

Managing Ocean Diversity in Global Change and Globalisation*

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Abstract : The 1972 United Nations Conference on the Human Environment sparked off actions aimed at protecting the ocean on all scales. Physical science was essentially in the foreground, and the ecological dimension remained in the background as well. During the following two decades, ocean uses increased and spread unexpectedly, and there was an urgent need for management patterns to deal with coastal areas, regional seas, and with the ocean as a whole. Meanwhile, mainly thanks to the Man and the Biosphere (MAB) programme, the ecological dimension of the environmental issue became more evident, while the concept of sustainable development was designed by the World Commission on Environment and Development (1987). As far as the ocean is concerned, by adopting Agenda 21, the 1992 Conference on Environment and Development (UNCED) could neither embrace a wholly ecology-oriented policy, nor adopt the concept of sustainable development in its whole extent. This circumstance encourages efforts to consider the ocean from an effective ecological perspective, and to explore how cultural and ecological systems have interacted. Hence the concept of diversity becomes an increasingly key factor.

Key Words : ocean diversity, global change, U.N.

요약 : 1972년 UN회의에서 해양 보호를 위한 활동이 고무되기 시작한 이후, 유효한 생태적 관점으로 해양을 고려하고, 문화와 생태계의 상호작용 방식을 탐구하기 위한 다양한 노력들이 있어왔다. 이로 인해 무엇보다 다양성의 개념이 주요 요소로 등장하게 되었다. 대표적으로 기후 변화와 지구화 과정의 연관 효과는 생태적, 경제적, 문화적 다양성을 강화하고, 해양 다양성에서 이 세 요소 사이의 피드백 과정을 가져올 것이다. 이러한 전지구적 과정을 다루기 위해, 데카르트적인 근대 인식론은 전혀 다른 원칙에 기반한 새로운 인식론으로 대체되어야 한다. 이러한 관점은 생태적 체계와 문화 체계로 구성된 이중 모듈의 체계를 고려하며, 이 둘의 상호작용을 중시한다. 새로운 다양성을 기반으로 한 접근법은 두 가지 주요 상호작용을 중시한다. 첫째, 생산적 상호작용은 본질적으로 생태계와 문화 모두의 다양성을 최대화하는 양의 피드백을 구성한다. 둘째, 반면에 위협적인 상호작용에서는 기후변화와 그 결과들과 같은 자연의 힘이나, 지구화와 같은 사회적 힘들은 자연과 문화 모두를 위협한다는 것이다.

주요어 : 해양 다양성, 지구적 변화, 유엔

As a consequence, the link in the chain between ecological diversity, spatial differentiation of ocean resource, and ocean use differentiation is consolidated. This process is expected to strengthen and expand, essentially due to the growth of the living resource exploitation, the birth of deep-sea mining,

the diffusion of human settlements and infrastructure and the exponential growth of human presence, at sea. The associated impacts of climate change and globalisation processes will be the background triggers. All these inputs will strengthen ecological, economic, and cultural diversity. Moreover they will

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carry a feedback among these three components of the ocean world diversity.

In order to tackle this global process, modern epistemology based on the Cartesian thought, which has been the leading factor of modern society, needs to be confuted and replaced by a fresh epistemology based on completely different principles. Indeed, a new approach should leave the cause-effect principle out to adopt the holism and pertinence principles. Constructivist approaches are required instead, thus integrating the ecological and cultural dimensions. From this perspective, ocean reality, including coastal and island milieus, may be faced with a focus on those areas of highly natural and cultural diversity. Here ample ecological and cultural elements may be found, as well as areas of high endemism -where one or a few ecological and cultural elements have played a leading role- and nursery grounds, considered as areas where species and cultures had the opportunity of rising and developing, and from where they spread out over the world. Diversity may be protected by concentrating, at both ecological and cultural levels, on small populations such as those with small recruitment as well as those with special requirements. Considering reality as made of bi-modular systems, consisting in ecosystems and in cultural systems, the interaction between these two modules is focused on. A diversity-based approach leads to focusing on two key types of interaction: first, productive interaction, essentially consisting in the positive feedback between ecosystems and in the cultures optimising the diversity of both; second, endangered and threatened interaction, where natural forces, namely climate change and its consequences, and social forces, namely globalisation, jeopardise both nature and culture.

1. Sailing

Stockholm, 5-16 June, 1972. The United Nations Conference on the Human Environment designs the

first global strategy to tackle the environmental issue. All world States are aware of their crucial role and the need to deal with it on an international, national and regional scale. This approach is going to make the organisation of modern society increasingly entangled since something alien from the conventional, productivity-centred economic policy is recognised as socially relevant. At the same time, some other factors are going to drive modern society towards a critical phase. The Bretton Woods system, which has ensured stable financial and trade conditions for almost three decades, is approaching its collapse. The Arab oil producers are about to provoke a rapid, catastrophic rise in the price of raw materials. Discussion has just got underway on the finite dimensions of natural resources, and the subsequent need to consider limiting growth.

In this context, the ocean gains unexpected and unprecedented importance. There is an increasing collective realisation of the close interaction between the physical ocean processes and the atmospheric processes which induces climatic change. The recently advanced plate tectonics theory has provided an integrated view of the evolution of the earth's crust, demonstrating how it has essentially evolved through geological mechanisms, within which the ocean has played a leading role. The monitoring systems, namely the *Landsat*, and more efficiently, the *Seasat* satellite series, have begun providing global visions of the physical properties and dynamics of the ocean. Immense mineral deposits, mostly found in polymetallic nodules, have just been discovered. Finally, the ocean has become the centre of conflict between the developing and developed countries since they all recognise that it hosts the largest biotic and abiotic patrimony for future generations. The United Nations Conference on the Law of the Sea (UNCLOS) is about to begin and will last as long as ten years (1973 to 1982) due to the strong influence of this quite dramatic dispute.

Hence, modern society sails from a vision which converged in the mid-nineteenth century - in which

the ocean is viewed as merely an inexhaustible resource reservoir free from human exploitation and conquest - towards a fresh vision, both bright and dark, of the post-modern ocean.

2. In Search of the Route

Rio de Janeiro, June 3-14, 1992. The United Nations Conference on Environment and Development (UNCED) attempts to design its own far-sighted, global approach to ocean management.

Let us consider that fascinating event from the current, early-21st century perspective. During the three-year preparatory work prior to the Conference, there is enhanced awareness of how much and how rapidly ocean uses have increased, and the rate by which they are expanding. Since the early 1970s marine catches have almost doubled, from 45 to 90 Mt, and are about to reach 100 Mt, which is estimated to be the threshold of maximum use of ocean biomass. This expectation forces fish farming to spread in many coastal waters, both at inter-tropical and temperate latitudes. During the last two decades, maritime transportation has increased by 1.5 times, and will double by the end of the century to reach 5,700 million metric tons. As regards the world population, maritime merchant traffic is going to increase from 0.200 metric tons per person in the early 1970s to 0.900 at the end of the century. Container traffic, in particular, which has been the best technological and organisational expression of modern maritime transportation, is going to increase by 17 times to reach 250 millions of Twenty Equivalent Units (TEUs) at the end of the century. The exploitation of offshore oil, which was 15 per cent of world exploitation in the early 1970s, is reaching the 30 per cent threshold. Meanwhile, the exploitation of offshore natural gas has risen from 13 to 20 per cent. The decline in the first generation of submarine telephone cables during the 1970s, was followed by the rise of the new, optic fibre, cable

generation which has been spreading all over the ocean, and is operating about 70% of world communication traffic.

Between the 1972 and 1992 United Nations conferences, the growing and expanding ecological impacts of resource uses on the ocean, particularly in the inter-tropical latitudes, has been associated with a huge increase in human pressure on coastal areas. In 1992, when the Rio Conference is held, at least half of the world population is estimated to live within a 60 km belt from the coastline, and this is expected to double by the end of the century. If the world coastal length-about 600,000 km, equivalent to 15 times the Equatorial circle-is considered, the *Coastal Human Pressure Indicator*, estimating the number of world inhabitants per kilometre of coastline, shows that the coastal pressure has increased from 6,300 inhabitants per kilometre in the early 1970s to 9,000 inhabitants in the early 1990s, and it is reasonably expected to reach the 10,000 inhabitant threshold by the end of the century.

The dissemination of coastal megacities, considered as those cities with 8 million inhabitants or more, has been one of the most significant features of such intensifying human pressure. Mostly located in the developing countries, there were seven during the 1972 Conference, 13 during the Rio Conference and are expected to become 20, totalling some 320 million inhabitants, during the first decade of the 21st century.

The environmental impacts caused by human pressure on coastal and deep-ocean waters are self-evident and impressive.

About 2,5 Mt of oil a year are released into the ocean because of human activity including spills, runoff and discharge. The river flow to the sea that has been dammed or diverted is estimated to be 13 per cent and will increase to 20 per cent by the end of the century. According to the World Conservation Union, as much as 10 per cent of all coral reefs in the world have degraded beyond recovery and a further 30 per cent is likely to decline. "Those at greatest

risk—the Independent World Commission on the Oceans points out—are in South and South-East Asia, East Africa and the Caribbean, but the problem is widespread: of 109 countries where reefs are known to occur, significant reef degradation has occurred in 1993. In the early 1990s the destruction of mangroves is estimated to be around 1 million hectares and is expected to spread.

Some regional seas have been seriously affected. The anoxic zone of the Gulf of Mexico lasts eight months a year and can extend over 9,000 sq.km. In the Baltic Sea, animal life at the sea bottom is almost extinct over an area of about 70,000 sq.km. The Mediterranean is affected by the release of some 0.6 Mt of oil a year endangering many rare species. Some major deltas, such as the Nile and Danube, are seriously jeopardised by man-accelerated erosion.

As a result, while the world is approaching the 21st century, resource uses and human pressure on the ocean environment are considered politically worrying by the Rio Conference Conventions and Agenda 21. Effective ocean policies are required in view of the contextual impact from climate change, together with the subsequent changes in the biogeochemical cycles and globalisation processes, such as the expanding containerised transportation, and the construction of a planetary network of communication cables. To meet these concerns, Agenda 21, Chapter 17, prescribes some strategies based on the integration of sectoral approaches on all geographical scales, from global to local, and incorporates principles and guidelines for the following five programme areas: coastal management, biomass exploitation, ocean research, monitoring and the protection of small islands and island states.

Looking at this approach from a critical perspective, it may be argued that Agenda 21 was only apparently a keystone to the approach to ocean management, and that it could merely provide a constructive prescription of how the ocean may be exploited and contextually protected. However, that approach was actually ambiguous and hesitant, pri-

marily for two fundamental reasons. First, Agenda 21 claimed that integrated management and an holistic approach are the appropriate tools with which to operate sustainable development in both coastal and deep-ocean areas. Sustainable development, though, was not defined. The work carried out in the context of *Man and the Biosphere* (MAB) programme, together with the statements by the *World Commission on Environment and Development*, have led to the conclusion that sustainable development should be considered as the contextual pursuit of (i) ecosystem integrity, (ii) economic efficiency, and (iii) social intra- and inter-generation equity. Yet, such an enunciation cannot be found in Chapter 17, nor in any other chapters of Agenda 21. Secondly, the adoption of the *Convention on Biological Diversity*, one of the clearest and best designed legal tools in UN history, would require the approach from Agenda 21 to be based on the concept of biological diversity. This therefore suggests that ecological integrity ought to be the key goal of management, directly influencing the effectiveness of the others i.e. economic efficiency and social equity. This lack of consideration is mirrored in the language employed in Chapter 17. The word “environment” occurs 126 times, one each 95 words of the Chapter, but ‘ecosystem’ occurs only 8 times (one every 1,500 words) and ‘diversity’ just 9 times (one every 1,300 words). In actual fact, the whole approach is consistent with a mere physical view of the environment, paying close attention to physical and chemical processes, and ignoring the trophic organisation. The progress made in the field of life sciences during the 1970s and 1980s, is not reflected adequately, and the approach is similar to the physically-sound one adopted by the 1972 UN Conference.

To sum up, ocean policy may be envisaged as a ship which sailed out twenty years ago, and now, at the time of the Rio Conference, is drifting towards the strait of confutation of conventional ideas, dominated by mechanistic and determinist approaches. Beyond this strait lies a different sea, the sea of

organicist and constructivist visions. The best route should be inspired by the idea of diversity, thereby linking natural and social sciences. However, the captain, trained by Agenda 21, hesitates to sail it, and hovers at the mouth of the strait. Behind the vessel stretches the space of conceptual certainty and modern determinist visions of the world-what is called meta-narratives by post-modernist approaches. Beyond it lies the space of a new conceptual exploration and discovery of post-modern knowledge, where novel humanistic approaches to our existential dimensions towards the ocean may be discovered.

Now, let us imagine the new route crossing ocean diversity.

3. Tracing the Route: The Ocean World

To imagine this route, it should be clarified that *diversity* is a Janus epistemological tool since it embraces two different meanings. The former draws from the Latin *di-ferre*, which means "to be, or to become different, to be distinguished from others." The latter derives from the Latin *di-vertere*, which means "to proceed along an opposite or different direction." The former has an ontological sense, since it is concerned with ocean reality. The latter has an epistemological sense, since it relates to the representation of ocean reality.

On the ontological level, the route of diversity may be viewed as consisting of three components - ecological, economic and cultural - which all relate closely and interact intensely.

1) Biological Diversity

At the present time, the ocean is supposed to host at least 15,000 species of fish, and 15,000 to 20,000 species of algae. This enormous ecological and economic patrimony is marked by high diversity at all of the three levels regarded by the UN Convention on Biological Diversity as being of major impor-

tance, namely: (i) *genetic diversity*, concerned with the populations and individuals included in the individual species; (ii) *species diversity*, concerned with the number of species within an individual ecosystem, and (iii) *ecosystem diversity*, concerned with the number of ecosystems coexisting in an individual area. Nevertheless, when dealing with the ocean, the ecological context may acquire more complicated features than in other terrestrial environments, thus leading to the involvement of three other kinds of diversity as well: (i) *the diversity of higher taxonomic groups*, intended as those phyla which have played a fundamental role in determining the diversity of the individual species; (ii) *functional diversity*, which refers to the role of the individuals within the single trophic webs; and (iii) *biochemical diversity*, which is concerned with defensive or predatory mechanisms (Norse ed. 1993, 9-16).

2) Ecological Ocean Diversification

When diversity is regarded as the grounds for understanding and representing the interaction between the ocean ecological context and human communities, a chain of relationships should be considered. This chain brings about *ecological ocean diversification*, and it encompasses the spatial manifestations of the interaction between the individual ecosystems, each endowed with its own species and genetic diversity, and the human communities, each employing its own strategy and technology.

Ocean diversification varies according to the biotic and abiotic components of the ocean ecological reality.

As far as the biotic component is concerned, the cardinal characteristic is due to the fact that the ocean biomass mostly involves the continental shelves, particularly those of the boreal temperate latitudes, where about 50 per cent of yield is located. As a result, the continental shelves have constituted the marine environments where fisheries and fish farming have extended in all forms. The technological advances lead to expanding catchment seawards

therefore involving the continental slope and rise, and deep-ocean areas. Due to the construction of open-sea installations, fish farming is also expected to expand seawards.

With regard to the abiotic component of the ocean ecosystem, it should be noted that the exploitation of oil and gas has essentially involved the continental shelves and the marginal slopes. It has been concentrated in marginal, enclosed and semi-enclosed seas, especially in the Gulf of Mexico, Gulf of Maracaibo, the Persian Gulf, East-Asia, Far-East and in the European marginal seas.

When the use of biomass and the exploitation of oil and natural gas are jointly considered, two spatial gaps come to the fore:

- i. a gap between the inter-tropical and the temperate ocean latitudes, the latter being much richer than the former ones;
- ii. a remarkable gap between the austral and boreal temperate latitudes, the northern latitudes being much richer than the southern ones.

3) Economic Diversification

Turning to the economic diversification of the ocean, it is worth noting some remarkable implementations of use, which are expected to take shape in the mid-term, tentatively by the 2020s.

The first impulse will involve the exploitation of polymetallic nodules, and, probably, gas crystals, therefore enhancing the initial phase of deep-ocean mining. The seabeds extending beyond the continental rise will be exploited using high-tech installations and mechanisms working in environmental conditions some 4,000 to 6,000 metres below the surface, with the ambitious task of extracting and collecting minerals without challenging the deep-ocean ecosystem. The inter-tropical and temperate latitudes of the Pacific Ocean will be the cardinal arena of this new kind of resource use, which has become practicable as a result of the 1994 entering into force of the UN Convention on the Law of the Sea (adopted in 1982).

The second impulse will be provided by the diffusion of large offshore installations and settlements. The expansion of artificial islands with urban, sea-port and manufacturing structures, together with the diffusion of coastal and deep-sea aquaculture platforms, submarine hotels and parks, bridges linking continents to islands, submarine tunnels, and others, and constitute the first generation of mega-engineering structures, designed to host and live in the ocean. Coastal waters extending from the Peninsula of Malacca to the Japanese archipelago are expected to be heavily involved in this wave of post-modern, high-tech infrastructures and superstructures. Indeed, prime examples may be found in the artificial islands created in the bays of Tokyo and Kobe during the last three decades of the 20th century.

The post-modern era of the ocean, marked by high-tech deep-ocean aquaculture plants, deep-ocean mining and ocean mega-engineering installations, will consolidate in the Pacific ocean, especially in its western side where attractive bays, gulfs, archipelagos and islands are located. The ocean environment moulded by the subduction of the Pacific plate into the Asian one, and the web of satellite microplates will be the tectonic region of the implementation of these activities, a region marked by the tremendous frequency of natural disasters. Meanwhile, this ocean space will play a leading role on the world stage because some key globalisation processes, such as containerisation and global logistic strategies, have had their take off and are expected to gain their major development in these waters.

4) Cultural Diversification

The more globalisation triggers the ocean economic diversification, the more endangered the cultural ocean diversity concerning coastal, island and archipelagic communities. During recent decades, particularly since the 1970s, an unexpectedly wide range of indigenous communities, such as Inuit, Aleuti, Sami, Yakuti and Chukchi, have been endangered in temperate and sub-polar latitudes.

Moreover, many communities have been threatened in inter-tropical latitudes, from Polynesia and Melanesia to the Philippines and Indonesia, and from the Caribbean to South-America. There is a vast multitude of peoples, who are not only victims of modern technology and economy but are also severely threatened by the standardised visions of the world disseminated by media. The protection of these communities and their cultural heritage implies not only preserving them from extinction, but also ensuring that they use their technological tools to exploit natural resources. A key aspect of this issue lies in the use of ocean biomass, where small, indigenous catches need to survive against the diffusion of large, high-tech fisheries. This issue, regarding both economic and cultural values, requires some far-sighted approaches (Garcia, Cochrane, Van Santen and Christy, 1999).

In general, it should be recognised that the coastal, island and archipelagic indigenous cultures have played a huge role in constructing and diffusing the visions of the ocean. The names and images of ocean animals, like turtles and brackish crocodiles, and the big mammals have influenced literature, poetry, paintings and architecture. The ocean landscape has suggested words which are used as metaphors to describe many other kinds of reality. Myths, religions, song and music have all been influenced by the ocean landscape and life (Norse ed., 1993, 31-2). It is this that has made the ocean a component of human spirit.

To sum up, where the evolution of ocean uses and the implementation of ocean policy are considered according to how and to what degree they influence ocean diversity and diversification, two consequences arise. On the one hand, diversity acquires a broad sense, which has a much wider meaning than the conventional one. On the other hand, the various meanings associated with diversity appear to be closely linked to each other.

Biological diversity is the basis to operate the protection of ecological diversity, consisting in the

preservation of the present web of ecosystems from human impacts. Ecological diversity is an essential condition for maintaining and optimising the range of abiotic and biotic ocean resources, which bring about the economic diversification of the ocean. The protection of the optimum range of ocean resources requires the survival of cultural diversity, consisting in the framework of coastal and island cultures.

There is a parallel linkage between the above components of ocean diversity and the prospect of sustainable use of the ocean. Ecological diversity relates to the pursuit of ecosystem integrity, which is the fundamental component of sustainable development—the more enhanced the ecological diversity, the more effective the sustainable development-aimed policy. Economic diversity is concerned with economic efficiency, which is the second component of sustainable development. Cultural diversity relates to the pursuit of social equity, which is essentially based on the protection of cultural heritage. Consequently, the more diversity influences the construction of epistemes, the more effective the policy. The more effective the policy, the more science is encouraged to explain and represent reality referring to the concept of diversity. This is particularly relevant to the ocean, because this part of the world is expected to play a cardinal role in the framework of post-modern society.

4. Tracing the Route: The Ocean Visions

If ocean diversity is designed as a three-faced concept—ecological, economic and cultural—on which ocean governance is to be based, an entirely new system of ocean knowledge is needed. As a result, the ontological part of our route leads to the epistemological one, along which the archipelagos of languages and representations of the world are disseminated. Changing the representation leads to changing actions. Hence the ocean is an area where a chain of inputs marking our civilisation and human spirit

have consolidated. Action is in thought, thought is in action. Thought is language, language is the representation of the world.

Looking at the ocean, it is clear that modern thought, being based on meta-narratives of economic and social evolution, was unable to deal with diversity and diversification of ecosystems and cultures. The question is whether post-modern thought is capable of changing direction to cope with the essential components of the planet and the world.

The route leading to the construction of a post-modern vision of the ocean, where ecosystems and cultures are holistically addressed, involves five steps.

First step-ecosystem. The ecological meaning of diversity becomes the grounds on which to move towards the design of ocean knowledge. Consequently, the natural context is viewed as a web of ecosystems interacting with their external environment. The conventional vision representing the ocean as a combination of physical and chemical properties and processes in their individual spatial manifestations, can be replaced by adopting the *vision supported by life sciences*. Accordingly, the ocean is represented as consisting of trophic communities living in abiotic niches. The conventional sequence of maps showing the geomorphologic, physical, chemical and hydrodynamic ocean features is replaced by the representation of the web of ecosystems.

Second step-ocean use structures. The representation of the ocean as consisting of separate fields of activities and resource uses, which reflected conventional visions, is replaced by the representation of the aggregates of uses playing a leading role in the interaction between human communities and the individual ecosystems. Conventionally, the exploitation of the ocean was represented by sectoral maps charting navigation, transportation, fisheries, submarine cables, and others. The post-modern representation of the ocean is based on maps showing sea use structures where the interaction between the individual uses, including conflicting relationships,

are highlighted.

Third step-ocean values and representation. The values attributed to the ocean by human cultures become the triggering factors of any representation of the ocean. In this regard, a feed-back relationship arises: values give shape to representations; representations are guidelines for actions; actions lead to operating values which, in turn, leads to implementing the representations of the ocean; and representations trigger actions. This pivotal feed-back will characterise the new vision of the ocean in which representation plays a key role. There is consensus that modern society, built on Enlightenment and Positivism, led to considering the representation of reality consisting of significant, as the triggering factors of knowledge consisting of the signified. There is no doubt that representation will continue to play and implement this role. Consequently, the post-modern episteme will be increasingly influenced by how the ocean system is represented. However, compared to the past, there will be a marked difference. Modern representations were the product of meta-discourses provided by ideological backgrounds, all designing determinist views of society. Post-modern representations, on the other hand, will be inspired by values.

Fourth step-diversity. The ocean episteme representing the ocean system as a bi-modular system, comprising the ecosystem and human community, is the key representation in which diversity may play a major role. Within this framework, biological, economic and cultural diversity are aspects of a unique reality, namely the interaction between Nature and human communities. Diversity is a unique reality, and this reality is based on our representations. As a result, changes in the representation of ocean systems are based on a view where changes in ecological diversity bring forth changes in economic and cultural diversity, and changes in economic and cultural diversity bring forth changes in ecological diversity. Science, considered as the design and operation of ocean epistemes, founds its

post-modern, innovative role on representing the ocean system through the concept of diversity.

Fifth step-*ocean science*. At this point, it is clear that diversity is also the cement with which to build effective inter-disciplinarity. Consequently, the ocean becomes an experimental space where an inter-disciplinary episteme may be designed and operated. During the 1980s the Intergovernmental Oceanographic Commission (IOC) of UNESCO outlined the prospect of the construction of ocean science, considering it as the result of physical, chemical and biological ocean sciences. Now, it is possible to move towards a more ambitious and demanding target consisting of the design of the ocean science as an area where cross disciplinary epistemes, dealing with ecological and social processes, are constructed.

In this view, ocean science does not acquire the role of the mere assembling of disciplinary perspectives and assessment, but it gains the role of a science which designs ocean governance patterns integrating ecology, social sciences, law and management sciences by adopting a mutual system of concepts and mutual fundamental ideas. Inter-disciplinarity would be the result of an epistemological contract. The construction of the epistemological contract may be the most far-sighted, ambitious and demanding task ever designed as a result of the geographical discussion.

Dear Colleagues and Friends,

The exploration that I had the honour to trace in this Congress began with the consideration of the unprecedented and unexpected implementation of ocean uses, and its consequences on ocean diversity. The berth towards which the exploration has led is located in the realm of representations of reality. Focusing on ocean reality has led to focusing on thought.

Apparently, this is a merely intellectual approach. But, in reality, it is something much more demanding since it is not interested in considering ocean reality *per se* but in framing it in a system of values which are closely associated with representations of reality. The modern vision of the ocean, triggered by the Industrial Revolution and Enlightenment, led to represent the ocean as a space of movement, and as a resource reservoir. The post-modern approach is moving towards representing the ocean as a realm of ecological and cultural values, which are an essential part of our life and our visions of the planet and the world.

From this perspective, diversity is a leading concept which allows the ocean to be managed with a new spirit imbued with fascinating new scientific sense and ethical values.

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Appendix

Conjunctive versus disjunctive logic. Application to coastal management

<i>Disjunctive logic</i>	<i>Conjunctive logic</i>
Cartesian thought	Theory of the general system
<i>Principles</i>	
<i>Evidence</i> Describing only those elements of the coastal area which are clear.	<i>Pertinence</i> Describing those elements of the coastal area which are perceived as essential to management.
<i>Reductionism</i> Desegregating the components of the coastal area, then describing the individual elements, separately.	<i>Holism</i> Describing the coastal area as a unique system interacting with its external environment. Considering detailed knowledge of the coastal structure as not essential.
<i>Causality</i> Moving from the simplest elements of the coastal area towards the most complicated. Supposing that the role of the elements is regulated by cause-effect relationship.	<i>Teleology</i> Leaving out the existence of a cause-effect relationship between the elements of the coastal area Focusing on feed-back and circular relationships Considering the evolution of the coastal system with reference to its <i>project</i> , i.e. to the goals which are pursued through its organisation.
<i>Exhaustiveness</i> Assessing all the elements of the coastal area in detail. Ensuring that nothing has been left out. Postulating that, only where these conditions are met, the subsequent knowledge is objective.	<i>Aggregativeness</i> Selecting those elements which pertain to coastal area management, i.e. the goals and projects of the coastal system, and leaving the rest out. Being aware that knowledge is relativist and partisan <i>per se</i> .