, this distinction is wholly theoretical. The OECD collects all taxes and fees under the name of "royalty". It notably distinguishes:

- Discharge royalties (payments on releases in the environment based on the quantity and/or quality of the discarded pollutants).
- Charges for services (at collective treatment costs or public releases) or
- Royalties on (pollutants) products OECD (1989).

The OECD notes that the fees and charges are admittedly quite widely applied today but the amount is generally too low to exert a satisfactory incentive effect.

B. *Fees and Charges*

Some confusion may be noted from the outset between the concept of "tax" and that of "royalty". In theory, the tax, also called "environmental tax", is the original pigouvian concept outlined above. It has an incentive effect and internalization of external costs. Although it does not recognise the price of pollution, the authority tries to give it one; which it can then adapt according to the reaction of agents.

As for the fee, it forces polluters to pay for environmental services they use, such as waste disposal service. The charge is primarily a financial function, because the funds collected are most often used to finance operations against pollution. This distinction is entirely theoretical, though. The OECD collects all taxes and charges under the term "royalties". It notably distinguishes:

- Tipping fees (payments on environmental emissions: calculated based on the quantity and / or quality of pollutants)
- Fees for rendered services (for the costs of collective or public treatment of dismissals) or
- Royalties on (pollutants) products (OECD, 1989).

The OECD notes that the fees and taxes are certainly more widely applied today, but their amount is usually too weak to

exert a good incentive.

C. Financial Aid

Grants are intended to encourage polluters to undertake antipollution investments. We can distinguish the following forms: shares by fiscal policy, grants for pollution control (negative taxes), support for operating purification devices, accelerated depreciation of the anti-pollution or credit facilities; by loans at lower interest rates. Consider especially the former case.

Fiscal policy can change the relative prices of products in heavily beating those that are harmful to the environment or, conversely, by reducing the tax on products that maintain it. We must take into account certain rather difficult aspects (Schwarz, 1991):

D. The Rights to Pollute

Like the introduction of a tax, a system of negotiable emissions permits also to achieve a certain level of pollution, which is more effective than direct controls. An environmental authority, as the "Environmental Protection Agency (EPA) in the United States, can put for sale the property rights for a certain amount of polluting emissions. These rights are sold and redeemed at a price reflecting supply and demand which will tend to stabilise at a cost rate [in marginal terms] antipollution to all polluters.

Indeed, each polluter will purchase rights until the price of these rights will be equal to the (marginal) cost of pollution reduction, and beyond this, it would become more expensive to buy rights than to pollute.

The overall cost to the community will be minimal, while the effectiveness, at least in theory, would be maximal. This system worked, albeit with some success in the United States in the field of air pollution.

In conclusion, we note three advantages of economic instruments to fight against pollution in relation to direct controls.

The mechanism of prices will encourage the owners of tanker fleets to find the cheapest way to reduce pollution. Thus, the less they pollute, the less they will pay for licences or taxes.

The environmental problem is primarily a problem of externalities

Therefore, the term "inciting tax" ("Lenkungsabgabe") is a bit lenient and we should speak of "internalization tax", though. A green tax would violate the principle of fiscal neutrality because it influences, through fees, the agents' behavior.

Environmental taxes must respect the neutrality of the state's share

It is desirable to completely separate the ecological tax from the considerations of the State, and then redistribute the product to the agents according to the principle of eco-bonus. In the opposite case, where the state needs money, the agent may be tempted to increase taxes without asking whether this is ecologically justified or not.

The State, however, would have an interest in promoting miss-behavior of agents.

Green taxes shouldn't be dealt with as instruments of redistribution

Economic instruments should lead to a change in relative prices. Certainly in the short term at least, this will inevitably lead to a general rise in prices, since free services must be paid. These remarks show how much we should be cautious with such an instrument, which has the merit of being truly revolutionary.

XI. RESPONSIBILITY OF INTERNATIONAL MARITIME ORGANIZATION

The dilution framework of responsibilities and the lack of transparency that characterize the financial rules of the sea under the International Maritime Organization (IMO) IMO has effective and efficient mechanisms in place for the elaboration, development and adoption of international treaties, rules and regulations and their implementation through the tacit acceptance procedure adopted for amendments to most fundamental international conventions.

IMO provides technical assistance to developing countries – individually and collectively– for establishing effective national Port State Control capacities, or regional mechanisms of co-operation for Port State Control activities.

We particularly believe that the absence of an unlimited, coherent and preventive responsibility of a national regime to be applied to oil transport by the sea, both at national and international levels, allows the maritime actors and their shippers to bear an inconsistent risk with the preservation of the environment which remains viable in case of disaster.

Unlike the UN agencies, the IMO does not work on the principle of "one state – one vote" but according to the relative weight of States in respect of maritime transport.

Consequently, flags of convenience such as Liberia, Panama, Malta and the Bahamas, which represent 40% of maritime traffic, make out a law of it. The rules of the IMO Maritime suffer from this backing of the lobby of private operators, ship owners, charterers and major petroleum owners. Flags of convenience are countries that offer tax advantages, a social right and a discount on almost total laxity in regulation (inspection of ships, etc. ...). Rather than fight against their existence, the EU

relations with this system are troublesome.

Consistent and Automatic Applications

The efficiency of direct controls depends too much, in its application, on the momentary popularity of anti-pollution and economic interests at stake. It should not, however, ignore all regulations. These are essential in some areas, such as hazardous waste control. Economic instruments that seek to integrate environmental factors in our economic system are useful additional direct controls, with which they can be combined to achieve better results in the fight against pollution.

International law establishes the principle of freedom of navigation on the international seas and the right of innocent passage through territorial waters of States. International law is framed by international conventions which are binding on States that have ratified them and therefore the ships under their jurisdiction.

Charters shall ensure in their charter contracts that the ship-owner with whom they contract complies with these conventions. Beyond the law, it is also the right of the port State and the right of the flag State.

In terms of risk prevention, including the risk of maritime safety, the most important international convention is that of the Safety of Life at Sea, known as SOLAS, adopted in 1960 and 1974. Its objective is to establish minimum standards for construction, equipment and operation of ships. States flag vessels have the responsibility to ensure that vessels flying their flag comply with the provisions of the Convention. The Contracting Government may inspect vessels of other Contracting States if there is a reason to believe that the ship does not comply with the provisions of the Convention.

The risk of pollution is taken into account by several conventions. The Torrey

Canyon accident in 1967 and its media have been critical. It was the first major oil accident, after which the International Maritime Organization, affiliated to the UN, has been initiated by the adoption of several international conventions.

The first is the MARPOL Convention of 1973/1978, which establishes rules designed to prevent and minimize pollution caused by ships, whether accidental or due to routine operations. Beyond these agreements, we must also recognize the voluntary efforts of industry, either the ship-owners or oil companies.

XII. CONCLUSION

The damages of the spill are equal, by definition, to reduced ecosystem services affected by pollution. This definition led to wide acceptance of the concept of damage as it integrates the downturns experienced by the market sectors depending on the quality of the environment (fishing, shellfish aquaculture, tourism).

It should be recalled that four solutions were considered for the evaluation of ecological damages.

The first is to apply a market price to the destroyed biomass. It is an arbitrary approach since prices resulted from the interaction of supply and demand. The second relies on the functioning of food chains. Lost biomass corresponding to their lower levels, the losses can be translated in terms of marketable species. Its implementation faces two major problems, firstly the uncertainty on the coefficients of passage between trophic levels, and the choice of shadow prices where the destroyed volumes were very high, on the other hand. A third approach is to value the loss of biomass from the prices paid by the laboratories for non-commercial species, is only applicable to small oil spills, the effects are not likely to affect those prices. In line with this approach, a fourth option was preferred. It was established claims based on the cost of restoring the environment. One of them, corresponding to a readymade program was accepted. However, an ambitious program of restocking was not selected as it had not been undertaken and it was to improve the ecosystem, not to restore it (United States District Court, 1988).

We particularly believe that the absence of an unlimited, coherent and preventive responsibility of a national regime to be applied to oil transport by the sea, both at national and international levels, allows the maritime actors and their shippers to bear an inconsistent risk with the preservation of the environment which remains viable in case of disaster.

Thus contribution of industrial ecology in terms of environmental sustainability can be summarized by a reduced consumption of natural resources (biomass, fossil fuels, minerals ...) and emissions per unit of riches created in the sea. (OECD 1991).

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ACRONYMS

IMO International maritime Organization**OPA** Oil Pollution Act**MARPOL** marine pollution**(IOPC funds)** The International Oil Pollution Compensation Funds**IFCP FIIPOL** International fund for compensation for pollution**OECD** Organization for Economic Co-operation and Development**VLCC:** Very large crude carrier**IEA** International Energy Agency**SOLAS** The Safety of Life at Sea, known as**UN** United Nations**UNDP** The United Nations Development Programme

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