FORUM FOR SOCIAL STUDIES

CIVIL SOCIETY AND ENVIRONMENTAL POLICY DIALOGUE

CONSULTATION PAPERS ON ENVIRONMENT No. 1

Environment and Environmental Change in Ethiopia

Edited by
Gedion Asfaw

Addis Ababa
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Environment and Environmental change in Ethiopia

FSS is once again launching a policy dialogue forum similar to the successful poverty dialogue forum and the recently initiated gender policy dialogue. This is the third initiative, which will focus on environment related issues.

The Environmental Policy Dialogue (EPD) will involve a programme of workshops to be held every two months, culminating in a series of consultation papers that will highlight the results of the workshop discussions and the presentations of the panelists. All in all 18 papers will be presented and discussed at these public workshops. A grassroots' discussion on environment will also be conducted at which farmers, pastoralists, urban dwellers, and community representatives will air their views on environmental issues of the country.

The first public discussions was held on January 24, 2003 at which three discussion papers were presented in addition to the introductory paper presented by Ato Gedion Asfaw, the programme coordinator.

The first presenter was Dr. Ermias Bekele and his topic of presentation was:-**"Causes and Consequences of Environmental Degradation in Ethiopia"**

Dr. Ermias focused on land, forest, and wild life resources and noted that there are proximity and underlying causes for environmental degradation in Ethiopia. The proximity causes included cultivation on steep slops and marginal lands, and loss of vegetation cover while the underlying causes were stated as population pressure, poverty, insecurity of land/tree tenure.

The paper outlined consequences of environmental degradation and concludes by stating the challenges and opportunities facing the country in addressing environmental degradation.

The second speaker, Dr. Demel Teketay presented a paper entitled 'State of the Environment in Ethiopia: Past, Present and Future Prospects'.

This paper was jointly prepared by Dr. Demel Teketay, Prof. Masresha Fetene, and Ato Asferachew Abate.

Dr. Demel presented a detailed recount of the existing situation of the environment in Ethiopia including basic definitions and principles with regards to environment, history and problems of the Ethiopian environment, institutions responsible for environment, efforts to mitigate environmental problems in Ethiopia, future prospects followed by conclusions and recommendations.

Dr. Demels and his co-authors have presented a detailed paper for which the FSS is very grateful. However due to space constraint and the need to be consistent, in terms of size, with the papers of the other panelists we have only published in this issue the abridged version of their paper. The full version of Dr. Demel's paper is available and can be obtained from the author or at the office of the FSS.

The Third Speaker Ato Dessalegn Mesfin presented a paper entitled **"Global Environmental Issues and their Consequences to Ethiopia"**

Ato Desallegne's presentation begun with a broad introduction of environmental problems and focused on global environmental issues such as climate change, ozone layer depletion and biodiversity degradation which he described as *'problems resulting from over development'*.

He also deliberated on the major issues related to climate change, ozone layer depletion, hazardous chemical and wastes, biologically modified organisms, biological diversity and desertification. The paper gave an outline of the various global conventions concerning the above environmental issues and pointed out their relevance to Ethiopia.

A number of issues were raised by participants of the workshop on all of the presentations. The major ones were as follows:

- Reservation was expressed with regards to the arguments stated by the first presenter referring to altitude as a cause of degradation and flood as a major cause of displacement. Some participants also noted that the trend in the state of the Ethiopian environment needed to be expressed in recent and updated information.

- Concerns were expressed with regards to presenters focusing only on problems and not suggesting solutions. Another participant argued that the major cause for environmental degradation in the country is the lack of commitment and awareness at all levels and this has not been articulated well in the papers presented.

- With regards to global environmental issues participants doubted whether issues such as ozone layer depletion are priority issues for Ethiopia and noted that given the wetland resources the country has, the Ramsar Convention should have been given priority and signed by Ethiopia, which other countries have ratified 30 years ago.

- The benefit of biotechnology to developing countries was also questioned. A participant suggested to differentiate between negative impacts caused by external factors and by our own doings.

- The argument which denounced the approach expressed as *'developing first and cleaning up later'* was refuted by simply pointing to the Ethiopian situation of endless hunger and poverty which is a worse condition than the conditions prevailing in the developed countries. There were other views that indicated 'one has to opt for sustainable development and not to be tempted to choose development over environment or vise versa.'

- Another point raised noted the importance of considering the impact of environmental degradation on economic development instead of the other way round.

- Important issues such as population and environment and lack of policy implementation mechanisms were also raised. There were views, which argued that population increase, may not be blamed for environmental degradation, rather it is mismanagement that is a cause to the predicament in which the state of the country's environment is currently found.

These were some of the issues discussed at the first public discussion on environment policy dialogue.

We noted with regret that the time for discussion was very short and all who wanted to forward their views were not able to do so. We think panelists need to be brief and focus on the main theme of their presentation to leave more time for discussions. The FSS has issued guidelines for panelists with regards to their presentation in the upcoming workshops.

Gedion Asfaw, Editor

CIVIL SOCIETY AND ENVIRONMENTAL POLICY DIALOGUE

Programme Brief and Introductory Remark

Gedion Asfaw, Editor and EPD Coordinator

INTRODUCTION

FSS is once again launching a policy dialogue forum similar to the successful poverty dialogue forum and the recently initiated gender policy dialogue. This is the third initiative, which will focus on environment related issues.

The Environmental Policy Dialogue (EPD) will involve a programme of workshops to be held every two months, culminating in a series of consultation papers that will highlight the results of the workshop discussions and the presentations of the panelists. All in all 18 papers will be presented and discussed at these public workshops. A grassroots' discussion on environment will also be conducted at which farmers, pastoralists, urban dwellers and community representatives will air their views on environmental issues of the country.

In the course of the next twelve months we will explore the following topical issues: *environment and environment change in Ethiopia; environment, poverty and gender; environment conflict; economic development and its environmental impact; government and environmental policy; civil society, environmental advocacy and public awareness.* Three papers will be presented and discussed under each of the above topics.

There is no denying that most of these themes have been discussed in other forums in the past or some of them may even be under discussion currently under the sponsorship of other civil society groups. The EPD has taken in to consideration the orientation and focus of other similar initiatives in the design and undertaking of the EPD in order to avoid duplication of efforts.

The EPD by and large focuses on the role of civil society with regards to environmental advocacy and will also assess the history and status of the Ethiopian environment including the reasons behind the continuing environmental degradation and our dismal performance in environmental management.

The research topics will further make in depth analysis and recommendations in the areas of *land degradation and resource tenure, environmental rehabilitation programmes, environmental resource conflict, urban environment, civil society and environmental advocacy.*

The information generated throughout this forum will be disseminated through published consultation papers, promotional materials and through the FM radio programme.

At this juncture, I would like to point out some of the focus areas and core issues, which the panelists and participants may consider in the course of our deliberations in the coming months.

Policy formulation and Implementation

The Environmental Policy of Ethiopia was approved by the Council of Ministers in April 1997 and addresses a wide variety of sectoral and cross sectoral environmental concerns in a comprehensive manner with the aim of ensuring *"sustainable use and management of the natural, human made and cultural resources and the environment."*

A number of other sectoal and cross-sectoral policies, strategies and laws that relate to environment have also been launched. These include *The National Population Policy of Ethiopia (1993), the National Fertilizer policy (1999), the National Science and Technology Policy (1993), National Policy on Biodiversity Conservation and Research (1998), National Policy on Disaster Prevention and Management (1997), the Ethiopian Water Resources Management Policy (1999), the Health Policy (1993), the Energy Policy (1993), the National Agricultural Research Policy and Strategy (1993), the National Drug Policy (1994), the National Health Science and Technology Policy(1994), Forest Proclamation No.94/1994, Mining Operations Council of Ministers Regulations No. 182/1994, Investment Proclamation No.37/1996, Commercial Regulation and Business Licensing Proclamation No.67/1997, Water Resources Management Proclamation No. 197/2000, Public Health Proclamation No. 200/2000.*

have been both degraded and underutilized, despite being the basis for agricultural, industrial and overall economic development. Unfortunately, over the years Ethiopians have not managed to transform these natural resources in to wealth and have not been able to improve their standard of living.

The underlying causes for this state affairs are by and large, policy and institutional issues, which include poor governance, violent change of governments, lack of continuity, inappropriate policies, frequently changing and ineffective legal and institutional framework, poor implementation of policies, misuse of human resources and ineffective bureaucracy resulting in low implementation and management capacity over the past several decades.

In the course of our deliberations in the coming months we will come across discussions related to how the above underlying causes have affected the environmental resources of the country.

Land degradation in all its forms-water and wind erosion, salinization and alkalisation, chemical degradation, physical degradation and biological degradation - has become one of the most serious problems facing the Ethiopian agriculture and more markedly in the highlands. Land degradation in Ethiopia is usually expressed in terms of soil erosion and soil fertility loss, reflecting the importance and linkage of land degradation to agriculture. Although over a decade and half old, the Ethiopian High Land Reclamation Study (EHRS) is still the most credible study on land degradation in Ethiopia. It concluded that over 14 million ha. in the highlands were seriously eroded, some 1900 million tons of soil were annually eroded from the highlands, equivalent to an average net soil loss of 100 tons/ha., with variations between 50 to 170 tons/ha. The Woody Biomass Inventory and Strategic Planning Project (WBISPP) however indicates that in the Amhara Region 82% of the region has a soil erosion rate of less than 12.5 tons/ha/year while 18% suffers a soil loss of 12.5 to 200 tons/ha/year. In Oromia 99% of the region has a soil erosion rate of less than 10ton/ha/year. The findings of the EHRS seem to be somewhat exaggerated when compared to the findings of the WBISPP. Are there policy implications with regards to these findings of the WBISPP? We need to explore this aspect of the new findings. We also have to endeavor to acquire area specific erosion rates as the strategies to address the problem differ depending on the rate of erosion. These recent findings however should not lead to the conclusion that soil erosion is no more a threat in the country as a whole. The study is simply indicating that certain areas of some of the regions have somewhat tolerable rates of soil erosion.

The Ethiopian Forestry Action Plan (EFAP, 1994) concluded that the deforestation rate in Ethiopia was 150000 to 200000ha per year. In economic terms EFAP estimated the full value of forest depletion in 1990 to have been about Birr 138 million or some 25% of the potential forestry GDP of Birr 544 million. A recent Ministry of Agriculture (MoA) study indicated an annual deforestation rate of 163600 ha between the 1970s and 1986/90. The same study revealed that in the early 90s the undisturbed closed high forest cover was only 0.20%. In just over a decade 2.79 million hectares have been encroached with an annual rate of encroachment of over 200,000 ha.

The limited supply of modern forms of energy and their high costs relative to the low average income per capita, has reinforced the dependence on biomass energy. This pattern of consumption has led to increasing deforestation, shortages of fuel wood and biodiversity degradation.

Ethiopia is renowned for its richness in its biodiversity. The extent of degradation of this resource is wide spread and sever. The undisturbed high forest has dwindled to only 0.2% while all of the parks have been encroached for agricultural and grazing expansion. A number of parks and sanctuaries suffered wide spread damage during the change of government. The handing over of parks and sanctuaries to the regions during the decentralization process without considering their capacity to manage these resources has resulted in their further deterioration. Although it is difficult to quantify the loss of biodiversity recounted above, the constraints, however, do reinforce each other resulting in rapid biodiversity degradation.

The major constraints with regards to land degradation include land clearing for agriculture, large scale infrastructure such as

roads and dam construction, agricultural malpractice, tenure insecurity, limited understanding of issues involved in biodiversity conservation and the Convention on Biodiversity both by decision makers and the public at large, lack of recognition of the roles and rights of local communities in the conservation and use of biological resources and diversity including the inability of responsible institutions to put in place a mechanism for communities to participate in biodiversity conservation. We have come across these constraints in many studies and discussion forums. What we expect in our subsequent discussions is verifying and defining the extent of the impact of these constraints and specifying strategies and actions to address them effectively.

The water resources in Ethiopia are unevenly distributed both temporally and spatially. Currently 30% of the total population has access to clean water while the rural water supply coverage is 23%. Poverty and underdevelopment in Ethiopia is closely related to the underdevelopment of its water resources.

Among the major constraints for the underdevelopment of Ethiopia's water resources are: lack of vision and focus on the part of successive governments with regards to integrated water resources development , the transboundary nature of the major rivers in which 75% of the waters flow out of the country, difficult and broken topography to promote irrigation and long distance water transfer, negligible or no participation of the private sector. As you note I have only provided generalized statement of facts, which have been repeatedly stated in many previous studies. I am recalling these issues and constraints for the purpose of exploring and analyzing them and coming up with practical recommendations in our subsequent discussions.

The built up, social and cultural environment

The built up environment include the urban environment, roads, bridges, dams, power stations and transmission lines, water works, industrial and agricultural establishments, and all other human interventions and artifacts.

The services provided by the built up environment to people define the social and cultural environment and are intricately interrelated.

Ethiopians are by and large rural, with low level of literacy of 23.4% in 1994, very low life expectancy (51 years) in 1992 and very high infant mortality (118/1000) and child mortality (173/1000)(UNDP,1998).

The nexus between poverty and environmental degradation is not straightforward and requires site specific in depth study due to the complexities of the 'poor communities', their surrounding environment and external forces shaping the decisions of the poor. For instance the" *vicious downward spiral*" and the *"environment entitlement*" arguments are not mutually exclusive and in the Ethiopian case many agree that the poor contribute to environment degradation, as do other actors such as the state, investors and the consequences of unwarranted government policies and programmes. It is much more important to deliberate on and specify the policy implications of the various arguments and school of thoughts in order to contribute to policy and practice change on the part of the policy markers and resource users. The policy, strategy and programme responses to poverty and environment degradation need to be based on studies which take in to consideration the specifics of localities, communities and the internal and external forces which shape the decision of the poor resource users. We will have ample opportunities to discuss poverty and environment issues during most of the public workshops.

Global experience shows that population growth alone may not cause environmental degradation, but if the human capital is kept underdeveloped, people are deprived of access to resources and good governance, lack alternative livelihood with no opportunity for non-farm income, and technological stagnation may lead to resource degradation. There is a wealth of information with regards to the population-environment debate and we hope to explore them during our discussions on this and related topics.

Environmental factors which affect health include polluted air which may cause acute respiratory infections, injuries and poisonings,

cardiovascular diseases, cancer, chronic respiratory diseases; poor sanitation and waste disposal which may cause diarrheal diseases, malaria and other vector-borne diseases; polluted water or poor water_management which may cause diarrheal diseases, malaria and other vector –borne disease, injuries and poisoning, unhealthy housing which may cause acute respiratory infections, mental health conditions, malaria and other vector-borne diseases.

Health professionals contend that in Ethiopia 70% of all diseases and 40 to 60% of all skin diseases are caused by lack of adequate potable water. Seventy percent or over 45 million of the Ethiopian population does not have access to potable water supply and relies on untreated and unprotected supplies from rivers, lakes, ponds and springs.

HIV/AIDS has now become the major health threat affecting physically and psychologically all Ethiopians of all walks of life. The most important health issues besides HIV/AIDS are water related diseases and malaria both consequences of the deterioration of the environment.

One aspect of environment, which has not been adequately addressed hitherto, which we will discuss, is the issue of environmental resource conflict. This topical issue will address issues related to resource scarcity, competition for limited resources and resulting conflicts among communities. There may also be opportunities to introduce a rather recent concept, which refers to "social resource scarcity"- a scarcity of adaptive capacity to manage environmental resource scarcity. (*after Lief Ohlsson, Environment, Scarcity, and Conflict.1999*).

The above urban, social and cultural issues, including gender, poverty, environmental refugees, environmental conflict and advocacy constitute quite a large portion of our discussion topics. These areas have not been given sufficient treatment hitherto and will require our undivided attention and serious considerations. The forum's success will largely be measured by what we are able to leave behind with regards to these issues in terms of contributing to policy development and implementation and engendering further debate and research.

Concluding Remarks

Ethiopia has made commendable efforts in terms of policy and strategy response to address environmental degradation, but their implementation leaves much to be desired. This is manifested by the continuing environmental degradation and little visible and practical environmental management activities in both rural and urban areas.

The usefulness of such discussion forums can only be justified if participants of this forum and those who will receive the products of the forum genuinely commit themselves to utilize the recommendations and outputs of the forum to enrich their understanding of the issues discussed, improve policies and strategies, increase implementation efficiency and ultimately show visible positive changes in the state of our environmental resources.

The FSS would like to take this opportunity to encourage all participants in the EPD programme to play an active role in the discussions and dissemination of the output of the forum. The objective of the EPD programme is to produce an "*advocacy document that will subsequently be used as a tool for reform advocacy, policy implementation and evaluation, public education, civil society sensitization*" and this can only be achieved through the active and committed participation of the panelists, the researchers, and the various stakeholders.

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State of the Environment in Ethiopia: Past, Present and Future Prospects

Demel Teketay *Ethiopian Agricultural Research Organization, P. O. Box 2003, Addis Abeba, Ethiopia;*
Masresha Fetene, *Department of Biology, Addis Abeba University, P. O. Box 1176, Addis Abeba, Ethiopia; and*
Asferachew Abate
University of Bayreuth, Germany

1. Introduction

For most of the time in their history on earth, humans remained a part of the natural ecosystem as hunter and food gatherers. It is only around the 18th century A. D. that the industrial revolution began through the wind, and waterpower had been in use on a wide scale in the 11th century. The discovery of new sources of fuel, along with rapid advancements in science and technology, made rapid onslaught on the environment.

Thousands of chemicals unknown to the environment before are being poured into the soil, air and water. In many places, the physical environment is no more habitable, and all these have created a fear of doomsday for humans. *Though the situation is getting worse, it is still possible that the application of an understanding of the functioning of nature and its limitation may rescue human beings.*

2. Major Components and Existing Situation of the Environment in Ethiopia

Ethiopia is a relatively unindustrialized, primarily agricultural country. Its economy is, thus, based on its renewable natural resources, which are mostly used as the basis for its prevalence subsistence life style. This means that virtually all the needs of the population are met by the renewable natural resources found within the country. The state of this resource base should, therefore, be examined in relation to the population.

An exhaustive description of the components of the environment in Ethiopia is beyond the scope of this paper. However, a summary of the major components, which have already been recognized and discussed by the *Conservation Strategy of Ethiopia* (CSE) are presented here.

2.1. Location and Topography

Ethiopia is located between 3° N and 15° N latitude and 33° E and 48° E longitudes. Its location near the equator, together with its extensive altitudinal range, has rendered the country suitable for human settlement based on a big range of crop production systems and pastoralism.

2.2. Climatic Resources

In Ethiopia, the highest mean annual *rainfall* (> 2700 mm) occurs in the south-western highlands, and that it gradually decreases towards north (< 200 mm), north-east (< 100 mm) and south-east (< 200 mm). The major sources of moisture flux into Ethiopia are the Monsoonal (westerly) wind systems from South Atlantic and the Indian Ocean and easterly winds from the Arabian Sea. Based on the annual rainfall distribution patterns, four major rainfall regimes have been recognized in Ethiopia, namely: *central, eastern and northeastern, southwestern and western* as well as *southern and southeastern*

The Afar Depression experiences the highest mean maximum temperature in the country at 45 °C from April to September and 40 °C from October to March. The northwestern lowlands get a maximum temperature of 40° C in June. The western and southeastern lowlands experience a maximum temperature of 35-40 °C during April. In general the highest mean maximum temperature of around 40 °C occur in the peripheral lowlands of the country from March to June, whereas the lowest mean temperatures of around 0° C or lower are observed at night in the highland areas between November and February.

2.3. Land/Soil Resources

Ethiopia has a total land area of about 113 million ha. The highlands above 1500 m constitute around 45% of the total area and are inhabited by 80% of the population. Here volcanic soils are relatively fertile and deep, and 75% of the area has a growing period that exceeds 180 days. The highlands reach up to 4620 m in altitude and provide a big range of environments suitable for the growth of a wide range of tropical, sub-tropical and temperate crops. An equally wide range of farming and land use systems has developed over millennia in response to this diversity.

Below 1500 m are found the lowlands in the northwest, east and south, which are more or less free from tsetse fly. But they are semi-arid and arid, and support pastoralists and agro-pastoralists, who also cultivate maize and sorghum on plains watered by flash floods.

2.4. Water Resources

Ethiopia is endowed with both surface and groundwater resources, and is known as the "water tower" of North-eastern Africa. Except for the Awash and Omo, all the large rivers originating in Ethiopia flow to neighbouring countries. The western part of the country drains into the Mediterranean Sea and the eastern part into the Indian Ocean. Out of the 12 basins in Ethiopia, seven are drained by rivers that flow along or through international boundaries. The total surface of the 18 natural and artificial lakes in Ethiopia is about 7,500 km^2. Seven of the eight major natural lakes are found in the Rift Valley. Ethiopian lakes are rich in fish. The maximum sustainable yield of fish from the major lakes is estimated at about 60,300 tons per year. Lake Shala and Abijata have concentrations of chemicals for the production of soda ash. A preliminary water resources master plan study of the various basins estimates it to be 2.9 billion m^3. So far, only a small fraction of this resource is in use, mainly for local water supply purposes.

The twelve major rivers have a potential to irrigate a total of 3,495,795 ha, of which only a net area of 161,010 hectare (ha) (4.6%) is under irrigation. Similarly, Out of the potential hydroelectric generation power of 135,311 (giga watt hour) GWh/year, only 1,698 GWh/year (1.25%) is actually utilized.

2.5. Forest Resources

The forest resources of Ethiopia had been estimated to cover more than 27.5 million ha of land in 1992 . These resources comprise natural high forests, categorized as slightly and heavily disturbed high forests, woodlands, bushlands, plantations and trees on farms.

2.6. Animal Resources

Ethiopia has the largest livestock population, estimated at 30.6 million Tropical Livestock Unit(TLU), in Africa, and the tenth largest in the world. Livestock are the principal capital of the farmer (0.4 TLU/household) and an integral part of nearly all-farming systems in the country. Production from cattle has been estimated at 620,000 tons of milk, 244,000 tons of meat, 24 million tons of manure and 2.4 million hides annually. The per capita consumption of milk is estimated at 19 liters a year, while per capita meat consumption is 13.9 kg a year, of which beef and veal contribute 6.4 kg a year while sheep, goats, chicken and camels provide the rest.

2.7. Wildlife Resources

The large diversity of ecological conditions determined by topography ranging from 110 m below sea level at Kobar sink in the Afar depression to a peak of 4,620 m above sea level at Ras Dejen, have created diverse and conducive environments for the development of a wide variety of wildlife resources, i.e. flora and fauna, in Ethiopia.

The flora of Ethiopia is very heterogeneous and has a rich endemic element. It is estimated to contain between 6,500-7000 species of higher plants, of which about 12% are endemic. Endemism is particularly high in the high mountains and in Ogaden. Ethiopia is said to have the fifth largest flora in Africa .

The diversity of fauna in Ethiopia is also high, owing to the diversity in climate, vegetation and terrain. It is estimated that there are 240 species of mammals and 845 species of birds of which 22 species of mammals and 24 species of birds are endemic . This makes Ethiopia the richest in avifauna in mainland Africa. Although very little study has been done on the groups, six reptile and 33 amphibian species are known to be endemic. Even less is known about insects and the other groups of vertebrates, but they are likely to contain at least the same proportion of endemic species.

The total area of the Wildlife Conservation Areas (all categories) is 187,712 km^2 (about 6.7% of the country).

2.8. Mineral Resources

In Ethiopia, mining accounted for less than three percent of GDP and less than two percent of merchandise exports in 1985. In 1993, the contribution of minerals was less than one percent to both GDP and exports.

2.9. Energy Resources

Ethiopia has both non-renewable sub-surface (e.g. coal and natural gas) and renewable energy resources (solar radiation and wind energy). To date, most of the energy comes from biomass resources (wood, animal waste and crop residues). Development of hydroelectric power has been expanding but other more modern technologies for harnessing and using other forms of renewable energy have hardly started.

3. Environmental Issues/Problems in Ethiopia

The environmental problems could be generally classified into two categories as *resource management and conservation* and *environmental pollution*. Both problems are linked, but may be also treated separately for the sake of convenience. *Resources are all those requirements of an organism, population or an ecosystem, which help in accumulation of energy by their increased availability*. They are divided into two as: (i) *biological (renewable) resources – resources that can grow in quantity through reproduction and utilization of simple substances*; and (ii) *physical (non-renewable) resources* – resources that are available in limited amounts and cannot be increased in any manner. The rapid decline both in quantity and quality of these resources has led to the concern for their management and conservation.

3.1. Deforestation and Forest Degradation

Although there are ongoing controversies about the extent of past forest cover in Ethiopia, there seems consensus in the fact that high forests might have once covered a large proportion of the landmass of Ethiopia. Authors also agree that deforestation has been a continuous phenomenon in the country, the rate and extent being higher to date than in the past. The underlying causes of deforestation are, however, closely linked with the vicious cycle of mutually reinforcing factors, i.e. poverty, population growth, poor economic growth and the state of the environment. In 1994, it has been estimated that high forests covered less than 2.7% of the country. With the reported annual loss of high forests, estimated at 150,000-200,000 ha, it has been projected that the area covered by high forests may be reduced to scattered minor stands of heavily disturbed forests in inaccessible parts of the country within a few decades.

The demand for wood and woody biomass products is composed of demand for industrial wood products, construction wood and fuelwood. Based on assumed per capita consumption requirements, in 1992 total requirements for wood products have been estimated to be 47.4 million m^3s, of which fuelwood demand was 45 million m^3s . The demand for industrial wood products was estimated to be 403,000 m^3s: 340,000 m^3s sawn timber (300,000 m^3s as urban consumption and 40,000 m^3s as rural), 23,000 m^3s ply logs for veneer and plywood and 40,000 m^3s equivalent of 160,000 telecommunication and transmission poles for the Ethiopian Electric Light and Power Authority and Ethiopian Telecommunication Authority. The consumption of construction wood, i.e. construction poles and fence posts for construction of new houses and renovation, was estimated to be 2.1 million m^3s.

3.2. Land Degradation

Land degradation involves both soil erosion and loss of soil fertility, especially in the highlands. While the soils in Ethiopian highlands have a high inherent fertility, the continuous *removal of nutrients without replacement* as well as the *steep and dissected terrain* with extensive areas of slopes of over 15%, coupled with the *high intensity of rainfall* have led to accelerated soil erosion reaching up to 400 tons/ha/annum . In 1986, half of the arable land in the highlands has been estimated to be moderately to seriously eroded . Of the remaining half, 50% had soils susceptible to erosion that required proper management. Erosion causes cropped areas to loose on average 100 tons of soil per ha annually, and the highlands to loose a total of 1.9 to 3.5 billion tons of soil. The loss in soil

fertility is due in part to the use of animal dung and crop residues as fuel as a result of scarcity of fuelwood. The use of these items for energy represents a loss in crop production of 700,000 tons of grain. The impact of soil erosion on crop yields is estimated to be a reduction of between 1 and 2% per year. The biological degradation due to the decline in organic matter causes a further loss of 1%. At the same time, about 20,000 to 30,000 ha of crop land in the highlands is being abandoned annually since cropping can no longer be supported by the soils. It is projected that 2.4 to 3.8 million people will be affected by the year 2000, and that land degradation at the present rates could destroy the farmlands of some 10 million highland farmers by 2010.

3.3. Degradation of Water Resources

Degradation of water resources involves both siltation and sedimentation leading to changes in the physical, chemical and biological conditions of the resources. *Deforestation, poor agricultural practices* and *soil erosion* increase *surface runoff* and reduce the amount of rainfall infiltrating the soil and eventually percolating into groundwater aquifers. About 74% of the annual runoff of more than 110 billion cubic meter goes into the rivers that flow into Sudan, Egypt, Somalia and Kenya. Lower levels of infiltration and water storage in soils also affect the availability of water for human use throughout the year. This, in turn, leads to higher peak flows in streams and rivers causing greater flood damage. Where soils are better at retaining moisture, spring and river flows are extended and evened out. This is important for irrigation development. Soil erosion also leads to a reduced life of storage dams due to siltation, and may change the conditions for transport and hydropower production. A case in point is the recent power crisis in Ethiopia caused by the siltation / sedimentation of Koka Dam. Other recent tragedies are complete drying out of Lakes Adele and Lange in Harerge. With the present rate of shrinkage, Lake Alemaya will have the same fate as the other two.

3.4. Decline/Loss of Biodiversity

Reduced vegetation cover and the associated impact on land degradation threaten ecosystems for flora and fauna, and thus, for genetic resources as well. Decline/loss in biodiversity ultimately implies economic losses to Ethiopia, a country known as an important regional center of biological diversity, and the world. In addition, removal of vegetation cover reduces the amount of carbon that can be sequestered from the atmosphere, contributing to global warming.

3.5. Invasive Weeds and Unforeseen Risks Associated with Exotic Species

There have been either intentional or accidental introduction of exotic species in the country. The introduction of species may cause several unforeseen risks, such as becoming notorious competitive weed (e.g. *Argemone mexicana, Parthenium hysterophorous, Prosopis juliflora,* water hyacinth, etc.) thereby reducing crop yield and replacing local flora, causing adverse effect on the environment (biotic & abiotic components), introduction of or susceptibility to disease (e.g. stem cracking young trees of *Cupressus lusitanica*).

3.6. Domestic Animal Resources

One other aspect of land degradation is the deterioration of rangelands that is directly related to the large population of animals with low quality, inadequate feeding systems and the breakdown of traditional systems for management of cattle grazing.

Those regions where the greatest numbers of livestock live are heavily cultivated for crop production. As a result, they are largely deficient in livestock feed resources other than agricultural residues. Rangelands (about 500,000 km^2 = 42% of the country's total area; altitude < 1700 and average annual rainfall < 600 mm) are the main feed sources of livestock in the non-cultivable arid lowlands, but pastures and rangelands only supplement crop aftermath and residues in the heavily cultivated parts.

Pastoralists, with a population of only about three percent are the users of rangelands. But due to the expansion in irrigated crop cultivation in some of the traditional pastoral areas, some traditional grazing lands have been lost. The most affected are the Afar and Kereyu pastoralists who have lost close to 35,000 and 22,000 ha of their best dry season

grazing areas, respectively. In addition, traditional grazing areas have been reduced for parks (19,767 km^2), wildlife reserves (28,100 km^2) and sanctuaries (9,536 km^2). This situation has led to conflicts between pastoral communities and animosities towards government organizations using these areas. The pastoralists have been forced to live in and utilize the marginal areas for livestock production. They have, therefore, become more vulnerable to drought than in the past.

3.7. Wildlife Resources

It has been indicated that for the conservation and sustainable utilization of wildlife in Ethiopia, 58 Forest Priority Areas (FPA) and 40 Wildlife Conservation Areas (WCA) have been established. None of the FPA and only two (Semen and Awash National Parks) of the WCA are gazetted. This has resulted in a lack of accountability and has encouraged uncontrolled and unsustainable use.

In most FPA, the existing management plans have been never implemented due to various reasons. Moreover, according to Reusing (1998), already in the beginning of the 1970s, 19 of the 58 FPA did not include any high forest cover. The number of FPA without high forests had further increased to 24 by the late 1980s. The contribution of these FPA to conservation of indigenous forest genetic resources is, hence, limited. The significant increase in FPA without high forest cover also illustrates their weak conservation status at present. The responsibility for the majority of the FPA has been devolved to the Regional States. However, due to insufficient resources in terms of trained manpower, equipment and finance, most of the regions were unable to fully assume the new responsibilities. As a consequence, many of the FPA have been without proper management for most of the last decade, which has accelerated their destruction and degradation. One other environmental concern is the replacement of farmers crop varieties/landraces by improved varieties, which eventually leads to genetic impoverishment or erosion.

3.8. Energy Resources Use

In 1984, the total net energy consumption was mostly composed of traditional biomass fuels (94.8%), the remaining (5.2%) coming from modern energy sources. Of the total net energy consumption, 86.7% was accounted for by the rural population, of which 95.4% was for household use. Traditional fuels contribute 99.9% of the rural energy consumption, with fuelwood being by far the most important source (81.8%), followed by dung (9.4%), crop residues (8.4%) and a small amount of charcoal. When the actual demand and supply of fuelwood are compared, there is a huge deficit already as early as 1992 (Table 1). Here also, consumption of wood exceeds production thereby leading either to "mining" of forest resources or increased use of dung and crop residues, leading to adverse environmental problems mentioned above.

Table 1. Projected demand, supply and deficit of fuelwood.

Year	Demand*	Supply	Deficit
1992	45.0	12.5	32.5
2014	89.0	??	??
Difference	44.0	??	??

Source: modified from EFAP (1994)

3.9. Mineral Resources Use

The process of removal of soda ash from Lake Abijata provides a good example of mining associated with great risks of pollution of a water body known to have very rich fish and bird life. The likely impact of the process of removal of this soda ash on the very rich fish and bird life of the lake has not been properly assessed. This is a major failure.

3.10. Climatic Resources

One of the chronic environment problems in Ethiopia is the recurrent drought over the past several decades and the associated adverse effect on human, plant, animal and microbial welfare. It has affected and continues to affect livestock populations, and hence, the ability of highland farmers to produce crops. The succession of droughts has also led to catastrophic livestock losses as well as deterioration in rangelands. Drought and a certain degree of desertification affect some regions of Ethiopia. At times, the other climatic extreme, i.e. too much precipitation and the subsequent flood, has also been a problem in many parts of the country. Flooding has led to great human, animal, crop

and infrastructure losses at different times in the past.

3.11. Urban Environmental Degradation

All Ethiopian cities, towns and small rural villages in transition to township lack basic services and proper planning. Only 17% of all Ethiopians have access to potable water and sanitation service . Poverty is rampant. The number of unemployed youth is increasing at an alarming rate in all urban centers. Housing is in short supply and a large percentage of the areas of all urban centers are slums making the urban environment difficult or unsuitable for habitation for the majority of urban dwellers.

3.12. Under-Utilization of Resources

Gedion Asfaw (1999) argues that under-utilization of resources should be considered as the very serious category of environment degradation in Ethiopia, where human, land, water, mineral, biodiversity and scenic resources are under-utilized. He noted that any of these resources, if not utilized properly at a point in time, is a lost resource to the beneficiaries of that time, thus, a lost/degraded resource.

3.13. Natural and Cultural Heritage

Ethiopia's rich natural and cultural heritage permeates every facet of daily life and provides a powerful and socially cohesive force in the national consciousness. It can also provide a major attraction for tourists and is an important element in the development of a tourist industry. However, much of this heritage and culture is under threat through the less visible and tangible impacts of changing socio-cultural values, foreign ideas and imported technologies.

3.14. Air Pollution

Air pollution is caused mainly by the addition of poisonous gases and particulate matter. Most of the gases are the products of combustion of fossil fuels in the automobiles, industry and domestic use. These gases include a mixture of carbon and nitrogen oxides and hydrocarbons. Large quantities of carbon particles and lead are also produced during combustion. Normally, these gases become dispersed in the atmosphere diluting their concentration to insignificant amounts. However, the urbanization and industrialization have resulted in areas of excessive pollution where dispersion does not occur over long periods.

Carbon monoxide is highly poisonous to humans since it lowers the oxygen carrying capacity of the blood or in other words, readily combines with the oxygen in the blood thereby causing damage due to deficiency of oxygen. It may cause giddiness and headache in less than an hour at a concentration of 100 ppm, and such situations are common during heavy traffic jams. At higher concentration it is lethal to humans and most other organisms. *Ozone* is highly oxidizing, and in nature, it can damage the leaves of crops like tobacco, tomato, peas and pines in concentrations as small as 0.2 ppm. The mucous membrane is injured at less than 1 ppm concentration. *Sulphur dioxide* and *hydrogen sulphide* have been reported to damage cereal crops, conifer forests and apple orchards. Being acidic in nature when combined with moisture, these gases affect metals, textiles and animals. *Nitrogen oxides* have highly oxidizing action that can kill organisms. Its greater role is in the formation of *smog* (smoke + fog) in cold and humid conditions. The various *hydrocarbons* and *nitrogen oxides* react together in the presence of light, produce *peroxyacetyl nitrate* (PAN) and similar compounds. On foggy days, these chemical substances remain suspended in the atmosphere, adsorbed around particulate matter, and influence all organisms. PAN causes irritation to eye s and bronchial disorders. Another gaseous substance, *fluorides*, is produced from aluminium industry. The fluorides cause serious damage to young leaves and fruit orchards, though some plants like onion, cotton, tobacco and citrus are highly resistant. The *particulate matter* arises from various industrial operations, mining, quarrying, grinding and polishing, saw mills, textiles and burning of fuels. While the larger particles above 10 μ settle down rapidly, the smaller particles remain suspended for very long. During cold or humid periods, they serve as nuclei for condensation of water vapour and produce fog. The particles when deposited on the leaves or even when suspended as part of fog reduce light intensity considerably affecting

photosynthesis. If they are inhaled by human beings, they can cause numerous respiratory diseases and allergies. The particulate matter may also consist of various chemicals, pesticides and poisonous substances as organic compounds of tin, lead and cadmium, which may cause tuberclosis and carcinomas.

3.15. Water Pollution

Addition of any organic or inorganic substances that may affect the physico-chemical and biological properties of water rendering it unfit for a particular use is considered *water pollution*. Since times immemorial, humans have been throwing their wastes into water, but it is only during recent years that fresh water streams have turned into open sewers. The addition of domestic sewage, agricultural waste and industrial effluents reduces the oxygen content of the water body on which most of the aquatic life, including the micro-organisms depend. The organic matter is not readily mineralised, and the anaerobic conditions produce foul smell due to production of ammonia and hydrogen sulphide. The additional input of materials leads to rapid growth of certain organisms, more particularly the phytoplankton, which further add more organic matter. Many poisons are brought with the effluent, and the pathogens make the water unfit for use.

The process in which the primary and secondary production of the water body increases rapidly is called *eutrophication*. The addition of detergents brings in large quantities of phosphates, which can be utilized only in certain group of organisms – the blue-green algae – taking the advantage of their nitrogen fixing ability, and this is again the beginning of eutrophication. The agricultural runoff also brings with it several organic compounds as pesticides, which soon enter into the food chain and become gradually concentrated in the tissues of the organisms at higher trophic level. The higher concentration results in death or impairment of life activities of the animal; for example DDT is feared to cause cancer in humans.

An important pollutant of water is mercury. Mercury compounds are produced as waste in paper mills, chloralkali industry, mercury vapour lamps and plant protection compounds. The inorganic salts of mercury are reduced under anaerobic conditions and in the presence of hydrocarbons into *dimethyl mercury* by various organisms. Dimethyl mercury being volatile and water soluble, enters into the food chain, and finally humans. Large-scale fish kills and deformation of human body (Minamata disease) have been observed from mercury pollution in Japan.

3.16. Soil Pollution

Pollution of soils has resulted from a number of human activities related to the utilization of land resources. The use of excessive fertilizers, pesticides and herbicides adversely affects the physical, chemical and biological properties of the soil, which in turn affects plant growth. Mining, excavating soil for brick making and construction of building, roads, etc. also reduce soil resources. Another source of soil pollution is dumping of solid wastes, which is increasing day-by-day. Other sources of pollution include ionizing radiation. Many of the radioactive substances enter into the food chain and become concentrated causing harmful effects. The ionizing radiation can cause death and bring about genetic changes through mutation.

From the above account, it can be noted that the problems of pollution arise from the human exploitation of natural resources, which has been increasing on a large scale with the general objective of providing better living conditions for human beings. However, *most of the benefits are nullified by the harms caused by pollution*. Many of the harmful effects may not be direct but when we realize ourselves as part of the whole earth ecosystem, in which our own existence depends directly or indirectly upon successful living of other plants and animals and the proper functioning of the environment, it becomes evident that any harmful effect of our activities is bound to reflect upon us too. *The principle of interdependence in the environment and knowledge of the functioning of the environment should only make us function as PART NOT AS MASTER OF THE ENVIRONMENT.*

There is almost no empirical data or documented information on pollution of the environment in Ethiopia. However, there is a

common agreement that our environment is being polluted as a result of compounds released from industries, burning of vegetation and organic matter as well as combustion in automobiles, movement of polluted air from elsewhere (source being from other places), domestic sewage, agricultural waste and industrial effluents, application of excessive fertilizers, pesticides, fungicides, herbicides, etc.

4. Institutions Responsible for the Environment in Ethiopia

Recognizing the magnitude of environmental deteriorations and the need for sustainable development, the Government of Ethiopia approved the Environmental Policy of Ethiopia in 1997. The overall objective of this policy is to improve and enhance the health and quality of life of all Ethiopians and to promote sustainable social and economic development through the sound management and use of natural, human-made and cultural resources and the environment as a whole so as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs

Implementation of the Environmental Policy requires the successive detailing of policy from the level of a very broad intent as expressed in a policy framework down to laws and regulations on the one hand, and to formulation of programs and projects on the other . This, in turn, requires the creation of an appropriate institutional framework. Institutions that affect sustainable development in a country can take several forms . These include among others: families and households, community based groups, local traditional authorities, non-governmental organizations, governmental organizations, religious organizations, higher learning institutions and research organizations.

The institutional setup given in the Conservation Strategy of Ethiopia broadly categorizes institutions into federal and regional. Also included in this document is the legal framework with which these institutions function while their mandates and responsibilities are outlined.

There is no universal model or set of institutions that can be taken as an example to bring sustainable development. However, for a real sustainable development, there is a need to create effective and integrated institutions as well as appropriate institutional arrangements that deal with: (i) formulating and implementing environmental policies, programs and projects; (ii) conducting research to bring solutions to critical environmental problems; (iii) collecting and disseminating environmental information; and (iv) regulating environmental management.

We have attempted to present institutions that have been involved in the formulation and implementations of environmental policies, carrying out research activities relevant to the environment, collecting and disseminating information as well as regulating the overall management of environment. We would also like to point out that only the major institutions actively involved in issues related to the environment and their overall mandates are mentioned here.

4.1. Implementing Institutions[1]

4.2.1 Ministry of Agriculture

The Ministry of Agriculture (MOA) is charged at federal level with responsibility of *inter alia* formulating and implementing land use policy, crop and animal husbandry, rangelands and pastoral development and for conserving and developing the forest resources of Ethiopia. With regard to forest management, the ex-Ministry of Natural Resources Development (now transferred to MOA) and Environmental Protection, has prepared the Ethiopian Forestry Action Program (EFAP). MOA is also currently implementing the Woody Biomass Inventory and Strategic Plan Project (WBISPP).

4.2.2. Ethiopian Wildlife Conservation Organization

The Ethiopian Wildlife Conservation Organization (EWCO), together with Regional Bureaus of Agriculture, is responsible for

[1] Note that only the major mandates and responsibilities of institutions have been included here. For detailed information, readers are referred to CSE (Anonymous, 1997, Volume III).

conservation of protected areas which include National Parks, wildlife sanctuaries, wildlife reserves and controlled hunting areas. These areas contain representative ecosystems in lowlands and the Afroalpine areas.

4.2.3. Bureaus of Agriculture

In each National Regional State, the Bureau of Agriculture (BOA) is responsible to implement the natural resources development and environmental policies of Ethiopia.

4.2.4. Ministry of Water Resources

The Ministry of Water Resources (MOWR) is responsible in determining the methods required for the optimum allocation and utilization of water that flows across more than one National Regional State. The Ministry undertakes the development of integrated master plans for the major river basins of Ethiopia. Accordingly, master plans have been produced for the major river basins, namely Abay (Blue Nile), Baro-Akobo, Omo-Gibe and Tekeze. These master plans contain, among other things, information on biodiversity, land use/cover, agro-climatic zones, population densities, cropping systems, livestock production, fishery and aquaculture.

4.2.5. The Bureaus of Mines, Energy and Water

In each National Regional State, implementation of programs and projects related to water and mineral resources is carried out by the Bureau of Mines, Energy and Water. The Bureau is mandated to cooperate with the Ministry of Mines and Energy concerning the protection of mineral resources and give the necessary support to mining and energy developments carried out in the region;, etc

4.2.6. Ethiopian Science and Technology Commission

The Ethiopian Science and Technology Commission (ESTC) was established with the objective of encouraging and enhancing science and technology (SAT) activities that enable the realization of the country's socio-economic development objectives. The Commission is involved in a number of activities including mobilizing of funds within and outside the country to support research, training of manpower and establish and/or strengthen SAT infrastructure.

4.2. Research Institutions

4.2.1. Ethiopian Agricultural Research Organization

The Ethiopian Agricultural Research Organization (EARO) is mandated to undertake or cause the undertaking of agricultural research activities and advise the government on issues related to agricultural research. EARO is mandated to coordinate agricultural research being conducted by the National Agricultural Research System (NARS), which is composed of Federal Agricultural Research Centers, Regional Agricultural Research Institutions (RARIs) and Coordination Offices (RCOs), Higher Learning Institutions (HLIs), Government and Non-Government Organizations, Private Sector and Regional and International Research Institutions. Currently, the research focuses on crops, animal science, forestry, soil and water management, dryland agriculture, socio-economics, agricultural extension research and technology transfer, plant protection, farm machinery, agrobiotechnology, food science and post-harvest as well as agrometeorology, GIS, biometrics and modelling. These research activities are financed, mainly, by the Government of Ethiopia.

4.2.2. Regional Agricultural Research Institutes and Coordination Offices

RARIs have been already established by promoting the RCOs, which were operating under the BOA, in five of the National Regional States (NRS), namely Amhara, Oromia, Somali, Southern and Tigray while the RCOs in Afar, Benshangul-Gumuz and Gambella will follow suit in the near future. The RARIs have mandates to undertake agricultural research specific to their own NRS and similar objectives as those of EARO.

4.2.3. Higher Learning Institutions

Higher Learning Institutions, namely Addis Abeba University, Alemaya University, Bahar Dar University, Debub University, Jima

University, Mekele University and Ambo College of Agriculture are not only involved in research but also provide training and extension services pertinent to the environment in the country.

4.2.4. Institute of Biodiversity Conservation and Research

The institute of Biodiversity Conservation and Research (IBCR), formerly known as Plant Genetic Resources Center for Ethiopia, is mandated for exploring, surveying, collecting, evaluating, documenting, studying/conducting research on and regulating the biodiversity resources, i.e. plants, animals and micro-organisms, in the country. In its *ex-situ* conservation efforts, IBCR has collected over 54,000 accessions of about 100 different crop plant species, 3,000 accessions representing 450 species of medicinal plants and seeds of important indigenous tree species.

4.3. Regulatory Institutions

4.3.1. Ethiopian Environmental Protection Authority

The Ethiopian Environmental Protection Authority (EPA) is an autonomous federal government authority. It is mandated to prepare environmental policy and laws and, upon their approval, follow-up their implementation. Other duties and powers include the development of environmental standards and their implementation, awareness-creation on environmental issues, environmental monitoring and the coordination and execution of Ethiopia's obligations emanating from international, multilateral and bilateral treaties and commitments.

4.4. Institutions That Collect and Disseminate Environmental Information

4.4.1. National Meteorological Services Authority

The National Meteorological Services Authority (NMSA) is mandated to explore and study the meteorological phenomena, especially the climate in the country, collect, document and analyse, climatic data, publish and disseminate the information generated therefore to end-users. It also provides various services, i.e. daily broadcasting service of analysed climatic data and associated potential events/phenomena; early warning services about climatic conditions, expected climatic variability, hazards associated with climatic factors, etc; provision of climatic data collected from different parts of the country to interested institutions, researchers and development workers; etc..

4.4.2. Central Statistical Authority

The Central Statistical Authority (CSA) has been responsible for the collection, documentation, analysis, publishing and dissemination of statistical data for the country since 1970. It is also responsible for standardizing statistical data collected by other organization. Biodiversity information published on annual basis include population of Ethiopia, population structure, population distribution by region as well as number of livestock and poultry by type, purpose, age and sex.

4.4.3. Ethiopian Mapping Authority

The Ethiopian Mapping Authority (EMA) is mandated to produce land information required for a variety of applications in the various sectors of the country. EMA has the required manpower and equipment to carry out most conventional methods of collection, processing, evaluation and map presentation of land-based information. The satellite data available at EMA consist of: (i) Landsat from 1972/1973: complete coverage of the country; (ii) KATE (Russian satellite images, 1984/85): full coverage of the country; and (iii) Landsat TM from 1985-1998: 80% coverage of the country.

4.5. Non-Government and Community-Based Organizations

There are quite a number of local non-governmental organizations (NGOs) and Community-Based Organizations (CBOs) working on various aspects of environmental management. The Ethiopian Wildlife and Natural History Society, Forum for Environment, Forum for Social Studies (FSS) and the Institute of Sustainable Development stand out for their work of environmental awareness creation and advocacy. In this connection, it is worth mentioning the

environmental advocacy efforts made by FSS, which led to valuable discussions and production of informative publications, namely a newsletter (*Medrek*), discussion papers (e.g. Desalegn Rahmato, 1999, 2001; Meheret Ayenew, 1999), monograph series and conference papers (e.g. Zenebework Tadesse, 2000, 2001) and the current initiative on "*Civil Society and Environmental Policy Dialogue*", to which this review is a part.
Some of the CBOs include "Idir", Women's Associations, Youth Associations in every parts of the country. However, these institutions are not involved in the management of the environment. There is a great potential of using these community-based organizations for sustainable management of the environment. Similarly there are also many international NGOs and CBOs actively involved in matters associated with the environment in Ethiopia.

4.6. Professional/Civic ocieties/Associations
There are many professional/Civic Societies/Associations, most with a Secretariat in the Ethiopian Science and Technology Commission, some with research and development programs, very strong advocacy initiatives and power concerning the environment in Ethiopia.

4.7. Other Institutions
There are also a number of international, regional and sub-regional institutions relevant to environmental management in Ethiopia. The most important institutions include the International Livestock Research Institute (ILRI), the World Conservation Union (IUCN), World Wide Fund for Nature (WWF) and the United Nation Environment Program (UNEP).

5. Efforts Made to Mitigate Environmental Problems in Ethiopia

The fact that the Environmental Protection Authority (EPA), mandated to oversee environmental protection in Ethiopia, had been established by proclamation in 1995 indicates the commitment of the Ethiopian Government to environmental protection in the country.

Ethiopia has ratified International Agreements, Conventions and also endorsed its Constitution; Overall Economic Development Policy, namely Agricultural-Development-Led Industrialization (ADLI); Sustainable Development and Poverty Reduction Strategy and Program, Rural Development and Capacity Building Policy and Strategies, Civil Service Reform Program, Conservation Strategy of Ethiopia (CSE); National Agricultural Research Policy; Biodiversity Policy; Population Policy, Energy Policy, Water Resources Policy, National Action Program to Combat Desertification, Forest Conservation, Development and Utilization Proclamation; etc., which are related directly or indirectly to the environment. Draft document of the National Agricultural Policy, which includes land use, Forest, wildlife, crop and animal production, plant protection, etc. has already been prepared and presented to the Government for approval.

However, the major policy framework with respect to environmental management of Ethiopia is the "*Environmental Policy of Ethiopia*" approved by the Council of Ministers in April 1997. The policy forms Volume II of the CSE and was prepared by EPA in collaboration with the then MEDAC. In the policy, the following sectoral and cross-sectoral issues are considered: soil, forest, biodiversity, water, energy, mineral, urban environment, waste, atmosphere, climate, culture, population, community participation, land tenure, land use, social and gender issues, environmental economics, environmental information system, environmental impact assessment, environmental education and awareness. The policy is supported by two other volumes on "Institutional Framework and Operational Arrangements" (Vol. III of CSE) and "Action Plan" (Vol. IV of CSE). Recently, EPA also prepared got the environmental legislation, required to enforce the environmental policy, as well as Environmental Impact Assessment Procedural and Sectoral Guidelines approved by the Government.

It is only hoped that if what has been planned in the policy and other documents of the CSE and the newly approved environmental law as well as the different sectoral policies, strategies, action plans/programs, projects, etc. relevant to the environment can be

implemented, there is still the opportunity to live in good harmony with our environment.

6. Gaps in Environmental Management in Ethiopia

It has been pointed out in the Environment Policy of Ethiopia that effective environmental management is dependent on the development of appropriate environmental policies and laws, incorporation of environmental concerns into economic development planning and budgeting, coordination and integration, capacity building in terms of skilled manpower and equipment as well as monitoring and evaluation of the planned activities with regard to management, conservation and sustainable utilization of the environment. In this regard, the following major gaps have been recognized during the preparation of the present review:

- *Absence or inadequate enabling policies, legislation, strategies, action programs/plans*: e.g. (i) complete lack of policies, legislation, strategies, action programs/plans on land use, forest, wildlife, crop, livestock, etc; and (ii) absence of environmental impact assessment practices.
- *Inadequate or inappropriate institutional and operational arrangements*: e.g. (i) low profile given to forestry, just a team, both in MOA (federal level) and most BOA (regional level) while it does not even have its own unit in EPA; and (ii) little or no intra- and inter-sectoral integrated efforts in the management of the environment by the different actors due to the existing inconvenient arrangements and/or "stand alone" attitude of the institutions;
- *Lack of National Environmental Research and Documentation Center/Institute and weak environmental research*: leading to: (i) scattered, usually, un-prioritized and uncoordinated, hence, cost-ineffective research activities on the environment; and (ii) inadequate or absence of proper acquisition, management and dissemination of available environmental information required by end users; there is a strongly felt need for establishing a research and documentation institute/center for environmental studies on Ethiopia, which will compile, systematize and distribute information relevant to the Ethiopian environment for end-users; moreover, study of environmental issues and environmental degradation in Ethiopia does not seem to be a direct preoccupation of any research institute; the closest governmental organization by mandate to the subject, EPA, while not engaged in any meaningful research, is more involved in regulatory undertakings and policy formulation. While some environmental research has been done by different departments of Federal and Regional agricultural research centers, these have not been systematic and coordinated.
- *Insufficient or complete lack of knowledge/information*: e.g. on extent (amount or area coverage), composition and number/diversity, values, past and present status, factors, including anthropogenic and natural factors, that favour or disfavour the well being of the various components of our environment is insufficient, scanty or totally lacking; most environmental studies undertaken so far appear to be disjointed and unrelated, nor have the approaches been systematic; there is a need to document and study systematically the status of the Ethiopian environment, especially environmental degradation, to: (i) develop procedure for the identification and documentation of land degradation; (ii) identify key indicator parameters for the study of land degradation; and (iii) develop manuals and/or guidelines for standardizing approaches, methods of assessment and monitoring, and interpretation of data; very few studies deal with description of intervention measures and still less relate to evaluation of intervention measures; comprehensive studies of the relations of environmental degradation, drought and famine and food security either on regional or pilot level are rare and far in between.
- *Shortage of or lack of appropriate interventions/technologies*: e.g. (i) for improving/enhancing productivity and production of the agricultural sector; and (ii) that can assist in the effective management, conservation and sustainable utilization of various components of our environment.
- *Disregard of social and cultural concerns and traditional knowledge*: e.g. (i) lack of incentive mechanisms, e.g. benefit sharing, for local communities that might encourage them to take keen interest and an

active part in the management of the environment; and (ii) insufficient/inadequate exploration, research, documentation and use of indigenous wisdom of local people in the management of the environment.

- *Insufficient and inadequate education and training opportunities (both in quality & quantity) on components of our environment*: at various levels, e.g. elementary, secondary, under- and post-graduate education as well in short- to medium-term on-the-job/hands-on training.
- *Inadequate management planning and weak monitoring and evaluation system*: a common gap in almost all institutions affiliated to the environment.
- *Shortage of resources*: be it financial, physical and skilled manpower in almost all of the institutions involved, directly or indirectly, in the management of our environment.
- *Lack of application of environmental economics in project appraisals.*
- *Insufficient or lack of public environmental awareness and education*, etc.
- *Insufficient/Inadequate support from the international communities for environmental management.*

7. Future Prospects

The future prospect of our environment stems from the status of its various components today and the type of overall environmental management plan that we have envisaged to implement in the future. Although the future prospect of most of the components of our environment seems uncertain, the fate of each component would vary depending on its current status of degradation and/or rate and extent of disappearance. Some of our environmental components, notably forest, land/soil, water and biodiversity resources, are in more desperate situations than others, more so to date than ever. If their current disappearance/degradation continues unabated, it could lead to serious damage to our environment, which would inevitably result in various undesirable consequences that are beyond our capacity to project at present. Hence, there is a great sense of urgency to design and implement strategies, programs and plans, with enabling policy and legislation environments, which could assist in mitigating these environmental problems by all concerned bodies.

8. Conclusions and Recommendations

In this review we set out by providing working definitions and general principles, which are crucial guides in the management, conservation and sustainable utilization of our environment. We have tried to demonstrate that a given impact, positive or negative, targeted to any of the components of the environment would result in the change of attributes of all other components, both biological and physical. The implication from these definitions and principles is that one has to think twice before deciding and applying any impact on any of the components of the environment.

From our review of the available literature and several years of experience in the management of the environment in Ethiopia, we have tried to analyse the past and present status and future prospects of the major components of our environment. The results of these analyses clearly show that considerable damage has already been inflicted upon some of the components of the environment, namely forest, land/soil, water and biodiversity resources.

Attempts were also made to review the major institutions, both Governmental and Non-Governmental, and professional/civic societies/associations that are actively involved in the management of the environment, through either implementing or regulating policies, laws, strategies, programs and plans, research and advocacy relevant to the environment, and the efforts/initiatives made, so far, to mitigate the environmental problems encountered in Ethiopia. The results from our review indicate that there are quite a number of institutions and societies/associations with encouraging, but most often scattered and uncoordinated/un-integrated, efforts and commendable contributions towards the conservation and sustainable utilization of the environment. Despite these efforts, the environmental problems (e.g. deforestation, land degradation and drought) in the country persist while the

processes of degradation/disappearance of components of the environment continue.

Hence, analysis was made to unravel the possible/potential gaps that might have constrained the successful implementation of efforts undertaken so far to bring about the desired/positive impact on the environment. This analysis led to the identification of several gaps (see Section 6) that could have contributed and might continue to contribute to our failure in mitigating the environmental problems and promoting sustainable management of our environment.

The cumulative results of all these chains of events and circumstances are reflected in the undesirable impacts, namely food, feed and wood insecurity, further degradation of the environment, poor economic growth and, hence, aggravated poverty. These, in turn, have placed tremendous pressure on the welfare of human beings, plants, animals and, presumably, micro-organisms.

Based on the foregoing discussions, the following recommendations could be drawn and forwarded to ensure better mitigation and management of the environment in Ethiopia.

- Create the appropriate enabling sectoral and cross-sectoral policy and legislation environment urgently, and facilitate the smooth implementation of policies and legislation relevant to the sustainable management of the environment; put strong laws and guidelines to ensure *Environmental Impact Assessment* (EIA) when and where it is required; IT MIGHT BE WORTH TO STRONGLY SUGGEST, HERE, THAT THE SETTLEMENT PLANS ENVISAGED BY BOTH FEDERAL AND REGIONAL GOVERNMENTS MUST BE BASED ON PROPER AND ADEQUATE EIA TO AVOID COMMITTING THE SAME MISTAKE MADE IN THE PAST.
- Design and implement institutional arrangements appropriate for the sustainable management of the environment and integrated sectoral and cross-sectoral strategies, programs and plans with the active participation of all concerned Governmental and Non-Governmental Organizations/Institutions, professional societies/associations, all segments of the society, development partners and the international communities, as appropriate.
- Establish urgently, where appropriate, Environment Research and Documentation Institute/Center, which should be responsible for developing policies, strategies, programs and plans as well as coordinating and strengthening environmental research in the country; among many others, the institute/center should spearhead the development and implementation of integrated studies of intervention measures to mitigate environmental problems and their monitoring and evaluation; the extent of the environmental crises we are in necessitate a greater concentration of resources, greater cooperation between institutions and persistent continuity of effort at all levels.
- Include social and cultural concerns and traditional knowledge in any endeavor aimed at managing or researching on the environment.
- Revise school curricula to inculcate and enhance the quality and quantity of environmental education and training at various educational levels in the country.
- Establish, where ever appropriate, strong planning, monitoring and evaluation systems on the environment, and include environmental economics in project appraisal.
- Ensure provision of adequate resources (human, physical and financial), as much as feasible, for management and research on the environment.
- Develop and implement attractive programs and mechanisms to increase public environmental awareness at various levels of Federal and Regional Governments and the society.

Finally, it can be concluded, from the foregoing discussions, that the future prospects of our environment depends totally on the current status as well as the rate and extent of damage inflicted upon its sub-sets and the environmental management plans, including mitigation measures, that we have envisaged or are willing to implement in the future. If their ongoing crises are allowed to continue unabated, the future fates of some of the elements of our environment, i.e. forests, land/soil, water and biodiversity, seem dark or uncertain with very frightening unforeseen

consequences. In general, the future well-being of our environment depends on good political will from our Governments, both Federal and Regional, integrated efforts by all concerned bodies working on the environment in the country and appropriate and adequate support from our overseas development partners and international communities.

9. Acknowledgements

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Causes and Consequences of Environmental Degradation in Ethiopia

Ermias Bekele, PhD

The Project Implementation Unit
DGIS-WWF Ethiopia Project
Ethiopian Wildlife Conservation Organization

I. Introduction

Ethiopia, with an area of approximately 1.12 million km^2, is a country of great geographic diversity including sharp and repeated environmental contrasts. The heart of the country is formed by a vast mountain mass, which is dissected into the Central and Eastern plateaus by the Ethiopian Rift Valley system.

The terrain of the high plateaus, often referred to as the Ethiopian highlands, with their diverse ago-climatic/ecological zones and a long history of human habitation, are where over 85% the population and about 90% of the national economic activities are taking place. Covering a little over 40% of the country's landmass, the Ethiopian highlands also harbor about 80% of the land above 3000metres above sea level(masl) in Africa.

The major part of the country comprises of the peripheral lowlands and holds an estimated 12-15% of the population with pastoralism as the main agricultural activity. In consequence, it is in the highland terrain where the lion's share of the environmental degradation in the country has been and continues to occur .

Though empirical data is scarce and/or often widely divergent, personal and professional lifetime observations indicate that environmental degradation, in the country, is enormous and increasing at an alarming rate. Land degradation, through soil erosion and loss of fertility, has become horrendous for various reasons. Deforestation rates have, for too long, been outweighing the sustainable yield rates. The loss of biodiversity, due to conflicts in land use and poaching, has also been and continue to be rampant.

The reasons for the unabated deterioration of the Ethiopian environment and the lack of success in mitigating its associated trends are complex. Hence, stock taking of its causes and consequences is a first and necessary step towards understanding and addressing the issues of environmental degradation in the country.

The purpose of this paper is, thus, to present a synopsis on the causes and consequences of environmental degradation in Ethiopia. It is a contribution towards the FSS workshop on "Civil Society and Environmental Policy Dialogue".

II. Environmental Degradation Defined

Environmental degradation, in this paper, refers to a visible reduction in the availability of goods and services (quantity-and quality-wise) from the physical environment and the renewable natural resource base. It is manifested in a number of ways including, among others, air pollution, land degradation, deforestation and forest degradation, degradation of aquatic systems/wetlands, degradation of grazing lands, loss of biodiversity, depletion of fishery resources, and degradation of the urban environment.

Given the environment as a cross-cutting issue and such a large concept, it is clear that any attempt to treat the topic of environmental degradation in a short paper such as this would neither be realistic nor does justice to the topic. The focus of this paper will, thus, be on the degradation of land, forest and wildlife resources since these are the areas, on which presently, there is relatively more information.

III. Historical Aspects

Historical accounts indicate that Ethiopia was, in the long past, rich in natural resources, had predictable climate, numerous domestic and wild animals and that most of its landscape was forest covered. EFAP (1994) reported that, based on potential climatic climax vegetation, about 42 million ha or the equivalent of some 35% of Ethiopia's land area might once have been covered by natural high forests. But that number dwindled to about 16% in the 1950's, 4.8% in the mid 1970's, 3.9% in the late 1980's and below 2.7% in the 1990's .

The driving force, among others, behind this precipitous decline in the country's forest cover was the demand for land to grow food and for wood as a source of household energy. Generations of farmers have broken the soil and used up its nutrients. They have cut down trees, and their cattle and goats have eaten away the vegetation. The gradual but steady removal of the vegetation cover reinforced a relentless process of land degradation, causing agricultural yields to fall. With the natural cover gone, the soil has become drier and drier, erosion more rapid and droughts more severe and frequent. This in turn induced further deforestation, as more forestlands were needed to be cleared for feeding a growing population. Estimates from the Woody Biomass Inventory and Strategic Planning Project of the Ministry of Agriculture, for instance, show that the annual rate of forest clearing for agriculture in the high forest areas of Bale, Sidamo, Illubabor, Keffa and Wellega, alone, is not only on the increase but also predicted to grow from 5.6% in 1995 to 7.7% in 2005 and 11.8% in 2015 .

The overriding issue affecting Ethiopia with regards to maintenance of the integrity of its natural resources is land degradation through soil erosion and loss of soil fertility in the highland areas. The NCS (1994), for example, notes that approximately 17% of the country's potential agricultural GDP are being lost because of soil degradation. Sutcliffe (1997), basing his argument on soil depth and associated type of crop grown as well as the landscape where the soil is removed and deposited, however, put this figure to an estimated low of 3.5%. He also predicted that there would be a 10% annual loss of livestock production by 2010 unless land degradation is arrested.

Indeed, accelerated soil erosion in Ethiopia has a history dating back at least to the Axumite State. As a result of the long history of human settlement in the highlands, little natural vegetation remains in that part of the country . Centuries of habitation of the highlands are associated with the practice of sedentary farming with livestock rearing by extensive grazing. It is also characterized by rain fed cropping by shifting cultivation with long fallow rotation periods at the periphery.

On the other hand, the wide-ranging ecological diversity of the highlands gave rise, over time, to an extraordinary variety of production systems, which sought to exploit the local and regional specifities to assure secure livelihoods. Hence, trees were cut down to give way for cropping to meet the basic needs of food for the family and for firewood. Livestock production also became the primary form of accumulation of wealth and asset and was the key factor that determined an individuals' economic, social and political status.

With the upward surge in human and livestock populations, activities on the use of the land resources also increased. This led to exploitation and over-use or mis-use of land resources including agricultural, forest and grazing resources to such an extent that vast areas of once-forested lands have permanently lost their vegetation cover. The ecological equilibrium attained through balancing the utilization of natural resources and economic needs became destabilized leaving many areas degraded and damaged beyond recover. The north, central and eastern parts of Ethiopia show in an irrefutable way, and with brutal realism, the process of deforestation, over-cultivation, and overgrazing and land degradation.

Simply put, the land can no longer provide the varied goods and services that the generation of present day Ethiopia need. The people are now increasingly dependent on relief food to survive. The life-support systems are in real threat and Ethiopia is facing an environmental deterioration unparalleled in its long history. It could and at best described not only as an EMERGENCY situation but also calls for decisive ACTIONS, on the part of all concerned, as of immediate.

IV. Basic Causes of Environmental Degradation in Ethiopia

The causes of environmental degradation in Ethiopia are diverse and complex. Many different factors are involved and their combination, relative importance and interactions vary not only from region to region but also, over the course of time, influenced by natural settings, socio-economic-political arrangements as well as government policies, strategies and programs .

Altitude, vegetation cover, rainfall, soil type and wind are key natural factors. Key factors among the socio-economic and political determinants are population pressure, poverty, land use and management practices, and farmers' perception and attitudes. Examples of government policies/strategies and programs that have and continue to influence the state of environmental degradation in Ethiopia relate to agriculture (including land, livestock, forest, water, wildlife, etc), industry, and infrastructure and urban development. Equally important are the crosscutting policy/strategy/programme issues of population, environment and gender.

The causes of environmental degradation in Ethiopia can effectively be categorized into proximate and underlying factors. Some of the major **proximate** causes include:

- Increased cultivation on steep slopes and marginal lands,
- Loss of vegetation cover resulting from deforestation and overgrazing,
- Low and declining use of fallow,
- Limited use of soil fertility enhancing inputs such as fertilizer, manure and leguminous crops,
- Limited adoption of soil and water conservation practices,
- Limited culture of tree growing,
- Frequent and wide spread forest fires,
- Poaching, and
- Industrial waste and the issue of solid waste management in urban centers.

The following are the major **underlying** causes of environmental degradation in Ethiopia:

- Population pressure,
- Poverty,
- Agricultural/economic stagnation and/or food insecurity,
- Absence of appropriate /effective and/or weak policies and institutional
- arrangements, including insecurity of land/tree tenure,
- Poor governance and political tolerance/protracted civil wars,
- Entrenched bureaucracy, and
- Rampant corruption.

Each of these proximate and underlying causes could be elaborated/substantiated at length. However, it suffices, here and for the purpose of illustration and conciseness, to focus on few aspects, each, of the respective proximate and underlying causes.

A. Proximate causes

Cultivation on steep slopes and marginal lands

Crops, increasingly, are being cultivated on steep slopes and marginal lands because of an ever-increasing population and the associated declining availability of prime arable lands. Very often, these are areas where the soil depth is very shallow and soil fertility low. The effects of such practices on integrity of the resource base and the associated decline in agricultural productivity/production are clear. Dawit Kebede (1996), for instance, reported that about 29% of the total area in the Amhara Region experiences a high erosion hazard (51-200 tons/ha/year; 31% exhibits a moderate erosion hazard (16-50 tons/ha/year and a 10% highest soil loss rate of > 200 tons/ha/year from increased cultivation on steep slopes and related factors. Even more interesting was the fact that the 10% highest erosion hazard contributed to almost 50% of the total soil mass removed from the Amhara region.

The FAO (1986) estimated an average soil loss of about 100 tons per ha per year from cropped areas. Available data on the impact of such soil loss on agricultural productivity vary from a national estimated low of 0.12 to 2 % (Kappel, 1996), 1.6% (Sutcliffe, 1993) to a high of 72% (Adugna, et. al., 1996) for a specific study area in Western Hararghe. These wide variations including the predicted area of some of 7,700,000 ha by the FAO (1986) and 490,000 ha by Sutcliffe (1993) of cropland that will be lost due soil erosion by 2010 are largely a function of the assumptions made by each source.

Loss of Vegetation Cover

BoA (1997) found that about 20 thousand hectares of vegetation cover is lost annually, in the Amhara region, for fuel wood, logging and construction purposes. In consequence, about 1.9 to 3.5 billion tones of fertile topsoil are

washed away, annually, into rivers and lakes due to deforestation, alone, as the denudation exposes the soils to high intensity of rainfall.

B. Underlying causes

Population Pressure

Population pressure, as an underlying cause, suggests increased need for food and other land products. At the current estimated population of 67 million and an annual rate of population growth of about 2.7%, it is projected that Ethiopia's population will reach 73 million by the year 2005 . Clearly, every new birth means a new mouth to feed, an additional bundle of fuel wood to cook the food with, and a new body to cloth and house. Dessalegn Rahmato(2001), however, emphasized that the issue is not simply acknowledging population pressure as an underlying cause of resource degradation but more importantly identifying the particular sector of the Ethiopian society, which is more responsible for and affected by the environmental degradation that has taken and continuous to take place in the country.

In the same vein, Dessalegn (2001) argued it is only under limited circumstances that population pressure might negatively impact on the well-being of the environment and concluded it is through the "rich and powerful and the lack of sound policies and development programmes" in which the loss of the country's forest resources could be explained.

Pender (2002), on the other hand, reported varied findings from the Tigray, Amhara and Oromiya regions, on the relationship between population pressure and environmental degradation. He noted that population pressure has insignificant impacts on crop yields, incomes and perceived land degradation indicators in Tigray. Moderate population pressure was indicated to contribute to the effectiveness of community management of woodlots and grazing lands while high population contributes to breakdown of collective action . It was further found that population pressure contributed to expanded crop production and income in Oromiya but was associated with lower crop yields and income in Amhara. Population pressure was, thus, concluded to contribute to land degradation and declining yields, to a greater extent, in the Amhara Region than in Oromiya or Tigray Region.

Poverty

Poverty, at the household level, relates to the basic issues of food, shelter and clothing. It is also about the issues of access to clean water, health, education and other social services. Jemal (2001) characterizes powerlessness, low self-esteem, lack of confidence and isolation as important attributes of poor people. He further explains that gender in-equality, food insecurity, inadequate social services and the prevalence of HIV/AIDS are additional and specific dimensions of poverty that need to be well responded to.

Poverty is unquestionably one of the fundamental problems, which almost half the Ethiopian population continues to face. It is not only a chronic problem made worse by a range of shocks including serious drought, famine, civil war and mass displacement but also causes enormous environmental damage as the poor are forced to mine the rapidly disappearing natural resources in their surroundings. Analysis by Dessalegn (2001), on the other hand, suggested that the two circumstances in which poverty might contribute to environmental degradation are firstly, that the poor can ill-afford the use of organic or fertilizers, and secondly their in-ability to mobilize large labor inputs for land improvements. The 1995/96 and 1999/00 National Household Income Computation and Expenditure (NHICE) surveys and analysis, by the Central Statistics Authority, indicate that the poverty situation in the country is not only deep, broad and complex but also that 44% of Ethiopia's population were absolutely poor in 1999/00 .

In a bid to address the poverty issue, the Ethiopian government has developed a Sustainable Development and Poverty Reduction Program for the country. A fundamental objective of its poverty reduction strategy is to reduce poverty by 10% by 2004/5 from its 1999/00 level of 44%. MOFED outlines the following as the four building blocks of Ethiopia's poverty reduction strategy:

Agriculture Development Led Industrialization (ADLI),
Reform of the Civil Service and Justice System,
Decentralization and Empowerment, and
Capacity building in public and private sectors.

Insecurity of land/tree tenure

The issue of land/tree is crucial to the whole operation of improved land management. Though there could be differences from region to region and among the poor and well to do, it appears that the question of ownership and titles to land is of paramount importance in farmer's decision making for investment on improvements to the land/tree growing. The matter is particularly complex with regard to common property resources (grazing lands, community forests, water rights, etc). In his analysis of the link between poverty and environmental degradation, Dessalegn (2001) noted that in a situation where there is an open access resources, it is the better offs who stand to exploit and benefit more than the poor, at least in the short term.

A doctoral study on the relationship between land tenure and environmental degradation by Terefe Degefa (1999) showed that peasants are forced to undermine long- term use of land resources and concentrate on short-term gains. His 1991 to 1997 work, in two villages of Kersaa and Kondalitii district of Central Ethiopia, showed that about 82% of his peasant categories do not feel secure about the existing land holdings, 15% feel to have secure tenure while 3% declined to reply. However, it was noted that about 89% of his peasant respondents did plant eucalyptus seedlings around their homesteads. Apparently, tree planting around homesteads was not a land tenure issue, as the purpose of such trees was intended not for conservation but rather fuel wood and construction purposes.

V. Major Consequences of Environmental Degradation in Ethiopia

Given the multi-sectoral nature of environmental issues, the consequences of environmental degradation in Ethiopia are, indeed, many and quite glaring. The following are the major ones and include loss of soil fertility, food insecurity, displacement of people, ever-diminishing availability of forest and non-wood forest products, and enhanced loss of biodiversity. A brief account on each follows:

Loss of soil fertility

The rugged terrain of highland Ethiopia, including slopes over 50%, are, because of demographic and other factors, cultivated and grazed increasingly and continuously with no opportunity for them to regenerate. In consequence, soil losses of and exceeding 200 tons /ha/ year have been recorded in the Amhara region. Bezuayehu, et.al. (2002) reported that up to 14 times wider and deeper gullies were observed throughout the Oromiya region because of severe erosion over the past four decades or so. Likewise, the rate of nutrient depletion (through the burning of cow dung and use of crop residues for domestic feed) is so great that Sutcliffe (1993) concluded the loss of soil fertility may, actually, be a larger problem than soil erosion in the Ethiopian highlands.

Food insecurity

MoFED (2002) recognizes that the performance of the Ethiopia economy and agricultural sector, over the last four decades, has been rather dismal. Various factors explain this situation and include limitations to:

Alternative livelihood options/lack of off farm employment,
Education of farmers including awareness and access to appropriate and profitable techniques,
Development or responsiveness of agricultural research and extension systems to farmers' needs,
Development of and access to market, infrastructure and credit, and
Land tenure insecurity, land fragmentation and limited development of land markets.

MoFED (2002) further acknowledges that the magnitude of the poverty indicators revealed

in the 1995/96 and 1999/00 NHICE surveys are a clear manifestation of the scope and depth of the food insecurity problems in Ethiopia. It notes that in one year and with a food poverty level of 44%, more than four million people faced food shortages and need relief assistance.

A combination of factors contributes to the serious and growing food insecurity in Ethiopia. These include environmental degradation, drought, policy induced agricultural stagnation, civil strife and poverty. The overall objective of the governments' food security strategy is to ensure food security at the household level, while its rural development policies and strategies (ADLI) focus on ensuring national food self-sufficiency. The strategy itself has three building blocks:

- Increasing the availability of food through domestic (own) production,
- Ensuring access to food for food deficit households, and
- Strengthening emergency response capabilities.

Displacement of people

For some time now, the effects of environmental damage have reached crisis proportions and are manifested through fuel wood shortages, drying up of streams, and the recurrence of drought and famines. Droughts have been part of the environment for centuries. As early as AD 841, Ethiopian scholars were writing about drought and famine. At that time the worst of them hit every 200 years . By the 1980's the droughts were occurring one year after another. The 1984-85 drought was the worst resulting in massive loss of property and incalculable human misery. And yet, possibly, the severest of them could be in the horizon given the prediction that "... the number of people facing starvation could rise to 15 million... "early in 2003 if donors support is not forthcoming (The Ethiopian Herald, 22 November, 2002).

Shocks due to floods, drought or famine and civil wars have lately become increasingly recurrent phenomena in Ethiopia. The almost regular annual floods in Addis Ababa, floods along the Awash and Baro rivers, the dreadful droughts of the 1970s and 1980s and the over three decades of civil wars in the country are but a few examples, to cite. In consequence, many Ethiopians were forced to leave their domiciles and resettle in areas hundreds of kilometer away from their birthplaces, where many unfortunate people perished. A more recent example of people displacement is the over 33,000 drought induced migrants who moved into the fringes of the Mena-Angetu National Forest Priority Area of the Bale zone, Oromiya Region, alone, over the past few months.

Diminishing availability of forest and non-wood forest products

Estimates on forest cover change in Ethiopia vary from a minimum of 62,000 ha/year (FAO, 1999) to a high of 150,000-200,000 (EFAP, 1994). While estimates by Reusing (1998) were 163,000 ha/year, the Woody Biomass Inventory and Strategic Planning Project (2000) of the Ministry of Agriculture came out with an estimate of 59,000 ha/year for the three better forest covered regions of Oromia, Southern Nations, Nationalities and Peoples and Gambella. Despite these estimate variations, there are clear implications for the sustainable provision of goods and services including forest and non-wood products from these areas. Possible goods and services include industrial wood, fuelwood, medicinal plants, honey as well as forest functions related to recreation, education and research.

Enhanced loss of biodiversity

Population pressure, which leads to conflicting land use practices remains a major threat to enhanced loss of biodiversity in Ethiopia. Natural forest clearings for the purposes of state farms, coffee and tea plantations, resettlement, villagization, private investments are important practices that have been and still continue to contribute, negatively, to the decreases both of our forest and wildlife resources.

The depletion of wildlife due to conflicts in land use and habitat destruction is even more revealing. Almaz (2001), for instance, reported that the population of Swaynes Hartebeest in

the Senkele Swaynes Hartebeest Sanctuary, declined from 2350 in 1990 to about 130 individuals by 2001 due to habitat fragmentation. She also noted that encroachment for grazing and settlement had become a cause for hybridization of wildlife (as in the cause of the endangered Ethiopian Wolf) and the transfer of diseases such as rabies and anthrax. An example, was the anthrax outbreak, due to settlement in and around the Mago National Park, which in 1990 and 2000 killed 1124 and 160 wild animals, respectively. Poaching has also been the cause of the recent disappearance of Grevy's Zebra from the Awash National Park, and for decline of wild ass, elephant and giraffe in other protected areas.

VI. Challenges and Opportunities

Ethiopia's goal towards achieving sustainable development and reducing poverty must, among other measures, encompass a reduction in the rates of land and forest degradation, deforestation and biodiversity losses. Thus, the major **challenges** that Ethiopia continues to face in addressing environmental degradation are to:

- Act on it, **Now**, including the mobilization of resources for the implementation of existing strategies and action plans,
- Make an in-depth analysis and create a sustainable and impact producing and/or enabling policy and institutional environment and effect its implementation, as soonest possible and at all levels,
- Strengthen capacity and improve its effective use,
- Promote partnership and the participation of key stakeholders towards the adoption of sustainable management approaches and practices including improved land husbandry, and
- Launch systematized and in-depth studies on key determinants to environmental degradation to fill the missing gaps in on our state of knowledge.

Among the major **opportunities** available to address environmental degradation in Ethiopia include the:

- Extensive renewable natural resource base (including rich floral and faunal diversity), which merits concerted conservation effort by national, international and non-governmental organizations,
- Potential for the promotion of key stakeholders participation (particularly local communities) in the planning, decision-making, implementation and monitoring and evaluation processes of conservation and development projects,
- Potential for the promotion of forest landscape restoration (due to its focus on the broader role of forest functions in livelihood security and in particular finding a balance between ecological integrity and human well-being) initiatives as effective vehicle through which the forest sub-sector can play a more meaningful role in the future of Ethiopia,
- Possible implementation of the Poverty Reduction Strategy, in which the forest and wildlife sub-sectors could make significant contribution to the poverty reduction initiative,
- A potential enabling policy environment of decentralization in which regional states have now the power to raise their own revenues, plan and execute conservation and development activities, establish and execute conservation and development activities, and establish and mandate appropriate institutions, and
- Creation of the Ministry of Federal Affairs whose mandate is to ensure synergy between different stakeholders, both at the Federal and Regional levels.

GLOBAL ENVIRONMENTAL ISSUES AND IMPACTS ON ETHIOPIA

Dessalegne Mesfin, *Deputy G/Manager, Environmental Protection Authority*

Introduction

Environment is the source of what every one of us needs to survive. It is also the source of the materials we require to take our lives from pure survival to subsistence and a better standard of living. However, the failure to continue on establishing equitable system among peoples, states and nature has lead to the disruption of economic, social and political framework necessary to ensure the uninterrupted continuation of civilization.

The major reasons why we care for the environment is, thus, predicated on the understanding that degradation and depletion of the environment and resources linked to it has not been slowed down let alone to be halted. First and for most, the traditional economic thinking, which does not center equity as well as sustainability, had exacerbated the problem.

The other cause that endangers the environment is poverty. Nowadays, poverty is recognized as the "worst form of pollution". Poverty places pressure on the environment and environmental resources. Furthermore, poor peoples are the most affected since they are more vulnerable and less protected from environmental risks.

The environment has always been critical to life but international dimensions of environmental problems have been recognized only recently. For instance, the idea that development endeavor could be limited by the finite size of non renewable resources and unsustainable use of renewable resources, and the transboundary nature of environmental problems is a very recent understanding. Environmental problems, particularly those of a transboundary nature, can not be resolved without worldwide cooperation and strong commitment.

The global environmental issues so identified accordingly are the prevailing over and under development. The specific global environmental problems such as, climate change, depletion of the ozone layer, destruction of biological resources, loss of biological diversity, land degradation or desertification and pollution resulting from hazardous things are causes and effects unsustainable development.

In tandem with the identification of general and specific environmental issues and problems, particularly, since 1972 a significant number of environmental conventions have been concluded. In particular, after the 1992 Rio-Conference international agreements have addressed environment and related issues within the context of sustainable development.

Problems Resulting From Over Development Climate Change

One of the areas that the international community agreed upon for the taking of global environmental measures has focused on the protection and utilization of the atmospheric resources. The management and utilization of the atmospheric resource requires a holistic approach. Because it is impossible to divide the atmosphere in terms of territorial boundaries for it is a single indivisible whole that is shared and put in use between and among nations.

The emission of such gases as carbon dioxide, methane and nitrous oxide of anthropogenic origins affect the atmospheric environment. As these gases form a blanket around the planet earth and preventing the radiation from going back into space, they constitute the greenhouse effect. This incident is likely to affect the climatic balance in ways prejudicial to human and environmental safety.

The concentration of Co_2 is singled out as one of the major greenhouse gases. It causes the greenhouse effect known as "global warming." Greenhouse gas emissions are unevenly distributed between countries and regions. Organization for Economic cooperation and development (OECD) countries contributed more than half of Co_2 emissions in 1998. The problem of global climate change attributes to irrational development activities since the industrial revolution. In particular, machines that are using fossil fuels and coal are the

major sources for excessive emission of carbon dioxide. This problem is exacerbated by destruction of vegetative covers that could have absorbed carbon dioxide emitted in excess.

Climate change has emerged as one of the major threats to biodiversity. Climate change could lead to adverse impacts on ecosystems and goods and services they provide. Due to climate change, desertification increases in some areas and some species could also become more vulnerable to extinction. Climatic variability and associated floods and droughts result in increased risks of crop failure and therefore resulted in reduced food security and increased incidences of malnutrition and diseases.

The United Nations Framework Convention on Climate Change [FCCC] and the Kyoto Protocol are the key international legal instruments adopted by the international community to address problems related to greenhouse gas emissions. The main goal of FCCC and Kyoto Protocol is to stabilize greenhouse gas emissions. The principle of "common but differentiated responsibilities" provided under FCCC has guided the adoption of a regulatory structure. This principle reflects the reality that most emissions of greenhouse gases are from industrialized states. That is why the Kyoto Protocol sets actual targets for emission reductions only on developed countries.

Issues In Connection With Climate Change

Climate change would also affect developed countries. But, in terms of livelihoods and other issues, these countries have demonstrated greater resilience. Developed countries are major emitters of carbon dioxide and other greenhouse gases and thus expected to take the lead in stabilizing their emissions and should bear the main responsibility in this regard.

The small island states felt that their very existence is at risk for sea level is rising and thus support targets for the stabilization and reduction of emissions of greenhouse gases. Oil-predicting countries felt that their economies would be at risk and request their economy to be taken into consideration in determining measures to stabilize emissions of green house gases. Countries, like Ethiopia, where in agriculture is the main stay of the economy are affected by climatic variability and associated floods and droughts that are resulting in increased risks of crop failure and reduced food security and increased incidences of malnutrition and diseases.

Depletion of the Ozone Layer

The other problem in connection with atmospheric pollution pertains to depletion of the ozone layer. Emission of ozone depleting substances beyond the carrying capacity of the atmosphere is the major cause of disturbances on the global atmosphere. The disturbance of this state of equilibrium entails adverse effects on the natural system.

In this context, the detection of a hole in the earth's stratospheric ozone layer posed challenges and required urgent response. Consequently, one of the global agenda has focused on the protection of the ozone layer. Ozone is the upper atmosphere [stratosphere, 25 to 40 Km above the earth's surface] and protects all life on earth against the short wave length ultraviolet radiation coming from the sun, which in higher quantities will be damaging to life.

The stratospheric ozone layer provides immense contributions in limiting the flow of ultraviolet rays. The flow of unlimited quantity of ultraviolet rays to earth will entail adverse impact on biological diversity and human health. The depletion of the ozone layer due to increased ultraviolet radiation has potential to cause adverse impact on health, plants, aquatic ecosystems and other properties. Ozone depleting substances also contribute to the greenhouse gas effect.

The decline of the ozone layer entails deleterious effects on a variety of life forms. The continued consumption of ozone depleting substances [herein after substances] and uses of appliances operating with the help of such substances [herein after appliances] are responsible for depletion of the ozone layer. Despite their adverse impact, however, the substances are very essential and so used for various purposes.

The international community adopted the Vienna Convention for the Protection of the Ozone Layer. The objective of the Convention is to protect human health and the environment against adverse effects resulting from the modification of the stratospheric ozone layer.

The Convention is a framework international environmental law. As such it imposes only obligations of a general nature. The framework nature of the Vienna Convention and its incapacity to implement itself necessitated the need to put in place subsidiary protocols. The substances the consumption of which is under way herein Ethiopia include CFC-11, CFC-12 and Methyl chloroform.

Issues In Connection With Ozone Depleting Substances

Ethiopia does not produce any of the substances nor appliances. All such substances and appliances have been imported into Ethiopia. The uses of all the imported appliances are mainly for domestic, commercial, industrial, medical and scientific purposes. Countries that are manufacturing appliances and substances are in the course of phasing out them in a progressive manner.

The national issue in connection with ozone is how to develop and implement a regulatory system to minimize and avert the adverse impacts likely to occur upon the national economy when the controlled substances and appliances that we need for various purposes get out of production and marketing? The other is how to counter, together with the international community, agricultural losses and adverse health effects from exposure to ultraviolet rays.

Hazardous Chemicals and Wastes

The growth of chemical production and trading during the past three decades has triggered concerns on risks of hazardous chemicals and wastes. Many hazardous chemicals are considered not only resources but also pollutants adversely affecting health and environment where they accumulated in the food chain or transported long distances.

Exposure to hazardous materials and wastes can lead to harmful effects. On human beings the said harmful effect may range from death to ill health or loss of amenity. Human beings and environment can be exposed to hazardous materials and wastes through various ways. This does not mean that all chemicals are hazardous.

However, there are chemicals that are exceptionally toxic, have exceptional capacity to resist degradation and accumulate and travel long distances across international boundaries and deposit far from their place of release.

These chemicals are dangerous to health. The health concern resulting from local exposure to persistent organic pollutants, in particular impacts upon women and, through them, upon future generations is a serious concern. As a result the Stockholm Convention on Persistent Organic Pollutants, Rotterdam Convention on the Prior Informed Consent Procedures for Certain Hazardous Chemicals and Pesticides in International trade and the Basel Convention on the Transboundary Movement of Hazardous Wastes are concluded.

The Basel Convention stipulates that training, education, and public awareness are important elements in developing country's capabilities and that where there is a lack of resources and expertise, technical assistance can be provided through bilateral and multilateral funding. As things stands out now the Basel Ban amendment and the Bamako Conventions prohibits the coming into Africa of any hazardous wastes for what so ever reason. This is on the assumption that developing countries do not have capacity to manage them in an environmentally sound manner. Unfortunately, the Basel Ban Amendment has not yet entered into force.

Issues In Connection With Hazardous Wastes

What can we do to facilitate the entry into force of the Basel Ban Amendment?

Biological Modified Organisms

Biotechnology has, in the form of traditional techniques, been used for decades. It has also been the basis of traditional animal and plant breeding techniques. The difference is that with genetic engineering one can now take a

single gene from a plant or animal cell and insert it in another plant or animal cell going beyond the taxonomic family.

This new technique entails both positive and adverse consequences. The organisms resulting from the use of genetic engineering referred to as genetically modified organisms (GMOs) are at the center of biosafety issues. GMO in turn form the basis of a range of products and produces. Such processed products containing GMO are normally categorized as products thereof. Genetic engineering promises to contribute in medical, agricultural and other fields. Proponents of the technology argue that genetic engineering has potential to ensure food security etc.

Genetic engineering is a very new field, and much about the interaction of GMOs with various ecosystems is not yet known. Genetic engineering can make contribution, if developed and used with adequate safety measures. GMOs and products thereof have risks. These risks include potential adverse impacts on biological diversity and human health.

Particularly unintended changes on target and non-target species and ecosystems, the potential for weediness in genetically modified crops and instability of inserted genes and their transfer to another host can be mentioned in this regard. Biosafety refers to measures to reduce or eliminate such a kind of risks. Biosafety measures are designed in line with the precautionary approach.

Added to this, patenting genetically modified organisms entails critical socio-economic issues that divides the whole world into two groups. The vast majority of the countries support no patent on living things for no one has yet learned to invent living things.

Loss of Biological Diversity

Benefits of Biodiversity

Loss of biological diversity is a serious disaster to the world in general and the underdeveloped country in particular for it is an irreplaceable resource to satisfy all the basic needs. Biodiversity has wide range of services. It helps regulate gaseous composition of the atmosphere, hydrological cycle and climate, generate and conserve soil fertility, disperse and breakdown wastes, pollinate crops, and absorb pollutants.

Human health and well-being are directly dependent on biodiversity. Some 75 percent of the world's populations rely for health care on traditional medicines, which are derived directly from biodiversity. Biodiversity also provides genetic resources for food and agriculture, and it is the basis for world food security and support human livelihood.

Not only the needs of the poor in particular but also the world's economy in general is anchored on biological diversity. For instance Ethiopian varieties provided protection from viral pathogens to California's barley crop, the contribution of which in terms of money is estimated US 160 million per year (UNEP, 1995). Due to unregulated and misguided development activities, however, the pool of biodiversity has been more and more endangered.

The ecological balance that sustained the wealth of biological diversity has been gravely handicapped and numerous genes, species and habitats have been smashed. CBD is the response to the increased recognition of the importance and adverse impacts resulting from the loss of biodiversity.

The objectives of CBD is to ensure conservation of biological diversity, sustainable utilization of its components and equitable sharing of benefits arising out of the utilization of genetic resources.

Issues In Connection With Biological Diversity

There are huge challenges that lie ahead. CBD's relationship with organizations such as the world intellectual property Organization and world Trade organization need to be clarified if there is to be further progress on the "fair and equitable sharing of benefits arising from genetic resources.

Furthermore, the question of whether provisions of CBD on access should have retroactive application or not and putting in

place a legally binding regime on access to genetic resources and benefit sharing are the contemporary issues.

Desertification

The UNCCD defines desertification as "Land degradation in arid, semi- arid and dry sub-humid areas brought about by factors such as climatic variations and human activities. Human activities contributing to land degradation include unsuitable agricultural land use, poor soil and water management practices, deforestation, removal of natural vegetation, overgrazing, poor irrigation practices etc.

The problem of desertification is a problem of unsustainable development and that the response to counter it requires actions focused towards achieving sustainable development in a progressive manner. Combating desertification and minimizing effects of drought is synonym to conservation and sustainable use of biological resources along with improving the social and economic environment of poor peoples.

Issues in Connection With Desertification

The issue is how to redesign the existing global economic system to work for the poor. At a national level what can we do to solicit and channel resources to those communities residing at the lowest administrative unit to start building sustainable development at a community level?

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Note: For the sake of brevity the extensive list of references, abbreviations, and acronyms of the above papers have been left out. Please refer to the original papers for these items and the FSS apologizes for any inconvenience.

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