

An idealized rural coastal zone management integrating land and water use

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Living off “nature’s interest” rather than “nature’s capital” is the underlying theme of sustainable development. Future generations should not inherit less environmental capital than the present generation.

Sustainable development as defined by FAO is “*the management and conservation of the natural resource base, and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development conserves land, water, and plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable, and socially acceptable.*”

The sketch on pages 16-17 is an idea of a thriving rural community with an idealized coastal zone management program (Primavera, in press) integrating its many livelihood sources—fishing, aquaculture, agriculture, forestry and others.

The coastal area is defined by Sorenson and McCreary (in Clark 1996) as the interface or transition zone where “part of the land (is) affected by its proximity to the sea and (where) part of the ocean (is) affected by its proximity to the land ... an area in which processes depending on the interaction between land and sea are most intense.” It includes floodplains, mangroves, marshes and tideflats as well as beaches and dunes and coral reefs.

Owing to its low altitudinal level, the coastal zone is a most vulnerable area to changes wrought by nature and man. Whatever pours on the hinterlands finds its way to the sea, whatever swims in the depths of the ocean, drifts its way up to the shore. Being the borderline between land and sea, it is the place where terrestrial-type planning and resource management programs are at their weakest (Clark, 1996).

For this reason, some countries have formulated special integrated coastal zone management (ICZM) strategies which seek to both manage development and conserve natural resources and integrate and coordinate the relevant people sectors and their functions and roles within the bounds of this rich realm.

Concerns that may be addressed by ICZM (as identified by the Philippine government, Clark 1996) are:

Natural resources degradation: beach erosion, conversion of mangrove swamplands into other uses, landfill or reclamation of foreshore areas; dynamite fishing; overfishing; and overexploitation of mangrove forests.

Pollution: industrial, domestic, agricultural and other sources.

Land use conflicts: human settlements encroachment on foreshore lands; unusable beach areas due to excessive pollution; conservation and preservation of mangrove areas vs. conversion of the same into fishponds, or reclamation of the same for human settlements and commercial purposes.

Destruction of life and property by natural hazards: flooding due to storms, earthquakes, tropical cyclones and tsunamis.

The background realities of some prevalent sources of environmental impacts (livelihoods) and recommendations to the concerns they raise in relation to the coastal zone management follows.

AGRICULTURE

The United Nations Environment Programme (UNEP) in 1992 reported that productivity gains have been largely achieved by way of the “green revolution”—technological packages which require use of high-yield varieties (HYVs)



of seeds and high inputs of water, fertilizers and pesticides. World consumption of chemical fertilizers and pesticides have rose to more than double in two decades (1970-90). About 50% of fertilizers and more than 90% of pesticides do not benefit the plants but are lost to soil, air and water. These eventually find their way to coastal waters. There, fertilizers create widespread eutrophication, generating dense algal growth in the surface. Pesticides, on the other hand, build up through the food chain and risk the life of humans.

Countries need to pursue development and implementation of environmentally sound agricultural development. Agricultural research centers around the world (FAO, UNEP, IRRI, etc) must study ways and means of increasing agricultural productivity in an environmentally sound manner. For input management, farmers must practice proper timing of fertilizer and pesticide application, and integrated pest management (IPM) techniques.

AQUACULTURE

Aquaculture can be divided into two categories: land-based operation (ponds, tanks) and open-water operation (cages, pens, rafts, stakes).

Environmental problems associated with coastal aquaculture include introduc-



tion of exotic species, destruction of coastal habitat and nursery areas for endemic species, disruption of hydraulic flows, pollution of coastal waters, over-harvesting of naturally occurring seedstocks or broodstocks, and aesthetic considerations (Clark, 1996).

Open-water culture by cages and rafts may hinder boat traffic and navigation while being considered offensive aesthetically. It may also hamper capture fishing operations.

To minimize sectoral conflicts arising from these concerns, it is important to consider site selection in both cases. In mangrove areas, the pond site should be located behind mangrove forests (+100 meters if possible) and when available, in areas defined as salt flats or pans for better production and environmental protection (Kittel in Clark 1996). Kittel also advised the construction of hatcheries if natural seed stocks in the wild are overtaxed; proper monitoring of feed; compliance with the ICZM master plan; increased efficiency of pond production; monitor and control of disease outbreaks; and a detailed analysis of amounts of polluting substances to be discharged and their effects on water quality. He also declared remote areas as least controversial sites for net, cage, stake, or raft-type aquaculture where there is minimal conversion of existing natural habitat and where there is least space competition.

Sustainable aquaculture studies done by Kautsky et al. (1997) in Colombia have specified an ecological footprint or ecosystem support area 35-190 times the size of a semi-intensive shrimp farm in a coastal

mangrove area. These studies showed that for every square meter of shrimp pond, there must be a 9.6 to 160 m² mangrove ecosystem whose purposes are to supply shrimp postlarvae, provide mangrove detritus as 30% shrimp dietary requirement, and assimilate eutrophication nutrients (phosphorus and nitrogen) released by the pond; a 14.5 m² sea area or marine ecosystem to support fish catch for pellet feed manufacture; a 0.5 m² agricultural ecosystem to provide the vegetable component in feed; a 7.2 m² mangrove lagoon for the annual water supply; and a 0.8-2.5 m² forest area to sequester carbon dioxide released by the pond.



FISHERIES

Fisheries supply 23% of all animal protein consumed worldwide (Clark 1996). Ninety percent of the estimated fish production in 1990 from marine areas came from coastal areas. A strong domestic fishery program promotes self sufficiency and reduces the outgo of foreign exchange. Also, profitable coastal fisheries reduce rural population migration to already crowded cities (UNEP 1992).

Clark (1996) characterizes fisheries of developing countries as mostly small-scale and artisanal in form, labor-intensive, largely conducted by too many craftsmen with low incomes and production quality levels, poor mechanical sophistication, limited fishing range, insignificant political influence, constrained market outlets, and restricted social mobility and employment opportunities. It employs millions of

full-time professional fishers, grouped in villages along the coasts of developing countries. In Asia, only 1/3 of these fishers own boats; 2/3 own some kind of fishing gear, while 1/3 own neither boat nor gear. Fishing families have incomes below those of many other groups in rural sector activities (Clark 1996).

Faced with declining catches, due partly to mangrove loss and to competition from aquaculture's appetite for wild seedstock and from bigger trawlers, small-scale fishers usually resort to wholesale resource destruction to maintain their usual output. This may involve "the use of gears and of mesh sizes not sanctioned by government and by fisherfolk communities and/or catching of fish "reserved" for a certain segment of the community; use of gears that destroy the resource base; and use of "gears" such as dynamite or sodium cyanide that destroy habitat and endanger the fisherfolk themselves" (Clark, 1996).

A possible solution to the burgeoning population of fishers is to provide alternative employment opportunities for some who are willing to abandon their trade. For the rest who decide to stay, opportunities for organizing must be provided them for a better community-based management of fishery resources. Also, to avoid a complete ban on "overfished areas," a keep-off zone somewhere between the areas for artisanal fishing and commercial trawling should be imposed by government to enable marine organisms to replenish their stocks. The use of destructive fishing methods should be sanctioned and harvest control management techniques should be employed.

FORESTRY

Forests cover 3,625 million ha or 27.7% of the total ice-free land of the world. Of these, 53.4% are tropical forests (UNEP 1992).

In the tropics, deforestation has been increasing due to the expansion of agricultural land and overexploitation for fuel wood. During the period, 1981-90, FAO



(UNEP 1992) recorded the annual deforestation rate at 16.8 million ha. Tropical forest loss affects millions through flooding, soil erosion and silting of waterways, drought, shortages of fuelwood and timber and displacements of societies and cultures.

The release of the greenhouse gas carbon dioxide into the air through the cutting of trees and the act of burning causes a rise in regional and world temperatures. Global warming brings hurricanes to coastlines and increases beach erosion and flooding by elevating the sea level. The El Niño is a rapid ocean warming along the Pacific equator caused by this climate shift.

To counter the negative effects of deforestation, it is important to protect remaining tropical forests, improve forest management and plant more trees. Traditional non-destructive rainforest technology such as rubber tapping and agroforestry must be practiced to achieve higher economic returns than logging, slash and burn agriculture and cattle ranching.

Mangrove buffer zone and greenbelt area. There are about 24 million hectares of mangroves in subtropical and tropical areas of the world. They are a rich source of detritus which is food to shrimps and some fishes. The mangrove forest is a valuable physical habitat for watchbirds, shorebirds, alligators, tigers, deer and monkeys, crabs, shrimps, fishes, invertebrates and insects. Mangroves are also good sources of medicinal com-

pounds. They act as a buffer zone against tide surges, absorb pollutants and stabilize coastal shorelines that would otherwise be subjected to erosion. Since they are intertidal species, they belong to the sea, and as such are regarded as common property and are heavily used for subsistence—timber, pulpwood, firewood and honey products (Clark, 1996).

The aquaculture boom, however, in Southeast Asian countries has converted the once extensive mangrove forests into ponds. Snedaker (in Clark, 1996) accounts that in the Philippines alone, 80% of mangrove loss can be attributed to aquaculture development.

Philippine Presidential Decree 705 otherwise known as the Forestry Code, favors the retention of exclusion from fishpond development of a 40 m wide buffer strip along rivers and other water bodies and 100 m belt facing bays or the sea (Primavera 1993). All mangrove swamps set aside as buffer zones for coastal protection shall not be subject to clear cutting operation. Mangrove swamps released to the BFAR for fishpond purposes which are not utilized or have been abandoned for five years shall revert to the category of forest land (Bonpin 1993).

Communities, aside from maintaining a buffer zone of mangroves may also engage in strip planting of shorelines to create “greenbelts” of trees to control erosion and reduce the effects of storm surges. This gradation of trees species from the water’s edge going inland, starting with mangroves, then coconuts, bananas and other plant species may benefit further the cause of biodiversity and be a source of food (Clark 1996).

HUMAN SETTLEMENTS

The village is the single most frequent form of human settlement. Cities and towns are far fewer than villages, isolated farmlands or herding camps. In 1970, 62.9% lived in



rural areas; in 1990, 57.4% and in 2025, it is projected to be 40% (UNEP, 1992).

The United Nations Environment Programme (UNEP) reports that in rural communities, houses are below standard and made of mudbricks, bamboo, wood or any locally available material. In 1990, 988 million people worldwide had no access to clean water while 364 million had no sanitary facilities. Electricity is rare and wood, agricultural residue and cow dung are used as fuel.

The phenomenon of acute shortage of housing in urban areas has 75% of the population unable to afford normal standard buildings. In developing countries, the average rate of occupancy is 2.4 persons per habitable room in contrast to 0.8 in developed countries. Slum and squatter conditions also proliferate in these cities, the abode of the marginally uneducated, undernourished, chronically ill and underclass “urban poor”.

Daily per capita domestic refuse generated in these developing countries is 0.4 to 0.9 kg. If not disposed properly this find its way into the groundwater supply, and rivers and seas, polluting them and rendering them lifeless.

There is a need therefore for governments to look into the planning and implementation of an increase in sanitary facilities; improvement of the standard of dwellings, garbage disposal efficiency, and the quality and incidence of potable water; extension of electrical power to the countryside and the enabling of lower income families to afford decent living quarters.



TOURISM

UNEP noted that tourism is big business worldwide. It is one of the potentially largest sources of employment in the world. However, it is important to note that it is not tourism that leads to development but the country's development that makes it profitable.

Nature tourism or ecotourism yields direct financial benefits that outweighs the development and cost of maintenance and stabilizes employment and economic development in surrounding areas.

Some mass tourism projects such as those that promote sand and sea suffer from deterioration and irreversible damage when their carrying capacities are exceeded. These are evidenced in the discharge of large amounts of sewage into the sea which reduce marine populations and renders the quality of waters not acceptable for bathing; damage to coral reefs; and water and electricity shortages.

Proper beach management includes the protection of both natural processes that supply beach with sand and sand storage capacity for beach elements themselves. Removal of sand, improper building or blocking of sources of sand replenishment may severely damage or obliterate the beach. Taking sand from any part of the beach should therefore be prohibited or tightly controlled. Sand replenishment or artificial beach nourishment may be the main hope for the restoration of badly eroded beaches.

Long term and environmentally sound

planning to preserve the balance between development and safeguarding the environment will make tourism sustainable (UNEP 1992).

TRANSPORT INDUSTRY

Transport is an essential component of social and economic development. Today more people travel over greater distances and more cargoes are transported around the world than ever before. UNEP reported that worldwide, the transport sector accounts for about 30% of total commercial energy consumption of which road transport alone consumes 82%.

Cars, trucks and buses which emit major air pollutants that contribute to greenhouse gas generation and are responsible for various lung ailments, also are a major source of noise. Oil pollution of the marine environment results from discharges of barges and ships.

Increasing energy efficiency, controlling fuel emissions, employing regulatory measures, switching to public passenger transport systems and reducing highway speed limits are some ways to save costs for fuel and minimize pollution.

RECOMMENDATION

The world is said to be essentially divided into two: the *haves* and the *have nots*. The *haves* who perceive resource supply as plentiful pursue eagerly development and as a consequence, accumulate too much waste. The *have nots* who only expect a scarcity in resources, are mainly concerned with surviving the harshness of environment, and as a result are largely responsi-

ble for its destruction.

This world view sees the *haves* thriving profitably from environmental pollution and decay (high rises amidst squalor), while the *have nots* earn their living from garbage and smut (scavengers). Each one aggravates the other's life. Everyone with not much thought for tomorrow.

How would succeeding generations live?

It would be a good idea if government, environment and development planners, scientists and scholars huddle together and try to achieve a workable balance between environmental conservation and sustainable development before Earth comes to chaos. These visionaries could conceive of a model community with structures and prescribe the right proportions and specifications for it. In these major decisions they should take into account and incorporate indigenous grassroots thinking and practices to truly represent all sectors and evolve a participatory consensus. They must recognize media's role in increasing public awareness to fully convey the importance and implications of these.

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