Some contents "for science & technology" report

D. Ben Sari

To consider and to emphasize four points :

I. Scientific & Technological advances :

- State of the art
- Threats and risks
- Challenges
- Monitoring and Transfer of Technology

II. Intersectorial issues : social, economic, environmental and cultural aspects :

- Biodiversity : prospection and industrial exploitation of biodiversity
- Marine resources : living and non-living resources, aquaculture
- Marine pollution : preventing emission of pollutants, recycling wastes, ...
- Coastal management : methodologies and tools for integrated coastal zone management (D.S.S., G.I.S. for environmental impact and risk assessment)
- Monitoring (data exchanges)

III. Capacity Building

- Training / action oriented research - Fellowships
- Monitoring
- Networking
- Data exchanges : Global system for data gathering, evaluation and access
- Public and decision making awareness

IV. Integrating science and technology aspects of all the new Conventions (L.o.S., Biodiversity, Climate, etc.) through a system (regional, global) serving them all.

Report of the Working Group
on
Science and Technology

In its deliberation the Working Group for Science and Technology took as its objectives the following quotes from the Terms of Reference of the World Commission on the Oceans:

"Encourage the further development of the ocean regime emanating from the United Nations -convention on the Law of the Sea in the light of changing scientific perceptions and discoveries, with particular attention to the problems and needs of developing countries.

Study the interactions between the UN convention on the Law of the Sea and other related legal instruments and programs of action (in particular Agenda 21 of UNCED), and explore ways to promote their implementation, taking account of overlap, complimentarity and synergy.

.....

Explore new forms of North-South and South-South co-operation in joint technology development."

It is the view of the WG that science and technology is not in itself a major issue for the Commission, but rather a means to meet the goals of the major issues which will constitute the basis of the final report of the Commission. We therefore see science, together with aspects of law, economy, social sciences and political considerations as integrated, hierarchical sub-topics under the umbrella of the major issues. A detailed specification of science and technology topics must therefore be established when the major issues for the Commission have been agreed upon

The WG discussed briefly what such major issues could be, and wants to propose the following:

Implementation of UNCLOS

The difficulties or slow progress of the implementation of UNCLOS is due to a host of problems , e.g. conflicts between national sovereignty and peaceful use of the ocean, resources, the high seas, delinearisation of Exclusive Economic Zones, etc. These problems also involve scientific and technological questions which must be identified.

Management of ocean environment and resources

The following sub-issues-issues where specified under this major issue:

i) The potential of coastal areas for economic and social development and the related environmental concerns.

Science and technology will play an important part in designing appropriate integrated models for solving multiple use problems related to coastal development, as well as for predicting environmental consequences of management decisions.

ii) Management of living resources
Although management as such is not in the realm of science and technology, there is no doubt that science can provide managers with important information as basis for rational decisions. There is a need to develop management models for living resources which take into consideration also the effect of management decisions on the ecosystem as a whole.

iii) Rational utilisation of non-living resources.
While the use of non-living resources by definition cannot be sustainable, it is generally considered that the rate of depletion of non-living resources should be related to the rate of development of adequate substitutes. The development of sustainable substitutes for diminishing non-living resources should therefore be a major challenge for science and technology.

Maintenance of the ocean as a major component in the life support system of the Earth
The global ocean may be a major dampening factor on the rate of global change and any threat to this role of the ocean may have serious repercussions for humanity. Science and technology must therefore concentrate the efforts on studies of the role of the ocean in regulating global change, as well as studies on the effects on the ocean from global change. The serious consequences of sea-level rise should be addressed in a regional context, in order to enhance the awareness of the general public and decision makers. As an example of other consequences of global change, the WG discussed the uncertainty about the effects on living resources from possible temperature changes in the ocean.

The ocean biodiversity is another area of concern. Habitat destruction and pollution in coastal areas, as well as overfishing and genetic pollution from aquaculture may have serious and long-term effects on life in the ocean. On the other hand, the living resources of the ocean may represent a potential for other economic development than food, an example is pharmaceutics. Marine science and technology has an important role in the identification of marine biological material for economic utilisation, while at the same time study the consequences of any such economic development. The Convention on Biological Diversity is currently addressing this issue.

The WG also discussed the question of generating awareness of the general public of the potential and the problems of the ocean. Such awareness at the level of the general public could be an important mechanism for influencing the political establishment in States to take necessary actions. In that sense a "global warning" seems closely related to "global warming".

The question of access to information and technology was considered of utmost importance for development of science and technology under all the major issues. As an example was mentioned that many developing states cannot benefit from nor meet the obligations with regard to UNCLOS because of the lack of appropriate scientific and technological capability. The question of access to information and technology was closely linked to the general need for capacity building in developing States. In

that context the WG pointed to the lack of co-ordination among bi-lateral and multi-lateral agencies in their activities in capacity building in the regions.

The WG is of the opinion that Agenda 21 of UNCED is equally important for consideration by the Commission as UNCLOS, because Agenda 21 imposes obligations on States and international organisations, whether sub-regional, regional or global, regarding access to technology for sustainable development of coastal and marine areas to developing countries, but it does not provide for mechanisms to implement those obligations. The Commission should suggest such mechanisms.

'SCIENCE AND TECHNOLOGY' STUDY GROUP

Draft priority tasks (Terms of Reference)

To consider and report on :

(1) The necessary conditions and arrangements for an effective input of scientific and technical knowledge and method to decision-making with respect to management of peaceful uses of the sea.

(2) The arrangements and requirements for an effective global system for data gathering, evaluation, interpretation and access in the context of the ocean as a 'common heritage' (term to be discussed to avoid legal provocation!).

Beijing

institutional

Regional

: essential

:

Conventions

Seabed A

INDEPENDENT WORLD COMMISSION ON THE OCEANS (IWCO)

Paper 3: Bridging the Gaps Between North & South in Future Uses of the Oceans and Their Resources

In all discussions and negotiations involving North-South relations the issue of access on the part of developing countries to appropriate technology has occupied a vital place and is a very sensitive one. This was evident, for exmaple, in the UNCED negotiations as reflected in Agenda 21, and in the Berlin Conference of Parties to the International Convention on Climate Change. The issue has long been on the agenda in the UN system, reaching a critical stage in the North-South debates and negotiations in the 1970s.

It is to be noted that Article 144 of the International Convention on the Law of the Sea deals with the acquisition of technology and scientific knowledge by the Seabed Authority, as well as the transfer of technology and scientific knowledge to developing states - all of this under fair and reasonable terms and conditions.

It is assumed that in respect of the issues raised in IWCO's Paper 3, as well as the other papers, proposed activities would take account of the relevant International Conventions and, most particularly, the Convention on the Law of the Sea.

Attention is drawn also to those Conventions relating to Regional Seas. In the case of the Caribbean, the Cartagena Convention is the basis for the Caribbean Environment Plan for the protection of the region's marine environment. The countries regarded as eligible for participation include the United States of America, France, the United Kingdom and the Netherlands, as well as the European Union.

It is possible that some of the other Regional Seas Programmes cover a mix of both industrialized and developing countries, offering possibilities for special cooperation, including the area of transfer of technology and scientific knowledge.

Article 13 of the Convention on the Caribbean deals with the question of scientific and technical cooperation. It calls on contracting parties to undertake to develop and coordinate their research and monitoring programmes on matters covered by the Convention, and to cooperate in the provision to other Contracting Partners of technical and other assistance in fields relating to pollution and sound environmental management of the Convention Area, taking into account the special needs of smaller island developing countries.

It is suggested that the Paper should place special emphasis on the situation and needs of small island developing countries. Particularly because of the dangers posed by a continuation of climate change and the prospect of sea level rise, a large number of these countries have formed an organization - The Alliance of Small Island Developing States. They negotiated effectively in the UNCED process and succeeded in getting approval for a special UN conference, held in Barbados in 1994, on their prospect for sustainable development.

They also prepared the draft protocol on fixed targets and timetables for the reduction of greenhouse gases by industrialized countries, which was considered at the Berlin Conference of Parties in 1995.

Among the issues which might be considered in the context of efforts to bridge the North-South gap in the areas covered by the Commission are the following:

- Training of developng country personnel is of course a vital factor, and could cover a number of areas including development of effective institutional arrangements, and the management of marine and maritime affairs; seabed mining (at least one training course was organized some time ago in Jamaica by Professor Elisabeth Mann Borghese). Jamaica established with assistance from Norway many years ago a Maritime Training Institute which also trains Jamaicans and other Caribbean personnel.

- The possibility of developing/promoting consortium arrangements between a number of countries in respect of some activities, including exploration and exploitation of the seabed, and protection of the areas under their jurisdiction.

- The development or extension of University programmes of research and teaching to meet the requirements of dealing in full measure with matters related to the oceans. This could be achieved by way of fellowships, visiting specialists, or cooperation arrangements between appropriate sectors of universities in a manner used in some fields by the University of the West Indies.

- Especially for small island developing states, but of relevance also to other coastal states, the development of appropriate technology and other means of dealing with areas or regions which are likely to be affected by climate change including more violent hurricanes, and flooding and sea level rise.
  This would include planning for the location of population, buildings, development projects, as well as construction methods.

- Adequate technology, information and equipment, and other means for ensuring effective security, e.g. in respect of drug smuggling by sea, other forms of smuggling, over exploitation of marine resources (fish, conc, lobsters etc.) and pollution and degradation of coastal areas, harbours and the marine environment in general.

Don Mills
April 1996

Second Plenary Session
Rio de Janeiro
1 July 1996

IWCO/WP 4

Bridging the Gaps between North and South : the future uses of the oceans and their resources

Attached is an outline on Capacity Building.

Bridging the Gaps Between North & South in Future Use of the Ocean and Their Resources

1 Introduction

During the United Nations Conference on Environment and Development (UNCED, 1992) an action list the so-called Agenda 21, was agreed upon in order to warrant a sustainable development of the Earth's environment. To increase the understanding of our home planet, major research initiatives such as the World Climate Research Program and monitoring activities (Global Ocean Observing System, GOOS) are underway.

In November 1994 the Third United Nations Law of the Sea (UNCLOS) came into force which gives coastal states national jurisdiction of the 200 miles Exclusive Economic Zone (EEZ). The marine promise is attractive to coastal (developing) countries. A major economic return from the newly obtained marine resources is expected. However, the pressure on the coastal zone is increasing dramatically since population growth and density are the highest within 60 kilometres from the coastline. Most developing countries hardly possess a marine science & technology capability to explore the sustainable use of the marine environment, to develop integrated coastal zone management plans or to participate in major international thrusts in marine science and technology.

Both UNCED and UNCLOS, like many other international conventions, call for new and integrated approaches for North - South and South - South capacity building activities. This necessitates a long-term perspective and policy support which is often lacking in the present donor support.

Issues to be addressed:

- UNCED
  background, conventions, Agenda 21, Marine biodiversity, Commission on Sustainable Development, funding needs and offers (GEF) etc.
- UNCLOS
  Background, effect EEZ (relation with resources), research, jurisdiction, conservation

UNCLOS defined the "New Ocean Regime" and endorsed the EEZ. This implied the greatest transfer of natural resources in history. Ninety percent or more of traditional fishing areas that used to be in international waters are now under the jurisdiction of individual coastal and island states. Thus, the instrument for a sustainable use and development of ocean resources is available.
Although the exploitation of oceanic mineral resources is beyond national jurisdiction and might for the time being, be a less urgent issue than previously thought, the role of UNCLOS in regulating this exploitation should be mentioned as a potentially important source of wealth for a number of

countries, with serious bearing on development and transfer of marine technology.

2 Capacity Building

Capacity building is a complex and difficult issue. One should realise that there are no clear cut answers and approaches. In contrary there are considerable differences between individual countries with respect to the already existing marine capability. Just as in building a house an integral plan for capacity building is needed. Such a plan should be based upon an assessment of the already existing capability and the needs of a country or region. After making this strategic plan the ground laying of the capacity building activities can start. There are different levels at which the activities should concentrate. These levels concern the individual scientist (training, appropriate qualifications, external contacts, motivation, salary etc.), the institutions (development of qualified management, networks of contacts, access to information, training programs of scientific and supporting staff, equipment, transfer of results to politicians, industry and the public at large etc.), a country (obtain support at a political level, develop science plans, socio-economics, professional environment etc.) and in some cases at a regional level (networks, equipment pools, joint training and research programmes etc.). So, a broad, integrated approach based on the coherence between the various levels and elements of capacity building is needed. This approach should be tailor-made or country- / region- specific and keyed to national requirements and priorities. These priorities could then be embedded in international thrusts or trends.

Issues to be addressed:

* What is capacity building and which are the mechanisms

Capacity building is seen as a process from a minimum to a maximum marine R&D capability. The lower limit is an easy one; a country does not have any know-how available at all. The upper limit is defined as "having access to an innovative state-of-the-art intellectual and technological capability". This type of capability is present in the leading marine R&D countries such as USA, Japan, France, UK, Germany, (India, China) etc. In most of these countries governments use their capability to assess issues such as the use of the coastal zone, fishery and other marine resources as well as the possible effects of Global Change. Most developing countries, however, can not rely on their scientific capability for decision making. Therefore, the aim of capacity building activities could be: the development of a marine R&D capability that allows governments/countries to make its own decisions based on their own (scientific) interpretation of the national and international available data and information. A next step could then be the active participation of these countries in the international marine R&D effort.

* Partners in Science concept (linking scientific research with capacity building)

A partnership programme is essentially based on the mutual interest of the scientific community from both partner countries. In such programmes scientific marine research and Official Development Aid (ODA) activities are linked as part of a long term (10 years) bi- or multilateral commitment. This is exemplified by the manner in which co-operative scientific programmes, their objectives and the detailed work plan are formulated jointly by the participating scientists/ institutions from the partner countries. While funding for the scientific components of the programmes should be granted by the relevant National Science Foundations, the funding for the capacity building component is sought through national and international ODA-organisations as well as from other sources such as the European Union, World Bank and the Global Environmental Facility (GEF).

* Examples such as Indonesia, Kenya, Pakistan

The development of the marine R&D capability in Indonesia during the last 15 years, is a highly successful one and can serve as a demonstration of such a process. An important element in the development of this capability in Indonesia was the on-going support of the Government. The present capability is the result of a careful planning process in which efforts of different countries and donors played an intrinsic role. Dr. Stel is discussing with Dr. Aprilani Soegiarto (LIPI)of Indonesia a study in which key-elements in the development process are identified. Elements of this study could be used for the IWCO-paper.

The development of a marine (science) capability in other countries can be used to compare different approaches and to distinguish basic principles in marine R&D capacity building. Countries suggested are Brazil, India, Pakistan, Kenya and the member countries of the South Pacific Applied Geoscience Commission (SOPAC). SOPAC members are among others: Australia, Cook Islands, Micronesian states, Fiji, Guam, Kiribal, Guam, Solomon Islands, Tong, etc. IWCO is asked to make a decision about which countries should be addresses, if any at all.

* A regional Partners in Science programme for Eastern Africa

Based on a mission by the IOC the development of a regional Partners in Science programme for Eastern Africa (Kenya, Tanzania, Mozambique, South Africa, Madagascar and Mauritius) is planned. The research programme is aimed on the Land-Ocean Interaction of the Coastal Zone (LOICZ) initiative of the IGBP. At present workshops are organised in co-operation with donors in order to prepare a workplan. The scope of the programme is 10 years. Parts of these plans could be incorporated in the IWCO-report in order to demonstrate or highlight issues such as regional co-operation, country specific approaches within such a regional co-operation, North-South and South-South capacity building etc.

* Canadian and Swedish marine donor activities, summary (CIDA and SIDA)
* National and international (Worldbank UNDP, EU etc.) donor organisations
* Global programmes such as WCRP, IGBP etc. and the START initiative

Global research programmes might offer an interesting opportunity for capacity building activities by facilitating the participation of (qualified) scientists from developing countries in these activities. Within the World Ocean Circulation Experiment and the Joint Global Ocean Flux Study a large number of research cruise has been executed by industrialised countries. By allowing the participation of scientists from the region e.g. Indian Ocean, Pacific where the cruises are taking place and by facilitating follow-up in his or her country seeds of capacity building are initiated. So far, few scientists from developing countries are involved in the major research efforts of the industrialised countries.

* Small Island Developing Countries

It is suggested that UNESCO's cross cutting initiative in this matter will be discussed.

* South-South partnerships

An interesting initiative is the University Science and Engineering Partnership in Africa (USEPIA) of the University of Cape Town, Republic of South Africa. USEPIA started in 1994 and is a university network in the Sub-Saharan region. It is funded by the Rockefeller Foundation, the Carnegie Corporation, Coca Cola and the Ridgefield Foundation. The focus of USEPIA is staff development (capacity building) through joint research projects with viable groups of scientists. The projects should lead to joint publications and jointly supervised PhD's. Research projects must be of mutual interest (just in the Dutch partnerships); selection takes place at the home institutions.

* Donor co-ordination

Many donors are often active in the same country or region (e.g. Indonesia, Eastern Africa). It is suggested that IWCO will look into the matter of a more effective donor co-ordination by which long term (10 years) commitments, necessary to develop a marine R&D capacity, becomes feasible. The idea to "adopt" a country by a specific donor might be worthwhile to proceed.

3 International Organisations

3.1 The IOC

The IOC is a dedicated mechanism for matters on science and marine research in relation to global and regional changes, development, organisation and co-ordination of long-term systematic observations on a well-founded scientific basis and adjusted to meet society's needs, with related

capacity building. The IOC can also act as a supporting scientific and technical body for other organisations and, on the other hand, it can identify related tasks which other organisations could assume.

The IOC has major responsibilities to provide technical assistance to coastal states to carry out marine research and systematic observations, and to disseminate marine scientific data and information, as well as in its advisory roles. Another major factor influencing the work of the IOC is the follow-up to UNCED, including the Convention on Biological Diversity, the Framework Convention on Climate Change, and Agenda 21. A third factor presently influencing IOC science programmes is the establishment of global change research programmes in the two main streams of the World Climate Research Programme (WCRP) and the International Geosphere-Biosphere Programme (IGBP). The IOC is a co-sponsor of WCRP, with WMO and ICSU, and is co-operating with several IGBP projects, notably the Joint Global Ocean Flux Study (JGOFS), the Land-Ocean Interactions in the Coastal Zone project (LOICZ) and the Global Ocean Ecosystem Dynamics project (GLOBEC), which is also becoming an IGBP project. A significant factor influencing IOC is the increasing demand for ocean services, articulated in the agreements on the development of the global observing systems GOOS and the Global Climate Observing System (GCOS). IOC is a partner in the development of both, with a leading role in GOOS. Finally, one of IOC's major goals is to serve as an intermediary between ocean and coastal research and systematic observations on the one hand, and policy formulation and decision-making by Member States on the other. IOC should help ensure that the required knowledge and scientific results are obtained, and that they are interpreted and provided to all Member States for use and application.

The implementation of the IOC programmes uses global and regional mechanisms. The global mechanisms concern the major co-operative efforts for which groups of experts and intergovernmental committees as subsidiary bodies are in place.

The shift of emphasis from the open-ocean to the coastal zone leads to a strong emphasis on regional or sub-regional co-operation. This includes sharing of equipment and common use of infrastructure and existing institutions. The regional programmes are developed and implemented mainly through the IOC regional subsidiary bodies. These are intergovernmental and are based on the participation of national institutions, identified and committed for this purpose by the governments. The programmes normally draw on the expertise and results of the IOC global programmes, but they are not a mere mirror of the global activities. The programmes address society needs and endeavour to provide the required information base for achieving sustainable development. An essential element of all these programmes concerns training and education, and capacity building. The IOC regular funding is used to support these bodies, which meet regularly at about 3 year intervals. However, the regular funding of the IOC is not sufficient to achieve an adequate and sustained implementation rate of the programmes, since the majority of the developing countries involved cannot provide the required resources themselves. Hence, there is a need to seek donor support for adequate programme implementation. These bodies presently are:

IOCARIBE	-Subcommission for the Caribbean and Adjacent regions
WESTPAC	-Subcommission for the Western Pacific
IOCEA	-Regional Committee for the Central Eastern Atlantic
IOCINCWIO	-Regional Committee for the Co-operative Investigation in the North and Central Western Indian Ocean
IOCINDIO	-Regional Committee for the Central Indian Ocean
IOCSOC	-Regional Committee for the Southern Ocean
IOC-Black Sea	-Regional Committee for the Black Sea

3.2 UNEP

Since 1975, UNEP has mobilised more than 120 countries, the majority of them as parties to legally binding agreements, to participate in 14 regional programmes for the protection and use of marine environment and its resources. The volume of data and observations generated by these programmes is huge, hundreds of national experts have been trained and the number of scientists, managers, and policy-makers.

Two of the four GEF's concentration areas (protection of international waters and biodiversity) have a direct relevance to the future uses of the oceans and their resources. The financial resources at GEF's disposal are far surpassing anything available for other international programmes and therefore, in the context of the paper, it may be advisable to highlight the potentials offered by existence and programmes of the GEF.

3.4 FAO

Fish is among the main tangible and accessible resources of the oceans, of highest relevance to developing countries (artisan fishery). FAO alone, and in co-operation with others (UNDP in particular) is for decades running global, regional and country programmes and projects aiming at stock assessment and exploitation, including vast capacity-building operations.

The world is facing a global fishing crisis of unprecedented proportions. The fact that the capacity of the world's fishing fleets is, generally speaking, far in excess of the amount of fish that can be harvested on a sustainable basis, is widely acknowledged. FAO estimates (using 1989 figures) that to rehabilitate fisheries to 1970 abundance levels and catch rates, would require the removal of 23% of the existing gross registered tons of the world's fleet (approximately 5.8 million GRT, at a cost of around US$ 73 billion replacement value). According to FAO, 70% of the world's major marine fish stocks are fully fished, over-fished, depleted or "slowly recovering". In a third of the world's major marine fishing regions, the catch has declined by 20% or more from peak years. Swordfish, cod, blue fin tuna and other popular species are among the fish that have suffered serious declines in some parts of the world. Over-fishing endangers a crucial source of food for the world, cost jobs in the fishing sector, disrupts the social and cultural fabric of fishing

communities world-wide, and jeopardises marine biodiversity through direct and indirect impact on marine birds, mammals, turtles and marine habitats. At its core, the crisis in over-fishing stems from the fact that the world now has a substantial overabundance of fishing capacity. Advanced technology now enables fisheries to identify, track and harvest fish extremely aggressively. Industrialised fleets aided by sonar, sophisticated satellite technology and highly efficient gear are now capable of fishing out vast areas of the ocean in very short order. Current economic incentives for over-fishing take a variety of forms, including direct subsidies for fleet construction, price support systems, import restrictions and other non-tariff barriers to trade in fish. Such subsidies and incentives serve to perpetuate over-fishing and economic distress. Reducing and eventually eliminating these subsidies, as well as fishing capacity in general, is essential if fisheries are to be restored to sustainability.

Bycatch is another problem associated with present fishing practices. A recent FAO study conservatively estimates that a total of 28.7 million tons of non-target species are caught annually in world marine fisheries, of which 27 million tons (i.e., the equivalent of more than one quarter of the total marine catch!) is discarded.

As remedies to overfishing and excessive bycatch, the early ratification and implementation of the provisions of the UN Agreement for the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and FAO's Code of Conduct for Responsible Fisheries, should be advocated. Measures which may improve the present situation fall in several categories, such as ecologically responsible fishing, the precautionary approach, social and economic reform and government action.

In recent years, mariculture development has been promoted as a solution to meet growing food needs from fish. Yet, mariculture as currently practised is often unsustainable, resulting in a variety of negative impacts. In particular, the rapid expansion in development of intensive aquaculture for high value species, such as salmon and shrimp, has resulted in widespread degradation of the environment and displacement of coastal fishing and farming communities.

3.5 IUCN

IUCN is for many years successfully involved in coastal area management programmes focusing on the protection of living resources and biodiversity.

3.6 IPCC

Our present understanding of the ocean processes is inadequate to explain (not to mention, to forecast) the forces behind the changes in the physical structure of the ocean and their correlation with the structure and functioning of the marine ecosystems. The possible contribution of changes in marine ecosystems to altering the carbon dioxide uptake of the ocean, an issue with far-reaching implication in the context of ongoing debate about the most

rational response to the predicted climate change, is unknown. Altered marine ecosystems may affect the 80 million tons of fish taken annually from the ocean through production of anthropogenic substances (e.g., persistent organics) and increased inputs of natural substances mobilised by man's activities (e.g., nutrients).

It may be advisable to refer in the paper to the parts of IPCC´s Second Assessment Report which are highly relevant to the future uses of the oceans. According to this report, and in spite of remaining uncertainties, a global mean surface air temperature of about 2°C may be expected by the year 2100 (the uncertainty range is given as 1-3.5°C). Because of the oceans thermal inertia, only 50-90% of the eventual equilibrium temperature change would have been realised by 2100. Temperature would continue to increase beyond 2100, even if concentration of greenhouse gases were stabilised at that time. The projected sea-level rise is estimated to ranges from 15 to 95 cm, with a best estimate of 50 cm by the year 2100, but sea-level would continue to rise after the global climate and the mean temperature would have stabilised. One can only speculate about the consequences of these changes for the physical and ecological characteristics of the oceans, but it is obvious that they will have the most profound effect on the future uses of the oceans, coastal areas and their resources. Year 2100 may seem remote to politicians, but IWCO should not remain silent on the dramatic impact (migration of hundreds of million of people) of climate change which may be experienced within the next century.

Other issues to be addressed:
* Science observations
* Strategies
* Co-ordination mechanisms

4 Benefits

The OECD Megascience Forum has in its report on Oceanography (1993) supported the concept of GOOS. It is, however, clear that to convince governments to invest in or redirect present investment towards GOOS, they must be convinced of the socio-economic benefits of a GOOS system for their country. Very few benefit-costs analyses are available. So far, the benefits of GOOS are either deducted from the benefits of the World Weather Watch system, or only concern certain sectors such as agriculture. A recent (OECD, 1996) benefit -cost analysis of the European Seawatch system indicates an economic return in certain areas (offshore, fishery and aqua-culture, insurance industry). In order to get hold of the possible country specific benefits and costs it is suggested that a series of benefit-costs analyses is carried out for developing countries or regions of developing countries.

Issues to be addressed:
* Economics of marine resources
* Mechanisms to estimate economic return

* Examples of cost-benefit analyses (ENSO, SeaWatch)

NOAA has organised a number of cost-benefit analyses of among others the return of the El Niño forecasts for the US-agriculture. Similar studies are underway for hydroelectric power and fisheries. The cost of TOGA to the U.S. government was $223M plus ship time ($12M). The cost of the El Niño-Southern Oscillation observing system is estimated to cost $12.3M per year. Economic sectors benefiting from climate forecasts include agriculture, coastal management, fisheries, resource management, and hydroelectric power. Estimate benefits of improved forecasts are only available for U.S. agriculture. The expected annual value of modest (60%) forecast skill is $240M, of high (80%) skill is $266M, and for perfect forecast skill (100%) is $323 million. Conclusions of the TOGA cost-benefit study were:

- the estimated lower bound economic rate of return to society (the U.S.) of the TOGA/EOS programme ranges from 19.5% to 26.4%.
- because those values exceed 7%, the TOGA/EOS programme represents an efficient use of society's resources.
- climate forecasts have significant economic value. They suggest that similar climate forecasting efforts focused on other climate phenomena and/or other parts of the globe may also represent sound use of global resources.

* Sustainable development
* Regional approaches (WESTPAC, IOCARIBE)
* Socio-economics

5 Remedies to present situation

* National and regional interests
* Priorities
* Tools and Methods

The Seawatch Europe project of the European Marine environment programme (EUROMAR) is an on-line monitoring and surveillance system of the North Sea and is a regional component of GOOS. Seawatch forecasts and environmental data are distributed to public authorities, aquaculture/fish farming, commercial fishing, tourist industry, research institutes, navy and coastguards. The Seawatch system is now operative in Norway and Thailand. It is at present installed in Spain and Indonesia. Seawatch has aroused considerable interest in Sweden, The Netherlands, Greece, Italy, Mexico, China, Korea, USA

As part of the European Research Co-ordination Agency (EUREKA), EUROMAR aims at the development of marketable advanced technology for environmental surveillance. The programme was launched in June 1986 and has stimulated co-operation between the European industry and science in developing marine instrumentation, methods and operating systems. The approach is a bottom-up one. So far, EUROMAR has launched more than 20 European projects of which 5 are completed, with a total investment of some $250 million.

Seawatch is one of the most striking results of EUROMAR. The technological objective of Seawatch-Europe is to integrate the various results of the EUROMAR programme within the areas of marine surveillance technology and information technology into an international operational monitoring system for, among others, the North Sea. By this the project implements the best available technology and develops an innovative operational marine environmental network. Major technical issues for the Seawatch system are: network structure, standardisation, innovative sensor technology for physical and "green" parameters and radioactivity, data transmission, data processing facilities and storage, integrated use of monitoring technology and operational modelling technology, and comprehensive user facilities.
Seawatch provides marine environmental information quickly, thus giving us the opportunity to make underpinned decisions when crises occur. The annual costs of a Seawatch "planning unit" consisting of 10 instrumented buoys and the associated data systems, are between $2 and 3 million. The Seawatch forecasts and environmental data are distributed to users whose livelihood depends on reliable information from the marine environment, such as: public authorities, aquaculture/fish farming, commercial fishing , tourist industry, research institutes, navy and coastguards.
A strong point of the Seawatch system is that it is commercially off-the-shelf technology. It can be applied anywhere in the world as a complete system or, based on local needs, as a stripped down version. It is a highly adaptable platform for placing a range of instruments *in situ* and extracting data in *real time*. For the seas of India, it has been estimated that the cost of purchase and operation of 12 Seawatch buoys will be approximately the same as that of a medium size oceanographic research vessel. There is no doubt that the 12 buoys will collect many times more data than one ship alone would be able to. For Eastern Africa a 9 buoys system might be adequate. Last but not least the implementation of a Seawatch system also includes training and technology transfer in relevant aspects, such as buoy operation, buoy maintenance, software use and training in forecasting related aspects. Therefore, Seawatch could become instrumental in Capacity Building activities in developing countries and by this allowing for the development of a truly global GOOS.

* Political commitments on a national and international level

The future uses of the oceans and their resources will critically depend on the development taking place on land, particularly in the coastal zones. At present only a few countries have well thought out and defined national plans towards their coastal zone development and clear policies towards the use of their marine resources on a sustainable basis.

* Implementation plan
* Use of international programmes as a CB-instrument
* Commitments
* Recommendations

This **draft paper** is based on input from dr. Jan H. Stel (IOC, the Netherlands) and dr. Stjepan Keckes (UNEP,Croatia)

JHS/16.06.1996