The IOC and International Cooperation in Oceanography

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Introduction

The Intergovernmental Oceanographic Commission has the acronym IOC. The same letters could also stand for "International Ocean Cooperation", the subject of this presentation. The coincidence was not intentional, but the relationship can easily be justified. In 1960, the founding fathers of the IOC had the ideals of international cooperation in mind when they established the IOC and placed it within UNESCO, where the goals of education, science and culture of that United Nation organization fitted the evolution of the Commission very well.

The international nature of the ocean is unchallengeable. They are a global commons and, despite the fact that the management of extended zones around the landward boundaries has been passed to Coastal States, and even though the rights to the mineral resources extend even farther from the shore, to the edges of the continental margin and beyond, yet the major part of the earth's surface remains the international ocean and therefore a joint responsibility of all the peoples of the earth.

This conference is a celebration of the start of international cooperation in operational oceanography and marine meteorology. We can congratulate ourselves on our progress over the past 150 years, but we cannot be complacent. The development of our ability to monitor, understand and manage the ocean is perilously close to the increasing potential of our society to irreversibly damage the marine environment and the existence of the planetary environment on which we depend. I would ask you to consider the present state of the ocean, at this point in the growth of our civilization. Have our successes in monitoring and understanding the ocean exceeded our failures in this regard? Certainly the question of whether we can eventually achieve a truly sustainable ocean environment has not yet been resolved.

Why not? Collectively, there has never been a better capability and capacity for achieving international cooperation than that which exists today. We possess the technical ability to monitor and predict ocean health and ocean processes. The research community lies ready to tackle the many challenges of this last remaining planetary frontier. There also exists a legal framework for the ocean. The Articles of the UN Convention on the Law of the Sea provide a strong basis for cooperation, for capacity building and technological transfer. In addition there are literally hundreds of global and regional agreements dealing directly or indirectly with the management and protection of the marine environment. The answer is that we have the tools, but we need the commitment and actions by our respective governments.

Today, I would like to speak about the progress of international cooperation in the ocean and the challenges that lie ahead, within the global context, but especially within the development of the IOC and its programmes.

Why do we need international cooperation?

There are many reasons why it is both effective and efficient to cooperate internationally and few to be found against. In a perfect society, the benefits of sharing knowledge and data would be automatically accepted. In the real world nationalism, competing jurisdictions, economic and technical inequalities, language and cultural barriers all confound progress towards that ideal. Nevertheless, even in the real world there are many reasons why differences should be set aside and governments should work together. It is a paradox that many of the most important of these reasons present the toughest challenges.

It is very difficult for an individual, going through the daily routine, sitting in a restaurant in Brussels, tending crops in Vietnam, fishing in the Bering Sea, working in an office in New York, to comprehend that their living environment is a unique, relatively thin shell of atmosphere, soil and water, surrounding a ball of rock, hurtling through the vacuum of space. We feel secure, but the growing size of our population and the concurrent burgeoning demand for resources has reached a point where we could threaten the very environment on which we depend for food, water and the air we breathe.

My message today, however, is not one of doom, albeit I regard the challenge as a serious one, but in the same way as a captain is concerned with the integrity of the ship, the collective governments of the world must be willing to act together to sustain the planetary environment for the future benefit of their peoples. This must be a long-term goal and, although basically the most important, it is not likely to be the most urgent on government agendas.

The urgent problems facing governments will be those that deal with economics and more importantly those that encompass social needs such as starvation and drought, poverty and health services. Most are linked in some way to the state and quality of the environment, whether the scale is local, national, regional or global. These urgent issues can also require international cooperation for their solution.

A basic need in any cooperative arrangement is that all partners achieve some visible and tangible benefit from working together. This is true for an agreement between individuals and it is equally true for governments. No visible benefits…. no interest. Why would an individual or a government expend money and effort for no reward?
Even for the case of international aid programs, any suggestion that all the benefits accrue to the recipient country and all the expense to the donor country is short sighted. Programmes aimed at the reduction of poverty, improvement of education, elimination of disease, the provision of adequate food and water, are examples of goals that benefit

every country in the long term, through the reduction of tensions, the promotion of peace and the establishment of future trading opportunities.

What has all the above to do with operational ocean data? As I have already stated, most of the urgent and longer term issues facing us have direct or indirect links to the environment. The ocean covers three quarters of the planet's surface. It is not only an integral part of the planetary environment on which we depend, it also affects our daily lives in countless ways.

To achieve a lasting solution to any problem, one needs data and knowledge and a management framework that can use that information wisely. The oceans are a complex jigsaw of international and national laws and jurisdictions that must be managed collectively. The collection of marine data is essential to address operational and continuing problems in the marine environment. To accomplish this we need to build upon and improve the international programmes of cooperation. The United Nations organization is the obvious focus for intergovernmental debate and its respective agencies, such as the World Meteorological Organization and the Intergovernmental Oceanographic Commission are the vehicles to be used.

Operational marine data

The major advantages for governments, in terms of cooperation in the collection of operational marine data, are:-

- gaining timely information that would otherwise be unavailable or arrive too late,
- developing methodology and technology at a cost and in a time frame that would be difficult or impossible for individual governments to match,
- obtaining access to data from areas that may be critically important for regional and/or global forecast models and which would be otherwise "off limits" to monitoring systems,
- sharing the burden of costs for monitoring international areas,
- avoiding wastage and duplication of effort,
- reducing bureaucracy and simplifying management effort through involving the relevant international and intergovernmental organizations in cooperative ventures,
- progressing knowledge collectively at a faster pace than individual scientists and institutions can achieve, and
- having the benefit of an international peer review system that solidifies and endorses an accurate path of scientific achievement.

The Benefits of International Cooperation

There are also many obvious economic and social benefits arising from the availability and interpretation of ocean data and these benefits can be categorised in many ways. One

of the standards against which we have judged our progress over the past decade is Agenda 21 from the 1992 Conference on Sustainable Development, in particular Chapter 17 of that agenda. It is useful to maintain consistency with that document, especially since the World Summit on Sustainable Development, in Johannesburg, last year, used Agenda 21 as a basis for its discussions.

Integrated Coastal Area Management

The role of the Coastal State has changed. The UN Convention on the Law of the Sea came into force in 1994. Coastal States now have jurisdiction over an Extended Economic Zone stretching out 200 nautical miles from their shores. This is a huge gain in resources, but the Articles also impose a responsibility for effective management of those waters. It is a responsibility that countries are finding difficult to implement. In order to manage the coastal zone and the waters beyond, it is necessary to have information on the living resources, their lifecycles and their habitat, on the non-living resources and the impact of the various industries on the environment, on land-based discharges, on the distribution and fate of chemicals, on the zoning of the offshore for cables and pipelines, coastal development and so on. It is a complex and demanding task for the fully developed countries and at present an overwhelming issue for those less fortunate.

As mentioned above, the sustainable management of our environment is a necessary objective. It is inevitable that a future ocean will be changed. In the same way as much of the terrestrial environment has been sculpted to fit human needs, the marine environment will be also be altered. However we must ensure that the resulting environment will be sustainable from generation to generation. We must understand the ocean environment and its ecosystem, the need for biological diversity, ecological integrity, the role of river inflows and air-sea processes, the need to protect habitats, migration routes and spawning areas. The lessons learned by the developed countries must be passed on to those that have not the present capacity to research solutions and scientists must also listen to the voices of those who have traditional knowledge from generations of managing these environments.

The last decade has seen a developing recognition of the importance of intergovernmental cooperation in ocean management. In 1997, the IOC established a programme specifically directed at the management of the coastal environment and coastal activities. The action was a direct reflection of the high priority given by governments to coastal issues and further amplified by their new responsibilities under the Law of the Sea. The Global Ocean Observing System, adopted by the IOC in 1993, has recognised the value of costal monitoring and has focussed a great deal of its efforts in this area.

Marine Environmental Protection

The fight against marine pollution has been a priority for the IOC from the very first years. It is an issue that lends itself to international cooperation, because there are many associated problems that can only be addressed in a global context. A recent example was the discovery that Persistent Organic Pollutants, in particular, those related to the use of herbicides and pesticides in tropical and semi-tropical agriculture, were accumulating in the fatty tissues of aquatic animals in the Arctic and thence finding their way into the diet of northern peoples, thousands of miles away. How else can one resolve such an issue than through intergovernmental agreement?

Many of the UN organizations with responsibilities linked to ocean health established a joint group of independent experts to study the scientific aspects of pollution in the marine environment. This example of international sharing of research and knowledge has yielded a large number of learned documents, including a series on the State of the Marine Environment. The latest of these, entitled "Sea of Troubles" received wide spread recognition.

The largest proportion of marine pollution emanates from land. The control of such a large number of varied sources requires international cooperation. Governments joined together in 1995 for the successful negotiation and signing of the Washington Agreement on the control of pollution from land-based sources.

Contaminant levels in the ocean arise from many sources, sea-based activities, waste disposal practices, river run-off, industrial discharges and municipal effluents. For governments to take action to control these sources, common regulations and standards need to be established. Governments need to collectively agree on standards, the setting of priorities for observation programs, the use of common sampling technologies and the training of personnel. The IOC uses its intergovernmental programmes to coordinate research on marine contaminants and to facilitate the sharing and transfer of knowledge on marine pollution.

Sustainable Use and Conservation of Marine Living Resources

Over-fishing of commercial fish stocks in the international ocean and in the coastal areas has led to much criticism of past fisheries practices and management policies. Present day practices are moving towards an ecosystem approach that recognises the interdependence of species and environmental factors. It is obvious that changes in fishing techniques and practices will not be successful unless endorsed by all the major fishing fleets. Again international cooperation is paramount. The IOC works in partnership with its advisory partners to address the role of the environment and how ocean measurements can be incorporated into fishery management procedures on all spatial and temporal scales, from local to global and from daily fluctuations to climatic changes.

Aquaculture and inshore fisheries are of increasing importance to economies and food supplies. These are particularly vulnerable to outbreaks of toxic blooms that seem to be increasing in frequency world-wide. The increase has been attributed to a variety of factors such as rising water temperatures, increasing pollution and the introduction of new species. To combat the effects, the IOC has set up centres to assist governments in the detection and prediction of these harmful events. Due to the global extent of the problem the IOC has joined with international and intergovernmental partners to study the processes that govern the cycles of these organisms.

Coral reefs form one of the most beautiful and fragile habitats of the marine world. Concern over the health of these magnificent natural environments has been growing, due to the impact of anthropogenic activities, warming ocean temperatures and rising sea levels. As recently as 2000, a status report documented nearly a quarter of the world reefs were lost or under stress. Many coastal communities depend on a healthy coral environment for their livelihood and close monitoring of the reefs is necessary for successful management. The IOC is assisting with the international effort to monitor the world coral reefs and with the preparation of manuals and training courses to improve management practices.

Acquiring Information to Predict and Manage Changes in the Marine Environment

If one had to choose a common element of the IOC programme that emphasizes the benefits of international cooperation, it would have to be that of the collection of ocean data.

From the early voyages on the ocean every civilization has had their heroes of early adventurers and explorers, setting out on ocean voyages, driven by the need to search for new lands for settlement or by goals of curiosity, trade or conquest. Initially, these intrepid mariners had no knowledge of their destination or the conditions they would face. Doubtless many perished. Information on maritime routes was built up over many generations. Later, navigators and chart makers began to assemble this shared body of knowledge and data into products that could be used by ship's masters to allow them to avoid the inherent dangers of the sea and to reach destinations more safely.

The point is that no one person, no single ship, not even a government can expect to tackle the huge problem of gathering ocean data without help. The early days of ocean exploration saw cooperation in its most rudimentary form. It took hundreds of years before adequate maps and charts were commonly available. Today, with modern technology and communications, through internationally agreed channels, data can be collected at remote locations and transmitted to data centres within minutes.

The build up of knowledge also benefits from a cooperative approach. From the early days of the Challenger through to the more recent coordinated global experiments, scientists need to be able to share information and results in a collegial manner. The IOC was established in 1960 by world leaders in ocean science that realized the need for an

organization to provide a forum for bringing together the collective scientific strengths of all governments and institutions in addressing ocean research issues. Forty years later, the role of the Commission has expanded to include the application of ocean observations and research on problems of management, marine protection, ocean services, prediction and capacity building.

Ocean Observations

The Global Ocean Observing System of the IOC is its flagship programme. It has been successful within the IOC because the programme is dependent upon international cooperation and its importance to all aspects of science and services. The importance of GOOS was recognized in Rio and endorsed in Johannesburg. Over the last decade, teams of international experts have been working to identify the types of data required globally to address issues in ocean health, coastal management, living resources, weather prediction and long-term changes such as climate change. It is accepted that total acceptance and full implementation of such a system will take time, maybe several decades. The greatest benefits are still to come. The GOOS does not operate in isolation but attempts to build upon existing and planned national efforts and upon the development of regional observing systems. Building the capacity to participate and benefit from the results in all countries is a standing goal of the programme.

The GOOS undertakes cooperative activities with related environmental monitoring programmes in other organizations and agencies. For example, GOOS is the ocean component of the Global Climate Observing System, GCOS, hosted by the WMO. GOOS also participates in joint expert groups dealing with common problems, such as data management and the use of satellite information.

The IOC has a partnership with the Committee on Earth Observations from Satellites, made up of agencies operating space borne vehicles. It is often difficult to separate the mandate of the IOC, in dealing with the ocean surface, from that of the World Meteorological Organization dealing with marine weather requirements. Both organizations have coordinated many of their respective activities for years, but have recently taken a large step forward through the establishment of a Joint Technical Commission on Oceanography and Marine Meteorology.

There are many new and exciting programmes aimed at increasing the level of ocean data collection to the point where computer models can begin to accurately predict ocean processes. Up until now there has been insufficient data to be able to generate such models. A bold new project has been launched that will see ocean data being collected from a system of 3000 floats, that are capable of cycling through the water column collecting data and periodically coming to the surface to release their stored data via satellite links.

The IOC has a long-standing and successful programme in the Pacific Basin, which facilitates an intergovernmental programme to warn of, and mitigate the impact of

tsunamis. Although the Pacific Rim is prone to earthquakes, there is no reason why such a programme should be limited to this region and countries bordering other ocean basins are requesting that attention be paid to the forecasting of tsunamis and earthquakes in their respective areas.

Data Management

One of the earliest actions taken by the IOC was to establish an international system for the management and exchange of ocean data. The system forms a global network of national data centres, some of which have additional responsibilities as regional centres or global centres for specific projects. About seventy of these centres are presently cooperating directly in ocean data exchange and the system provides worldwide access to millions of ocean measurements. The IOC has been responsible for the development of most of the international formats and standards necessary to run the global programme. In the early days of the Commission, the focus was on collecting ocean data from national institutes and research programmes in an archival mode. Often these data were many years old by the time they were submitted. Now the capability exists to provide comprehensive data sets incorporating real time data with existing long term series. Many centres now use the Internet services to provide direct and rapid access to data holdings and the present programme at the Commission remains the world authority for ocean data standards. Despite the large involvement of countries around the world, capacity building in developing countries remains an important objective. For example, the Commission has facilitated partnerships between governments and donor agencies that have allowed a network of 20 ocean data centres to be established in Africa.

Global warming and climate change

The ocean plays a major role in shaping the global environment. What happens to the planetary environment affects all peoples and to understand the processes involved requires the collective efforts of all governments.

The build-up of greenhouse gases in the atmosphere is an issue that has potentially severe consequences for the environment and reducing the anthropogenic sources of greenhouse gases is proving to be a serious challenge for both the economic and social policies of governments. Only about half of the carbon dioxide released remains in the atmosphere and the rest ends up in the ocean or in plants. The ocean contains about 50 times more carbon dioxide than either the air or the land, but will its ability to absorb these excesses continue? This and many other questions are still to be answered.

An associated consequence of global warming is the threat of sea level rise, partly due to the melting of the glaciers and partly through the thermal expansion of ocean waters. The predictions of the amount of rise and its timing continues to be a matter for debate, however, for many areas of the world even a minor increase in sea level can threaten the existence of low-lying islands and coastal lands. The accurate prediction of sea level has

its operational requirements for port and sea defence engineers and for the marine transportation industry. The IOC programme on GLOSS, co-ordinates a system of international networks for the reporting of regional and global sea levels.

The IOC has been one of the organizations assisting with the huge research and data measurement efforts required to explain climatic processes and to find answers to the important global environmental issues. Scientists from many different countries have recently participated in a ten year international effort, the World Ocean Circulation Experiment, to gain knowledge and data that can be applied to computer models. The next challenge will be for governments to use the results gained in support of sound policies for sustaining the environment.

Climate change and weather prediction

The complex interactions between the ocean and atmosphere are important, not only for climate changes, but also for seasonal and daily weather predictions. The IOC and its partner organizations are continuing with more detailed research on the relationship of the ocean and weather variation, which will lead to far more accurate predictions of long-term and seasonal changes. The results will be of great economic value to agriculture, forestry and resource industries and allow governments to prepare strategies for dealing with potential extremes.

Once known only to the local populations of the tropical Pacific, the occurrences of El Nino have become widely publicised since the relationship of this regional phenomena have been linked to severe weather changes over large parts of the globe. Many countries have been cooperating to understand and predict these occurrences and several are participating in an operational network of monitoring stations across the tropical Pacific as part of the IOC ocean observing system. The associated information is used to give warnings of impending El Nino episodes months in advance of weather changes. It is not only the El Nino phenomenon that is responsible for wide spread and potentially serious weather variation. Scientists know that other major atmosphere/ocean interactions impact on global weather. The joint technical Commission formed between the IOC and WMO will be supporting multidisciplinary science and observational programmes that address such problems.

Ocean Economic Forces

Shipping remains the single most active community in the routine collection and use of daily marine data. The merchant fleet that transports the major part of world trade, the fishing vessels that still supply nearly a quarter of the protein we consume, ferries and the growing industry of marine tourism all require up-to-date and timely information for safe operation. Information on marine weather, waves, currents, tides, bathymetry, positioning and in extreme incidents, search and rescue and contingency support. Most

vessels contribute to the data that is gathered synoptically through the World Weather Watch.

Transportation is not environmentally neutral. Ports are located at the interface between land and sea, where estuaries, marshes and wetlands provide important habitats. Issues of stack emissions, tank washings and the introduction of alien species through ballast water discharges, all have to be addressed and enforced through intergovernmental agreements.

As more and more of our population migrate to the coast, the danger of damage to property and loss of life through the impact of hurricanes, typhoons and cyclones grows higher. Winds, wave action, storm surges and the rarer, but devastating tsunamis, need timely data and accurate interpretation to warn populations at risk.

Oil and gas production now takes place in water depths approaching 2000 metres. At such sites the operational information currents throughout the water depth and the need to predict changes in environmental conditions to allow for safe shut down is essential. The world is likely to continue its dependence on oil and gas for very many years and the proportion of hydrocarbons from marine sources will continue to grow, as will the associated requirement for environmental data and information.

The mapping of the sea floor has assumed wider importance as interests have developed in the laying of marine cables, the placement of platforms and the need for countries to submit jurisdiction claims over seabed resources under the Law of the Sea. The Commission has worked in partnership with the International Hydrographic Organization for many years to produce the series of bathymetric charts on the ocean. Accurate mapping and positioning is a prerequisite for scientific and observational activities. Advances in multi beam acoustic systems and the capability to analyse and display the resulting data are generating a whole new field of uses and demands.

For several countries, the growth of the recreation and tourist industry has surpassed many of the more traditional industries in importance. Cruise ships, once a rarity, have now grown in numbers to a point where international action is required to control potential impacts. Governments and the industry itself, are working together to protect the quality of the environment, which is essential for the tourism industry.

There will doubtless be many new and important ocean industries that will require governmental action to develop and regulate. Those that take place in the international ocean will need to be addressed by the global community, those taking place within national waters will profit from the co-operative exchange of data and knowledge. Harvesting genetic materials and pharmaceuticals from marine species, using ocean space for wind farms and offshore structures, along with mariculture and deep sea mining, are examples of potential activities that will require to be addressed. Governments and industrial spending on marine research is presently insufficient to keep abreast of new demands. The IOC can assist governments in negotiating agreements and requirements and facilitate the development of environmental standards and regulations when required.

Strengthening International and Regional Co-operation and Co-ordination

Agenda 21 (21:17.115) recognized "….that the role of international cooperation is to support and supplement national efforts. Implementation of strategies and activities under the programme areas related to marine and coastal areas and seas requires effective institutional arrangements at national, sub regional, regional and global levels as appropriate."

The IOC has six major regional bodies with regional programme responsibilities in the geographic areas of the Western Pacific, the Caribbean, the Indian Ocean, the Western Indian Ocean and the Black Sea. Regional initiatives are also pursued and encouraged in several other regions. The IOC programmes are always initiated through the collective efforts of its Member States and the implementation of programmes through regional cooperation has been a long standing practice. In localized areas of the ocean, regional priorities can be articulated, common issues can be addressed, and training and capacity building programmes can be better co-ordinated. Nevertheless it is difficult for a relatively small intergovernmental organization to maintain the needed financial and staff support for decentralized administration. The IOC is seeking new ways to obtain additional support so that the objectives of an effective and efficient regional programme can become a reality.

On a global scale the most significant ocean agreement of all time, the UN Convention on the Law of the Sea, came into force in 1994. The IOC is recognized in its Articles as a "competent international organization". Although the negotiated text has been in existence for many years, the implied responsibilities for the Commission are still new and subject to continuing debate. The IOC is particularly concerned with the Articles on marine pollution, capacity building and on the conduct of marine scientific research. The IOC has a role to play in other global agreements, such as the Framework Convention on Climate Change and the Convention on Biological Diversity.

At the UN General Assembly there has been increased attention paid to the ocean and this has led to several initiatives. Governments now meet in an informal consultation on the ocean to contribute to, and supplement, the annual discussion on ocean that takes place in the General Assembly. The Secretary General has issued instructions to UN Agencies and Organizations to address ways for improved coordination of ocean programmes and a potential new programme to provide a regular assessment of the state of the ocean is under discussion.

International regional and global agreements, of which there are many hundred related to the ocean, can only be successful when the basic understanding of the subject under discussion is shared and accepted. Once implemented there will be an ongoing need for monitoring and knowledge. Unfortunately many of the existing agreements are neglected by governments, probably because they have become outdated, have not been adequately researched, lack information or have not yielded anticipated benefits.

Changes in the Intergovernmental Oceanographic Commission

It is impossible to divorce the development of the capability to manage and govern from the evolution of scientific and technical cooperation. As an example one can take the changes that have taken place within the IOC mandate, as shown by the changes in its Statutes from 1960 to the present day. The Commission was originally established to assist in the coordination of ocean research programmes. The changes recently approved by the Assembly and by the General Conference of UNESCO, describe new responsibilities in ocean science, services and management, that are directly related to real issues and to the priorities of governments and the international community.

Capacity Building

The participation of all Member States in the programmes of the Commission has been a long-term priority for the Commission. Although the regular budget has been inadequate to carry the burden of large scale assistance programmes, seed money has always been found for training courses workshops and materials. More involvement and financial assistance from governments is needed to enable developing countries to participate fully to the benefit of themselves and the international programme. This is an area where international cooperation is urgently needed.

Conclusions

The ocean sustains the planetary environment in which we thrive and on which we depend. It sustains the economies and trade that are vital to our way of life. We must exercise care and wise stewardship to ensure that we maintain and protect this most valuable and essential planetary resource. Governments have the largest role to play, because planetary problems need international solutions. Governments, acting on behalf of their peoples, will need to use their collective wisdom and commitment to ensure that the benefits from the ocean are maintained for generations to come. The people themselves need to understand the importance of the ocean and to be aware of the issues involved.

For the future we will need to expand upon the present efforts to improve the coordination of ocean programs amongst UN Agencies. The many UN organizations with responsibilities in the ocean must cooperate more closely on global ocean programs through the establishment of joint bodies, such as the WMO/IOC Joint Technical Commission on Oceanography and Marine Meteorology, through Memoranda of Understanding, through regular inter-secretariat meetings at a high level and through combining efforts on global issues. Governments have an essential role to play in these efforts, for it is the Member States, at the respective governing bodies of these organizations, who dictate direction and policy. Too often national delegates attending one intergovernmental meeting are unaware of actions taking place in another. A

continuation and strengthening of the discussions on ocean issues now taking place annually at the UN General Assembly will go a long way to address this issue.

The operation of observation, monitoring and research programs in the ocean is a complex and expensive undertaking. The burden on individual governmental and institutional programs is reduced through the exchange of data and knowledge through international cooperation. Programs such as GOOS, the World Weather Watch and J-COMM provide the framework for this cooperation. The task is still an enormous one, and governments still need to be convinced of the benefits that will result from the establishment of operational observation programs and robust ocean science and service programs.

An examination of the large number of existing regional and international agreements related to the ocean should be undertaken in order to eliminate duplication and to consolidate requirements. Nevertheless, there will be a requirement for additional international Protocols and Agreements to cover present and future demands arising in the ocean environment. These should build upon the broad responsibilities laid down by the UN Convention on the Law of the Sea and give substance to international efforts to tackle real issues.

One could consider a comprehensive international agreement on ocean science and services that covered specific requirements in a series of separate protocols. The MARPOL Convention under the International Maritime Organization was such an instrument with an umbrella agreement on marine pollution from ships implemented through a series of individual protocols. For ocean science and services, the protocols could cover agreements on such real issues as; state of the ocean reporting, harmful algal blooms, tsunami and storm surge warning systems, the extraction and use of genetic materials, coral reef protection and operational systems for weather prediction requirements.

Finally, there remains an essential need for Capacity Building. I will close with an extract from the GOOS document on Capacity Building Principles, where it is stated ….

”The need to address the growing imbalance between the have and the have-not countries is fundamental to a sustainable future for the world community on two major fronts. Firstly, there can be no hope of achieving and preserving a peaceful future unless there is a better balance of quality and dignity of life than we have at present. Secondly, there is no way that the present critical environmental issues can be addressed unless all governments are able to cooperate in joint solutions…”