

Abatement of Climate Change Impacts With Integrated Coastal Management

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Abstract

Coastal zone of the world is rich in a variety of natural, commercial, ecological, industrial and aesthetic resources of immediate and potential value for the present and future well beings of the nations. However all low-lying coastal areas and islands are highly vulnerable to climate change and very sensitive to global warming, one direct consequence of anthropogenic sources affecting the climate change. Global warming climate change will result in accelerated sea level rises, together with concurrently related heavy waves, storm surges, frequent cyclones and typhoons, floods, erosions, etc., exacerbating the severe destructive threat to all resources along the coast.

For most island countries, the entire nation is essentially or totally dominated by the domain of the coastal zone. The United Nations Conference on Environment and Development in 1992, the Earth Summit, called for all nations to commit for sustainable development in Agenda 21 for environmental protection and natural resource conservation. The Agenda 21 stresses all coastal and island nations to develop ecologically sound integrated coastal management programs.

The Integrated Coastal Management Program is a dynamic process in which a coordinated strategy is developed and implemented for the allocation of environmental, social-cultural, and institutional resources to achieve a conservation and sustainable multi-use of the coastal zone. The development and implementation of the Integrated Coastal Zone Management Program as a powerful mechanism to abate the climate change impacts is the best practical approach for sustainable development for coastal and island nations. From basic science on climate change to an coherent integrated coastal management program will be briefly presented.

I. Introduction

The Earth's climate is a very complex system involving many existing systems in space and on earth, including the solar space system, the ocean-atmosphere system, the land and marine ecosystems, and the earth geo-morphological system. Every body in the celestial system exerts influencing forces to the others. In general, the whole system maintains an internal dynamic balance and orderly variations in nature. The earth climate change is usually low in frequency and large in scale under the natural influences. However both natural influences and human activities affect the behaviors of the earth's climate. It is the human induced climate change, such as the greenhouse effect global warming, that scientists believe, may occur at a much faster pace than that of the usual natural climate change.

Recent scientific studies, observations, and computer simulations have led to the concern that human activities have been behaved to affect the Earth's climate change adversely (IPCC, 1990). In particular, much attention has been focused on global warming, or an accelerated "greenhouse effect," which suggests that more of the Earth's heat will be retained in the atmosphere by increasing amounts of heat absorbing trace gases, such as carbon dioxide, nitrous oxide, chlorofluorocarbons (CFC's), and methane produced as results of human activities. Scientists believe that if such a warming of the Earth's climate were to occur, it would have serious consequences affecting many sectors in the earth system, including sea level rises, water resources, agriculture, and forestry. A broad international consensus of the scientific community regarding global climate change has been developed and reported in the Intergovernmental Panel on Climate Change (IPCC) publications (IPCC, 1991, 1992).

The basic physics on the greenhouse effect due to anthropogenic sources that results the global warming climate change is easy to understand. The earth climate system is generally under a state of energy balance in the solar-earth system. The earth's atmosphere acts like glass panes of a greenhouse. Solar energy from the sun passes through the atmosphere and warms the surface of the earth. Heat rising from the surface warms the atmosphere, and like the glass panes of the greenhouse, certain gases in the atmosphere absorb the heat and reflect back to the ground. Portion of the heat absorbed in the earth surface and the atmosphere also reflect back to the space. However, recently too much greenhouse gases from human activities have dumped into the earth atmosphere that prohibit energy reflection back to the space but increase more heat storage in the earth surface and the atmosphere. This greenhouse effect disturbs the natural energy balancing climate system. Scientists that

study the climate system have concluded and adopted that "the balance of evidence suggests that there is a discernible human influence on climate change" (IPCC, 1994).

Some direct prominent results of global warming climate change are severe and frequent cyclones, storms, floods, droughts, and accelerated sea level rise (ASLR). According to recent estimates, ASLR over the next century will be .3 to 1.1 meters (IPCC, 1994). The ASLR would lead to more disastrous storm surges, flooding, increased erosion on beaches, loss of woodlands, intrusion of salt water, destruction of coastal ecosystems, damage to properties if appropriate adaptive measures are not taken. ASLR could adversely affect socio-economics and population in coastal regions, where the majority of the world's population live and work. As global population expands, a significant proportion of population growth will also take place in the heavily populated coastal regions, particularly in developing countries. Hence, human-induced climate change and the resulting ASLR are expected to significantly increase the stresses on coastal resources. On the other hand, much progress in science has been made in understanding coastal processes, and advanced high technological vulnerability assessment tools, such as coastal modeling, are now available. The IPCC Coastal Zone Management Sub-Group (IPCC CZMS) recommended urgently that all nations develop and implement integrated coastal zone management (ICM) plans with advanced knowledge and available impacts (IPCC CZMS, 1992, 1994). Many island nations have taken ICMst within forums of the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and the National Environmental Management Strategies.

For most island nations, the "coastal zone" is essentially the whole island. Layered on top of this reality are a range of political, cultural, and legal arrangements which affect the utilization and management of the island resources. Therefore, ICM is designed to promote sustainable development of the nation's coastal resources, a synonym for "integrated island management". It is as important for island nations' ICM's to reflect the particular island's circumstances, the ethics, and directions of development initiatives as it is for them to seek for developed countries' models of ICM. That is, island problems require island solutions. The challenge for islands under such circumstances is to bring together the essential concepts of ICM in ways which meet community and cultural needs and aspirations. This will dictate a largely process-oriented approach merging the modern contemporary assessment tools and new management skills with the traditional

system. Otherwise there will only be a limited possibility of obtaining the interest, involvement, and commitment of the very communities of the traditional management system, whose actions are at the center of the coastal management equation and who dictate the day-to-day resource management decisions and actions over their part of the coast. In this presentation, we recommend that, by absorbing the advanced scientific knowledge and adopting the improved application tools and skills, including the high-tech information and modeling system, all island nations should develop coherent ICM programs based on their respective traditional practices with community participation. This is the timely and realistic approach for every island nation to take for their respective present and long-term sustainable development. The major objective is to provide a useful reference in planning ICM programs for island nations not only for adaptation strategies against global warming climate change but also as an essential part of planning for economic growth and coastal development. Since ICM is basically a set of principles in formulating a better coastal resources management and specifics varying from place to place and from plan to plan, our presentation will also only emphasize on general principles to approaching a better ICM program plan for island nations.

II. Abatement Strategies and Options

Integrated coastal management is not a methodology, but a set of principles offering a coherent and balanced

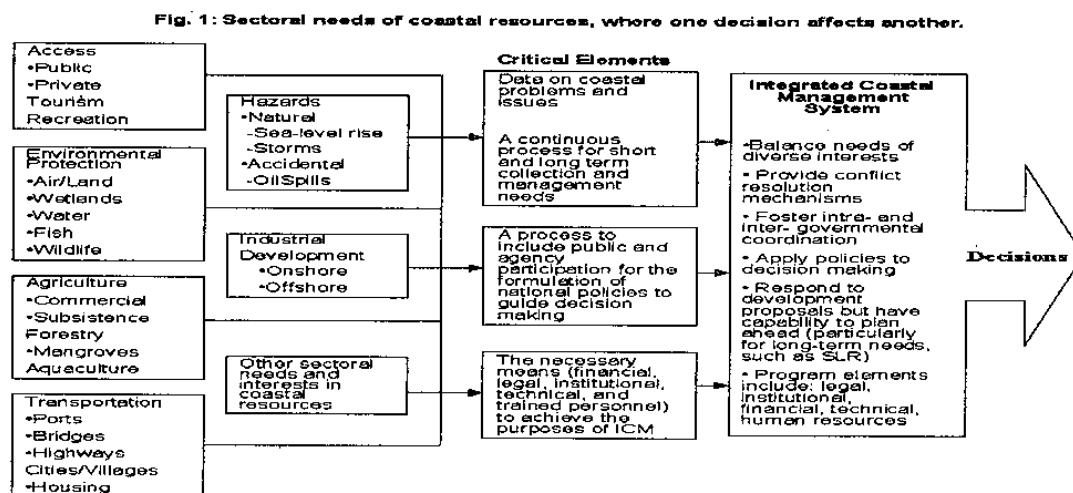
approach in managing the coastal resources and maintaining sustainable development. A typical ICM program, as recommended by IPCC CZMS (1992), is a dynamic process by which decisions are made for the use, development, and protection of coastal areas and resources to achieve sustainable goals established in cooperation with national and local authorities and with groups of people who use those resources.

Basic principles for ICM

These basic principles for ICM consist of the following:

1. A continuing process to collect and disseminate the necessary scientific information and data for impact assessments on resources, on coastal problems and issues, on functional uses and development, and on the needs and desires of the public.
2. A public participation process for formulating national policies and developing a coastal governance system that applies those policies in an integrated fashion.
3. The development, acquisition, or strengthening of the legal, institutional technical, financial, and human resources to achieve the purpose of the program.

Figure 1 presents a generic model for a coastal zone management program. It outlines a process for decision makers to use when integrating the many sectoral needs within coastal zones.



There are some fundamental differences between continental and large island states and small island nations in the general approaches for coastal management. Continental states recognize their coastal zones as distinct regions with resources that require special attention, resulting in the well-established sectoral approach to these areas. Though the continental ICM has some flexibility and volunteerism built in the program, the program itself relies on modern contemporary knowledge and high-tech utilities and tools with some rigid legislative constraints and heavy enforcement components in the executions and implementation, clearly a more top-down approach.

Island Nation's ICM

The coastal areas of islands are the locations of the vast majority of human habitation, the foci of subsistence and commercial agricultural and fisheries activities, and the target of most economic development. Pacific coastal areas are also subject to the damaging effects of natural hazards such as cyclones (typhoons, hurricanes), storm waves and abnormally high tides. Low elevation islands and the low-lying coastal areas of the larger, higher Pacific islands are particularly at risk. Global warming Climate Change now threatens to exacerbate these hazards through accelerated sea-level change, increased frequency and intensity of cycles and storms, and other changes to atmospheric and oceanographic conditions. All these coastal problems further point to the need for integrated coastal managements.

For Pacific islands with dominant traditional cultures, a different conceptual approach to ICM development should be encouraged. The customary systems, structures, and processes should form the basis of ICM rather than merely include customary processes in ICM. Such an approach would require the initial development and implementation of ICM to be based on the scale of the most "effective management unit," be it the village, district, or whole island. This type of approach may be slower in the short term and more difficult to develop, but it should prove in the long-term to be far more effective, especially when it encompass larger areas.

One essential synergetic step is that "appropriate" methodologies and approaches must be adopted and used for effective ICM to occur in Pacific islands. What is deemed appropriate will vary considerably among islands. As for the development of ICM in Pacific islands, it will be the process of implementation that is critical. For example, the balance of power between the federal government and the local traditional authority in the implementation of the ICM program has to be appropriately maintained. In the Pacific islands region the decision making processes

involve a considerable number of meetings - both as a means to provide information, as well as the prime means to arrive at a consensus decision. This is the "Pacific Way," and it will be flexibility, not rigidity, in implementing ICM in the Pacific islands that is required

Regional ICM Efforts

The Pacific region's unique characteristics provide significant opportunities for developing ICM for the island nations. Despite its large area with a diversity of culture and political systems, there are similar coastal management problems throughout Pacific region. A wide range of coastal management related issues and problems are common to all states. In addition, certain critically important management tools and information, such as the climate data information and coastal modeling, are very hard, if not impossible, for individual state to successfully achieve and continuously carrying out alone. These common interests, when combined with a history of successful regional cooperation, provide a positive foundation upon which to develop a cost-effective regionally-based ICM project to assist in satisfying national needs.

III. Conclusion

The probable adverse effects caused by the climate change global warming and the direct result of ASLR have alarmed island countries to take early abatement and adaptation measures for climate change. The UNFCCC and IPCC all recommended coastal and island nations should develop ICMs for sustainable development. The establishment of an ICM program on a traditional land tenure system, and the integrating of the traditional and the centralized, legislative managing systems in an ICM program will result in more effective land and resource use decisions, better retained cultural tradition, and better sustained essential costal resources.

The threat of climate change has obliged the international community to realize that we all inhabit on a single planet, and share a common , but differentiated, responsibility to preserve its well-beings. The challenge posed by climate change is so overwhelming that we have been forced to act together as never before, as evidenced by UNFCCC. Continued good will is essential in order to meet this global threat, which transcends national borders, circumstances, and capabilities. International cooperation is the most important element in coping with the climate change.

Most small island nations have limited resources both in technical fields and in financial aspects. They need both technical and financial assistance in implementing the recommendations from the UNFCCC and IPCC to establish their regional and national ICM's for

sustainable development. We call upon the developed nations to pay more attention to the small islands' concerns and provide assistances!

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