



PART II

**SELECTED TOOLS FOR
ENVIRONMENTAL MANAGEMENT**





Chapter 7

Conservation and Natural Resource Management

Introduction

The history of conservation and natural resource utilisation is as old as the human race. Interestingly, it is characterised both by the nullification of the user rights of communities, and by devolution of power to the communities. On the one hand, nullification of user rights was a measure adopted by many nations to control access to natural resources, ostensibly for the purpose of management. But it was obviously also a strategy for the monopoly of substantial amounts of the benefit accruing from resource exploitation. On the other hand, devolution of power to the communities was necessitated by the realisation of some governments of their inability to effectively and efficiently control resource exploitation, and of the costs and risks associated with the responsibility. This highlights the significance of the generally held view that the success of natural resource management (NRM) depends on the involvement and active participation of communities that traditionally or naturally have rights of access and use of resources to satisfy their basic necessities, hence the term 'community-based natural resource management'.

Today, natural resource management has become important, especially to NGOs around the globe. The role of these NGOs is to encourage the devolution of power to rural communities by reluctant governments, and in building the capacities of communities. But despite their efforts, problems still abound around the management of natural resources in many parts of the world. This chapter highlights some of the problems as it attempts some definitions, classifications and arguments associated with natural resource utilisation.

Definitions

Natural resources are all the natural items (organic or inorganic) that provide our sources of food, medicine, building and ornamental materials necessary for our daily lives and pleasures. This definition, though simplistic, especially from an ecological perspective, is apt within the context of NRM. Although non-human living organisms utilise a wide range of resources, the combined ecological consequences of their utilisation are minor compared with human use.

Debates in conservation and NRM circles emphasise that a world without humans would leave the earth and its resources in their usual dynamic but self-sustaining state. We humans are by nature omnivorous and insatiable. With our rapidly increasing populations and growing demands, humans present a mounting threat to the earth and its limited resources. Fortunately, as humans are also, relatively, the most intelligent living creatures on the planet, we are capable of managing these resources.

Conservation and NRM are synonymous, both referring to the utilisation of natural resources in ways that allow the present generation to satisfy their needs, and make it possible for future generations to satisfy their own needs (Begon et al. 1996; Neba, 2005). Conservation, or NRM, is the sustainable management or conservation of natural resources. The process involves preventing resources from rapid exploitation and pollution. Resource depletion results from over-exploitation and/or from poor harvesting. Over-exploitation is closely linked to what may be described as economic warfare, characteristic of open-access regimes, which, at the micro-level, force individuals to increase their rate of exploitation in order to maximise their profits (Hardin 1998). Poor harvesting is a feature of societies that still employ unsound exploitation techniques, due to the absence of modern or improved alternatives.

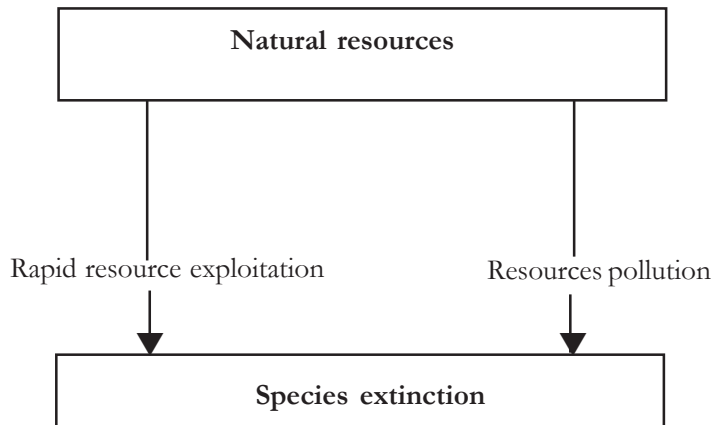
Economic warfare, at the macro-level, encompasses three main types of continuous and never-ending struggle: 1) the struggle by developed countries to maintain their position on the top rung of the economic ladder in order to continue to enjoy their dignity as super powers; 2) the struggle by developing countries to also reach the top rungs of the global economic ladder in order to gain recognition as super powers; and 3) the struggle by the undeveloped countries to get out of the abyss of poverty in order to seek ways of developing and liberating themselves from characteristic aid-dependent mentalities.

Let us turn to the question of resource pollution. This can be described as the unavoidable economic by-product of using chemicals, or of embarking on genetic manipulation or engineering without proper care, but with the primary aim of achieving maximum resource yield. Often, polluting chemicals are manufactured. They are readily preferred by the poor consumer nations, because they are cheap. However, the lack of political will in the application of sound technologies by the manufacturing nations, the weakness of international legislation to control manufacturing, marketing and use of the chemicals, and the low awareness levels of a majority of the poor countries about the real human impacts of these chemicals contribute to their continued manufacture and use.

As intelligent humans, it is incumbent on us to take precautions as we observe the obvious signs of rapid resource depletion and pollution. Either of these situations can eventually lead to an irreversible phenomenon known as extinction (Figure 7.1). Rapid depletion results from the fact that when resources are over-exploited, very little or no room is allowed for their regeneration. Pollution either destroys resources directly, or suppresses their ability to function properly and regenerate.

Regeneration, however, is not characteristic of all natural resources. We shall now consider their classification in order to establish where this term actually applies.

Figure 7.1: Rapid Exploitation and Pollution of Natural Resources Lead to Extinction



Classification of Natural Resources

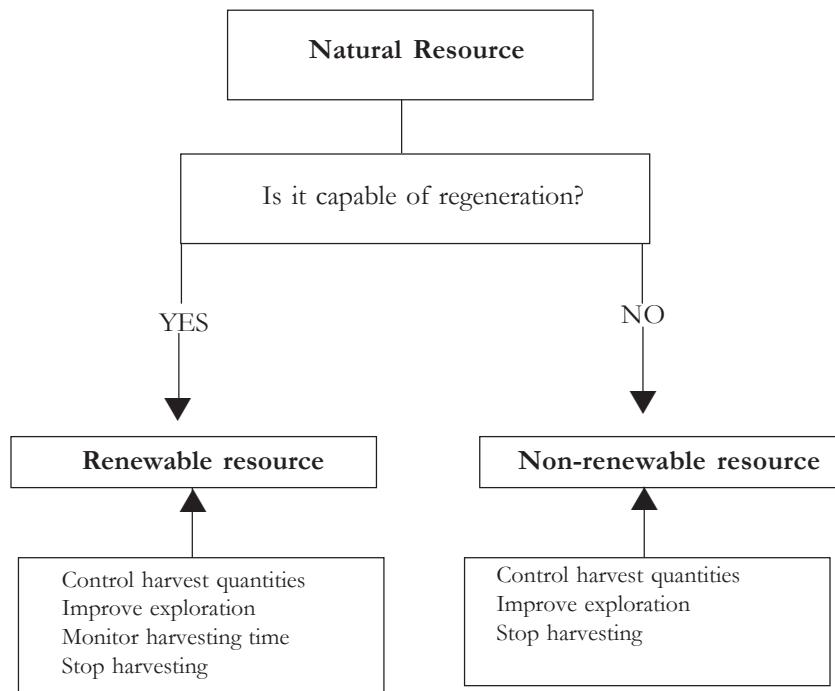
We are familiar with the classification of resources as biotic and abiotic. This classification is common to all biological texts. It simply illustrates whether a resource is composed of living or non-living materials, and whether the resource itself is living or not. In NRM, this classification is extended to include what these resources are capable or not capable of: what is their economic interest to us. Our concern is whether as we continue to exploit these resources, whether they are able to regenerate, or not, hence their broad classification as renewable and non-renewable. Renewable resources are those whose stocks are capable of being decreased, through intra- and inter-specific interactions and human interference. They can increase within the carrying capacity of the ecosystems in which they are found, as a normal or compensatory response made possible by their potential to regenerate or renew their stocks, such as a forest or a population of animals, if and when the impacts of competition or exploitation are within tolerable thresholds.

It should also be noted that resources exhibiting continuous flow through time, such as the energy from the sun, and the waves or tides, are also considered renewable (Pearce and Turner 1990). However, we have no influence or control over these continuous flow resources. Their consideration in NRM is not for their management per se, but for their potential uses as alternative energy. Similarly, non-renewable resources such as mineral resources, including fossil fuels, cannot regenerate their stocks, and deserve proper care in harvesting them. For instance, once an oil well or a coal mine has been exhausted, it cannot be replenished.

Renewable and non-renewable resources may both play equally important roles in our subsistence and economic lives. However they pose completely different problems and challenges to our management strategies. It goes without saying that

the challenge to managing non-renewable resources is far greater to manage renewable resources. Figure 7.2 provides an illustration of how to distinguish between renewable and non-renewable resources, as well as some strategic management options that could be applied to each of these classes.

Figure 7.2: Some Options for Managing Renewable and Non-renewable Resources

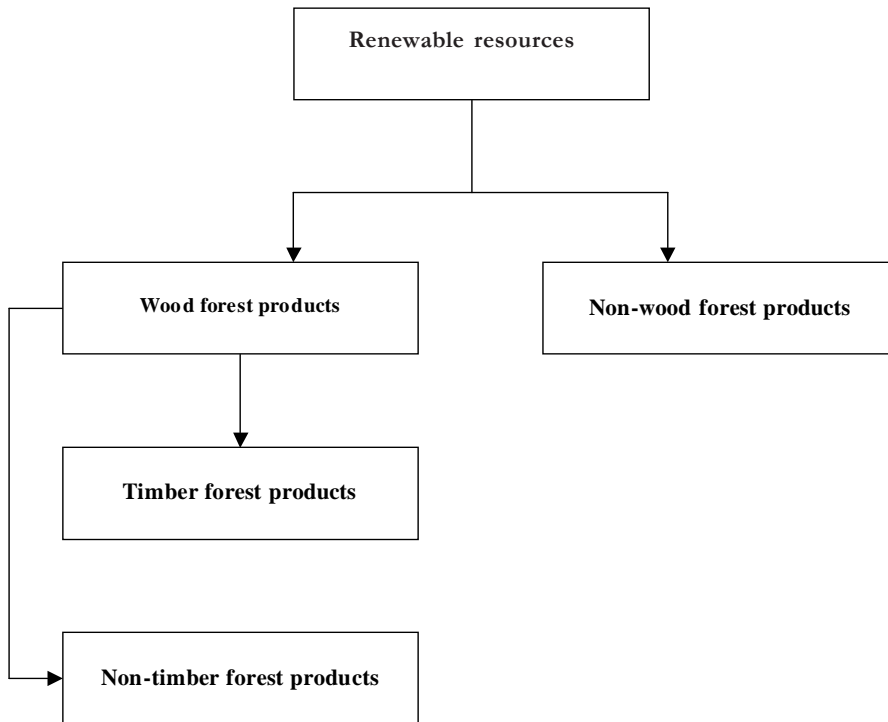


Conservation, or NRM, should, as a matter of principle, focus mostly on non-renewable resources, while paying proper attention to renewable resources, because they hold more promise for sustainability, if properly managed. Although the latter have the potential to regenerate, human exploitation rates may far exceed their regeneration rates. Exploitation techniques employed may be too incompatible with the facilitation of their regenerative capacities. *De facto*, the over-exploitation or the application of poor exploitation techniques could render renewable resources 'non-renewable', hence the imperative to promote the sustainable utilisation of renewable resources. To guarantee this requires not only the application of legislation and development of regulatory mechanisms, but also the implementation of studies to properly understand their ecology, the promotion of capacity building and institutional strengthening efforts geared towards NRM at local, national and regional levels.

This century has seen an explosion in capacity building and institutional strengthening on the part of governments and NGOs, as well as important studies of a broad range of natural resources. One result has been their classification into wood

forest products, further divided into timber and non-timber forest products, and non-wood forest products, which include animals of various types (Figure 7.3).

Figure 7.3: Classification of Renewable Forest Resources



Because of the increasing rate of species extinction, due to human activity, there is now global emphasis on conservation, defined, simply, as the sustainable use of natural resources. Conservation is also defined as the management of the biosphere in order that it may yield the greatest sustainable benefit to the present generations, while maintaining its potential to meet the needs and aspirations of future generations.

A sustainable process or condition can be maintained indefinitely, without progressive diminution of valued qualities, inside or outside the system in which the process operates or condition prevails (Holden et al. 1995). Sustainable development can be defined as any type of development that yields long-term benefits with minimal or no impact on the environment, which otherwise would reverse the situation. *Our Common Future*, the 1987 report of the World Commission on Environment and Development, chaired by Norwegian Prime Minister Gro Harlem Brundtland (hence the report's popular title, the Brundtland Report), defined sustainable development as development that satisfies the needs of the present generations without compromising those of future generations (Cunningham et al 2003).

Conservation and sustainable development are increasingly treated as two sides of the same coin. In actuality, conservation per se may be repellent to some communities while development is a readily welcomed idea. This is so because the communities may not see the benefits of conservation as clearly as those of development. Conservation may even be seen as a means of controlling or prohibiting the use of some natural resources that have long been part of the economy. Whereas development is readily considered as means to improve the welfare and living standards of the population.

It is in view of these misconceptions about conservation that some projects now include aspects of development in their plans, at least to demonstrate their intention to ensure long-term benefits to local populations, who are not sufficiently patient to wait for conservation benefits that often take time to accrue. Some projects are designed as integrated conservation and development projects (ICDPs). This is obviously to ensure the adoption by the rural communities of sustainable development ideals, which do not undermine conservation needs.

Arguments for Conservation

As already indicated, it is often difficult to convince rural populations that conservation is serving their own best interests. It may be advisable to state how natural resources benefit these populations, and how by not using these resources properly could lead to their extinction. Taylor et al. (1997) identified three principal areas in which arguments for conservation can be made: economics, ecology and ethics.

Economic Perspective

The *economic* perspective considers the direct and potential values of resources. Many of these resources contribute significantly to the rural economy, as food, building materials, medicines and tourist attractions. Many more have the potential to do so. The over-exploitation of these resources, at levels that may lead to their extinction, could mean huge losses to the populations.

Ecological Perspective

Some resources play important ecological roles that contribute to the distribution and abundance of other resources or species. For example, some animals act as agents of dispersal or pollination for a wide variety of plants. While others act as key predators that help in the maintenance of prey populations in order to reduce the negative effects of intra-specific competition. Others still may also act as principal prey that feed the populations of a number of predators. The seeds of certain plants can only germinate after they pass through the guts of certain animals, e.g., elephants. Leguminous plants are also important in enriching the soil.

Ethical Perspective

Ethically, every species has a value in its own right, and, therefore, the right to live. It is true that the values of some species are difficult to appreciate. This could make any support for their conservation sound ridiculous. But our inability to appreciate their value is not the fault of the species. It is largely due to the fact that our knowledge of the species is generally rather embryonic.

Considering our limited knowledge, we may never know whether the destruction of a species, today seen as having no value, could result in the disruption of an ecosystem. It is also important to note that the loss of such species means the loss of genetic diversity. With improvements in knowledge and technology, these species may come to be seen as indispensable to genetic engineering or medical advances.

Cultural Perspective

Though not universally applicable or scientifically explicable, it might be necessary to add a fourth perspective to the arguments for conservation, namely, culture. In some parts of Africa (and this is true also for other parts of the world) there is an intricate relationship between nature and culture. Many traditional cultures are characterised by secret societies that depend on specific natural resources for their rites and ceremonies (Figure 7.4). It is easy to guess what would happen to these societies should resources become depleted. Similarly, in some of the cultures, certain individuals, families or clans maintain close spiritual (or supernatural) links with particular animal species, referred to as totems.

Figure 7.4: Traditional Ceremonies Depend on Natural Resources



Photograph taken at Tangang village in the southwest region of Cameroon.

Family or clan totems are believed to be responsible for the protection and general welfare of social units. Their destruction is believed to have serious repercussions for the social unit. Individual totems are acquired for self-protection but mostly as a source of supernatural powers against enemies. It is believed that the death of a totem, often as a result of poaching, could result in the death of the individual associated with it, except in a case where there is a powerful traditional doctor who could intervene immediately to link the individual to a new totem of the same or a different species.

In discussions about the importance of conservation with people from strong cultural backgrounds, it might be instructive to use the cultural basis as an entry point, before moving on to the economic, ecological and ethical considerations. Many species and habitats are known to have survived to this day as a result of community adherence to traditional beliefs and taboos. Some species, including certain totems, are regarded as taboo-animals. They must not be harmed at all, or eaten, by certain groups or individuals.

Conservation Strategies

Increased knowledge of and concern for environmental problems have motivated individuals, NGOs, and private and public institutions to seriously engage in conservation in various ways and at different levels. There are two approaches to conservation, *in-situ* and *ex-situ* conservation, irrespective of its methods, and the level at which efforts is directed.

In Situ Conservation

In situ conservation describes a situation where the conservation initiative is implemented directly at the site where it is intended. This comprises the identification, designation and management of natural areas to give them various levels of protection, as defined by conservation objectives. These objectives could stress the protection of whole habitats, including all the species therein, or of a specified number of species they contain. From these broad definitions, designated areas are classified as fully protected or partially protected.

Fully protected areas include, in order of importance, world heritage sites and national parks. These are areas where human activities, such as hunting, harvesting or the collection of natural resources and agricultural activities, are strictly prohibited. Partially protected areas include reserves and sanctuaries. Reserves are classified as production and protection reserves. In production reserves, individuals with permits are allowed to use resources within specified limits, whereas in protection reserves, no one is allowed to use resources until such a time as when the reserves change their status to permit human use. In the case of sanctuaries, individuals, again with permits (or user rights), are allowed to use all but those resources that they are created to protect, or are protected throughout the national territory.

It is important to observe that protected areas serve as safe havens where species breed and multiply freely, without human interference. Naturally, these species spill over into areas outside the boundaries of the protected areas, where local communities are free to harvest them with fewer restrictions, taking advantage of user rights; but in accordance with the law. In such situations, it is important that everything possible is done to improve harvesting methods, and to control the harvesting effort. The cruder the methods, the higher is the possibility that resources will be destroyed in the process of harvesting. The bigger the harvesting effort, the greater is the proportion of stock to be harvested. Intensification of harvesting could place it far beyond the sustainable levels of each given resource: above levels that leave room for the regeneration of the resource. But controlling the harvesting effort in such open-access regimes is difficult to achieve, as each individual strives to maximise profits from the common pool. Fortunately, devolution of power and management responsibility to local communities have proved to be effective means of redress. However, for the arrangement to be successful, appropriate tools and mechanisms, which guarantee sustainability, must be implemented.

The effective management of any protected area depends on a management plan. This document gives a clear description of the biophysical aspects of the area, the kinds of activities and pressures that constitute a problem, and the management options that could be applied to zones in the area. Drawing up a management plan involves several years of basic and applied research within biological and socio-economic domains. It involves consultations with all stakeholders, including the local communities, local organisations, and relevant government institutions. It should be stressed that a good management plan depends on both expertise and indigenous knowledge of the area concerned.

Ex-Situ Conservation

Now let us consider the next conservation approach: *ex-situ conservation*. This is a process by which individuals, organisations or institutions are engaged in conservation-oriented activities outside the intended conservation areas, with the ultimate aim of promoting conservation of the intended areas. This may require the application of high skills and sophisticated technology to activities such as captive breeding and development of seed banks. Captive breeding programmes are commonly carried out in well developed zoos. This effort has saved many animal species from becoming extinct. Endangered animals are bred in captivity, and are reintroduced into the deprived wild areas where they once roamed.

The development of seed banks is another type of *ex-situ* conservation. A huge collection of seeds of endangered plant species is kept under conditions favouring prolonged storage. The seeds are used for breeding at much later dates in areas where species are either critically endangered or already extinct. The development of sperm banks may be included in this category. This requires at least one living and healthy female species on which to conduct artificial insemination or implantation, depending on how critical the situation is, with regard to the species concerned.

This is very risky, as the result may not lead to the correct level of captive breeding, due to factors ranging from success with the technique to survival of the female species.

Gender Considerations in Natural Resource Management

Gender issues are now widely and frequently discussed and debated at local, national and international levels, due to the recognition of the continued marginalisation of women in many parts of the world. In developed nations, women take part in policy and decision making, and participate in a wide range of cultural events, also in political, economic and environmental activities, at all levels. This is rarely the situation in a majority of developing countries. However, there is now growing interest in the active role of women in development, as can be seen, for example, from the massive participation of women at the conferences in Dakar in 1994 and Beijing in 1995 (Burnley 1999). The exclusion of women from, for instance, environmental management, can have negative impacts at both household and community levels (Commonwealth Secretariat 1996).

The interaction of women with the environment is no less important than male interaction, in terms, particularly, of their effects both on the environment and the human community. In rural areas, women's livelihoods are intimately linked to natural resources. Women are the primary exploiters of non-timber forest products (NTFPs) for both domestic consumption and income generation. In some forest areas of Cameroon and Nigeria, such products include *Invingia gabonensis*, *Gnetum africanum* and *Ricinodendron heudelotii*. Women are engaged in trading these and other non-timber forest products such as game meat (Figure 2.8), which is also sold by some women as pepper soup (Figure 2.14). The continuing increasing economic values of these products is a function of increasing human populations, and of the rising scarcity and demands for the products.

Rural women spend considerable time processing and transforming raw materials or products like cassava and oil palm nut, into widely consumed and highly priced foodstuffs. In their product processing and transformation role, women are also generators of domestic waste, the disposal of which can have serious implications for both environmental and human health. Furthermore, in many rural communities, women play a major role in the burning of farm plots, and in the cultivation and care of food crops. They are also largely responsible for the collection of fuelwood, the fetching of water and the cooking of meals for the household. In these roles, women are both agents and victims of air and water pollution, and of soil degradation or improvement.

In their more traditional roles as home managers, women are frequently exposed to household chemicals in various products. Their bodies absorb pollutants and toxins, which, in reproductive terms, are passed on to the next generation. Perhaps the most extraordinary feature is that women are also engaged in the collection of waste items for recycling purposes. See for example, the woman depicted in Figure 7.5. This effort brings women reasonable cash, and helps clean the environment

where the collection is done. Mostly children from poor homes collect waste items, which they supply to women during their routine trips, to raise cash for their own needs.

Figure 7.5: Women Interact with Different Natural Resources in Various Ways

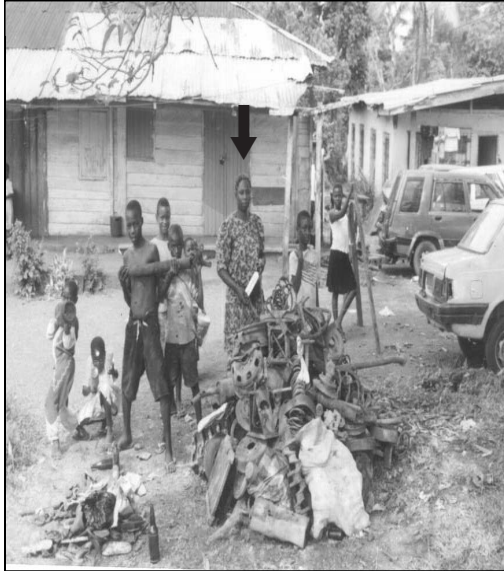


Photograph taken at Nguti town in the southwest region of Cameroon.

By interacting with natural resources in such an intimate fashion, women have, over the centuries, accumulated a stock of knowledge about the local environment, nature and the durability of land, water and other natural resources, besides the medicinal and other uses of these resources (Commonwealth Secretariat 1996). Their indigenous knowledge, together with their multiple roles, can be usefully exploited to give meaning and relevance to environmental education. This could serve as a starting point in the conception of informal and non-formal environmental education programmes. By implication, women should be considered a very important target in the design, development, and implementation of such programmes, particularly because of their additional role of caring for and raising children. In this way, environmental education can also help clarify the roles of women in community natural resource management and be used as a tool for women's empowerment. However, it should be recognised that if women are required to participate in community meetings and workshops, then the time that is required should be factored into their overall commitments (Commonwealth Secretariat 1996).

Women interact with natural resources to obtain products for domestic consumption and income. Unfortunately, until recently, little market attention has been paid to many of these products, possibly because men, who have taken a leading role in many promotional activities, such as search for markets, were not traditionally engaged in their harvesting, collection and marketing. Consequently, the harvesting and gathering methods of NTFPs have largely remained underdeveloped, and, as a result, large-scale processing is absent, and low quality products are common.

Box 7.1: Women are also Engaged in Environmental Sanitation through Recycling Efforts



This Cameroonian woman, Fanshi Perpetua Chengwe (follow arrow), is a pioneer in the business of collecting waste items for the purpose of recycling. She makes regular trips to surrounding towns, some two hours drive away, and collects old roofing sheets, old rubber shoes and old iron rods which she sells to middlemen in Kumba, her base. The men supply these items to different recycling industries in the country. The old rubber shoes are supplied to Cisplast and the old iron rods to Foukou (both recycling industries in Douala) while the old roofing sheets are sold locally for local production of cooking pots. She has been in this business for almost ten years now. Although she

does this primarily to generate income for herself, she is very conscious of the fact that she is helping to clean the environments of the communities where she operates. She is beginning to see some positive changes in the habits of people in the communities. For instance, in the past the people dumped all sorts of rubbish (including kitchen refuse) together, which made what she collected usually so nasty; but now they are beginning to separate the wastes and keep what she would come back for in much tidier conditions.

However, she continues to take precautionary health measures, as she does her business, knowing that no matter how neatly kept the waste items are she will still get in contact with disease germs through them. She is proud to note that the environments in the communities where she operates are taking on a better look due to her activities.

The implication is that very little value is added to these products before they are marketed (Nkwatoh 2000), thereby contributing to low market prices, compared with those of products harvested and marketed by men. This is another important subject of women's empowerment. Moreover, developing the potentials of a wide variety of these products to yield more sustainable income earnings for rural communities would guarantee the conservation of tropical forests (Ndoye et al. 1999). The logic is that a significant increase in the contribution of these products to the rural economy, and, therefore, to rural development could result in a corresponding reduction in the incentive for local communities' support of logging operations. Reaching this stage also depends on the local communities' appreciation of the value of a standing forest in terms of its important economic and environmental functions (Nkwatoh 2000). This points to the need for environmental education.

There is a widespread misconception that the exploitation of NTFPs has no ecological consequences. Since a forest exploited for its non-wood resources, unlike a logged-over forest, maintains an appearance of being undisturbed, as the impacts are subtle and hard to observe to the untrained eye, there is the assumption that these resources can be harvested repeatedly, year after year, on a sustainable basis (Peters 1999). It is argued that even when the harvesting of some NTFPs does not involve damage to, or killing of, the stock, as is the case with the collection of the fruits of bush mango and *njansang*, collection in commercial quantities spells severe competition with frugivores (some of which may also be herbivores) that are naturally forced to increase their foraging to obtain sufficient food to sustain their lives.

What are the consequence? First, the number of seeds actually left behind from the combined activities of commercial collection and foraging is too small to guarantee any recruitment into the population. Second, foragers that could easily switch to herbivory now increase their attack on the vegetation, including what remains as the seedlings of target NTFPs that managed to survive into the germination stage) that would have been somehow spared during that period.

Conclusion

The earth is blessed with both renewable and non-renewable natural resources that serve as insurance for the continuous improvement of the general welfare of humankind. Classification of resources as renewable means that they have the potential to regenerate and increase within the carrying capacity of their various ecosystems. But it is also clear that they can be rendered non-renewable by the human tendency to carry out exploitation at rates higher than their regeneration rates, and to apply exploitation techniques incompatible with their regenerative capacities.

The current global trend shows that natural resources are under increasingly serious stress due to a combination of a number of underlying factors, including poverty, a lack of political will and struggle for economic power. Non-renewable resources present enormous challenges to NRM efforts. The situation would be made even more complex if renewable resources were allowed to degenerate into that category.

There are fundamental arguments that can be advanced for the conservation and sustainable management of natural resources, and well established strategies to achieving conservation objectives. However, arguments and strategies, though useful in education terms and conservation, are not in themselves sufficient to bring about the desired change. For instance, it is increasingly obvious that effective and efficient natural resource management can be achieved only through the involvement and active participation of communities with traditional rights of access to the utilisation of resources to meet their basic requirements. The role of women in natural resource degradation and management must be given utmost importance.

Revision Questions

1. With concrete examples, define natural resources.
2. With examples, distinguish between renewable and non-renewable resources.
3. Conservation and natural resource management are used interchangeably. Define and state the objectives of this practice.
4. Discuss the three basic struggles that economic warfare promotes at the macro-level, which create an impact on the environment.
5. Advance and discuss three arguments in favour of conservation and natural resource management.
6. With illustrative examples, distinguish between *in situ* and *ex situ* conservation.

Critical Thinking Questions

1. Conservation is a determinant of sustainable development. Discuss.
2. The belief in totems offers great opportunities in the conservation of the African environment. Discuss.
3. The effective management of any protected area depends on a management plan. Discuss how this can help in the management of a protected area of your choice.

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