

Integrated environmental management

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IN THE EARLY twenty-first century many cities in third world countries are expected to double or more in size because of accelerated population growth and migration of people, resulting in increased environmental, economic and social problems. The challenges for these countries will be to manage and protect the land quality, water resources, sanitation and other environmental facilities, and to provide new environmental services for those who are now without them. Environmental degradation, especially in the water resources sector, is a significant problem in many countries of Asia and this has been mainly associated with rapid urbanisation, poor sanitation infrastructure, deforestation of river catchments and various land use patterns. There are even predictions that a world water crisis will develop by the middle of the twenty-first century because of soaring demand for water (Falkenmark and Lindl, 1976).

Environmental degradation

Every human being lives within a complex community of organisms on earth. One of the primary goals of environmental management is to establish ways to avoid disturbing the delicate balance of biological systems that support human life. Ecological disturbances in the riverine environment have been caused by the construction of large dams, hydropower schemes, dykes and levees, diversion canals and vast irrigation systems. Also, the river ecosystems are poisoned by industrial chemicals and agricultural runoff. Although ecologically sustainable development is beginning to be considered in conjunction with industrial development, there is doubt as to what will be achieved because of lack of integrated environmental planning and management. For example, China is so engrossed in economic development that it has overlooked the environment. In South China the smoke belching from the "economic zone" factories obscures the daylight while the Pearl River depicts signs of severe pollution. In other parts of China, such as in Sichuan, it is hard to find a hill that has not lost all its trees cut to supply the building industry which is hence the cause of massive soil erosion and silting of many waterways.

In the Philippines some of the rivers are already dead and more than 75 per cent of the rainforest has been destroyed, causing severe erosion problems and reduction in biodiversity, while only around 20 per cent of the forests remain in Thailand. Also, air pollution from motor vehicles is at unacceptable levels in Bangkok causing respiratory diseases. The Indian sub-continent is not free

from environmental problems. There is water scarcity and pollution associated with population pressure and industrialisation, soil erosion linked to deforestation and agricultural activities and social problems arising from resettlement of people for river hydro schemes. Despite the fact that India has been one of the great dam builders this century with more than 1600 large dams constructed for irrigation and hydropower, major flooding still causes loss of life and reduces agricultural production. The main cause of water supply problems has been identified as due to the lack of co-ordination between responsible departments (Arthur, 1995). Water quality is a catchment management issue with geographical complications. Rivers receive sewage discharges as well as diffuse pollution from urban and agricultural areas, and the population downstream receives upstream contamination. This creates problems where the rivers cross national or state boundaries because the control of pollution becomes a political issue.

Rationale for integrated environmental management

Various land uses can have significant implications for water quantity and quality and many benefits and disasters on the land are linked to water. Thus it is much easier to resolve problems by considering water, land, vegetation, fauna and other natural resources together, rather than focusing on each in isolation. There are government departments and agencies which have been established with roles which focus on a specific resource. For example, one department is responsible for water, another for land management and soil conservation, another for natural resources and environment, and yet another for energy. Each of these organisations has a role in environmental management and the resulting overlap of responsibilities, together with lack of co-ordination usually result in the activities of one organisation accidentally undoing the work of another. In Australia the present arrangements for stormwater management in the Sydney area require co-operation and co-ordination between various authorities. A number of stormwater problems have been caused by the lack of co-ordination among the agencies responsible for stormwater services, primarily in the areas of urban planning and development. There is fragmented ownership, management and control of drainage infrastructure, and many authorities duplicate actions with varying impact on the stormwater services (Urban Stormwater Pollution Task Force, 1994). A proper

environmental management plan will eliminate such problems by co-operation and co-ordination between city councils who manage the stormwater services, and water boards or river authorities who manage the rivers which receive the polluted stormwater. Integrated environmental management is a process which recognises the relationships among natural resources and its aim is to integrate the management of land, water and related resources in order to achieve the sustainable and balanced use of these resources. It is a useful tool when management of one resource can have implications for other resources and their users, and when multiple interests with conflicting goals are involved. Benefits of integrated environmental management can be classified as:

- improved land productivity;
- efficient water management;
- maintaining biodiversity and protection of aquatic ecosystems;
- increased conservation of natural resources;
- enhanced environmental protection; and
- improved productivity and activities based on sustainable development.

Planning and implementation

Integrated environmental management involves everyone from individuals to governmental and non-governmental organisations. The participants in the process can be classified as:

The community:

- individual persons;
- landholders;
- local environmental care groups in urban or rural areas;
- conservation groups;
- community interest groups.

Institutions:

- educational establishments;
- research organisations.

Industries:

- food processing;
- manufacturing;
- chemical;
- mining.

Local government:

- city councils;
- village councils;
- community health service.

State government:

- environmental authorities;
- road and transport authorities;
- water and river authorities;
- agricultural agencies;

- health agencies.

Federal government:

- Ministry of Environment;
- Ministry of Health;
- Ministry of Industries.

Politicians:

- at all levels.

All the participants in the process are involved in planning, implementation, action, and monitoring and evaluation. The inter-relationship among the participants and the various activities is illustrated in Figure 1.

A surface water catchment represents an example of a naturally-defined land system or natural resources ecosystem. At any given time it may be occupied by a specific population of flora and fauna, and humans. It is the human kind who disturb the natural balance either by population explosion or by various land use patterns. Over population is in almost all countries, the direct cause of serious environmental damage. Thus population control should be one of the aspects of environmental management. In order that an environmental management plan for a catchment is successfully prepared and implemented, a mix of governmental and non-governmental organisations and individuals have to become involved in the planning and implementation process. This requires proper organisation.

Individuals should have a responsibility to ensure that their activities do not have detrimental effects in their catchment and they should contribute to the resolution of catchment-wide issues through the establishment and participation in local environmental care groups. The form and structure of such a group can vary from an informal group to a more complex, formally established committee. The informal group comprising of some concerned citizens is suitable to deal with simple issues such as establishing riparian vegetation, local erosion control, litter control and dealing with local traffic and noise problems. A complex lake or river management problem involving point source and diffuse source pollution from a variety of land uses in the catchment is most likely to require involvement of a formally organised committee comprising of individuals, public agencies and private organisations. A surface water catchment may be divided into a number of sub-catchments, each managed by an environmental care group and these groups should aim not only towards remedy or restoration but should concentrate on preventative measures as

The environmental co-ordinating committees need to be more formal than environmental care groups and are to be established to address the complex environmental management issues that involve many environmental care groups, other community groups and government agencies. These committees should consist of representatives of the major sectors of the community, institutions,

agencies, industries and governments which are engaged in, or affected by the management of natural resources in the catchment.

Appropriate environmental management strategies should identify the important land and water issues in the region and contain recommended actions to address specific issues through governmental support and community organisations. The assessment process is important and there should be ongoing monitoring and research as implementation proceeds with a follow-up strategy.

Conclusion

Integrated environmental management is a useful tool to deal with the present environmental problems as well as the environmental challenges facing the twenty-first century. The process recognises the interaction and interde-

pendency of the participants and the resources in the management of the issues relating to the environment. The success of such a plan is achieved by a balance between economic development, protecting natural ecosystems, providing appropriate environmental services and satisfying social values.

References

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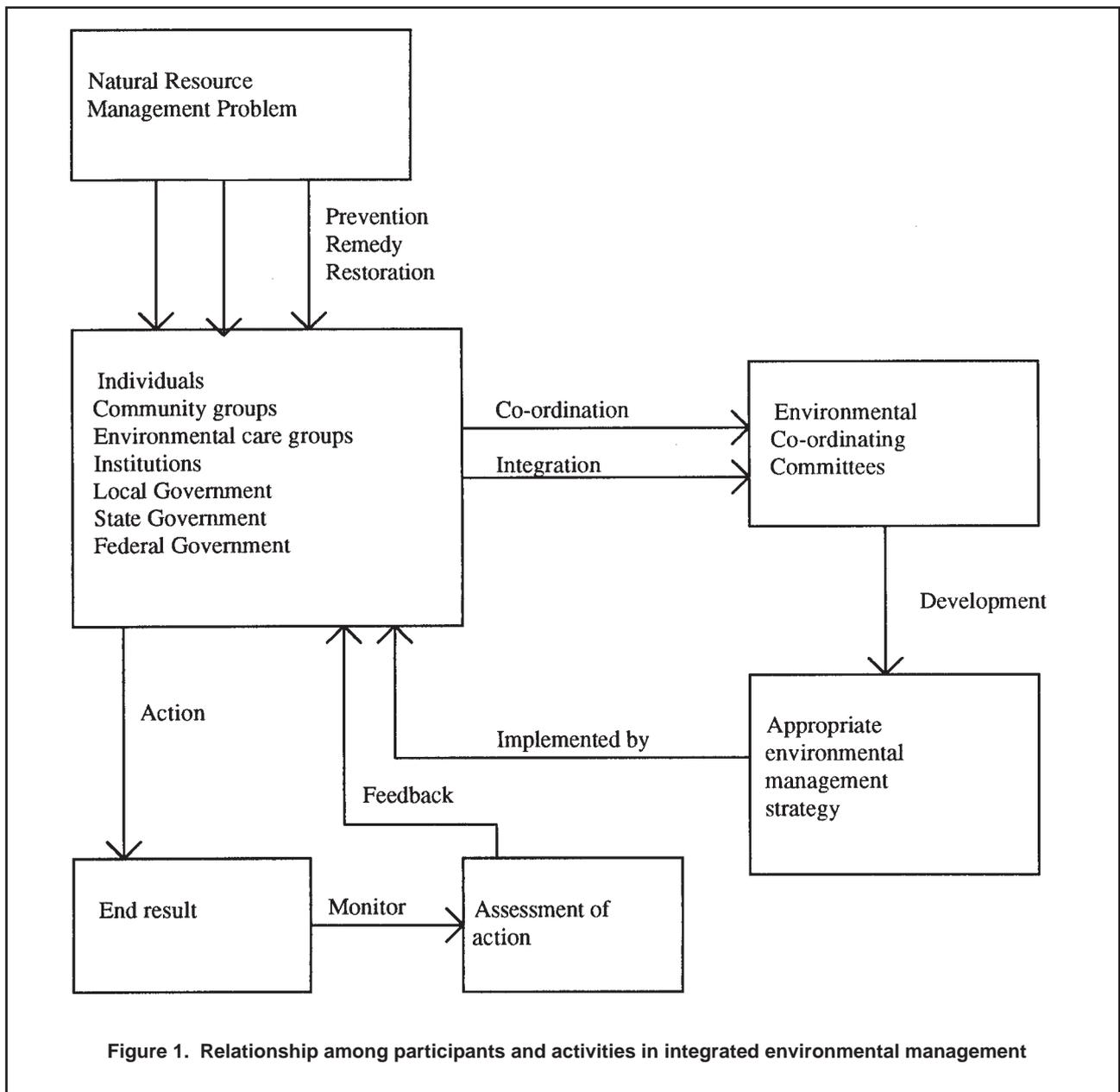


Figure 1. Relationship among participants and activities in integrated environmental management