Damage Assessment and Liability Compensation for Marine Oil Spills: Short and Long Term Strategies that Achieve International Consensus

by
Clotilde Armand

Submitted to the Department of Ocean Engineering in Partial Fulfillment
of the Requirements for the Degrees of:

MASTER OF SCIENCE: OCEAN SYSTEMS MANAGEMENT PROGRAM

and

MASTER OF SCIENCE: TECHNOLOGY AND POLICY PROGRAM

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

FEBRUARY 1997

Signature of Author: _____
Department of Ocean Engineering
January 14, 1997

Certified by: _____
Judith Kildow
Professor of Ocean Engineering
Thesis Supervisor

Certified by: _____
Richard de Neufville
Chairman, Technology and Policy Program

Accepted by: _____
J. Kim Vandiver
Chairman, Departmental Committee for Graduate Students

Damage Assessment and Liability Compensation for Marine Oil Spills: Short and Long Term Strategies that Achieve International Consensus

by
Clotilde Armand

Submitted to the Department of Ocean Engineering on January 17, 1996
in Partial Fulfillment of the Requirements for the Degrees of:
Master of Science: Ocean Systems Management Program and
Master of Science: Technology and Policy Program

ABSTRACT

Oil has unique environmental consequences, demonstrated by events such as the accident of the Amoco Cadiz in 1978 and the Exxon Valdez in 1989. The present international conventions refuse to seriously consider environmental damage assessment, and thus lack incentives to protect the environment adequately. The elaboration of a new international framework for compensation is the objective of this thesis.

Our proposal must respond to two goals: to not damage the environment and to restore completely when damage has occurred; and must comply with the criteria that we derive from the OECD criteria for environmental policy: environmental effectiveness, economic efficiency, equity, administrative feasibility and cost, and acceptability. Our final recommendation is a short term and a long term policy. The long term policy is the ideal policy to be reached gradually. The short term policy takes into account today's socio-economic, technical and scientific constraints/limitations. The pillars of these policies are as follows: A restoration plan is chosen, that will completely restore the environment and/or provide the public with "equivalent" resources or services during restoration.The plan is chosen by a panel composed of the Responsible Person (RP), the public and the Trustee (scientific expert accountable for this process). The RP is liable for paying the costs of assessment and implementation as they are incurred.

These policies are compared with the rules of NOAA (the response to the new requirements of OPA 90) regarding damage assessment for marine oil spills. The day-to-day operations of our proposed long term policy is inspired by the NOAA rules.

However, there are barriers to the adoption of this proposal due to political and social frameworks, corporate behavior and current technological and scientific knowledge. Moreover, the proposal does not address the issues of uncertainty over the scope of the damages resulting from an oil spill, or of the irreversibility of part of those damages.

Thesis Supervisor: Judith Kildow
Title: Professor of Ocean Engineering

TABLE OF CONTENT

Introduction: The Question

Global interdependence, though real, is today still at an early stage of evolution. Compared to the necessities of the second millennium, those of the 1990s will seem to have been slight. Economic, political and environmental interdependence is growing daily. Whether as a consequence of will or destiny, the political and environmental realms cannot and will not remain forever separated. To understand the trends of the present and to identify the needs of the future is an immediate task.

Greatly relied on by both producers and consumers, transported oil is the quintessence of international interdependence. At the same time, oil has unique environmental consequences, demonstrated by events such as the accident of the Amoco Cadiz on the French Brittany coasts in 1978 (67 million gallons) and the Exxon Valdez in 1989 (10.8 million gallons and total loss of $4 billion). There is nothing more shocking than seeing thousands of birds stranded in the black, oily beaches. Beyond desperation or exasperation, we must advocate a wiser use of technology. There is a duty to protect the international environment and inaction can be as wrong as action. The elaboration of an international framework for compensation is a definitive step in this direction. The logical question that must be answered is addressed in this thesis:

What are the Short and Long Term Strategies that Best Achieve International Consensus
for
Damage Assessment and Liability Compensation
for Marine Oil Spills?

1. The **concern** of the thesis is the discharge of oil into or upon the ocean and shorelines, or *marine oil spills.*

This concern is at the same time a local and a world-wide concern. Indeed, the interested parties are very diverse, from the direct local victims to the whole oil industry. Let us see who the parties are:

- the potential immediate victims, who are the people living on shorelines, commercial

fishermen, shipping interests, wholesale and retail seafood enterprises, seafood restaurants, marina and boat rental operators, fishermen, oystermen, shrimpers and crabbers who engage in these activities for recreational purposes, etc.

- the oil tanker owners and cargo owners, which means oil shipping companies and oil companies
- the insurance companies
- the world community through its environment advocates, such as environmental protection associations
- the oil consumers who are affected by oil prices.

This concern is justified. The Amoco Cadiz in 1978 spilled 67 million gallons of oil on the French shore. Accidents like this affect whole ecosystems. Briefly, here is an idea of the consequences of oil transportation and oil spills on the environment:

- water quality: Oil spills from tankers and barges have added many polluting constituents to water environments. About 6 million tons of oil pollutants enter the ocean each year.
- biological resources: Both plants and animals can be affected directly by oil transportation or indirectly through water quality. The integrity of an ecosystem can be destroyed if only one link in the food chain is eliminated. Oil spills from pipelines have been relatively small and confined to a limited area. Discharges from tankers and barges are potentially much more damaging because they can contaminate large areas of the marine environment and directly threaten biological resources.
- social and economic impacts: Environmental degradation has social and economic impacts with both monetary and non monetary components. The tourism and recreation industries, and commercial fisheries will decline after an oil spill. Health can be threatened by water supplies. Moreover, when ecosystems are damaged, aesthetic values will be diminished. Finally, if the assimilative capacity of the environment to absorb wastes is decreased by oil spills, other sectors of the economy will have to pay more to dispose of waste.

2. The **issue** is *damage assessment and liability compensation.*

Within the industry, the insurance companies insure the shipment and the ship. The issue here is beyond liability compensation for the shipment and the ship. When speaking about damages, we include all types of damages; and consequently, when speaking about liability compensation, our concern is compensation for the wide scope of the damages.

This issue is at the same time:

- broad: It includes all kinds of costs (economic, ecological, etc.) and all kinds of actions (cleanup, injury assessment, prevention, restoration, etc.)
- delicate: It implies liability assessment, huge costs to be paid, exacerbated by reactions of frustration, etc
- new: Neither the history of oil spills nor the history of environmental concerns has been long, which means that there are no deeply rooted customary laws or moral values.

The complexity of this issue is mainly due to the wide range of potential damages after a tanker accident. These damages are numerous and are often a question of definition and discussion. Here is the most commonly accepted list of types of damages:

- commercial losses

These are losses to commercial enterprises which operate in conventional markets. The expression of these damages in monetary terms is not too controversial. For example, all the information on the tourism industry that is available makes it not too difficult to assess the effect of an oil spill on tourism, even if one must distinguish the effects of oil pollution from other factors, such as the weather. The commercial costs include the loss of the vessel and the cargo, the cost of salvage operations and the increase in insurance premiums.

- social and recreational losses: general recreation, recreational fishing, bathing areas, recreational boating, areas of cultural interest

These are losses to natural or cultural resources which have recreational and/or social value for consumptive users of the resources, like recreational fishermen or recreational hunters, and non-consumptive users like bathers or photographers, as well as those who wish to retain the option for future use or are willing to pay for the knowledge that such resources exist. These losses are difficult to assess. One method used is the Contingent Valuation Method (CVM).

- ecological losses: conservation areas, beach ecosystem, fish spawning/feeding/growth areas, marine mammals, seabirds, salt marshes

This includes interruption of fundamental functions of ecosystems that recover slowly or sometimes not at all - affecting a range of factors such as water quality, resources and shoreline stability. These losses affect both users, like bird watchers, and non-users who value the resources. Areas can have several types of use. For instance, a beach can be a bathing area in the summer and a bird watching site in the winter. This results in an overlap of this category with the previous one. These losses are also difficult to assess. One method used can be "willingness-to-pay" studies.

3. The **frame** of the thesis is the policy-making context.

Indeed, *strategies* that achieve *consensus* among the parties become policies. Environmental policy-making is like any other area of policy-making in the fact that: "Agreement will never be unanimous - there are too many particular interests for that - but in time a consensus can be forged that will provide a basis for informed and responsible action" (Hanson, 1986). In order to reach this agreement, the proposal must comply with all the requirements of a policy. The OECD (1991a) suggests the following five sets of criteria for the choice of environmental policy:

- Environmental effectiveness
- Economic efficiency
- Equity
- Administrative feasibility and cost
- Acceptability.

4. The **scope** of the thesis is the *international* environment, for two reasons:

- There is a need for an international framework, expressed through the elaboration of the present international conventions. By refusing to consider environmental damage assessment, we believe that these conventions do not fulfill the need.
- There already exist national frameworks (in the US, and draft frameworks in Europe), which moreover do not satisfy the global problem: they just address part of it from the point of view of one or several nations.

5. The **purpose** of the thesis is to recommend the *best* policy: this means the optimal combination of feasible strategies that achieve consensus among the parties. This task requires the definition of best policy, which demands a set of criteria by which we can measure and select the best policy or policies.

6. The **result achieved** by the thesis is the recommendation of two policies: the short term and the long term policies.

The long term policy is the ideal policy to be reached little by little. This policy is the result of reflection on an ideal society and an ideal world where:

- we have perfect knowledge about the environment and the damages that occur;
- the environment can be replaced and fully restored with a sufficient amount of money

and time;
- a consensus can always be reached among all the parties;
- there is adequate correlation between costs and benefits.

The short term policy takes into account today's constraints which are:
- the economic and social frameworks;
- our imperfect scientific knowledge and technical limitations regarding the environment.

The political constraints of the proposals will be addressed in the last part of the thesis.

The proposal includes:
- the ground rules and regulations for the ideal policy
- the adaptation of these regulations in the case of the short term policy
- the implementation framework and procedures for the short term policy
- the implications and potential consequences of both policies
- the reason why we believe that our proposal is better than what has already been proposed.

The answer to the thesis question is divided into 4 chapters:

1. An explanation of the context, the existing international regulation frameworks, the current national approvals, the "world's state of mind."

2. The elaboration of the policies:
- Definition of the goals we want to achieve through the implementation of the policy.
- Definition of the practical criteria that our policy must meet. These criteria address all the possible issues: socio-political, ecological, economic, technical, etc.
- Definition of the ideal 'best policy'. The best policy is the one that best fits the goals and the criteria. This ideal policy is our 'long term' policy, since today's world does not correspond to the requirements of an ideal world, (recognizing that forecasting an ideal world in the long term is a difficult speculation, but our action is directed towards this goal, anyway)
- Definition of the 'best policy' for the next ten year, or in other words the short term policy. It is the same policy as the chosen policy but adapted to our imperfect world.
- Comparison of the chosen policy to the new rules of NOAA (valid since January 1996) regarding environmental damage assessment for marine oil spills. This new set of rules

is the response of NOAA to the new requirements of OPA 90 which are the focus on restoration and the consideration of all environmental values.

3. Description in detail the chosen long term policy with its day-to-day operations. The inspiration for the detailed description will be the NOAA rules, modified and adapted to the international environment.

4. Analysis of the implications of the implementation of the long term policy.

1. Context

This first section provides the context of the thesis.
As we saw in the introduction, the purpose of the thesis is to design the *best* short and long term policies.
The first task that we must undertake is to identify the actors and understand their concerns and reactions. The policies that are designed need to address their concerns.
The second task is to understand what the current international policies are. This is necessary in order to understand how much has to be changed when drawing a new policy.
Finally, the third task is to analyze the current ideological controversies on damage compensation. These controversies supply the crucial issues in the development of the thesis.

1.1 The actors

Generally, two types of actors are concerned with environmental policies:

- the corporate actors, who use the resources
- the general public, to whom the common resources belong.

For these two types , we will identify the specific actors, their needs and concerns, and their reactions to different situations.
Moreover, we need to understand the specific actors at the International Maritime Organization (IMO), since this international government body has control over most of the relevant policies regarding ship-based pollution.

1.1.1 The corporate actors

i/ The oil companies

The oil companies have three objectives:

- To assure transport of oil in a timely fashion.
- To keep costs as low as possible. For example, they are willing to use pipelines or any other kind of transportation if it proves to be more cost-efficient.
- To build or to keep a good public image. They are aware of the importance of their public image. They could be labeled as polluters by the media.

To understand better the behavior of oil companies, let us examine their reactions when they faced the US Oil Pollution Act of 1990 that exposed tanker owners to unlimited liability.

" The shipping strategy of the major oil companies has been at a crucial crossroads. Virtually all have now made their choice. However the different routes chosen show a marked divergence of opinion between those believing in the integration of shipping operation (BP, Chevron, Mobil, Shell), those believing in disintegration (Texaco, Amoco, Marathon) and those that would rather not say (Exxon)." (Box,1995).
Let us examine the philosophies behind the two main different routes. (We do not examine the Exxon case).

- The companies opting for integration follow the "If you want something done right, you've got to do it yourself " strategy. Mobil Shipping and Transportation Company's president Gerhard Kurz says that "Protection of the marine environment must take precedence over any commercial or operational considerations... We believe that our goals for maximum safety and minimum risk are best met by transporting oil in controlled vessels and by maintaining a rigorous ship inspection programme for all chartered vessels". BP Shipping's planning manager, Paul Oliver, explains that "We tend to hold the view that the only way of guaranteeing quality is to control those things that make up quality" (Box,1995).
- Some of the large companies are unwilling to risk their corporate assets to potentially unlimited liability. For instance, Texaco has chosen to disband its fleet entirely. Even as recently as two years ago, the company had seventeen vessels (Lloyds shipping Economist, 1995). Since then, Texaco has entered a joint venture with Star Enterprise of Saudi Arabia. Generally, for oil companies, getting out of the shipping business does not mean forgetting about safety. First, the oil companies enter "strategic alliances" with first class shipping companies that have good safety records. Second, the oil companies can exert a positive influence on the shipping companies. Third, the steady revenue generated helps the shipping companies to perform well on safety issues.

Conclusion:

The different strategies among oil shippers are not divided between the pro and con safety, but rather between one management choice and another. "Either you believe you can do your shipping and manage your own risks better than anyone else. Or you believe that others can do it better than you can. Or, perhaps, you can't justify doing it yourself when some-

one else can do it for a fraction of the cost" (Box, 1995). OPA 90 has forced different shifts in strategy among the major oil shippers, and these new strategies probably help make the oil transportation business safer.

ii/ The shipping companies

The market for transporting oil is very competitive. In the past decades, big investments in the new generation of super-tankers have resulted in poor returns. No supertankers were built in the first part of the 80's. However, "there has been a steady level of additions to the world fleet during the latter part of the 80's and the 90's. This is due to a combination of improved financial returns and the need for companies to replace existing aging tonnage," explains Drewy Shipping Consultants (1994).

Again, we examine the situation in the US after OPA 90 as a benchmark. There was a fear that the Act would merely encourage the proliferation of single vessel companies unrelated to the oil company whose oil was being transported, in order to limit the oil company's liability. Nicholas Blenkey, editor of the Marine Log, stated that, "At its worst [the bill] would mean American oil would be imported in tankers by dubious one-ship companies that will walk away from the ship in the event of a spill." In other words, bankruptcy would be a possible escape for situations where the assets (the vessels) would be worth less than the liability.

In reality, most oil and shipping companies complied with OPA 90 in order to continue their business in the US. Moreover, as we saw above, the oil companies exert an important influence on the shipping companies (whether the latter are affiliated or not with the former) and require good safety records. Further, the steady revenue generated by the new alliances between oil and shipping companies helps the shipping companies to perform well on safety issues. This may be reflected in the fact that in 1995 tanker spills fell to a record low (Marine Pollution Bulletin, 1996). Finally, all things considered, OPA' 90 increased financial penalties have probably helped make oil transportation safer.

iii/ The insurance companies

The main objective of the insurance companies is to obtain a monetary limit for compensation, in order to minimize their risk. They insist that they need a liability limit in order to calculate their premiums.

1.1.2 The general public

It is natural to consider the general public as a party in the oil pollution debate because it is the victim. Indeed, the damages of oil pollution affect nature, a global heritage of humanity. Over the past decades, the responsibility for this common heritage was overwhelmed by the benefits of economic development. Today, the current generation understands that development does not always create well being but can also cause a lot of damage (Vermeersch, 1994).

Moderate environment advocates

The oil consumers are more and more aware of environmental issues and are willing to pay more in order to respect the environment. This is definitely true for countries such as Germany, where the environmental friendliness of cars is a strong marketing argument. In other parts of the world, such as the US, where the automobile culture is strong, it is not certain that consumers are ready to make sacrifices. "Californians have separate and opposite sets of emotions for the oil that runs their cars and the oil that dirties what's left of their beaches" (Mead, 1978). (However, California has the most stringent automobile emission standards among the US states).

Extremist environment advocates

Part of the public believes that no price can be placed on the environment. For these extremists, the best for society means the best for the environment. For instance, the environmental historian Nash said:

"So I am prepared to say 'no' to oil. Not 'no, unless technology improves' or 'no, until we really need the oil next century' or 'no, if it involves more than a dozen platforms,' but just plain 'NO!'... I reject the whole notion of compromise." (Nash, 1972).

Generally, the portion of the public that is very involved with environmental issues does not trust private companies and is ready to put pressure on politicians to make the rules as strict as possible. Their behavior can turn to paranoia, creating dichotomies of good (the environment) versus evil (oil companies).

Their ideas are supported by ecological movements, such as the "Greens" in Germany. "Against the market rationale, the challenge for the Greens is to prove that there is a social and ecological value to the preservation of nature and taking this into account, it is more rational to preserve than to consume and to recycle than to waste." (Alario, 1995).

As policy-makers, we will need to understand and anticipate the reactions of the general

public. There can be two major difficulties for policy-makers regarding public pressure:

- Lack of real scientific knowledge about the different policy alternatives. The public, through ignorance, could approve of a policy which would seem to be environmentally friendly even if it is not economically and environmentally optimal (with less resources, it could be more environmentally efficient).
- The conflicts between the interests of local communities and those of the whole society. It happens that the maximum net benefits cannot be achieved because of the opposition of local communities. These protest when it appears that they must bear most of the risk and reap few of the benefits from a project. Let us take an example to illustrate this last point. It is estimated that of the millions of tons of oil spilled each year into the ocean, less than 5% are contributed by offshore drilling and production operations, and more than 50% from tankers. Consequently, the reliance on tankers to import oil rather than developing local petroleum resources when possible presents a higher probability for large spills. However, in the US, communities adjacent to the petroleum resources are generally very reluctant to have offshore production platforms in their coastal waters. The local area will bear the external costs associated with a spill, whereas the benefits of the production development -- less risks of large spills from tankers -- occur elsewhere. In the US, this syndrome was called NIMBY: "Not In My Back-Yard".

The perception of the general public will need to be taken into consideration when designing our policy proposal.

1.1.3 The actors at IMO

Most of the international agreements to prevent oil pollution were reached through the International Maritime Organization (IMO).
The types of actors involved in the negotiations to control this environmental problem are common to many contemporary international issues.

- Governmental actors have no monopoly. Non-governmental -- "transnational"-- actors have significant roles. 'Transnational' actors are mainly the oil and shipping industries. It is their activity beyond any national control that creates the problem. Moreover, as a consequence of their control over information and technologies and their active lobbying within national capitals and at IMO, these actors have an important influence on the outcomes as well.

- Governmental actors are not coherent units at IMO. The ministry that largely controls the course of the negotiations (transportation) is often in conflict with others in their own government, for instance, the ministry of environment. Consequently, the whole process is best perceived as a continuing 'transgovernmental' one rather than one of unitary states formally consulting at a diplomatic level. The transgovernmental network is centered on the specific concerns of the problem: oil, shipping and the marine environment.
- Scientists are "transnational" actors (see GESAMP, section 1.3.4: The role of science).

Because of these characteristics, the patterns of policies and influences mainly reflect the specific attributes of the issue (and not the dictates of national military forces for instance). The policies and alliances of the major actors are thus largely along the lines of shared industrial and commercial interests in the concerned areas. Likewise, the influences of these states vary according to their possessions at the different levels: tanker tonnage, control of the oil market, and maritime expertise.

As a result, conflict among the major participants to the negotiations usually has been contained within the limits of the issue, and minor actors have shown no interest in making linkages to outside issues where they might have a greater negotiating power. This point is important for us as policy-makers. It insures that only the specific attributes of the issue of oil transportation and pollution damages will be considered by the parties to sign the policy.

1.2 The International Conventions

It was the Torrey Canyon incident in 1967 which first provided a major stimulus to the development of four international agreements -- two international conventions and two voluntary plans -- through which compensation for pollution damage and cleanup costs following marine oil spills is available.

The following paragraph briefly gives the contents of these four international regimes (plus the protocols), mainly developed in the 1970s. They are the Civil Liability Convention, the Fund Convention, TOVALOP and CRISTAL. Then, we examine the definition of the international conventions for assessing environmental damages, which is the key point for understanding which damages are compensated. Finally, we analyze the limits and the future of environmental damage assessment in convention nations.

1.2.1 Introduction to the International Conventions

i/ The Civil Liability Convention (CLC)

Responding to the necessity for developing international policies for oil pollution liability, IMO (then IMCO) sponsored in November 1969 the International Legal Conference on Marine Pollution damage for the purpose of drafting two conventions. The first one, the Intervention Convention, addresses issues of intervention rights; the second one, the International Convention on Civil Liability for Oil Pollution Damage, addresses liability and compensation for pollution damage. It is known as the Civil Liability Convention (CLC).

The purpose of the CLC is defined in its preamble as being a means to "ensure that adequate compensation is available to the victims of pollution damage and that this is achieved through the application of uniform international rules and procedures" (M' Gonigle and Zacher, 1979). See Appendix 2.1 for more details.

ii/ The IOPC Fund Convention

In 1971, before the entry into force of the 1969 CLC, delegates met to draft a companion convention, the International Convention for the Establishment of an International Fund for Compensation for Oil Pollution Damage, which supplemented the CLC by ensuring the availability of adequate compensation funds. This convention, known as the International Oil Pollution Compensation (IOPC) or Fund Convention, also ensured that oil cargo interests bear a portion of the economic responsibility for oil pollution damage to relieve the shipping industry of total responsibility. The Fund Convention establishes a compensation fund from monies collected from oil companies, and as a result shifts some of the financial burden to the oil industry as a whole. See Appendix 2.2 for more details.

iii/ The 1976, 1984 and 1992 Protocols (CLC and IOPC Fund Conventions)

In 1976, 1984 and again in 1992, contracting parties to the CLC and Fund Conventions met with the IMO to make amendments to the convention in the form of protocols. The 1984 protocols were never entered into force. The 1992 protocols entered into force in May 1996. The general ideas of the drafts are respected in the protocols. The coverage limits are higher, the coverage area is extended, the definition of "pollution damage" is modified. See Appendix 2.3 for more details.

iv/ Two voluntary agreements: TOVALOP and CRISTAL

In the aftermath of the 1967 Torrey Canyon spill, oil industry officials and tanker owners became concerned about pollution damage liability and their ability to provide large amounts of compensation until any international conventions entered into force. In December 1969, before the drafting of the IOPC, tanker owners met under the auspices of ITOPF to establish their own voluntary compensation agreement to assist tanker owners in providing adequate compensation. At the end of the 1969 meeting, the tanker owners adopted the Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution (TOVALOP) to help tanker owners meet the cost of oil spill cleanups and damage compensation.

Furthermore, a group of oil companies and cargo owners, representing 90% of the world's fuel oil cargo, joined a complementary voluntary compensation agreement in 1971 to provide oil pollution damage compensation that exceeds the limit of TOVALOP. The agreement is called the Contract Regarding Supplement to Tanker Liability for Oil Pollution (CRISTAL). See Appendix 2.4 for more details.

1.2.2 Definition of "pollution damage" according to the Conventions

In order to successfully apply the CLC and the IOPC, all parties must agree to a common definition of "pollution damage". This is one of the most controversial points of the different conventions and protocols. The main difficulties concern environmental damages and pure economic losses. The evolution of the definitions follows:

i/ First draft (1969 and 1971)

Pollution damage is broadly and vaguely defined as "the loss or damage caused outside the ship carrying oil by contamination resulting from the escape or discharge of oil from the ship, including the costs of preventive measures and further loss or damage caused by preventive measures."

In reality, prior to the 1992 Protocol entering into force in 1996, the international Conventions have not covered natural resource damages (Jones, 1996). In fact, in response to a USSR claim under the Conventions for pollution damages calculated by a mathematical formula, the IOPC Fund Assembly explicitly resolved [Assembly resolution No.3] to exclude any claims for natural resource damages based on "an abstract quantification of damage calculated in accordance with theoretical models," and subsequently affirmed the

restriction of claims to "quantifiable economic losses" [FUND/A/ES.1/13. paragraph 11(a) and Annex I, and FUND/A.4/16, paragraph 13]. Its justification is that it is too difficult to assess the "market value of the environment."

The term "quantifiable economic loss" has a broader meaning in the economics profession than is apparently intended here. Here, the term appears to refer to what economists call "financial losses", such as lost profit, the increase in costs of purchasing a good or service, or lost property value or the cost of replacing property. We adopt the term "financial losses" to denote these described losses in the rest of this paper.

ii/ 1992 Protocols, entered into force in May 1996 (and the 1984 Protocols, never entered into force)

- "Reinstatement" costs:

The protocols both amended the definition of pollution damage to incorporate a restoration-based component of damages. The new definition of pollution damage includes the "costs of reasonable measures of reinstatement actually undertaken or to be undertaken" [Art. 2(3), 1992 protocol CLC].

An IOPC Fund Working Group met during 1994 to establish guidelines for implementation of reinstatement cost provisions. The group discussed whether reinstatement measures should refer not only to restoration of the injured or destroyed resources themselves, but also the replacement of injured or destroyed resources or acquisition of the equivalent when in situ restoration is not feasible (Jones, 1996). The final report does not provide explicit guidance on the issue (Jones, 1996). The Working Group agreed on the following criteria for admissibility of reinstatement claims:

- the costs should be reasonable;
- the costs should not be disproportionate to results achieved or reasonably expected to be achieved;
- the costs should be appropriate and offer reasonable prospect for success;
- any implication of 'contingent value' of the impacted environment should be removed. [FUND/WGR.7/21, Annex I, page 4.]

In contrast, the broader definition of reinstatement is explicitly included in the 1993 Council of Europe Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment. (Article 2(8), Treaty) (Jones, 1996).

In further contrast, the measures of damages in the draft protocols (UNEP/CHW.1/WG.1/1/5, UNEP/CHW.1/WG.1/2) for the 1989 Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal (1989 288 I.L.M.) and for the Antarctic Treaty (XVIII ATCM/WP.2, April 10, 1994) allow for the calculations of lost value as an alternative to reinstatement costs (Jones, 1996).

In conclusion, the lack of precision on the definition of reinstatement is actually an important limitation on the definition of reinstatement.

- Interim losses:

Questions remain regarding the scope of losses to be covered. In particular, does reinstatement include replacement of the interim losses of resources and their services as well as returning the resources to their baseline levels? No: as discussed above, the other components of damages in the international conventions were unchanged in the Protocols, and thus limit claims for interim losses to financial losses. (Only part of the interim losses are financial losses).

1.2.3 Limits and future of environmental damage assessment in convention nations

i/ The limits of the international conventions

By limiting damages to financial losses, the international conventions potentially exclude a major portion of social losses as a result of two fundamental limitations (Jones, 1996):

- First, by definition, public natural resources are in the public domain (they are not privately owned). Consequently, the resources and their uses are not typically bought and sold on markets. Thus, users do not necessarily directly incur financial losses when resources are injured. For instance, the fact that you cannot go and have a swim in the ocean is not a financial loss for yourself (it may be one for the tourism industry).
- The second problem is more subtle and more complex. Financial loss is calculated as the change in price for a fixed quantity of goods and services: it cannot embody the loss to consumers associated with a substantial reduction or elimination of the supply of any good or services. However, these are financial losses for consumers. For example, in the Exxon Valdez oil spill, important salmon fisheries supplying a large share of certain

consumer markets on the pacific Coast and in Japan, were closed for most of a season. As a result, the price of canned salmon was substantially higher than it would have been without the spill (Jones, 1996).

We will see in the following parts of this thesis that these limitations are fully addressed by the concept of restoration. restoring or replacing a resource means that all the values attached to the resource are reinstated.

The idea of "reinstatement" as developed in international Conventions addresses just the basic restoration (primary restoration) and cannot answer adequately the limitations indicated above.

ii/ The future of environmental damage claims in convention nations

In the future, the policy against natural resource or environmental damage claims may become even more stringent, since :

- The shipowner liability is limited to the compensation for impairment of the environment to the costs of reasonable measures or reinstatement actually undertaken or to be undertaken, but no definition of 'reinstatement' has been provided.
- The Convention needs to 'quantify' environmental losses to compensate for them.
- Any quantification through the Contingent Valuation Method (CVM) or formula must be removed.
- A crucial concern is a liability limit: a number has to be provided (all the discussions and negotiations throughout the Conventions have been around a number).
- The policy of eliminating environmental or natural resource damage claims is consistent with the philosophy of those opponents who do not recognize any validity in placing a market value on an exploited natural resource or environment.

We have come to a dead point where any improvement seems impossible.

1.3 Controversies related to damage compensation

The objective of this part is to understand the major controversies among the stakeholders, in order to find the principles on which all could agree (in the next part). Stakeholders are divided over the followings:

1. the type of liability
2. the limitation of liability
3. the differing social values within the international community
4. the need for a scientific analysis
5. the choice of a discount rate.

1.3.1 Fault v. Strict v. Absolute Liability

One of the most important points of discussion and controversy during the elaboration of the international agreements was the type of liability that the responsible parties - cargo and ship owner - should face. First, we must understand the implications of the definitions of the different types of liability.

Definitions

- In **fault liability**, the liability falls on the person whose conduct caused accident. Traditional fault liability is sometimes modified by relieving the plaintiff of the burden of proving fault and requiring the defendant to prove its absence.
- The term **strict liability** is applied generally to a regime whereby the fault criterion is discarded in theory, but the defendant is permitted to escape liability by showing that the incident was caused by factors entirely beyond his control, such as Acts of God, "force majeure," Acts of war, or the acts of a third party.
- The expression **absolute liability** is used to denote a regime more stringent than strict liability in that such events as Acts of God, 'force majeure', or acts of third parties are not admissible defenses. Under this system, there are no exculpatory events whatsoever, or else they are limited to rare and exceptional circumstances such as war and insurrection. The U.N. Convention on International Liability of Damage caused by Space Objects, and the multilateral conventions of nuclear accidents are sometimes cited as examples of absolute liability for environmental damages.

Two main points of view are in opposition:

- Proponents of absolute liability contend that it is unjust to force third parties to accept environmental risks that are created by industrial activities. An enterprise that creates a risk for its own profit should, it is argued, be required to bear the consequences.
- Others ask if oil exploitation is only profitable to the oil industry or also to the whole society. Society needs the oil industry in order to develop and thus creates its own risk.

Consequently, society should pay something for this risk also.
The question here is whether the oil industry or shipping companies should be considered the only responsible party for the risk they create. We discuss this issue below.

Discussion

- *The argument of professors, lawyers and idealists*

In writing of the Torrey Canyon disaster, Professor Goldie explained:

" The legal system and public opinion have significally failed to keep pace with the development of tankers and their noxious cargoes of ever-growing bulk and threat. Significant differences set the giant tankers apart from all cargo ships, for example, the ratio of their dead-weight to their net tonnage, their power-weight ratios, their drafts when laden, their maneuverability, and their minimum turning circles. Indeed, relative to the bulk they carry and their power, they are no more than fragile containers for transporting vast quantities of noxious fluids. The larger these giant vessels become, the more cheaply, it is said, they can carry their cargoes from production to distribution centers. On the other hand, the more they increase in capacity, the greater will be the risk to coastal and insular populations, and to the ocean environment, of pollution by oil. Hence, the economies these big ships create are, at least in part, not merely economies of size, but also savings made at the expense of third parties (namely coastal populations) and the environment." (Goldie, 1970).

These observations lead to the idea that ultra-hazardous activities should pay their way when they cause harm. These activities are only the result of a cost-benefit analysis, and not the expression of a general social necessity. As a result, they should not be entitled to pass on the cost of the risk they create to their potential victims. This risk is uniquely derived from their activity, and the cost of the service should reflect it. In other words, they should be liable for damage arising from the risk they create, despite the observance of the necessary safety precautions.

This argument for absolute liability corresponds to the common sense expressed in this much-quoted formula by Justice Blackburn in the Court of Exchequer Chamber:
"We think that the true rule of law is, that the person who for his own purposes brings on his lands and collects and keeps there anything likely to do mischief if it escapes, must keep it in at his peril, and, if he does do so, is prima facie answerable for all the damage which

is the natural consequence of its escape." (Fletcher v. Rylands, 1866).

An example of such a responsibility is liability for nuclear plants. Even if all the risk factors are not uniquely under control of the risk creator -- the general public, or "acts of god", or "acts of war" may interfere with the safety programs strictly established by the risk creator - the responsible party of the nuclear plant faces an absolute liability. It is its duty, as risk creator, to minimize all possible interventions of third parties.
Then, why should the oil industry not face this same absolute liability?

- *The argument of economists and policy-makers*

They argue that oil pollution is (like most environmental matters) simply a minor undesirable consequence of a larger, more 'important' economic activity. Economic development, technological expansion, and rising standards of living all have had an obvious and central role in the development of the environmental crisis. More specifically, the world's great and growing dependence on oil and its recently developed capabilities for constructing giant supertankers are themselves direct products of the burgeoning world economy.

This world economy is indeed the ultimate cause of the oil pollution problem but at the same time the world economy will not be changed as a whole by the oil pollution problem - unless pollution provokes the collapse of the economy. Consequently, pollution control must fit itself into the prevailing economic and political systems. Pollution control has been and will likely continue to be a peripheral activity, only needed to contain the unwanted effects on economic activity.

As a result, alternatives for pollution control, and more specifically pollution liability, are limited by what the larger system permits. At the international level, this system is one of great competition and interdependence. Confronted by this global system, states seek to ensure only the acceptance of regulations that will treat their industries no less favorably than any others which are affected. Most important is the desire of all participants to avoid being subjected to any competitive disadvantage or unfair burdens.

Briefly, we have already implicitly accepted the idea that all legislative changes that affect our world economy are the prerogative of particular economic interests.

Only catastrophes are still able to regenerate the political momentum to break this pattern. The catastrophes create another variable: public outcry. The pressure that the public applies

can defy the monopoly of the powerful forces in the economic system. The Oil Pollution Act of 1990 (OPA) is a good example of a product of public anger. But this public outcry only exists during the short time of a crisis. (The word 'crisis' shows clearly that at that precise moment society does not fit in the balanced economic structure. Thus, these short moments of public outcry are not lasting).

Conclusion

The most commonly accepted solution to the ideological controversy discussed above is that the stringency of the liability should be allowed to vary according to circumstances. There may be no need to postulate a single regime applicable to all pollution injuries in all circumstances. The degree of risk posed by the polluting activity, and the social utility (or essentiality) of the activity are the primary factors to consider in determining whether a given activity should be subjected to fault, strict or absolute liability. Professor Goldie (Goldie, 1970) states that:

- risk creation
- risk exposure
- social desirability

must all be weighted as interrelated factors when determining the strictness of the liability to be imposed. In our case, it appears that:

- Before the 1960s (before the development of a strong environmental concern from the Torrey Canyon accident in 1968 and the Amoco Cadiz on the French Brittany coasts in 1978) risk creation and risk exposure were not perceived to be strong, and at the same time there was no restraint to the social desirability of this easy source of energy. This is why liability law for oil tanker accidents was not stringent.
- Since the alarms of famous oil spills such as those cited above and the Exxon Valdez spill in 1989, the risk created is perceived as important. Even if risk exposure, due to improved technology, has diminished, the social desirability of oil is more and more questioned, and some communities are ready to prove that they can live without it, or with less. Consequently, our model implies that the liability could be stricter and even absolute.
- The issue is to guess what these three parameters will be in the future. While the side effects of the world economic activity have more and more impact on the environment, the environmental concern is growing with time. Consequently, the parameter of risk creation can only be perceived as increasing. However, technical improvements, increased information and training of the crews will decrease risk exposure. As a result,

the future liability will mainly depend on the parameter social desirability. On one hand, if the whole community considers oil as necessary and is ready to share and bear the consequences of this dependence, the liability will also be shared between oil industry and society; on the other hand, if part of the world community does not consider oil as necessary and is not ready to accept the risk, then the oil industry alone will have to carry the burden associated with the risk it creates.

Note:
The oil industry and shipping companies will pass on the added costs of strict or absolute liability to consumers. Therefore, why does it make a difference to them whether their liability is fault, strict, or absolute?

- In the short term, the companies who have to bear huge costs for an accident may not make any profit.
- In the long run, a higher price for oil means that less oil will be consumed, either through the investment in more energy-efficient machines, alternative fuels, or simply through a decreased consumption (thus conservation). Consequently, less oil consumed means less revenue and less profit.

1.3.2 Limited v. Non-limited Liability

The issue of limited or non-limited liability is similar to the issue of the strictness of the liability.

- The former question was: should the oil industry pay for the risk it creates?
- The new question is: should society bear a part of the costs when these are too heavy for the private sector?

Two philosophies are in conflict. The first one says that the oil industry should pay for the total costs of the damages, and not shift part of the losses to the victims as it is the case with limited liability. The second one says that the pollution problem is an externality of the development of the world economy. In this case, the pollution problem is a burden that must be partly carried by the whole community. Moreover, the solution to this problem must be acceptable to the prevailing international economic structure.

The advocates of the second philosophy explain that a realistic approach must include not only the viewpoint of the polluted party or victim wishing to obtain full compensation for

the damage, but also that of the oil or shipping companies and their insurers.

- In view of the scale of the damage caused by the oil spills, the concerned industries claim the right to restrict their liability to a specific ceiling. Their justification is that businesses need to estimate the costs that may have to be born.
- Insurers moreover insist on a ceiling figure, which they need to calculate their premiums.

(However, it should be possible to limit the insurer's liability without limiting that of the insured. The underlying assumption appears to be that important companies should not, as a matter of economic policy, be exposed to non-insurable contingencies).

Such limitations represent a conscious decision to shift part of the losses arising from major accidents (the most expensive) to the victims, in order to protect socially useful enterprises from potentially crippling contingencies.

As we did above, we could develop a model that would assess the tradeoff between:

- the "social usefulness" of the concerned enterprises and
- the "society's willingness to bear the losses" in case of an accident.

1.3.3 Differing Social Values

i/ Dealing with social values

Environmental costs have not traditionally been an internal cost of doing business. Economists call them a "technological externality" or a social cost. To internalize these costs is an expensive and unsettling task, especially at the competitive international level. There are only two ways of motivating maritime governments to adopt costly environmental initiatives. The first one is political pressure from another state (pressure from the US on Mexico for instance). The second way, that we discuss here, is domestic pressure from the public. "Almost nowhere has the movement on behalf of the human environment originated within governments. Particularly in the more highly developed nations, concern for the environment has been thrust upon often reluctant governments by popular demand." (Caldwell, 1972). Public political pressure is the counterbalance to limited economic interests.

After the recognition of these social costs, the difficulty is to quantify them. The issue here is whether or not these costs can be assessed scientifically. The reason why ecological costs are not considered in international regulations is the lack of a scientific and economic basis

for them. More and more, these costs represent a large portion of the cost of an oil spill, and not accounting for them correctly is missing the real total cost of a spill. An indirect consequence of not assessing the right price of the spill is not giving enough incentives to prevent the spill, since all prevention investment is calculated on some cost/benefit analysis.

The characteristics of a social cost are its subjective (or social) values.

- What is the value that society attributes to the environment?
- What is the cost that society assesses for environmental damages?

It depends on which society we are talking about.

- Whether a society is rich or poor.
- Whether it is possible to calculate an objective, scientific value for the environment.

The following discussions focus on two particular problems linked with social values of first the developing countries and second, the United States.

ii/ The problem of environmental values in developing countries

There are probably no two countries in the world which have an identical scale of social values, although countries at the same stage of economic and social growth will tend to have very similar scales, for instance in Western Europe. The most fundamental of these social values are human health and safety. Safety standards, for example, reflect the value attached to human life. Safety standards do not have the same priority in all the countries of the world. We will see that one reason for the spotty performance in the enforcement of international conventions is that these conventions tend to reflect the value scales of rich countries, which are very influential, and not of the poor countries.

- *Developing countries' social values*

The overriding concern of the developing nations in international environmental negotiations has not been the quality of the marine environment. This they view as largely an issue for the rich. Rather, they have been primarily worried about the effect which pollution regulations could have on the future of their shipping industries and on their economic development in general. With limited capital resources and largely secondhand vessels, they have frequently proclaimed their opposition to regulations whose costs (Malgren, 1971):

- would curtail their maritime ambitions and
- would require a diversion of resources from higher priority objectives for economic development.

As one observer has noted,
"Capital investments for a cleanup for developing nations involve a direct tradeoff with increased employment opportunities or increased exports or other economic growth objectives which are necessary simply to sustain life. The quality of life issues for non-affluent countries will tend to take lower priority than the more immediate issues of economic survival."(Malgren, 1971).

Advocates of developing countries positions have three types of arguments:

- A way of lowering competitive position

Economically speaking, there is no more unfairness in the competition of sub-standard ships than in the competition of low paid labor, so long as the price paid for the labor is at least equal to its opportunity cost in its own country. Many developing countries feel that the attempts of rich countries to force identical standards of safety on all countries are a device to lower the competitive position of the poor countries; they see the insurance companies as collaborating in this effort.

- Imposition of alien values

Moreover, the safety standards and liabilities for environmental damage are only justified as corresponding to rich countries' social values. Some communities are more willing to accept ecological damages if those damages are necessary conditions that come with industrialization. Environmental concern is a matter of anticipation (since the damages to the environment are long-term effects) and the time scale of these communities is not always the same. For rich countries, the immediate future is not the main preoccupation, as opposed to the case of some developing countries. Their priorities are different and, consequently, their discount rates for the future are different. "The sacrifice of long-term sustainability for immediate economic returns implies a high discount rate" (Barbier, 1993 and Pierce, 1988). It is not fair that rich countries impose their social values on the other countries, where these values do not make sense.

- Lack of choice for developing countries

Furthermore, very often, environmental values are not a matter of choice for developing nation as it is for developed nations. Some countries can not afford an expensive fuel to obtain electricity to run their hospitals for instance. A necessary condition to have electricity may be to import oil in cheap unsafe tankers. As long as the behavior of communities is not dictated by desired social choice but by constraints, it is pointless to impose rules intended to shift behaviors.

However, these positions do not take into account the fact that pollution may have many short term economic drawbacks for developing countries:

- pollution destroys their fisheries, which in many coastal countries are a basic good
- pollution destroys their sources of tourist revenues.

These two examples show that pollution is not only a matter of social values or luxury, it can be a threat for the short term economic survival of developing countries. Missing this point, as political officials usually do until the point is made in reality, is missing an important aspect of the problem.

Moreover, the positions of developing nations described above is inconsistent with certain international activities that do not pollute one's own environment but another nation's environment. For instance, if a developing nation spills oil off a developed nation, the environmental values of the former have no relevance to the latter.

- *Impact of these social values on international conventions*

Relative to rich countries, developing countries pay little attention to environmental problems and thus to the IMO conventions; and when they do, it is their identification with the necessities of economic development, not oil pollution, that conditions their policy position. Their governments have more pressing demands on their limited financial and bureaucratic resources than compliance with international regulations.

The most serious effects of the attitudes of developing countries regarding compliance have been:

- The lack of interest on the part of the oil-exporting states to inspect tankers in their ports due to "the shortage of experienced and expert personnel to undertake the task of inspection of ships arriving to their ports" (Henry, 1985).

- The failure of all developing countries to build reception facilities in conformity with the obligations of the 1973 Convention. This failure will make it virtually impossible for many vessels to respect the discharge regulations (OECD, 1978).

Note:

The lack of interest developing nations show towards environmental matters is certainly not the most important reason for the difficulties encountered in achieving compliance with international regulations. The lack of financial resources, the lack of expertise and the difficulty in implementing codes that only have been promulgated in English and French (Henry, 1985) are other major reasons.

At the same time, at the conferences on liability and compensation, large numbers of the coastal developing states with minor shipping interests asked for higher liabilities. They were most often the victims of other people's spills off their shores, and they would be the major beneficiaries of higher compensation (Pearson, 1975).

- *Some solutions?*

One way for the developing countries to avoid the costs of international environmental regulations has been through their advocacy of a 'double standard' whereby requirements for environmental protection would not be as stringent for themselves as for the wealthier industrialized nations. The desirability of taking the level of economic development into account in setting environmental standards was accepted in the Stockholm Declaration on the Human Environment and at Rio for the UNCED. Principle 23 of the Stockholm Declaration states:
"Without prejudice to such criteria as may be agreed upon by the international community, or to standards which will have to be determined, it will be essential in all cases to consider the system of values prevailing in each country, and the extent of the applicability of standards which are valid for the most advanced countries but which may be inappropriate and of unwarranted social cost for the developing countries."

A justification for the principle is that:

"The developed states realized their greatest period of economic growth under conditions of completely free, laissez-faire access to international water. This provided them with a decided cost advantage. Now, if environmental constraints are to be imposed on all states, the developing states during their period of major economic growth will not enjoy that cost advantage. Indeed, it can be and is argued that their further economic growth will be penalized by the earlier growth of the developed states, and that therefore, the situation of an abuse of rights may be extant... Political realities demand that if developing states are to be asked to order their economic growth within established environmental limits, they should be compensated for the economic handicap thus imposed." (Hull and Coers, 1975).

On the other hand, there will be no sustainable growth for anybody in a polluted environment. "If the present growth trends in [...] pollution continue unchanged, the limits to growth on this planet will be reached sometime within the next 100 years" (Meadows,

1994). Saying that the right to pollute existed in the past does not mean that those who had no opportunity to exercise it then should be allowed to do it now. The technical environment of the major growth period of developed nations was not as hazardous as today's technologies. The idea of an "abuse of rights," based on a comparison between yesterday's laissez-faire policy and today's control of hazardous activities, seems to be a pretext to fight for a more economic competitive position by developing countries.

The issue of the economic progress of developing countries is the real and urgent concern, as only states with a sufficient level of economic security are able to integrate "ecological consciousness" into their policies.

There is a difficult tradeoff between:

- giving developing countries a "right to pollute" in order to allow them to be competitive and to reach the developed countries' living standards in the long term - if at all;
- the short term environmental necessities.

iii/ A justification for the unilateral action of the US

The US is conspicuously absent from the ratification list for the two international agreements, the CLC and the Fund Convention. According to observers at ACOPS (1990), "it was essential that the US ratify these protocols because they are structured in such a way that, without the participation of the US, which receives far more oil transported by ship than any other country, their criteria for entry into force for these treaties would be difficult to meet." With the implementation of OPA 90, it became extremely unlikely that the US would ever ratify the protocols as they stood, because the US would have had to lower the damage compensation available in case of a spill off the US coasts. Frederick Presley, staff attorney with the US Coast Guard Maritime International Law Division, said, "the passage of this bill [OPA 90] means there will be no involvement of the US in the international protocols in the near future." The 1984 protocols, which adopted a broader definition of damages and thus extended the scope of the liability, were more difficult to accept for most nations than the initial conventions. Without US ratification, the IMO became uncertain (after 1990) whether the 1984 protocols would enter into force in the foreseeable future. Eventually, they never entered into force.

All these observations tend to condemn the US for diverging from the international agreements by their unilateral action. The US chose not to sacrifice their environmental values.

Is this a selfish attitude, or does it highlight the need for a responsible global strategy in environmental matters? The American leadership in environmental protection gives the US the responsibility for promoting their social values, which are the sustainable values of the future. Unilateral action can be an efficient tool towards this objective. By its nature unattractive, unilateral action can be a constructive instrument to overcome the inertia of the status quo. It is an exceptional remedy, as it puts one value, environmental protection, above many of the others - maintenance of smooth shipping practices, collaborative interstate relations, and so on. As a result, the Americans used the unilateral action strategy, and it actually improved the quality of international rule-making at IMO. After all the interests were fairly and openly assessed, the unilateral action remained. In this light, unilateralism can be evaluated not as a defiant and impetuous breach of faith, but as a legal act resulting from the failure of other states, after sufficient opportunity, to fulfill their obligations (according to American values).

We have the duty to protect the international environment and inaction can be as wrong as action. From this perspective, unilateralism can be a contribution to world order, helping to overcome the obstacles inherent in a voluntaristic international legal and political system.

In conclusion, political strategies that can lead to greater environmental protection with reduced chance of confrontation must be pursued.

1.3.4 The role of science

As with most environmental issues, observers have been highly dependent on scientific analysis - rigorous and precise - for their identification of the problem and for their appreciation of its consequences.

Catalyzing political action

The following points show all the barriers to catalyzing political action.

- Scientific information is not enough to catalyze political action. Oil pollution has been varied in its impact. In localized areas it has had visibly damaging effects, although in most areas it has had a slow, incremental development, the sources and effects of which often have gone unnoticed by the public.
- Environmental issues need to have "the relevant data [...] politicized by mobilizing social interests of sufficient intensity to generate the process of public policy-making."

(Slouka, 1972). The problem is that scientific disputes over the long-term consequences of persistent oil have prevented any significant politicization of the issue, relegating it instead to specialized bureaucratic rather than political actors.

- The public shows a general lack of interest in or knowledge about scientific arguments. This problem is exacerbated by the fact that scientists do not make science understandable to common people.

To catalyze political action, the IMO has been extremely dependent on catastrophe. It was only with the disastrous Torrey Canyon accident that the oil pollution problem ceased being just a minor localized issue or a remote statistical trend and became instead a tangible political reality. This dependency on disaster is not a characteristic unique to IMO's environmental responsibilities. For instance, the first Safety of Life at Sea Convention, 1914, was drafted only after the sinking of the Titanic. Indeed, writing of the threat of nuclear catastrophe, Richard Falk has observed,

"Only a traumatic course of events provides the learning experience needed to bring about modifications in the organization and values underlying human experience. Educational efforts, appeals to history and reason, warnings about the eventual breakdown of the system and even crises at the brink are not able to overcome the rigidity of vested interests, habits of affiliation, and bureaucratic practice... World order goals remain abstract for people." (Falk, 1975).

The problem of the interpretation

It is not surprising that when conflicting scientific analyses emerge (as they often do, given the need to interpret data), governments tend to back those conclusions which support their existing policy preferences. As a result, scientific information itself frequently becomes a basis for bargaining between opposing interests rather than being treated as material deserving of objective, independent analysis.

Some UN agencies, fearing that scientific or technological arguments may be used to shore up policies motivated by other concerns, felt the necessity for independent scientific advice to emanate from the UN agencies themselves. In 1967 the Joint Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) was established. GESAMP was created by international organizations of governments to help serve governments. However, as Peter S. Thacher explains, "although GESAMP provided scientific advice to agencies, there was no means to coordinate all the information", given that "the problem of marine pollu-

tion was one of excessive compartmentalization; many separate bodies were responsible for pieces of what was essentially a holistic problem" (Thacher, 1993). No scientific information, considered partially (with one point of view on the problem) can be of objective value.

The problem of who has the burden of proof

Another important effect of differences in scientific opinion has been to create a fundamental conflict over the question of who has what burden of proof. Environmental problems often have a long-term subtle development, so environmentalists have argued that "to postpone action on environmental issues until all the evidence was in [...] could result in irretrievable failure." (Caldwell, 1972). The popular biologist Paul Ehlich warned that "the trouble with almost all environmental problems is that by the time we have enough evidence to convince people, you are dead."

Yet, the burden of proof is not on the polluter. As a result, those who are liable for the accident are reluctant to accept costly "solutions" to a problem they believe might not exist. Visible manifestations of coastal pollution, such as thousands of dead birds and dead fish did provide the impetus for the first oil pollution conference, but without obvious proof of the seriousness of oil's polluting effects, most participants were unperturbed. MacGarvin explains that the greatest barriers to action are "lack of awareness and inertia, not the means and economic cost" (MacGarvin, 1994). Anything short of visible, immediate catastrophe is equivocal and invites equivocal response. Meadows and Randers (Meadows and Randers, 1972) explained this problem as a consequence of the "mismatch between:

- the time-span of environmental problems
- the time horizons of institutions designed to deal with these problems," a product of the economic system which forces such behavior based on discount rates.

The precautionary principle

The difficulty in dealing with the scientific arguments is the uncertainty underlying all scientific research on environmental matters. The question arises as to whether it is possible to establish quantitative criteria for the concept of uncertainty.

A guiding principle is emerging today: the precautionary principle. As a new "customary" legal strategy, the precautionary concept merely "advocates a shift away from the primacy of scientific proof and traditional economic analyses that do not account for environmental degradation" as the environmentalist E. Hey said. The policy maker will rely on science not

as an absolute guiding principle but as a tool to help to better evaluate the risks and uncertainties. Because of the strong "positivist" culture of our technological society that relies mostly on objective scientific proof, it is not possible to rigorously apply the precautionary principle in the short term. But in the long run, the precautionary principle will be greatly needed to resolve international disputes about the interpretation of scientific data. It is built into recent international agreements from Rio (UNCED) and its aftermath.

In conclusion,

- will the precautionary principle be able to "institutionalize" caution?
- does it have the potential to act as a regulatory forcing mechanism?

This is uncertain. Even if the states take measures to prevent harm and to reduce and control pollution, in order to respect the precautionary principle, there would still be some risks associated with industrial activity. Applying the precautionary principle completely would actually require a very deep change at the source of the problem, which is in the consumer's behavior.

1.3.5 Which discount rate should be chosen?

One of the major items of controversy with respect to quantitative evaluation of the environment (cost/benefits analysis for environmental management) is the idea of discounting and the derivation of a discount rate. Decisions concerning whether to undertake projects with long-term benefits (for example, Research &Development investment in oil spill prevention) or with long term costs frequently turn on the choice of a discount rate. Economic arguments about the choice of a social discount rate can be differentiated into 5 categories:

- An infinite social discount rate should be used: only the values and needs of today's people are to be taken into account. The infinite discount rate has the effect of ignoring the future.
- The intergenerational (between generations) discount rate should be greater than zero, but less than infinity: the needs and values of people of other generations do matter, but less than the needs and values of today's generation.
- The intra-temporal (within a generation) and intergenerational discount rates should be the same; which means that the future, whether I am concerned or future generations are concerned, has a value. Future in itself is considered, not in relation to the people that may be affected in this future; this is why the same discount rate is used for the long

term and short term futures.

- The appropriate social discount rate is zero: today' needs and values are given the same weight as future ones; the future is considered as important as the present.
- A negative intergenerational discount rate should be used: we owe something to future generations, and because of uncertainty, we should give more weight to their future needs and values.

Many people have tried to justify one or another of these arguments. Lemons (1983) has placed the philosophical viewpoints on whether a duty to posterity exists into three categories (Lemons, 1983):

- No moral obligations beyond the immediate future exists;
- Moral obligations to the future exist, but the future is assigned less weight than the present
- Rights and interests of future persons are the same as those of contemporary persons."

This is an incomplete ranking and should also include:

- Moral obligations to the future exist, and the future is assigned more weight than the present.

This last point of negative time preference is very easy to prove experimentally: in any war or revolution, the people are ready to sacrifice themselves for a better world for their children. (However, just because they are willing to do this does not mean that they have the moral obligation to do so).

The list of these philosophical viewpoints prove how far away the question of quantitative analysis can lead us. The choice of a discount rate is a problem that still needs to be solved if quantitative analysis is the chosen method of environmental assessment.

2. Theory

The objective of this section is to explain the logic behind our proposed compensation policy. The goals and objectives that will be developed in the first part and the criteria from the second part will help to define an ideal policy. This "ideal policy" will be used as a reference point for a short term policy to be implemented as an interim while aiming for an eventual long term goal. The proposed strategy of the US National Oceanic and Atmospheric Administration (NOAA) is an example of a current short term policy. We will use the NOAA rules to provide us with guidelines to evaluate the acceptability of our own proposal.

2.1 Rationale for a new Framework : Goals and Objectives

The first question which we must answer is: *What goal(s) do we want to reach?*

The problem we face is the existence of externalities linked to an oil tanker accident. In this statement, the time continuity is interrupted by the occurrence of an accident. This discontinuity introduces two different goals in the management of our problem:

- the first one is a priori, before any occurrence of an accident
- the second one is a posteriori, after an accident has occurred

2.1.1 First Goal: Do Not Damage the Environment

Is risk accounted for?

An easy goal is a goal for which we can say: it has been reached, or it has not been reached, like Boolean variable. There is no ambiguity on the definition of its success or failure. Using the term "goal" for the proposition "Do not damage the environment" is very deceptive. It seems to suggest that we have the choice between damaging or respecting the environment, but often the choice is between one type of damage and another: if oil is not transported by sea, it will have to be transported by other means, and there will still be inevitable environmental risks linked to these other methods of transportation.

Avoiding oil transportation by any method that would imply the slightest risk for the environment would lead to a situation where you cannot transport any oil.

Considering that it is impossible to transport oil without any environmental risk, two questions arise:
1. Does it mean that we should not transport any oil, which means that we should not use any oil?
2. In the case we still want to use oil, how to allocate the risks among the different scenarios of oil transportation?

These questions reveal the need to account for the environmental risks, and to make decisions about risk allocation. Is it worth it to use oil?

We must here define the word risk. Risk is the decision to use an oil tanker knowing that there is a certain probability for an accident to occur. The uncertainty is whether the accident will occur or not, as opposed to the certainty of the probability of the accident. Usually, for any kind or risk, whether we deal with financial stocks, engine rupture or risky jobs, the risk is accounted for in the price: the more the engine may break, the less expensive it would be (or the less demand there would be for it at a given price); or the more risk you take in the stock market, the more return you want, or the more risky your job, the more reward you expect. In these cases, the market system articulates the prices, supply and demand and reflects the risk preferences of customers. Risk is allocated by the customers' values through the market system. In the case of tanker transportation:

- The risk of losing the tanker is accounted for in the price of the tanker: an old tanker, with a bigger probability of engine failure costs less than a brand new tanker.
- The risk of an oil spill is not accounted for in the price of transportation: whatever method of transportation is used, the price of oil is the same; the safety of transportation is not reflected in the price. The world society does not generally discriminate between risky tankers and safe ones, instead of refusing the risky ones and accepting the safe ones, as it would happen if environmental risk (risk of an oil spill) was regulated by the market system.

If environmental risk is not accounted for in the price of oil transportation, customers do not know about it, and do not take it into account in their purchasing choice. In order to account for this risk, the real costs of using common goods should be calculated and charged to the users, at the disposal end or use end of natural resources use. Consumers cre-

ate the demand for these natural resources and should be choosing to use oil (as opposed to other resources) based on these "real costs".

This concern was expressed in the User-Pays-Principle.

The User-Pays-Principle

Essentially, the User-Pays -Principle states that the price of a natural resource should reflect the full range of the costs involved in using it, including the costs of the external effects associated with exploiting, transforming and using the resource, together with the costs of future uses foregone. In the case of oil transportation by sea, the price of transportation, and finally the price of oil, should reflect the costs of the external effects associated with an accident, weighted by the risk of an accident.

The User-Pays-Principle is basically the underlying principle for the economies of all OECD countries. OECD now proposes to apply it as an overall guiding principle to the use of natural resources such as water, land and forests.

The User-Pays-Principle would be a major factor in:

- reducing resource use conflict: the less environmentally costly resource would be chosen by the final users through the market system, environmental costs being taken into account in the price of the resources (if there is a choice)
- improving resource use efficiency and thus decreasing the demand; an easy example is car engine manufacture: by experience, we know that there is a high correlation between the price of oil and the energy efficiency of car engines.

Need for risk prevention

The assumption of this demonstration is that risk is inherent to the use of the environment, in this case use of the ocean by oil tankers. This is true, since no human system can eliminate risk. However, risk can be lowered by:

- prevention
- development of less risky technologies, such as the transport by pipeline, which is much less likely to result in a spill than tanker transport (US Coast Guard, 1987. Data series).

Hence, the second objective drawn by our initial goal is that efforts must be made as much as possible to minimize risk. This means that prevention technologies (which includes adoption of less risky technologies) have to be developed. Strong incentives in this direc-

tion must be created.

The Tragedy of the Commons

We understand the need to institute risk prevention. But why do we need incentives to encourage the companies to improve their service? In a normal market system, the companies would naturally tend to decrease risk of accidents and damages and to increase reliability and good service. Not in this case: here appears the Tragedy of the Commons. If the company invests in oil spill prevention, the benefits of the investment will be spread over the entire community. Yet, if it does not invest in such prevention, and if as a result there are pollution damages that affect common property, the cost will fall on the entire community too. There is no incentive for companies to try to prevent oil spills.

Conclusion:

The initial goal "Do not damage the environment" is an ideal. In order to be usable within our economic system, we need policy-oriented objectives. Consequently, we arrive at the two objectives:

- Risk prevention must be developed.
- All costs related to environmental risk and unintended (non-negligent) environmental damages must be born by consumers; all costs related to damage prevention must be born by consumers.

2.1.2 Second Goal: Restore Completely when Damages have occurred

The importance of restoration (including clean up)

Restoration is a crucial component of efforts to reverse the effects of coastal pollution; it is the only activity that directly addresses environmental harm caused by humans. All other policies (prevention, standards setting, fines, etc.) address the potential for harm and give incentives not to harm, but do not address the damages when they have occurred. By rehabilitating or replacing resources, restoration offsets the pressures put on our coasts and helps ensure that valuable resources will be available to future generations.

Indeed, the scope of the damages resulting from an oil spill is so large (after the Amoco Cadiz oil spill, 180-200 miles of marshes, sand/gravel beaches, tidal mudflats, exposed rocky shores, salt marshes, and piers in 76 different Briton communities were oiled) that these damages cannot be ignored with a fatalist attitude if we want to leave valuable re-

sources to future generations.

"In restoration, not only are abuses halted, but the resource itself is physically repaired, and, if necessary, its missing components are replaced [...] While certainly no longer in a pristine state, the restored resource becomes healthy, life supporting, and pleasing to the eye. In this condition, the resource provides a sound basis for the creation of new jobs and prosperity." (J.J. Berger, Restoring the Earth).

How to clean and restore?

In 1993, Judith Kildow wrote in the Technology Review:

"At present, both large and small spills are cleaned up the same way: with methods that are woefully out of date and abysmally inefficient. Emergency workers attempt to contain a spill with booms and then deploy skimmers and pumps to suck up floating oil, sometimes using chemicals to simply disperse the damage." (Kildow, 1993).

In the best circumstances, only 10 to 20% of the oil can be recovered. Oil that reaches the beaches is scrubbed off with water or steam jets, and often soaked up with absorbents. These cleanup techniques, particularly steam and chemicals, harm the environment out of all proportion to their benefit. Lately, however, some important improvements have appeared in clean up and restoration technologies, in countries such as the US where the emphasis has recently shifted towards restoration.

It took a long time for the adoption of valuable technologies for clean up and restoration because of the political process. In the 70's, following the first major oil spills, research was developed to implement and improve oil spills response and oil spills clean up technologies. The issue after an oil spill had occurred was: how to make the clean up work? However, in the 80's, the concern shifted towards the political process instead of the restoration process. The issue after an oil spill had occurred became only: whose fault is it? The consequences of this shift are:

- a lot of energy is spent on inquiring and discovering the blame
- the guilty party is more preoccupied with justifying itself than with restoring
- the potentially guilty parties have no interest in spending money for research on clean up technologies: once the accident has occurred, no credit can be obtained for good restoration.

Consequently, it is crucial that one of the objectives of our policy be strong incentives to

develop clean up and restoration technologies.

Conclusion:

We arrive at two clear objectives:

- Restitution of natural resources and/or services through restoration if possible and other means if restoration is not possible
- Continue to improve clean up and restoration technologies (thus better knowledge of the environment).

2.2 General Rules for an Acceptable Framework: Criteria

The question we must answer here is: *What criteria should our proposed policy respect?*

In order to build an international framework which would meet these goals, we need criteria which would restrict the number of possibilities and make our proposal acceptable.

The criteria that we must consider in setting up a proposal belong in many categories:

- respect for human values
- operational feasibility, from the points of view of the administration, the economic system, the social system, etc.
- compatibility with the goals

2.2.1 The OECD Criteria

OECD (1991a) suggests the following five sets of criteria for the choice of environmental policy instruments:

- (1) Environmental effectiveness: The environmental effectiveness of economic instruments is mainly determined by the ability of polluters to react. The primary objective of economic instruments is to provide a permanent incentive to pollution abatement, technical innovation, and product substitution.
- (2) Economic efficiency: In a broad sense, economic efficiency is achieved by an optimal allocation of resources; in a limited but more operational sense, it implies that the economic cost of complying with environmental requirements is minimized.

- (3) Equity: Distributive consequences vary according to the types of policy instruments applied. For example, pollution charges or taxes entail additional payment on the discharge of residual pollution; additionally their distributive impact would depend upon how the revenue from these charges and taxes is used. Similarly, with marketable permits, the distributional effects will differ according to their initial allocation.
- (4) Administrative feasibility and cost: All types of policy instruments involve implementation and enforcement structures. This relates in particular to the ease and cost of monitoring discharges and the number of target groups involved and also upon the nature of existing legal and institutional settings.
- (5) Acceptability: It is of crucial importance that target groups be informed and consulted on the economic instruments imposed on them. In general, the success of any (economic) instrument requires certainty and stability over time with respect to their basic elements.

2.2.2 Practical Criteria for our Proposal

The above criteria do not address specific issues and provide only general concepts. These concepts, in our particular case, can be expressed through the practical criteria discussed in this paragraph.
The criteria were chosen to meet the following requirements:

- universal acceptance
- compatibility with our goals
- operational basis.

The following criteria will be applied to the proposal:

- The polluter-pays principle
- No rigid quantitative criteria in the proposal
- The party with financial responsibility manages the costs
- Respect for all values: use and non-use
- Respect for each individual's values for the environment
- Respect for implicit property rights
- Subsidiarity principle
- No quantitative assessment of subjective values

- No geographical discrimination due to the differences in wealth and living standards (North v. South)
- The nationalities of the tanker or cargo owner do not matter

i/ The polluter-pays principle

The polluter-pays principle is very well known. It was first adopted in 1972 by OECD as a fundamental principle for allocating costs of pollution prevention and control measures mandated by the public authorities in member countries. Principle 16 of the Rio Declaration highlights the essential features of the polluter-pays principle as:

"National authorities should endeavor to promote the internalization of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade in investment." (Distr. General A/Conf.151/5/ Rev./13 June 1992, Original English Agenda item 9, Principle 16).

The rationale for deciding that the polluter should pay is:
- The polluter is the most able to prevent the occurrence of an accident.
- The polluter can pass along the costs of any accident which occurs to users (internalization of environmental costs).

This decision may seem to be obvious; however, as discussed in the section on fault v. strict v. absolute liability and limited v. unlimited liability, it is controversial whether the burden of the damages should be on the companies who created the risk of damages or on the entire society. We decide that whether the damages result from the polluter's fault or not, the polluter will still pay. Indeed, in all cases, the costs would finally be carried by the users, who implicitly accepted the risk created by their demand. Furthermore, the polluter is still the one who has the most control of business risk, and thus can invest in order to reduce this risk. Briefly, the polluter has absolute liability for any kind of accident.

The polluter-pays principle meets the following OECD criteria:
- Environmental effectiveness: the polluter-pays principle gives incentives for the polluter to spend on prevention.
- Equity: the costs are passed on to the users through the polluters so that only the users pay.

ii/ No rigid quantitative criteria in the proposal

Flexibility in the process to reach a goal allows project managers to decide on the optimal means. A rigid frame of action only increases the constraints and thus increases the chances to miss a better alternative. In implementing an international policy instrument, OECD suggests that strict uniformity may be unnecessary and even undesirable:
"Taking due account of diversities between different countries and regions is, in fact, an important condition for efficient environmental management, both at a national and an international level, since each policy must fit as much as possible into the environmental conditions, social preferences, and economic structures prevailing in each country." (OECD, 1991b).

For instance, suppose that the objective is the restoration of a beach. Requiring the completion of the restoration within one year is not optimal if the marginal cost of completing the restoration within one and a half years is very negative. It would certainly be better to plan a more careful, cost-efficient restoration plan over one and a half years in this case, than a quick, careless and expensive one year restoration.

This proposition meets the following OECD criteria:
- Economic efficiency, by attempting to reach an optimum.
- Environmental effectiveness, by providing incentives for the technical improvement of restoration and for innovation in the washing and rehabilitation processes.

iii/ The party with financial responsibility manages the costs

The inspiration for this criterion is nearly the same as for the preceding criterion.

- In the former criterion, no quantitative requirement is imposed on the management of the project; only achievement of the goal is taken into account.
- In this case, no requirement is imposed on the management for the costs of the project: once again, the conformity of the results with the goals is the only valid method of measuring the performance.

Organizations or systems in which the cost manager is not financially responsible provide little incentive to be cost efficient. The fear that the payer will try to save on his/her budget without giving too much consideration to the achievement of a goal in which he/she has little interest, is the reason why it is often decided that the payer and the manager will be

two different parties. In our case, it is more efficient if the party with financial responsibility manages the costs. Of course, in this situation, the condition for this criterion to be goal efficient is that the payer considers as his goal that of the project he has to manage.

This criterion provides for the following:

- Incentives to spend efficiently as required by OECD economic efficiency criteria.
- Acceptability.

iv/ Respect for all values: use and non-use

The total economic value of a resource is divided in two parts:

- A use value is the direct value of the services the resource provides, such as the recreational use of a beach.
- A non-use value is the intangible indirect value the public ascribes to the existence of the natural resource, whether or not society uses it for any purpose, such as the value of a remote nesting area for marine mammals.

Each of these branches can also be sub-divided in different nuances:
The use value can be:

- a primary use value derived by the direct use of the asset, such as fish caught from the ocean;
- a secondary use value derived by the indirect use of an asset, such as sea-food restaurants who indirectly use the presence of the ocean;
- an option value, which is the option to use the asset in the future.

The non-use value can be:

- A bequest value, which is the value individuals derive from ensuring that a resource is preserved for use by successive generations. This is a non-use value with respect to the present generation, but will become a use value for future generations
- An existence value. Individuals may express a value for things which are considered to have no use value for themselves or future generations. This is a value expressed purely for the continued existence of the asset. For example, individuals may express a value for the preservation of a species of deep ocean plant life simply because they believe in the preservation of all flora and fauna.

<u>Slightly different definitions:</u>

In *Ohio v. Department of the Interior*, the Washington D.C. Circuit Court defines "use values" slightly differently. The definition broadly encompasses both direct use and passive-use values.

Direct use values are defined as "the value individuals derive from direct use of natural resources, including consumptive uses, such as fishing and hunting in which resources are harvested, and nonconsumptive uses in which the activity does not reduce the stock of resources for others at another time, such as bird watching and swimming." Passive use values are defined as "the values individuals place on natural resources independent of direct use of resource by the individual, including: the value of knowing the resource is available for use by family, friends, or the general public; the value derived from protecting the natural resource for its own sake; and the value of knowing that future generations will be able to use the resource."

The temptation of economists is to neglect non-use (or passive-use) values, since they are not easily quantitatively assessable. However, it is obvious that in the economic sense we derive utility from existence and bequest values.

- The desire to leave some assets to one's heirs has a long history as the strongest incentive for individuals to fight.
- Moral, idealistic, religious and mystic beliefs, which give existence values for cities, buildings, natural sites, and many other assets, have been the justification of human existence since the beginning of humanity.

These are convincing examples of the necessity for not leaving out non use values compared to use values.

This criterion is important to ensure equity. For instance, it is equitable that not only people suffering from monetary losses be considered, but also people suffering from emotional losses.

v/ Respect for each individual's values for the environment

The right to a healthy environment is becoming a human right. As an illustration, here is the first part of the first principle of the Stockholm Declaration in 1972:

"Man has the fundamental right to freedom, equality and adequate conditions of life, in an environment of a quality that permits a life of dignity and well-being, and he bears a solemn responsibility to protect and improve the environment for present and future generations."

This indicates that the relationships between the individuals and the environment are becoming more recognized as a human value and are to be respected as such. Consequently, whenever the environment is at stake, all individuals' voices must be listened to. Now the difficulties start: we have to consider these different values all together, since they all concern the same environment. How do we account for all of them?

Let us consider a site which must be restored. In order to know the scope of the restoration, some individuals are asked to express their subjective values for the site.

- Aggregating these values would mean that a site well known by two million people would have ten times more value than a site visited by two hundred thousands people!
- In contrast, we assume that the valuers are revealing the value they think belongs to the site: the values given by the individuals are a reflection of the value these individuals believe the site to have.

This last procedure is like the one we use if we have a precious stone valued by a number of experts. They may not agree precisely on the value of the stone, but the average of the values they assessed can be considered as a reasonably good approximation to the stone's value. The procedure of multiplying their valuations by the number of valuers would give a result with no significance. This example is given in the proceedings of a workshop held at Lugrove Hall, Middlesex Polytechnic (Coker, 1992).

In conclusion, we consider that humanity gives its value to the environment. "Humanity" means humanity at large: past, present and future generations. Humanity can be represented by one individual or by a crowd. Whenever one or many individuals assess a value to an environmental good, this value has to be respected as the value humanity gives to this environmental good.

This allows us to consider the value given to barely known places in the Antarctic Ocean, or to places which only have value for few poor communities living there, etc.

This criterion is crucial to ensure OECD equity criteria.

vi/ Respect for implicit property rights

"Traditional commons like meadows, woods or coral reefs used to be the property of an identifiable community. Right of access was restricted to members. Within the community, social rules regulated use in the interests of the members and of the sustainability of the resource. Management failures can often be attributed to the misperception that the commons belonged to everyone, ownership being consequently vested in the State. The result was a loss of information as well as incentives to manage the resource in a sustainable way" (Dommen, 1993).

Here is an illustration of this deep frontier in today's regulations between what is considered as valid property rights and invalid property rights. In the US, most courts hold that maritime tort law permits recovery of physical loss to a proprietary interest and for economic loss accompanied by such physical loss. The majority of the circuits do not allow recovery under maritime tort law for economic losses when the party seeking to recover those losses has not suffered physical damages to proprietary interest. An exception has been carved out of this rule in favor of commercial fishermen who may recover the revenue foregone as a result of an oil spill, but shipping and other shipping type interests that are unable to traverse the area of the spill cannot assert a claim under US maritime tort law.

Beyond the social issue, there is an economic issue in not recognizing property rights to communities on commons. Most people agree on the following two statements:

- Owners have an interest in defending their property
- Those who directly use a resource get to know it well, and so have some of the knowledge necessary to restore it when it is damaged.

Recognizing ownership rights in favor of the users, which is an aspect of the Subsidiarity Principle explained below, is a way to ensure that information exists on the property and is used correctly. When management requires complex knowledge and experience at a local level, if there is a group that has been exploiting a common property resource, then denying property rights to it would result in loss of output and consequent loss of welfare for the whole community. (For economists, this would be a movement away from the Pareto frontier, where the Pareto frontier is the locus of all the points of optimal social welfare.)

The management of resources outside the market is particularly an issue for the poor. Poor

communities often have sophisticated mechanisms for managing the resource base on which they depend entirely. When these non-market forms of resource use are considered within a development or restoration or any "outsider" process, full weight must be given to "traditional" forms of resource management.

This criterion ensures that two of the OECD criteria are specifically respected:

- The OECD equity criteria.
- The OECD economic efficiency criteria. Recognizing the property rights of the group that has been exploiting a resource will helps in acquisition of the knowledge and experience of this group. This knowledge and experience is needed to manage the resource efficiently.

Note: There is no discrepancy between respecting property rights and respecting all individuals' values for the same property (officially a common property). Indeed, most of the time, the individuals who express their value for a common property resource are those who have an implicit property right to the commons. Value conflicts must consider the impact of the use of the property on the users' lives. Very often, one of the users is far more deeply involved with the resource than the other ones. For instance, the fishermen who live in a village in the coast are more concerned and impacted by an oil spill off their coast than the tourist who may come one week per year to enjoy the beaches.

vii/ Subsidiarity Principle

The policy that we will propose certainly involves environmental projects. This principle ensures that the actors and the issues of these projects will allow their success. The adequacy and success of the projects coming out of a policy are a necessary condition for the validity of the policy. Some of the greatest failures of development or restoration policies are mega-projects which have no actual roots in the environment where they happened to be planned by a centralized bureaucracy or even worse, a foreign enterprise. Development or restoration projects would be better achieved by fostering small projects involving the self-interest and self-help of the local people. This is a form of subsidiarity and this concern has been expressed in the Subsidiarity Principle.

The essence of this principle is that political decisions should be taken at the lowest possible level, or level closest to those who are affected.

A reference to the subsidiarity principle can be discerned in principle 10 of the Rio Declaration, which states that "environmental issues are best handled with the participation of all concerned citizens, at the relevant level." Currently, the subsidiarity principle reflects normal management practice. More fundamentally, it requires popular participation; it aims to ensure that local interests are articulated and incorporated into the decision-making process. In this regard, Jacques Delors, President of the European Commission, stated in his speech in March 1991 "Subsidiarity arises from a moral demand which makes respect for the dignity and responsibility of the people who compose it the objective of every society [...] it is also an obligation for a superior authority to act regarding that person or that community so as to give them the means of their fulfillment."

Beyond this recognition of the subsidiarity principle, its literal application causes controversy. The following reasons favor high-level (international level) regulation:

- The need to induce reluctant states to adopt more stringent measures
- The need to manage resources situated within several states or several communities or in areas beyond the limits of national jurisdiction
- The need to avoid distortions of competition due to different environmental costs.

The counter-balancing reasons for respecting the Subsidiarity Principle follow:

- The greater potential of enforcement action taken close to the source of a problem
- The need to take land-use and water-use decisions locally and with the participation of those concerned
- Acceptability of decisions.

Since application of the Subsidiarity Principle is quite likely to result in different groups making different decisions on similar problems, the Subsidiarity Principle gives more importance to each community's values than to a universal statement of values. In this sense, the Subsidiarity Principle contains two of our previous criteria:

- Respect for each individual's values for the environment
- Respect for Implicit Property rights.

The application of the subsidiarity principle ensures:

- Economic efficiency (OECD criterion 2)
- Equity (OECD criterion 3)
- Acceptability by the concerned populations (OECD criterion 5).

viii/ No quantitative assessment of subjective values

One of the previous criteria takes into account use and non-use values. Two possibilities exist to account for values which cannot be assessed by the market system.

- Assess a quantitative value to each subjective value, in order to be able to compare them with any other quantitative values.
- Do not assess a quantitative value for any subjective value; instead express these values in their own units in order to compare these values among themselves.

The following examples show that it is not possible to coherently and consistently substitute a quantitative objective value for a subjective one.

- First example: A Beach

Imagine a small hidden beach in which I treasure the solitude and the connection to nature I have found there since childhood. It is impossible to assess any value to this beach. First, its market value is zero: nobody knows about it, nobody wants it. Second, the value of any other beach is incomparable to the value of THIS hidden small beach of which I am so fond. Third, if an oil spill occurs and destroys it, no amount of money can provide an equivalent for me: the qualities I liked in this small beach is intrinsically linked to its existence. When a value is linked solely to the existence of a particular asset, the rate of substitution of this asset by money is infinite (the utility I derive from the asset is its existence).

- Second example: Bird Species

Let us suppose that environmental issues have value to me. Consequently, I am ready to pay $100 to save a bird species from extinction; but for some reason, this is not practicable. It does not follow that there will be some sum, $100 or less, that will compensate me for the failure to save the bird species. The situation is not one where compensation is relevant. It is clear that I am affected by the failure, since I would be ready, if it were possible, to invest my money in the environmental value; but receiving any quantitative compensation for the disappointment and sadness I feel not to be able to help does not make sense. For many other similar values (for instance, humanitarian), quantitative compensation is not relevant.

John O'Neill, in his article *Cost-Benefit Analysis, Rationality and the Plurality of Values*, defends the plurality of values (not only monetary) and examines the consequences of admitting that "a common unit of value" (O'Neill, 1996) does not exist. A summary of his

opinion is:

"Critics of cost-benefit analysis have often called attention to the difficulties of quantifying environmental "goods' and "bads" consistently. Intractable as these problems are, however, they result from a more general confusion between rational decision-making and calculation which afflicts most orthodox twentieth-century economics. This confusion is tied to an institutional framework which frustrates the full use of rationality in environmental choice. Current efforts to "green" economics should abandon the attempt to commensurate plural values and focus instead on the institutional conditions which enable individuals and groups to treat the environment in a prudent and sensitive way" (O'Neill, 1996).

The practical implications of this criterion are:

- Any method such as Contingent Valuation (CV) or Willingness-to-Pay studies are not considered valid.
- Only costs actually incurred have to be paid for.

This last point emphasizes a conceptual implication of the criterion: money is not used as a compensation for a non-marketable good and is not considered as the universal good in the proposed bartering system. The criterion recognizes that money cannot be used to trade for everything. Human values, for instance, such as love, justice and suffering cannot be traded for money. Intending to compensate for these values by money would empty them of their essence; it would destroy them. Some people, alienated by material necessities, would be ready to accept this destruction in order to receive compensation. Nevertheless, the duty of policy-makers is to respect the essence of these human values and not to accept that they are themselves alienated.

This criterion is justified only because it makes the policy proposal acceptable from the industry point of view. It ensures the respect of the OECD acceptability criteria. Moreover, it helps ensure that OECD "administrative feasibility and cost" criteria are met. Indeed, the interdiction of any quantitative assessment of subjective values eliminates any use of CV method, or Willingness-To-Pay studies. (These methods can be as expensive as the costs of the damages they assess).

ix/ No geographical discrimination due to the differences in wealth and living standards (North v. South)

Some previous criteria, such as "Respect for all values: Use and Non-Use" and "Respect of each individual's values for the environment" require avoiding discrimination between different types of values and between different individuals. The environmental values of the people living in developing countries (those in the South) are respected as much as the environmental values of the people living in developed countries (those in the North). The problem is that people from the South seem to give less value to the environment than people from the North. The remainder of this section explains this apparent difference.

South and North have different priorities. In the scale of the social and individual needs, the needs to eat and to feel security come before the need for a clean environment. For example, very few people care about pollution during a war. Once their basic needs are fulfilled, people start devoting their time to less urgent needs. Consequently, in the South, the presence of more basic needs hides their environmental need, but this need exists at least as great as in the North.

Briefly:
In the North, the need for a clean environment is high relative to other needs, since most high priority needs have already been fulfilled. In the South, the environmental concern is low relative to other short-term vital concerns. But in absolute value, the environmental concerns of the South may be higher than those of the North, because technically sophisticated societies tend not to be as near to nature as traditional societies. This implies that there should be no environmental discrimination between North and South.

This criterion is important to ensure equitable treatment.

x/ The nationalities of the tanker or cargo owner do not matter

It is vital to avoid any discrimination that might occur as a result of the apparent difference in environmental values between different countries.

- The concern of the previous criterion was distinction among communities that are potential victims of environmental damages (geographical discrimination)
- The concern of this criterion is distinction among polluters: those who are required to assume responsibility, because of national values, company reputation or media pressure, and those who do not feel the same necessity to assume responsibility. For instance, an oil company doing most of its business in a country like Germany must manage an oil spill in the most environmentally friendly way because of public and me-

dia pressures. These pressures might not be present in a country like Saudi Arabia.

The discussion in part 1 showed how it was difficult to impose the same requirements on all companies, whatever their nationality. The controversy is over whether it is necessary for developing countries, whose economies have yet to catch up with the industrialized ones, to pay for the full cost of energy (including the environmental cost).

Our proposal adopts the position that the same requirements should be imposed on all companies, whatever their nationality is. The nationalities of the tanker or cargo owner do not matter. This point of view is justified by Robert Repetto, from the World Resources Institute, who explains that the development of developing countries do not require that energy be cheap: "In all countries, and particularly in developing countries, the scope for economically and technically feasible investments in energy efficiency is large [...] Promoting energy efficiency requires governments to reduce energy subsidies [...] The belief that cheap energy is essential for economic growth is behind energy subsidies, but low energy prices typically mean low and stagnant energy efficiency, not rapid economic growth. On the contrary, many countries have achieved rapid economic growth since 1973 with relatively high energy prices and little increase in energy consumption" (Repetto, 1990).

In conclusion, the requirements of our international framework is not affected by the nationalities of the parties. It seems fair that whoever the responsible party may be, the same victims and the environment in the same circumstances should receive the same care. This ensures the OECD equity criteria are respected.

2.3 An Ideal Proposal

2.3.1 The Proposal

In the case of an oil spill, the parties involved must go through the process of damage assessment and liability compensation described according to the following rule.
The different descriptive sections of this rule are:

- the parties
- the objectives
- the procedures
- the liabilities and responsibilities

i/ The parties

There are three main parties involved in this process of damage assessment and liability compensation. They are:

- the Responsible Party, or RP. The RP is the operator of the ship from which the oil was spilled
- the victims of the damages or affected populations or more generally the public
- the scientific experts on oil spill cleanup and on restoration, who are accountable for the whole process described in this rule; also called the trustee(s).

ii/ The objective

The objective of the process is double:

- to completely restore the environment (to reach total recovery)
- to provide the public with 'equivalent' resources or services during restoration. Equivalent services will be provided when it is impossible to provide with equivalent resources.

This objective is reached through the implementation of a restoration plan.

iii/ The procedures

The process must be composed of three phases:

- The preassessment phase

During the preassessment phase, trustees (and RP if he/she participates) determine, based on the circumstances of a given incident, whether a restoration plan is justified.
Other matters considered during the preassessment phase include:

- data collection
- notice of intent to conduct restoration planning and opening an administrative record
- conduct of any necessary emergency restoration

- The restoration planning phase

The tasks of the restoration planning phase are:
1. To understand the impact of the incident on the environment and on society through adequate environmental and social impact assessments.
2. To develop alternatives to address:

- the environmental injuries if primary restoration is possible and

- the social impacts of the incident through compensatory restoration if primary restoration is not possible.

The method used to develop those alternatives must be the resource-to-resource or service-to-service method. No quantitative assessment is needed; no quantitative methods should be used as criteria for decision-making.

3. To understand the impact of the restoration alternatives on the environment and on society, through adequate environmental and social impact assessments.

4. To choose a restoration alternative, through a panel decision-making procedure. The panel must be composed of the three parties.

- Restoration implementation phase

After the selection of the restoration plan, the trustees must address three different issues: the administrative issue, which means closing the previous administrative record and opening a new one; the financial and liability issue, which has not been addressed until now, and which consists of presenting a demand for damages to the RP; and the implementation operations, such as monitoring and implementing corrective actions. There must be continuity in the procedures and criteria used for assessment and monitoring.

iv/ The liabilities and responsibilities

Four main points must be emphasized:

- The RP is liable for paying for the costs of assessment and implementation of the restoration plan. Regarding the restoration phase, costs must be paid as they are incurred.
- The trustee is accountable for the equity, environmental effectiveness, economic efficiency and acceptability of the restoration plan.
- The RP can participate in all the phases described above.
- The RP commitment and the public participation are necessary conditions for the achievement of the objectives of the process.

See 2.5.3 for comparison between our proposed policy and NOAA policy.

2.3.2 Respect of the Goals

First Goal: Do Not Damage the Environment

We consider the two objectives that we assigned to ourselves as steps towards this goal, and how the proposal meets them.

i/ The full cost of the use (and thus risk and damage) of the environment must be paid for by the users (who indirectly are also the risk-takers and the polluters)

The key elements must be considered:

- The Responsible Party, who will pay for the damages, will necessarily impose the cost of restoration on its consumers, who are part of the users
- The involved companies (oil and shipping companies) by investing in prevention, development of spill clean-up technologies and restoration know-how, will impose these expenses on their consumers, thus making the oil price higher because of its environmental risk.
- There is no different treatment for different cargo owners; the same policy will be implemented for the international community of cargo owners. This means that the users cannot escape paying for the damages by choosing a company of a certain nationality. (The international community should make sure that all the shipping companies have the adequate funds to face liability).

ii/ Risk prevention must be developed

When an incident occurs, the RP incurs three types of costs:

- the restoration costs (directly in monetary value)
- the costs of the procedure: paying for the assessment, and paying for the time spent in negotiation, implementation, etc. (directly in monetary value)
- the costs of having a bad image and of bad publicity (not directly in monetary value)

For the RP, this is an incentive to spend at least as much as the cost of restoration on prevention. This is an incentive for a more rational management of the corporate spendings, which is spending ex ante an accident instead of ex post.

Second Goal: Restore Completely when Damages Have Occurred

We consider the two objectives that we assigned to ourselves as steps towards this goal, and how the proposal meets them.

i/ Restitution of natural resources and/or services through restoration if possible, and other means if restoration is not possible

The primary objective of the process is the exact expression of this goal.

ii/ Clean up and restoration technologies and better knowledge of the environment must be developed.

The spill clean up and restoration costs incurred by the RP are likely to decrease if clean up and restoration become more efficient. This is an incentive for the RP to develop clean up and restoration technologies.

2.3.3 Justification of the choice of the Proposal/Respect for the Criteria

The criteria examined in part 2.2 are given in italics. The proposed rule must meet these criteria.

i/ The parties

The RP is the polluter. In conformity with *the polluter-pays principle,* he/she is a party in the restoration process.

The victims are a party. A victim is not only any person who can no longer use an environmental resource that was damaged, but also any person who feels affected by the environmental damages. In other words, the rule *recognizes implicit property rights.*

ii/ The objectives

The objective makes it clear that either the resources themselves or the services they were providing are restored. The concept of services embodies all the possible utilization of the resource (active and passive or use and non-use). All values are taken into consideration, or in other words, the rule implies a *respect for all values: Use and Non-Use.*

iii/ The procedures

No quantitative assessment is needed; no quantitative methods should be used as criteria for decision

Our proposed rule will make it necessary to assess subjective environmental values (indeed, *use and non-use environmental values must be taken into account*; and non-use values are subjective since they are not valued by the market system). Our criterion: *no quantitative assessment of subjective values* requires that the methods used for assessments are not quantitative.

Resource-to-resource assessment

It is the most adequate assessment to compare injuries and benefits in the ideal world. The ideal world is a world where all injuries can be repaired and where there exists an equiva-

lent for all environmental goods. Then a resource-to-resource analysis is like a cost-benefit analysis where:

- the cost is the dollar cost of restoration and/or of providing an equivalent, for a damaged specific resource
- the benefits are the restored particular resource and/or the equivalent for this particular resource, expressed in environmental unit (the resource itself). The damages of this specific resource are expressed in the same environmental unit.

With the constraint that benefits are at least equal to damages, the costs can be minimized.

Instead of considering the resource itself, the resource can be considered as the provider of a service. In this case, the objective of restoration is to provide the same service or an equivalent. The same analysis as the resource-to-resource can be performed, replacing the item resource by service.

This method allows us to compare costs and damages or costs and environmental benefits of restoration regardless of the "price of money" in the place where the incident happened, or in other words, without considering the living standards of the populations affected in relation to the restoration costs incurred. Thus, this method respects the criterion: *no geographical discrimination due to the differences in wealth and living standards (North v. South)* Moreover, the qualitative characteristics and the flexibility of this method meet the criterion: *no rigid quantitative criteria in the proposal.*

Panel discussion and negotiation

"When a new development is proposed that would significantly affect an area that is regarded as *sensitive* because of its special value, there is a potential conflict that involves three groups: those who would gain from the proposal, those who would lose, and those who have the jurisdictional responsibilities for the area. Thus, there is a strong incentive to adopt a procedure for mediating the conflict." (Stauth, Sowman and Grindley, 1993). In our case, the first part of the *new development* is already present: it is the consequences drawn from the oil spill. However, the second part of the "new development", in other words the restoration project, is still to be negotiated. We will evaluate our proposed "procedure for mediating the conflict" based on the three criteria established by Susskind and Cruikshank (Susskind and Cruikshank, 1987):

- Fairness

"In a public dispute, a good process produces a good outcome; and a better process a better

outcome. A process is fair if it is perceived to be fair by the disputants and the community at large" (Susskind and Cruikshank, 1987).
Our panel decision-making (where the public is a member of the panel) implies that:

- the process is open to public scrutiny
- all the groups who want to participate are given a chance to do so
- all the parties are given access to the technical information they need
- everyone is given an opportunity to express his or her own views.

The fairness of this process ensures the fairness of the decision.

- Efficiency:

A fair agreement is not acceptable "if it takes an inordinately long time to achieve, or if it costs several times what it should have. [...] A better process produces a more efficient as well as a fairer outcome" (Susskind and Cruikshank, 1987).
Indefinite delays can be caused by excessive appeals or unclear delineation of decision-making authority. Participation in a decision-making process provides the participant with a sense of ownership over resulting agreements or decisions. With this sense of ownership comes support for its implementation and, ultimately, the achievement of an efficient decision.

- Stability:

"An agreement that is perceived as fair, is reached efficiently, and seems technically wise is nevertheless unsatisfactory if it does not endure" (Susskind and Cruikshank, 1987).
A forum in which participants can cooperatively raise and discuss concerns gives participants the opportunity to listen to the concerns of others, test assumptions, and adjust personal arguments to accommodate others. Such a forum increases the likelihood that ideas will be constructively developed and problems creatively solved.

Ultimately, stability depends on the relationships fostered during the process. Susskind and Cruikshank stress that conventional methods of settling disagreements are potentially win-lose. They suggest that if effort is made to build good working relationships between disputing parties, the prospect for stability are greatly enhanced. Relationships are built by providing opportunities for joint fact-finding, incorporating value differences into decision-making and providing incentives for cooperation and collaboration (Susskind and Cruikshank, 1987).

It appears clearly from the description of the three parameters above of a good decision-

making procedure that the proposed rule meets our three criteria: the *Respect for each individual's values for the environment*, the *Subsidiarity Principle*, and the *Respect of Implicit Property rights.* Moreover, the qualitative characteristics and the flexibility of this method meet the criterion: *no rigid quantitative criteria in the proposal.*

iv/ Liabilities and responsibilities

Liability of the RP

The financial liability of the RP is imposed by the *polluter-pays principle.* In order to avoid the need for compounding and discounting the future costs of restoration, the rule says that the costs must be paid as they are incurred. Assessing a discount rate could be very controversial and furthermore would not conform to the criteria precluding a quantitative frame in the rule.

Accountability of the trustee

Criteria such as: *the nationalities of the tanker or cargo owner do not matter* needs the assurance of an impartial and equitable body who would be accountable for the equity of the process. The presence of criteria to respect through the application of a rule implies the presence of a neutral body who is accountable for the respect for the rule. The trustees are accountable for the respect for all our criteria through the application of this rule.

Public involvement:

Public involvement is a necessary feature of the process. It is useful from three points of view.

- the social success of the process

Oil spills generate exasperation, anger, and the frustration at being a silent victim. It often leads to aggressive behavior. Asking people to express their suffering, their needs, their ideas, will prevent this behavior, and give them the satisfaction of helping to preserve their environment.

- the economic efficiency of the process

The objective of the restoration project is to provide the public with an equivalent of the damaged environment. It thus seems necessary to obtain public cooperation to understand its needs and to answer to them in a satisfying way. The process, in order to be time and cost efficient, needs more than just public censorship.

- the ecological success of the process

Collaborating to a restoration project will make the public think about the environment, and

how much they value it. The public will be more aware of unconscious or unconsidered environmental choices they make in everyday's life.

- the acceptability of the result of the process

If the public is involved, it will trust the process as a fair one.

Public involvement is also a necessary corollary of *the Subsidiarity Principle* and of the desire to *respect each individual's values for the environment.*

Responsible Party commitment

The Responsible Party commitment is necessary for the conduct of a good restoration project, since it is the party who has control over management of the costs.
There are many incentives for the Responsible Party to try to reach the best alternative for all the parties:

- the need of using the most cost-efficient project:

The people whose advice and suggestions are the most needed are the people living in the place which was damaged. The services to be restored must meet the needs of these people. The social impact of the project is an important measure of its success. Consequently, the RP will need the commitment of the victims, and thus will need to make them concessions.

- combining the need to be both time and cost efficient:

Working cooperatively with trustees to collect data and conduct assessments minimizes costly duplication of efforts. Moreover, the best way to be time-efficient is a quick procedure accepted by all the parties, and results accepted by all the parties as well, avoiding costly litigation.

- the need to promote the image of a environmentally friendly company.

The responsible party needs a counter-weight in the balance of "good" and "evil". They spilled oil, so now they need to support projects that would restore the environment and their image at the same time. Since the public is often most angered by the spiller's apparent "lack of concern about anything but its own profits," the degree of commitment of the company to restoration often measures the "seriousness" of the companies' environmental concern. As one oil company executive expressed, "the notion that an oil company is monitoring its rehabilitative costs and is sparing any expense is going to be looked at unfavorably by the public."

The RP commitment is necessary if we want to ensure that *the party with financial responsibility manages the costs.*

2.4 A Practical Proposal for the next 10 Years

The previous proposal assumes an ideal world where:
i/ An "equivalent" exists until the restoration project is completed
ii/ The environment can finally recover from the damages
iii/ Circumstances do not change over time
iv/ An agreement can be reached
v/ Adequacy between costs and benefits is assumed

We examine how to address the possibility that these assumptions may not be correct. The following paragraphs must be added to the previous rule in order to ensure that our proposal is implementable in today's world.

2.4.1 If a perfect "equivalent", during the restoration, cannot be achieved

Practically, it is impossible to provide for a perfect equivalent before the completion of the total restoration. In order to allow recovery for the parties whose revenues have been forgone as a result of an oil spill, and cannot be recovered before restoration, our framework must include the proposition that:

- the R.P. will pay for the direct economic losses (direct uses of the ocean as a resource)
- the R.P. will provide the best possible equivalent for indirect economic losses (indirect uses of the ocean as a resource)

Examples of parties who can claim direct economic losses:
- Commercial fishermen

Examples of parties who can claim indirect economic losses:
- Shipping and/or other shipping type interests unable to traverse the area of the spill.
- Wholesale and retail seafood enterprises not actually engaged in fishing, shrimping, crabbing or oystering in the mandated area
- Seafood restaurants
- Marina and boat rental operators
- Tackle and bait shops
- Fishermen, oystermen, shrimpers and crabbers who engaged in these activities for rec-

reational purposes only.

The rationale for this proposition, in light of the criteria dictated above, is that money can be considered as an equivalent for direct but not for indirect economic losses. This is because direct users of the ocean use a marketable good derived from the ocean, whereas indirect users use a non-marketable good. In the first case, providing the victims with the good itself (coming from another non damaged area) or with money can be considered equivalent. In the second case, money cannot be considered as a good barter for the loss incurred, whereas an equivalent will provide a value as near as possible to the initial value of the environmental good. (For instance, an equivalent for a damaged touristic beach would be the opening of a museum of ecology where tourists would come to understand the functioning of an ecosystem).

2.4.2 If total restoration cannot be achieved

If the recovery of the environment will never be possible, two options are left:

- either it is possible to provide equivalent services for the part of the damages that will never recover
- or nothing can be done (and no compensation must be paid)

In the case where it is possible to provide for equivalent services, these services must be provided as long as:

- they still make sense given a changing society
- there is still a link between the non-availability of these resources and the incident (the resources would perhaps have disappeared after a few years even though the incident had not occurred).

These criteria must be included in our proposal as a requirement for the RP to provide equivalent services (even after the completion of the restoration plan).

2.4.3. Reopener Clauses

Even when a restoration project is presumably settled, new discoveries may require that the restoration plan be rediscussed. These new discoveries may be:

- discovery of previously unknown conditions, whether these conditions concern the environmental or the social impact assessments
- discovery that the remedy no longer protects public health and the environment

In this case, the scope of the changes needed for the restoration plan goes beyond the flexibility of monitoring the restoration plan. In order to respond to these circumstances, there must be a provision within a settlement to "reopen" the case at a future date pending certain criteria.
Re-opening the case means re-starting the procedure from the preassessment phase and taking into account the actual situation.

For our proposal, the reopener clause requires that:
- the trustees decide that the case must be re-opened in order to re-design and re-select a restoration plan,
- the trustees make this decision based on new discoveries,
- these new discoveries must not have been addressed (even as a probable event) in the former restoration plan and are important enough to justify re-opening the case.

The inspiration for this proposition comes from the 1986 amendment of CERCLA (*Federal Register*, Vol. 52, #143, July 27, 1987).

2.4.4 If an agreement cannot be reached

Due to the fact that:
- the public disagrees
- the project selection is not optimal
- The RP does not recognize the scope of the liability.

Public disagreement
If the public representatives do not agree with the selection of a project that the trustee and the RP estimate as correct, the trustees have to take the following actions:
- Conduct a public survey to see if the public representatives live up to public expectations.
- Better inform and educate the public. The disagreement may be due to misconceptions.
- Get the advice of experts or other consultants that may have more public credibility.
- If the public still disagrees with the proposed final decision, the trustee may decide to

start the restoration plan, providing that a social impact assessment will be performed within few months, and allow the decisions regarding the restoration plan to be reconsidered subsequently.

Non-optimality

If any of the parties disagree with the selection of a project because of its non-optimality, and if the trustee recognizes that the project is not optimal, the panel may agree that the alternatives have to be re-developed. The panel will then meet later to discuss re-developed alternatives.

RP refusal to recognize the scope of his/her liability

When the negotiation comes to a point where the trustee estimates that the RP does not recognize the scope of his/her liability, the trustee may decide to start the restoration plan that he/she and the public representatives estimate to be the most adequate. The RP can challenge the trustee in court.

2.4.5 If there is no apparent adequacy between costs and benefits

In order to limit an apparent inadequacy between costs and benefits for replacing resources, the rule should include the provision that:

In cases where compensation provided for resources is unreasonably expensive, (replacing a complex habitat that is normally built by animals over time, for instance) then it may be acceptable to provide compensation for services only.

Note on efficiency:

In this rule, efficiency is not the major criterion that should be applied when comparing alternative resource allocation options, since the objective is restoration, and not costs/benefits efficiency. "Nevertheless, a proposal that is inefficient will generally not be given serious considerations, as for most resource managers, the principal concern is to find ways to increase net benefits that can be obtained from a given number of resources" (Stauth, Sowman and Grindley, 1993).

2.4.6 A Learning Curve

The main parties to this rule cannot adapt to so many changes in only a few months: They must adapt to a changing attitude, the emergence of environmentalism; they must adapt to a changing law, this proposed rule; they must adapt to changing partners, the new partners assessed by this rule who are the environmental experts and the public. A learning curve will slowly occur, improving the application of the short term policy described in the previous paragraphs towards the long-term policy.

This learning process will occur in various fields:

Science and technology:
Obtaining scientific and technical knowledge on ecosystems is key to better restoration. Little by little, we accumulate more data on the environment response to attempted restorations. For instance, the restoration work completed in the Florida Keys National Marine Sancturay, was an innovation in the "development and engineering of a concrete structure to act as a framework on which to transplant coral" (NOAA, 1995). The success of this restoration will allow many other coral reefs to be restored in the same way. The development of science and technology in ecology, engineering, and environmental planning, design and construction techniques will allow society little by little to reach total restoration.

"The emerging science of restoration ecology is faced with many challenges. Every restoration project yields new ideas and innovative applications of established technologies. As restoration science matures and its results are monitored over time, natural resource trustees will be able to achieve their goals with increasing precision and effectiveness" (NOAA, 1995).

Public education:
It may take time and effort to educate the public to commit itself to environmental matters, to have reasonable expectations, or to understand the complexity of the environmental issues. For example, it has been proved to be difficult for the concerned public to accept that aggressive rehabilitative measures are not always worth the extraordinary expense. However, public awareness and public knowledge are an essential improvement towards a better application of environmental laws (Cf the Subsidiarity Principle).

Human relationships:

There is little experience in cooperative involvement of RPs on which to base a model agreement (NOAA, 1995). This means that trustees and RPs will have to learn how to manage a viable partnership in which they both find their interest. The improvement in the knowledgebase for negotiation and competitive decision-making in the last decades (Susskind and Cruikshank, 1987) proves that knowledge and experience are of great benefit in this area.

RP learning curve:
RPs will have to learn how to manage the critical passage through the damage assessment and liability compensation procedures. For instance, the RP, at the outset, must come to terms with the fact that, regardless of any and all extraordinary efforts to "make amends" with the environment (and the public), there will usually be a small (but vocal) element that will be dissatisfied.

Economics:
With experience, the meaning of "reasonable costs" will become clearer, and will better reflect the real costs of damages.

2.5 An Example which is also a Model: NOAA Rules

NOAA stands for National Oceanic and Atmospheric Administration, a US federal agency, which is part of the department of Commerce. We first introduce the context and the main ideas behind the rules of NOAA. We then examine how the rules operate; and finally we discuss how well they conform with the criteria we developed above. This last discussion will enable us to have a better understanding of the criticism that our proposal may arouse.

2.5.1 Context and main lines of the NOAA rules

On 5 January 1996, NOAA published its 170-page Final Rule on Natural Resource Damage Assessments in the US Federal Register (Vol.61, No.4, pp.340-510).

In the introduction, NOAA final rule states the goal of the ruling:
"The goal of the Oil Pollution Act of 1990 is to make the environment and public whole for injuries to natural resources and natural resource services resulting from an accident in-

volving a discharge or substantial threat of a discharge of oil. This goal is achieved through returning injured natural resources and services to baseline and compensating for interim losses of such natural resources and services through the restoration, rehabilitation, replacement or acquisition of equivalent natural resource and/or services. The purpose of this rule is to provide a framework for conducting sound natural resource damage assessments that achieve restoration under OPA." It is clear that the emphasis is put on restoration.

NOAA stresses that the only damage costs recoverable from the RP under OPA 90 are:

- the cost of restoring, rehabilitating, replacing, or acquiring the equivalent of the injured natural resources and/or services pending restoration
- the cost of generating an interim 'equivalent' of those natural resources and/or services pending restoration
- the reasonable cost of assessing those damages.

In other words: "Responsible parties are liable for the cost of implementing the restoration that would generate the equivalent value, not for the calculated interim loss in value".

NOAA believes that the damage assessment as recommended in the rule will result in compensatory damage costs rather "punitive damage" costs to the RP. The damage assessment process must be driven by science instead of the "threat of litigation". Consequently, NOAA explained that "there is no need to specifically provide a role for either trustee agency counsel or attorneys representing the RPs in the proposed rule."

<u>The rule-making process:</u>

It is important that we have an idea of the way the ruling was elaborated in order to understand if and how the consensus among the parties was achieved.

Since the vote of OPA 90, NOAA has been working on the ruling for the implementation of OPA 90. NOAA is not working alone. Four types of parties were also interested in the issue of the ruling:

- the environmental organizations, such as the National Wildlife Organization
- the oil industry, and some organizations such as the American Petroleum Institute (API)
- the press specialized in oil industry issues
- other trade organizations.

In order to allow these parties to get involved as much as they desired in the rule-making process, some actions were taken:

1. Over the 5 years 1990-95, a series of meetings were organized by NOAA (more than a dozen of them).
2. Representatives of the interested parties were chosen.
3. NOAA sent a notice to the representatives for each new determination of the ruling.
4. NOAA received and analyzed all the comments that were sent (more than 15,000 pages according to Burlington, NOAA General Counsel Natural Resources).

The interested parties responded vigorously to these incentives. The industry group was the most active during the procedure and who sent the larger volume of information. The reason for this large participation is first that the industry is the most challenged group by OPA 90. Moreover, the industry has available funds to investigate through commission studies. The environmental groups made comments on behalf of two or three organizations, and supported the rules rather than challenge them it. The objective of an organization such as the Natural Resource Defense Council was mainly to make sure that all environmental issues were covered, not to challenge the ruling.

The two following points must be emphasized:
- environmental groups supported NOAA rules
- NOAA rules incorporated the industry's suggestions; there is industry input in the final rules.

2.5.2 Operations in the NOAA rules

Composition

The rule describes three phases of natural resource damage assessment:
1. the Preassessment Phase, "during which trustees determine whether to pursue restoration"
2. the Restoration Planning Phase, "during which trustees evaluate information on potential injuries and use that information to determine the need for, type of, and scale of restoration"
3. the Restoration Implementation Phase, during which trustees ensure implementation of restoration"

The second part, by far the most important and controversial, includes:
- *Injury determination*, including assessing the feasibility of detecting injury with valid scientific studies;

- *Injury quantification*, through measuring of direct changes in the natural resource itself, or measuring changes in the level of services provided by the natural resource, and co-ordinating scientific and economic data;
- *Restoration planning*, with the objective of returning an injured resource or service to as close to baseline as possible "through restoration, rehabilitation, replacement or acquisition of equivalent natural resources and/or services" (NOAA, p.440);
- *Compensable values determination* for those natural resources and services that have been diminished in value until restoration or natural recovery;
- *Scale of restoration actions determination*, through "the resource-to-resource or service-to-service approach and the valuation approach" (NOAA, p.442);
- *Selection of a preferred alternative.*

Key elements of the operations

When possible, we will give the actual experience of NOAA with the implementation of the ruling. Under the new rules, NOAA has been entirely responsible for assessing at least 4 spills up to now. Moreover, NOAA has been partially responsible for assessing about 40 spills (which means that in this case NOAA is not the only agency responsible for elaborating a damage compensation procedure: the process is not only at the federal level, but also at the state level or the city level; in other words, federal resources are damaged as well as with state resources and local resources).

- *Soliciting public input:*

OPA 90 provides that restoration plans "shall be developed and implemented [...] only after adequate public notice, opportunity for a hearing and consideration of all public comment." "NOAA believes that an assessment that focuses on evaluating injuries relevant to feasible restoration alternatives and soliciting public input in restoration planning will accomplish three major goals:

1. validating trustee determinations regarding those actions that will make the environment and the public whole;
2. ensuring that appropriate assessment procedures for determining restoration actions for a given incident are followed;
3. and reducing transaction costs."

The methods that NOAA finds the most efficient are

1. sending some agents into the neighborhood, who go door to door to inform people, explain the issues to them, and try to arouse interest;

2. publishing in local newspapers asking for answers and suggestions;
3. sending notices of meetings that would take place in the evening in town and where all citizens are invited to participate;
NOAA' s experience is that it is difficult to find a community who feels involved in the restoration project going on unless NOAA works with the state or the city council. In this case, it is easier to solicit public input, since the public gets more easily involved when local resources are at stake.

An example is the restoration of the marshes which were hit by the Exxon Bayway oil spill in the New York City metropolitan area in January 1-2, 1990. NOAA and its co-trustees (the States of New Jersey & New York and the cities of New York, NY and Elizabeth, NJ) set up a restoration plan relying on important public commitment: "Restoration activities include a comprehensive monitoring program and a volunteer labor and education component. The extensive volunteer effort represents a significant savings in labor costs and allows concerned members of the public to participate in a "hands-on" effort to speed recovery "(NOAA, 1995). The restoration plan was a success.

- *Acceptable restoration:*

"Acceptable restoration actions include any of the actions authorized under OPA (restoration, rehabilitation, replacement, or acquisition of the equivalent), or some combination of those actions."

- *The resource-to-resource approach or the Habitat Equivalency Analysis (HEA)*

"To ensure that a restoration action appropriately addresses the injuries resulting from an accident, trustees must scale the action."
"Under the resource-to-resource or service-to-service approach to scaling, trustees determine the appropriate quantity of replacement natural resources and/or services to compensate for the amount of injured natural resources or services. Trustees must consider using the resource-to-resource or service-to-service approach for actions that provide natural resources and/or services of the same type, quality, and value as those lost."
The experience of NOAA leads to two opposite viewpoints about HEA:

First, it is a difficult procedure to implement, since it is complex and requires a deep understanding of the environment. For instance, the Greenhill Oil Spill on September 29, 1992, in Timbalier bay, Louisiana, affected intertidal marshes that provide wildlife and estuarine nursery habitat and promote storm erosion protection. Moreover, the spill also adversely

affected marine and estuarine fish, bottom dwelling species, birds, and sediments. Consequently, the ecological analysis undertaken by the trustees to determine the scale of wetland creation necessary was complex (Burlington, 1996).

Second, it provides a feeling of satisfaction to the people implementing the restoration, as Burlington explains. This method makes you comfortable since you have the feeling you are "making things right again". The feeling of satisfaction from doing one's best is important since our relationship with the environment is above all a "feeling" relationship. In the case of the Greenhill Oil Spill, the final settlement provided for the creation of 22 acres of tidal marsh and monitoring of the created wetlands; the major construction and planting was completed by October 1994, with great success and satisfaction (Burlington, 1996).

- *RP involvement:*

Regarding the involvement of the RP, trustees and RPs work together in the damage assessment and restoration plans. However, the trustees ultimately make the decisions. The RP actually pays for it. "The advantages of a cooperative RP in an assessment have resulted in smooth assessments and a focus on the environment, not on the courthouse" states NOAA. The advantages of RP involvement are:

- the RP ensures the cost-effectiveness of assessments (as a control on state and federal bureaucrats)
- an involved RP is more likely to pay the damages
- involving the RP diminishes the risk of an expensive confrontation in court and eliminates the costly duplication of studies.

NOAA has had good experience with RP involvement. The partnership which is built between the trustee and the RP has never been broken; in other words, a settlement has always been reached without the need of a court suite. Mrs. Burlington explains that in practice there is no limit to the extent of RP involvement.

An example of a good partnership is the restoration of the environmental damages caused by the Greenhill Oil Spill, which was mentioned above (Burlington, 1996). "The Greenhill settlement is a good example of the partnership efforts that may evolve when the focus is kept on the recovery of the habitat. Instead of involving monetary damages, this settlement allowed the spiller to take direct responsibility for restoration, resulting in the quick formation, approval and implementation of restoration activities. Using criteria developed jointly by NOAA and its co-trustees, Greenhill presented several restoration and monitoring op-

tions to the trustees. Greenhill began creation of new marsh areas in December 1993 and completed work in October 1994" (NOAA, 1995).

During the assessment phase, most of the RPs do want to be involved to check on the adequacy of the methods chosen. However, RPs do not feel the necessity or the ability to implement the plan themselves, as proposed in the ruling. Mrs. Burlington explains the presence of a learning curve:

- In the earliest ages, the majority of the RPs were not interested in the implementation phase and preferred to write the check.

- Today, the RPs have more experience and want to work on the implementation themselves. Consequently, half of the restoration plans are implemented by the RPs, half by NOAA.

When RPs decide to work on the implementation by themselves, two alternatives exist:

- hiring a contractor

- having their own department of biology that can handle the restoration plan. This is the case for companies such as Mobil Oil and Shell.

In all cases, NOAA will still be responsible for inspecting the individual projects and monitoring the total plan for a period of 2 to 5 years.

- *Use of C.V. methods*

The regulations include the use of the C.V. method for some situations. According to NOAA' s Linda Burlington, the agency intends to use the C.V. method in less than one percent of all oil spill incidents, cost being the major disincentive. She explained that "if the loss is small, it does not justify the expense. Do you do a $3-million survey to recover $10,000 in passive loss? NOAA will not."

- *Use of a compensation formula and the nature of its results*

NOAA has emphasized that the primary advantages of a compensation formula are simplicity and cost-effectiveness.

- *Possibility of a Regional Restoration Plan*

A Regional restoration Plan may allow several relatively small recoveries from spills in a certain region to be pooled to achieve a more comprehensive restoration than would be possible through a smaller, more comprehensive approach. This was the strategy adopted for the restoration of the injured natural resources in the New York/ New Jersey Harbor. The

funds raised from the Exxon Bayway oil spill and from settlements from other cases contributed to the bay-wide trust fund.
"Trust fund resources help to foster cooperation and coordination among the parties involved in restoration strategies and implementation at a number of sites, increasing cost-effectiveness and efficiencies of scale in planning and administration" (NOAA, 1995).

2.5.4 Criticism of NOAA rules

i/ Commenters' critique:
These are some of the points of views that were expressed:

The restoration plan: the apparent discrepancy between costs and benefits

- Restoration activities required by OPA 90 can cause considerable expense without necessarily resulting in net benefits. In the words of damage assessment analysts Richard Dunford, Sara Hudson, and William Desvousges, of Research Triangle Institute in North Carolina, "[OPA 90] requires the restoration of foregone natural resource services, without requiring that restoration activities produce net benefits. Consequently, the most cost-effective restoration alternative may cost more than the benefit it produces" (Dunford, Hudson and Desvousges, 1991). This apparent discrepancy between cost and benefits in environmental projects is due to the fact that the existence of the restored good itself is not considered by cost/benefit analysis as a benefit.

The appropriate standard of judicial review of damage assessment

- The RP has the legal right to put natural resource damage assessment disputes to a jury trial as guaranteed by the US Constitution. Thus, issues related to the selection of assessment and restoration must be decided by a trial court.

The recovery of damages for passive use values for natural resources and the measurement of these values; use of CV method

- CV should not be used in scaling.
- CV has not been proven reliable and should not be used for transitory effects.
- CV would generate overstated damage claims.
- CV is a controversial procedure, rejected by rigorous peer review and "impartial scientific research."

(The use of CV in the NOAA rules raised a controversy among economists. For example,

in their article: *Contingent Valuation Methodology in the Natural Resource Damage Regulatory Process: Choice Theory and the Embedding Phenomenon*, Brian R. Binger, Elizabeth Hoffman, and Robert Copple, two Professors of Economics and one Environmental Attorney, argue that NOAA's proposed NRDA process does not conform with basic tenets of choice theory and that the CVM safeguards created by NOAA are not adequate to address the inherent, and perhaps irreconcilable, flaws in CVM assessments (Binger, Hoffman, and Copple,1995).)

The use of a compensation formula and the nature of its results

- The damages will not sufficiently reflect the actual injuries or on the contrary overstate them; and there is a risk that a compensatory assessment could be transformed into a punitive exercise. Thus, the "incident-specific factors" must always be considered.
- The use of simplified procedures is the only way to determine restoration costs for the thousands of small incidents that occur annually, since trustees lack the personnel, time and financial resources to conduct in-depth, incident-specific assessments for every little incident.

The definition of assessment costs

- The criteria requiring cost-effectiveness and weighing the benefits of a procedure against its costs might be interpreted to require strict cost-benefit analyses of all possible procedures, inappropriately diverting trustee efforts from assessment work and driving up costs.
- The balance should more appropriately weigh expected assessment costs against overall expected damages, because assessment costs cannot be meaningfully scrutinized relative to expected informational benefits from an assessment procedure.

The pooling of recoveries from various "small" discharges to conduct restoration efforts from a regional or water shed approach.

- The idea of regional planning is not in the spirit of OPA 90.

ii/ Industry critique to NOAA rule:

In October 1993, the American Petroleum Institute (API), on behalf of 18 trade associations, submitted a report to the Department of Interior in response to the 29 April 1991 proposed NOAA rules on NRDAs. API's comprehensive report addressed a number of issues, including (Etkin, 1995):

Additive Liability

- NOAA' s "inappropriate expansive measure of damages:" "it is inappropriate and internally inconsistent to define the "restoration element" of natural resource damages as including both the restoration of "services" and the literal restoration of each and every injured natural resource, [rather than] clearly enunciate a presumptive standard for measuring damages that is limited to the necessary costs of restoration." (Etkin, 1995).

Quantification of the procedures and the assessments

- The ruling cost-effectiveness and cost-benefit analyses: regarding the acquisition of equivalent resources for example, "the proposed rule should require trustees to perform service quantifications, pathway determinations, resource recoverability analyses, or similar investigations for equivalent resources that can be directly linked to the investigations and studies already performed on the affected resources." (Etkin, 1995).

Scope of the costs

- The measure of damages should be restricted to the necessary costs of restoration.
- Moreover, "the costs must be "reasonable" to be compensable." (Etkin, 1995).

A control method for the trustees' determinations

- "If an RP learns through discovery that trustees had several comparable alternatives available, yet selected a plan that was more costly or less technically feasible than those other alternatives, there would be no regulatory standard from which to judge the trustees' actions." Thus, there should be an objective procedure for the selection process (that would allow control of the selection process). (Etkin, 1995).

CV Methodology

- "Because CVM is the only putative method "available" for monetizing society's "compensable value" and because the regulated community is convinced of CVM's illegitimacy, its threatened application in NRDA cases to be pursued under these regulations promises to channel RP's resources into the legal system and out of the environment."
- However, if CVM must be used, "trustees should be required to make certain threshold determinations before conducting a CVM study to measure nonuse values;" and regulations should specify protocols for the conduct of any CVM study. (Etkin, 1995).

Valuation of the use of resources

- The most controversial point is the valuation of the use of a resource. When the resource can be totally restored, there is no need for an evaluation of the value of the resource and its use, and thus no controversy. The difficulty arises when the resource cannot be totally restored and an equivalent must be provided. The scaling effort which is then necessary requires evaluating the resource and its use. (Etkin, 1995).

2.5.3 Comparison with our goals, criteria, and rules

i/ Comparison with our goals:

The clear, stated objective of NOAA rules is restoration.

Furthermore, "in addition to restoring injured resources, [the NOAA] process:

- provides incentives to the private sector to prevent injury;
- makes the polluter pay to restore public resources; and
- demonstrates that small investments in the damage assessment process yield big returns in restoration." (NOAA, Nov. 1995).

Consequently, NOAA rules are perfectly adequate to our goals.

ii/ Main points of discrepancy between NOAA rule and our rules and criteria:

- Lack of emphasis on social impact assessment:

Social impact assessment concerning both the impacts of the damages and of the restoration project is a main body in our rule, as opposed to NOAA's rule. The objective of our proposed rules is to meet the criteria requiring *respect for every individual's environmental values.*

- Quantification of the injury for scaling the action:

NOAA must quantify the damages in order to demand monetary compensation. This includes quantification of losses to individuals. However, "public trustees in the USA do not have the authority to provide compensations for natural resource damages directly to individuals" (Jones, 1996). Rather, trustees may spend the money recovered only to enhance or to create natural resources.

Our proposed ruling does not follow the same rationale. Restoration is not simply a path for spending the recovered money. Restoration is the ultimate objective that the RP has to pay for. This is why damages do not need to be quantified for our proposed ruling. Only

the costs of the restoration of the damages have to be evaluated in order to be paid by the RP. (These costs, by nature, are quantitative and can directly paid by the RP).

In conclusion, our proposal demands that the RP pays the cost of restoration, as opposed to NOAA proposal, where the RP pays for the cost of damages. (Moreover, our criteria: *no quantitative assessment of subjective values* would make it difficult to quantify losses of subjective value).

- Involvement of the RP:

In NOAA's rule, the final determinations belong to the trustees. NOAA rules do not establish a panel discussion and negotiation. The objective of our proposed rules is to respect the criteria stating that *the payer should be the responsible person for the management of the costs.* For instance, the RP should manage the costs, in agreement with the trustee.

- Involvement of the public:

The panel method in our proposal gives a lot of strength to public expectations, which is not the case in NOAA's rule. Once more, the purpose of our rules is to ensure that we *respect every individual's environmental values.*

- The possibility of using a compensation formula:

Our proposed rules exclude any use of compensation formula, since it would not meet our proposed requirement of *absence of any arbitrary assessment.* Instead, our proposal requires to choose and implement a restoration project that will be funded by the RP. (Of course, for small incidents, the restoration projects to be implemented can be of the same nature, and thus of similar cost).

- Monitoring:

As opposed to the NOAA's rule, our proposal insists on continuity between assessment and monitoring, and on the need to draft in the environmental impact assessment some measures of ecological integrity that will be used in monitoring.

- The necessity to give a "final number" for damages that must be paid by the RP:

The necessity to assess such a figure requires an arbitrary forecast of the future costs and the choice of a discount rate, which is not consistent with our proposed requirement of *absence of any arbitrary assessment.*

Chapter 3 elaborates the principle differences in implementation between the NOAA proposal and ours.

2.6. Acceptability of our proposed rules

The policies that we propose above raise many issues. In this chapter, the objective is to stress the ideas that are becoming more widely accepted, and the ones that are still controversial. In part 4, we will more specifically examine which points nations think are the most unacceptable.

2.6.1 What is becoming more widely accepted

- The idea of "reinstatement"

NOAA rules, the 1992 and the 1984 international Protocols show us that the idea of a reinstatement of the environment (and not just the cleanup) is little by little becoming accepted. The idea of "making things right again as long as it is possible" is becoming universally accepted. However this accepted reinstatement only concerns "primary restoration", which means the natural recovery or the monitored recovery of the damaged resources. It does not address the cases where primary restoration is infeasible, or when long-term unanticipated results may occur.

- The rejection of quantitative assessments of non-use (subjective) values

This point was the main criticism that the industry group made to NOAA rules.

- The cooperation between the industry (the RP) and the government at large (the trustees)

The industry noticed that the final determinations in NOAA rules belong to the trustees and expressed their desire for a real partnership.

- The involvement of the public

As we saw before, the participants to the Rio Earth Summit strongly advocated the deep involvement of the public in environmental projects (Cf Local Agenda 21, Chapter 28 of Agenda 21). In other words, the subsidiarity principle is becoming customary.

- The idea that only costs incurred can be paid back

This concept was expressed in the international Conventions where a criterion for "reinstatement" claims demands that expenses must actually have been incurred to be eligible for refund (whether these expenses are incurred by individuals or by the agency managing restoration projects).

2.6.2 What still is very controversial

- The absence of cost/benefit analysis

The objective of our proposal is not to assess damages and to restore with a budget constraint equal to the quantified amount of losses as in NOAA rules. The objective is total restoration with the constraint that costs should be reasonable given the benefits. The controversial point between the two is which way ensures that the costs are reasonable given the benefits. As a result, even if the industry may agree on the concept, the reason why it would not agree on implementing the process is that there is no way of measuring adequately the value of the lost resource and its use, or the value of the benefits of restoration. Any valuation seems to be highly speculative.

One way of addressing this controversy is to make the assumption that an environmental good cannot be worth less than the cost of its replacement. For environmentalists, this is an assumption.

- The infinite liability in size and time

Two important concepts result in "infinite" liability:
- the case can always be re-opened in the future;
- there is no "final number" for liability, and any costs of restoration implementation incurred must be paid back (given certain criteria).

- The idea that some damages may not be recovered:

Damages that cannot be repaired or compensated through the supply of other resources or services are not recovered by monetary compensation. Environmentalists may not agree with the point that some damages may not be recovered.

2.7 Definitions

Baseline:

The baseline is the state of resources and services that would have existed if the accident had not occurred. There is no need for an absolute site-specific description of the baseline. Injuries can be quantified or qualified in terms of incremental changes instead of in terms of absolute changes relative to a known baseline. The example given in the NOAA ruling is that counts of oiled bird carcasses can be used as a basis for quantifying incremental bird mortality resulting from an accident (NOAA p.447). Beyond this example, incremental changes are very complex to evaluate.

Services:

Natural services are all functions that a natural resource provides for another natural resource(s) or for the public. Natural resource services may be classified as follows (NOAA, p.448):

- ecological services: the physical, chemical, or biological functions that one natural resource provides for another. Examples include provision of food, protection from predation, and nesting habitat, among others
- public services: the public uses natural resources or functions of natural resources that provide value to the public. Examples include fishing, hunting, nature photography, and education, among others
- a complex mix of both.

Injury:

Injury is defined as an observable (i.e. qualitative) or measurable (i.e. quantitative) adverse change in a natural resource or impairment of a natural resource service (NOAA p.447). Injury includes adverse changes in the chemical or physical quality or viability of a natural resource. The simplest example is death of an organism, but indirect, delayed, or sublethal effects may also constitute injury. Potential categories of injuries include adverse change in (NOAA p.447):

- survival, growth, and reproduction
- health, physiology and biological condition
- behavior
- community composition
- ecological processes and functions
- physical and chemical habitat quality or structure

- services to the public.

Injuries to non-living resources (oiled sand on a recreational beach) as well as injuries to natural resource services (lost use associated with a fisheries closure to prevent harvest of tainted fish, even the fish itself may not be injured) may be considered beyond the injuries considered in terms of adverse change in biota.

Oil:

The term "oil" means oil of any type or any form, such as petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil (this is not a list). However, any substance qualified in international agreements as a hazardous substance is not subject to this policy.

Recovery:

Recovery is the return to baseline of injured natural resources. This process encompasses the inherent tendency of natural resources and services to vary over space and time.

Restoration:

Restoration is any action (or an alternative), or a combination of actions (or alternatives), to restore, rehabilitate, replace, or acquire the equivalent of injured natural resources and services. This rule includes the concepts of primary and compensatory restoration:

- Primary restoration is any kind of action (whether on-site, off-site, in-kind, out-of-kind) that returns injured natural resources and services to baseline.
- Compensatory restoration is any action (or an alternative) taken to compensate for the interim loss of natural resources or services that occur from the date of the incident until such natural resources or services have recovered to their baseline condition. For instance, compensatory restoration projects may involve creating or enhancing spartine wetland habitat at a comparable nearby site. Or, to compensate for a three-week closure of beaches due to a spill, restoration actions may include building boardwalk over sand dunes (to provide access to the beach while at the same time protecting, and proving access to, the fragile dune habitat) or constructing near-shore artificial reefs for snorkeling, diving or fishing.

Pathway:

Pathway is the medium, mechanism, or route by which the incident has resulted in an injury. For discharges of oil, a pathway is the sequence of events by which (NOAA p.447):

- the oil traveled through various components of an ecosystem and contacted the natural resource of concern
- exposure to oil in one part of an ecosystem was transmitted to the natural resource of concern, without the oil directly contacting the natural resource.

Service-to-service approach:

Service-to-service scaling is a procedure in which the appropriate quantity of replacement of natural resources and/or services is determined by obtaining equivalency between the quantity of services lost due to the injury and the quantity of replacement services provided by compensatory actions. The implicit assumption of the service-to-service approach is that the public is willing to make a one-to-one trade-off between a unit of lost services and a unit of restoration project services. The assumption may be met when the restoration project provides services of the same type and quality, and of comparable value as those lost due to the injury.

Habitat Equivalency Analysis:

The habitat equivalency analysis is a procedure used by NOAA to scale restoration actions which:

- replace entire habitats that support multiple species or
- replace individual species that provide a variety of natural resource services.

To ensure that the scale of the restoration action does not over- or under-compensate the public for injuries incurred, the habitat equivalency analysis establishes an equivalency between the present value of the quantity of lost services and the present value of the quantity of services provided by the restoration action over time.

3. Practice: Development of a New Framework

The purpose of this part is to propose a new practical framework to conduct the assessment and implementation of the restoration project.

This framework is composed of 3 sequential steps:
1. the preassessment phase, which defines the basis of the total project
2. the restoration planning phase, which determines the content of the restoration project
3. the implementation phase.

The source used as a guideline for the elaboration of this practical framework is the NOAA ruling. However, due to the differences examined above between our proposal and the NOAA ruling, the content of the relevant sequences is different.

The sequences which have the same content as in the NOAA rules are in italics.

3.1 Preassessment Phase

3.1.1 Purpose

The trustees and the RP are the main actors in the preassessment phase. The RP is invited to participate, but does not have to do so until there is a decision to proceed with the assessment phase.

During the preassessment phase, trustees (and the RP if he/she participates) determine, based on the circumstances of a given incident, whether a restoration plan following this rule is justified.
Other matters considered during the preassessment phase include:

- funding (this purely financial issue, which deals with insurances and other available funds, is beyond the scope of this thesis; consequently, we will not address this topic)
- preliminary determinations regarding the type of injury assessment and restoration actions that may be pursued
- data collection
- notice of intent to conduct restoration planning

- opening the administrative record
- inviting RP's participation, if he/she does not participate yet

During the preassessment phase, the trustees can also conduct any emergency restoration measure.

These emergency actions, due to the need for a quick decision, are not subject to public review and comment, and do not need the RP review and comment. *However, it must be proved that these emergency actions are:*

- *necessary (likely to minimize continuing or prevent additional injury)*
- *cost-effective to the extent reasonably practicable.*

Emergency restoration may be considered implemented at any time throughout the assessment.

3.1.2 Determinations

The decision is whether restoration actions should be pursued or not. This determination depends on the following conditions:

(1) Injuries have resulted or are likely to result from the incident

(2) Response actions have not adequately addressed, or are not expected to address, the injuries resulting from the accident

(3) Feasible primary and/or compensatory restoration actions exist to address the potential injuries.

If all the conditions listed above are met, trustees and RP may proceed with preassessment actions.

In order to make their determination, trustees and RP have to:

i/ Identify the natural resources (and services) at risk:

Such identification requires consideration of the circumstances of the incident, the characteristics of the discharge, the characteristics of the natural resources, and the potential for injury. Injuries resulting from actions taken to respond to the incident have to be considered as well.

ii/ Examine the effectiveness of response actions in eliminating injury

Trustees and the RP must determine whether resources and/or services injured as a result of the incident are likely to be adequately addressed through response actions. If response

actions will not alleviate residual natural resources and/or service injuries, the following step must be taken.

iii/ Make an early identification of potential restoration actions:

Such identification is needed to help justify the decision to proceed with an assessment that will lead to effective restoration actions, and provide the focus for designing injury assessment studies that will produce useful information on the type and scale of restoration needed.

Considerations important to the early identification of restoration actions include:

- potential nature, degree, and spatial and temporal extent of injury, with or without restoration

- need and potential for restoration given the types of injuries

- potential type and scale of restoration

- extent to which information relevant to determining restoration needs is known

- time, money and personnel required and reasonably available to obtain missing or additional information relevant to restoration

- social acceptability of restoration projects

- requirements imposed by other applicable laws, regulations, and permits that would affect that restoration

3.1.3 Data Collection during Preassessment Phase

i/ Data on the environmental damages:

- *data necessary to make a determination to proceed with the preassessment*
- *ephemeral or perishable data may be lost if not collected immediately*
- *data necessary to serve as a basis for the selected damage assessment procedure*

ii/ Baseline data

It is indispensable to have a knowledge of the baseline, in order to know the objective that restoration must achieved. The types of information that may be useful in evaluating baseline include:

- *information collected on a regular basis and for a period of time from and prior to the incident*
- *information identifying historical patterns or trends on the area of the incident and in-*

jured natural resources and services

- *information from areas unaffected by the incident, that are judged sufficiently similar to the area of the incident with respect to the parameter being measured*
- *information from the area of the incident after particular natural resources or services have been judged to have recovered.*

ii/ Data on the environmental history of the area:

The experience acquired through former oil spills must necessarily be taken into consideration. For example the reaction of the ecosystem to past restoration projects can be very useful to determine which restoration project will be more environmentally efficient. Furthermore, if other oil spills have happened in the same area, a Regional Restoration Plan may be allowed to achieve comprehensive restoration, which would lead to a more cost-efficient result than through a smaller, more segmented approach.

iii/ Data on the human environment:

The concern is data on the population who has implicit proprietary rights to the damaged environment. This is not easy to identify in all places of the world, since populations are not all sedentary, or will not all come to claim the losses they incur. In the preassessment phase, the data collection must include:

- recognition of the affected populations
- size and other main characteristics of the affected populations
- culture and patterns of resource use
- extent of dependence on the "lost resources"

iv/ Data on the interactions between the environment and the affected populations

- to what extent the damages affected the populations' way of living
- what could be an equivalent for the damaged resources or the services

Data collection and analysis during this phase must be coordinated with response actions, such that the collection and analysis do not interfere with response actions.

3.1.4 Notice of intent to conduct restoration planning

If the trustees (and the RP) determine that there is a reasonable likelihood that injury has occurred as a result of the incident and that feasible restoration actions exist that would

address these injuries, the trustees and RP may proceed with the assessment.
A notice of intent to conduct restoration planning must be prepared that will include:

- the fact of the incident

- trustee authority to proceed with the assessment

- natural resources and services that are, or are likely to be, injured as a result of the incident

- potential restoration actions relevant to the expected injuries.

If the RP was not involved yet, the trustees must invite the RP to form a 'partnership' to conduct the assessment and the implementation of the restoration project. A Memorandum of Understanding that will be valid during the whole Restoration Planning Phase must be signed.

3.1.5 Administrative Record

An administrative record must then be opened.

- The objective is to provide a central repository for all materials relied upon by trustees in making determinations about restoration actions appropriate for the incident.
- The objective is not to provide exhaustive and logical proof for the decisions made during the process, but to provide sufficient information to support review of the decision-making process.

The administrative record should include:

- the notice of intent to conduct restoration planning

- the draft and final restoration plans

- the public comments

- any relevant data, investigation reports, and scientific studies

- work plans, quality assurance plans

- literature

- and any agreements among the participating trustees and the RPs

3.2 Restoration Planning Phase

3.2.1 Purpose

The assessment is essentially a restoration scoping exercise, and the various studies and analyses conducted during this phase should be viewed from the restoration perspective. Potential assessment activities should be examined carefully to ensure that the results will be useful and relevant to restoration.

The purpose of the restoration planning phase is:

- *to understand impact of the incident on the environment and on society*
- *to develop alternatives to address:*

- the environmental injuries if primary restoration is possible
- the social impacts of the incident through compensatory restoration if primary restoration is not possible

- to understand the impact of the restoration alternatives on the environment and on society
- *to choose a restoration alternative*

These steps are sequential. However, we choose to present the first three steps not in this sequential way, but on a per issue basis:

- the first issue includes: threats to the biophysical environment; development of alternatives to restore the biophysical environment; and assessment of the environmental impact of these alternatives in the future.
- the second issue includes: social impact of the incident; development of alternatives to restore the lost uses of the natural resources; and assessment of the social impact of these alternatives in the future.

As a result, this chapter is divided in the following sub-sections:

- environmental impact assessment, which includes the injury assessment
- social impact assessment
- restoration selection.

3.2.2 Environmental Impact Assessment

The objective of this part is to assess the injuries to resources, to analyze the possible alternatives to address those injuries, and to set up a method for continuous environmental im-

pact assessment during the monitoring of the restoration plan.

Resources provide two kinds of services: services to the other elements of the ecosystem (which rely on a given resource to grow for instance) and services to human beings.
In this part, we speak in terms of resources and non-human services, as opposed to the following chapter (social impact assessment) where we speak in terms of services to human beings. The focus here is on the environment for its own sake, not on the environment as a provider of services to society.

The following sequential steps must be taken by the trustees and the RP:
- *injury assessment*
- *analysis of natural recovery*
- *analysis of other biophysical restoration alternatives*
- continuous environmental impact assessment.

1. Injury Assessment

i/ Purpose

The goal of injury assessment is to evaluate the nature, degree, and spatial and temporal extent of injuries to natural resources. This is needed in order to evaluate the need and the scale for restoration.

The exposure and pathways determination must be conducted as precisely, accurately, and with the least speculation and assumption as possible. The necessity of conducting the injury assessment in a scientific way reflects the necessity to build a solid scientific framework as a basis for the next steps of the assessment. This solid framework is needed:
- to start the partnership between the trustees, the RP, and in some sense the public, with the assurance that all the parties have the same knowledge basis and that there is no misunderstanding of the damages to be restored
- to be sure not to make any mistake or omission at the beginning of the assessment
- to have a precise scientific idea of what happened. The knowledge of what happened is the only knowledge on which we can make assumptions, since we often do not know how the environment is going to react to our actions.

Exposure and pathway determinations allow the selection of the injuries to be included in the assessment. They thus allow the evaluation of the need for restoration. Injury quantifi-

cation allows the evaluation of the scale of the needed restoration.

ii/ Exposure determination

The purpose of the exposure portion of an injury assessment is to establish whether natural resources came into contact with the oil from the incident. Exposure is broadly defined to include:

- *direct physical exposure to oil*
- *indirect exposure (e.g., injury to an organism as a result of disruption of its food web)*

However, evidence of exposure alone may be insufficient to conclude that injury to a natural resource has occurred (e.g., the presence of petroleum hydrocarbons in oyster tissues may not, in itself, constitute an injury)

A combination of assessment procedures may be necessary to determine exposure. The appropriate procedures to evaluate exposure must be determined on an incident-specific basis. Some procedures available are:

- *visual observation in the field*
- *site-specific sampling: chemical analysis, biological analysis*
- *modeling*

iii/ Pathways determination

To determine whether an injury resulted from a specific incident, a pathway linking the incident to the injury must be established (for instance a cause-effect link). *However, evidence of a pathway alone is not sufficient to conclude that injury has occurred (e.g., demonstrating that prey species are oiled can be used to document a pathway to a predator species exists; however, such data do not, in themselves, establish that the predator species is injured).*

Pathway determination includes an evaluation of the sequence of events by which the discharged oil injured the natural resources. The two possibilities are:

- *the oil came into direct physical contact with the exposed natural resources*
- *the oil caused an indirect injury to an natural resource and/or service (e.g., oil transported from an incident by ocean currents, wind and wave action cause reduced populations of bait fish, which in turn results in starvation of a fish-eating bird). Pathway determination does not require that injured natural resources and/or services be directly exposed to oil.*

As with exposure determination, trustees and the RP must determine the most appropriate procedures to evaluate whether a pathway exits on an incident-specific basis.

iv/ Injury quantification

Injury quantification is the process by which trustees and the RP determine the degree, and spatial and temporal extent of the injuries relative to baseline. Thus, injury quantification typically provides information on the scale of restoration that may be necessary.

At a minimum, the factors to be evaluated are:
1. Degree of the injury. Degree may be expressed in terms such as percent mortality, proportion of a population, species, community, or habitat affected, extent of oiling.
2. Spatial extent of the injury. Spatial extent may include quantification of the total area or volume of injury
3. Temporal extent of the injury. Duration of injury may be expressed as the total length of time that the natural resource and/or service may be affected.

Moreover, during the injury quantification step, some measures of ecological integrity should be drafted that will be the measure used during the whole continuous process of environmental impact assessment during the monitoring phase of the restoration plan.

- These measures should respect the criteria given in the following part 4: Continuous environmental impact assessment.
- An example of a set of measures is given in the following part 4: Continuous environmental impact assessment.

2. Analysis of natural recovery

Natural recovery is a restoration alternative whereby injured natural resources and services are allowed to return to conditions prior to the incident without human intervention, following any response actions. The time for natural recovery must be estimated. Analysis of recovery times may include such factors as:
1. the nature, degree, and spatial and temporal extent of injury
2. the sensitivity and vulnerability of the injured natural resource and/or service
3. The reproductive and recruitment potential
4. The resistance and resilience (stability) of the affected environment
5. The natural variability

6. The physical/chemical processes of the affected environment.

3. Analysis of other biophysical restoration alternatives

In this part, we consider restoration for lost resources and lost services, but without considering the services to human beings. Restoration for lost services to human beings will be addressed in the following chapter dealing with Social Impact Assessment.
Primary restoration is by essence addressing the loss of resources. This is why primary restoration will only be considered in the environmental impact assessment.
However, compensatory restoration addresses both losses of resources and services. In this part, we will focus on compensatory restoration that provides a compensation for lost resources and services lost for other living resources than human beings.

i/ Primary restoration

Alternative primary restoration actions can range from natural recovery with no human intervention, to actions that prevent interference with natural recovery, to more intensive actions expected to return injured natural resources to baseline faster or with greater certainty than natural recovery. When identifying primary restoration actions, trustees and RP should consider:

- *whether activities exist that would prevent or limit the effectiveness of restoration actions (e.g., residual sources of contamination)*
- *whether any primary restoration actions are necessary to return the physical, chemical, and biological conditions to a condition that allows recovery (e.g., replacement of sand or vegetation, or modifying hydrologic conditions)*
- *whether restoration actions focusing on certain natural resources and services would be an effective approach to achieving baseline conditions (e.g., replacing essential species or habitats that would facilitate the replacement of other, independent natural resource)*

ii/ Compensatory restoration

In addition to primary restoration, trustees and the RP must consider compensatory restoration actions in some or all of the restoration alternatives. The extent of interim natural resource losses that must be addressed by a particular restoration alternative may vary depending on the level and speed of recovery generated by the primary restoration component of the restoration alternative. Actions should as much as possible provide natural resources of the same type and quality, and comparable value to those injured.

In general, both primary and compensatory restoration of services must be accomplished through actions to restore natural resources or to preserve or enhance the amount, quality, and/or availability of natural resources. This may include actions to improve access to natural resources, although in selecting such actions, the trustees and RP must carefully evaluate the direct and indirect environmental impact of the improved access on natural resource quality and productivity.

iii/ Scaling: the resource-to-resource approach

After identifying the different actions possible through primary or compensatory restoration, the action must be scaled.

- For primary restoration, scaling may be determined based on such factors as area of habitat contaminated at unacceptable levels, or the volume of removed sand that should be supplied.
- For compensatory restoration, the resource-to-resource approach is used. Under the resource-to-resource approach to scaling, the appropriate quantity of replacement natural resources is determined by obtaining equivalency between the injured and replacement natural resources.

4. Continuous environmental impact assessment

Impact assessment is not a one-time process. Through the whole process of implementation of the project, constant feedback from the ecosystem will be needed. This continuous feedback requires a continuous assessment of the ecosystem health. This is the reason why the measures or indicators used for the first injury assessment (the first step in the restoration selection) should be developed to be useful and efficient for the continuous assessments occurring in the implementation phase. The next paragraphs are intended to be guidelines to choose the adequate ecosystem integrity measures.

i/ Criteria for assessment measures

NOAA does not address specifically any continuous impact assessment. The following criteria were developed by Stephen Woodley for the monitoring of any project on stressed ecosystems (Woodley, 1996):

Monitoring and assessment measures of an ecosystem condition:

1. Should be relatively easily and reliably measured. Otherwise it will be difficult to main-

tain the project over the long term.
2. Should ideally have the capability to provide a continuous assessment from polluted to unpolluted (stressed to non-stressed) conditions.
3. Should not depend solely on single criteria, such as the presence, absence or condition of a single species. Any conclusions about ecosystem condition should be based upon a collection of measures, interpreted by experts.
4. Should not depend on a census or even inventory of large number of species, but focus on critical indicator species.
5. Should reflect our knowledge of normal succession or expected sequential changes which occur naturally in ecosystems.
6. Should have a defined reference level with a variance whenever possible. If references and variances do not exist, data collection should be designed to establish them.
7. Must be designed to accommodate the wide range of spatial and temporal scales, from individual to community to landscape.
8. Should be designed, wherever possible, to account for catastrophic changes that occur in ecosystems. In this sense programs must be adaptive to change with changing conditions.
9. Must be based on the concept of ecosystems and not institutional boundaries. for example, the assessment of the states of ecosystems protected by parks and protected areas must be done on the basis of assessing the larger ecosystems of which parks and protected areas are part.
10. Should provide for the early detection of change so that management action, if required, may be taken before the change becomes irreversible. However, not all assessment measures should be designed to provide for early warning. Some measures should be longer-term and diagnostic in nature (Woodley, 1996).

ii/ Ecological integrity measures

An example of ecological integrity measures in relation to the hierarchical scale of a system can be the measures selected by the biologist Sheehan in 1984 (Sheehan, 1984).

- Individuals and populations:
    1. direct mortality or chronic accumulation causing death
    2. sublethal impairment of behavior, physiology or function
    3. altered growth and reproduction
- Ecosystem structure and dynamics:
    4. reduction in population size and species extinction
    5. loss of species with unique functions

6. decrease in species richness
7. changes in community composition and dominance patterns (indicator species)
8. decreased species diversity
9. differences in taxonomy between healthy and polluted systems (similarity indices)
10. changes in the ecosystem spatial structure
11. ecosystem properties of resilience, inertia, stability, constancy, elasticity, amplitude, hysteresis and persistence
12. reversal of some aspects of succession with stress

- Ecosystem functional changes:
  13. reduced decomposition, nutrient conservation, and primary productivity
  14. increased energy costs
  15. alteration of cycles of essential nutrients, food web and functional regulation of ecosystem processes (Sheehan, 1984).

iii/ Interpreting the data

Two general approaches might be followed to interpret the data collected. These approaches are proposed by Stephen Woodley (Woodley, 1996):

- use of reference systems, that compare the state of the test ecosystem against a known or reference ecosystem.:

"The use of reference systems depends on the existence and the knowledge of similar systems, or on baseline conditions. However, the principle of comparison to reference standards is a good one and will have many general applications. For example, there are many published examples of decomposition rates for different ecosystems. These values could be used to compare values obtained."

- analysis of trends:

"The measures are all chosen to show trends that would be expected in stressed ecosystems. The inability to retain nutrients, loss of native species diversity, changes in community diversity and habitat fragmentation are all examples of trends associated with stressed ecosystems. They must be assessed over time as trends."

iv/ Conclusion: an example

The following are the sequential steps of the development of a monitoring program for known stresses, established by Stephen Woodley for the Canadian National Parks (Woodley, 1996):

- Identification of stresses and threats (injury assessment)
- Development of a stress response model (alternatives)

Consideration of relationships, timing, synergistic interactions, intensity, and other influencing factors.

- Application of specialized techniques to determine most sensitive and appropriate indicators

Consideration of feedback's and lags; signal/noise ratios; kinetic models; creative scenarios; biological indicators.

- Monitoring program

Including sampling procedure; sample variance; data handling.

- Feedback from monitoring program.

3.2.3 Social Impact Assessment

The international scope of this procedure requires the trustees and Responsible Party to be very careful when dealing with populations whose culture may be very different from their own. For the same incident, alternatives valid in one place in the world would not be valid in another one. The difficulty of this issue is exacerbated by the fact that the populations that could be the most impacted by the environmental damages may be the ones who will be the most different from the cultural origin of the trustees and the Responsible Party, and for whom it will be the most difficult to communicate their values. For instance, it may not be easy for an American expert to understand the real social impact of an oil spill on a village that traditionally uses algues in its everyday' s life. This is the reason why this proposal insists on the adoption of a rigorous method to assess the social impact of the damages and of the restoration project.

Both the trustees and the Responsible Party are responsible for the success of the social impact assessment. The social impact assessment will be crucial and essential to the success of the restoration project. The positive social impact of the project finally selected is the measure of the adequacy of the project.

The social impact assessment should contain 12 steps. These steps are logically sequential, but overlap in practice. This procedure was elaborated by the Interorganizational Committee on Guidelines and Principles for Social Impact Assessment (ICGPSIA), Institute for Environmental Studies, Washington D.C., who published in the *Environmental Impact As-*

sessment Review "The Guidelines and Principles for Social Impact Assessment" (ICGP-SIA, 1995). The ICGPSIA is today widely recognized as a reference on this topic. Our proposal adapts ICGPSIA's guidelines to our particular case.

1. Public Involvement - develop an effective public involvement plan to involve all potentially affected publics;

After the recognition of the affected publics in the preassessment phase, this step requires the involvement of the population. With this objective in mind, we must:

- explain the issues of the restoration process to the public;
- inspire trust and confidence in order to obtain the assistance and support of the public for the development of the procedure;
- give this public incentives to elect some representatives who will participate in the assessment procedures;
- determine the ways each representative will be involved in the planning and decision processes;
- assume stakeholders representatives are well informed with state-of-the-art information;
- determine the most adequate ways of collecting information about public perceptions.

Public involvement plays an important role in recruiting participants for the planning process who are truly representative of affected groups. Public involvement should be truly interactive, with communication flowing both ways between the trustee-RP partnership and affected groups.

This can be achieved through an early communication with the public through:

- hearings,
- conferences, forums,
- articles in local papers and the Federal Register,
- notice by direct contact (door to door), etc...
- formation of carefully selected groups for participating

In this first step, the pieces are put in place for the involvement and commitment of the public, that will last all along not only the procedure of the social impact assessment but also the whole restoration project selection and implementation (ICGPSIA, 1995).

2. Baseline Conditions - Describe the relevant human environment area of influence and baseline objectives;

In order of importance, the following topics must be described as accurately as possible:

- the relationships of the affected populations with the biophysical environment, including:
  - areas having economic significance to specific people
  - areas having recreational significance to specific people
  - areas having aesthetic significance to specific people
  - areas having symbolic significance to specific people
  - residential arrangements and living patterns
  - attitudes toward environmental features
  - patterns of resource use

- the political and social resources, including:
  - the distribution of power and authority
  - the capacity of relevant systems or institutions (e.g. the school system)
  - friendship networks and patterns of cleavage or cooperation among affected groups
  - level of residential stability
  - distributions of sociodemographic characteristics such as age and ethnicity
  - presence of distinctive or vulnerable groups (e.g. low income)
  - linkages among geopolitical units (national, county, local, and inter-local)

- the culture, attitudes and social-psychological conditions, including:
  - attitudes toward the proposed action
  - trust in political and social institutions
  - perceptions of risks
  - relevant psychological coping and adjustment capacity
  - cultural cognition of society and environment
  - assessed quality of life and important values that may be relevant

- the historical background, including:
  - initial settlement and subsequent shifts in population, development events and eras
  - past or on-going community controversies
  - other experiences likely to affect the level or distribution of the impacts on local

receptivity to the proposed action

- the other population characteristics, including:
  - the demographics of relevant groups
  - major economic activities, future prospects, the labor markets and available work-force
  - unemployment and underemployment
  - availability of housing, infrastructure and services
  - seasonal migration patterns

3. Identification of the services lost - describe the services that were provided by the damaged resources

The objective of this part is to establish the link between the injury assessment and the social data provided above that examine the relationship between the affected population and the environment.

All services lost must be listed, if possible by differentiating the types of services:

- commercial (commercial fishing, tourism industry)
- recreational (swimming)
- cultural
- others

4. Scoping - identify the full range of probable social impacts as a result of the services lost, based on discussion or interviews with numbers of all affected

First, the scope of the service losses must be evaluated by addressing the following issues:

- the number of people affected by the losses,
- the duration of the losses,
- the existing substitutes,
- the qualitative evaluation of the importance of the service (how much the lives of the individuals and their meanings are affected; how much their quality of life is diminished)

Second, a deep insight on the last point can be effectuated by identifying the probable social impacts of leaving the situation as it is (given the presence of the injuries resulting from the incident). These impacts can belong to the following categories:

- unemployment
- decrease of human population

- reduced recreational quality of life
- reduced aesthetic quality of life
- increased hazard for human health
- reduced cultural interest of the place.

5. Identification of Alternatives - describe the alternatives from the point of view of their social consequences

The alternatives considered will be compensatory restoration actions for losses of services, since

- primary restoration
- compensatory restoration for losses of resources

have been addressed in the environmental impact assessment.

To the extent practicable, when identifying the compensatory restoration alternatives, trustees and the RP should consider compensatory restoration actions that provide services of the same type and quality, and of comparable value as those injured. This is the preferred approach to identifying compensatory restoration actions. If such actions do not provide a reasonable range of alternatives, trustees and the RP should identify actions that, in their judgment, will provide services of at least comparable type and quality as those injured.

The service-to-service approach

After identifying the different actions possible through primary or compensatory restoration, the action must be scaled. Under the service-to-service approach to scaling, the appropriate quantity of replacement services is determined by obtaining equivalency between the injured and replacement services.

Caution

In the natural resource damage context, a service may not be viewed as an abstract economic unit or activity that may be restored independently of the natural resources from which the service flows. *Trustees and the RP should be careful to avoid double-counting, which could result from developing multiple restoration actions that compensate for ecological and direct human services losses over time.* For example, when determining the need for compensatory restoration actions that directly address lost human services, trustees and the RP should take into account any compensation for those lost human services provided by other actions intended to compensate for lost ecological services.

We should not forget short term practical aspects of the alternatives such as:

- need for a local work force
- size of the work force (local or not)
- institutional resources.

Broadening of the definition of an impact:

From now on, the concept of impact embodies two ideas:

- the impact of the action taken through the proposed alternative
- the impact of letting the injuries (already occurred as a result of the spill) remain unrestored (as in the above paragraphs)

This means that the concern is the impact of the proposed restoration project in addition to the already impacted situation after the incident. The baseline considered is not the situation that would be without the restoration project, but the situation that would be without the incident.

6. Scoping - identify the full range of probable social impacts that will probably result from the implementation of the possible restoration plans (alternatives), based on discussion or interviews with numbers of all affected.

The relevant criteria for selecting significant impacts are:

- "probability of a given social impact
- number of people that will be affected
- duration of impacts (long term versus short term)
- value of benefits and costs to impacted groups (intensity of impacts)
- extent that the impact is reversible or can be mitigated
- likelihood of causing subsequent impacts
- relevance to present and future decisions
- uncertainty over possible effects" (ICGPSIA, 1995).

7. Projection of estimated effects - investigate the probable impacts

Methods of projecting the future lie at the heart of social assessment, and much of the process of analysis is tied up in this endeavor. In spite of the long lists of methods available, most fall into the following categories (ICGPSIA, 1995):

- comparative method (comparison between the future with and without the proposed action)
- straight-line trend projects (taking an existing trend and simply projecting the same rate

of change for the future)

- population multiplier methods (each specified increase in population implies designated multiples of some other variable, e.g. jobs, housing units)
- scenarios (1) logical - imaginations based on construction of hypothetical futures through a process of modeling the assumptions about the variables in question; and (2) fitted empirical - similar past cases used to analyze the present case with experts adjusting the scenario by taking into account the unique characteristics of the present case
- computer modeling (involving the mathematical formulation of premises and a process of quantitative weighing of variables)
- calculation of "futures forgone" (a number of methods have been formulated to determine what options would be given up irrevocably as a result of a plan or project).

Investigation of the probable impacts involves five major sources of information:

- data from project proponents
- records of previous experience with similar actions as represented in reference literature as well as other environmental social impact assessment
- census and vital statistics
- documents and secondary sources
- field research, including informant interviews, hearings, group meetings, and surveys of the general population.

"The record of previous experience is very important to the estimation of future impacts. It is largely contained in case reports and studies and the experience of experts. Variations in the patterns of impacts and responses in these cases should also be registered Experts knowledge is used to enlarge this knowledge base and to judge how the study case is likely to deviate from the typical patterns. The document and secondary sources provide information on existing conditions, plans reported attitudes and opinions; and contribute to case record. The field research involves interviews with persons who have different interests at stake, different perspectives and different kinds of expertise." (ICGPSIA, 1995).

8. Predicting responses to impacts - determine the significance of the identified social impacts

"This is a difficult assessment task often avoided, but the responses of affected parties will have significant subsequent impacts. After direct impacts have been estimated, the assessor must next estimate how the affected people will respond in terms of attitude and actions." (ICGPSIA, 1995).

9. Indirect and cumulative impacts - estimate subsequent impacts and cumulative impacts

"Indirect impacts are those caused by the direct impacts; they often occur later than the direct impacts, or geographically further away. Cumulative impacts are those impacts that result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions regardless of which agency or person undertakes them." (ICGPSIA, 1995). "Although they are more difficult to estimate precisely than direct impacts, it is very important that indirect and cumulative impacts be clearly identified in the assessment." (ICGPSIA, 1995).

10. Changes in alternatives - recommend new or changed alternatives and estimate or project their consequences

"Each new alternative or recommended change in already assessed alternatives should be assessed separately." (ICGPSIA, 1995). "The number of iterations will depend mainly upon time and the magnitude of the restoration project." (ICGPSIA, 1995).

11. Mitigation - develop a mitigation plan

"A social impact assessment not only forecasts impacts, it should identify means to mitigate adverse impacts. Mitigation includes avoiding the impact by not taking or modifying an action, minimizing, rectifying, or reducing the impacts through the design or operation of the project or policy, or compensating for the impact by providing substitute facilities, resources or opportunities." (ICGPSIA, 1995). The sequencing strategy to manage social impacts should be:

- during the first sequence, try to avoid all adverse impacts
- in the second sequence, try to minimize any adverse impact that cannot be avoided
- during the third sequence, try to compensate for adverse impacts, (ICGPSIA, 1995).

"There are at least three benefits to identifying unresolvable social impacts that may result from a proposed project:

- The first is identifying methods of compensating individuals and the community for unavoidable impacts.
- The second occurs when the community may identify ways of enhancing other quality-of-life variables as compensation for the adverse effects.
- The third happens when the identification of unresolvable social impacts makes community leaders and project proponents more sensitive to the feelings of community res-

idents." (ICGPSIA, 1995).

12. Monitoring - develop a monitoring program

"A monitoring program should be developed that is capable of identifying deviations from the proposed action and any important unanticipated impacts. A monitoring plan should be developed to track project development and compare real impacts with the projected ones. It should spell out (to the degree possible) the nature and extent of additional steps that should take place when unanticipated impacts or impacts larger than the projections occur." (ICGPSIA, 1995).

"Monitoring programs are particularly important for restoration projects that lack detailed information or that have a high variability or uncertainty. It is important to recognize in advance the potential for "surprises" that may lie completely outside the range of options considered in the social impact assessment." (ICGPSIA, 1995).

3.2.4 Restoration Selection

After identifying a reasonable range of restoration alternatives (resulting from both the environmental and the social assessments), a panel composed of the trustees, the RP and the public (through its representatives) must evaluate those alternatives, select one, develop a draft restoration plan and produce a final restoration plan.

i/ Formation of a decision panel

This phase needs the formation of a decision panel composed of the trustees, the RP and the public, through a limited number of its elected representatives. For all the issues and controversies, those who could gain and those who could lose should be represented within the panel.

Two necessary conditions regarding the panel for good decision-making:
"i/ The stakeholders must be well-informed:

- The most relevant information must be elicited
- The best available information must be transferred to the stakeholders

ii/ Stakeholders preferences must be included in the decisions:

- Stakeholders' preferences must be elicited
- Stakeholders' preferences must be combined to make the decision." (Stancik,

1995)

The trustees play the role of those who have the jurisdictional responsibility of the procedure, which must respect the three criteria of a good decision-making procedure: equity, stability, efficiency (Susskind and Cruikshank, 1987).

ii/ Evaluation of restoration alternatives

See Figure 1.

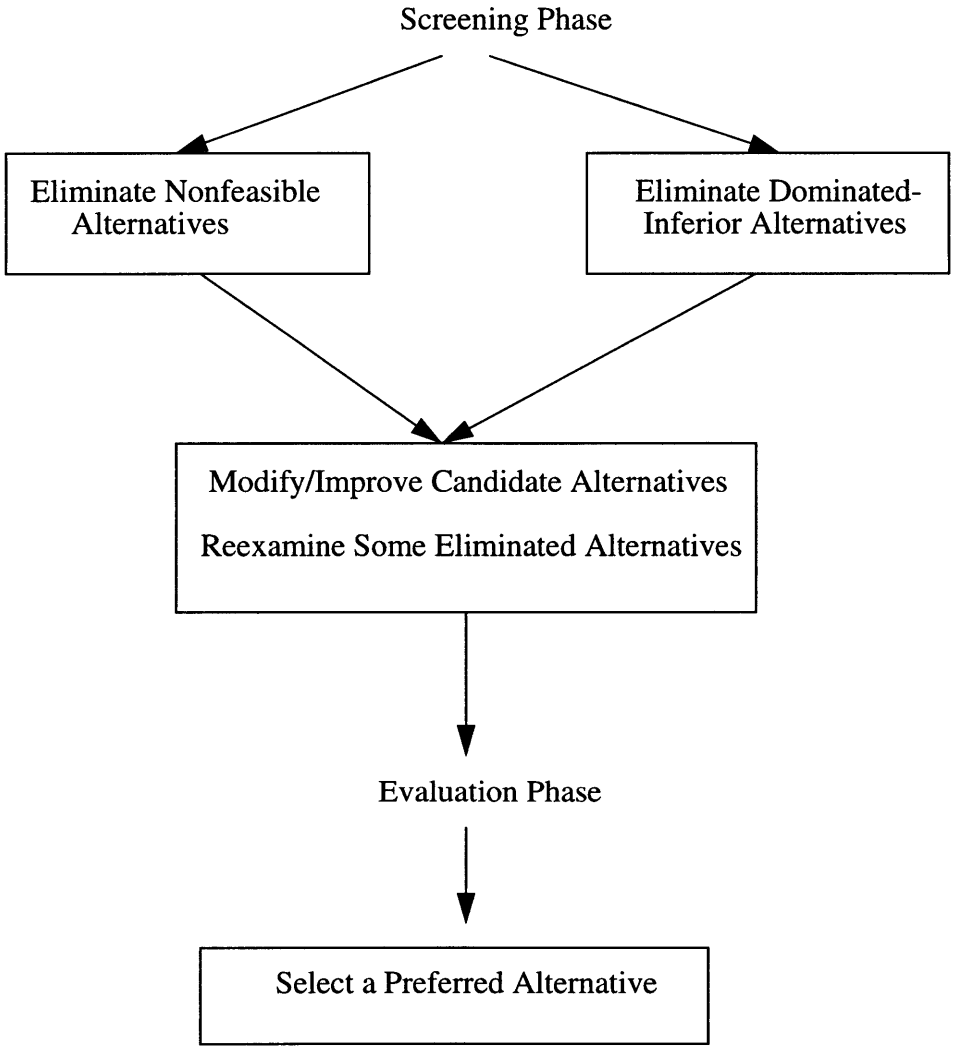

Figure 1.
Representation of decision objectives,
drawn by Mohammed Lahlou and Larry Canter, 1993.

The **screening phase** include the definition of the problem, overall goal and objectives. "To make good decisions, there should be no misunderstandings about what exactly is the problem and the overall goal. Good decision-making requires determining very specifically what is desired in the problem solution and everyone must agree to it" (Stancik, 1995). Some criteria added to the six criteria listed below can be formulated.

The **non-feasibility** of alternatives refers to:

- the technical unfeasibility, which is a fact
- the economic feasibility, which must be negotiated.

These are issue which were not addressed in the selection of the possible alternatives.

The **inferior-dominance** of certain alternatives appears as a result of the union of the two objectives:

- the ecosystem integrity (assessed in: 3. 2. 2: Environmental impact assessment)
- the society integrity (assessed in: 3. 2. 3: Social impact assessment)

The **evaluation phase** is the optimization of the system composed of:

- three constraints: - biophysical
  - social (including political and economic)
  - technical (feasibility)
- at least, the six decision criteria:

1. The cost to carry out the alternative

2. The extent to which each alternative is expected to meet the goals and objectives in returning the injured natural resources and services to baseline and/or compensate for interim losses

3. The likelihood of success of each alternative

4. The extent to which each alternative will prevent future injury as a result of the incident and avoid collateral injury as a result of implementing the alternative

5. The extent to which each alternative benefits more than one natural resource and/or service

6. The effect of each alternative on public health and safety.

Based on an evaluation of these factors, trustees, the RP and the public select a preferred

restoration alternative. If they conclude that two or more alternatives are equivalent based on the above factors, they must select the most cost-effective alternative.

Scaling and weighting procedures

- Scales describe or measure the impact intensities of each alternative with respect to the given set of decision criteria.

Their expressions can be numeric, linguistic, character, or symbolic. The ratings (or scores) of alternatives with respect to a selected scale can be displayed in a uniformly scaled pay-off matrix. Finally, there are four basic types of scales: nominal, ordinal, interval, and ratio. Each of them may be used by the panel to help the negotiation. For instance, the likelihood of success of each alternative (one of our decision criteria) can be estimated numerically (and then compared).

- The other component of comparative is the relative importance of the decision criteria, and/or the priorities among the project objectives.

This significance is usually derived as importance weights to each attribute with respect to other attributes and/or with respect to higher level objectives. Even though the parties of the panel will not obtain similar weight for all the criteria, the weighting procedure could help the negotiation. For instance, the decision criteria: the likelihood of success of each alternative may be weighted more than the cost to carry out the alternative, another decision criteria.

Pilot restoration projects

If a promising restoration action cannot be adequately evaluated without testing, the decision panel may implement pilot projects. Pilot projects should only be undertaken when, in the judgment of the panel, these projects are likely to successfully provide information for the evaluation of the factors specified above. Examples of situations where pilot projects may be appropriate include application of a proven technology in a different habitat type, or using different species from those used in previous applications.

iii/ Restoration plans

After selecting a restoration alternative, trustees must prepare a Draft Restoration Plan. Development of a Draft Restoration Plan provides a vehicle for informing the whole affected public of the results of the panel's analyses and decisions, and encouraging public review. Public review can also supplement experts peer review when comments are solicited from various professional communities or other knowledgeable persons.

Draft Restoration Plan

The Draft Restoration Plan must include:

1. a summary of injury and social assessments used
2. a description of the nature, degree, and spatial and temporal extent of injuries resulting from the incident; description of the services lost
3. the restoration goals and objectives
4. the range of restoration alternatives considered, and a discussion of how such alternatives were developed and evaluated
5. an identification of the panel's tentative preferred alternative
6. a description of monitoring for documenting restoration effectiveness, including performance criteria that will be used to determine the success of restoration and need for interim corrective action
7. a description of a mechanism to deliberate the need for and type of corrective actions in a settlement agreement where the types of contingencies that suggest the need for corrective actions cannot be completely foreseen.

When developing the Draft Restoration Plan, the panel must clearly define plan objectives that specify the desired outcome to be accomplished and the performance criteria by which successful restoration will be judged. The panel should, at a minimum, determine what criteria will constitute success such that responsible parties are relieved of responsibility for further restoration actions or necessitate corrective actions in order to comply with the terms of a restoration agreement.

Refer to: - 3.2.2.4: Continuous environmental impact assessment
- 3.2.3.12: Monitoring - develop a monitoring program

The types of parameters that should be addressed in monitoring include:

- key indicators to evaluate changes
- *duration and frequency of monitoring needed to gauge progress and success*
- *the level of sampling needed to detect success or the need for corrective action*
- *whether monitoring of a reference or control site is needed to determine progress and success*

Public review and comment

The panel should use the methods listed in 3.2.3.1: Public Involvement - develop an effective public involvement plan, to involve all potentially affected publics. Other ways of so-

liciting comments such as direct contact to known interested parties and other experts should also be used. The panel must give incentives to public review, listen and take into account all comments, and provide a procedure by which the public can freely participate to give their preferences and reasons for these.

Final Restoration Plan

After reviewing public comments on the Draft Restoration Plan, the panel *must develop a Final Restoration Plan. In response to the comments*, the panel *may need to modify the restoration alternatives being considered, supplement, improve or modify the analyses, make factual corrections, or explain why the comments do not warrant further panel response. In the Final Restoration Plan,* the panel *indicates the restoration alternatives that will be implemented. The format of the Final Restoration Plan, which essentially follows that of the Draft Restoration Plan, should clearly indicate all significant changes to the Draft Restoration Plan.*

iv/ Use of a Regional Restoration Plan

The rule allow the panel to *consider all or part of an existing Regional Restoration Plan or other existing, planned or proposed environmental restoration project as one of the range of restoration alternatives, including natural recovery, evaluated to restore injuries resulting from a particular incident. Selection of an existing plan or project as the preferred restoration alternatives requires that the plan or project has been developed with public review and comment, or is subject to public review and comment. The existing plan or project must also be demonstrated to provide a sufficient link to the incident in terms of the type and scale of natural resources and services provided by the plan or project.*

The rule also allows trustees to recover partial funding of existing plans or projects from Responsible Parties, where a plan or project that represents the preferred primary or compensatory restoration for an incident will provide significantly greater levels of natural resources and/or services than those lost as a result of the incident. In these instances, trustees may request the scale of the restoration determined be appropriate for the incident of concern.

3.3 Restoration Implementation Phase

3.3.1 Purpose

After the completion of the Restoration Planning Phase, the trustees must address three different issues: the administrative issue, which means closing the previous administrative record and opening a new one; the financial and liability issue, which has not been addressed until now, and which consists of presenting a demand for damages to the RP; and the implementation operations, such as monitoring and implementing corrective actions. Consequently, we will review the following subchapters:

- administrative record
- claims to the RP and other financial issues
- implementation operations

3.3.2 Administrative record

For practical reasons, trustees will need to open and maintain an additional administrative record to document implementation of restoration. This record should document, at a minimum, all Restoration Implementation Phase decisions, actions, and expenditures, including any modifications made to the Final Restoration Plan. This record is necessary to keep the public informed and for potential use in any enforcement actions, such as seeking additional work from the RP to comply with the restoration plan and implementing agreements.
The record will also ensure an accurate and complete accounting of all actions and costs associated with implementing the Final Restoration Plan.

First decision: who is going to implement the Final Restoration Plan?
Moreover, the first decision to be documented in the administrative record is the decision of who is going to implement the restoration plan. The Final Restoration Plan may be implemented by the trustees or by the RP with trustee oversight. The RP has to choose whether or not they are willing to implement the plan, as opposed to just paying for it.

3.3.3 Claims to the RP and other financial issues

Presenting a demand for damages to the RP
After completion of the Restoration Planning Phase, the trustees must present a demand

asking for the RP to pay for the damages. Two possibilities exist:

1. The RP has decided to implement the plan. In this case, the RP must reimburse the trustees for their assessment and oversight costs (including the costs of any emergency restoration and other costs).
2. The RP has decided to pay assessment costs and the costs associated with implementing the Final Restoration Plan. The RP must deposit an amount of money in an account for Recovered Damages to cover the costs. These funds would then be used to reimburse the trustees for past actions, for future actions or revert to the RP if not needed.

Opening an account for Recovered Damages

Trustees must maintain appropriate accounting and reporting procedures to keep track of the use of sums recovered or to be recovered. Brief reports on the status of these sums should be made part of the administrative record for the Restoration Implementation Phase.

Any sums remaining in an account established under this section that are not used either to reimburse trustees for past assessment and emergency restoration costs or to implement restoration must be reimbursed. On the other side, the RP should make sure that the account established under this section is always positive or equal to zero, but never negative.

Discounting and compounding

Past costs should be compounded in order to be reimbursed from the present deposit of funds in the account for Recovered Damages. In the same way, at the end of the restoration project, the sums remaining in the account should be compounded to be reimbursed to the RP. The interest rates to be used should be agreed upon by the trustees and the RP, and must be the one that makes the most sense given the circumstances.

Unsatisfied demands

If the RPs deny all liability for the claim or fail to settle the claim embodied in the demand within a certain fixed amount of time after they are presented with the demand, trustees may elect to commence an action in court against the RPs or the guarantors, or seek an appropriation from international oil spill liability funds.

3.3.4 Operating the Implementation Phase

As seen above, the Final Restoration Plan may be implemented by the trustees or by the RP with trustee oversight. In either case, several common steps may characterize the Restoration Implementation Phase, including:

- *establishment of a trustee committee and/or Memorandum of Understanding*
- *development of more detailed workplans for the conduct of restoration actions*
- *monitoring and oversight*
- *evaluation of restoration success or need for corrective actions*

Trustee Committee

The agreement that existed between trustees and RP at least during the Restoration Planning Phase (refer to 3.1.4 Administrative Record) *must extend through the Restoration Implementation Phase. The other possibility is that new agreements or committees are formed for the restoration implementation. Representatives of each participating trustee agency should be appointed to an oversight committee. Functions of such a committee may include:*

- *authorizing expenditures from a joint account*
- *participating in monitoring and oversight of restoration actions*
- *evaluating performance criteria for restoration actions*
- *making the determination that the goals and objectives of the Final Restoration Plan have been achieved, or*
- *determining the type of corrective actions that need to be pursued, and ensuring that these actions are implemented.*

Monitoring plan

A well-designed and executed monitoring and oversight plan is required to assess progress toward the stated goals and objectives of a restoration plan. Refer to 3.2.3.12: Monitoring - develop a monitoring program. Monitoring should be designed around performance criteria that will indicate success of restoration.

Detailed workplans

Detailed workplans should be developed at the beginning of the implementation phase if they were not included in the Final Restoration Plan. These detailed workplans include all the details contained in the Final Restoration Plan, such as: the restoration expectations, performance criteria, timelines.

Restoration success and corrective actions

The type and scale of corrective actions must be determined relative to the restoration goals and objectives set out in the Final restoration Plan. The mechanism described in the Final restoration Plan allows to deliberate the need for and type of corrective actions.

In addition, trustees must recognize that circumstances well beyond the control of any of the parties may not be the basis of requiring corrective actions, such as natural occurrences that would meet an "Act of God" standard.

4. Consequences drawn from the implementation of the new framework

When proposing a new international policy, an important issue is how the proposal will be received in the political arena. We examine whether the International Maritime Organization will be able to support the adoption of the proposed policy and how the nations might react. It follows that some structural changes are needed for the proposal to be implementable. We detail these necessary changes. The last paragraph looks at the proposed policy from a long term environmental point of view. Is the proposed policy sustainable for the future?

4.1 How would the proposal be received in the political arena?

In this section, we analyze how the proposed policy will be received by the governments and international regulatory organizations. The first body that we examine is the International Maritime Organization (IMO), to whom the proposed policy could be submitted. Will IMO be able to implement it? The second and third paragraphs address the reactions of nations. After defining the different parameters and different roles that nations can play, we examine the components of national policies that the proposed international policy must deal with.

4.1.1 Will IMO be able to implement the proposed policy?

This proposed policy is intended to be submitted to IMO. The issue is to which extent, if any, IMO will be able to impose the proposed policy to the international community. We first examine what the historic status of IMO is. We then examine the future of IMO. Finally, we conclude that IMO will be a catalyst for the implementation of the proposed policy, but it will need strong support from the nations.

i/ The historic status of IMO

The historic status of IMO has always been consultative. IMO has mainly provided consensual recommendations.

Consultative status:

IMO was created in 1959. "As originally conceived, IMO was to be a simple secretarial organization whose purpose was to collect and disseminate information to its members." (Henry, 1986). Until 1982, the Organization was known as the Inter-Governmental Maritime Consultative Organization (IMCO). Its name was changed by an amendment to the IMCO Convention adopted by the Assembly of the Organization in 1975 (Resolution A. 358 (IX) of 14 November 1975, IMO Doc. 023.82.08E). However, even though its status was widened to a legislative body, IMO cannot enforce any recommendation which has not be signed as a convention.

Consensual recommendations:

IMO seeks consensus among its members.

"Recommendations of IMO seek to achieve practical results rather than impose legal duties; they attempt to bring about decisions which will encounter general acceptance; they emphasize usefulness rather than obligation and are less motivated by the desire to regulate at all costs." (Henry, 1986). This consensual attitude is not consistent with supporting a policy that will face many rejections (see next section 4.1.3).

ii/ Some promises for the future

Since 1959, IMO has had to face a changing world. IMO has needed and still needs a new structure to meet new needs.

New needs:

"The increased membership of the Organization, the disastrous consequences of collisions and pollution which the international community suffered as a result of the increased carriage of oil by sea, the growing use of specialized and extra large ships, and, finally, the growing awareness of the necessity to find cooperative solutions to the multi-dimensional elements involved in the shipping industry, seem to have made obsolete the purely consultative and advisory functions originally intended for the Organization." (Henry, 1986).

A new structure:

"IMO had to re-adjust its structure to reflect the new realities". (Henry, 1986). One of the results of this re-adjustment has been the deletion of the words "consultative and advisory" from the IMO Constitution as a recognition of the new regulatory, administrative and operational functions of the Organization. However, IMO has no enforcement power. Thus,

the enforcement of IMO conventions depends either on the compliance desires of each nation or on persuasion tools exercised by nations such as "maritime ostracism". "The maritime ostracism which may flow from non-compliance is a potent force which may help to achieve general acceptance." (Henry, 1986).

iii/ Conclusion

Will IMO be able to implement the proposed policy? Yes and No. Yes because IMO can be the catalyst in achieving the adoption of this new policy. "Recommendations from IMO may complement treaty instruments, play the role of precursors to such instruments and serve as model laws in certain instances" (Henry, 1986). No, because IMO cannot adopt or implement any policy alone. First it needs the political support of the majority of the nations, and second it has no enforcement power.

4.1.2 Different parameters and different roles

Our international regime may be particularly advantageous or disadvantageous to a state. Most of the differences in the way states define their interests in environmental issues can be explained by the following variables:

- The interests of powerful economic or bureaucratic parties in avoiding the regulation, more particularly the oil and shipping industries
- The relative strength of a domestic environmental constituency, especially at the polls
- The degree of vulnerability to the consequences of an oil spill: whether the state is a coastal state, and, if so, the length, importance and fragility of its coasts
- The ideology of the political leadership in power.

As a result of the roles of these variables, the state actors may play one of four possible roles in an environmental international negotiation: lead state, supporting state, swing state, or veto state.

- A lead state has a strong commitment to effective international action on the issue, proposes its own negotiating formula as a basis for agreement, and attempts to get the support of other state actors.
- A supporting state may be either behind stronger action from the beginning or initially uncommitted but then gravitate toward support for the initiative of a lead state.
- A swing state demands significant concessions to its interests as a price for going along for an agreement for which it lacks enthusiasm.

- A veto state opposes intransigence to the negotiated agreement.

We study here which states may oppose or support the agreement by examining each of the above influencing parameters. Our indicators will be, most of the time, circumstantial and speculative evidence, since neither action nor position have been taken regarding our rule.

4.1.3 Analysis of the reactions in the international political arena

i/ Existence of economic or bureaucratic interests

Economic interests (strict or comparative)

The International Maritime Organization (IMO) is dominated by the states that control significant shipping, such as the United States, Japan, and Norway. Those states, in turn, were strongly influenced by the seven major oil companies, which own a large percentage of world tanker tonnage directly or through dummy corporations. Oil and shipping interests have always been strongly represented in the delegations of marine states, and the detailed papers submitted by both organizations have often defined the terms of the discussion. This emphasizes the importance of the issue of economic interests.

Regarding, the shipping economic interests, two types of countries can be opposed:

- Norway, Japan, and Greece have tended to be swinging or blocking actors on questions of marine pollution from oil tankers because of the importance of their shipping industries;
- Germany, Italy, the Netherlands, and Sweden (all of which have smaller shipping industries) have been more flexible.
- US oil companies or shipping companies already face a strong domestic regulation (OPA 90) on oil transportation and liability. Consequently, they are likely to support international action to impose similar standards on competitors abroad.

Regarding another consequence of the agreement, the oil prices rise, the attitudes would be:

- The oil-exporting countries would oppose adopting rules raising the price of oil or limiting the use of oil (Saudi Arabia and Kuwait did not sign the Climate Convention, 1992, and placed reservations on the atmosphere chapter of Agenda 21 (Grubb, 1995), since these two agreements result in limiting the use of oil).
- In the case of countries such as France and Japan, there can be comparative advantages

over other industrialized countries in an agreement that would raise oil price: France, which lacks self-sufficiency in fossil fuels, has a low concentration of heavy industry, an extremely modern industrial sector with high energy efficiency, and relies on nuclear power for more than two thirds of its electricity, with little popular dissent. Not only is France already less reliant on fossil fuels than other industrialized states; it hopes that a convention that would raise oil prices will boost its export of nuclear power. Japan is also planning to rely on nuclear power for as much as 43% of its power by the year 2010, compared with 27% in 1990; moreover, the proposed convention would present promising new opportunities to market its energy-efficient technologies abroad. Thus Japan and France would find economic advantages to commit themselves to the proposal.

Bureaucratic interests

In most developing countries, the need to maintain political stability and social peace in major urban centers has an important indirect impact on energy policy. Urban populations are especially sensitive to the price of transportation, and an increase in this price often triggers demonstrations and other forms of protest that threaten the future of the administration. This has been the major reason why developing countries have maintained subsidized prices for gasoline (the average price is about 40% of the average in industrialized countries).

- Consequently, an increase in oil price as a result of the proposed policy would either directly affect the budgets of most developing countries if the gasoline price is still artificially maintained, or have the feared social consequences explained above.

ii/ Strength of a domestic environmental constituency

The existence of an environmental movement that is a potential swing vote in parliamentary elections is a decisive factor in a state's role. For example, the sudden emergence of German and French bids for leadership roles on environmental issues in 1989 reflected in large part the upsurge of public support for strong environmental protection in Western Europe (the West German Green Party had won 8.2% of the votes in the 1984 European Parliament elections, and by 1985 the party, backed up by popular environmental sentiment, was a strong force in the German parliament). The same strength of pro-environment sentiment was evident in Australia.

- Due to the publicity from oil spills (the Amoco Cadiz accident, which happened along the Brittany coast, in France, was the largest spill in history: 68 million gallons), states such as France and Germany will have strong political incentives to agree on the proposal.

On the other side, the absence of popular pressures is sometimes due to the existence of political processes minimizing popular involvement in international issues. In the case of Japan, the political system makes it difficult for private interests groups without high-level political links to influence policies. Japanese Non-Governmental Organizations and public interest groups are almost non-existent in comparison with those of North America and Western Europe, with only 15,000 Japanese (most of whom are birdwatchers) belonging to environmental organizations.

- As a result, public pressure will not influence Japanese decisions on our environmental proposal.

iii/ Degree of vulnerability

Some states, because of a very sensitive coast line and because they are in the pathway of tankers (on a shipping road), would be much more interested than others in a framework including compensation for use and non-use environmental values. Such nations would be Spain, the United Kingdom, France, New-Zealand, the coastal African nations, the US, etc...

iv/ Ideology of the political leadership in power

The shift of the developing countries

Sometimes the belief systems of policymakers rather than objective characteristic of the country and its economic interests ultimately determine a state's policies. At the Stockholm conference in 1972, for example, the developing countries charged that environmental protection was a luxury of the rich and of no importance to their poor countries. They posited their demands for development firmly against environmental concerns; indeed, they charged that the highly industrialized countries of the North were using the threat of pollution to restrain the South's economic growth. Within ten years, however, as the immense costs of environmental degradation became clearer - sickness and death from polluted water - developing country leaders publicly pulled back their 1972 declaration that environmental issues were not their problem.

In Africa, this shift of concern is clear. "Africa is acutely aware of the ravages that environmental degradation have brought to its economies and of the fact that environmental destruction has begun to undermine the prospects of future development and even survival. The new ear of economic growth in Africa must begin with the widespread application of

Environmental Impact Assessment as a tool for protecting the environment and for measuring sustainability." (Kakonge and Imevbore, 1993). Some actions have already been taken, like the Action Plan for the Protection and Development of the Marine and Coastal Environment of the West and Central Africa Region (WACAF). "Its objectives are to consolidate and to expand pollution monitoring and control, promote national environmental legislation, increase ability to respond to pollution emergencies, promote integrated coastal zone management to prevent erosion, adopt protocols on hazardous waste and pollution, and expand public awareness." (*Environmental Policy and Law*, 1993).

In Brazil, the immensity of the resources make environmental degradation less obvious. "At the International Environmental Conference in Stockholm in 1972, the Brazilian delegation argued that the international preoccupation with environmental defense hid imperialistic interests and was meant to thwart the development of poorer countries;" (Fowler and Dias de Aguiar, 1993) and still currently, Brazilian society is structured to attain economic growth regardless of structural factors such as public health, education, recreation, and workplace conditions (Branco, 1989).

- Consequently, it is not clear whether the developing countries will all feel the need for a costly agreement on oil pollution. However, the proposal would be very well adapted to the developing countries' society, due to procedures concerning social impact assessment:

"The importance of an impact is considered in terms of its social return, or how important the impact may be to the affected population. Currently, in Brazil impacts are principally social value judgments. Technical considerations frequently conflict with political decisions. It is therefore important that the public participate in decisions based on the importance of those impacts." (Fowler and Dias de Aguiar, 1993).

<u>The emergence of the concept of damage in developed countries: the example of Italy</u>

The concept of environmental damage has been recently introduced in the Italian legislation by Law No. 349 of 8 July 1986 regarding the establishment of the Ministry of the Environment and rules on environmental damage. According to Article 18, paragraph 8, in his decision the judge shall order restoration of the damaged place at the infringer's expense, if restoration is feasible. (Maffiei, 1993). This emergence of the notion of environmental damages is a pattern in almost all developed countries. The emergence of a concept is always the first step towards the integration of the concept into the laws, the mentalities, and finally customary laws. It is much easier for a nation to accept concepts proposed by inter-

national legislators when these concepts already belong to customary laws.

Conclusion

The paragraphs above try to show the complexity of the factors leading to the decisions of the nations. Depending on circumstances and on the nations, the political, social, economic and environmental interests will be weighted differently. However, a general trend appears in favor of the proposed rule. Indeed, the objective of the rule is to go towards a sustainable society, and at one time or another the consciousness of a need for sustainability arises in the nations' interest. For instance, we can compare the progress of this consciousness in African countries between the UN 1972 Environmental Conference and the Rio Environment and Development Conference in 1992.

4.2 What structural changes are needed for the proposal to be implementable?

We will examine the need and potential for structural changes in different fields:

Political field:	- need for an adequate political structure
Social field:	- need for educating the public
	- need for adequate "trustees" (which is also a political issue)
Economic field:	- need for "greening business" (which is also a social issue...)
Scientific:	- need for environmental and technical research

4.2.1 Need for an adequate political structure: Need for democracy?

The need for democracy

Even at the community level, for people to participate actively and without reward in public affairs costs them time and effort. In some cases it may well also entail financial or physical risk for those who find themselves in opposition to a strong interest group. It is therefore not surprising if most people prefer to leave such participation to others. Even in established democracies, the majority of the citizens will only participate on a given issue when it directly and strongly affects their personal interests (Sharp, 1993). Thus, when we speak of participation, what we should mean is the opportunity to participate.

This raises the question of what conditions constitute adequate opportunities. Many of

these are culture- or subject- specific, but the most obvious include (Sharp, 1993):

- full access to and explanation of information on assessments and restoration alternatives
- freedom of association to permit the discussion of issues by all interested groups within the community
- regular meetings with elected officials or representatives to be elected who would receive the views of the community and be held accountable for the actions taken on its behalf (Gran, 1983).

These conditions will need to be realized in a wide variety of institutional forums, allowing for the forums themselves to change. However, in the end, the opportunity for people's participation in any society is determined by the quality of civil and political rights that they are accorded: in a word, political freedom (Sharp, 1993). It is thus significant that the UN Development Program's Human Development Report, in its initial work to construct an index of freedoms by country, detects a high correlation between human development and human freedom (UNDP, 1991).

Today, whether the country is led by a centralist government or is an emerging democracy in the South (with scant resources to manage the transition), it is difficult to implement public participation. Kakonge and Imevbore (1993) explain that in most developing countries, the system of public inquiry is not institutionalized because government works mainly within a regulatory framework and official information on project is kept secret so as to reduce possible pressure by various interest groups.

Deep structural changes are needed that would allow a sustainable system of public participation. As one distinguished African commentator has noted: "The needed transformation in the political process goes beyond multi-partyism or concessions granted by the government. It is necessary to strengthen civil society at all levels, including peasants, workers and students movements, NGOs, professional associations, academic groups, etc." (Damiba, 1991).

How far participation will be allowed in centralist governments?

Despite difficulties, over the past decade, the commitment to public participation in any kind of environmental project has made progress. "It is now standard practice to try to involve the intended beneficiaries in the design, planning and management of projects" (Sharp, 1993). A difficult question, however, concerns the extent to which participation to projects will be tolerated - or can restrain their integrity - within a nonparticipatory political

system. There are many countries where development projects have already thrived at community level even though the national government has been anti-democratic; examples include countries as diverse as Kenya, Pakistan and Indonesia (Sharp, 1993).

Many centralist governments have not stood in the way of small-scale participatory initiatives, but there is a variable borderline beyond which such projects will find themselves in conflict with the government's assertion of its prerogative in policy-making. The viability of local-level participation in the absence of a positive enabling environment can only be measured on a case-by-case basis, but it will depend significantly on the level up to which participation is permitted in the pyramid of social organizations (Sharp, 1993).

The need for a local political structure; "Local Agenda 21"

Given the difficulties encountered in implementing public participation in non-democratic or/and developing countries, another question is the structural reason for the low public participation in rich democratic countries. In the strongly-structured societies of the North, the public will not be able to communicate its interests without the existence of a local political structure to organize and represent the public. This need was also recognized in the "local Agenda 21" (Cf. chapters 28.2 and 28.3) of the 1992 Rio Earth Summit.

Alan Petterson and Kate S. Theobald commented that: "Activity at the local level is widely accepted to be crucial in implementing the principles of sustainable development, and local authorities have a central role to play in this through "Local Agenda 21". These ideals imply changes in the structure and role of local government, with emphasis being on the integration of a concern for environmental issues across the local authority as a whole, coupled with greater levels of public participation".(Petterson and Theobald, 1996).

The need for a local political structure has traditionally been satisfied by NGO's in developing countries. In the past years of economic crisis, the role and power of NGO's have been increasing on human rights and environmental grounds.

4.2.2 Need for educating the public

Part of the mission of getting the public involved in restoration projects is education. But education is at stake even when the public is ready to get involved into the decision-making process. Indeed, our proposal embodies the belief that people should be able to choose the

best restoration alternative in accordance with criteria which emphasize the need to take into account all individuals' values and needs. These include the values and needs of future generations. Thus people's responsibilities form the crux of the sustainability of the restoration plan selected.

However, people in many countries have followed unsustainable systems or practices: the rape of tropical rainforests, the acceleration of desertification... It is very possible that in the place where the oil was spilled, some unsustainable practices had existed for a long time (a fishing practice that results in a lot of by-catch for instance).

The populations who will be the decision-makers must be able to:

- assume their responsibility towards future generations. In the proposed policy, there is no objective tool (such as the discount rate in cost/benefit analyses) to make sure that the needs of future generations are accounted for. We believe that the current populations can freely and intuitively take into account the needs of future generations.
- understand the need for change in certain of their unsustainable practices. The proposed rules do not forbid the unsustainable practices that existed before, since the purpose is to go back to the situation "as if no incident had occurred". However, trustees will tend to implement sustainable restoration projects unless the populations' desires are strongly in favor of the former practices.

Consequently, the public must be provided education and skills at the community, district and provincial levels to produce an adequate cadre of trained and well-motivated people who will understand the values of, and be competent to manage, the participatory system.

4.2.3 Need for "Greening business"

"Greening business" is a necessity if we want the negotiating and decision-making processes to be efficient and to achieve the environmental goals of the rules. For the RP, trying to go through the restoration selection process without any environmental commitment means missing the point.

Across the world, company responses to environmental issues have mostly been driven by legislative demands, with "probably no more the 100-200 companies worldwide having made environmental performance one of their top concerns" (Cairncross, 1990). We need

more than a mere compliance with legislation in our case; we need the collaboration of the private sector. In other words we need the companies, and more specifically the multinationals in environmentally intensive industries (the oil and shipping companies), to develop a kind of "corporate environmentalism" (Robins and Trisoglio, 1993).

Here are some issues that companies should pay attention to in order to allow themselves to be more in the "spirit" of the proposed ruling.

Accountability: public and shareholder disclosure

The argument is often that even if companies have resources available for investing in new, better tankers for example, these investments must compete with other project proposals, which could have higher short-term financial returns. The issue is exemplified by the remarks of an executive from a UK water company who explained inadequate investment in environmental protection by the fact that other investments were "better for shareholders" (*Sunday Times*, 1991). This argument is based on the assumption that the shareholders only look at the final earnings, without being aware of the missed environmental opportunities of the company which ultimately could increase its benefits.

Not only do companies have a duty to disclose their environmental impacts to all their stakeholders, in the same way as financial auditing displays their economic activities, but experience has demonstrated that public disclosure has a powerful catalytic effect on corporate behavior.

Without accurate information and reporting, investors are unable to make fully informed decisions. This was the concern of the Valdez Principles, launched by a group of environmentally concerned shareholders after the 1989 *Exxon Valdez* spill in Alaska. These principles are intended to act as "broad standards for evaluating activities by corporations that directly or indirectly impact the Earth's biosphere" (CERES, 1990). Signatory companies agree to abide by ten principles, including "conduct and make public an annual self-evaluation of our progress" (ibid.). However, by 1991 only twenty nine smaller companies had signed up, although CERES expected to have some *"Fortune 500"* companies sign during 1991. (See the Valdez Principles in Appendix).

"Greening investors"

An important problem is that even when there exists an adequate disclosure to shareholders, investor pressure is too low if not absent. Only 10% of European executives in the 1991

DRT International survey acknowledged that they had been influenced by shareholders or insurers to alter their business for environmental reasons. This drives the conclusion that "greening business" also means "greening investors".

However, investors are now looking for liability exposure in companies, forcing companies to take preventive measures. "Greening" can happen as a result of trying to avoid environmental liabilities.

Long term goals

Having long terms goals is the key to sustainability and thus to environmentalism. However, the capital markets and shareholders who ultimately judge industry's achievements are setting increasingly short-term financial performance goals, which make it difficult to make the necessary environmental investments. In this sense, Juan Rada, the former Director-General of the IMD business school, believes that "a sustainable economy requires capital markets, tax structures and regulations that privilege investments and savings over consumption, the long over the short term and the stakeholders over a narrow definition of the shareholders" (WICEM, 1991).

Nevertheless, capital markets, shareholders and corporate behavior are strongly interrelated which means that all the components of the economic and financial structure should adopt long term goals and influence each other towards this direction.

Allocation of responsibility: "greening the management"

Successful corporate programs towards a stronger dedication to environmental issues have relied on strong support from senior management and significant reforms in organization and management structures to allocate responsibility and provide effective incentives for reducing environmental impacts (Robins and Trisoglio, 1993). Again, regulation and liability problems have also helped.

Attitude in developing countries

For developing countries, however, a prime concern is how to ensure that multinational corporations do not abuse their lack of media, public pressure, and shareholders pressure (who often only care about environmental issues in their own country) by operating with double standards (Robins and Trisoglio, 1993).

Conclusion

Davis ascertains that: "sustainable development challenges the entire industrial and commercial system to restructure itself, based on a completely new set of assumptions and beliefs about the ways we must conduct our economic affairs. We should be making a profound mistake if we perceived the change in terms any less fundamental than that" (Davis, 1991).

From a global perspective, the 1990 United Nations Industrial and Development Organization report declared that "if the current patterns of structural change in world industry should continue unchecked, environmental problems in developing countries will be likely to reach crisis proportions in the near future" (UNIDO, 1990).

4.2.4 Need for adequate "trustees"

Trustees play a major role in the whole assessment procedure. The personalities of the trustees will have an impact on the outcome of the procedure. Trustees uphold the equity, and thus the acceptability of the procedure. This is why the following three requirements for trustees are demanded:

- *Accountability*

Trustees should be accountable on many different levels:

- financial accountability: to guard against the poor management of funds (the RP will be the most concerned with the trustees' financial accountability)
- political accountability: to ensure that agreed plans are carried through (the affected public will be the most concerned with the trustees' political accountability)
- environmental accountability: to ensure that the goals of the restoration (to restore totally and/or to provide for an equivalent) are reached
- social accountability: to ensure that no values of any significant minority have been forgotten when evaluating the social impacts of the incident and of the restoration plan

Trustees are accountable before the United Nations, which means to all human being.

- *Transparency*

The processes of assessment and decision-making must be open to public view and thus be seen to be free of interference from special interests. For example, even in the absence of media pressure, the trustee should not let themselves be influenced by the RP.

- *Non-biased values*

Due to the uncertainty of environmental assessments and the difficulty and controversy of social impact assessments, there is a need for a non-biased mediator in the decision-making process. A necessary quality of the trustee must be the understanding of the environmental values (which includes the services provided by the environment) of the impacted populations. The trustees must not be "blind" because of their own values. This may require that trustees belong to different cultural backgrounds.

4.2.5 Need for technical and environmental research

Need for information on ecosystems

Some alarming reports have been written on the difficulty of applying environmental legislation in developing countries due to the lack of information. The following is an example from Brazil.

"Although environmental considerations are mandated by law, there are basic structural deficiencies. The principal problem is the lack of information on most Brazilian ecosystems. Cartographic data is out of date and rarely available at scales appropriate for Environmental Impact Assessments (EIAs), which means that most EIAs require extensive field work. Even when data are available, they are dispersed among different institutions. In many cases data are not collected but, rather, are extrapolated from similar environments, leading to a loss of tolerance and criteria." (Fowler and Dias de Aguiar, 1993).

Some solutions have been proposed. Ahmad and Sammy (Ahmad and Sammy, 1985) suggest that one of the ways to address the problem of EIA data in developing countries is to establish an environmental data bank (e.g., on soils, vegetation, etc.) which would be updated periodically. Agenda 21, recognizing this major issue, recommended in the chapter "Marine environmental protection" (Agenda 21, Forest Principle, Part II, B.) that "States should, as appropriate, and in accordance with the means at their disposal and with due regard to their technical and scientific capacity and resources, make systematic observations on the state of the marine environment." Some practical recommendations follow.

Need for technological improvement

The main difficulty for many developing countries will be lack of equipment, facilities, and expertise capacity for implementation of the proposed rule. This problem was identified in

the Rio Conference, and was emphasized strongly along all the recommendations: for each recommendation, the "scientific and technological means" that would be necessary for the implementation were identified and technological transfer from North to South was strongly encouraged.

4.3 Sustainability of the New Framework: Part of the Environmental Costs are not Compensated

One of our objectives was to recover totally what was lost because of the incident. However, even if an appropriate restoration was implemented, our goal would not be perfectly achieved,

- due to uncertainty: we do not know part of the damages that may appear in the very long term; and we ask only compensation for what we know in the present or what we can anticipate with very little uncertainty.
- due to irreversibility: some damages will never be recoverable, some losses are irreversible, such as existence values (authenticity) or aesthetic values.

4.3.1 Uncertainty

The static interrelationships and the processes of change in almost all ecosystems are extremely complex. Establishing cause and effect relationships is a major difficulty. As a result, we do not know if the environmental damages of a particular incident may appear in the very long term; we only ask compensation for the damages that we know in the present or that we can anticipate with little uncertainty. Uncertain damages are ignored.

What follows is an the example given by Yosef Gotlieb when talking about the uncertainty around environmental degradation.

The October 1994 oil spill in Russia's Komi republic is estimated to have greatly exceeded, perhaps by an order of magnitude, the amounts released in the Exxon Valdez incident. Even if it proves considerably less catastrophic in scope, it took place in a critical zone - the territories and waterways adjacent to the Arctic icecap. Oil is reported to have filtered perilously near the Arctic Ocean. (Yosef Gotlieb, 1996).

Had this happened, it is conceivable that climatic conditions over the polar cap would be affected, at least temporarily. The Arctic's central role in the global hydrological cycle would undoubtedly be disturbed, and increased sea levels along the Canadian Maritimes, the northeastern coast of the United States, and along the coasts of Scandinavia and northern Europe, as well as Russia, would be likely. The rise in sea level would be indiscernible, and it would likely take a season or more before the thermal effects were detected. Still, a likely impact area would be the Gulf Stream, the current of warm water that swerves off the coast of Florida into the northern mid-Atlantic. A departure of even one degree could induce thermal shock among fragile plant and animal species in the marine ecosystem. Were this to occur, species higher on the food chain would be affected. The extent of damage could not be predicted in advance. (Yosef Gotlieb, 1996).

The crisis described above may not happen. One could justifiably argue that the hypothetical conditions would not materialize and, if so, they would have only transient effects. However, in the event of a negative outcome from such an incident, the impact could be much more complicated and devastating than we could anticipate on the basis of current knowledge. We simply do not know.

4.3.2 Irreversibility

Many events impacting the environment have effects that are, for all intents and purposes, irreversible. The most extreme examples concern events which lead to the extinction of a species (by, for example, destroying its last remaining habitat). The elimination of that one species represents the loss of part of our global genetic heritage (and part of a complex web). This heritage has been millions of irretrievable years in the making. Equally, as soil and water chemistry are changed and landscape is altered, impacts are irreversible. Such losses literally leave humanity poorer.

The costs of irreversibility are ecological and by extension economic. The loss of a key plankton as a result of wetlands conversion because of an oil spill, for example, may reduce the quantity of seafood in the food chain. This portends dire economic ramifications for inhabitants of area villages where fishing is the dominant economic activity, as in the case of New England and Canadian fishing villages along the Atlantic coast. These villages will have to convert to another economic activity, or will be abandoned. The other dimension of irreversibility, the socio-political dimension, manifests itself through social alienation,

political unrest and cultural conformity rather than diversity. "The loss of culture, like species loss, represents a permanent reduction in resources available for human progress" (Yosef Gotlieb, 1996). This can may be expressed by the concept of entropy: the loss of biodiversity and of cultural diversity is the expression of the increase of environmental and human entropy.

Note:
Irreversibility is not an absolute attribute. It has different meanings over time. All time scales are not relevant when we speak about irreversibility. For instance, global warming is relevant in human time scale. It may be irrelevant in geological time scale.

4.3.3 Conclusion on Sustainability

The criteria of reversibility/irreversibility has been often proposed to determine whether a social adaptation to global change is sustainable or not. "Insofar as human activity produces change that is reversible (or stated more affirmatively, promotes the options available to a society for indefinite survival), it is sustainable. Adaptations that are irreversible reduce the recovery potential available to the society in proportion to the scope and gravity of the damage produced. In gauging social change, the prospects for the reversal of damage due to human agency serve as an indicator of sustainability" (Yosef Gotlieb, 1996). Consequently, at the degree of technological mastery we have achieved, we must rapidly distinguish and discriminate between sustainable and unsustainable interventions.

These distinctions and discriminations must occur through international regulations that manage to assess the real social (environmental) cost to uses of the environment. This real cost might appear to be so high that some uses of the environment will be abandoned. Today, there is still margin for action. "Despite all the regulatory efforts to date, no country has yet managed to fill the gulf between the social and environmental costs, or to delink economic growth from production of waste" (Robins, Nick and Alex Trisoglio, 1992). For example, in Germany total spending on environmental protection reached 1.5% of GDP in the mid-1980s. However, the costs of pollution has been estimated to be in the region of 10% of GDP (Weizsäcker, 1991).

The profound and unconscious belief of our positivist society is that science will find a way to reverse some impacts of technology that are today irreversible. The precautionary prin-

ciple says that we must not assume that at any moment in the future we will be able to reverse negative impacts. Sustainability now depends on our adoption of the precautionary principle.

Conclusion

Across the world, the environment is in peril. Forests are being stripped, stressed, and burned. Natural habitats are vanishing. Deserts are advancing. Croplands suffer from waterlogging in some regions, overgrazing and salinization in others. The atmosphere and ozone shield are under assault. And last but not least, the oceans are being loaded with pollutants and swept of marine life.

Even if what we have lost could be termed idyllic, it is a lost paradise unavailable as a future option. Our only recourse is to choose strategies for social change that are sustainable and compatible with the futures of societies and communities. This will demand life-style changes.

Regarding ocean pollution by oil spills, these changes must be initiated in three areas.

First, prevention must become a higher priority. The real social costs of environmental damages must be taken into account. In other words, all values -- use values such as property losses and non-use values such as recreation, aesthetics, culture, affection -- must be reflected into the cost of an oil spill. Investments in prevention must be adjusted to the magnitude of damages that are avoided.

Second, we must commit ourselves to restoration. "In restoration, not only are abuses halted, but the resource itself is physically repaired, and, if necessary, its missing components are replaced... While certainly no longer in a pristine state, the restored resource becomes healthy, life supporting, and pleasing to the eye. In this condition, the resource provides a sound basis for the creation of new jobs and prosperity" (Berger, 1987). Recovery also means an awareness of painful truths, specifically that we have engaged in a kind of modern alchemy that, in effect, presupposed unlimited growth despite bounded resources and intricately complex biophysical systems. Further, it is possible that the ecosphere has been so damaged by human actions that recovery is no longer possible since our "progress" has reduced biodiversity, landscape integrity and cultural uniqueness.

Finally, the public and the corporate managers must be informed and involved in environmental issues. As is now increasingly recognized, the pre-condition for any sustainable fu-

ture lies in the mobilization of human resources to plan and manage it. A country's priorities for human resource development need to be assessed (or reassessed) not only according to the requirement of a given sector or institution but in light of the wider issues of sustainability.

We believe that the framework that we propose implements these three necessary changes and thus is a step towards sustainability.

Annexes

1. Technology Standards: a Better Alternative than Liability?

Economic incentives are designed to lower the probability of contamination (ex ante policy) or to create a threat of suits for liability if a spill occurs (ex post policy).
Technology standards belong to the first type of incentives.

Setting technology requirements in certain cases is a good way of insuring a basis for security. Technology requirements prevent the companies from using technologies which are known to be very risky, and oblige them to use technologies which have proved to be reliable. The use of technology standards is only justified by the need for imposing a bottom line of security.

But in the case of oil transportation, there are very few companies, if any, who do not respect this bottom line of security. Most tankers accidents (85%) are caused by human error, and not technology failure. Economists have long argued that technology requirements are seldom efficient.

- First, as demonstrated by many accidents, it is the actions that are unobservable ex ante that may be a large determinant of the probability of an accident.
- Second, pollution incidents are so diverse in nature that it may be difficult to select one pollution control measure that would be effective in all or even most cases.
- Third, the regulatory authority's information regarding the kind and level of prevention technology required is imperfect.
- Selecting a fixed technology is likely to stifle development and use of other designs that could make ship ruptures even less likely.

An example of a technology standard: the double-hulled tankers
The current trend is to require double-hulled tankers. In the US for instance, the Oil Pollution Act requires that by 2015 all tankers plying US waters have double hulls. In a grounding or a collision, the outer hull is supposed to take the shock while the inner hull remains intact.

However, the efficiency of the double-hulled tanker policy regarding the probability of an

oil spill is questioned:

- Double hulls reduce the usable dimensions of the tankers, thus increasing the number of trips. Analyses have shown that the number of port-calls or trips rather than the tonnage moved gives the best correlation with the incidence of spills.
- Building ships with two hulls is expensive in terms of money and time. As a result, shippers undoubtedly try to squeeze more miles from conventional tankers until they must be scrapped or retrofitted by 2015. The result may be an aging fleet and growing danger of accidents.
- The double hull design decreases the number of small oil spills, but increases the gallons of oil spilled if the spill actually occurs. It is uncertain whether the environmental benefits of the double-hulled tankers justify the heavy cost of the requirement.

Some alternatives:

Rather than selecting a single ship design, legislation would ideally set performance standards and encourage innovations to meet them. It seems useless to debate specific regulated designs each time a new idea appears.

The last alternative is ex post liability, very commonly used in all domains as an incentive for pollution prevention. The companies invest in accident prevention technology in order to reduce the probability of having to pay for damages incurred if there is an accident. Moreover, the companies have an incentive for technological improvement at the least cost. All these advantages make this last method the most desirable one.

2. The International Conventions

2.1 The Civil Liability Convention (CLC)

Answering to the necessity of developing international policies about oil pollution liability, IMO (then IMCO) sponsored in November 1969 the International Legal Conference on Marine Pollution damage for the purpose of drafting two conventions. The first one, the Intervention Convention, addresses issues of intervention rights; the second one, the International Convention on Civil Liability for Oil Pollution Damage, addresses liability and compensation for pollution damage. It is known as the Civil Liability Convention (CLC).

The issues and different interests

Most delegates to the conference agreed with the purpose of the CLC, which is defined in its preamble as being a means to "ensure that adequate compensation is available to the victims of pollution damage and that this is achieved through the application of uniform international rules and procedures" (M' Gonigle and Zacher, 1979). But many convention delegates also viewed these two objectives as being distinct and conflicting. Three questions were raised in the compensation issue:

- Who should be liable for pollution damage?
- What is the basis (or criterion) for this liability?
- What is the limit of this liability?

Many different interests were involved in the discussion. Below are the positions from some of them.

- Many major shipping nations, such as the US, Germany, and France, argued for strict liability for the shipowner alone, for fear that any liability burden on the cargo owners or oil industries would result in major financial burdens on their oil companies.
- Many coastal nations, wishing to have a liability as high as possible, argued for the burden to be put both on the shipping and oil industries.
- The UK, with its large insurance and protection and indemnity (P&I) club industry, was concerned that exceedingly high liability limits would very quickly dry up the funds available through the world insurance market.
- The US delegation expressed a greater concern for environmental issues, reflecting the strong public trend in its country, explaining: "The convention should not be dictated by a small group of insurers. It should be drafted in the interests of the victims and the insurers should be expected to adapt themselves to such needs" (M' Gonigle and Zacher, 1979).

<u>The main principles of the CLC</u>

The signing parties to the CLC agreed on:

- Criterion to apply the CLC

The CLC applies to oil pollution damages resulting from laden tankers suffered in the territory or territorial sea of a contracting state. The only criterion is where the damage has occurred; the flag state of the tanker or the nationality of the shipowner is irrelevant.

- Which oil spills?

The convention only applies to spills from tankers carrying oil in bulk as cargo. Spills from tankers during ballast voyages or spills of bunker fuel from ships other than tankers are not covered. Spills from offshore operations are also not covered by the CLC. Moreover, only damage by particular types of oil (persistent oils) is covered.

- Strict liability

The shipowner has strict liability in the absence of fault with the exception of cases involving:

- damage resulting from an act of war or grave natural disaster
- damage wholly caused by sabotage by a third party
- damage wholly caused by the failure of authorities to maintain navigational aids
- warships.

When two or more ships have caused pollution, the owners shall be jointly and severally liable.

- Contributory liability

The plaintiff may be established to have contributory liability in certain cases.

- Liability limits

The shipowner can limit his liability. The owner can be deprived of the right to limit his liability if the claimant proves that the incident occurred as a result of a personal fault of the shipowner.

- Insurance obligations

Ships carrying over 2,000 metric tons of oil (588,000 gallons) must maintain insurance. Insurance is also required for ships flying the flag of a non-member state when entering a port or terminal installation of a party to CLC.

- Limitations for rights of action

There is a limitation of three and six years for rights of action

2.2 The IOPC Fund Convention

In 1971, before the entry into force of the 1969 CLC, delegates met to draft a companion

convention, the International Convention for the Establishment of an International Fund for Compensation for Oil Pollution Damage, which supplemented the CLC by ensuring the availability of adequate compensation funds. This convention, known as the International Oil Pollution Compensation (IOPC) or Fund Convention, also ensured that oil cargo interests bear a portion of the economic responsibility for oil pollution damage to relieve the shipping industry of total responsibility.

Membership to this convention is open to states that are parties to the 1969 CLC. Signing parties adopted the Fund Convention under the auspices of the IMO on 18 December 1971 in Brussels, Belgium. The convention officially entered into force on 16 October 1978.

Objectives of the Fund Convention

The delegation to the conference in 1969 applied 'the polluter pays' principle in drafting the final convention, though the members disagreed on the precise definition of polluter -- the industry or the shipowner. In the end, the CLC imposes strict liability on the shipowner only. The Fund Convention establishes a compensation fund from monies collected from oil companies, and as a result shifts some of the financial burden to the oil industry as a whole.

In essence, the purposes of the IOPC Fund are to:

- Pay compensation to victims of oil pollution in member states when:
  - the shipowner invokes one of the exemptions for liability under the CLC;
  - the owner is financially incapable of meeting CLC obligations or has inadequate insurance; or
  - the damage exceeds the owner's liability under the CLC (most common reason).
- Indemnify the owner for a portion of his liability under the CLC.

Main principles of the Fund Convention

The signing parties of the Fund Convention agreed on the following:

- The creation of the IOPC Fund;

- The fund compensates any person suffering pollution damage who is unable to obtain full and adequate compensation under the 1969 Liability Convention, including the cost of measures reasonably taken to minimize the damage;

- The Fund is not obliged to compensate for damage caused by acts of war, hostilities, or discharges from a warship;

- The limits of the Fund's obligations are set at one million francs for any one incident (US $170,270);

- The Fund indemnifies shipowners for the amount of liability incurred in excess of 1,500 francs (US $255) per ton of the ship's tonnage, but not in excess of 2,000 francs (US $340) per ton or in any case of 210 million francs (US $35.76 million);

- Contributions to the Fund are made with respect to each party by any individuals or companies who, in the calendar year before the entry into force of the Convention by that party, received over 150,000 tons of oil. The government of a state is not responsible for this payment unless it has voluntarily assumed such responsibility. These annual contributions are levied to meet anticipated payments of compensation and indemnification for the coming year and administrative expenses for that year. Amount of annual contributions (rate for contribution on a per ton basis) is decided yearly by the IOPC Fund Assembly.

Reputation of the Fund Convention

The IOPC Fund has been involved in the settlement of claims arising out of more than 70 accidents since its establishment in October 1978.

"The Fund has developed a reputation for quick settlements of claims. This is based on the fund's careful monitoring of accidents that may lead to claims against the fund, of its readiness to provide information on how to present claims, the well-defined procedures laid down for compensations, and its close cooperation with shipowners' P&I clubs." (Jacobsson, 1991).

2.3 The 1976, 1984 and 1992 Protocols (CLC and IOPC Fund Conventions)

In 1976 and again in 1984, contracting parties to the CLC and Fund Conventions met with the IMO to make amendments to the convention in the form of protocols. These protocols were never entered into force. They will come into force when ratified by ten states, including six with not less than one million units of gross tanker tonnage each. Only six nations had ratified the 1984 Protocols.

The general ideas of the drafts are respected in the protocols. The coverage limits are higher, the coverage area is extended, the definition of "pollution incident" includes "threat of pollution", the definition of "pollution damage" is modified.

IOPC Fund member states turned these recommendations into new protocols at a November 1992 meeting held under the auspices of IMO. The newly adopted 1992 protocols retained the substantive provisions of the 1984 protocols but amended the entry into force provisions to ensure earlier ratification. The 1992 CLC protocol requires ratification by four states with not less than one million units of gross tanker tonnage. States ratifying must represent together at least 450 million metric tons.The 1992 protocols entered into force in May 1996. Besides these, the 1992 CLC and IOPC Protocols also represented changes in:

- Higher limits of compensation
- No indemnification of shipowners
- Extension of geographical scope of application
- Spills from unladen tankers covered
- Pre-spill preventive measures covered
- Pollution Damage redefined

2.4 Two voluntary agreements: TOVALOP and CRISTAL

In the aftermath of the 1967 Torrey Canyon spill, oil industry officials and tanker owners became concerned about pollution damage liability and their ability to provide large amounts of compensation until any international conventions enter into force. In December 1969, before the drafting of the IOPC, tanker owners met under the auspices of ITOPF to establish their own voluntary compensation agreement to assist tanker owners in providing adequate compensation.

- Intended only as temporary interim schemes, the nature of CRISTAL and TOVALOP changed substantially in 1978.
- CRISTAL and TOVALOP now merely supplement the funds available for compensation through the IOPC and other compensation schemes to ensure adequate compensation for individuals and governments suffering oil pollution damages.
- The agreements also indemnify tanker owners and cargo owners for partial liability.
- Moreover, CRISTAL and TOVALOP also provide coverage for certain types of liabil-

ity not covered by the IOPC Fund, such as an intentional act or omission by third party and negligence of governments.

- In countries where the IOPC Fund scheme operates, the Fund will always take preference and the voluntary schemes would only apply if there were uncompensated damages above its limits.

Members of TOVALOP and CRISTAL met in October 1991 in Norway and agreed to extend these agreements for two years to February 1994. In May 1993, the administrators of TOVALOP and CRISTAL met again and proposed a three-year extension of the agreements to 1997. The proposal also includes a provision to increase the limits of TOVALOP and CRISTAL so that they retain the same ratio to the 1992 CLC and IOPC Fund protocols as they did to the limits to the conventions in place in 1986 when TOVALOP and CRISTAL were revised.

ITOPF spokesman Ian White argued that he sees a complete termination of TOVALOP and CRISTAL as "not being far off." White argued that greater emphasis would be placed on ratifying the 1992 CLC and IOPC Fund protocols and relying on these compensation schemes rather than on the voluntary schemes. Until the protocols are ratified, which could be as long as three years off, the voluntary schemes will be in place.

TOVALOP

At the end of the 1969 meeting, the tanker owners adopted the Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution (TOVALOP) to help tanker owners meet the cost of oil spill cleanups and damage compensation.

Tanker owners or "bareboat" charters who are TOVALOP members are responsible for settling claims and must demonstrate that they are financially capable of meeting all TOVALOP requirements when they apply for membership into the organization. In most cases, members obtain the appropriate amounts of oil pollution insurance through the International Group of P&I clubs.

TOVALOP membership consists of 3,500 tanker owners and 'bareboat' charters, who operate 6,500 tankers, combination carriers, and barges. It represents 97% of the world's total tank vessel tonnage. TOVALOP pays a maximum of $70 million for one pollution incident for a tanker of over 140,000 gross tons.

CRISTAL

A group of oil companies and cargo owners, representing 90% of the world's fuel oil cargo,

originally joined a complementary voluntary compensation agreement in 1971 to provide oil pollution damage compensation that exceeds the limit of TOVALOP. The agreement is called the Contract Regarding Supplement to Tanker Liability for Oil Pollution (CRISTAL).

To be eligible for funds through CRISTAL, the cargo must be owned by a party to CRISTAL and the tanker owner must meet the financial obligation up to the limit as stated in the supplement to the TOVALOP Agreement, currently set at $70 million. CRISTAL maintains and pays out claims from a money fund. CRISTAL members contribute to the fund based on the amount of the crude and fuel oil members receive from the sea, and the actual amount and frequency of contributions depends on the amount of claims paid out of the fund. The group pays out a maximum of $135 million for one pollution incident. (The present compensation limit under the IOPC Fund is $80 million for one incident, and the 1984 protocols would raise this amount to $191 million).

The CRISTAL membership now consists of 750 oil companies.

3. The Valdez Principles

"Introduction

By adopting these Principles, we publicly affirm our belief that corporations have a responsibility for the environment, and must conduct all aspects of their business as responsible stewards of the environment by operating in a manner that protects the Earth. We believe that corporations must not compromise the ability of future generations to sustain themselves.
We will update our practices constantly in light of advances in technology and new understandings in health and environmental science. In collaboration with CERES, we will promote a dynamic process to ensure that the Principles are interpreted in a way that accommodates changing technologies and environmental realities. We intend to make consistent, measurable progress in implementing these Principles and to apply them to all aspects of our operations throughout the world.

Protection of the Biosphere

We will reduce and make continual progress toward eliminating the release of any substance that may cause environmental damage to the air, water, or the earth or its inhabitants. We will safeguard all habitats affected by our operations and will protect open spaces and wilderness, while preserving biodiversity.

Sustainable Use of Natural Resources

We will make sustainable use of renewable natural resources, such as water, soils and forests. We will conserve nonrenewable natural resources through efficient use and careful planning.

Reduction and Disposal of Wastes

We will reduce and where possible eliminate waste through source reduction and recycling. All waste will be handled and disposed of through safe and responsible methods.

Energy Conservation

We will conserve energy and improve the energy efficiency of our internal operations and of the goods and services we sell. We will make every effort to use environmentally safe and sustainable energy sources.

Risk Reduction

We will strive to minimize the environmental, health and safety risks to our employees and the communities in which we operate through safe technologies, facilities and operating procedures, and by being prepared for emergencies.

Safe Products and Services

We will reduce and where possible eliminate the use, manufacture or sale of products and services that cause environmental damage or health or safety hazards. We will inform our customers of the environmental impacts of our products or services and try to correct unsafe use.

Environmental Restoration

We will promptly and responsibly correct conditions we have caused that endanger health, safety or the environment. To the extent feasible, we will redress injuries we have caused to persons or damage we have caused to the environment and will restore the environment.

Informing the Public

We will inform in a timely manner everyone who may be affected by conditions caused by our company that might endanger health, safety or the environment. We will regularly seek advice and counsel through dialogue with persons in communities near our facilities. We will not take any action against employees for reporting dangerous incidents or conditions to management or to appropriate authorities.

Management Commitment

We will implement these Principles and sustain a process that ensures that the Board of Directors and Chief Executive Officer are fully informed about pertinent environmental issues and are fully responsible for environmental policy. In selecting our Board of Directors, we will consider demonstrated environmental commitment as a factor.

Audits and Reports

We will conduct an annual self-evaluation of our progress in implementing these Principles. We will support the timely creation of generally accepted environmental audit procedures. We will annually complete the CERES Report, which will be made available to the public.

Disclaimer

These Principles establish an environmental ethic with criteria by which investors and others can assess the environmental performance of companies. Companies that endorse these Principles pledge to go voluntarily beyond the requirements of the law. The terms may and might in Principles one and eight are not meant to encompass

every imaginable consequence, no matter how remote. Rather, these Principles obligate endorsers to behave as prudent persons who are not governed by conflicting interests and who possess a strong commitment to environmental excellence and to human health and safety. These Principles are not intended to create new legal liabilities, expand existing rights or obligations, waive legal defenses, or otherwise affect the legal position of any endorsing company, and are not intended to be used against an endorser in any legal proceeding for any purpose. " (http://www.ceres.org/Principles.html).

References

Ahmad, Y.J. and G.K. Sammy, *Guidelines to Environmental Impact Assessment in Developing Countries*, Hodder and Stoughton Ltd, London, 1985.

Alario, Margarita, *Environmental Destruction, Risk Exposure and Social Asymetry: Case studies of the environmental movement's action*, University Press of America, Lanham, Md., 1995, p.72.

Barbier, Edward, Joshua Bishop, Bruce Aylward and Joanne Burgess, "Economic Policy and Sustainable Natural Resource Management" in Johan Holmberg (ed.), *Making development Sustainable*, Island Press, Washington, D.C., 1992.

Berger, J.J., *Restoring the Earth: How Americans are working to renew our damaged environments,* Anchor Press, New York, 1987.

Binger, Bria R., Elizabeth Hoffman and Robert Copple, "Contingent Valuation Methodology in the Natural Resource Damage Regulatory Process: Choice Theory and the Embedding Phenomenon." *Natural Resources Journal*, Dec. 1995.

Box, Bill , "Oil company shipping strategies: Getting it right or getting right out." *Seatrade Review*, Feb. 1995, p.83.

Branco, S.M., *Ecossissímica: Uma abordagem integrada dos problemas do meio ambiente*, Edgar Blutcher Ltd, Sao Paulo, Brazil, 1989.

Burlington, Linda B., *Natural Resource Damages, NOAA's Approach,* NOAA, 1996.

Caldwell, L. K., *In Defense of Earth: International Protection of the Biosphere*, Indiana University Press, Bloomington, 1972, p.3.

CERES, *The 1990 Guide to the Valdez Principles*, CERES, New York, 1990.

Coker, Annabel and Cathy Richards, *Valuing the Environment: Economic Approaches to Environmental Evaluation; Proceedings of a Workshop held at Lugrove Hall, Middlesex Polytechnic, on 13 and 14 June 1990*, Belhaven Press, London, 1992.

Damiba, Pierre-Claver, "Governance and economic development." *Africa Forum*, 1, 1991.

Davis, John, *Greening Business*, Blackwell, Oxford, 1991.

Dommen, Edward (ed.), *Fair Principles for Sustainable Development: Essays on Environmental Policy & Developing Countries,* published for and on behalf of the United Nations by E. Elgar, Brook Field, Vt., 1993.

Dunford, R.W., S.P. Hudson and W.H. Desvousges," Linkages between oil spill removal activities and natural resource damages." *Proceedings of the 1991 International Oil Spill Conference*, 1991, pp.377-83.

Environmental Policy and Law, "WACAF", Vol. 23, No. 2, 1993.

Etkin, Dagmar S., "The financial Costs of Oil Spills." *OSIR*, Cutter Information Corp., Arlington, Ma, 1995, pp.156-174.

Falk, Richard, *A Study of Future Worlds*, Free Press, New York, 1975, p.45.

Fletcher v. Rylands, 1866: L.R. 1 Ex. 265, 279.

Fowler, Harold G. and Ana Maria Dias de Aguiar, "Environmental impact Assessment in Brazil." *Environmental Impact Assessment Review,* Vol.13, 1993, pp.169-176.

Goldie, "International Principles of Responsibility for Pollution." *Columbia Journal of Transnational Law*, Vol. 9, No. 2, 1970.

Gotlieb, Yosef, *Development, Environment and Global Dysfunction, Toward Sustainable Recovery*, St. Lucie Press, Delray Beach, Fla., 1996.

Gran, Guy, *Development by People: Citizen Construction of a Just World*, Praeger, New York, 1983.

Grubb, M., M. Koch, K. Thomson, A. Munson and F. Sullivan, *The Earth Summit Agreements, an Analysis of the Rio '92 UN Conference on Environment and Development*, Earthscan Publications Ltd., London, 1995.

Hanson Philip P. (ed.), *Environmental Ethics: philosophical and policy perspectives*, Institute for the Humanities/SFU Publications, Burnaby, British Columbia, 1986.

Henry, Cleopatra Elmira, *The Carriage of Dangerous Goods by Sea: The Role of the International Maritime Organization in International legislation*, Frances Pinter, London, 1986, p.150 & p.84.

Hull, E. W. Seabrook and Albert W. Coers, *Introduction to a convention on the International Environmental Protection Agency,* 1975.

ICGPSIA (Interorganizational Committee on Guidelines and Principles for Social Impact Assessment), "The Guidelines and Principles for Social Impact Assessment." *Environmental Impact Assessment Review*, Vol. 15, No. 1, Jan. 1995, pp.11-44.

Jacobsson, M., "Future of the international conventions on liability and compensation for oil pollution damage." *Proceedings of the 1991 International Oil Spill Conference*, 1991, pp.689-90.

Jones, A. Carol, *Compensation for Natural resource Damages from Oil Spills: A Comparison of USA Law and International Conventions*, Resource Valuation Branch, Damage Assessment Center, NOAA, 1996.

Kakonge, John O. and Anthony M. Imevbore, "Constraints on Implementing Environmental Impact Assessment in Africa." *Environmental Impact Assessment Review*, Vol. 13, 1993, pp.299-308.

Lahlou, Mohammed and Larry Canter, "Alternatives Evaluation and Selection in Development and Environmental Remediation Projects." *Environmental Impact Assessment Review*, Vol. 13, 1993, pp.37-61.

Lemons, 1983, quoted in Nick Hanley and Clive L. Spash, *Cost-Benefit Analysis and the environment*, E. Elgar, Aldershot, Hants, England, 1993.

Lloyd's List, At1, Col. 7-8, June 30, 1990.

Lloyds shipping Economist, *Oil majors review Own Tonnage Fleets*, Dec. 1995.

M' Gonigle and Zacher, *Pollution, Politics, and International Law; Tankers at sea*, University of California Press, Berkeley, 1979.

MacGarvin, Malcom, "Precaution, Science and the Sin of Hubris," in Timothy O'Riordan and James Cameron (eds.), *Interpreting the Precautionary Principle*, Earthscan Publications Ltd., London, 1994, p.70.

Maffiei, Maria Clara, "The Compensation for Ecological damage in the "Patmos" Case," in Francesco Francioni and Tullio Scovazzi (eds.) *International Responsibility for Environmental Harm*, Graham & Trotman, London, 1991.

Malgren, Harold B., "Environmental Management and the International Economy," in A. Kneese, S. Rolfe, and J. Harned (eds.), *Managing the Environment: International Economic Cooperation for Pollution Control*, Praeger Publishers, New York, 1971, p.54.

Marine Pollution Bulletin, Vol. 32, No. 8/9, Aug./Sept.1996.

McCracken, Jennifer A., Pretty, Jules N. and Conway, Gordon R., *An Introduction to Rapid Rural Appraisal for Agricultural Development*, Sustainable Agriculture Programme, IIED, London, 1988.

Mead, Walter J., *The Economic Cost of the Santa Barbara Oil Spill*, 1978.

Meadows, Dennis L. and George Randers, "The Time Dimension," in David A. Kay and Eugene Skolnikoff (eds.), *World Eco-Crisis: International Organizations in Response*, University of Wisconsin Press, Madison, 1972, p.48.

Nash, A. E. Keir, *Oil Pollution and the Public Interest: a study of the The Santa Barbara Oil Spill*, Institute of Governmental Studies, University of California, Berkeley, 1972.

NOAA, *Final Rule on Natural Resource Damage Assessments*, US Federal Register, Vol.61, No.4, Jan. 5, 1996, pp.340-510.

NOAA, *Natural Resource Restoration*, NOAA, 1995.

NOAA, *Reversing the Tide, Restoring the nation's Coastal and Marine Natural Resources*, NOAA, Nov. 1995.

O'Neill, John, "Cost-Benefit Analysis, Rationality and the plurality of Values." *The Ecologist,* Vol. 26, No. 3, July 1996.

OECD, *Legal aspects of Transfrontier Pollution*, OECD, Paris, 1978.

OECD, *Combating oil Spills*, OECD, Paris, 1982.

OECD, 1991a, *Technology in a changing world*, OECD, Paris, 1991.

OECD, 1991b, *Technology in a changing world,* OECD, Paris, 1991, p.88.

Olsen, P.C., and W.R. Hamilton, "Estimating the work required to clean up after the Exxon Valdez," in *Proceedings of the 1991 International Oil Spill Conference*, 1991, p.709.

Pearson, Charles S., *International marine environment policy: the economic dimension*, Johns Hopkins University Press, Baltimore, 1975.

Petterson, Alan and Kate S. Theobald, "Local Agenda 21, Compulsory Competitive tendering and Local Environmental Practices." *Local Environment*, Vol. 1, No. 1, 1996.

Pierce, D. W., "The economics of natural resource degradation in developing countries" in R.K. Turner (ed.), *Sustainable Environmental Management: Principles and Practices*, Westview Press, Boulder, 1988.

Repetto, Robert, *Promoting Environmentally Sound Economic Progress: What the North Can Do*, World Resources Institute, Washington D.C., 1990, pp.13-14.

Robins, Nick and Alex Trisoglio, "Restructuring Industry" in Johan Holmberg (ed.), *Making Development Sustainable*, Island Press, Washington, D.C., 1992.

Sharp, Robin, "Organizing for Change: People-Power and the Role of Institutions" in Johan Holmberg (ed.), *Making Development Sustainable*, Island Press, Washington, D.C., 1992.

Sheehan, Patrick J., *Effects of Pollutants at the Ecosystem Level*, Published on the behalf of the Scientific Committee on Problems of the Environment of the International Council of Scientific Unions by J. Wiley, Chichester, N.Y., 1984.

Slouka, Zolenek J., "International Environmental Controls in the Scientific Age," in Lawrence Hargrove (ed.), *Law, Institutions and the Global Environment*, Oceana Publications, Dobbs Ferry, N.Y., 1972, p.208.

Stancik Maureen M. *Combining tools and processes to facilitate Coastal Environmental Decisions which reflect well-informed societal preferences*, Doctorate Thesis, MIT, 1995.

Stauth, Roy, Merle Sowman, and Shirley Grindley, "The Panel Evaluation Method: an Approach to Evaluating Controversial Resource Allocation Proposals." *Environmental Assessment Review,* Vol. 13 , No. 1, 1993.

Susskind, L. and J. Cruikshank, *Breaking the Impasse: Consensus approaches to resolving public disputes*, Basic Books, New York, 1987.

Thacher, Peter S., "The Mediterranean: a New Approach to Marine Pollution," in Gunnar Sojostedt (ed.), *International Environmental Negotiation*, Sage Publications, Inc., Newbury, Ca, 1993, pp.110-134.

UNIDO, *Industry and Development: Global Report 1990-91*, UNIDO, Vienna, 1990.

US Department of the Interior/Minerals Management Service, *Outer Continental Shelf Natural Gas and Oil Resource Management Comprehensive Program 1992-1997 (Decision Documents)*, Minerals Management Service, Washington, D.C., April 1992.

Vermeersch, Etienne, "The Future of Environmental Philosophy", in Wim Zweers and Jan J. Boersema (eds.), *Ecology, Technology and Culture*, White Horse Press, Cambridge, UK, 1994.

Weizsäcker, Ernst Ulrich von, "Sustainability is a task for the North." *Journal of International Affairs*, Winter, 1991.

WICEM, *WICEM II: Conference Report and Background Papers*, ICC, Paris, 1991.

Woodley, Stephen, "A Scheme for Ecological Monitoring in National Parks and Protected Areas." *Environments: A Journal of interdisciplinary Studies*, Vol. 23, No. 3, 1996.