



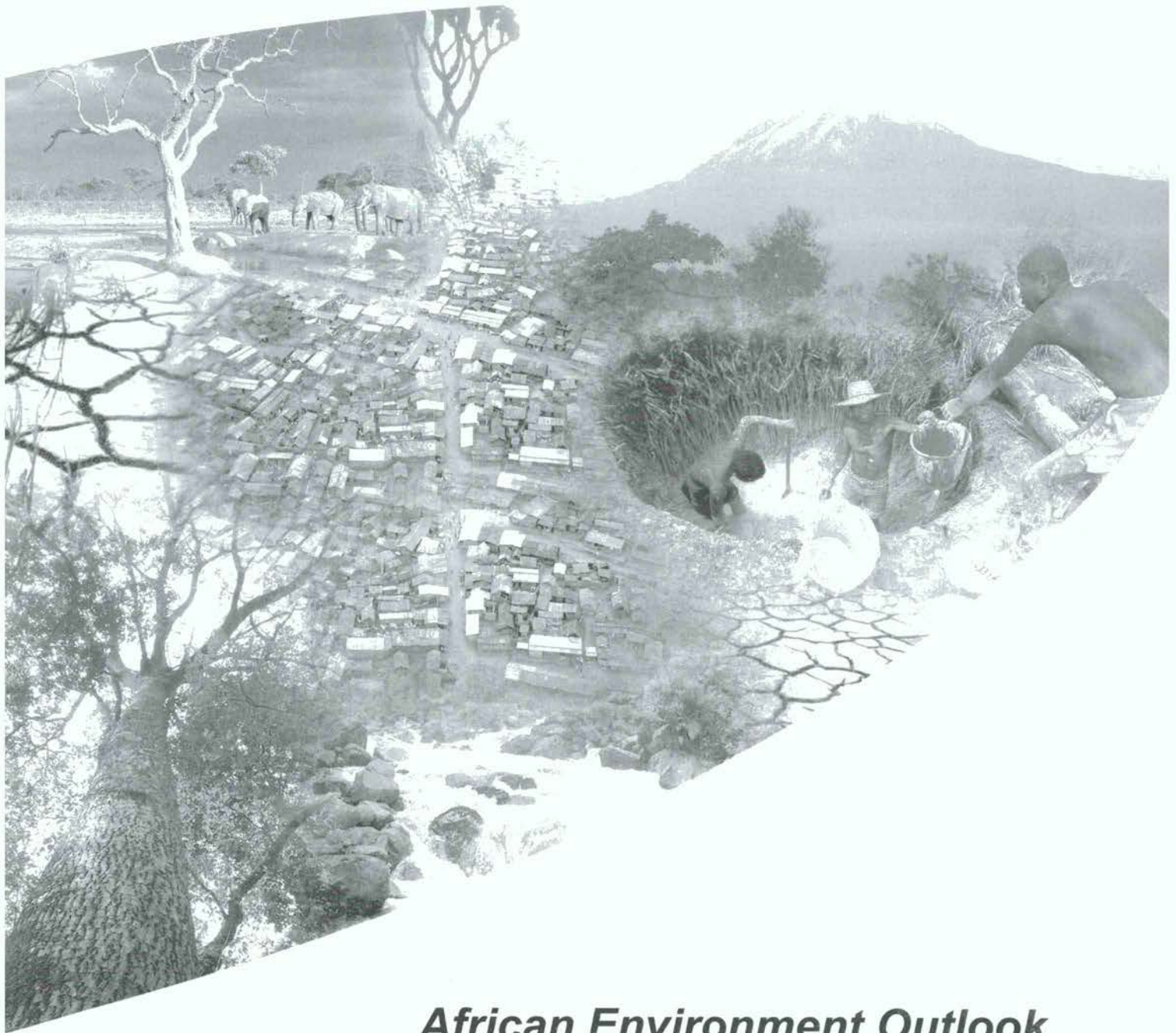
***Africa Environment Outlook***  
**Case Studies**

***Human Vulnerability due to  
Environmental Change in Africa***

**Executive Summary**







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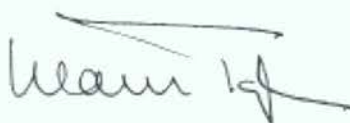
## FOREWORD

The livelihoods of people in Africa are closely linked to access to natural resources. The quality and integrity of the resource base impacts on the stability of many societies in the region. The *Africa Environment Outlook* report (AEO), launched in Kampala in July 2002, the first comprehensive report on the state of Africa's environment, highlighted a number of issues exacerbating environmental degradation and ecosystems instability. Environmental degradation only heightens human vulnerability because of the dependence by most Africans on natural resources for basic human needs. Rural people suffer the most in terms of poverty, poor access to health services, food insecurity, economic losses, and conflicts resulting from disputes over natural resources.

This report containing case studies on environmental change, human vulnerability and security, brings into focus many of the issues that are highlighted in the AEO report, by providing concrete examples of the impact of environmental change on human vulnerability, and the ways people respond to these impacts.

The importance of self-reliance in achieving sustainable outcomes to development interventions cannot be overstated. Thinking in terms of local examples can underscore the need to shift from external development paradigms to those derived from an examination of indigenous responses to problems. The case studies illustrate the particular nature of vulnerability in the African context, and the specificity of the lessons and recommendations that they provide. This is indeed an important aspect of self-reliance. Sustainable development takes place in a particular context that is social, cultural and environmental in nature and therefore interventions to promote such development will be more likely to succeed by considering each set of contexts.

The challenge presented by the case studies is to connect the wealth of resources and abilities found at the local level, with policymaking at the national, sub-regional and regional levels to reduce human vulnerability. It is clear that integration of indigenous knowledge of resource management in Africa can make a major contribution towards achieving sustainable development in the region.



Klaus Toepfer  
Executive Director  
United Nations Environment Programme



## EXECUTIVE SUMMARY

### DEVELOPMENT OF THE CASE STUDIES

Chapter 3 of the AEO report was written to convey the message that people in Africa have become increasingly vulnerable to environmental change since the 1970s through both natural processes and inappropriate human actions. Decisive, appropriate actions can reduce vulnerability and increase human security as coping capacities are strengthened.

This message was also the guiding principle for the case studies. Experts who had contributed to the AEO report, and were familiar with the contents of the volume were commissioned to come up with case studies that would be able to draw out issues from the report, especially those in Chapter 3. The material was to be presented in a format agreed upon in meetings held during several workshops. The experts were asked to focus on aspects of environmental change, human vulnerability and security, including factors such as: coping mechanisms, institutional frameworks and mechanisms, governance, investments, capacity development, regional cooperation, empowerment, community participation and responses, environmental management (including environmental impact assessments), poverty reduction strategies (with environmental components) and early warning mechanisms.

The case studies were to demonstrate models of development, simplify the main messages of vulnerability through explicit messages and lessons, and be relevant and contextual in relation to policy action with examples of good practices (or perhaps some failures). Ultimately, the case studies were to stimulate interest and action in similar situations at national, sub-regional and regional levels.

The case studies were to follow, as closely as possible, the Pressure-State-Impacts-Responses framework used in the AEO report. Experts were asked to provide data from their own research or information gathered in their professional capacities. In other cases, the experts undertook extensive literature reviews in order to find data or references, which illustrated environmental change as a contributing factor to human vulnerability. Over half of the case studies rely heavily on data collected by the authors.

The case studies were to have the following elements:


An introduction, which would provide a description of the setting, the time horizon, the location of the case study, and the main role players, or stakeholders involved. Authors were asked to explain the type of environmental change that had rendered humans vulnerable, and explain the kind of vulnerability involved. They were to provide a message in relation to environmental change, human vulnerability and security.

Pressures on the environment were to be explained clearly. The authors were to confine themselves to those pressures that could be linked to changes in the environment over the period of the study. The natural processes or social and economic activities that were causing the pressures were to be examined.

Authors were asked to identify the impacts that have occurred as a result. These impacts may affect the environment, or society (or both) at different levels. A particular focus was on livelihoods, human health and security, and the extent to which pressures have made humans vulnerable and insecure, limiting economic and social development or causing them to pursue economic activities in ways that are not sustainable. Authors were asked to address the outlook for the communities in question (or others in a similar predicament), identifying broad trends to be gathered from their case studies.







The responses to these impacts and increases in vulnerability were to be provided. This section was to answer the question: 'What is being done?' The answer would be to include responses made or currently being undertaken at all levels of society to increase security. Authors were also asked what policy actions (or lack of action), and what institutional frameworks and mechanisms are being provided at various levels. Actions to increase coping capacities or for governance and empowerment of communities could be included. Other responses, in terms of community or social action, investments, capacity development, natural resources management, education and regional cooperation could be examined.

The case studies were to draw conclusions and make proposals for further action. The conclusions were to include an analysis of the most significant components affecting the case study area, or where appropriate, the sub-region in particular and Africa in general. In the case studies in Part 1, recommendations are provided by the authors. The case studies in Part 2 provide lessons learned from the interventions and projects that were implemented to reduce environmental change and human vulnerability.

Each paper has gone through a number of reviews. In addition, the authors met to go over their work as a group, and discuss further comments and ideas about the case studies before their compilation into a single volume.

The papers in the first section take a look at complex problems in a range of ecosystems (rangelands, freshwater, tropical forests and coastal) and livelihoods. The emphasis is on pressures and impacts on the environment, and the responses of those whose vulnerability is affected. The authors have made recommendations, which they feel could help to mitigate environmental degradation, and more importantly, reduce the vulnerability of the most affected members of the population.

Papers in the second section concentrate on practical examples of interventions that have taken place in specific situations: rangelands, the western Indian Ocean Islands, and a large urban informal settlement. These case studies examine the successes and failures resulting from interventions and draw lessons which can be applied elsewhere.

## PART 1

### CASE STUDIES ILLUSTRATING ENVIRONMENTAL CHANGE AND ITS IMPACT ON HUMAN VULNERABILITY

Common themes include the complexity of the environments involved and ways in which attempts at initiating development activities or of resolving environmental and development 'problems' have increased the vulnerability of certain segments of the population. An important set of discussions revolves around the conflict between different livelihoods systems and competition over the resources: initiatives aimed at improving the lot of some groups frequently have negative implications for others.

The first three case studies look at the drylands areas of East Africa, and are largely concerned with vulnerability of nomadic pastoralists and sedentary agricultural populations. 'The effects of environmental change on human vulnerability and conflict in the Horn of Africa by C. Huggins, 'The impact of environmental change on human vulnerability in Karamoja, north-eastern Uganda' by Y. Moyini and 'Environmental change and the vulnerability of pastoralists to drought: the Maasai in Amboseli, Kenya' by D. Western and D. L. Manziolo Nightingale all discuss areas with harsh environments, and livestock owners who have traditionally pursued a system of nomadic pastoralism as a way of coping with environmental uncertainties. These traditional systems allowed efficient use of marginal areas in the past, as people moved their herds to track green grass after the rains, reducing their vulnerability to drought. However, the authors of all three case studies note that one of the most serious pressures on the environment and the people in these pastoral systems has been the loss of mobility and flexibility in responding to short-term environmental stresses and shocks. This has been caused by the alienation and fragmentation of land for purposes such as settlement, agriculture, wildlife and forest reserves, as well as by drought, land degradation and competing customary regimes. The changes in land-use patterns disrupt migratory pathways, and result in a loss of grazing areas, drought refuges, water sources, causing an increased vulnerability to drought, and reduced areas available for livestock. Simultaneously, governance systems are faced by changes in the socioeconomic and sociopolitical context, posing challenges to natural resource management and conflict resolution.

The most notable impacts that affect pastoral livestock economies include: decrease in per capita livestock numbers, and a weakening of the pastoral economies, through an inability to exist on subsistence pastoralism. In the case of Sudan, temporary bans and low prices on livestock exports, have increased vulnerability, and have caused localized increases in the number of animals, leading to negative impacts on grazing land. Conflicts of various kinds result as well: Karamoja and Darfur exhibit high levels of conflict with neighbouring communities, as different groups compete over land for different uses such as pasture or agriculture. These conflicts, combined with the introduction of small arms, have had a serious impact on local economies.


People in Amboseli have experienced a certain degree of non lethal conflict with neighbouring communities, but a much higher level of conflict with wildlife, as well as a decline in biodiversity.

Impacts on traditional cultural systems are also notable, and carry a high price for the environment. These include the disruption of traditional sociocultural structures, including those that govern resource use.

Rangeland productivity and health were discussed in the case studies, but this is where some differences in interpretation emerge. The Karamoja study expresses concerns about overgrazing and







rangeland degradation. In contrast, 30 years' worth of rangeland production data from Amboseli show that whereas productivity oscillates over time (with rainfall and grazing pressure), there is no long-term evidence of grassland degradation, except for the cover loss around permanent settlements.

The authors make a number of specific recommendations, some of which are applicable to all three areas: It is imperative to restore flexibility to resource users and look at ways to allow mobility, and examine the use of space within settlement patterns. There should be an attempt to increase water harvesting and storage. Encouraging of diversification of livelihood options, including revenues from wildlife based enterprises, should be a priority. In all cases, stakeholders must be included in decision making, governments and communities should take steps to curtail banditry, warfare and insecurity, and introduce disarmament measures. A major recommendation is to improve monitoring and warning systems of local environmental conditions, as well as of potential escalation of conflict.

Commercial logging in forests, while delivering profits, employment and business opportunities to private companies and certain sectors in the population, is a direct cause of vulnerability among those communities that live in Cameroon's forests, and are dependent on its non-timber forest products for their livelihoods. In 'Deforestation as a cause of human vulnerability in Central Africa: communities living near the Dja Biosphere Reserve, Cameroon', L. Ntonga Mvondo describes activities which cause deforestation in the Congo basin, specifically in the area bordering the Dja Biosphere Reserve in Cameroon. The study area is home to several communities, including sedentary agriculturalists and semi nomadic pygmies, the Baka. The Baka have traditionally subsisted on hunting and gathering, as well as fishing, and have always engaged in the barter of goods with their more sedentary neighbours. Although the exploitation of the forest has had some positive impacts, such as the introduction of roads, jobs, trade, revenue from taxes, and secondary activities, it has had some negative consequences for the area and for the Baka, who have become especially vulnerable to poverty, social disruption and health problems. Deforestation has resulted in the loss of land, formerly used by the Baka, to agriculture as trees are cut down and cleared away. The loss of tree cover has meant an increase in soil erosion, and threatens the integrity of the larger ecosystem, and its connection with the Dja reserve. The intensification of the bushmeat trade has reduced biodiversity, as well as leading to its large scale commercialization. An interesting and particularly pointed observation is the way that competition between forest conservation programmes distorts relationships between communities which depend on forest resources. The communities began to compete for opportunities arising from these conservation programmes. The sociocultural impacts on the Baka are manifested in their increased marginalisation, and dependence on more sedentary groups as they lose access they once enjoyed to all of their range areas, and resources. They themselves have become increasingly sedentary, with the introduction of new problems such as waste in their settlements, and pollution in their water, leading to health problems. Increasingly dependent on the commercial bushmeat trade, they have become a source of cheap labour for other communities, and are facing increasing problems of alcoholism and, with the change in diet, malnutrition. Possible ways of reducing vulnerability of Baka and other forest dwelling communities include initiatives to decentralize forest management, introduce the certification of timber, promotion of community forestry initiatives and the recognition of the importance of non-timber forest products. Conservation organizations or others who work in these areas must collaborate in their work, taking into account the heterogeneity of the communities affected and ensure that their work does not exacerbate relations between groups, marginalising some and increasing their vulnerability. The development and implementation of better strategies for rural development (including initiatives involving the private sector logging companies in conservation and community projects) could include some or all of these initiatives. In the long run it is important to try to improve the lot of agricultural communities outside the area, with a view towards reducing pressure on the communities resident in the forest.



'Lake Victoria: a case study of complex interrelationships' and 'The consequences of hasty industrialisation in Saldanha Bay, South Africa', both by R. Fuggle, serve to illustrate the role that forces of globalization can have on local fishing/farming communities, and how the promotion of large scale, commercial developments, while achieving a certain amount of economic success, can increase the vulnerability of small, local business and urban residential areas, cause unemployment, and threaten biodiversity as well.

The largest of the central African lakes, Lake Victoria is shared by three countries: Kenya, Tanzania and Uganda. Among the Kenyan Luo people, fishing was traditionally managed by territorial user rights, which were also regulated with respect to seasonality, restrictions on canoes and equipment, local affiliation, age and marital status. However, an increase in human populations and plantation agriculture around the lake, and the introduction of gillnets reduced many of the fish populations to commercial extinction. In response, the colonial authorities introduced non-native species of fish, (serious predators on the endemic smaller species). As a result, Lake Victoria is the most important source of freshwater fish in the world. The industry is, however, a threat to its own success and appears to be unsustainable. It has, as well, completely changed the local fishing industry and the distribution of wealth. Women no longer have access to the small fish (many of which cannot be found), and therefore lose control over this part of the local fishing economy. Because the women are no longer selling fish to the villages, lakeside communities suffer malnutrition around this 'sea of plenty'. Pollution from sewage and from runoff from the tea and coffee plantations in the surrounding hills encourages the spread of water hyacinth. This increases pressure on endemic fish populations, while making life even more difficult for fishermen, who at times cannot get into the lake. Other impacts on the lake (and of the loss of certain species of endemic fish) include increased levels of malaria, schistosomiasis and cholera.

Water hyacinth is almost impossible to eradicate, and some of the proposed measures (herbicides and mechanical chopping and shredding) are opposed on environmental or regulatory (EU import regulations) grounds. The case study illustrates clearly how economic, social and political decisions have unintended consequences, and that environmental deterioration in turn has an impact on economic, social and political life.

Fuggle's second case study describes a coastal fishing community in South Africa, whose commercial activities were threatened by a proposed steel plant in Saldanha Bay. The project was hurried along, despite objections from some segments of the community, because of the impending repeal of a tax concession for expenditure related to export production. Although the introduction of the steel plant was meant to create jobs, there were more jobs threatened in fisheries and tourism than could be created by the new plant. There were also threats to local biodiversity reserves. The development went ahead however and impacts included serious water shortages in nearby urban areas, with an increase in tariffs. As a result, a dam will have to be built, and there will be a need for water extraction from another river, which will threaten small towns further along. The steel plant jobs did not materialize in the numbers promised, due to a down turn in international steel markets, which meant that profits were lower. The development also caused a decline in production in the mariculture industry, and stagnation in tourism.

In the case of Lake Victoria, many of the negative results of development initiatives were not anticipated. In the case of Saldanha Bay, an environmental impact assessment had been carried out. However, it was limited in scope, and did not consider impacts further up the river basin. In addition, objections made by those communities that considered themselves vulnerable were not taken into account.





## PART 2

### CASE STUDIES SHOWING INTERVENTIONS TO CONTROL ENVIRONMENTAL DEGRADATION AND REDUCE HUMAN VULNERABILITY

'Reducing vulnerability of herders in the eastern region of Morocco' by O. Salem and 'The role of community wildlife-based enterprises in reducing human vulnerability: The Il Ngwesi Ecotourism Project, Kenya' by J. Waithaka, both describe attempts to reverse rangeland degradation and economic decline on pastoral communities. The case studies come up with strikingly similar results and lessons, this in spite of the very different conditions and sizes of the projects: one covering a region of over 3 million hectares in Morocco, with 9000 families, the other an 8700 hectare group ranch in northern Kenya, which is home to not more than 450 families.

Both examples show that changes in strategies governing natural resource use, especially the loss of seasonal mobility and sedentarisation lead to further environmental changes, which are aggravated by drought. The result is a decline in productivity and survival of herds, rendering livestock owners vulnerable to poverty, health problems and insecurity. In both cases, the interventions involve partnerships between the communities and other stakeholders. In the case of Morocco, it was the Ministry of Agriculture, IFAD and ADB. In the case of Il Ngwesi, the community went into partnership with a private sector ecotourism operator, as well as a parastatal organization (the Kenya Wildlife Service) and conservation NGOs. Both communities willingly set aside some of their grazing areas, and observance of the rules prohibiting livestock in those areas was high. In Morocco, the project used a mixture of old and new institutions to establish an operational common property management regime, in order to improve the productivity of the grazing land. The community at Il Ngwesi established a conservancy area to restore plant diversity, in order to attract wildlife back to the ranch, and formed a group of community scouts to control poaching and cattle rustling.

The results in both projects show that environmental degradation can be reversed quite quickly. In Morocco, the rested land showed a fivefold increase in fodder production over 3 years, and this, along with veterinary campaigns, converted into positive results in terms of herd production. At Il Ngwesi, the case study documents an increase in plant and animal species biodiversity in the conservancy area, as well as increased security for people and livestock all within a 6-year period. Members of the community receive a certain amount of cash from the project, but the most important changes are the improvements in water delivery, health care, education and transportation. Most people now consider themselves less vulnerable as a result of the project. Women and men are equally involved in the project, which has helped to change gender relations in a positive way for women.

Parallels emerge in the lessons that can be drawn from the two projects. It is important for these pastoral communities to be able to control access to their resources. The initiatives and motivation should come from within the communities, who took an active role. Voluntary compliance with control measures was a key factor. Development should focus on the "human factor", and pay attention to (and include as a key component) cultural values and practices, especially where these can be used as tools in implementing the project. Both projects stress the importance of monitoring, assessment and evaluation in projects, and they demonstrate the long-term benefits of enabling vulnerable communities.

'Land degradation and human vulnerability in the drylands of northern Namibia' by S.K. Imbamba is presented somewhat differently from the other case studies in this volume. It describes a community beset with a host of environmental and socioeconomic challenges. The people of Uukwaluudhi live in an environment characterized by variable, but low rainfall. Traditionally, they had institutions that



helped to manage common property resources. These institutions were gradually dismantled by various governments in a bid to control overgrazing. Rather than improve rangeland management, however, these government initiatives have done much to aggravate the situation. Intensified droughts have put pressure on the land, with soil erosion, overstocking and deforestation leading to a negative impact on the livelihoods of the local communities. Increased vulnerability is expressed as a decline in agricultural production, scarcity of fuel wood (increasing the work load of women and girls who collect it), increased food insecurity, a deepening poverty and increased migration of local communities into marginal areas.




In spite of a series of national land policies and efforts to control desertification in the sub-region as a whole, things in the case study area have not improved. The author provides three examples of successful projects in drylands (from Burkina Faso, Kenya and Mauritania) that have halted soil erosion, reclaimed land, increased water supplies, stabilized sand dunes and increased the livelihood security of farmers in all three areas. The author hopes that these examples will inspire other similar projects, and could help reduce degradation and vulnerability in Uukwaluudhi. He notes that in order to halt environmental degradation in Ovamboland, local communities (and especially women in those communities) must participate in making and implementing decisions on the sustainable management of land resources. Projects should only be initiated after adequate preparation, which includes a focus on livelihood concerns, and using locally available tools, materials and skills.

The last three case studies move away from themes of natural resource management and traditional strategies and coping capacities. 'Decreasing human vulnerability in Manchieyt Nasser, Cairo, Egypt' by O. Salem and two case studies by J.L. Roberts: 'Cyclone early warning systems in the western Indian Ocean' and 'Malaria control in the Republic of Mauritius' examine interventions used to upgrade overcrowded urban settlements or the use of modern technologies and disease vector control to reduce human vulnerability to disasters and malaria outbreaks among large populations.

Manchieyt Nasser is the largest informal settlement in Cairo, Egypt. Originally a limestone quarry and later a dumpsite, it now provides a focus for rural migrants and has a population of up to half a million people. Uncontrolled growth has, however, increased the pressure on the site, resulting in vulnerability and insecurity due to scarcities of water, sanitation, access roads and health care. Security of tenure is another issue: legal title to land is difficult and expensive to acquire, the result is informal occupation, subdivision and then sale of plots to others without proper documentation. As overcrowding increased, people began to build dwellings and live in very weak and unstable parts of the former quarry. Human activities such as small enterprises that require burning and sorting of garbage have created changes in the limestone underneath. Leaking sewers and septic tanks have destabilised the limestone, heightened erosion and the risk of falling rocks. In 1992 an earthquake caused a large rock to fall on some houses, killing the inhabitants.

At the end of the 1990s, two participatory initiatives were launched to provide a master plan for the area, to upgrade infrastructure and one of the neighbourhoods, as well as to formalize land tenure. The projects made efforts to maintain links between them in order to cooperate where possible. Important features of these projects included creating partners' groups and the facilitation of private sector and local NGOs to participate in urban management. Small enterprises were provided with access to cleaner technologies and infrastructure, and waste recycling was introduced. The projects show that it is possible to develop trust between marginalised groups and the state, and that empowerment of the local inhabitants early on in interventions can pay dividends. Collective action was possible because of the inclusive mechanisms enabling inhabitants to participate in decision making. Political support for the initiatives was a key factor. Although coordination between stakeholders was difficult, it was a key factor. Of paramount importance in reducing vulnerability was the establishment of secure tenure for inhabitants. The study notes that governments must recognize





the positive side of informal settlements, in that people are able to shelter themselves without government support. It cautions, however, that this should not be a reason for the governments to disengage themselves from issues besetting informal settlements.

The people of the western Indian Ocean Islands, their homes, businesses, crops and livestock are highly vulnerable to the impact of seasonal tropical storms and resulting floods which are capable of causing destruction of the physical environment and pose risks to human survival and health. The resulting seasonal floods also create an ideal environment for the spread of malaria. The two case studies by J.L. Roberts show how IOC countries have established a coping strategy for early warning of cyclones, and how one of the Indian Ocean countries, Mauritius, has managed to eradicate malaria from the island, at a cost of only \$US 1 per head per year.

Cyclones are unavoidable, but an integrated programme of early warning, protection and recovery systems can reduce deaths and the physical impact (and therefore the financial burden) of cyclones on a population. The programme should include precautionary elements (environmental protection and control and early detection and tracking of cyclones), as well as mechanisms for response and recovery, and education of both professionals and the public.

Any programme of this size will need to be assured of government and inter-governmental support, high-tech equipment and the maintenance of coordinated and highly qualified teams backed by adequate resources. The case study concludes that countries that have early warning systems will gain more from strengthening other aspects of protection, such as dwellings and infrastructure, refuge and rescue services. It also suggests that the risks presented by cyclones should be viewed in the broader perspective of other risks to security and welfare (car accidents or diseases), which can be far greater in terms of numbers of people affected.

Densely populated and liable to flooding from tropical storms, Mauritius presented ideal conditions for the establishment and spread of malaria. Climatic conditions, combined with the damming of rivers and the creation of channels for irrigation, increased the prevalence of this environmental hazard. Malaria epidemics became regular and widespread with sugarcane workers being especially vulnerable. In the last 50 years, systematic programmes of environmental and public health control have succeeded in eradicating the disease and the only cases at present are those introduced by travellers from abroad. These are followed up and treated.

An important lesson coming out of this case study is that control measures must be maintained after eradication. This became clear after a resurgence of malaria, which was caused by a combination of factors. In 1975 a cyclone resulted in a large amount of standing water on the land, and on newly constructed houses with flat roofs. In addition, the emergency relief and reconstruction needed was provided by workers such as engineers from countries with endemic malaria. A relaxation of controls at entry points meant that these workers were never screened on arrival. Declining concern about standing water and clearing streams resulted in more breeding areas for mosquitoes. An intensified programme was initiated in 1982, and has been maintained ever since. The case study shows that although malaria presents a major threat to which people in Africa are highly vulnerable, an integrated programme of environmental control, restricted use of DDT, and screening can be effective at a minimal cost.



## CONCLUSIONS

The case studies in this volume were undertaken to shed light on the unintended and undesirable consequences of environmental change with respect to human vulnerability. They allow us to understand ways in which developments, meant to help communities become better off, may have the opposite effects. In illustrating these processes, they allow the formulation of recommendations and the application of lessons which can help vulnerable communities cope with the increasingly rapid pace of change.

The case studies show quite clearly that many efforts made to improve production and income for people have, in fact, destroyed their previously established abilities to cope with environmental changes, hazards and shocks. 'Coping capacities' are investments that societies have built up over generations, and are truly valuable assets. Abrupt changes in the basic relationships between people and their natural resources which are brought about by large scale interventions, resource extraction and changes in control over and access to their resources can negate many of the positive effects of development projects. In addition, the examples given here show quite clearly that some groups are disproportionately affected by change. The vulnerability of such groups is cause for careful consideration.

- In this set of studies, the especially vulnerable groups include 1) marginal communities, especially those who live in areas where resources are varied in the way they are distributed in time and space. As a result, these people pursue strategies of mobility; 2) people who have no security over their livelihoods and dwellings, especially those who live under informal arrangements; 3) those who depend on small businesses and; 4) sub-groups in any of the above, such as women and children.
- Many groups that relied on the use of natural resources in the past have specific knowledge of the patterns that characterize natural resource distribution in their areas. Their environmental management strategies should be viewed as investments that societies have made in the establishment of their own institutions, and as cumulative stores of experience and knowledge. *Traditional institutions should be treated and valued as assets, rather than being discarded. Their appropriate application for resource management, facilitation of community cohesion and conflict resolution can save time, money and lives.*
- Development paradigms are usually based on assumptions that the people who will benefit are, or should be, settled in areas where infrastructure and services will be provided or upgraded. Societies where mobility is the key strategy in resource management and use then find that they must give up traditional livelihoods to benefit from infrastructure and services. This, however, requires them to take up activities that are unfamiliar, and for which they may lack appropriate skills. In addition, the new activities may not be sustainable, and may push them into deeper levels of poverty than experienced under their traditional systems. *The importance of mobility as a sustainable way of exploiting resources should be recognized.* Ways of allowing people to continue some form of mobility as well as innovative ways of using space and time to manage and use resources should be explored. *Traditional/indigenous institutions can be combined with new ones in order to provide specific mechanisms that cater for societies who do not fit into the development paradigms proposed so far.*





- *Changes in the management or use of natural resources should be based on a thorough understanding of the needs and requirements of all stakeholders.* If not, this can lead to conflicts between groups of stakeholders. It will pose constraints on attempts by governments and other interested organizations to help these communities improve their lives. As a result, some of the groups may become especially marginalized and vulnerable to food insecurity and violence.
- *The importance of involving stakeholders in the design of arrangements for managing resources* (whether common property resources, or housing in informal settlements), *interventions or commercial activities* has been emphasized in the case studies. Deployment of skills (technical, intellectual and social) that exist within the stakeholder communities can give projects an additional set of strengths.
- *Organizations setting up conservation or development projects or interventions must establish links with one another and cooperate,* in order to avoid creating competition and tensions between vulnerable groups vying for benefits from these projects.
- *Communities are less vulnerable if they have security of access to their resources.* They should have a choice in whether this security is provided under common property, or other forms of tenure. For those living in informal settlements, security over their property is vital in reducing vulnerability. In Africa, access to natural resources including land is often subject to a number of forms of tenure, customary as well as 'modern'. In some areas, several forms of tenure are in competition, with various levels of acceptance from communities and institutions. This is particularly true in areas affected by urbanization and changes in livelihood strategies, where communities which follow different customary systems find themselves sharing resources. The state, which ideally plays the role of a neutral facilitator and mediator in such disputes, must be wary of favouring certain systems over others, thereby 'marginalizing' particular groups.
- *Early warning of disasters and early warning systems for conflicts* are both proposed as important measures to reduce vulnerability caused by environmental change and hazards. It is possible to reduce human vulnerability to disasters and epidemics, by applying integrated measures of warning and prevention, rescue, recovery and education.
- *Control/prevention measures for diseases or other hazards have to be maintained,* as a change in conditions can often cause the problem to return.
- *The case studies repeatedly bring up the importance of monitoring and assessment.* One way of controlling the vulnerabilities seen in this volume, is to monitor local environmental conditions, taking into consideration all areas that might be affected by proposed developments or changes in resource use. Cultural and social factors should be included in assessments when planning for land-use. Stakeholders' input into these assessments will allow for the identification of problems and concerns early on, before environmental degradation as well as vulnerability become extreme.

Finally, the case studies do show that it is possible to reduce or reverse environmental degradation, as well as to increase livelihood security for certain vulnerable groups. In spite of their vulnerability, these communities hold a wealth of resources and abilities. In their efforts to promote sustainable development at the local level, governments should make every effort to promote balanced interventions that respect traditional institutions and unlock the potential of these communities for self-reliance.

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