

AALCC

INTRODUCTORY REMARKS

It is a great honour and privilege, as well as a challenge, to have been invited to cooperate with this great organisation in the elaboration of a common project to advance our common goal and aspiration. What we all want is the coming into force and implementation of the 1982 United Nations Convention on the Law of the Sea whose adoption was rightly hailed by the Secretary General of the United Nations as the greatest event since the adoption of the Charter of the United Nations.

We are aware of the crucial role played by your organisation at the early stages of the Third United Nations Conference on the Law of the Sea, and we are convinced that you can and will play an equally crucial role now, in this final stage of bringing the Convention into force. This is very much in the hands of the great people of Asia and Africa.

This Convention is the first, and thus far, the only piece of a new international order, including a new international economic order, and such a new international order is needed, not only by the South,

but equally by the North, and it is coming: far more rapidly than we ever thought possible.

The speed of this change is indeed breath-taking; and any one who would have predicted it only three years ago would have been dismissed as unrealistic and utopian.

Excellencies, friends, this takes me to the first preliminary point I want to make here to set our project into its proper context: I beg you not to dismiss lightly the proposal before you as "unrealistic," "academic," or "utopian." Our proposal is based on tried and tested methods of scientific-industrial organisation and on the perception of irreversible trends in the industrial world outside and within the Preparatory Commission itself.

When this august body adopted, almost two decades ago, the concept of the Exclusive Economic Zone, it was utopian, academic, and unrealistic. Were not the great maritime powers against it? It was your decision that it was to be real, that made it real. You have it in your hands, equally, to decide that the Convention should come into force and to realize a concept like the one we put before you today.

My second preliminary point is this: Rumours are being spread, far and wide, that seabed mining itself is utopian and unrealistic, and since the great United States has lost interest in the subject, we all must do the same.

These rumours do not correspond to reality even in the United States. They merely serve to undermine the Convention.

I have brought with me an American journal, paid for, and serving the interests of, the American marine industries. The journal is called *Sea Technology*, and this is the most recent issue, January, 1990. The article I am referring to describes in some detail -- very similar to the description you find in our study here -- the investments and activities in seabed mining in various parts of the world, and comes to the conclusion that "the future of marine mining is no longer questionable. it is a matter of "when."

Proposals have been launched by the National Academy of Science, for the establishment of "Ocean Enterprises," including seabed mining enterprises, to the tune of seven billion dollars a year. These are to be organised, on a national scale, very much along the

same lines as our proposed joint venture, that is, combining the private and the public sector. The prestigious Science journal launched a proposal for the establishment of a sort of MITI in the United States to finance the research and development necessary as a basis for the operations of these enterprises.

Excellencies, Ladies and gentlemen: My third preliminary point is this: We are all aware of current attempts to find ways and means to effectively change the Convention before it comes into force. I fully share the position of my friend Frank Njenga that, presently, there is no legitimate forum for the discussion of any such changes; that, politically, they would be unacceptable to the vast majority of States, and that, even in practical terms, it would be unwise to try to replace articles, which were drafted in the '70s and which are obsolete today, with articles which may be obsolete when seabed mining becomes operational -- probably 15 or 20 years from now.

This, however, does not mean that we should close our eyes in the face of the fact that certain articles are indeed obsolete; that the scientific, technological, and economic situation has changed and

keeps changing very rapidly and that, practically, we must find ways to adapt to the changing situation. This has nothing whatsoever to do with making concessions and reaching North-South compromises. What is needed is a common effort to deal with change, which in our modern society is a necessity for any industrial enterprise and reflects itself in contemporary management training and in the continuous search for flexible, adaptable industrial structures..

In our case, this effort, it seems to me, should be embodied in a three-pronged strategy.

First of all there should be a concerted campaign to bring the Convention into force as quickly as possible. This great organisation represents a large number of States. If we all agree, it should be possible to mobilize eighteen ratifications in a relatively short time. Give it one year. In 1991 the required number of ratifications should be complete. In 1992 the Convention should come into force: at which time, according to the present schedule, also the work of the Prep.Com. should have been completed.

That is the first prong of the strategy I want to propose.

The second is that we should agree that a few articles, which simply cannot be applied today, should be frozen. That is, we agree not to use them. Since we cannot use them anyway, this does not constitute a sacrifice in any case.

What I have in mind, is, for instance, the financing of the Enterprise in Annex 3. This provision, like a few others, was based on assumptions which simply do not exist today. There is no State or Company today that would invest 2 billion dollars in an integrated mining project, and since the Authority's Enterprise is to keep pace with the other arm of the parallel system, but cannot possibly race ahead of it, it seems reasonable to suggest that this over-all financing of an integrated project must be postponed: not changed; not renounced; but the time table must be adjusted. So again: this provision should be frozen.

Hand in hand with this freezing process, however, comes the third, and most important and most constructive and dynamic prong of our strategy and that is the creation of a viable interim regime for exploration, technology development and the development of human resources, these being the activities that are

going on now, which should be brought within the framework of the Convention and shared by developing countries.

And this is the essence of the proposal we put before you today.

Now we need your contributions to the project, which, I would hope, would be a number of additional papers prepared by various delegations between now and later this year, when we shall have our seminar in New York. These papers could be of two types: they could be comments, criticisms, and elaborations of the material presented in our basic document; or they could be additional data: additional information on the status of research in development, and the needs in this sector, in various countries.

So this really should become a common project, on which we all cooperate.

Let me now quite briefly "walk" you through the main points of the document.

The purpose of the study is "to explore ways and means to

complete arrangements under para.12 of Resolution II in the most cost-effective

manner, beneficial to all parties concerned;  
enhance the participation of developing countries in ongoing ocean mining research and development activities and give a focus to the development of human resources in such activities;

advance international cooperation in R&D in high technologies under an interim regime, in accordance with the Convention and Resolution II, which can smoothly be integrated into the permanent Convention regime;

remove some of the uncertainties surrounding the discussions on the establishment of the Enterprise, by focusing on the near and medium term, that is, on exploration, technology development and the development of human resources."

The study falls into three parts. Part I gives a summary overview of ongoing R&D activities among Pioneer investors, potential investors as well as States interested in selling deep-sea mining technologies. It has been estimated that more than \$650 million (constant 1982) has been spent to develop



technologies for manganese nodules during the sixties and seventies. During the eighties, spending levels dropped to about \$100 million a year. It seems likely, however, that the decrease was cyclical and that investments will rise again in the nineties. R&D will be crucial in bringing down production prices to commercially competitive levels.

It is pointed out that R&D costs to individual companies or States could be cut by up to 75 percent if these efforts were to be undertaken jointly.

Part II of the study elaborates a model agenda for a joint undertaking in exploration, technology development and development of human resources, which represents a mix of long-term projects, of a futuristic orientation, with short-term projects based on technologies already in existence and likely to incrementally develop in the next 10 years.

Any such agenda must necessarily contain the following elements:

. Mapping of the ocean floor and acquisition of data about the ore and its substratum, followed by a compilation of deposit maps;

- II. testing and upgrading of technology of exploration and mining;
- III. conducting pilot tests;
- IV. developing new mining concepts;
- V. conducting economic/financial studies, including a feasibility study and a plan of work;
  - 1. Assessing environmental impact; and
  - 2. Development of human resources.

Projects within this framework should be selected as interested partners and funding become available: each selected project is to be funded half by the proposing company or State, half through development banks, etc., on behalf of the Authority or the Prep.Com -- on the pattern of EUREKA.

With regard to exploration and mapping activities, we recommend the implementation of the exploration plan already adopted by the Pioneer Investors.

In connection with the economic/financial studies, let me draw your attention to the study, recently published by IFREMER, which, contrary to the Australian study published a couple of years ago, indicates that even with present metal prices and presently existing technologies, nodule mining would be profitable.

With regard to environmental assessment, we note that this is a point recently attracting much more attention than previously. It is, in fact, a crucially important point. We have given it a high relevance in our study. It is a point that can be satisfactorily dealt with only on the basis of international cooperation. A joint venture such as the one we are proposing would be an eminently suitable instrument.

With regard to training, we recommend the implementation of the programme already adopted by the Prep.Com. This programme does not specify the number of trainees. This number will depend on the number of R&D projects adopted at any one time. What we anticipate to be the starting situation, could accommodate, we think, a total of 40 trainees for the first year.

Part III, finally presents an institutional framework for the joint undertaking, based on four proposals already before the Preparatory Commission:

The Model Joint Venture Agreement for Seabed Mining, submitted by the Delegation of the Federal Republic of Germany;

The Agreement on the Establishment of the Interoceanmetal Joint Organisation for Exploration, Prospecting and the Preparation for Industrial Exploitation of Ferro-Manganese Nodules, submitted by the East European Socialist States;  
JEFERAD, submitted by the Delegation of Austria;  
THE INTERNATIONAL VENTURE, submitted by the Delegation of Columbia.

It is suggested that each one of these models, presenting the views of North, South, East and West, has something to contribute to the envisaged agreement.

A final section is devoted to an analysis of the status of intellectual property in the context of joint technology development, and this was a very interesting study to make.

First of all it is clear that contemporary technology is making the concept of intellectual property quite problematic. The development of every new technology -- integrated circuits, software, genetic engineering -- raises new problems. Pirating, to the tune of billions of dollars annually, is rampant and likely to increase unless the whole process is brought under a rational common-heritage system.

Secondly, there is a great deal of flexibility as to how patent rights to technology developed in common are divided and assigned. We have given you a number of case studies. In no case has there been any serious problem among partners.

This, fellow delegates, concludes the first part of our study. The next part is up to you. You should study the text and prepare your own input so that we can have a fruitful discussion at the New York seminar.

The Prep.Com., and the Pioneer investors have already gone an amazingly long way in the direction here indicated. But it is the final step, that is the inclusion of a flexible framework for R&D that would turn the present debate from a wrangling of concessions by the technologically more advanced to the developing countries into a common, productive, even financially rewarding effort and that would create an interim regime that might be universally acceptable.

## Pittsburgh Lecture

There could be no more appropriate way to honor Rachel Carson, one of Chatham's most illustrious graduates, than by dedicating this day to an in depth consideration of the problems of the oceans which she was one of the first to raise, no one has ever raised them more brilliantly and more poetically. A great deal has happened since she described for us the oceans in their immensity, and in their fragility. Technological developments have brought growing portions of the immense wealth of the oceans within our reach: The same technological developments have magnified the hazards of pollution and destruction which Rachel Carson was one of the first to identify. The marine environment, from which all life on earth originally arose, is being attacked from pollution from the deep sea, the water column, the atmosphere, and, worst of all, from landbased sources. Clearly, something has to be done about it, if mankind is not to destroy itself by destroying its environment.

This line of thinking takes me back some forty-five years, to the time when the American conscience was shaken by the first atomic explosions: The hazards of the atomic age were so great, threatening the extinction of all life on earth, that, clearly, something had to be done about it. The same human intelligence that had split the atom now had the responsibility of uniting the world: world government was needed to preserve peace and save the world from atomic destruction.

It sounded most convincing: and it sounded simple. but it was not. Atomic destruction, although terrifying, was more terrifying for some than for others. Some people in the world had greater terrors at their door steps: terrors more real, more palpable, than the hypothetical dangers of atomic war. The terrors of hunger, of abject poverty, of social injustice and oppression. If the rich countries wanted security under a world government, they had to pay a price: the price of justice, as it was called at that time, or of a new international economic order, as it is called today.

We were at that time working at the University of Chicago, which had done the ground work on the atomic bomb: and it was

there that Chancellor Hutchins, my husband G.A. Borgese, and a group of colleagues from other Universities, founded the Committee to frame a World Constitution. Our Draft World Constitution was based on the principle that peace must be the result of justice *pax opus justitiae*. The new international economic order we proposed -- in 1948! -- was based on the principle that land and its resources, water and its resources, energy, and the atmosphere were to be property held in common by all mankind -- or, as we would say today, are the common heritage of mankind.

Now, why am I telling you this rather antique piece of history?

Because the problem today is pretty much the same.

The pollution of the oceans holds more terror for some people than for others. Some people value the right to development much higher than pollution abatement, which might be costly and slow down development. After all, the rich nations became rich by polluting their environment. Why should the poor nations today not have the right to pollute, to develop and to become rich?

If we want a new order in the oceans to preserve the oceans to preserve ourselves, it must be an order based on economic justice: it must be an order based on the principle of the Common Heritage of Mankind.

But there is one difference: when we drafted our World Constitution at the University of Chicago over thirty years ago, we were academics, idealists, utopians. Those of us who have been engaged, during the past ten years, in the awesome task of drafting a constitution for the oceans, based on the principle that the oceans and their resources are the common heritage of mankind, are moving in the realm of politics and of realistic negotiations.

I would like to spend the remainder of my time tonight to explain why I think the oceans play such an enormously important role in the building of a new international economic order. There are ecological, technological, economic and institutional

aspects to my reasoning.

The ecological reasons are the most obvious. The oceans occupy two thirds of our planet, contain 97 percent of the earth's water, have created the atmosphere we are breathing and keep interacting with this atmosphere, largely determining the earth's climate. The oceans have given rise to life on earth, contain vast living resources, and are a rich store house of metals, minerals, and energy: more, in fact, than can be found on earth.

The technological reasons are manyfold and rather fascinating.

Human beings, like the penguins long before them, or the whales and seals and the other marine mammals, human beings are returning to the sea. While the returning birds and mammals have adapted the rythm of their breathing to long stretches of time under water, and their wings and legs turned back into flippers and tailfins, human beings have equipped themselves with aqualungs and flippers of rubber and plastic. The effect is the same. Human evolution, as we know, has become cultural evolution. Cultural evolution is much faster than biological evolution. Also, it is reversible, at least to some extent. Unlike the marine mammals, the mutant human being has not lost his terrestrial capacities: he has become a true amphibian.

Under our eyes, the industrial revolution is penetrating deeper and deeper into ocean space, intensifying asnd diversifying its uses beyond anything anybody would have imagined at the time we were drafting our World Consttitution.

Aquatic living resources could make a vital contribution towards the satisfaction of world food needs over the next 25 - 50 years. And by that I do not mean traditional, commercial fisheries which have never contributed more than at most 2 or 3 percent of the needed world protein supply, and which today are overfished, polluted, and depleted. I consider these a remnant of an old order: a hunting society.

Under our very eyes a transformation is taking place: to my mind, one of the major transformations of the culture of homo sapiens: of an importance compasrable to that which, ten thousand years ago, transformed a hunting and gathering eco-



nomy into an agricultural economy: and that is the ongoing transformation of capture fishery to culture fishery. Most of the world's fisheries will become cultures in the sense that there will be human intervention at least once or more times in the life cycle of fishes, and capture will become merely a phase of culture. There are a number of major reasons and some minor ones, for the spectacular advance of aquaculture in our age and in the forthcoming decades: Changes in the world's climate, which affect marine harvests less directly than terrestrial harvests; the limits of the expansion of agriculture as against the boundlessness, for all practical purposes, of aquaculture, including ponds, lakes, rivers, swamps, inlets, fjords, coves inland seas and the open oceans, and including the cultivation of seaweeds, molluscs, crustaceans, and fin fish. Another advantage is that while agriculture is bi-dimensional -- one crop at a time in one place -- aquaculture is tri-dimensional permitting polycultures of five or six species in one space, one feeding on the waste products of another -- a highly economical and ecologically sound system. Shorter food chains, and the higher assimilability of fish protein are other advantages -- and the technologies are there: hatcheries for the artificial breeding of fish; technologies for the rearing of fry, for the industrial production of fishfeed, for cage cultures, for sea-ranching in the open seas, for hybridizing, for transplanting fish, and the plankton on which they live, from one ocean to another. During the half decade from 1970 to 1975 the world production of aquaculture more than doubled. It could easily increase tenfold by the end of the century. The technologies, of course, are mostly western; but it is in the Orient, especially in India, China, and Southeast Asia, that aquaculture has a very long history, reaching back over thousands of years, and deep and strong roots in the cultural, social and economic infrastructures. A successful merger of the Western scientific method with Eastern cultural traditions could revolutionize the world's food production systems. Studies are under way to understand and overcome the cultural impediments that have prevented, thus far, the rise

of aquaculture in much of Africa and South America. But in these parts of the world, too, very promising beginnings have been made.

Another vital contribution that the oceans will make to the world economy comes from ocean mining. Some metals and minerals have been mined offshore for as long time. Petroleum production is moving deeper and deeper into the sea. Offshore oil production constitutes today almost 20 percent of the total world hydrocarbon output, and may rise to 50 percent by the end of the century. But the most spectacular innovation, made possible by the new technologies, is the mining of ferromanganese nodules from the deep ocean beds of the Pacific and Indian Oceans, and the mining of metaliferous brines from the bottom of the Red Sea. A considerable percentage of the world's nickel, copper, cobalt and manganese supply, plus, very likely, a number of other metals and phosphates, will come from sea mining, by the end of this century, with a significant impact on the commodity market, metal prices, and the economies of some developing countries.

One should mention, finally, the oceans' energy resources, made accessible by modern technologies. One of these technologies is ocean thermal energy conversion (OTEC), involving the utilization of the difference in temperatures between surface and deep water which is particularly marked in tropical seas. Present work on this technology indicates that OTEC could become a major source of energy and of a number of industrial products before the end of the century. This would have a far-reaching beneficial impact on the progress of economic development for many developing coastal States.

All these are examples for the ongoing shift from land-based, exhaustible resources to marine-based, practically inexhaustible resources. This shift, caused by population pressures on land and a number of converging factors, in turn has important political consequences and deeply affects relations among people North, South, East and West. The nature of the oceans is profoundly different from the nature of the land exploited thus far: it requires new modes of dealing with nature

and with one another: new forms of cooperation. The old laissez-faire regime of the freedom of the seas is no longer operable, in view of the penetration of the industrial revolution into the seas and the intensification and diversification of their uses. There is a strong temptation to extend to the seas, together with industrialization, the systems and rules we practice on land: based on principles of sovereignty and ownership. But this cannot work either, considering the nature of the oceans, their ecology, their hydrology.

All this has given rise to the already long -- over ten years -- and immensely intricate and complex history of the Third United Nations Conference on the Law of the Sea. There is no time tonight to go into the details of this history. All I want to do is to indicate where this Conference is most likely to contribute to emergence of new forms of cooperation, new forms of organization responding to the economic, political, and ecological needs of the late twentieth and early twenty-first century.

The Conference is creating the first, the prototype, public international resource management institution, called the International Seabed Authority. The importance of this creation, which is beset with immense difficulties, cannot be over-rated.

The International Seabed Authority is based on the revolutionary principle that the resources it is to manage, that is, the minerals of the deep seabed, are the common heritage of mankind. This means, these resources cannot be owned or appropriated by any nation or corporate entity or person; they can be managed, but they cannot be owned. The Common Heritage of Mankind requires, accordingly, a system of management in which all users share and which manages the resources for the benefit of all countries, with particular regard for the needs of developing countries. Thus the International Seabed Authority is the institutional embodiment of the Common Heritage principle. Benefit sharing is to be construed in a very comprehensive way, including not only the sharing of financial benefits, but the benefits accruing from shared management, including the transfer of technologies. There are two more attri-

butes to the Common Heritage principle: Resources that are the common heritage of mankind can be used for peaceful purposes only -- and the seabed and its resources thus are subtracted from the arms race; and, finally, the common heritage of mankind must be transmitted in good working condition to future generations: it must be shared with future generations, and this implies a sound policy of conservation and environmental management.

All these principles are spelled out in the Draft Constitution for the Oceans which we are discussing at the United Nations Conference on the Law of the Sea.

The concept of the common heritage, you will remember, was first proposed by the great Ambassador of a small country -- Arvid Pardo of Malta, at the United Nations in 1967. While it was first berated as legally meaningless, rhetorical, idealistic, it was subsequently accepted and endorsed by the General Assembly by consensus (1970). Interpretations, however, still vary in some important details. For the industrialized countries "management" basically means the power to regulate under a licensing system; for the developing countries, "management" means "management," exercised through an operational arm of the Authority, the so-called Enterprise, that is, a public international company. Also, over time, some rather profound differences have developed as to the real purpose of the Authority. The initial enthusiasm about creating a new type of international institution producing something that was to benefit mankind as a whole, soon gave way to more direct and short-range considerations. After all, one of the main reasons for the industrialized nations to develop their costly and sophisticated deep-sea mining technologies was that they wanted to decrease their dependence on some developing countries, considered politically unstable, for strategic metals and minerals such as cobalt and manganese, besides copper and nickel. While trying to gain independence from these countries, they found themselves slipping under the control of the International Seabed Authority, dominated by those very same countries they

tried to elude. The developing countries, on the other hand, soon discovered that seabed mining was to be a source of competition for the land-based production of some developing countries and that, far from benefiting these, it was going to decrease their export earning. The main concern of these countries, therefore, was that the Authority should have the power to control and limit production. Canada is playing a leading role in giving expression to this concern.

These are some of the tragic contradictions built into the process of building the first international resource management authority.

an attempt was eventually made to compromise between the industrial countries' demand for a licensing system and the developing countries demand for an Enterprise system by proposing the so-called "parallel system" providing both for an Enterprise and for a licensing or "contractual" system. This seemed to be a stroke of Solomonic justice, but instead it created a multitude of insoluble difficulties. If the industrial States and their mining consortia were free to mine what they needed under a licensing system, who needed the Enterprise? If nobody needed the Enterprise, which thus was demoted to the position of a status symbol, who would finance it? The problems of financing the Enterprise and of assuring it access to technologies, including processing technologies, enabling it to compete effectively with the integrated operational systems of the established industry are some of the great unresolved problems still before the Conference: Either the financial burdens imposed on the industrialized States and their consortia are sufficiently heavy to finance the initial operations of the Enterprise -- but in that case they are too heavy to bear for the industrialized countries; or these burdens are light enough not to discourage seabed production by these countries and their companies -- but then there is not enough money to get the Enterprise started.

Recently the Conference has begun to look at an alternative system of production: a so-called unitary joint-venture system under which industrialized countries and their companies would have access to the seabed area and its resources but only if they form a joint venture with the Authority. Probably, the

solution will lie somewhere in this direction.

The negotiations have been, and are, extremely difficult. but this effort is not wasted -- even should we fail, for reasons extrinsic to the Conference, to establish the International Seabed Authority in the imminent future. There are a number of concrete, practical lessons the world community has learned from this pioneering experience: lessons that may be applied, at a later stage, to the building of other international resource management systems which we will need without any question, if the various crises of energy, resources, and environment -- all connected -- which are besetting us at this time, are to be overcome.

International resource planning and management will have to be undertaken for a variety of reasons, serve a variety of purposes, and therefore take a number of different forms.

There are other resources, besides those of the deep seabed, which are beyond the limits of national jurisdiction: for instance, the resources of Antarctica and, eventually, those of outer space, the moon and other celestial bodies. Within the context of a New International Economic Order such resources must not be exploited by a few nations which have the technologies to exploit them. They must be explored and exploited for the benefit of mankind as a whole, with special regard for the needs of developing people. This requires an international system of management.

There are resources whose uneven distribution may cause, and is already causing, grave imbalances and explosive world tension. Food and energy and some other commodities fall into this category. It is impossible to establish a more equitable world order without some degree of international planning and management with regard to such resources.

There are, finally, resources, such as nuclear resources, whose development for peaceful purposes entails concomitant dangers of large-scale environmental degradation or diversion for military purposes. Neither peace nor development can be safeguarded without some degree of international planning and management with regard to these resources..

Thus the main purposes of international resource planning and management are:

- . to insure equitable sharing in the production and consumption of resources;
- . to insure the participation of developing countries in international decision-making;
- . to reduce international tension;
- . to increase international security.

Thus it is to be foreseen that a number of public international Enterprises will be established in various sectors of industrial production over the next 25-50 years.

Of the many lessons learned from the Seabed negotiations and applicable to other international resource management systems -- which I have tried to put together in a recent paper -- I shall mention here only two:

1. International resource planning and management cannot be based on the classical Roman-law concept of private ownership and on the classical, static concept of national sovereignty. Both the concepts of ownership and sovereignty are being transformed by the new, revolutionary concept of the Common Heritage of Mankind, as defined by the United Nations Conference on the Law of the Sea. If there are to be other international resource management systems, the principle of the Common Heritage must be expanded from the resources of the seabed to such other sectors. This is already in the making. The United Nation has applied the concept to Outer Space, the Moon and other Celestial bodies and their resources: these have solemnly be declared to be the common heritage of mankind. It is quite possible that the concept will be applied to the resources of Antarctica and in one way or another, to the living resources of the seas. (So far it had been restricted to the non-living resources). And this process will continue.

2. Secondly, international management of resources must

be complemented and integrated with international management of technologies. Without such integration, international resource management would be both unpractical and unacceptable. There are a number of converging reasons for this. Resources and technologies are interdependent. Resources become exploitable as the technologies, from simple to highly complex, from "labor-intensive" to "capital-intensive," become available and their cost can be borne by the market. Without "appropriate" technology, therefore, there cannot be any resource management at all. The generation of wealth through resource management has four component factors: resource, capital, labor, and technology: each factor assuming a variable proportion of importance throughout history. Industries based on highly developed technologies are less resource-intensive than industries based on less developed technologies, in as much as substitution, synthesizing, and recycling reduce the amount of raw materials required. It is therefore essential for developing countries that the international management (in which they participate) of resources and technologies are balanced and integrated. Finally, there is a political reason for this integration: Resources, in today's post colonial extraction economy, are located largely in developing countries. Technologies are the monopoly of industrialized countries. If developing countries are asked to accept a common-heritage status for the resources over which they hold sovereign rights, industrial States, as a counterpart, must accept the same status for their technologies.

The first industrial revolution, based on coal and oil and cheap labor, was resource- and labor-intensive. It led to the subjugation and exploitation of the non-industrialized world. The second industrial revolution, based on renewable energy resources, micro-electronics, and bio-industries, is neither resource- nor labor-intensive. Commodities and cheap labor are rapidly ceasing to be bargaining values. The second industrial revolution may well lead to the marginalization of the non-industrialized world. This might entail a serious set-



back to development. On the other hand the challenge could be met by a leap forward: If it is recognized that reliance on an extraction economy and on cheap labor is not conducive to development in any case and if the developing countries, abandoning these obsolete values, join instead the second industrial revolution from the outset. This requires internal restructuring. It also requires participation in the new industrial developments of the industrialized countries. This can only be achieved through the kind of international Enterprises initiated with the International Seabed Authority and expanded, through international agreements embodied in Treaties, to other sectors of production. If the international community succeeds in building one of these Enterprises through the Conference on the Law of the Sea, it might as well succeed in building them all.

## SUSTAINABLE DEVELOPMENT AND OCEAN GOVERNANCE

I returned last night, after midnight, from a three-week whirlwind trip around the world --and am not quite sure where I am at this particular moment. So please excuse some degree of incoherence in my remarks --which may be out of place also for another reason: that I could not listen to your discussions yesterday.

The difficulties in managing sustainable development are, to my mind, of three kinds. They are of a practical, a theoretical, and an institutional nature.

Let me take the practical dimension and look at the case of China.

But travelling widely in China this time -- I was setting up training programmes in ocean management in India and in China, and working for the ratification and implementation of the Law of the Sea Convention --and that was an experience which indeed has a bearing on today's discussion. It underlines the tremendous difficulties we have to face in trying to formulate strategies of sustainable development and implement them.

Development in China is moving fast. There is a tremendous emphasis on building the necessary scientific and technological infrastructure, in all branches of High Technology; China is cautiously, but efficiently liberalizing the economy, permitting, e.g., private management of fishfarms on publicly owned aquaculture sites, and with the necessary R&D input, and the seed fish, from State-run hatcheries and institutions. A private individual fish farmer may make as much as \$10,000 a year, which is a lot.

You see joint ventures everywhere, in high-tech enterprises as well as in the service sector: Hotels are being built even in small towns like Xiamen, which are first-rate by European and North American standards.

The South is wealthy. There is surplus money which people spend on their privately owned houses, and on large-scale packaged tourism to the historic site in Beijing, etc. Air planes and trains --even the first class, where it exists, are filled to capacity: all by Chinese, well dressed, well fed, and with money to spend.

The North is a bit bleaker but there is a lot going on too.

Now we all know that, up to a certain point at least, or, let us say, historically, the rate of development is fairly closely related to the rate of growth of energy demand, and, indeed, wherever you look in China, there are mountains of coal. But an increase in the burning of coal to sustain the economic development of this kind for over a billion people, may be environmentally unsustainable.

What to do? The cost of converging this huge economy to natural gas, which is also abundant, would be rather astronomical. "The Market" --so much celebrated today: I should say: deified --will not solve the problem, that much is sure. Trying to move through the sea of people, the crushing masses, at a railroad station in China, one physically senses the enormity of the problem of practically implementing "sustainable development" in a country like China!

The second aspect of the problem is, as I said, theoretical. Do we really know what is "sustainable development"? Will we, can we, ever know?

On the airplane I was studying a new book, a volume of the information series of the Club of Rome, called "The limits to certainty": Facing risks in the new service economy, co-authored by my great friend Orio Giarini and a Swiss economist, Walter Stahel. It is quite an exciting book.

"Service Economics," based on the tremendous changes that have taken place, is beyond Socialism and Capitalism. It is an opening up of the traditional parameters of economics. In Service economics, the authors state, the market system and particularly the free market cannot be identified with the whole of the economic problem: the free market system is important, but it is only a sub-system of the economy as a whole." Service economics introduces a new, wider, and more comprehensive notion of value: no longer restricted to the monetarized sector, but embracing the nonmonetarized sector as well, no longer static, but dynamic, integrating real time as a factor: the time of utilization of a product which is to be maximized through service, during all phases: production, maintenance, recycling and disposal. The integration of the time factor introduces another new notion: Indeterminacy: the social and economic analogue to Heisenberg's physical indeterminacy: Uncertainty, risk taking and risk management.

When I first read it, I was concerned that the negation of certainty, which includes security, could have elitist, anti-social implications, which are so wide-spread today. But when I read that the authors advocate a guaranteed minimum income for every person for life, as a measure of risk management, my concerns were dispelled. Incidentally, this measure, of a guaranteed income, is not as utopian as it might seem at first blush. As the authors point out, already today, even in the country that most adores the golem, the golden calf of the "market," about 50 percent of all persons are dependent on payments received from the State, if you consider civil servants and State employees at all levels, war veterans and old-age pensioners, and the unemployed. It is on the basis of this minimum guaranteed income that the authors discuss risk taking, entrepreneurship, and creativity, whether monetarized and paid for, or nonmonetary.

In the service economy industrial production takes a back seat to service which, in the industrialized countries accounts for 60 percent of the GNP, considering that, for most products today, service costs account for about 80 percent of the total cost while manufacturing accounts for only 20.

Service economics does not measure and quantify money flows; it measures ups and downs of stocks of real wealth, taking into account also negative flows or deducted value, including environmental cost. Service economics, as developed by these authors, thus truly integrates environment and development.

One could imagine that developing countries will have to do something like "phase skipping," skipping the socialist or capitalist phase of the industrialization period, and moving right into the service economy. China's emphasis on science and high technology seems to point into this direction.

Well, I found the book, as well as Giarini's earlier work, very exciting. But whatever it is, sustainable development, or the integration of environment and development, needs a new economic theory, and here, I believe, is an example, a beginning.

The third aspect of the challenge, then, is institutional: for if we are to manage sustainable development, we must have institutions capable of doing it; and here --whether by chance and due to the indeterminacy of history, or

because of the very nature of the medium, the oceans, where everything flows and everything interacts with everything else, we are, I believe, far more advanced in the marine sector than in any other sphere. The emerging institutional framework for ocean governance holds many lessons for the governance of other global concerns, whether energy or food or science and technology, or atmosphere and outer space.

We have a whole big international conference coming up next month in Lisbon, Portugal, attempting to describe this institutional framework, already clearly discernible, that is emerging, evolving, in the wake of the adoption of the United Nations Convention on the Law of the Sea.

That Convention, I never tire to point out, contains the only existing comprehensive, binding, enforceable international environmental law: covering pollution from all sources, whether oceanic, land-based, or atmospheric. It is the only legal instrument that effectively integrates the protection of the environment and development: development of living and nonliving resources; of science and technology; of human resources. It is the only existing legal instrument that provides for mandatory, binding, enforceable settlement of disputes arising from environmental problems.

Another corner stone of our envisaged institutional framework is the Report of the World Commission on Environment and Development, **Our Common Future**. From it we distil three more basic concepts which will help shaping the institutional framework we are trying to project.

First, the boundaries between sectors of government or governance, have become "porous," due to the interlocked, interdisciplinary character of the issues to be dealt with.

Second, the boundaries between 'public' and 'private' sector are becoming porous. This applies to public and private law, which interact more intensely than in the past; and it applies to relations between business and government. New forms of public/private cooperation are needed, at the national as well as the international level.

These recognitions imply the need for horizontal, intersectoral, interdisciplinary integration in the planning, regulatory, and decision-making

mechanisms.

Third,

National boundaries have become so porous that traditional distinctions between local, national, and international issues have become blurred.

This recognition implies the need for vertical integration among levels of governance: local, national, regional and inter-regional.

In the marine sector, this need for both horizontal and vertical integration is more marked than in any other realm of governance.

The specific form of these mechanisms for integrated ocean policy making will vary from country to country, depending on the existing infrastructure and resource base as well as on ideological orientation.

Almost every conceivable Government Department is involved, in one way or another, with ocean affairs, and it deals with them from the perspective of its own priorities. Integration would require, first of all, strengthening of awareness of and competence in ocean affairs within each Department concerned, and this requires changes in the recruitment of staff within each Department. Secondly, there must be some interministerial coordination mechanism for the integration of policies. On the whole, the establishment of new Departments or Ministries for Ocean Development has had only limited success in the making of integrated oceans policy. In India, e.g., this new Department has greatly enhanced the development of specific new ocean activities, such as deep seabed mining or Antarctic exploration, but it has not influenced policies of other Departments, concerned, e.g., with fishing or shipping.

New trails will have to be blazed. To fulfil the participatory requirements -- stressed in the Report of the World Commission on Environment and Development --it may even be necessary to call periodically --perhaps bi-annually --an 'Ocean Assembly' at the national level, or a Special Session of Parliament (or Congress or National Assembly) for the discussion of ocean affairs in an integrated manner. One could imagine that the agenda for the decisions to be taken should be prepared by a National Ocean

Institute reporting to Parliament, and that industry, science, the NGO sector and local authorities would have the right to propose items for inclusion.

What should be emphasized, in any case, is that this integration does indeed have institutional implications which have to be faced in a spirit of innovation.

National and regional ocean management are intimately linked, and one is not possible without the other. Without regional cooperation, national development would be handicapped in sectors where issues transcend the boundaries of national jurisdiction, such as fisheries of straddling stocks or transboundary pollution, or where economies of scale are needed, as, e.g., in the advancement of the marine sciences or the development of marine technologies. Without strong national infrastructures and broad national constituencies, regional organization remains ineffective. National and regional institutional frameworks will have to be matched to be able to interact. Capacity has to be built nationally and regionally at the same time.

The development of regional organization is bound to be flexible and varied, depending upon the characteristics and needs of the region concerned: whether it is centred on an enclosed or semi-enclosed sea or consists of a group of island States, or a group of mainland States, or States bordering a wider ocean; and whether the countries included therein are developing States, industrialized States, partly autonomous territories, or a combination thereof. Another consideration to be taken into account is the impact of overlapping continent-centred regional development and its institutions such as the Regional Economic Commissions, Regional Development Banks and other regional institutions, whether of an economic, environmental or scientific/technological character.

Thus the Mediterranean Regional Seas Programme necessarily interacts with the European Community and its institutions as well as with the Organization of African Unity and the League of Arab States.

The most advanced example of regional cooperation and organisation for integrated ocean management, cited in the Secretary-General's Report on the Law of the Sea, is the Indian Ocean Marine Affairs Co-operation

(IOMAC), established in 1990. IOMAC's scope is more comprehensive than that of any other regional organization: both functionally --it covers all uses of the ocean --and geographically --it includes the landlocked States, which are as yet excluded from other programmes such as the UNEP-initiated Regional Seas Programme. The inclusion of land-locked States into regional arrangements is not only highly desirable from the point of view of economic development and distributional justice, it is an absolute necessity for environmental conservation, considering that pollution is largely carried by rivers which may originate in land-locked countries. The inclusion of land-locked States in regional seas programmes will require institutional changes within the land-locked countries themselves, just as in coastal States. The scope of the new institutional framework in land-locked countries will have to be integrated policy and management of aquatic resources, including fresh-water resources as well as sea-water. A unique precedent for this integration is given by Sri Lanka's institutional framework NARA (National Aquatic Resources Agency) which covers both fresh-water and marine aquatic resources.

IOMAC's institutional framework is at an early stage of its evolution, and will have to develop in harmony with the national institutions of its member States.

UNEP's Regional Seas Programme, a pioneering effort initiated in the wake of the 1972 Stockholm Conference on the Human Environment, started from the basis of the then still prevalent sectoral concept of action and institution-building. UNEP's focus is the conservation of the environment. Its very establishment as a separate organization, just as the establishment of separate Departments of the Environment within States, reflects the kind of sectoral approach that has now reached its limits. UNEP itself, however, and, in particular its Regional Seas Programme, has been a catalyst in the great transformation in thinking that has marked the two decades from Stockholm, 1972, to Brazil, 1992, from 'Environment' to 'Environment and Development.'

The Regional Seas Programme quickly realized that, to be effective in the protection and conservation of the marine environment, one had to deal with all major uses of the sea as well as a number of land-uses. Activities in the Regional Seas' Plans of Action indeed cover a wide range, from fisheries and aquaculture to the extraction of energy, from coastal management to the



development of technology. The Mediterranean Blue Plan is an exemplary document, from the point of view of the broadness of its scope. The institutional framework, however, remained as it had been conceived in the early seventies: sectoral. Policy is defined by a bi-annual meeting of States Parties to the Barcelona Convention. States are of course free to send whomever they wish to represent them at these meetings. Thus far, however, it has generally been the Ministries of Foreign Affairs that have been represented. There have been no linkages to other national Government Departments engaged in ocean affairs, such as agriculture & fisheries, energy, mining, shipping, science and technology, etc. Clearly, here is an example of the 'institutional gaps' noted in the Report for the World Commission for Environment and Development.

**The objective of sustainable development and the integrated nature of the global environment/development challenges pose problems for institutions, national and international, that were established on the basis of narrow preoccupations and compartmentalized concerns. Governments' general response to the speed and scale of global changes has been a reluctance to recognize sufficiently the need to change themselves. The challenges are both interdependent and integrated, requiring comprehensive approaches and popular participation.**

**Our Common Future, p.9**

The changes needed at the national and at the regional level thus are strictly interrelated. If, at the national level an institutional infrastructure is created that transcends the sectoral approach and integrates decision-making on ocean policy, it will be this infrastructure, rather than a sectoral Ministry, that will be the 'constituency' on which the Regional Seas Programme will be based. This will change the character of the Meeting of States Parties, which will become a form of regional 'Ocean Assembly,' including also the nongovernmental sector as well as the intergovernmental organizations engaged in marine affairs at the regional level.

If the scope of the Regional Seas Programmes is now broadened to integrate environment and development and cover all major sea uses, one should

lengthen this list of global issues calling for interregional action. A number of shipping problems as well as the problems associated with highly migratory species (especially tuna) in the fisheries sector belong to this category. So do many aspects of marine scientific research. So do disarmament issues.

The United Nations Convention on the Law of the Sea contains about sixty references to the 'competent international organizations' -- named only once, in Annex VIII of the Convention: IMO, for issues arising from shipping and vessel-source pollution; FAO, for fishing; IOC/UNESCO, for marine science; UNEP for the protection of the marine environment, to which one has to add the International Sea-bed Authority (ISA). These are best prepared to take care of "global issues" and of co-ordinating inter-regional issues, besides the many other tasks which the Convention imposes on them: from the establishment of lanes for vessel traffic control to the assistance to be given to developing countries in all sea uses and coastal management and the development of human resources.

There are, besides the above mentioned five, other U.N. Agencies involved in ocean affairs: above all, UNCTAD (in the economics of shipping; commodities, including those produced from the sea; technology transfer; the development of land-locked and small island States); UNDP (development cooperation in the marine sector); WMO (ocean/atmosphere interaction); ILO (Labour in the marine sector) WHO (Health in the marine sector): There are, as a matter of fact, as many specialized Agencies and institutions involved in marine affairs at the international level as there are Government Departments within nation States. And this entire institutional framework is in need of exactly the same kind of overhauling as national government structures. Each institution needs to be strengthened internally, in structural as well as in financial terms, to be able to cope with its new tasks; and inter-agency linkages must be intensified or newly created, to enable these institutions to generate an integrated oceans policy.

There are, furthermore, a growing number of increasingly important NGOs, who must also be included in the making of such a policy and in the monitoring of its execution. It is significant, e.g., that they will be represented at UNCED in Brazil, 1992, by as many as 30,000 delegates from all parts of the world!

Individually, the "specialized agencies" dealing with ocean affairs will have to undergo a twofold development --both aspects being interconnected. They will have to develop from a merely co-ordinating role to a operational role. This development is well on its way.

As already noted by the Delegation of Portugal, just before the end of UNCLOS III, a forum is needed where States can discuss the problems of ocean space in their close interrelation, where they can consider them as a whole, and take decisions on an integrated ocean policy, which then can be implemented by the specialized agencies and their international civil service functioning like government departments at the international level.

Such a forum, which must include also the nongovernmental sector, could take a number of forms: A permanent Conference, like UNCTAD; a Special Session of the United Nations General Assembly, perhaps every two years; a wider mandate to the periodic meeting of States Parties to the Convention, already foreseen in the Convention; or some other form. But such an 'Ocean Assembly' is an absolutely essential part of the institutional framework for ocean governance in the 21st century. Multiple, functional representation within each delegation, as proposed for the regional 'ocean assemblies -- and as practised by some States e.g., Canada) throughout UNCLOS III! --might solve the problem of grass-root participation in decision-making.

## CONCLUSION

Considering the "porousness" of the boundaries between levels of governance - national, regional, global -- this institutional framework is highly interdependent and interlinked.

Clearly, the structure of international relations has been in a process of transformation for some time. Suffice it to refer to the Preamble of the United Nations Charter. The opening words refer to the fact that 'We, the Peoples of the United Nations' have undertaken and shall undertake in the present and in the future a number of principles and obligations. While the

basis of the international system is still the nation State --in ocean affairs as in other sectors of international relations, increasingly, the pivot of the system is shifting from the national to the regional level -- in production, trade, financing, just as in the ocean sector. The regional level of organization cannot function properly, however, without effective national infrastructures and proper linkages to national and local levels, or without an effective global institutional framework and proper linkages to it. In the marine sector --due to the very nature of the marine environment in which everything flows and everything is linked to everything else --the development is most advanced and offers concrete opportunities, or more than that, an ineluctable necessity, for action. Here we can build the prototype for global governance in the 21st century.

THE PROTECTION OF THE MARINE ENVIRONMENT

IN THE CASE OF WAR

The United Nations Convention on the Law of the Sea, 1982, contains the first comprehensive framework of international environmental law. This is indeed one of the most progressive and constructive aspects of the whole Convention.

But the Convention covers only the peaceful uses of the oceans. And thus it is the impact of man's peaceful activities on the marine environment that is regulated. What happens in case of armed conflict is another question. The purpose of this paper is to explore some of the aspects of this problem.

On March 2, 1983, Iraqi bombers hit an already leaking Iranian offshore oil installation in the Nowruz offshore oilfield, about 60 km from the Kharg Island oil port. They also hit six other wells nearby. Infernal flames lit the sky by night. Black smoke covered the sun by day. Week after week that passed. When the flames died down, the oil kept pouring forth into the Gulf, at a rate of about 7,000 or even 10,000 barrels a day. As the oil slick grew, to about 12,000 square miles, the winds carried it southward, spread it until it threatened the entire semi-enclosed Gulf and the coasts of Saudi Arabia and Qatar, reaching for the Straits of Hormuz and the Indian Ocean. There was a great dying of fish and fowl everywhere. Dead turtles and dolphins stranded. The mighty bodies of more than fifty dugongs -- almost the entire known Gulf population of this endangered species -- were found floating on the oil, or washed ashore. Ports closed down, and a foul odour rose over the Gulf. The international community looked on aghast at this unprecedented disaster, involving warring and nonwarring States alike and destroying the sea and its living and nonliving resources.

On March 29, the 19 oil companies operating in the

gulf issued a statement warning that the unchecked leakage would turn the Gulf into one vast oil lake and had the potential for unprecedented environmental and ecological damage. By May, the giant oil slick reached the coast of Bahrain and Qatar.

Some observers hoped it would force an end to the two-year old war that was lacerating the region and threatening world peace: the parties would have no choice but to get together to repair the damage. The Regional Organisation for the Protection of the Marine Environment called a meeting on April 3-7, but neither Iran nor Iraq attended, and the meeting failed to reach any results, as did a subsequent meeting of Gulf States Foreign Ministers (April 16).

In October, 1983, Iran succeeded in capping one of the run-away wells, although it is not known whether this operation was one hundred percent successful. In any case, at this writing, the oil from the other wells continues to flow.

It remains extremely difficult to assess the damage because of the many conflicting reports from inside and outside the region. It is known now, for instance, that many of these reports, including one using satellite images, were deliberately distorted by unscrupulous business interests. Another complicating factor was that polluters, using the Norwuz spill as cover, took the opportunity to dump wastes into the Gulf.

Whatever the precise dimension of this disaster, oil pollution of the oceans, globally, increased by a factor of 930 percent during 1983, according to a report released by the British Oil Spill Intelligence Report (New York Times, October 7, 1984); and this was largely due to the ongoing situation in the Gulf.

The United Nations Convention on the Law of the Sea has no consolation to offer in such a situation. It deals

with pollution from the peaceful uses of the sea, heedless of the fact that the worst of all polluters is war; heedless, also, of the fact that, in our age, *the boundaries between peace and war are getting blurred*, as international wars and civil wars increasingly interact, with partisans, guerrillas, and terrorists taking up arms alongside and across the lines of regular armies, and the number of civilian casualties exceeding that of the military. With the progressive disintegration of the concept of national sovereignty, we witness the disintegration of the concept of international war: wars that started at a precise date, with a "declaration of war," and ended at a precise date, with the surrender of one party, followed by a peace treaty. We witness, furthermore, the disintegration of the very concept of "weapon," for, modern weapons of mass destruction consist of technologies which, without much transformation, have peaceful as well as military applications (atomic energy, chemical and biological agents; outer space and deep sea technologies, lasers and electronics). At such a time, it may be futile to try to insist on a clearcut distinction between "peaceful uses" and "military uses," and to provide for the ones while trying to ignore the others.

This is an aspect of the problem that still awaits attention and action.

Could one think of protocols, incorporated into the Regional Seas Action Plans, providing for relief of environmental disaster, not only in case of peace but also in case of war?

The purpose of such a protocol or convention would be (a) to prohibit warlike measures or the use of weapons in relation to installations, oil wells, atomic energy plants or other establishments of a similar nature, which cause or may cause extensive and irretrievable damage to the environment; (b) to establish the duty/obligation of warring states to prevent irreversible damage to the environment; (c) to protect neutral States against damages arising from a

war in which they have no part.

The instrument would be both preventive and remedial. The preventive part would consist of a reciprocal agreement among all participating States that installations whose destruction would cause irreversible damage to the environment or damage to third parties, such as oil wells or atomic energy plants are immune and cannot be attacked in case of armed conflict or insurrection. The Hague Conventions of 1907 contain similar exemptions (Art. 24) for hospitals, churches, historical monuments, or open cities. Other conventions, such as the Fourth Geneva Convention of 1949 or the 1975 Covenant on Human Rights in Armed Conflict could be cited, which confirm these principles.

These rules have been swept away by the introduction of the modern weapons of mass destruction and the general disintegration of modern war. Perhaps the time has come to reconsider them in the new context, in this era beyond peace and war.

One also could invoke the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques: for whether such modification is intentional or a by-product of "conventional" destructive activities, it is still environmental modification. This opinion is shared by the Editor of the above cited Oil Spill Intelligence Report, Richard Golob, who, in introducing the report, said: "That was one of the first times in history when the environment was used as a way to wage war." The prohibition of attacking oil wells and nuclear energy plants thus would be a way of implementing the Convention prohibiting environmental warfare.

Immunity against war damage of such installations, of course, would be a tremendous bonus, not only to neutral States, not only to the environment, but to the warring States and, especially to their industries, and the question arises, whether there should not be a quid pro quo. The



protocol, or convention, might, in fact, have some features of an *insurance contract*, for which the insured parties pay a premium. There are of course precedents for this kind of agreements as well. The 1979 Convention on oil pollution; the establishment of a Special Fund in the Gulf in 1978, come immediately to mind. But they apply to peace-time accidents. What is new in the present proposal is that it combines a principle familiar in the law of war with one relating to peaceful uses.

The premiums, which might be rather substantial, considering the magnitude of the damage against which they insure, could be paid to a Special Fund, perhaps within UNDP, to be utilized for development purposes, including, above all, reconstruction in the war-ravaged region.

The remedial part of the Protocol or Convention should provide that, if damage occurs, inspite of the rule of immunity of the installations concerned, there must be an immediate cease-fire, wide enough and of sufficient duration to permit the establishment of a safety zone around the damaged installation, and its repair by a crew of technicians from neutral States.

In March, 1983, it would have taken two days to repair the damaged wells in the Gulf, according to U.S. experts. By July, it would have taken two months, and the damage is becoming irreversible. Such a situation might be prevented by the remedial part of the Protocol, freely entered, on a reciprocal basis, by the States of a region in peace time.

Such a protocol or convention would have an arms control effect by establishing sanctuaries or weapon-free zones; it would have an environmental effect of the utmost importance; and, through the "insurance premiums" to be paid, it would have a development effect, as it would generate funds for development purposes.

It is such multi-purpose agreements that we have to look forward to in the future: considering the close

interrelationship of issues, not only in the oceans, they offer the only hope for success.

Speech  
8'91

You have already heard, and you will hear a lot more during these coming months, about the Law of the Sea, and, so let me begin by telling you a funny experience.

Sometimes, when one travels, one finds oneself seated on a plane next to a friendly person, and a little conversation gets started, and the other person, having explained that he is a computer salesman, asks, "and what are you doing?"

My field is the Law of the Sea," I say.

"Your field is WHAT??? What is that -- the Law of the Sea"

The fellow never had heard of it.

I told the story to a young friend of mine. He looked a bit puzzled. He never had heard of the Law of the Sea either.

So much for the North.

And what about the South?

Just the other day I lectured to a group of civil servants from developing countries in an institution in Yugoslavia, the International Centre for Public Enterprises in Developing Countries. Quite a few of the Public Enterprises in Developing Countries, of course, do deal with the oceans in one way or another.

I started by asking: How many of you have heard about the United Nations Convention on the Law of the Sea? How many have seen it? How many have read it?

There was not one person who had ever read it. Very few had heard about it, and only vaguely.

We, the older generation should not be baffled by this situation. After all, almost ten years have gone by since the Convention was adopted; and it is not yet in force. There is a new generation of civil servants, a new generation of diplomats now;

there are burning problems, there are emergency situations in so many countries that claim priority attention and action -- and who has time to bother about the Law of the Sea? It is becoming a non-issue.

None of you has gone through the exciting years when that Convention was in the making, greatest learning experience Few remember Secretary General saying

We want, in this programme, directed by one of the great leaders of the Third United Nations Conference on the Law of the Sea, to transmit to you, the younger generation, this excitement we felt; those high hopes we had, and still have, that here there was a new beginning that the oceans which are tremendously important by themselves, are, more than that, a real laboratory for the making of a new international order, including a new international economic order, which was the dream of the 'seventies.

The Third United Nations Conference on the Law of the Sea was in fact the only international forum where the North-South dialogue was successful where some solution was found for almost every major issue raised, but not solved, in other fora: the General Assembly, UNCTAD, etc. Commodities, technology transfer, international taxation, a code of conduct for multinationals, sovereignty over natural resources, South-South cooperation, etc.

There may be several reasons for that. The most important one perhaps was that this Conference, unlike the others, was not a straight North-South confrontation, but the North-South issue was overlaid by other issues, such as the interests of maritime, coastal, landlocked and geographically disadvantaged States -- as

well as a few other issues. This made the negotiations very complex indeed, and very long, but there was a process of give and take; there were trade-offs. UNCLOS III succeeded not in spite of its complexity but because of its complexity, because, unlike other fora, where the North succeeded in separating issues that cannot be separated, such as, for instance, trade and the monetary system, energy and food, etc., in UNCLOS III, the whole range of issues which cannot be dealt with separated in reality, was considered together, in a package which had something for everybody.

The two basic principles of this Convention, which will determine your mode as ocean managers in the future are

that the problems of ocean space are closely interrelated and need to be considered as a whole; and

that there is an area and there are resources which are the Common Heritage of Mankind which cannot be appropriated by anybody, which must be managed for the benefit of humankind as a whole, with special regards for the needs of developing countries; which must be reserved for exclusively peaceful purposes, and which must be used in such a way as to be conserved for future generations since these future generations, too, are part of humankind and have a right to these resources.

We want to discuss with you, during these next 10 weeks, how these innovating, I should even say, revolutionary principles will affect your work and your life.

The interrelatedness of issues has personal as well as institutional implications. On the personal level, it means that if you are a fisheries manager, you will have to learn not to look just at fish, which in itself turns out to be quite challenging,

but you will have to figure out how your industry, your use of ocean space, interacts with all other uses of ocean space: With offshore oil production, with tourism, with the management of ports and harbours, with employment, with trade, with food in general, with energy, with science and technology -- without these, there can be no successful ocean management -- and with international relations. Fish don't stop at national boundaries. Hence you have to learn to look at the interrelations between national, regional, and sometimes global issues.

We think therefore that every one, before he or she goes into specialization in one particular aspect of marine affairs ought to acquire an overview perspective. Every one has to learn to look at management problems both in depth and in their interrelation. Otherwise the benefits of the wealth of the oceans remains illusory.

The institutional implications are straight forward: If you are to deal with the problems of the oceans in their interrelations, you must have institutions through which you can do that. It means, there must be new laws, and new types of institutions through which to work, and the creation of such institutions, at the national, the regional, and the global level, all interlinked, is a big and exciting task. You will deal with that during the coming weeks.

The principle of the common heritage of mankind, likewise poses new challenges and raises new hopes. Have you ever thought about what it means that resources must be developed, conserved, and reserved for peaceful purposes? It means that we have to find ways to put together development and environment in the concept of sustainable development. We'll have to re-examine what we learned

at school about economics and come up with some new approaches. It means that we must add to this disarmament, new ways of thinking about security as common and comprehensive security that includes economic as well as environmental security. A new concept of security means new strategy: new uses for our navies. A World order aiming at sustainable development must also aim at common and comprehensive security without which it is not possible and the whole system will have to be based on the economics of the Common Heritage which, like the concept of common and comprehensive security, has components of development, of environment, and of disarmament.

The world situation today is just about as bad as it ever was, with hunger, disease, armed conflicts, natural and man-made disaster ravaging so many countries. All this calls for crisis management, and it is hard to keep one's head high enough to look above it. Take these ten weeks in your lives as a break: an occasion to look beyond all the problems of detail and daily care that consume your minds and your energies on your regular jobs. Crisis management is necessary, but it does not solve the problem. We need to have a vision of the world we want for us and for our children.

The new Law of the Sea and the development of ocean resources happens to be the most advanced instrument for national and international restructuring that exist today. Let us see together how we can best use and develop it. Let us also begin to see what we can learn from ocean management for the management of other global issues, such as food, energy, technology.

On behalf of the International Ocean Institute, I wish you success with your work here, and also some fun and enjoyment

*because, if everything is interrelated, work and fun, too, must be interrelated!*



## **Caird Medal Address**

**April 12, 2000**

I feel deeply honoured by the award of this beautiful and important medal, bestowed on me at this inspiring place, that reflects the beauty of the oceans and their timelessness, and our growing but for ever incomplete understanding of their importance..

I have devoted the better part of my adult life to the oceans, not only because I have loved them since early childhood, not only because I have learned to understand a little better how crucially important they are for the conservation of the biosphere and biodiversity, for the survival of humanity on earth; for the enrichment of our cultures, including the arts: for the world economy; for the enhancement of national and international security, but I had, from the very beginning, the gut feeling that more was at stake than the oceans, great as they are. The fact is that in trying to build a new system of governance and management for the oceans and the coastal areas, we will be making, perforce, a major contribution to the building a new national/international system or order for the next century. The world ocean has been, and is, so to speak, our great laboratory for the making of a new world order. For a combination of reasons it was in the oceans, and only there, that we could introduce a series of new concepts, principles and norms which eventually will have to be applied to the world as a whole.

While all these matters are closely interlinked and ought to be considered as a whole, I have chosen today to focus on the economic dimension and, within this perspective, on the development and the potential of one of the new institutions created by the United Nations Convention on the Law of the Sea, the International Sea-bed Authority with its headquarters in Jamaica.

I am going to move from the more general to the more specific.

The first thing that strikes you when you work with the oceans is that they are a medium that is so different from the terrestrial medium within which we are used to work, that it forces you to think differently, to think anew. This applies to the conduct of marine scientific research, which has become increasingly *interdisciplinary* as well as *international* because geology, biology, meteorology, hydrology, chemistry and physics, social sciences and natural sciences all interact. When we deal with the oceans; everything flows, and boundaries are more fiction than reality as political boundaries, economic boundaries, and ecological boundaries no longer coincide. It applies to the making of law and governance, as we discovered during the long years of the Third United Nations Conference on the Law of the Sea; and it applies to economics: from whatever starting point we move into the oceans, we have to change our thinking towards the conceptions of very large, complex systems and interdisciplinary, comprehensive, and integrative approaches.

I

When we look at what the ocean environment does to mainstream economics, we come up with some extraordinary challenges. I will mention only three of them. All of them are really challenges to the economic system as a whole, but in the oceans they are so overwhelming that we simply cannot ignore them.

The first one is absence of sovereignty and ownership in large areas.

A very large portion of economic activities take place, or depend on, areas beyond national jurisdiction, where the closely interrelated concepts of “sovereignty” and “property” or “ownership” are not applicable. Our traditional economic systems, however, whether market-based or centrally planned, are based on the concept of “property” or “ownership,” in the Roman-law sense. The 1982 United Nations Convention on the Law of the Sea declares these

resources to be the Common Heritage of Mankind, which means -- as spelled out in Articles 137, 140, 141, 145. of that Convention, they cannot be appropriated, they must be managed by an international Authority *for the benefit of humankind as a whole*, including future generations, and they are reserved exclusively for peaceful purposes. This concept, introduced by the great Ambassador Arvid Pardo of Malta, thus establishes the basis for an economic system of *non-ownership*, including an ethical dimension (*equity: benefit for humanity as a whole with particular consideration for the needs of the poor*); an environmental dimension (conservation; rights of future generations) and a peace-building dimension (reservation for peaceful purposes). Such a system, replacing the Roman-Law concept of "ownership" with that of "non-ownership," based on "stewardship," more familiar to non-Western cultures, could be important for the building of bridges between Western and non-Western cultures -- and culture certainly includes economic theory and practice -- now that the domination of Western cultural values is coming to its end. These cultural, ethical as well as institutional implications of the concept of the Common Heritage of Mankind need much further study.

The second challenge is that the oceans have not only a "resource value" that can be quantified in monetary terms; they have much more important values of a different kind, very difficult or impossible to quantify. The oceans are part of our life support system and ocean economics will have to recognize *the vast preponderance of the non-quantifiable components* of the system. The need to integrate quantifiable factors with an overwhelming majority of non-quantifiable factors. Classical economics comprises only what can be *quantified* and expressed in terms of dollars and cents or, as Orio Giarini, the Italian economist and my colleague at the Club of Rome, put it, what can be "monetarized." This gives a limited and distorted view of the real wealth of people, of nations, of the world. For real wealth consists of far more than what can be quantified and expressed in monetary terms. It includes environmental resources (air, water,

solar energy, *inter alia*); it includes unpaid work (e.g., household and child rearing work); as well as cultural and ethical values: the sum, in other words of natural and man-made goods and services monetarized or not monetarized, in what Giarini calls “Dowry and Patrimony” - a concept closely related to that of the Common Heritage of Mankind.

At the same time, real wealth consists of *less* than indicated by money-making. Very destructive activities are making heaps of money: Money is made by polluting industries, or by industries that repair pollution damage, but really do not add anything to real wealth creation. Huge amounts of money is made by the drug industry -- illegally -- or the weapons industry -- legally -- both of which have the same effect of destroying people. Instead of being added to the money value of real wealth, they obviously should be deducted from it (“deducted value.”).

Economics thus is faced with the problem of summing quantifiable and nonquantifiable factors -- factors preceded by \$signs +/- factors without \$signs, and it should be noted that the proportion between these two categories, which may affect also the way of dealing with them, has been changing throughout history. In pre-modern times, and still today in low-income strata as well as in so-called “primitive” economies, the non-monetarized sector, outside the “market” tends to be too much larger. Mutual aid in services, unpaid care for the old, unpaid food production for the household; home building, are all outside the “market.” During the last 300 years, in conjunction with the rise of the nation state, money has assumed an unprecedented importance, and has become the only measure of economic value. This historical linkage may have interesting implications. It may lead us to consider modern economics, historically and ideologically, as an “economics of war.” Historically, because the development of Western capitalism and market theory coincides with the history of European expansionism, conquest and the establishment of colonial empires. Ideologically, because it is based on conflict and competition rather than on equity and cooperation. The question to be studied is: What would be

an economic theory that could be part of a Culture of Peace and enhance such a culture?

If, leading us into the next century, a development is in course to restore to economics the ethical, philosophical, and social dimensions it once had, then it is likely that “ocean economics” will be a lead sector. Hopefully, this will also enhance the development of a new “economics of peace.” or, as Arvid Pardo, the father of the new Law of the Sea put it as early as 1974,

...governments must show awareness of the need to move from a law of the sea that encourages destructive competition between states, wasteful resource exploitation, and environmental abuse, to an international order for ocean space based on principles of international cooperation, resources management and conservation, environmental protection and equitable sharing of benefits...

The third challenge we are facing in the oceans is that of *uncertainty*. Uncertainty now is a key word in science in general as it tries to cope with ever more complex systems and determinism and predictability give way to chaos and unpredictability. In the marine sciences, the margin of uncertainty and unpredictability is huge.. We know how little we know Even subsystems, as for instance, fish stocks and their sustainability, are so complex that they defy our models; the interactions between the ocean floor, the water column, the coasts, the atmosphere are beyond the comprehension of our computers; nor are we able to unravel relations between anthropogenic and natural impacts on biodiversity or climate change.

Uncertainty begets risk, and risk is a far greater factor when we deal with the oceans than it is on land. Risk management and risk reduction ought to be an essential part of “integrated ocean and coastal management, but it is not, or not yet.

Risk necessitates cooperation. Cooperative spreading of risk reduces risk; competition increases risk. The overwhelming presence of uncertainty and risk in dealing with the oceans thus may contribute, in another perspective, from another angle, to the emergence, in the next

century, of the kind of cooperative economics or economics of peace, envisaged by Arvid Pardo

II.

The first institution to apply the economics of the Common Heritage in the No-man's land of the deep ocean floor was to be the International Sea-bed Authority. Arvid Pardo's concept of the Authority was comprehensive and integrated. In his seminal speech of November 1, 1967, he said

Hence our long-term objective is the creation of a special agency with adequate powers to administer in the interests of mankind in the oceans and the ocean floor beyond national jurisdiction. We envisage such an agency as assuming jurisdiction, not as a sovereign, but as a trustee for all countries over the oceans and the ocean floor. The agency should be endowed with wide powers to regulate, supervise and control all activities on and under the oceans and the ocean floor....In our view the agency should have the power effectively to regulate the commercial exploitation of the ocean floor. We would envisage exploration rights and leases being granted in the area within its jurisdiction...

In his monumental Maltese Ocean Space Draft Treaty of 1971 (A/AC.138/53) he spelled his concept out in some detail, although he was careful not to go over board with details. "It was thought preferable," he wrote in his introduction, "to lay down only general guidelines (articles 138 e seq) on the manner in which the management powers of the Institutions should be exercised rather than to attempt a detailed regulation of exploitation without knowledge of the conditions under which exploitation will be undertaken in practice." This, the over-burdening of the Convention with administrative and even fiscal detail, was one of the mistakes committed by UNCLOS III, which made Part XI of the Convention practically inapplicable, and it was repeated by the Sea-bed Authority, with the detailed elaboration of the "mining code."

Pardo had some fairly precise ideas about the economic value of the resources of international ocean space. In 1967 he wrote:

On the assumption that an agency would be created in the year 1970, that technology will continue to advance, that exploitation will be commensurate with the presently known resources of the ocean floor, that exploration rights and leases will be granted at rates comparable to those existing at present under national jurisdiction, and that the continental shelf under national jurisdiction will be defined approximately at the two-hundred-metre isobath or at twelve miles from the nearest coast, we believe that by 1975, that is, five years after an agency is established, gross annual income will reach a level which we conservatively estimate at around six billion dollars.

This estimate has been widely criticized as it became increasingly clear that the exploitation of manganese nodules was uneconomical for the foreseeable future. But if one takes the trouble to examine his premises, his estimate was totally realistic. He was not talking about manganese nodules, to which UNCLOS III and the International Sea-bed Authority erroneously limited their attention. He was speaking of all known resources of the ocean floor, including hydrocarbons beyond a 12-mile limit of national ocean space. Prophetically, he also included the genetic resources -- "phytozoa of International Ocean Space (Article 141). He also included a tax to be paid by States on the exploitation of natural resources within national ocean space.

.During his later years, Pardo avidly followed every discovery, and every new technological development, all of which corroborated his earlier vision.

In the light of new scientific evidence and technological capacity, the deep ocean floor today is infinitely more important for the determination of the world's climate, for the conservation of biodiversity, for economic development including the production of resources, energy, and services, and for the maintenance of international, regional and national security, than it was thought to be in the 'seventies, when Part XI of the Convention was drafted.

I shall now try to indicate quite briefly the most important of these newly discovered

resources and newly established services, which would form the basis of the new economics of the common heritage.

As far as resources are concerned, the commercial exploitation of the Sea-floor Massive Sulphides appears to be closer at hand than that of the manganese nodules.

Two Exploration Licences, covering more than 5000 square km of sea floor off the coast of Papua New Guinea are the first licences ever to have been issued for the exploration and development of sea floor massive sulphide deposits. The grant was made to the PNG-registered, Australian-led company Nautilus Minerals Corporation Ltd. Application was made following a series of discoveries in the Bismarck Sea by Australia's state-owned scientific research body, the Commonwealth Scientific and Industrial Research Organisation, CSIRO. Nautilus also announced that a research partnership has been signed with CSIRO Exploration and Mining for cooperation in developing techniques for exploring these deposits over the next two years. Two areas in the Manus Basin, have been identified, the SuSu and Vienna Woods fields. It appears that they constitute the richest volcanic deposits ever found at sea, with a value estimated at billions of dollars. Sample ores contain up to 26 percent zinc, 15 percent copper, and a record average of 15 g of gold and 200 g of silver per tonne. New discoveries are being made in continuity.

The Government of Papua New Guinea is presently elaborating a mining code for the exploration and exploitation of these resources, and the International Sea-bed Authority is in the process of drafting rules and regulations for the prospecting and exploration of the sulphides in the international Area where they also abound. In accordance with the Convention, these rules and regulations have to be completed in 2001, three years after a Delegation, in this case, the Russian Federation, made the request. Thus a process of expansion and evolution of the Authority's scope of activities has started. In fact, if the Sea-bed has become more important, the



importance of the Sea-bed Authority must grow commensurably.

Another mineral resource that recently has been attracting much attention are the methane hydrates which abound in the Arctic and Antarctic permafrost zones as well as on the deep sea-bed.

Gas hydrates are ice-like crystalline compounds of gas (mainly methane and water) which are stable both at very low temperatures in permafrost regions, and in the low-temperature-high pressure-regimes present in the deep ocean. A consensus has developed that the amount of methane held in the form of gas hydrates worldwide is  $10^{15}$  to  $10^{17}$  cubic metres, and this contains a mass of organic carbon that is perhaps a factor of two larger than that in all known fossil-fuel deposits (coal, oil, and natural gas.) The methane is contained in the hydrate itself and even more methane is trapped beneath the Hydrate Stability Zone, at water depths between 500 and 4,000 metres and temperatures between 2.5°C and 25°C. Methane hydrates are widespread both on continental margins and in the international Area.

Methane hydrates are now universally considered as perhaps one of the most important energy resources for the next century.

Methane, however, is a "greenhouse gas." Although there is a lot less in the atmosphere than there is carbon dioxide, each molecule has a much larger heating effect. For example, the global warming potential of methane is calculated to be 56 times by weight greater than carbon dioxide over a 20 year period...

Collapse of gas hydrate-bearing sedimentary deposits on the sea floor may be the primary process that releases methane from the hydrate reservoir to the atmosphere. On the continental slopes and rises this release is likely to be associated with landslides which may break cables and cause oil platforms to collapse.. Thus methane hydrates influence the stability of the sea floor and may bring about changes in the global climate.

The methane hydrates in the international Area undoubtedly are part of the Common Heritage of Mankind for which the International Sea-bed Authority is responsible. The Authority is also responsible for harmonizing its own activities with the activities of States in the Area.

A great deal of international cooperation, between Governments, industry, and academia is already going on in hydrate research and development. In the U.S., a Senate Report encouraged Congress to

ensure that data and information developed through the program are accessible and widely disseminated... Working with the Natural Gas Supply Association and the International Centre for Gas Technology Information, we are proposing to develop a methane hydrates Internet site that will be used to enhance information dissemination among the world's community of hydrate researchers and technology users, as well as to obtain stakeholder input.

The problem is: all this is going on without any reference to the Law of the Sea Convention or the Authority. Considering the enormous abundance of the resource and its widespread availability on the continental margins, under national jurisdiction, it will not be easy for the Authority to attract attention to the international Area -- unless it can offer unique advantages and services through public-private cooperation in the international Area. These might be created through cooperation between the Sea-bed Authority and the Climate Convention organization which is responsible for studying the impact of the hydrates on climate change.. We envisage a regime of rules and regulations for the exploration, the Research and Development, and the safe, efficient, and economic recovery of methane from oceanic gas hydrates, the coordination and harmonization of this new use of the deep sea-bed with other uses, including the safeguarding of cables from breakage. At this stage, the focus of the regime would be on joint R&D and joint technology development including developing countries. which otherwise would have no chance to participate in this new phase of the industrial

revolution.

Another newly discovered resource of very great potential, anticipated by the vision of the prophetic Arvid Pardo, are the genetic resources of the deep sea-bed. Recent discoveries of myriads of bacteria on and under the deep sea-bed are rather mind-boggling. . Geologists studying deep-sea volcanic events have found rock walls, only months after an event, covered with thick mats of bacteria feeding on minerals, archaic creatures restaging the origin of life. Intensive bio-prospecting is being carried out, and many of these genetic resources, with their unique heat and pressure tolerance, are already commercially exploited to the tune of billions of dollars a year.

The industries utilizing these genetic resources are quite diversified. They include the pharmaceutical industry, the waste treatment, food processing, oil-well services, paper processing industries, as well as mining applications. . The potential market for industrial uses of hyperthermophilic bacteria has been estimated at \$3 billion per year.

Clearly, the International Sea-bed Authority has some responsibility for the conservation and orderly utilization of these newly found resources, even if the Convention limits exploitation rights to the mineral resources of the Area. Article 145 of the Law of the Sea . Convention establishes that “necessary measures shall be taken with respect to activities in the Area to ensure effective protection for the marine environment from harmful effects which may arise from such activities”. Subparagraph (b) establishes that such measures must include “the protection and conservation of the natural resources [biodiversity] of the Area and the prevention of damage to the flora and fauna of the marine environment” This flora and fauna includes the genetic resources..

This responsibility, however, is now shared with the Secretariats of the Biodiversity and Climate Conventions. Article 5 of the Biodiversity Convention provides that “each contracting

Party shall, as far as possible and as appropriate, cooperate with other Contracting Parties, directly or, where appropriate, *through competent international organizations, in respect of areas beyond national jurisdiction and on other matters of mutual interest, for the conservation and sustainable use of biological diversity.* Clearly, “the competent international organisation”, in this case, is the International Sea-bed Authority; clearly, also, the “area beyond national jurisdiction” is the international sea-bed area. *Nothing at all has been undertaken as yet to implement the Convention and protect biodiversity in international waters, including the sea-bed beyond the limits of national jurisdiction.* This is a lacuna which must be filled, through a regime of rules and regulations which should enhance

- the conservation of biological diversity in the Area;
- the sustainable use of its components;
- the precautionary approach and intergenerational equity
- the fair and equitable sharing of benefits arising from the use of genetic resources;
- participation of developing countries in the bio-industries; and.
- international cooperation in technology development in a sector likely to be of primary economic importance in the Twenty-First Century.

It is essential that this regime, to be jointly elaborated by the Sea-bed Authority and the Biodiversity Convention institutions, must be compatible with the regimes that are emerging, at the national and, especially, at the regional level, for the protection of biodiversity under national jurisdiction. This applies to genetic resources just as it applies to the oceans’ fisheries resources, where compatibility between regulations within EEZs and regulations in international waters, especially within regional seas, has been assured by the Straddling Stocks Agreement of 1995.

I would anticipate that the rules and regulations for bioprospecting and the protection of biodiversity on the deep sea-bed would have to take the form of a Protocol to be adopted by the States Parties to the LoS Convention.

Let me now come to the Services being developed within the international se-bed area.. Considering the time constraint, I will mention only the two most important ones. The emergence of an overwhelmingly important “service sector” on the deep sea-bed, incidentally, is another fascinating phenomenon as it reflects what is going on in the world in general: the ongoing transformation of our economies from one based on industrial production to one based on services. Services now are responsible for 60 to even eighty percent of the global GNP.

As far as the sea-bed is concerned, by far the most important is the development of a gigantic telecommunications system through the laying of fibre-optic cables passing through the international sea-bed area.

The first undersea fibre-optic cable was installed in 1988.. Today there are 228,958 miles of fibre-optic cable on the sea-bed, enough to encircle the Earth almost 10 times (*Herald Tribune*, March 10, 1998). This figure does not include Project Oxygen, a \$14 billion Super Internet, adding another 200,000 miles of cable with 96 landing points in 75 countries It is estimated that by 2003 more than US\$ 56 billion will be invested in the fibre-optic undersea market, with about one million route kilometres in place. And while the transmission capacity of these hair-thin fibre-glass cables has increased by orders of millions — the newest trans-Atlantic cable can handle 2.4 million voice conversations at one time, thanks to a laser process called “wave division multiplexing” — the cost of fibre optic cable is decreasing almost as dramatically.. In 1987 each voice circuit in a trans-Atlantic cable cost about \$40,000 to build and maintain. Today the cost is approximately \$100-200 per circuit. As the *Herald Tribune* states it, “Under-sea fiber-optic cables have become one of the most crucial components of today’s

communication-based global economy...”

The value of business transacted through this network -- phone, e-mail, Internet, e-commerce — is estimated as \$1 trillion per year. Add to this that the laying and leasing of the cables themselves is a most profitable business, with a rate of return on investment of 30 to 50 percent per year.. Thus it appears the Gemini cable will be so profitable that the parent companies are already planning a “Gemini-2” and that Worldcom will be able to sell capacity on the cable to other operators at a 2000% profit.

The fibre-optic cable industry is an example where technological development was very much faster than legal development, and the industry today enjoys its existence in a legal vacuum, still relying on the High Seas Freedom to lay cables and pipelines enshrined in a Convention of the year 1884, which has been taken over, practically unchanged, by the Law of the Sea Convention of 1982..

On the continental shelf, the Law of the Sea Convention authorizes coastal States to regulate the routing, laying and the maintenance of the cables, and the harmonization of these activities with other uses of national ocean space; and regimes are emerging in many States and also, for instance, in the European Union as a whole. These also include fiscal regimes, the payment of fees for licences, property taxes for cable head-ends, etc. The Authority, at present, has no such powers, but clearly, it should have them. For the safety of the cables themselves, the Authority must ensure the avoidance of conflict of uses of the area, it must agree to the routing and know exactly where these cables are and be informed about their maintenance. In return for these regulatory activities the Authority would be entitled to some payments. A minimal tax, either in the form of a Tobin tax, let us say of 0.001 percent on the trillion dollar annual business transacted through the cables, crossing the Area which is the Common Heritage of Mankind would not only revitalize the Authority but change the whole picture of international

development cooperation and constitute a first positive answer to the insistent call, by the World Bank, the United Nations system and the developing countries, for “innovative ways” of generating “new and additional funding” to enable developing countries to implement all the Conventions, Agreements and programmes emanating from the Earth Summit of 1992.

Finally, the international sea-bed is already being used for construction of permanent deep ocean sea floor observatories. Quite a few have already been constructed by the United States, Japan, and Europa. Scientists and Engineers funded by the National Science Foundation and affiliated with the Incorporated Research Institution (IRIS), the University of Hawaii, and the Woods Hole Oceanographic Institution, have successfully created the first permanent, deep ocean sea floor observatory, able to observe ocean processes over periods of years. By connecting a junction box to a retired telephone cable on the sea floor in the middle of the Pacific Ocean, between Hawaii and California, the observatory, called “the Hawaii 2 Observatory” or “H2O, is placed in 16,400 feet of water. A seismometer and a standard hydrophone are the first instruments that have been installed at the site to listen for seismic events such as earthquakes and tsunamis.

HUGO (Hawaii Undersea Geo-Observatory) is a submarine volcano observatory located at the summit of Loihi volcano southeast of the Island of Hawaii. Loihi is an active volcano, likely to become the next Hawaiian island in about 100,000 years. HUGO was installed in 1997, when a 47 km electro-optical cable donated by AT&T was installed between the island of Hawaii and the summit of Loihi. A Junction box attached to the cable allows instruments to be installed and removed using a submersible. Electrical power and commands to instruments are sent to the Junction Box from shore, and data from the experiments are sent through the optical fibers to shore.

Future observatories are in the planning stages; the most ambitious of which is

NEPTUNE, which will instrument the Juan de Fuca tectonic plate off the northwest coast of the U.S. using about thirty junction boxes and two cable connections to shore. In addition to monitoring the plate boundaries, NEPTUNE will be capable of monitoring hydrate deposits on the continental margin and movement of salmon along the coastline.

This new use of the international sea-bed is closely related to the growth of the fibre optic cable industry: The cost of the observatories has become affordable through the use of decommissioned cables which litter the deep sea-bed. With the rapid progress of the fibre optic technology and the incredible increase in demand for transmission capacity, these cables become obsolete within a few years and are decommissioned. They are, however perfectly adequate for the use by the observatories and constitute a most valuable asset which should be monitored and safeguarded by the International Sea-bed Authority.. Given the Authority's mandate to coordinate scientific research in the Area and even to conduct such research itself, clearly the Authority has everything to gain from cooperation with the observatories, IRIS in Washington DC.. The Authority should keep a register of the observatories and the cables installed on the ocean floor, with a view to future cooperation in environmental and resource monitoring.

The continuous discovery of new resources and the introduction of new uses and services into the international sea-bed area could provide an economic basis for the International Sea-bed Authority even broader than envisaged by Arid Pardo in the sixties and seventies. If, through an evolutionary and cooperative approach and the adoption of protocols as may be required, the Authority could adjust its scope to changing times and circumstances while remaining faithful to the principles on which it was founded, in particular the principle of the Common Heritage of Mankind establishing that the Area its resource base and services must be used for the benefit of humankind as a whole, with particular consideration of the needs of poor countries, the



conservation of the environment and biodiversity and that it must remain reserved for exclusively peaceful purposes, this really may be the beginning of the building of a new economics of peace..

Summary Talk by Elizabeth Mann Borgese at the Erice Workshop  
"The Future of the Mediterranean Area-Environment and  
Environmental Education" October 1988

I feel honoured to have been given the impossible task to summarize the results of the workshop concluded last week in the magnificent ancient mountain town of Erice, in Sicily, on the protection of the environment in the Mediterranean and on environmental education. It was a rich and productive programme, and I certainly cannot do justice to it in this brief summary.

It certainly was useful, first of all, to place the issues of Mediterranean environment and development into their broader global context, for, obviously, the Mediterranean does not exist in a vacuum, and many of the issues we are facing transcend regional boundaries. This is true in a physical sense: There are fish stocks straddling the Mediterranean and the Atlantic Ocean on the one side and the Indian Ocean on the other; and management decisions must take this into account. Pollution from landbased sources as well as pollution through the atmosphere may come from great distances, and this, again, is a factor that complicates environmental management. Shipping is a global concern, and regional standards for the safety of shipping and of the marine environment must be harmonised with global standards. The fact that the Mediterranean is the theater of the largest concentration of warships in the world does not depend on the States of the region, but on super power confrontation. The reservation of the Mediterranean for peaceful purposes, therefore, can only be negotiated in a global context.

This takes us to the political context of our deliberations, and here the discussion became rather heated, as it must, considering the degree of explosiveness the situation has reached.

The East is on fire, and the means to put that fire down are not at hand, nor even in sight. In the South, the economic situation is rapidly deteriorating, exasperating North-South tensions and

inhibiting North-South cooperation in the region. The North is drawing closer together, into a truly common market by 1992, which again, may deepen the chasm between the North and the South and frustrate the concept of a Mediterranean community. That similar fears have been expressed by the countries of Eastern Europe only confirms the reality of this concern.

Let me add a personal comment at this point. I think we all agree that a certain degree of optimism is a moral duty, failing which there can be no constructive political action. I shall return to this at the end. Keeping this in mind, the integration of Western Europe is not necessarily an evil, from the point of view of the South. Even a totally integrated Europe can never be a closed system. The United Kingdom is a member both of the European Community and of the British Commonwealth of Nations. There is no reason why Italy, France and Spain, or Turkey and Greece, cannot be members both of a European and of a truly Mediterranean community, with its specific values, economic interests and environmental imperatives. Anthropologists, in fact, tell us that in so-called primitive societies, the overlapping of social systems, that is, the fact that some subgroups are part of two or more larger groupings, increases stability and peace in the whole system.

In this broader, physical and political context, we looked at the Mediterranean and its uses, and at sea management as the management of complexity. A systems-analytical approach indicates as many as 22 uses of the sea, all interacting, geographically and functionally, giving rise to a continuous process of change. Traditional uses change, new uses spring up. The reference framework changes under the impact of technological pressures, EEC policy, the strategies of developing countries and implications arising from the international law of the sea.

If managed in their interaction, and in their interaction with the environment, there is a high potential of economic benefit, of environmental security, of community building. If unmanaged, or mismanaged, these uses, conflicting in congested spaces are

bound to kill one another and the environment. Alternative scenarios were examined, as presented by the Blue Plan.

This, in fact, is one of the more exciting aspects of ocean management: that we must do it together or we cannot do it at all. If, however, we can cooperate in the ocean, we can, conceivably, do it in other areas as well.

The over-all picture of the uses of the Mediterranean Sea and their potential then was dissected into its various components. We dealt with population patterns, their impact on migration and on the environment. There was consensus, however, that linear projections are of limited value and that futurecasting must not degenerate into a spectator sport where we passively wait for inevitable events to take place. The purpose of futurology is to build scenarios on which we can act: based on the awareness that the future, though indeterminate and unpredictable, is largely in our own hands. An impressive picture of evolution was presented, from the simplest and smallest of living systems to the most complex and largest supersystems - suggesting complementary trends of integration and decentralisation, as binding forces decrease with the increase in complexity of integrative systems. Human society, in this context, is likely to be more dynamic, doing more with less, using its energy more efficiently, and balanced at a higher level of disequilibrium. The viability of this new stage of system's organisation, however depends on one thing: the balance of the global environment.

We looked at the environment, and on activities to protect it, in various countries: in Egypt, or in Greece, with its success story of HELMEPA activities, which could be emulated in other countries. We looked at the important role of local communities and "micro-projects" in the protection of the environment, and we looked at the activities of nongovernmental organisations. There was consensus that every form of organisation, governmental or nongovernmental, local, national, or international, grass-roots or highly technical, must be mobilized in the struggle for an economic development in tune with its ecological foundation.

Micro-projects might include activities such as building restoration, coast and littoral planning or waste control, or construction of infrastructure and facilities or even the development and application of solar energy. Also the chartering of a special boat - the "Mediterranean Express" - to foster a sense of Mediterranean community and environmental awareness, was included in the micro-project proposal. This was later taken up and included in the final recommendations. The importance of NGOs was seen in their capacity of stimulating public involvement and participation. Without the restraints imposed, generally, on governmental entities, and with their direct links to the grass-roots, they might assume such tasks as the development of new concepts for environmental protection, sustainable development and human welfare. I mention this in a very summary way: the paper discussed was far more specific in its suggestions.

Great stress was laid on the importance of environmental education which must penetrate all levels of education. It should not be conceived as a subject or limited area of study but rather as an integral part of a learning and training process, i.e., as a consubstantial part of any modern educational system, conceived as life-long education.

Environmental education should contribute to resolve basic human needs providing a sense of security, wellbeing, equity, achievement, and participation.

Here is a great opportunity and a great challenge for UNESCO to assist both developed and developing countries.

Elementary and secondary schools ought to revise their curricula, from geography to biology, from history to sociology, and pass from a traditional static methodology to a more dynamic one, enabling children, from the earliest age on, to grasp the concepts of ecological systems and the need of their protection. The media, especially television, can be effectively used to raise environmental awareness, provided the message is suitably

packaged, even by resorting to entertainment techniques such as cartoons, to reach the audience. Special training can be provided to specific users of the sea, such as ship-owners and mariners, and the effectiveness of HELMEPA is a vivid demonstration. Foundation courses for policy makers - the persons responsible for the making of environmental/developmental laws and their implementation, such as the programmes organised since 1980 by the International Ocean Institute, constitute another building block for this educational structure. Starting next year, the IOI is going to run such programmes in different Mediterranean countries, specifically tailored to the needs and challenges of the Mediterranean region.

During the almost two decades since the Stockholm Conference on the Human Environment, the concept of the protection of the Environment has undergone significant changes, it was pointed out. While environment and development were viewed as conflicting in the early years, they are today seen as inextricably interconnected. Poverty, next to war, is the worst polluter, and a policy that does not aim at the eradication of poverty, cannot aim successfully at the protection of the environment. On the other hand, an economic development strategy that destroys its own resource destroys itself.

The linkage between environment and development has profound implications, which are touched upon, but not yet fully developed, in the Brundtland Report.

These implications are of an institutional nature: If environment and development are linked, we must have institutions which can deal with them in an integrated manner; they have implications for economic theory: New ways of measuring economic values, probably a new economic theory, synthesizing economics and ecology, as Aurelio Peccei put it, must be developed, and, in the last analysis these implications are philosophical. The Eurocentric value system, considering man as the pinnacle of evolution who can deal with nature as his servant, must yield to humbler concepts viewing humankind as part of nature; culture as

a continuation of nature, and science and technology as an instrument of culture.

The workshop dealt in some detail with the problems of scientific and technological cooperation between the "North" and the "South" of the Mediterranean community, and a proposal put forward by the International Ocean Institute, for the establishment of a Mediterranean Centre for R&D in Marine Industrial Technology was discussed. It was pointed out that the Declaration of Genova, a Protocol adopted unanimously by the 18 signatories to the Barcelona Convention, expressly mandates the establishment of training programmes, the transfer of technology, and a wider cooperation with developing countries to assist them to fulfil their responsibilities for the protection of the Mediterranean. The establishment of a Mediterranean Centre such as that proposed by the IOI, and already endorsed and supported by the Government of Malta and by UNIDO and the Secretariat of the United Nations, thus fits into UNEP's mandate. It is now up to the Mediterranean States to demonstrate how serious they are with regard to the obligation they have already assumed with the adoption of the Genova protocol.

Science, technology, environmental education, of course, are part and parcel of a wider culture complex. The existence of a common Mediterranean culture has deep roots in history. One participant characterized this culture as having three particular aspects: faith, drama and hope. The Mediterranean as the home of the three major monotheistic religions and the importance of religion as apart of the culture of the region is manifest. So is the more dramatic, less restrained way of life and of expression of all the people around the Mediterranean, as well as the presence of hope - not as short-range optimism or self-complacency, which is a disguise for the defense of the status quo, but as long-term hope for change towards a better system; hope that does not shy away from harsh criticism of the present.

The seminar closed with the adoption of a strategy to develop a "Mediterranean Project", aiming at the establishment of a

flexible network. This should provide an umbrella for different activities, and it should constitute the missing link between the technical experts and the people of the Mediterranean community, while being itself a process, capable of evolving. It might engage itself in policy research, in information gathering and distributions, in the establishment of a data base, in the editing of a newsletter. The common motivation for the network to exist would be: care for the future of the Mediterranean, the issues of the sea, of populations of culture. Environmental education would be given a high priority. All avenues of communication and information would be explored and utilized. All NGOs in the region should be mobilized. This should be done in cooperation with UNEP which has already initiated projects of coordination and cooperation with the NGOs in the region.

Foci, or resource persons in all Mediterranean countries should be identified. A pilot project, such as an upcoming next seminar, to be held on a ship cruising the Mediterranean and making port calls in every Mediterranean country, should be examined. A feasibility study should be undertaken for the establishment of a co-ordinating Mediterranean Institute which, perhaps, some day, could be developed into a Mediterranean University.

Two informal working groups were established, one to study the modalities for the establishment of the network; the other, to study the feasibility of a Mediterranean "Boat" as a means to enhance awareness of environmental concerns and Mediterranean community.



Although the Mediterranean area has fostered some of the greatest civilizations of the world, it is not presently thought of, even by its own inhabitants, as an area that shares common interests, such as those related to the sea with its uses and its preservation. This pattern extends to settlements around the Mediterranean where what is perceived is sharply divided between North and South, with countries in the North belonging squarely to Europe and those in the South belonging to Africa.

This emphasis on the North and the South is exacerbated by the different development patterns of the last hundred years, most particularly those occurring after World War II. This has created tensions which are often explosive, especially in the Eastern part of the Mediterranean. The existence of the European Economic Community and its consolidation in the near future seems to stress the gulf between the North and the South in the Mediterranean, separating even further the countries of Europe from those of Africa.

Undoubtedly, however, there exist very important elements of common history, common values, common culture and religion in the Mediterranean. Especially in our time, there are also common environmental issues which concern the inhabitants of both shores of the Mediterranean.

Both these uniting trends as well as the growing chasm between North and South stimulated the organization of a workshop in Erice by the Fondazione Aurelio Peccei on the "Future of the Mediterranean Area", concentrating primarily on the Environment and on Environmental Education. It was the intention of the Foundation in this meeting to strive to develop different ways of thinking in relation to the Mediterranean, with a view of bridging the gap between scientific and technical discussions of the Mediterranean and a more socioeconomic and cultural approach to the problems of the area. Another of the objectives of the Erice Workshop was to elicit suggestions for a Mediterranean project which may help accomplish this goal and have some impact

on the North-South question. During the numerous discussions in Erice two possible Mediterranean projects emerged, which aroused considerable interest among the participants. These were:

- 1) The feasibility of establishing a Mediterranean network which could identify and connect in an informal way the various groups working on different aspects of the Mediterranean environment - with environment interpreted in a rather broad sense.
- 2) Exploring the possibility of having some sort of Mediterranean vessel on which, while travelling between different locations, training and cultural programs relevant to the Mediterranean environment could be held.

To keep the dialogue started at Erice open, we thought it would be useful to summarize below some of the principal items which were brought up during the workshop on both the above topics.

Three main points emerged during the discussions of a possible Mediterranean network:

- a) The network should not be vertical, but rather neural in character, with many separate interconnections. In this way the network could easily grow and it would not suffer unduly if some links were to become inactive. Indeed the building of the network should be considered as an educational project in itself, in a field in constant transformation, taking advantage and involving all already existing efforts.
- b) The network should encompass a broad gamut of activities, containing both groups interested in more academic endeavours as well as more grass roots oriented organizations. The network should provide a locus and an avenue for exchange of information among groups doing research in, or disseminating information on, various aspects of the Mediterranean, ranging from the utilization of common living spaces and the impact of population structure and migrations in the area, to the action of environmental action groups at the local or national level. The

network should strive to include both governmental, intergovernmental and nongovernmental organizations.

c) A first step toward the formation of this Mediterranean network requires the establishing of a data base of relevant groups at the national level. This data base could already begin to be assembled, for a number of countries, by various of the participants of the Erice workshop.

Various points also emerged in connection with the idea of a Mediterranean vessel:

a) Having a boat travelling in the Mediterranean would provide a visible link among the countries of the region and emphasize their common concerns for the environment.

b) By holding training courses or seminars on board and inviting local experts to lecture at the various ports, one could make excellent use of the human resources available in the Mediterranean area.

c) The practical issues associated with establishing such a floating school are complex and require considerable further study. A possible approach to test the feasibility of this project would be to have a follow-up meeting on a ship to discuss both this idea and that of establishing a Mediterranean network.

The Fondazione Aurelio Peccei would be happy, within the constraints of its limited human and financial resources, to try to foster these possible projects. Your input, however, will be crucial for further development.