

ENVIRONMENTALLY SOUND TECHNOLOGIES FOR DECISION MAKING IN INTEGRATED COASTAL MANAGEMENT: PROSPECTS OF CO-OPERATION WITH UNEP-IETC FOR EDUCATION AND TRAINING IN THE MEDITERRANEAN

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Abstract

The present crisis in urban management in developing and 'transitioning' countries is largely the result of rapid urbanization and modernization which came to these countries without the basics of planning and management that should have gone hand in hand with them. Because economic growth was the primary goal, the advent of urban development further resulted in the degradation of the urban environment, notably its freshwater and marine resources. Today, the need for urban environmental management has become urgent more than ever especially for decision makers.

Urban environmental management is a high level skill that is expected from decision makers - those who have the responsibility to establish priorities and create a balance between urban development and environmental conservation. Knowledge and skills in urban environmental management can make a difference to people faced with a choice, for instance, between protecting a natural coral reef or developing that into a marina for economic and tourism purposes; or between saving a wetland or building on it rows of condominiums for commercial gains; or selecting between an incinerator, composting or landfilling for disposing of solid waste. Above all, it means being able to incorporate environmental considerations into the decision factors.

UNEP-IETC is mandated to facilitate the transfer to developing and 'transitioning' countries of environmentally sound technologies (ESTs) for urban environmental management as well as for the management of freshwater resources. Considerations of urban environmental factors and the impact of land-based activities on coastal resources enrich the process of integrated coastal management. IETC has developed decision making tools for urban environmental management which would be useful instruments to improve integrated coastal management for the Mediterranean or elsewhere. It has published international source books and technical reports which provide information on ESTs for urban environmental management and freshwater resources management. IETC's information system on ESTs, particularly its tool for accessing and exchanging information called maESTro will be helpful for education and training. Its training modules on urban environmental management could be also adapted to suit the requirements of the Mediterranean for integrated coastal management.

Introduction: Impact of Urbanization and Land-based Activities on Coastal Areas

A recent update prepared by UNEP for the 1998 Year of the Oceans¹ states that:

- About 60% (3.6 billion) or nearly 2/3 of the world's population lives within 100 km. of the coastline. They rely in some manner on coastal and marine habitats for food, building sites, transportation, recreation, and waste disposal.
- In the Mediterranean, West of the Urals, almost 30% of the population lives within 50 km. of coastline waters.
- Within three decades, 75% or 6.4 billion will reside in coastal areas which is close to one billion more people than the present global population.
- Further, UNEP's GEO reports that many of Europe's remaining marine and coastal sites of ecological importance have no protected status. Of 135 sites evaluated in 1995, nearly half were considered under threat from coastline development. In France, for instance, natural coastal areas are being lost at a rate of 1% a year; 15% have disappeared since 1976, and 90% of the French Riviera is now developed.(2)

Urbanization Trend

The world is urbanizing and urbanization is increasing at the rate of 4% every decade since 1975. At this rate, the impact on marine resources of urban demands is alarming. The demand for more food, for instance, from an increasing world population would worsen the over exploitation of marine fisheries as well as degradation of marine areas from pollution and other urban impacts. It is expected that by the turn of the 21st Century, 2 years from now, every second human being is expected to live in urban areas, many of which will be coastal cities, and this trend is likely to continue. Currently, of the world's 30 megacities (those with over 5 million inhabitants), 20 are in the coastal belt and are growing at a rate of about one million people per day.

In the Mediterranean, the population growth rate is very high and numbers have increased five-fold in the South since 1950. This population growth has resulted in accelerated urbanization (from 91 million urban dwellers in 1950 to between 380 and 440 million in 2025) which is concentrated in the coastal areas where the urbanization level will reach 75% to 80% in 2025.³

In terms of the size of urban populations by region, statistical figures show that the world's urban population will continue to be found in Asia (48.1% in 2000 to 53.7% in 2025) and followed by Africa (15.9% in 2025). Asia will also continue to have the most number of urban agglomerations (150 out of 341 of the world's total in the year 2000).

However, in terms of level of urbanization - i.e., of the ability to cope with urban issues and provide the necessary facilities and services to satisfy urban needs, Asia and Africa will lag behind Europe, Latin America, North America and Oceania. Since most of the world's coasts and coastal cities are found in the regions and countries, including those in the Mediterranean, that are least able to provide the necessary urban facilities and measures to protect their marine resources from degradation, this situation will have implications on practically all marine resources of the world.

Table 1 below shows the world's 30 largest urban agglomerations in 1990 (with populations of 5.0 million or more). Twenty are coastal areas; one is in the Mediterranean.

Table 1. The world's largest urban agglomeration in 1990

Urban agglomeration	Population (thousands)1990	Increment in population (thousand)1980 - 1990	Growth rate % 1980 - 1990
Tokyo	25,013	316	1.4
New York	16,056	46	0.3
Mexico	15,085	120	0.8
Sao Paolo	14,847	275	2.1
Shanghai	13,452	171	1.4
Bombay	12,223	416	4.2
Los Angeles	11,456	193	1.9
Beijing	10,872	184	1.9
Calcutta	10,741	171	1.8
Buenos Aires	10,623	72	0.7
Seoul	10,558	228	2.5
Osaka	10,482	49	0.5
Rio de Janeiro	9,515	73	0.8

Paris	9,334	40	0.4
Tianjin	9,253	199	2.4
Jakarta	9,250	327	4.4
Moscow	9,048	91	1.1
Cairo	8,633	178	2.3
Delhi	8,171	261	3.9
Manila	7,968	201	3.0
Karachi	7,965	294	4.7
Lagos	7,742	336	5.8
London	7,335	-41	-0.5
Chicago	6,792	1	0.0
Istanbul	6,507	211	4.0
Lima	6,475	204	3.9
Essen	6,353	2	0.0
Teheran	6,353	128	2.3
Bangkok	5,894	117	2.2
Dhaka	5,877	267	6.2

Source: United Nations, World Urbanization Prospects: the 1994 Revision, Population Division, New York, 1995.

Consequences of urbanization and land-based activities

Other than source of food for people and a natural habitat for other forms of life in the ecosystem, the oceans have also become the final depository of all kinds of wastes being generated from land-based activities. Whether by design or by accident, people are using the oceans for dumping waste products - solid, liquid and gaseous. Many of these include highly toxic elements, such as, hazardous chemicals, radioactive wastes, junk metals, automobile exhausts, pesticides and detergents. And these are usually concentrated in the small portion of the seas supporting nearly all marine life along the continental coasts.

The Mediterranean Sea is a receptacle for many kinds of pollution. According to MED POL (Programme for pollution assessment and control in the Mediterranean Sea, 1980), 85% of waste water from the large coastal towns was untreated, 24% of the beaches were not safe for bathing, and the bays and lagoons were uninhabitable for marine species. MED POL also stressed that urban and industrial land-based effluents, waste and hydrocarbons from ships, and airborne chemical products were destroying biotopes, concentrating in trophic chains and contaminating sediments. (4)

The GEO also reports that the Mediterranean Sea, together with the Baltic and North Seas, the Black Sea, and the Sea of Azov, consistently receive the highest loads of land-based contaminants - loads that are 10 to 100 times greater than those in the White, Barents and Norwegian Seas. On the whole, nearly 80% of marine pollution and other types of marine degradation is caused by land-based activities from an increasing population, industrial growth, tourism development, and the siting of transportation and trade centers.

Mass tourism is particularly affecting the coasts and mountains and deteriorating water quality in freshwater and coastal ecosystems in the Mediterranean, greatly threatening its biodiversity. Mediterranean plant and animal communities are among the most endangered species in the world. In the sea, posidonia meadows, marine turtles, cetaceans and monk seals symbolize the pressures on these marine species. Eutrophication is frequent in bays and lagoons while the wetlands are being destroyed, especially by agricultural and industrial development. On the land, the Western Mediterranean contains over 500 endangered phanerogams and, in Crete alone, 100 out of 150 endemic plants are threatened. The same developments

are affecting cultivars and domestic animal breeds for whose wild parents the Mediterranean Basin is the cradle. The region is one of those which has suffered the greatest losses of biological diversity during recorded history, irreversible losses with grave consequences for the future.(5) As a consequence of land-based activities, around 1/3 of the world's coastal regions are at high risk of degradation due to pollution and infrastructure development. The European coasts are most affected, with some 80% at risk. In the West of the Urals, it is estimated that 86% of the coastal ecosystem are at high risk or moderate risk from development.(6) In other parts of the world, such as Asia-Pacific, 70% of its coasts are at risk, following close to Europe in the degree of degradation of coastal areas. In Latin America, 50% of critical coastal resources, such as mangroves and coral reefs -- among the most productive and biologically diverse ecosystems on Earth - are being plundered in the name of development. The encroachments of coasts by infrastructure development are particularly affecting small island developing states.

Environmental Considerations in ICM

The statistics have shown that the greater source of the problem affecting the coasts is pollution from land-based activities. Governmental attempts to solve this problem have included the preparation of coastal management plans and strategies. However, it is reported that of the 53 countries which have drawn up coastal management plans, only a few of them have implemented such plans. And many management strategies have not gotten beyond the pilot phase. It is also reported that current management plans are either too broad or sectoral, with a limited understanding of the cross-cutting role of the environment factor.

It is recognized that for coastal management to be effective it has to be integrated within and across sectors, horizontally and vertically. Horizontal integration would involve linking land and water elements of the coast with the management of freshwater, forests, and other land resources, giving due consideration to the environment as a whole, particularly to the need to maintain the ecological balance within the coastal area while trying to meet the economic, social and cultural needs of humans and the habitat needs of other forms of ecosystem life. This will require the application of a management strategy which understands and treats water as a resource in a dynamic continuum - flowing continually from its main sources from the mountains and the rainforests, coming out as surface water and wetlands, stretching upstream and downstream to the rivers and lakes, going further down as ground water, eventually flowing out to the sea and the oceans, evaporating into the atmosphere and coming down to the earth's surface again in the form of precipitation such as rain, mist or snow. And the cycle goes on. This linkage between freshwater bodies and the sea results in an ecological balance so intrinsic in nature's value that respect for this continuity is indispensable if humankind desires a sustainable life on Earth.

Vertical integration would involve linking the economic, social, cultural and habitat needs at different levels - local/community, municipal, national, regional - with each other. This will require administrative and political coordination which can be a more cumbersome and tedious process than horizontal integration.

Major Constraints in Coastal Management

The major constraints in coastal management are not the lack of information and knowhow in the integrated system and methodologies of coastal management since there is an abundance of expertise and publications on the subject. Essentially, the problems are more related to people - their institutions and institutional arrangements and their capacities or lack of these to handle management requirements and issues.

It is now common knowledge that many Governments, especially in the developing and transitioning countries of Asia, Africa, Eastern Europe, Latin America, including many countries in the Mediterranean experience in various ways a combination of these problems:

- (a) Inadequate policies and regulatory framework to manage their water bodies, both freshwater and marine waters, and coastal areas. In many instances, the formulation and enforcement of legal and economic instruments which are designed to implement environmental policies are done independent of each other. This results in rules and regulations which are either unenforceable or are enforced randomly because these have not considered the multisectoral (e.g., land-water relationship) character of resource management.
- (b) Weak institutional arrangements for coordination and cooperation. There is a general lack or absence of a mechanism to involve the participation of all stakeholders in coastal resources, hence, allowing turf matters to have precedence over the more important matters of coastal management. Governmental agencies or institutions assigned to manage the different water bodies operate under varying principles and

guidelines which are oftentimes conflicting, resulting in total neglect or improper management of water bodies.

(c) Unskilled or inadequately trained personnel. Institutions which have been established to handle development issues, including freshwater and coastal management issues, do not have personnel which are equipped with the appropriate technical and management skills and knowhow to formulate and implement policies, manage programmes and enforce regulations.

(d) Weak planning and management system which considers the environment as only a sector. Many developing countries lack the mechanism to consolidate the various elements of development - social, economic and physical - within a single conceptual framework of development planning and management which considers the environment as not just one of the sectors to be planned but as the integrating factor itself with which and around which issues in coastal management can be addressed in an integrated fashion. While the environment is a sector which requires special consideration, its integrative role is not often understood. This problem could be also due to unskilled or inadequately trained personnel.

(e) Lack of access to information on environmentally sound technologies for decision making in coastal management. There may be loads of information on the latest techniques in coastal management which would be undoubtedly available in print and, recently, also in electronic format which can be accessed via the internet. But many policy and decision makers in Governments are still unaware of such information for several reasons: (e.1) They have not received this information in whatever form; (e.2) They do not know where to get such information; (e.3) They have no access to the internet; or (e.4) They do not have the necessary equipment, i.e., computers to access the internet.

Among the affluent Mediterranean countries who would have the necessary institutions, resources and capacities to manage their coasts, the problems in coastal management would still revolve around people and institutional issues (for how explain the continuing degradation of their coasts?) but, perhaps, with a different character. The problem could be the lack of or weak political will to protect their coastal environments from further degradation, including the political will to elevate the environment into its integrative, cross-cutting role in the formulation and implementation of development policies and regulations to protect the coasts, and to involve their constituencies or stakeholders in the planning and implementation processes.

ESTs for Decision Making in Urban and Coastal Management

Integrated coastal management requires sound planning and decision making which considers the environment as the integrating factor. There are available environmentally sound technologies designed for planning and decision making which can be utilized to address coastal management issues. These are not referred to as technologies for coastal management. These are normally technologies for urban environmental management which would also be applicable to coastal management. And the process of integration between and among sectors would not differ much whether it is used for addressing urban issues or coastal issues.

What are Environmentally Sound Technologies?

Environmentally sound technologies or ESTs are technologies which generally perform better for the environment compared with other technologies. They do not pollute the air, land or water; they recycle or recover their waste; reuse products or produce less waste. They are energy-efficient and cost-effective.(7) However, there are really no hard and fast rules to define or determine what are ESTs. There is only the general rule of thumb - that they do not damage or should do less damage to the environment.

'Soft' and 'Hard' Technologies

ESTs are either 'hard' or 'soft' technologies. 'Hard' technologies refer to the hardware or to the equipment, machineries and physical infrastructures, including their material accessories, to handle waste products (solid, liquid or gaseous) or to monitor, assess and measure environmental quality in the air, water and soil. 'Soft' technologies are the intangibles which support or complement the 'hard' technologies. These include management systems and procedures, policy and regulatory frameworks, economic instruments, environmental monitoring and assessment procedures, environmental performance standards and guidelines, and others. Both technologies are equally important. But the more critical aspect of environmental management whether for urban or coastal areas is understanding the role of 'soft' technologies in the application of the 'hard'

technologies. This is an aspect of integration in planning and management that is, perhaps, less understood. Since generally, the 'soft' technologies are not perceived as necessary prerequisites for the effective application and management of 'hard' technologies, problems of maintenance of equipment and infrastructures and of a consistent application of management systems arise.

Role of IETC

IETC is mandated to promote and facilitate the transfer of environmentally sound technologies for urban environmental management and the management of freshwater resources to developing and 'transitioning' countries. It would like to change the prevailing concept of technology transfer which connotes the transfer of 'hard' ESTs and usually from the developed to developing countries in a totally top-down process. What IETC would like to emphasize and to make people aware of is the need to understand the technology transfer process from the level of the recipient countries by promoting the adoption and use of environmentally sound technologies rather than technology transfer per se. This approach reverses the perception of the transfer process by placing more emphasis on the active rather than the passive role of the recipient. It encourages decision makers in recipient countries to think inwardly in terms of their own needs and to be more cautious and evaluative in importing technologies. It is also instructive to technology providers to consider technology modifications vis-a-vis particular conditions of potential technology users in developing countries, to be more transparent about the implications of the technologies being promoted and to rethink the ways by which they undertake technology transfer.

There are a number of examples of transfer of 'hard' technologies for environmental management to developing countries which have only resulted in unnecessary huge expenditures or in destroying the ecological balance in one sector of the natural environment because of the absence of a multisectoral approach in the design of the facility. Classic examples are the incinerator plants for solid waste in Quezon City and Dagupan City in the Philippines which have become white elephants because their designs are unsuitable to the kind of waste being generated by the cities; and the sewage treatment facility in Nakuru, Kenya which has resulted in a gradual destruction of the habitat of the flamingos in Nakuru Lake, a major tourist attraction providing the main source of revenue for this small town, because the design of the sewage system failed to consider the nutrient requirements of the flamingos and other aquatic life in Nakuru Lake. There would be other examples but these are not easy to find since bad examples of management practices are not normally admitted and do not find their way into the work of researchers.

IETC promotes the value particularly of 'soft' technologies in the search for solutions to environmental problems, stressing that hard technological solutions are not always the right and effective solutions to these problems, but that the understanding, adoption and application of 'soft' technologies will contribute to their effectiveness. IETC's information and capacity building services and activities are geared to promoting 'soft' technologies.

ESTs for decision making

IETC has developed ESTs for decision making in urban environmental management which would be useful and applicable to integrated coastal management. These include management systems and procedures for: Environmental Technology Assessment (EnTA), Environmental Risk Assessment (EnRA) for sustainable cities; and Selection, Adoption, Application and Management of Environmentally Sound Technologies (SAAM-ESTs). These 'soft' technologies are designed for decision makers, policy makers as well as urban managers.

EnTA is a technology choice tool which follows a rationalized process from needs analysis to identifying alternatives prior to making a final technology choice. It puts a premium on the importance of evaluating several technologies or alternatives which include management systems and procedures ('soft' ESTs) and not just a technological solution. It emphasizes the need to evaluate technologies in terms of the impact on the institution or institutions which will adopt the technology - on their capacities or lack of it to sustain the system - as well as its impact on the community in which the technology will be operating.

EnRA is an environmental planning and management tool which shares the objectives of environmental impact assessment (EIA) but is more focused and less rigid because it does not impose legal restrictions as EIA does. Similarly with EnTA, EnRA is a process. It is a process which provides the basic principles and guidelines to resource management by understanding the risks and implications of the risks to the health of humans and the ecosystem from a degraded environmental resource that may be caused by the introduction of a new technology or infrastructure.

SAAM-ESTs is also a planning and management tool to guide technology users through the whole gamut of selecting, adopting, applying and operating the selected technology. It uses the technology assessment process of EnTA and proceeds to the next steps of the need to evaluate local conditions, socially, culturally,

economically and politically to ensure a smooth transition from the old to the new or modified system, and on to the final steps of systems application and operation.

IETC promotes and facilitates the adoption and use of environmentally sound technologies in three ways: (1) through information services; (2) through capacity building services; and (3) by building partnerships for technology cooperation.

Information services

IETC disseminates information on ESTs through the print and electronic media as well as through seminars. It has produced an "International Source Book of Environmentally Sound Technologies for Municipal Solid Waste Management" and "Regional Source Books for Freshwater Augmentation". It has in its publication pipeline an "International Source Book of Environmentally Sound Technologies for Waste Water and Storm Water Management", an "International Source Book of Environmentally Sound Technologies for Air Quality Management", and a "Guidebook for Planning and Management of Lakes and Reservoirs to Address Eutrophication". Through its Technical Publication Series, it disseminates information on specialized technologies and reports of workshops and seminars. It also publishes a quarterly newsletter which provides updates on selected themes related to freshwater and urban environmental management as well on IETC's activities.

To facilitate information dissemination and exchange, IETC has developed an electronically searchable EST directory which is complemented with a software called maESTro. The EST directory and maESTro contain three databases on ESTs - institutions, information systems and technologies. MaESTro which contains the directory is structured by region, country and by type of information and can be cross-referenced. MaESTro provides benefits to users of ESTs in several ways. These are: (1) It improves access to information on ESTs by making the information obtainable through the internet for internet users, through CD-ROMs for non-internet users, or through the conventional printed reports in the absence of a computer. Unlike other information systems which are purely internet-connected, maESTro is flexible. It can put information on ESTs into the hands of decision makers and other users of information whether they have access to high tech information technology or not; hence, making it useful especially to decision makers in developing countries which may not even have a computer. (2) It is a dynamic information system which has the capability to give information as well as to receive information. As such, it facilitates the exchange of information between technology users and technology providers through the maESTro website and CD-ROMs. It only requires that users avail of DIF (data interchange format) to establish compatibility. (3) It contains information on ESTs from all over the world and not from a single or selected technology providers. As such, it provides technology users with an array of potential technology alternatives. And, (4) It is cheap; for Governments, it is free of charge.

Capacity Building Services

IETC is not a training institution but it develops training modules on the use and application of environmentally sound technologies to address general as well as specific issues on urban environmental and freshwater management and conducts regional or global pilot training activities to test the modules. The training modules are designed especially to build or enhance the capacities of decision and policy makers to make informed technology choice as well as to build or enhance the capacities of urban managers and freshwater managers to appreciate the value of ESTs and to understand the process of EST selection, application and operation. Already developed and pilot tested in several regions are the training modules for EnTA, EnRA and SAAM-ESTs as well as a training module for municipal solid waste management. Other training modules being planned for development and pilot testing are training modules for waste water and storm water management, on freshwater augmentation technologies and on planning and management of lakes and reservoirs to address eutrophication.

An important part of IETC's capacity building services is the extension of technical and policy advisory services to Governments, upon their request, on environmentally sound technologies to address their particular urban environment or freshwater problems. IETC is presently working on a request from an academic institution in Southeast Asia which is engaged in environmental studies to help them design a demonstration facility for waste management in its new campus.

Partnerships for technology cooperation

Since IETC is a small Center with a global responsibility, its main strategy to be able to reach and serve as many developing countries as possible is building partnerships within UNEP, with other UN agencies, with

Governments as well as with national or regional training/academic institutions and professional associations to undertake research and publications, disseminate information, develop and pilot test training modules and extend technical or policy advice. The sharing of limited resources and expertise with other institutions expands the capacities of IETC's limited resources as well as those of the partner institutions, amounting to a mutual satisfaction. Partnerships for capacity building have been developed with academic and training institutions in Asia Pacific and in Africa and, hopefully, soon in the Caribbean and Eastern Europe. IETC's current partners include its supporting foundations - the Global Environmental Center (GEC) and the International Lakes Environmental Committee (ILEC); the Water Branch, Industry and Environment Office, the Regional Offices of UNEP, and soon also with the Regional Coordination Unit of the Caribbean Environment Programme of UNEP; UNCHS, UNDP and WHO; and a number of public institutions in Africa, Asia Pacific, West Asia and Europe.

Conclusion: Prospects of Cooperation for Education and Training in the Mediterranean

There are two key factors which may contribute to an effective integrated coastal management - access to information on environmentally sound technologies applicable to ICM and the capacity to make informed technology choice, including the capacity to use and manage technologies. These are areas where prospects of cooperation for education and training in the Mediterranean can be explored with IETC. IETC's information system on environmentally sound technologies and its tool maESTro would be an excellent instrument for generating awareness on environmentally sound technologies for urban environmental management which are applicable to ICM as well as for facilitating information dissemination and exchange. MaESTro will provide access to ESTs that are applicable to ICM; it can be a useful material for training and teaching environmentally sound technologies for ICM to a variety of audience; and it can be useful as a general reference for planners, researchers and academicians who are interested in environmental management. IETC's training modules on EnTA, EnRA and SAAM-ESTs can be adapted to suit the requirements of ICM. Specifically designed for training decision and policy makers and urban managers in urban environmental management, these planning and decision making tools can be applicable to ICM with modifications. IETC's training modules on municipal solid waste management and on waste water and storm water management would be also useful for short term training courses in urban environmental management where ICM would be an important component. IETC will be prepared and will welcome developing partnerships with training and academic institutions, governmental or non-governmental, which will be interested to collaborate in these areas for education and training in ICM for the Mediterranean. Prospects of collaboration could include: (1) Developing a training or teaching material with maESTro as source of information and guide for training or teaching. (2) Adapting or retooling the 'soft' technologies developed by IETC to make them more focused on ICM. This may require developing new training modules for the purpose. (3) Conducting jointly a pilot training programme on ESTs for ICM in the Mediterranean. And (4) preparing and publishing a guidebook on environmentally sound technologies for ICM that is designed for local authorities. IETC will be open to other ideas of collaboration in relation to environmentally sound technologies for urban management and ICM. To reiterate, IETC is a global center which promotes ESTs globally and regionally. Based on its mandate, it is prepared to extend assistance in its areas of expertise to developing countries in the Mediterranean and to work with interested groups and institutions towards this end.

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