TRANSITIONAL GOVERNMENT OF ETHIOPIA

NATIONAL CONSERVATION STRATEGY

VOLUME I

NATIONAL POLICY

ON

THE RESOURCES BASE, ITS UTILIZATION

AND

PLANNING FOR SUSTAINABILITY

National Conservation Strategy Secretariat
Ministry of Natural Resources Development
and Environmental Protection
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CHAPTER I

A CONCEPTUAL FRAMEWORK FOR ENVIRONMENT AND DEVELOPMENT IN ETHIOPIA

A hypothesis or a point of view is useful for martialling information, and martialling has to be efficient if such a wide topic as environment and development is to be covered in as short a space as is being allowed here. The more generalized (or the less specific) a point of view is the less ruthlessly discriminating it needs to be in the selection of the information considered relevant.

Such a broad point of view has already been used in connection with the planning of the conservation of natural resources (Tewolde, 1990), and will be adopted here.

1.1 A General Framework

Development can be viewed as the use through the application of labour and technology by a people in a given area, usually constituting a nation, of the natural resources of the area to obtain required goods and services.

A resource is a potential or an actual commodity. It is scarcity that adds value to materials to highlight them as resources. Scarcity is created by people. A unique item would still remain ordinary if there were no people to appreciate its uniqueness. It is, therefore, people that transform a material into a resource. If resources are a joint creation by all people, this alone would be argument enough to call for their joint management by all people. But if all people are to manage resources jointly, they should also plan this management jointly. Participation in resources management is, therefore, naturally prescribed. As resources without people do not make sense, and as much of what people do is aimed at the creation and use of resources and services related to them, it is convenient to treat people and their resources together. There are also human traits and natural abilities which are so scarce as to become valuable resources. Society cultivates and nurtures them to make them even more specialized and useful to itself. It even creates scarce traits and abilities through education, both formal and informal. It thus creates the commodity we call labour out of human resources.

People are geographically divided into nations, or, more precisely, into portions of humanity living in separate political entities which we call countries. We thus have to create artificial national boundaries to our planning and management of resources.

People are divided not only by geography into nations, but also by time into generations.

The modern aggressive process of carrying out commerce has made it clear to us that the creation and use of some resource in one country can very seriously affect people in other countries. We are thus forced to consider resources in other countries when we deal with resources in our own.

In an even more direct way, the planning and management of resources in a given country progressively affect the generations separated by time in that country. It is considerations of the effects of our creation and use of resources now on the generations following us that call for conservation measures. These relation-ships can be pictorially depicted using the basic concepts of set theory in which natural resource is seen as a subset of the materials of the earth; human resource is seen to include all of humanity, and the intersection of the sets of natural resource and human resource is commodity-labour, or the combination of labour and commodity; countries are seen as geographical slices and generations as temporal slices (Fig. 1).

1.2 What Are Natural Resources?

Natural resources are created as a result of human demand for them. Humans want them because they are useful and/or beautiful. There is nothing more useful than air, but we pay nothing for it. It is, therefore, not usefulness alone that makes a material a resource. It is when that material can become a commodity, or at least a potential commodity, that we think of it as a resource. Now that it seems that we are poisoning the atmosphere it could happen that, like divers, we will soon be forced to carry clean air on us in containers. We are, therefore, moving towards thinking of air as a resource. The classic example of a relatively unimportant material made perhaps the most important resource by scarcity is gold. However, some relatively abundant materials can also become resources because, through an input of labour, we can transform them into commodities. Nitrogen, for example, is the most abundant gas in the atmosphere. It becomes a resource as soon as we think of the manufacture of nitrogen fertilizers.

From this, it follows that the specifications of resources change with economic and technological conditions. Considering our model in Fig.1., this means that different slices in time through our material and human sub-cylinders would show varying thicknesses of their intersection. The intersection would also involve different parts of the cylinders at different times. This is geometrically difficult to visualize. So, it is useful to imagine the cylinders as containing some powders or liquids which are allowed to mix only at the intersection, but which can have all

parts of their contents capable of shifting so as to have access to the intersection.

What are the materials that are also resources? The answer to this question is time-specific. For this reason, we will now try to categorize only those materials which are resources now. Because of the technological backwardness of Ethiopia, some of the resources which are very useful in the industrialized countries are not so very useful to us. For example, we do not make very much use of our urban wastes. In many industrialized countries, they make fertilizer out of them. Some materials become valuable resources at higher latitudes but not at our latitudes, e.g. thermal springs for heating houses. As resources do not have to become commodities immediately, i.e. as not only actual but also potential commodities are resources, and as we believe we are in the process of industrialization, we can use the human-material intersection as we find it in the industrialized countries to characterise resources even in our un-industrialized situation. This makes it possible for us to disregard the current geographical variations in the designation of materials as resources and use a generalized system applicable to our time or generation.

We can categorize natural resources into biological and non-biological. The non-biological resources can be divided into atmospheric and crustal components. These categories keep interchanging materials naturally. In making commodities out of resources, humans often modify these interchanges, sometimes with drastic consequence. This is basic to our understanding of the issues in conservation planning. We have, therefore, portrayed the dynamics of these material interchanges and the effect of humans on them in a flow chart reproduced in Fig. 2.

Some atmospheric resources, e.g. nitrogen, and some widespread and easily available crustal resources, e.g. silicates, can be used in industries. These have to be used in local industries, there being little prospect for exporting the raw materials. The scarce non-biological resources are all crustal. They can be used in local industry or, in an economically less rewarding but technologically less demanding mode of use, can be exported for foreign industries to use. All these create wealth, which should be used, among other things, to improve the usage of the non-biological resources, including watching for and taking precautionary measures against, the impact of substitution in importing countries. Concomitantly, the wealth should be used for discovering substitutes for the scarce crustal resources. If substitutes are discovered nationally without recourse to foreign technical assistance, it implies the existence of capacity for research, and hence for maximising the usefulness of natural resources. It also usually implies capacity of local industries to process these new resources so that it is the finished products, which obviously fetch higher prices, that are exported. This

does not preclude, however, the export of these newly discovered replacements of scarce resources to other countries.

1.3 What are Human Resources

Who are the human beings who can be considered resources? They are the people who can be made to acquire skills or special abilities that they themselves and other people need to use . It is those who become specialized workers who produce goods and who give services. It is the whole people.

Each society in Ethiopia had, and still has to varying degrees, its traditional specialized workers. They were mostly trained as apprentices, usually to a family member. But there have also been formal schools where some of the more specialized of these workers were trained.

Now Ethiopia has also created European-style institutions for training some of its labour force. The same population is thus producing specialized workers through two different systems. The traditional system produces those that mainly work in the country, and the European system produces those that mainly work in the city.

City and country in any society are traditional antagonists, the one caricatured as rustic rough and the other as sophisticated suave. There is very little validity in these caricatures as, in the Ethiopian setting, the traits are, if anything reversed with the cities breeding our roughest citizens. Nevertheless the antagonism in Ethiopian is very real. There is a big overlap in the training of specialists by the two systems. But, as these do not enjoy mutual recognition, they compete as systems to their mutual detriment. If the competition were at the level of individuals, it would have been constructive.

As those trained through the modern system have formalized official government recognition and thus occupy all the positions in the monetized modern sector, they have greater power and, as a rule, more money than their traditional equivalents. They, therefore, act superior and, as a rule, reject all contact with their traditional counterparts. Because of this the traditional specialists end up defensive and secretive, making it possible for the under-qualified and charlatan to parade as one of them. This further undermines their position in society. The position of the traditional healer epitomizes this situation. Traditional medicine serves more people than modern medicine does, and there is probably no Ethiopian who has never used a traditional medicine. But the modern doctor, conspicuous in his white garb and dangling stethoscope, will, as a rule, not condescend to consider the ordinarily clad, equally though surreptitiously influential, traditional doctor worth knowing as an individual, let alone exchange

information with him. We have many other antagonistic groups of worker, e.g. the modern farmer and the subsistence farmer, the traditional craftsman and the engineer, the traditional singer and her/his modern counterparts, the traditional story teller and the modern author, even the beleaguered traditional religious leader and the modern proselytizer. Some of these antagonisms are unimportant. We can shut our ears when music which we do not like is played. But, if we are sick, we must have a doctor. Which doctor?

This question must be answered if our health is to be cared for effectively. So must similar questions. We cannot develop and conserve our resources in this schism; we must harmonize the two systems.

1.4 Conservation

The term "conserve" etymologically suggests the idea of holding something and keeping it for posterity, like burying gold. This is unfortunate. If we bury gold, someone may dig it out. The best way to handle gold is to use it to produce more gold and to deploy the labour necessary to look after it. The only way we can keep natural resources from being dug up and lost is through using them to produce more resources so that we may afford to give them their due protection. Sentimental naturalists who shout " hands off" have probably harmed the cause of conservation more than any other group. When we conserve something, therefor, we must use it now, or keep it in such a way that it is obvious to everybody that it is being kept because it will be of better use in the future. Even then, we can sell the idea of future use only if the people affected by the conservation measure are well off enough to afford to look to the future, and with interest vested enough in the future to worry about it now. For example, protecting the elephant from extinction is noble. If the process of protecting it hurts no one, all will accept the idea. But the elephant will want space, a specific space, not a portion of everyone's space. It will destroy a small group of trees and crops, not a portion of everyone's trees and crop. The people negatively affected by the elephant will be only those whose space overlaps with that of the elephant's range. On the other hand, if the elephant were killed, those very people whose crops and trees it would have destroyed will benefit from its tusks. It is, therefore, clear that left to events, the elephant will get killed. If society and humanity at large want the elephant protected, they must make good what those people whose territory overlaps with that of the elephant loose by its protection. It is well to argue that tourism will pay for its protection. But pay whom? The travel agent from the industrialized country? The local entrepreneur who builds hotels and restaurants? Yes, all these, but not the people who would benefit form the death of the elephant. So, the elephant dies. The extinction of the elephant may cause us only an emotional trauma; but the future may also have in store for us a usefulness of the elephant which will be revealed in due course. But the

erosion of the genetic base of rice, wheat, coffee or cocoa would have a definite economic impact now throughout the whole world.

The implications of collective benefit coupled with specific harm, or collective harm coupled with specific benefits must be remembered when we think of conserving genetic resources for posterity. If humanity is keen for posterity, it must collectively pay the present specific bill. This calls for a new conservation order.

The issue of conserving a mineral deposit poses a dilemma of a different quality. The exploiter of the deposit has the most to benefit from the mineral. The exploiter wants maximum benefit in her/his lifetime and will not be bothered about posterity and is likely to exhaust the deposit and pollute the surrounding. It is in the interest of the nation at large to ensure that the benefits of the mineral last as long as possible and that the environment does not deteriorate as a consequence of mining operations. The issue of the conservation of non-renewable natural resources is the domain of the people who are affected by that resource, which can be the whole population of a country.

The issue of conserving renewable resources is somewhere in between those of conserving genetic resources and mineral resources. Except in relation to the impact of biomass destruction on climate, which affects the whole world, the concern over conserving soil, water and biomass resources is usually confined to specific countries or even localities, at most regions made up of neighbouring countries. The distant future is not an issue as all these resources can presumably be formed again. But the present and the near future are directly affected by existing usage patterns and conservation measures. Also these renewable resources affect more people than the mineral resources and the concern over them becomes more truly national.

There are also non-renewable resources which have value only because of our emotional attachment. Fossils are a resource only because we use them to learn about our pre-history. Their usefulness lies in keeping them as they are, not in working on them. Fossils usually have a universal appeal, and they equally benefit the whole of humanity. Artifacts. e.g.. historical monuments and buildings likewise have only an emotional value. Their appeal is however, less universal, and may even be parochial. The continued existence of these resources, which we can call emotive resources, does not usually interfere with the economic benefits of groups of people. The only resource of economic value that would be unavailable for circulation is the land they are on, which is usually small and can easily be disregarded. Except for the technicalities of how to protect them from deterioration with time, therefore, conserving emotive resources does not raise complex economic choices.

Orographic features are important in making a landscape attractive, and that is why such areas as the Grand Canyon of Colorado in the U.S.A. and the Himalayas in India fascinate people. Fortunately, humans have not got the ability to destroy such features though they can deface them. Conserving them per se is, therefore, not a burning issue, though conserving other resources found on them usually is. For example, the Semien National Park is a World Heritage site because of its ecosystem and because of its topography. As exemplified by the fate of Walia, there is a genuine fear that the ecosystem may be irrevocably damaged. But the topography will last millions of years.

Conserving human resources involves caring for people and educating and training them to produce effective workers who can interact constructively with natural resources, and, in general, with nature to satisfy their material and spiritual needs as well as the needs of others for commodities and services. This is the most difficult part of conservation. An effective system of conserving human resources would automatically conserve all the other resources as well.

For the purpose of marshalling information for planning the development and sustainable use, or "conservation" for short, of resources, therefore, it would be helpful to rank the various resources on the basis of the complexity of the efforts needed to deal with them. Their ranking, beginning with the most complex, is thus as follows:

1. Human resources;
2. Genetic resources;
3. Renewable resources;
4. Crustal resources;
5. Emotive resources;
6. Orographic resources.

If conserving human resources is so complex, and if all other conservation measures depend on it, what chance is there at all of conserving the other resources? Conservation efforts have so far failed because, frightened by the complexity of human resources conservation, focus has shifted to the resources involving less complex issues. But how difficult is human conservation? If we, individually or in small groups, try to conserve our respective societies, it is indeed hopelessly difficult. But if we only try to motivate society itself to conserve itself, we will have released a force that is compatible with the complexity of the issue and the difficulty of the mission. But how can we do this? The concept that has been gaining acceptance is that it can be done through participation.

1.5 Participation

Instinctively participation sounds the right thing to do. Nevertheless, participation cannot solve all our problems. However, participation is a *sine qua non* condition for conservation, and it must be used as the core of any planning on conservation.

But what is participation?

When an army fights, every soldier shoots. But no soldier is responsible for the tactics used in the battle. Though it is the solder who is winning or losing the battle, he/she cannot be said to have participated in making it. He/she is there to simply obey to death, to defeat or to be defeated. The army is not participatory. Similarly, if a government simply orders people around, it is not participatory. It can be correct in its decisions and it may even sometimes be effective, but it cannot be said to be participatory.

Visualize that you are very ill. You are afraid of dying. You go to a doctor. Your tell yourself that the doctor is your only hope. You allow him to do with you what he will. You are afraid of death, but you let him knock you out with drugs, or anaesthetize you. Then he cuts you up. You do not know what he will do with you. Are you participating in treating yourself? No. If a peasant community says that it needs to boost its food production and asks technocrats to do whatever they fancy, telling them that it will do whatever they ask it to do out of sheer need, is it participating? No.

If you examine the programme of a given political party and approve of it and vote for that party to govern you, are you participating in the governance? You vote for the party on the assumption that it will stand by what it states on its election manifesto. But it need not, and often does not, stand by the manifesto. Will you accept being responsible for all that that party does? You have not participated in governing yourself, and you cannot be held responsible either for the achievements or for the failures of the government. Otherwise, in cases of a government's failure, your action should have been abdication from politics instead of voting in another election. Similarly, if technocrats work out a plan of development on behalf of a community and ask it to approve, the assumption being that the technocrats will execute the project, albeit with material and labour assistance from the community, it cannot be glorified as community participation. It would only be community assistance for a project of the technocrats, or community mobilization.

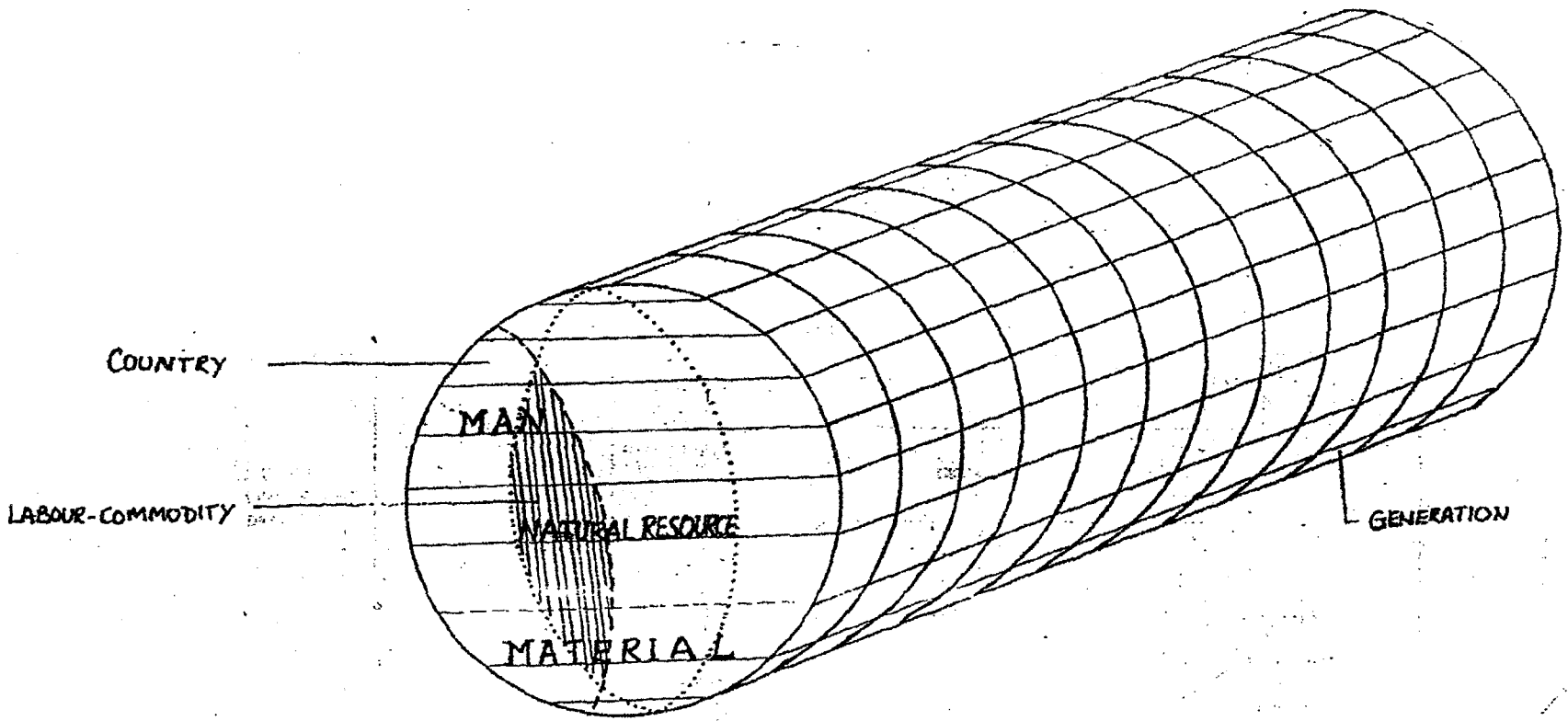


Fig. 1. A representation of the material set with its subsets of natural resources and human resources, which have the labour-commodity intersection, commodity as seen from the natural resources subset, and labour from the human resources subset. Transverse slices of the set represented by a disc from the cylinder give us generations and longitudinal slices countries.

Figure 2. INTERACTION BETWEEN BIOLOGICAL AND NON-BIOLOGICAL RESOURCES

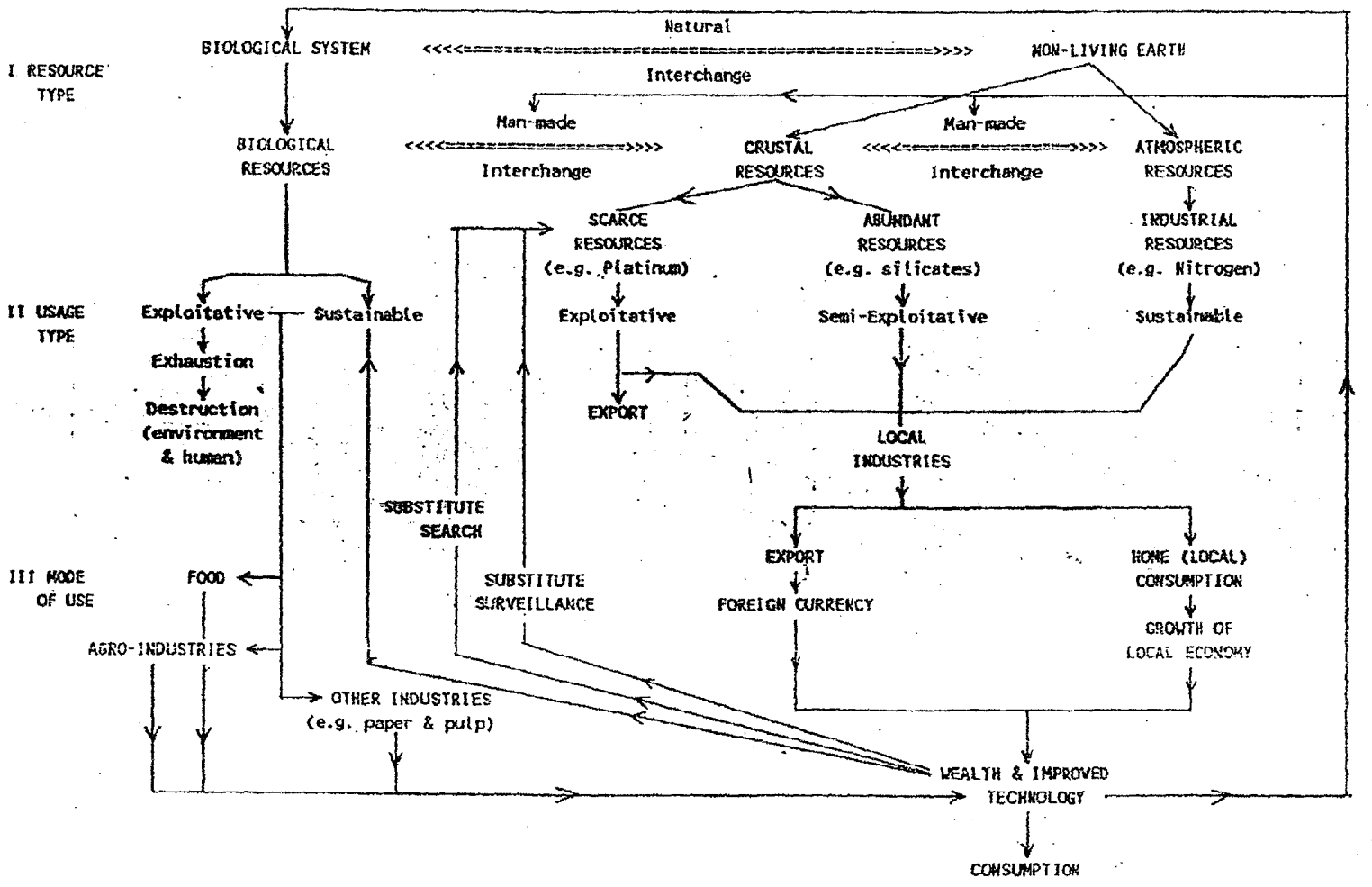


Figure 3. UTILIZATION OF NATRUAL RESOURCES IN ETHIOPIA

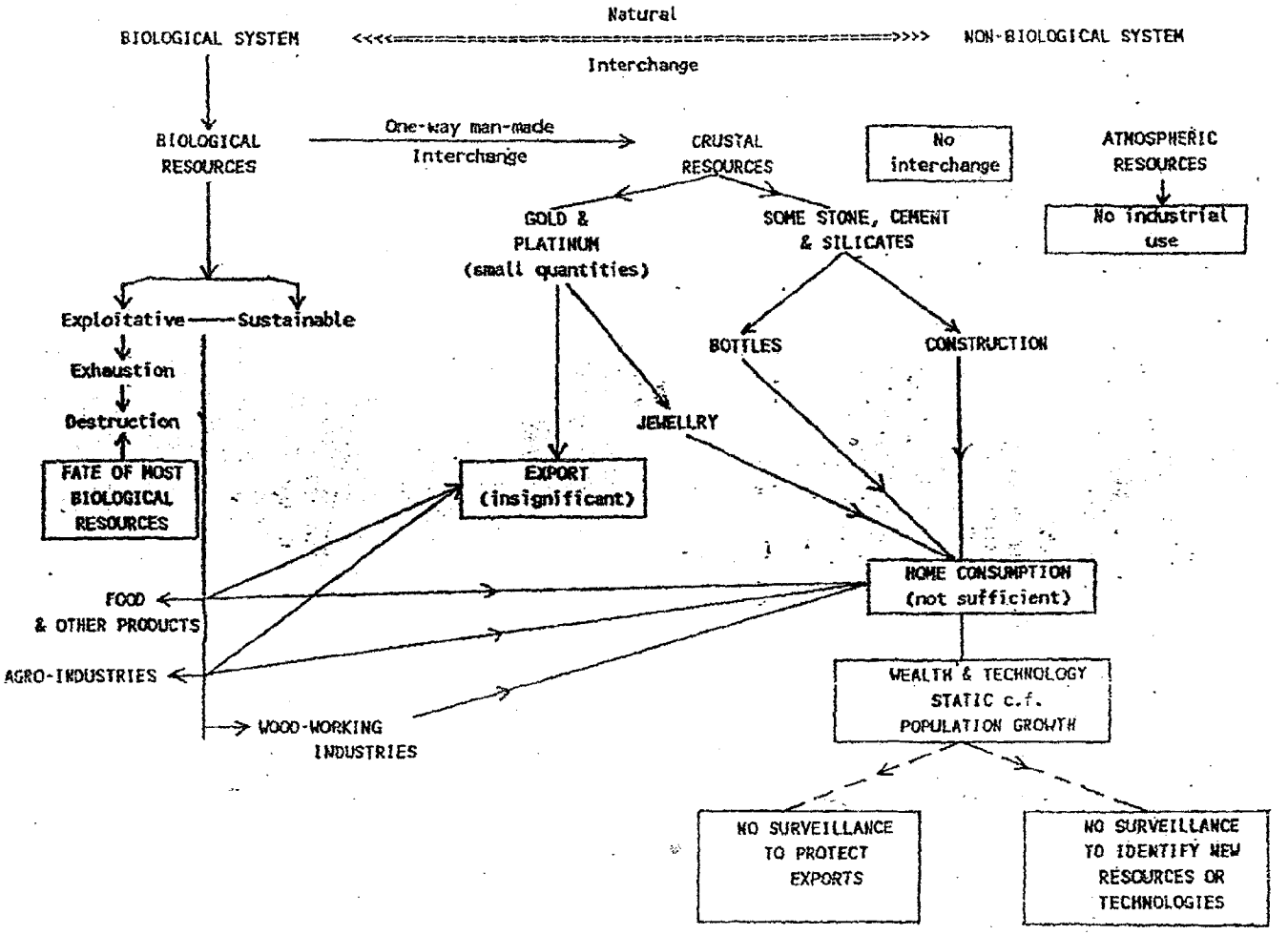
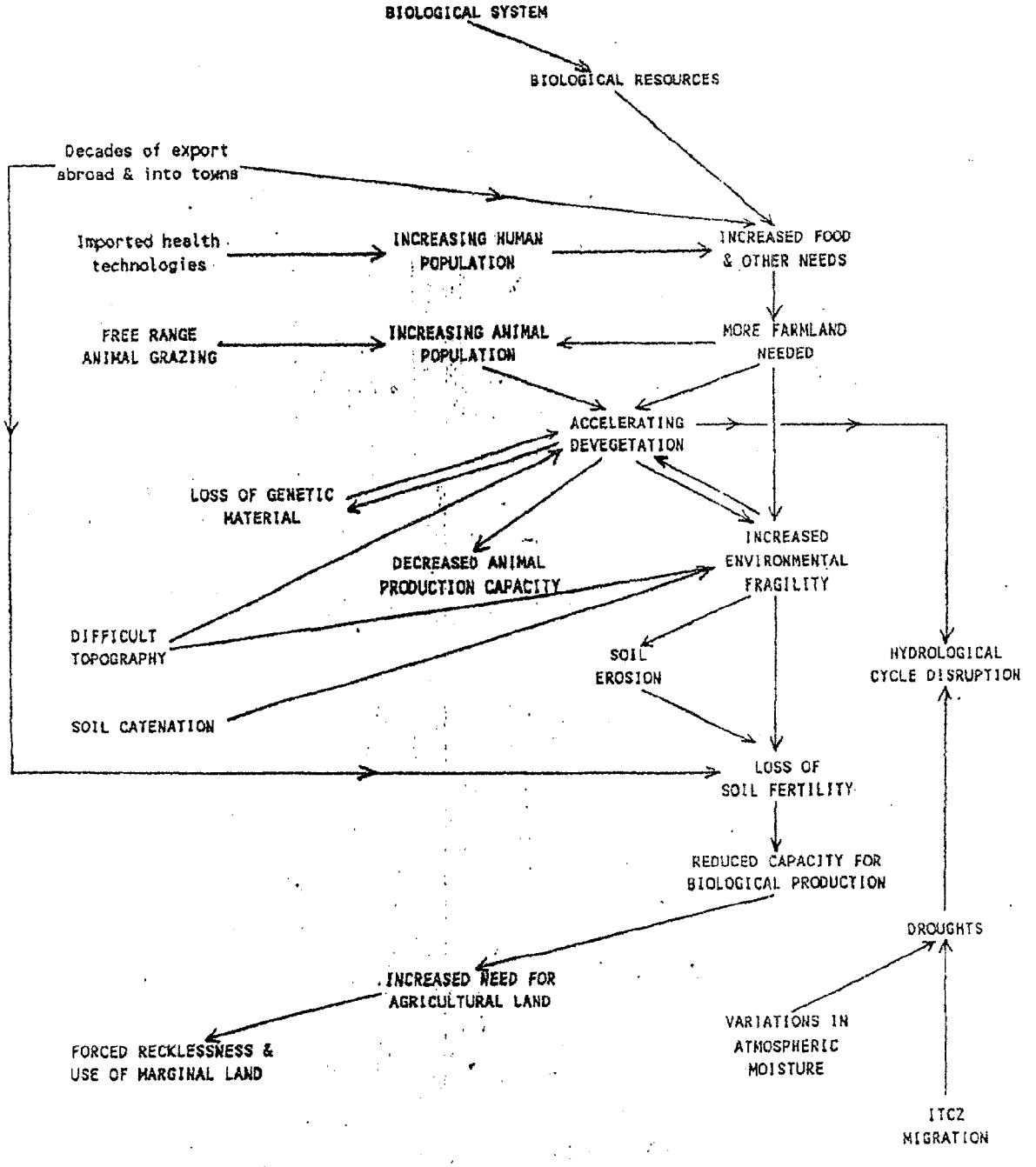


Figure 4. UTILIZATION AND STATE OF BIOLOGICAL RESOURCES IN ETHIOPIA



Ordering someone to submit to do what one says, taking over the power of decision when someone cannot decide immediately for herself/himself, or even deciding on someone's behalf when so authorized, do not constitute participation.

If a conservation project is to be really participatory, the community has to feel, at least as much as the planning expert, that it has decided that conservation is its priority problem, and that it wants to undertake specified conservation measures, e.g. planting trees. It should decide on how it can allocate the land, the funds and the human resources and how it can organize itself to carry out the measure. Of course, as agents of government we also carry out a similar exercise, first on our own, and then by trying to modify our plan and the peoples's plan so as to produce a mutually acceptable compromise plan. The people's plan may not be well written, it may even not be written at all. But people have ideas on how things should be done. If we want their participation, we must open a dialogue with them to find out what they think. More importantly, we must allow people to organize themselves so as to consciously express their views through their own chosen organizations. If we really represent their own organizations we can plan for them; for, as soon as we fail to do it their way, they will kick us out. But as soon as they fail to kick us out when they want to, then participation stops. If we want participation, we must ensure that our plans are as much as possible based on consensus and failing that, on the majority opinion of the people. If the consensus or the majority opinion is wrong and we are sure of the fact, then we must provide the people with enough information and open a debate so that they can either see the sense as we see it, or convince us that we are wrong. At any rate, we have no right to dictate. It is only in an atmosphere of genuine dialogue that a mutually agreed plan will emerge. Then we both. i.e. the people and the agents of government, can execute the plan in a mutually acceptable way. This is participation.

When we plan and then try to hijack the community along, it is not participation. It is bulldozing, also respectfully called mobilization, the exact opposite of participation.

1.6 Planning Participatory Conservation of Resources

"Too many cooks spoil the broth" is an English adage with equivalents all over the world. Participation goes against the grain of this philosophy. But in some situations participation is inappropriate. For example, it would not taste good to eat a lunch cooked by a group, each member in a truly participatory sprit doing the same thing, such as adding salt, at the same time. However, a family would be disgruntled if the head of the family changed house without consulting them. Routine activities like cooking, which are known to everybody, are best done by one person and do not require participation to make them acceptable. But

activities that require a change in people's attitudes and ideas can only be done if time and effort are sufficient to convince them. Should a cook come up with an entirely novel recipe, chances are that some, and probably the majority, of the family members would be put out even if they had been told in advance that they were getting something new. Changing one's diet is drastic, but changing one's way of, thinking about, and doing, things is perhaps the most drastic happening imaginable. Such a change has to be made by each individual who is expected to accept the new way of thinking and doing. Development, including conservation, requires such a change. If society is to develop, therefore, the barest minimum requirement is that a sizeable component of its members change their ways of thinking and doing.

Only when the majority of the people in a country so change can the society be expected to be irreversibly developed. How can one change a people's thoughts and action short of making them think and do like oneself, which is obviously, for all practical purposes, impossible? It is trying to answer this question that forces the issue of participation efforts at development in general and conservation in particular. But, if participation is so difficult, why bother?

1.6.1 Reasons for Participation in Conservation Planning

The arguments for participation in conservation of resources can be summarized as follows;

- Materials are changed to resources by the way people think about them. They are a creation of the collective social mind. Their collective creation would indicate a collective say in how they are managed and used, in their conservation;

- Conservation requires a change in the ways of thinking and doing by people. Such a change can take place only if a person is convinced and motivated internally. Therefore, it has to be participatory;

- Conservation in an area requires that all the people in that area do certain things and refrain from certain others. If conservation is not done through participation, therefore, it has to be done through coercion. The surveillance of the activities of every individual is impossible and coercing the whole population is thus ineffective; but even if only a simple majority of a participating population accepts conservation measures, the minority would also feel obliged to conform and accept them. Participation is the only way to enlist people's self-motivated support, and it is thus the most effective tool for conservation;

- A conservation measure based on coercion will collapse when the coercion stops; and coercive systems, as a rule, someday collapse suddenly; conservation through coercion is, therefore, though in the short run perhaps gratifying, in the long run elusive;

- Once the idea of conservation is accepted by the people, there will be the ingenuity of almost each of the members of the population deployed in finding measures to put it into effect; a coercive conservation measure, however, remains singularly sterile and liable to be beaten by the sum of ingenuities ranged against it.

1.6.2 Steps in Participatory Conservation of Resources

A meaningful participation can take place only among freely interacting equals. The mechanisms for such a free exchange of ideas and for the arriving at a consensus, or failing that, at a majority decision, is called democracy. We may thus argue as to what components best constitute such a mechanism, but that such a mechanism is absolutely essential for participation is obvious. We are often misled by the external trappings of an apparently democratic looking system when, in practice, it blatantly disregards its population in whole or in part. There are many clever ways of doing this. Perhaps the most effective one is through the diversion of attention, e.g through captivating attention by raising controversies, or even starting conflicts, through idolizing consumerism to the extent that peoples's attentions are always rivetted on commodities, through soap operas, through rumours and fashions. In the long run, the least effective measure is brute force.

In a society which is so stabilized that the issue that could arouse controversy are mostly relatively trivial, even a democracy with a lot of diversionary practices can work, e.g. Western Europe and North America. Imagine, if you will, a situation in which the family cook experiments with new recipes, but because any member dissatisfied with a particular meal can always have a "television diner~" from the deep freezer, crises are avoided. When, as in Ethiopia there is no freezer, not even a larder, if the family cook is to be adventurous, she/he better have consulted each member of the family beforehand. If we are at all to develop and conserve our resources, we need democracy in both form and spirit, form alone will not do.

To ensure that participation is really carried out in form and spirit, the following steps in conservation planning are suggested.

1.6.2.1 A Democratic and Decentralized Governance

If the government as a whole is not democratic, it is extremely unlikely that the planning and execution of conservation measures alone could become democratic. This is not to argue that if a government is not democratic a participatory conservation strategy should not be tried. It is only to point out that not much beyond sowing seed for possible future participatory strategies can be expected as an immediate outcome. If a government is really worried about its country's resources, it had better accept democracy.

The larger an area and the more the people, the more cumbersome a democratic process gets. A really democratic society should, therefore become decentralized. A constructive government should democratize and decentralize.

1.6.2.2 An Integration of Modern and Traditional Systems of Education

It has already been pointed out how the Ethiopian society has been split into antagonistic modern and traditional sectors. Our societies can, therefore, be compared to schizophrenics. You can imagine what validity an attempt at a consensus based on Dr. Jekyll's deliberations will have in enlisting Mr. Hyde's support. If we want a long term functional participatory process, we must harmonize Dr. Jekyll and Mr. Hyde; we must develop a unified educational system. How can we do that? In a participatory spirit, the two systems through their representatives must develop a joint curriculum so that the child grows up appreciating both. Those of us who belong to the modern sector will argue that the traditional sector is merely old wives' tales. If so, what have we got to fear from participation? We could have no better opportunity to dispel these tales than by presenting them parallel with our "scientific facts". Sooner or later we will have to do that.

This is not to imply that the process will be easy. To begin with most of traditional lore is oral. But if we join in a spirit of partnership with the traditionalists, we can help them write it up. Secondly, the traditional system has been in hiding so long that it works only surreptitiously. To overcome this, our governments have to openly allow it to organize itself so we can negotiate with it. It is encouraging that an association of traditional healers has now been legally formed through the auspices of the Ethiopian Science and Technology Commission.

This is not to imply that no participatory conservation planning can be done without this. But if we do not do this, we will fail in at least as much as we cannot enlist traditional labour. And yet most of our labour force is traditional. Any human resources conservation effort that excludes it would thus be very weak. The repeated stories of the abysmal failure of extension efforts arises precisely from

this problem. The target, the traditional labour, cannot be approached from our side of the fence dividing the modern from the traditional. For the same reasons, participation with the rural people from our side of the fence for natural resources conservation is likely to be weak.

1.6.2.3 The Views of the People

What ever choice we might have made on democratization and society harmonization, we need to know as precisely as possible what the population at large knows and has been doing about resources and about conservation, and what its opinions are on various possible measures. These can be explored through the usual research methods. In any case, whether researched or not, it will emerge as a result of interactions if there is genuine participation.

1.6.2.4 Informing the People

Just as information is gathered from the people, so must information be diffused to them. The information should include our findings about their knowledge and views and new information of relevance to supplement, complement or modify that knowledge and those views. It is through an iterative process of finding the views of the people and informing them that a change in their knowledge and views, in their way of thinking about and doing things, will take place; there is no other way of doing this short of formal schooling.

1.6.2.5 People's Organization

It is impractical to think of contacting each citizen, arguing with him/her and changing his/her way of thinking about, and doing things. Hierarchically organized groupings with the members of the lowest hierarchy being small enough in number for all to meet, discuss, and arrive at consensus or majority decisions is essential for this to happen.

A democratic society always makes this possible, but dictatorships can usually not tolerate such organizations. The ultimate target of the iterative information gathering and dissemination process should be these small groups of the lowest hierarchy, the higher units being used for agglomeration of decisions all the way up to the national level and for transmission of information all the way up and down to the level of the individual.

1.6.2.6 The Planning Process

Theoretically, a national plan for conservation can be made in an office in the capital city by a small number of experts. Alternatively, plans from each of the

lowest level units of the people's own hierarchical organization can be transmitted upwards and agglomerated into a national plan. The first process would result in a plan which is insensitive to local peculiarities. The second would result in a plan insensitive to emergent national and regional needs not reflected at the local levels. In practice, therefore, the lowest levels of the hierarchy, each succeeding level higher up, and the national level should all carry out planning exercises to cater for the needs emerging at each level. The process of iterative communication and modification among the various levels should then be used to produce a compromise national plan, with everyone knowing to what extent it is a compromise and to what extent it addresses level specific needs and wishes. Its chances of being supported will then be maximized.

In the initial years, this process will be very slow and very cumbersome. But there is no alternative. In time, however, the process should work faster even though it will never be as fast as the preparation of a coercive top down plan. The execution of such a slow maturing plan should, on the other hand, be fairly speedy and simple since its executors will already have been motivated by the participatory planning process.

For conservation measures to be acceptable at the lowest level of the hierarchy and, more importantly, at the level of the individual when the economic base is as low as it is in present day Ethiopia, they must be seen to endow economic advantages within a short time. Considerations of posterity will not appeal to the poor individual, nor even to the lower levels of the people's own organizational hierarchy. Conservation measures that do not pay within a short time can only be expected to be suggested at the highest levels of the people's own organizational hierarchy, and they must be paid for from the coffers at that level or higher.

1.6.2.7 Monitoring

The steps for monitoring to be taken during execution should be indicated in the plan. Without monitoring, it would not be possible to react to successes or failures, and without this, the development could not be self correcting. The main purpose of the monitoring process should be to provide feed-back to the various levels of the people's own planning and executing hierarchy and thus help improve both the execution of existing plans and the making of new ones.

CHAPTER II

THE IMPLEMENTATION OF THE ETHIOPIAN NATIONAL CONSERVATION STRATEGY PROJECT

2.1 Background

The National Conservation Strategy (NCS) takes a holistic view of the natural, human-made and cultural resources and their use and abuse. It seeks to integrate existing and future Central and Regional Government planning in all sectors that impinge on the natural and human-made environments. The purpose of the NCS Project was the assessment of the status and trends in the use and management of the resource base of Ethiopia, the formulation of a policy and strategy framework which addresses the key issues which have been identified, and the development of a National Action Plan and Investment Programme including legislative measures and management and operational arrangements for implementation. The formulation process has been country driven, multi-sectoral and participatory.

The first project agreement was signed between the World Conservation Union (IUCN) and the government on March 15th, 1990 for assistance in drafting a National Conservation Strategy to run from May 1990 to April 1992. The formulation phase was formally launched at a National Conference held in Addis Ababa in May 1990. Following the Conference a Secretariat was established in the Ministry of Planning and Economic Development. By December 1990 the Director and an IUCN Technical Advisor had been appointed. An analysis was made of the issues raised at the Conference and a programme of work was drawn up to take the process forward.

However before the programme could be fully initiated security conditions in the country deteriorated rapidly and culminated in the flight of President Mengistu Haile Mariam, the fall of Addis Ababa to the forces of the Ethiopian Peoples' Revolutionary Democratic Front and the establishment of a Transitional Government of Ethiopia (TGE). It was not until November 1991 that implementation of the programme of consultation and task force creation could begin in earnest.

The Transitional Government announced a radical restructuring of the country's administration with the formation of 14 autonomous regions. Five regions subsequently joined together reducing the number of regions to 10. This restructuring of government required a radical change in the NCS formulation process with the need to formulate Regional Conservation Strategies if the

national strategy was to be implementable given the federal government structure that was emerging. A second project agreement was signed between the TGE and IUCN to run from May 1992 to April 1994. To provide assistance to the enlarged regional strategy development programme a separate agreement was signed between TGE and the United Nations Sudano-Sahelian Office (UNSO) to run in parallel from May 1991 to April 1994.

2.2 The NCS Process and Progress Achieved

The NCS formulation process was undertaken on three fronts:

- the formulation of regional strategies, action plans and investment programmes.
- the formulation of national sectoral policies, strategies, action plans and investment programmes,
- the formulation of cross sectoral policies, strategies and institutional and legal frameworks.

2.2.1 Regional Consultations and Strategy Formulation

The Regional/Zonal process moved forward in 4 stages through the use of task forces and the experts in the NCS Secretariat.

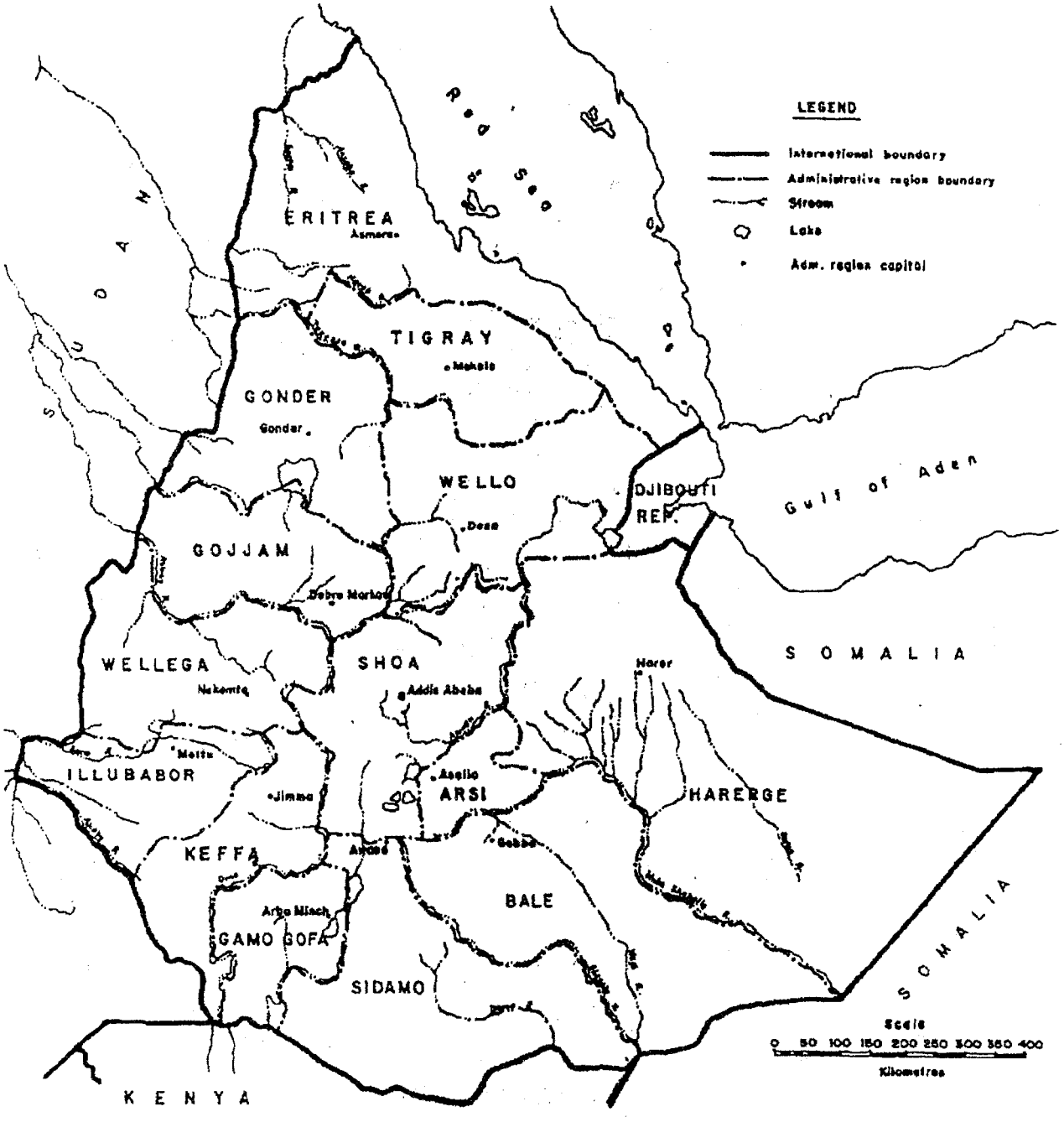
Stage 1: The stocktaking and assessment of resources and consultations at the village and wereda levels, usually on regional sample basis, were carried out in the regions which existed before the fall of the previous government. Many of these regions are now zones in the new regions. The reports written were, therefore, on the old regions. These old regions are given in Map 1A.

Stage 2: Identification at the zonal level of the key resource issues, problems and potentials and a framework for a sustainable development strategy.

Stage 3: Based on the new 10 Regions (see Map 1B), a Regional Conference was held in each Region where all the Zonal Task Forces presented their findings. Each Regional Conference developed its Regional Strategy for Sustainable Development and Management of Resources, or in short, its Regional Strategy Report, indicating priority sectors and priority Zones.

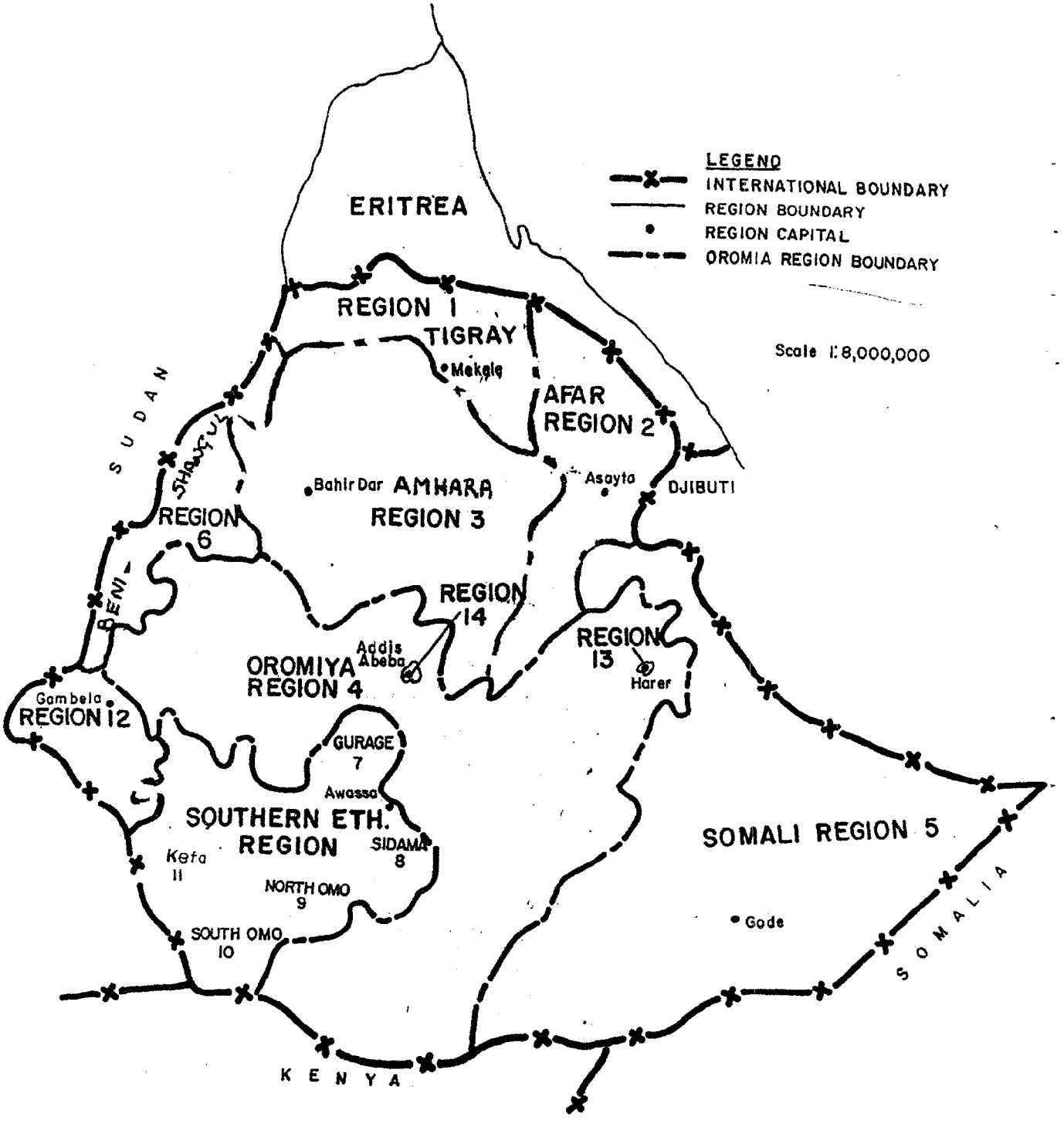
Map 1 A

ETHIOPIA: ADMINISTRATIVE REGIONS UNTIL 1987



ETHIOPIA - UNCED NATIONAL REPORT: RESOURCE BASE

Map 1B


LEGEND
INTERNATIONAL BOUNDARY
REGION BOUNDARY
REGION CAPITAL
OROMIA REGION BOUNDARY
Scale 1:8,000,000
ERITREA
REGION 1
TIGRAY
Mekele
AFAR
REGION 2
SUDAN
Shiraro
Bahir Dar
AMHARA
REGION 3
Asayta
DJIBUTI
REGION
6
BENI-
REGION
14
REGION
13
Addis
Abeba
Harer
OROMIYA
REGION 4
Gambela
REGION 12
GURAGE
7
Awassa
SOUTHERN ETH.
REGION
SIDAMA
8
Kefa
11
NORTH OMO
9
SOUTH OMO
10
SOMALI REGION 5
Gode
SOMALIA
KENYA

Stage 4: Using the National Policy and Strategy Framework, Action Plan and Investment Programme and the Regional Strategy Report, the Regional Action Plans and Investment Programmes were developed.

The survey stage commenced in late 1991 when the country still comprised 28 Regions. Inter-ministerial Task Forces were established in all 28 Regions with the regional office of the Ministry of Planning and Economic Development being the focal agency. The NCS Secretariat provided guidelines but emphasized that giventhe extremely varied conditions in the country, they were to be used in a very flexible way. Notwithstanding the difficult conditions in some parts of the country at the time, with many regional offices short of transportation vehicles and equipment, many Regions were able to complete the 1st Stage before the Regional re-organisation took place in late 1992.

Fortunately many of the old Regions became "Zones" during the new Regional re-organisation into 8 "rural" and 2 urban Regions (of Addis Ababa and Harer). The old Regional Task Forces therefore became Zonal Task Forces although in most cases there was an almost complete turnover of personnel. However the documentation remained to provide the basis for the 2nd Stage. In some new Regions it was necessary to establish new Zonal Task Forces where some old Regions were divided into two or more Zones. In this way the number of Task Forces rose from 28 to 40.

With the new administrative reorganization in which each Regional had a number of Zones and in which elected Regional Governments took over administrative authority, it was considered necessary to provide "regional" rather than national coordination and policy guidance to the regional, zonal and local level consultation and formulation process. To this end **Conservation Strategy Steering Committees** were established at the Regional Government level. The Regional Steering Committees comprised as a minimum:

- the elected Vice President for Economic Development
- the heads of the Bureaus of the Planning and Economic Development, Natural Resources Development and Environmental Protection, and Agriculture
- a senior representative of the Regional Development Association, which is a non-government organisation

Regional Steering Committees were established in 7 of the 8 rural regions. It was not possible to form steering committees in the remaining 3 regions the Addis Ababa Regional Bureaus having until just recently been totally occupied with

developing the new urban land tenure structure, whilst delays in fully staffing the Harer and the Somali Regional Bureaus prevented their creation.

The Zonal Task (previous Regional) Forces undertook the grassroots consultations, the detailed studies and the analysis required in Stages 1 and 2. Regional (of new Regions) Task Forces undertook Stage 3, and the NCS Secretariat undertook stage 4. The reports from the NCS process are given in Annex 1.

The purpose of the Regional Conferences was for the Region as a whole to systematically prioritize the key resource development and management issues, and develop a consensus as to the strategies to be adopted.

The last stage of the process, the development of detailed Regional Action Plans and Investment Programmes will commence after April 1994 and is expected to take up about twelve months to complete. This will involve a detailed consideration of the priorities and strategies agreed to at the Regional conference, the National Policy Framework and the National Action Plan and Investment Programme.

2.2.2 National Sectoral Strategy Formulation

Ethiopia has divided its development sectors into six Country Development Programmes. There are eleven sectoral strategies which have been or are being developed under the auspices of the NCS. These include the Ethiopian Forestry Action Programme, Programmes 1, 2 and 4 of the Country Development Programme, the Regional Strategy formulation process and some specialised government agencies as indicated below:

- Forestry Conservation and Development (under the Ethiopian Forestry Action Programme)
- Soil and Water Conservation and Land Husbandry (Programme 2A of Country programme)
- Water Resources (Programme 2B1 of Country Programme)
- Mineral Resources (programme 2B2 of Country Programme)
- Energy Resources (Programme 2B3 of Country programme)
- Cultural heritage (partly under programme 2B4 of Country programme, and document prepared by the Ministry of Culture and Sports)

- Biological Diversity (partly under Plant Genetic Resource Conservation Policy and Strategy, partly under Wildlife Conservation Strategy and partly under Programme 2B4 of Country programme)

- Rangelands and Pastoral Development (partly under a National Pastoral Conference, partly under Programme 2A and partly Programme 4 of Country Programme)

- Human Settlements, Urban Environment and Environmental Health (partly under Programme 2B1 of Country programme, partly under Programme 3 of Country Programme and the Addis Ababa Master Plan)

- Control and Management of Industrial Waste, Hazardous Materials and Pollution (being developed by the Environmental Protection Department of the Ministry of Natural Resources Development and Environmental Protection, also from the draft Ethiopian Water Code)

- Atmospheric Pollution and Climatic Change (developed by the NCS Secretariat)

2.2.3 National Cross Sectoral Policy and Strategy Formulation

Twelve cross sectoral policy and strategy areas have been identified and have been or are being developed as part of the strategic planning activities. Other macro national policy formulation activities (eg. the National Economic Policy, The National Population Policy, and others listed below) have also been taking place in various relevant government agencies. These include:

- Population Growth and Distribution and the Sustainable Development of Resources and the Environment (Prime Minister's Office)

- Peoples' Participation in the Sustainable Development of Resources and the Environment (All sectoral agencies with respect to their areas of mandate both at Regional and National levels)

- Land and Resource Tenure and Access rights (All natural resources sectors in their areas of mandate at both Regional and National levels)

- Land Resource Use Policy and Strategic land Use Planning (Ministries of Agriculture and Natural Resources Development and Environmental Protection at both Regional and National levels)

- Intersectoral Impact and Sectoral Responsibility (Prime Minister's Office, Ministry of Planning and Economic Development as well as Regional governments)

- Social Sustainability and Gender Integration (The Prime Minister's Office)

- Environmental economics, Macro Economic Policy and Economic Development Planning (Ministry of Planning and Economic Development)

- Environmental Information Systems (Prime Minister's Office and Ministry of Natural Resources Development and Environmental Protection)

- Environmental Research (Science and Technology Commission, and National and Regional agencies in their respective sectors)

- Science and Technology for Sustainable Development (Ethiopian Science and Technology Commission)

- Environmental Impact Assessment for policies, programmes and projects (Ministry of Natural Resources Development and Environmental Protection)

- Environmental Education and Awareness, and Human Resource Development (Ministries of Education, Agriculture and Natural Resources Development and Environmental Protection as well as their respective Regional Bureaus)

- Environmental legislation (Prime Minister's Office, Ministry of Natural Resources Development and Environmental Protection, other relevant ministries and their Regional Bureaus).

2.2.4 Policy Implementation

The **National Policy Framework for the Sustainable Development and Management of Ethiopia's Natural, Human-made and Cultural Resources and Environment** outlines the institutional framework, responsibilities and mandates and the principles which should guide the legislative framework. Much of this has been derived from legislation passed by the Transitional Government in the past two years. This is listed in Annex II.

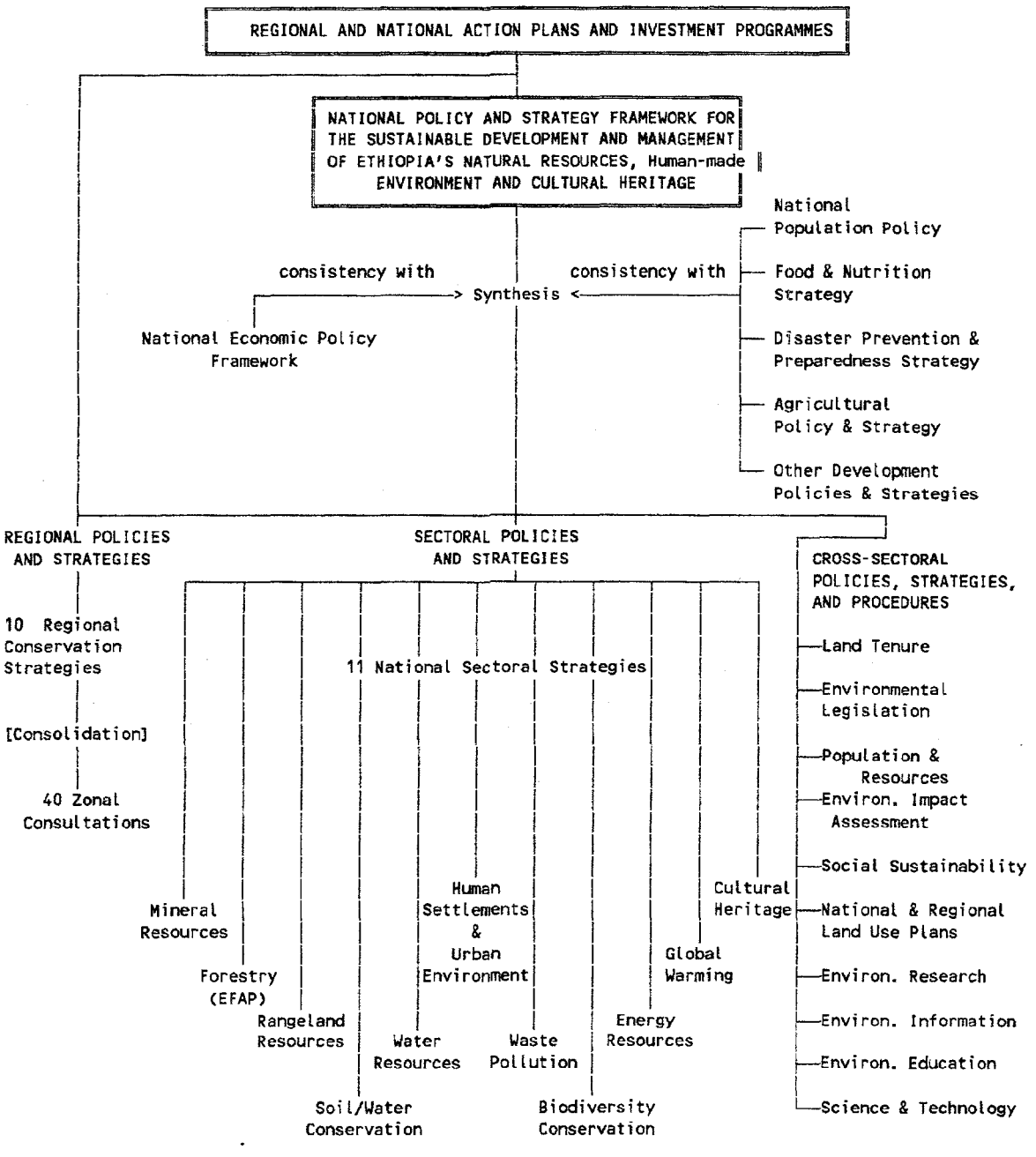
2.2.5 The National Conservation Strategy Documentation

The NCS document has three components. The first is a comprehensive review of the **Status and Trends in the Use and Management of Ethiopia's Natural resources, Human-made Environment and its Cultural Heritage**. This is based on the stocktakings and surveys undertaken at the local, Zonal, Regional and National levels. This review identifies the trends in resource use and the environmental, economic and socio-cultural implications.

The second component is the **National Policy Framework for the Sustainable Development and Management of Ethiopia's Natural, Human-made and Cultural Resources and Environment**. This sets out the objectives, guiding principles and key strategies for the twelve cross-sectoral areas and eleven sectors, and the institutional and legislative framework for implementation. It is based on the Regional consultations, workshops and conferences undertaken under the auspices of the Ethiopian Forestry Action Programme and the National Country Programmes, as well as a number of new national policy (eg. population, women) documents.

The third component will be an integrated and prioritized **National Action Plan and Investment Programme for the Sustainable Development and Management of Ethiopia's Natural, Human-made and Cultural Resources and Environment**. This will detail an integrated set of programmes, projects and actions, institutional structures and operation procedures for the implementation of the NCS.

FIGURE 1. THE NCS PROCESS



CHAPTER III

THE NATURAL RESOURCE BASE

Most statistical data and information on natural resources are available for Ethiopia and Eritrea together as Eritrea became an independent country hardly a year ago. This survey of natural resources will, therefore, not try to exclude data and information on Eritrea except where it is easy to do so. A more thorough separation can be done at a later date when sufficiently differentiated data become available.

Even within Ethiopia, administrative boundaries have changed twice within a few years making the determination of information on administrative unit basis difficult. The latest system of administrative organization has, in fact, left some boundaries not yet completely determined. In any case, even those fully determined were fixed only in 1992, and there are hardly any data compiled based on them. Therefore, in the following survey of natural resources, the two previous system, i.e. the one that divided the country into 13 regions, with addis Ababa as the fourteenth, and the one following it which divided the country into 28 regions will be used as the case may be.

Ethiopia is a relatively un-industrialized, primarily agricultural country. Its economy is thus based on its renewable natural resources which are mostly used as the basis for its prevalent subsistence life styles. 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. In this chapter we shall look at the natural resources base, to be followed in the next chapter which deals with the human resources base, and the last chapter which looks at the economy and the use that the population makes of the natural resources.

Compared with many countries, Ethiopia is relatively well endowed with natural resources in terms of stock, quality and diversity. These will now be briefly reviewed.

3.1 Location

Geographical location is a resource in its own right. Climate, agriculture, trade, access to coastal resources, are all influenced by the location of a country. Ethiopia is located between 3°N and 15°N latitudes and 33°E and 48°E longitudes. Inspite of being landlocked, it is the hinterland for all the coastline of

Eritrea on the Red Sea, and of Djibouti and Somalia on the Gulf of Aden and the Indian Ocean. Its location near the equator, together with its extensive altitudinal range, has rendered the country suitable for human settlement based on crop production and pastoralism.

3.2 Topography

Ethiopia is a country of great geographical diversity. Through millennia, erosion, volcanic eruptions, tectonic movements and subsidence have occurred and still continue to occur accentuating the unevenness of the surface. The main topographic features are shown on Map 2. Altitudes range from the highest peak at Ras Dejen, 4620 m above sea level, down to the Afar Depression about 110 m below sea level. Much of the country consists of high plateaus and mountain ranges with precipitous edges dissected by numerous streams which feed major rivers including the Abay (Blue Nile), Tekeze, Awash, Omo, Wabi Shebele, Baro and Akobo.

The Great Rift Valley separates the Western and Northern Highlands from the Southeastern and Eastern Highlands, and on their other sides, these highlands give way to vast semi-arid lowland areas in the east and west, and especially in the south of the country (Ethiopian Mapping Authority, 1988).

3.3 Climatic Resources

In order to maximize the benefits from climatic resources, it helps to understand the magnitudes and the spatial and temporal distributions of rainfall, temperature and potential evapo-transpiration (PET). These are described in the following sections.

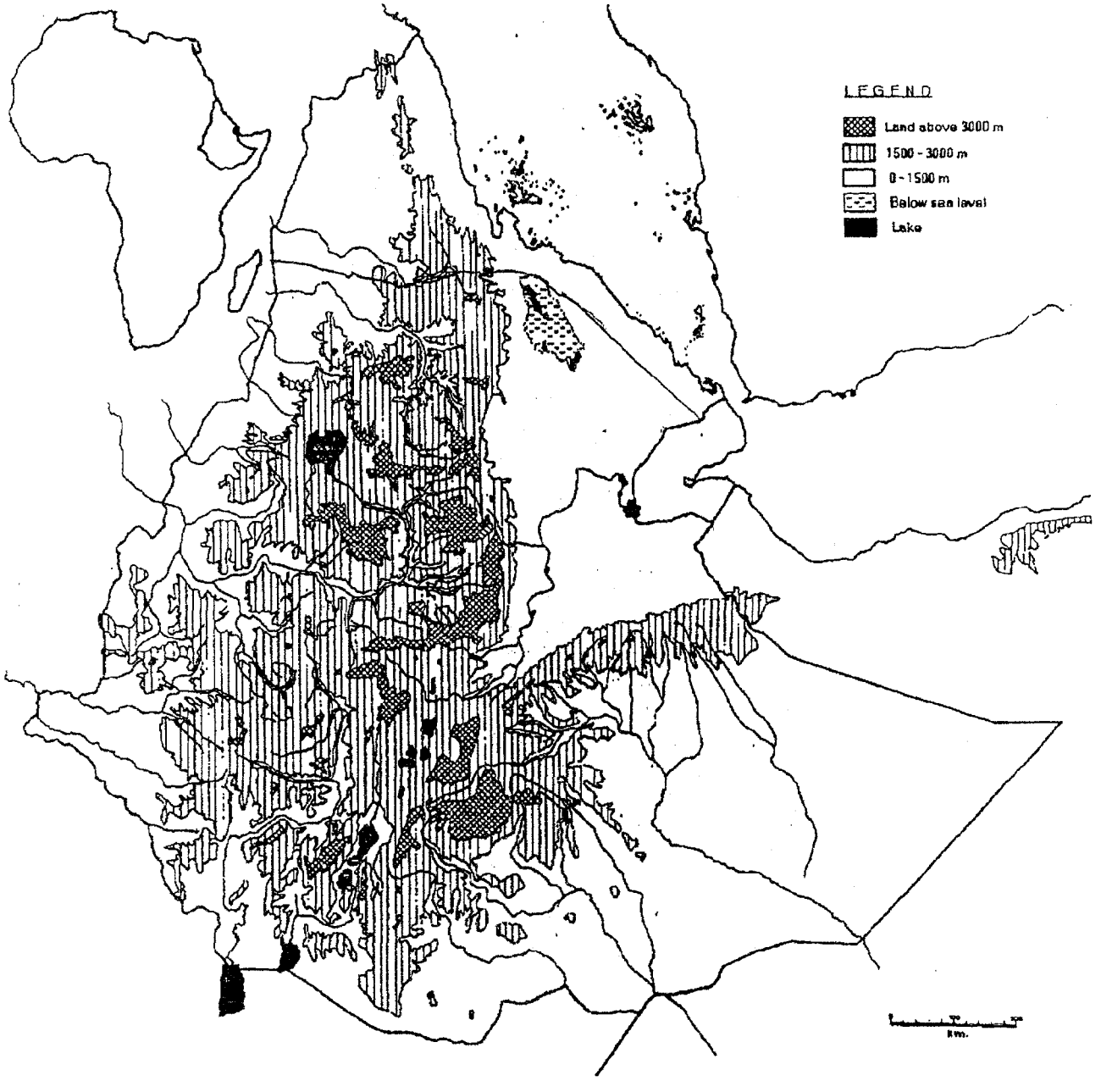
3.3.1 Rainfall Distribution and Rainfall Regimes

Map 3 gives the mean annual rainfall. It shows that the highest mean annual rainfall (over 2700 mm) is in the southwestern highlands, and that it gradually decreases north (to less than 200 mm), northeast (to less than 100 mm) and southeast (to less than 200 mm) (Tesfaye Haile, 1986; Workineh Degefu, 1987 and NMSA, 1989).

The rainfall pattern of Ethiopia is influenced by two moist wind systems, one coming from the Atlantic Ocean and the other from the Indian Ocean. Based on the annual rainfall distribution patterns, the four major rainfall regimes given in Map 4 have been delineated as follows.

Map 2

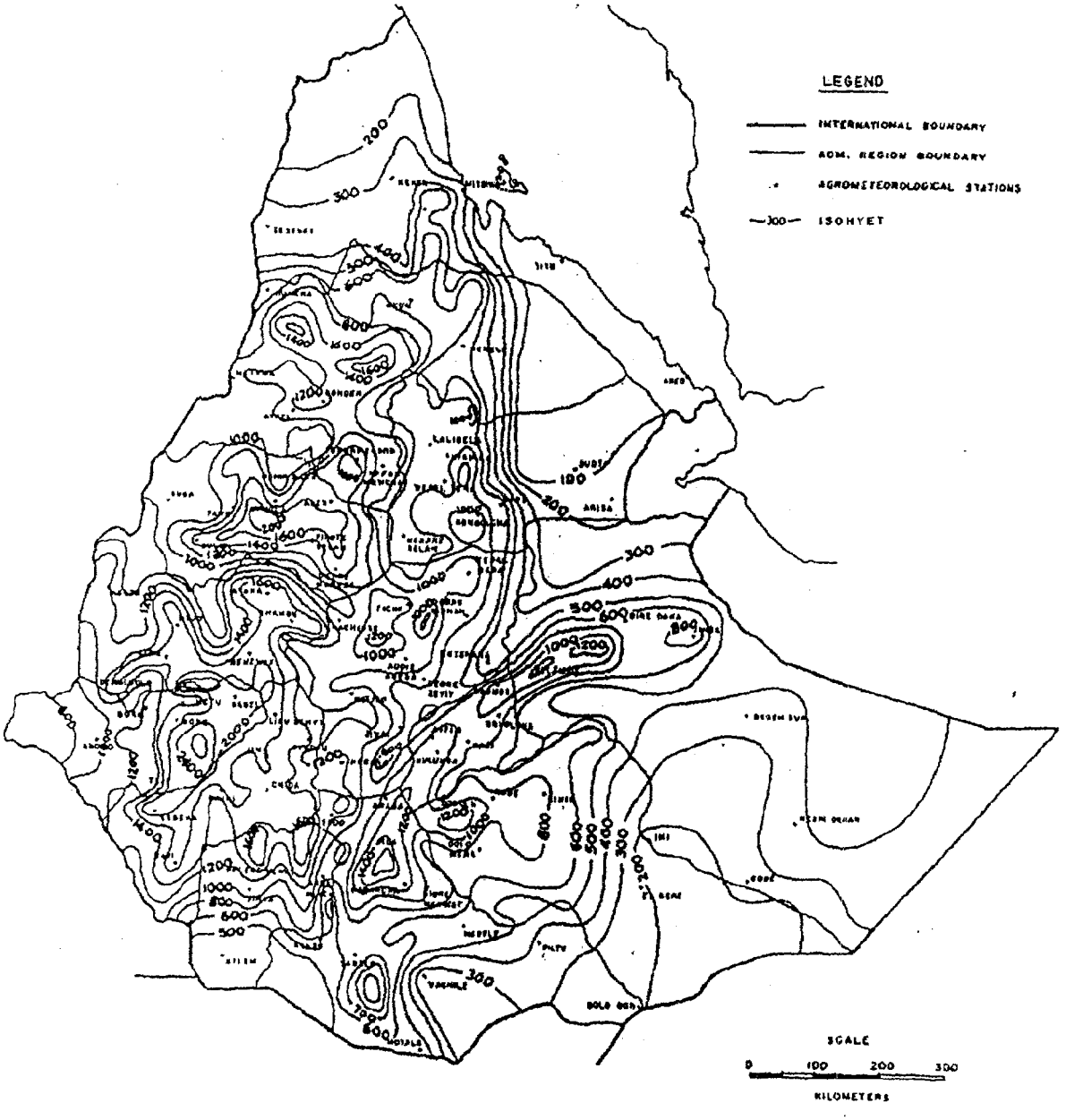
ETHIOPIA: MAIN TOPOGRAPHIC FEATURES



ETHIOPIA - UNCED NATIONAL REPORT: RESOURCE BASE

Map 3

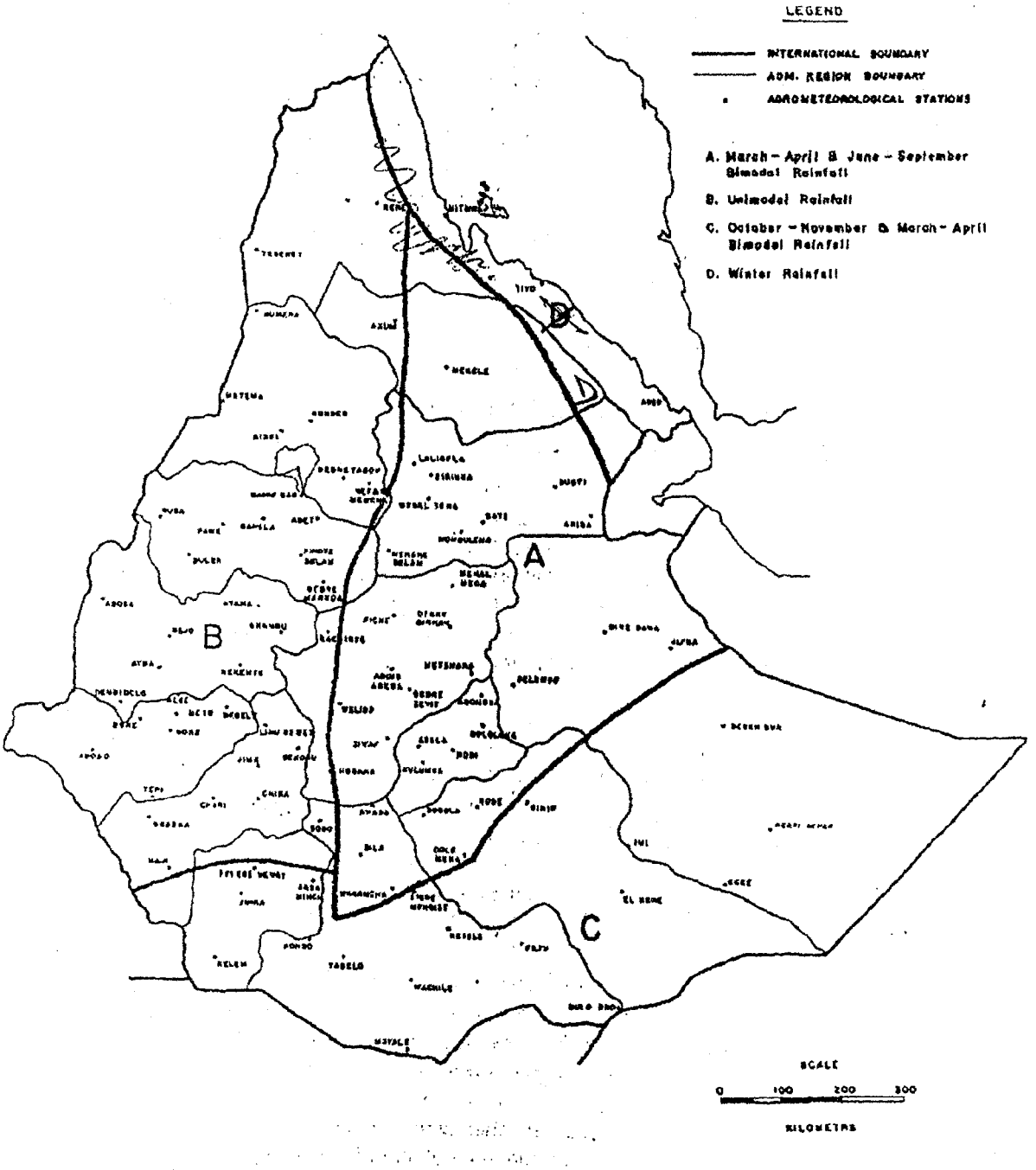
ETHIOPIA: MEAN ANNUAL RAINFALL DISTRIBUTION
(Isohyets in mm)



ETHIOPIA - UNCED NATIONAL REPORT: RESOURCE BASE

Map 4

ETHIOPIA: DISTRIBUTION OF MAJOR RAINFALL REGIMES



ETHIOPIA - UNCED NATIONAL REPORT: RESOURCE BASE

A. ***The central, eastern and northern areas of the country*** experience a nearly bimodal rainfall distribution. The small (Spring) rains (February - May) come from the Indian Ocean and the big (Summer) rains (June - September) mainly from the Atlantic but also from the Indian Oceans. A long dry period (October to January), and usually a short dry spell (mid-May to mid-June) occur between the two rainfall periods. Both rainy seasons decrease in length northwards, with the small rains, which are erratic even in Central Ethiopia, often failing or being reduced to odd showers in Northern Ethiopia. The intervening dry period is short enough for crops which require long growing seasons (sorghum, finger millet, maize, some varieties of teff) to be planted during the small rains and mature in the big rains. Land preparation for planting when the big rains start is also done during the short rains. The western escarpment of the Rift Valley and adjacent lowland areas of the Northern half of the country usually receive enough Spring rain also for short growing season crops, e.g. teff, barley, wheat so that these areas have 2 growing seasons.

B. ***The southwestern and western areas*** of the country are characterized by unimodal rainfall brought by the wind system coming from the South Atlantic Ocean and the Indian Ocean with the length of the wet season decreasing northwards.

C. ***The southern and southeastern areas*** of the country are dominated by a bimodal regime receiving rain from the Indian Ocean from September to November and from March to May with two distinct dry periods separating the two rainfall periods.

D. ***Along the northern part of the western escarpment*** of the Rift Valley and on the adjacent lowlands rainfall is scanty and the distribution pattern is rather diffuse but with a pronounced winter rain peaking between November and February (NMSA, 1989).

3.3.2 Monthly Mean Maximum and Minimum Temperatures

For various economic activities, especially for the agricultural sector, temperature is an important climatic variable. The performance of crops and other plants during their varying stages of growth is related to temperature. The maximum and minimum temperatures, which can be used to estimate the average temperature as well, are thus important climatic variables for agriculture (NMSA, 1989).

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 get a maximum temperature of 35-40°C during April (NMSA, 1989; Ethiopian Mapping Authority, 1988).

In general the highest mean maximum temperatures 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 (NMSA, 1989).

3.3.3 Mean Annual Potential Evapotranspiration (PET)

From Map 5 it can be seen that generally the potential evapotranspiration (PET) is lowest in the western part of the country and highest in the northeastern and southeastern parts (NMSA, 1989). It varies from less than 1200 mm in the southern and western highlands to over 3000 mm in the Afar Depression.

3.3.4 Climatic Classification

In Ethiopia the major factors influencing rainfall are the inter-tropical convergence zone (ITCZ), the northeastern trade winds and southwestern monsoon. Climatic conditions are varied and have been classified into generalized categories. It should be realized, however, that there are significant micro-climatic variations over relatively small distances arising from micro-relief differences. Altitude is one of the factors influencing the climatic condition of the country. The main climatic regions according to the modified Köppen classification system are the following:

i) Dry climate
ii) Tropical rainy climate
iii) Temperate rainy climate

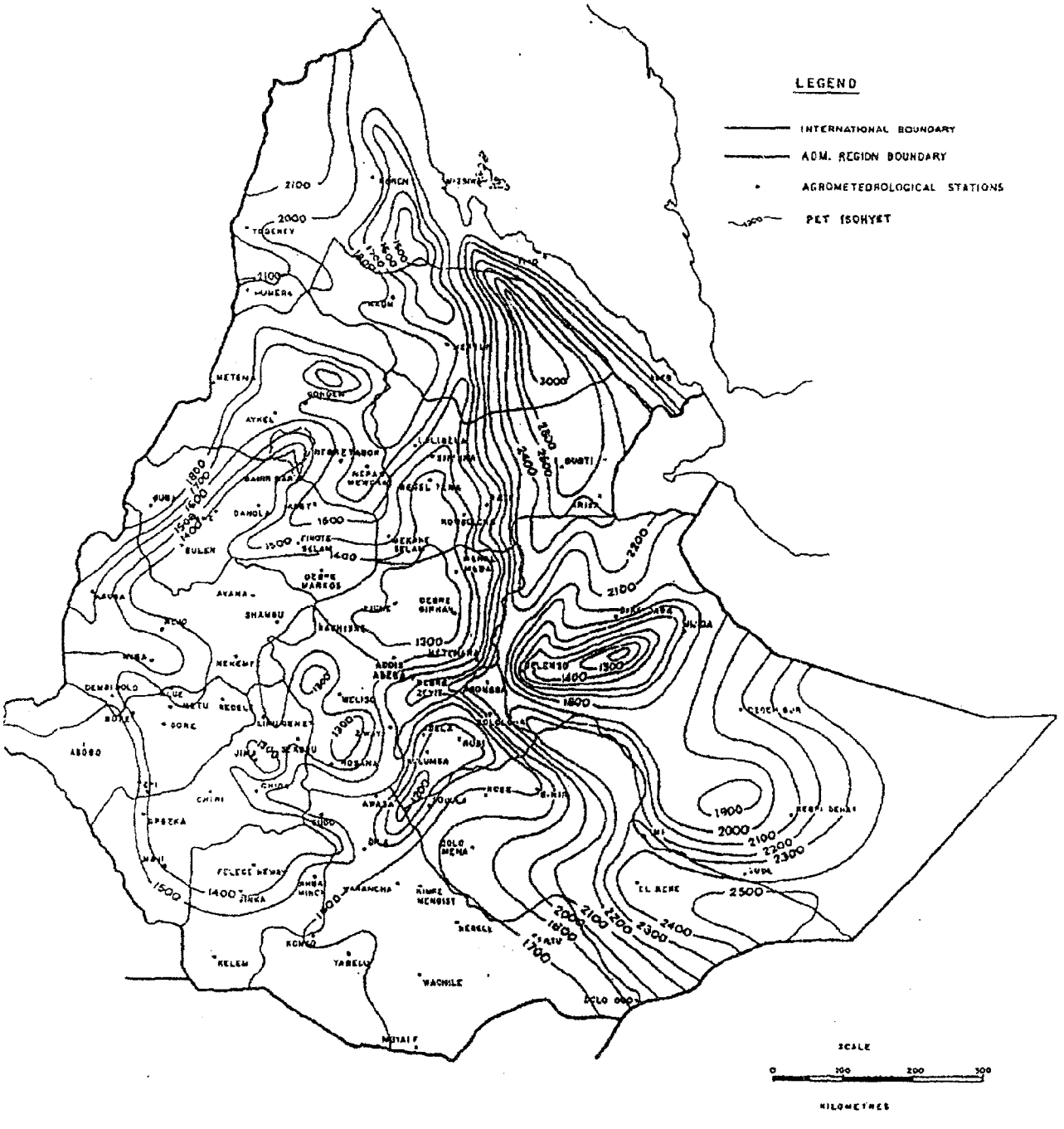
These three main climatic regimes are each subdivided into three or more regions (Map 6).

Dry Climate

i)	Hot Arid Climate:	Mean annual temperature 27°C; mean rainfall less than 450 mm; low relative humidity; little cloud; evaporation twenty or more times in excess of rainfall in some places.
ii)	Hot Semi-Arid Climate:	Mean annual temperature 18°C-27°C; mean rainfall 410-820mm; evaporation exceeds rainfall.
iii)	Cool Semi-Arid Climate:	Mean annual temperature below 18°C; mean annual rainfall 410-820 mm; evapotranspiration reduced owing to low temperature.

Map 5

ETHIOPIA: MEAN ANNUAL EVAPOTRANSPIRATION (PET)
(PET Isohyets in mm)



ETHIOPIA - UNCED NATIONAL REPORT: RESOURCE BASE

Tropical Rainy Climate

i)	Tropical Climate I:	Has some dry months in summer; mean temperature of coldest month above 18°C; mean annual rainfall 680-1200 mm.
ii)	Tropical Climate II:	Has some dry months in winter (= "bega" or dry season). Mean annual rainfall 680-2000 mm.
iii)	Tropical Climate III:	Temperature of coldest month above 18°C; mean annual rainfall between 1200-2800 mm.

Temperate Rainy Climate

i)	Warm Temperate Climate I	Distinct dry months in winter; coldest month of mean temperature above 10°C; and mean for more than four months above 18°C. Annual rainfall greater than twenty times the annual mean temperature plus fourteen [20x(t+14)].
ii)	Warm Temperate Climate II	Dry months in winter; mean temperature less than 18°C; rainfall greater than one-third of that of the wettest winter month and also greater than one-tenth of that of the wettest summer month.
ii)	Cool Highland Climate III	Dry months in winter; mean temperature of the warmest month 10°C or less; annual rainfall between 800 and 2000 mm.

The systems of classifying climate for agricultural purposes are different from these, and two agro-climatic classification systems have been produced for Ethiopia, one based on the climatic index of agricultural potential that deals with relative biomass productivity and another based on the length of growing period.

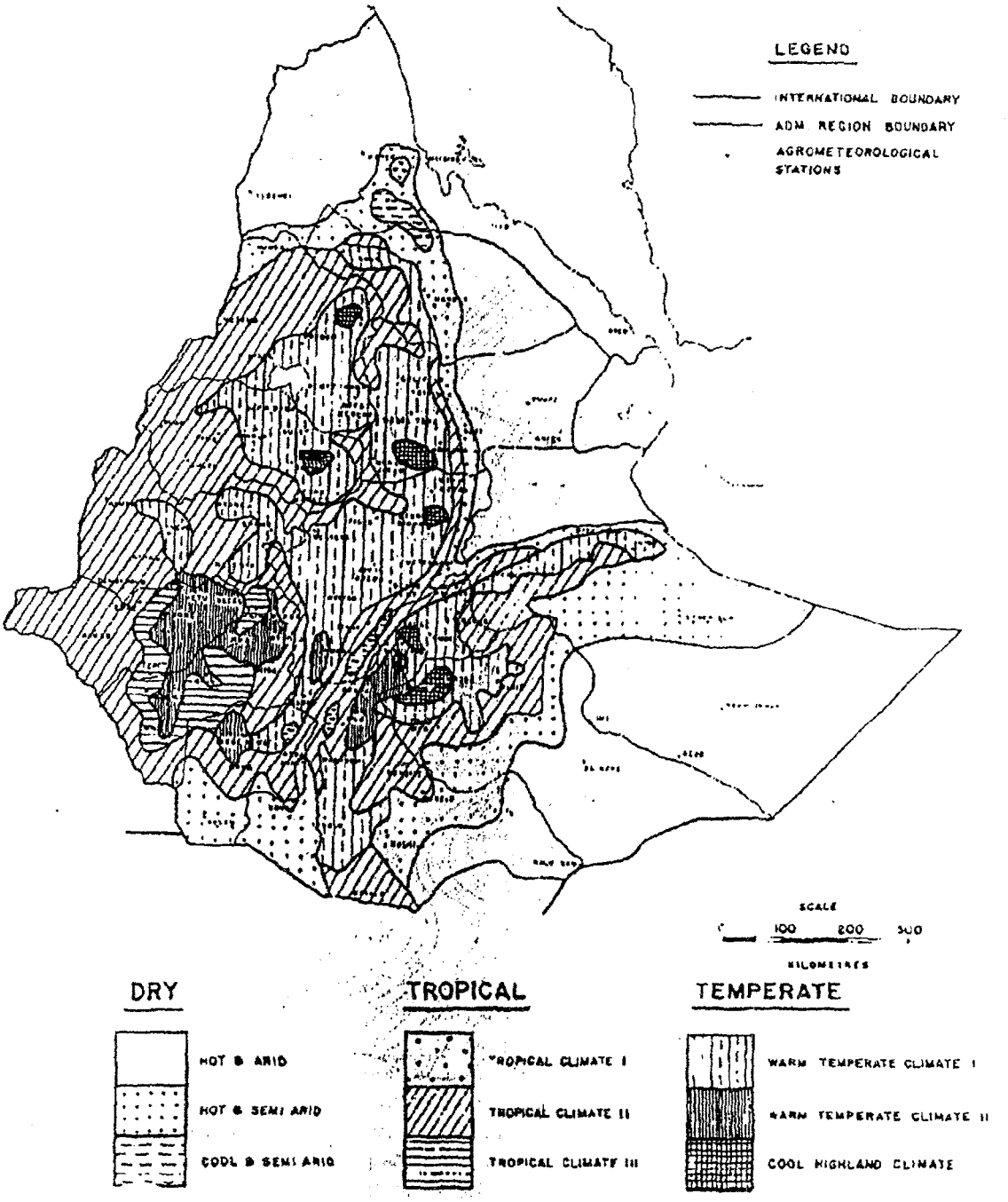
3.3.4.1 Relative Biomass Productivity

In order to assess quantitatively the agro-climatic resources of the country, at least in relative terms, the climatic index of agricultural potential (CA), referred to as relative biomass productivity, has been used (NMSA, 1989). This index is the sum of the products HT Fs for each of the 12 months, where HT is the heliothermic (radiation and temperature) factor and Fs is the moisture factor.

The relatively lower southwestern highlands of the country, have a high value of CA. This decreases towards both the north and the east. Areas with CA values of about zero show that the climate cannot support rainfed agriculture. However, these areas provide grazing for livestock and if irrigated can be very productive. Generally CA values are lowest in the lowland areas due to low moisture and in the very high mountains due to low temperatures. The optimal biomass productivity is found at altitudes of about 2000 to 2700 m.

Map 6

ETHIOPIA: CLIMATIC ZONES
(Modified after Köppen)



3.3.4.2 Growing Period and Agro-Climatic Zones

The length of the growing period is an index used for assessing the relationship between rainfall and evapo-transpiration. It defines the period in which agricultural production is made possible by the availability of moisture.

In order to delineate growing period zones the following factors have been considered.

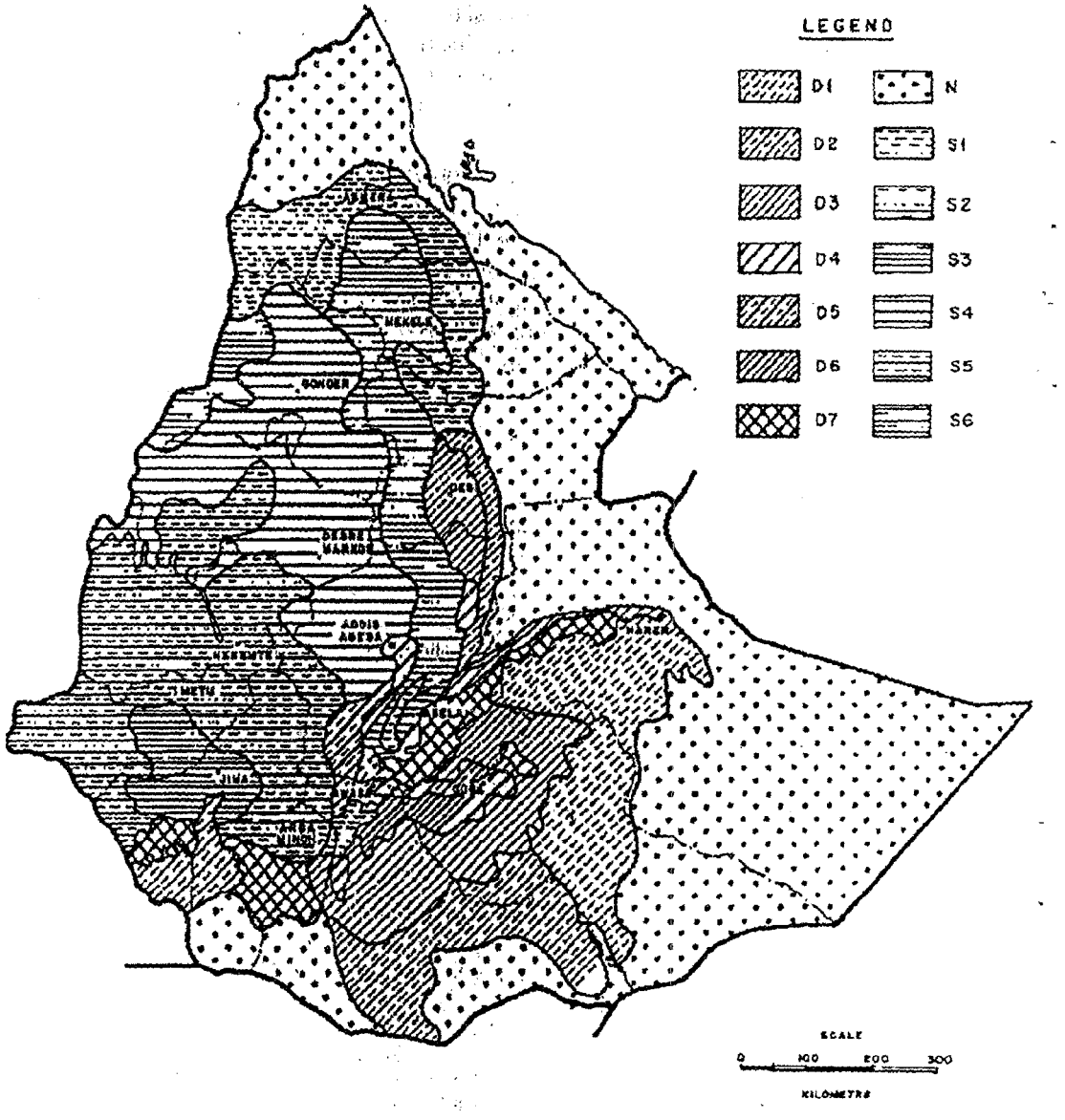
a) whether an area has one or two growing periods; and
b) whether the growing periods would be adequate to support a crop grow for a minimum duration of 3 months in most years, or whether supplementary irrigation would be required for crops to mature.

Using these factors, the growing period zones have been divided into three groups consisting of areas with no, one or two growing periods respectively.

The country consists of a total of 53 growing period zones which comprise 5 with no growing period, 21 with one growing period and 27 with two growing periods in a year (NMSA, 1989). The 53 growing period zones have been grouped into 14 broad growing period regimes which are shown on Map 7 (NMSA, 1989).

Map 7

ETHIOPIA: AGROCLIMATIC ZONES



ETHIOPIA - UNCED NATIONAL REPORT: RESOURCE BASE

MAP 7 LEGEND: GROWING PERIOD ZONES

Map Symbol Condensed Zone Description

N No growing period in most years even for very quickly maturing drought resistant crops as rainfall is inadequate to meet the water requirement. Full irrigation necessary.

S1 Single growing period, inadequate to meet in most years the water requirements of even very quickly maturing crops. Supplementary irrigation necessary.

S2 Single growing period adequate to meet the full requirement of very quickly maturing crops in many years, but in most years supplementary irrigation desirable.

S3 Single growing period adequate in most years to meet the full water requirements of quickly maturing crops. Crops with longer growth periods may be frequently exposed to end-of-season drought. Moisture conservation methods desirable.

S4 Single growing period adequate in most years to meet the full water requirements to maturity of crops with growing period of medium duration.

S5 Single growing period adequate in most years to meet the full water requirement of slowly maturing crops.

S6 Single growing period adequate in most years to meet the full water requirements of slowly and very slowly maturing crops. Less suitable for annual than perennial crops.

D1 Two growing periods per year neither of which is adequate for rainfed crop production of even the quickest maturing crops. In most years supplementary irrigation necessary.

D2 Two growing periods per year one of which is adequate for rainfed crop production of the quickest maturing crops in most years. Supplementary irrigation desirable.

D3 Two growing periods per year only one of which can be considered adequate for rainfed crop production in most years.

D4 Two growing periods per year both of which are adequate for rainfed crop production in most years, but double cropping is usually not feasible because of overlapping between the two growing periods.

D5 Two growing periods per year both of which are adequate for crop production in most years. The second growing period is the most important.

D6 Two growing periods per year both of which are adequate for rainfed crop production in most years. The first growing period is the most important and the dry period between the two growing periods is longer than in Zone D5.

D7 Two growing periods per year both of which are adequate for rainfed crop production in most years. This includes areas in which the two growing periods merge into a single long growing period and where long-maturing crops can be safely grown.

3.4 Land Resources

Ethiopia has a total land area of about 113,000,000 hectares and, together with Eritrea, a total of 122,300,000 hectares[1]. The amount of land used for various purposes in Ethiopia and Eritrea is as given in Table 1 (Ethiopian Mapping Authority, 1988). The highlands above 1500 m constitute around 45 percent (52,589,000 hectares) of the total area and are inhabited by four-fifths of the population (Central Statistics Office, 1984; Ethiopian Mapping Authority, 1988). Here the volcanic soils are relatively fertile and deep, and 75 percent of the area has a growing period which 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, subtropical and temperate crops. An equally wide range of farming and land use systems has thus developed over several millennia in response to this diversity.

Below 1500 m, the lowlands in the northwest, east and south, which are more or less free from tsetse fly but are semi-arid and arid, support nomadic and semi-nomadic pastoralist, who also cultivate maize and sorghum on plains watered by flash floods. In the southwest and west, the tsetse infested humid and sub-humid lowlands are sparsely populated by groups of shifting cultivators and

1 Estimates for the total area of Ethiopia and Eritrea vary between 122 and 125 million hectares.

partial hunter-gatherers. There are some large scale irrigated farms in some of these areas.

Table 1: The distribution of land put to various uses

	Area in hectares	Percent of total area of the country
Intensively cultivated land	12 596 900	10.3
Moderately cultivated land	15 287 500	12.5
Afro-alpine and sub-afroalpine vegetation, too cold for cultivation	244 600	0.2
High forest	5 381 200	4.4
Woodland	3 057 500	2.5
Riparian woodland and shrubland	733 800	0.6
Bushland and shrubland	26 172 200	21.4
Grassland	37 301 500	30.5
Water bodies	611 500	0.5
Others	20 913 300	17.1
Total	122 300 000[2]	100.0

Source: Ethiopian Mapping Authority (1988)

Table 2: Agricultural land use classes

Land Use Class	Description	Area (million ha)	Percent of total
Arable Land (excluding vertisols)	- Dependable growing period (DGP) more than 90 days - Soils more than 250 mm deep - Surface with less than 50 % stone cover - Slopes less than 30 percent	34	27
Vertisols	- All areas predominantly covered by heavy black clay soils	7	6
Other Arable Land			
Steep Land	- All land of over 30 % slope - All other factors as for arable land	6	5
Marginal Land	- Land with significant moisture limitations (less than 90 days of DGP but more than 60 days on average) - All other factors as for arable land	16	13
Non Arable Land	- Land with severe moisture limitations (less than 60 days DGP on average) - Soils less than 250 mm deep - Surface stone cover greater than 50 %	61	49
Total		124[3]	100

Source: Ministry of Agriculture/UNDP/FAO (1988)

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2 Estimates for the total land area for Ethiopia and Eritrea vary between 122 and 125 million hectares.

3 Estimates for the total land area of Ethiopia and Eritrea vary between 122 and 125 million hectares.

Several physical, chemical and soil factors influence the capacity of land resources for agricultural development. The Master Land Use Plan of Ethiopia (Ministry of Agriculture/UNDP/FAO, 1988) has defined five agricultural land use classes (Table 2).

3.5 Forest Resources

For its needs of wood for construction, industry and fuel, Ethiopia relies mainly on its natural forest resources. However, plantation forestry is increasing in importance.

3.5.1 Natural Forest

FAO (1981) and many other publications state that closed forest covered 40 percent of the country only a century or so ago. This figure has been derived from the work of the forester, Brietenbach, (1962) who considered the effect of climatic factors to determine the extent that the climax forest vegetation cover must have had. He did not consider the effects of human activities. The lowlands below 1500 m are generally too dry for forest-type vegetation to develop (see section 5.15 for a description of the main vegetation types). The figures for areas which could have been covered by forest and woodland before human interference started have been estimated to be only 37% (Aklog Laike 1990). Agricultural activities have been going on in Ethiopia for at least 5000 years and have been most extensive between 1500 and 3000 m above sea level. Historical sources, for example Alvares (1961), who visited the country in the beginning of the sixteenth century, describe the Ethiopian highlands as extensively cultivated with many trees, but few closed forests. It is, therefore, not possible that Ethiopia has ever had a closed forest cover within historical times as extensive as that described by FAO. The history of changes in vegetation, reconstructed from various written sources, has been summarized by Tewolde (1990) for the period since 1500 A.D. His conclusion is that Ethiopia's forests were of limited extent, and that they were at their most extensive, in the 19th. century. Deforestation was accelerated towards the beginning of this century, and in 1960, closed natural forest covered only about 4,120,000 ha or 3.37 percent of Ethiopia (Aklog Laike, 1990). But since high forest was estimated to cover 4.4% in 1988 (Ethiopian Mapping Authority, 1988), it is obvious that these estimates are all unreliable and more precise data are still needed.

3.5.2 Human-made Forest Resources

The first human-made forest plantation was established around Addis Ababa at the turn of the century. Peri-urban plantations, particularly of *Eucalyptus globulus*,

increased and reached their largest extent in the early 1970s. Satellite data analysis shows that around Addis Ababa the plantation area shrunk by 32.8 percent between 1973 and 1976. This was because of the loss of protection of these forests following their nationalization in 1975. In the 1980's some large plantation projects were launched incorporating previously existing, plantations as well, but their impact has not been commensurate with their size owing to poor implementation and even poorer subsequent care. On the other hand, the estimate of the areas of plantation arrived at through a careful study by the Ethiopian Forestry Action Programme (1993) gives a higher area of 95,000 ha. for industrial plantations and a slightly lower area of 35,000 ha. for peri-urban plantations. (Table 3)

Table 3: Extent of Human-made Forest in Ethiopia

A. Peri-urban fuel wood plantation projects

Project	Area planted 1984-92 (ha)
Addis Ababa	12 815.0
Nazreth	5 181.0
Debre Berhan	3 113.0
Dese	3 059.0
Bahar Dar	465.0
Gonder	783.3
Addis Bah	16 708.3
Total	42 124.6

B. Other plantations

Category	Area in 1989 (ha)
Industrial Timber	18 706.0
Community Woodlots	44 634.0

Source: State Forests Department files, MoNRDEP

3.5.3 Forest and Woodland Products

Forests and woodlands provide wood for various uses. They also provide other useful products including incence, myrrh and gums and grazing for livestock especially during the dry season, and foraging for honey bees. The moist south-western forests also produce important spices, e.g. kororima, (*Aframomum korarima*) and coffee.

The amount of wood products supplied in 1989-93 have been compiled by the Soil and Water Department of the Ministry of Natural Resources Development and Environmental Protection and are given in Table 4.

According to the Ethiopian Forestry Action Program (1993), the production and use of industrial wood products is one of the lowest in the world, being much lower than that of Tanzania inspite of the higher population. This is not to imply, however, that wood is not used much. The low amount of industrial wood is only

a reflection of the fact that the bulk of both the cutting and the using of wood in Ethiopia is largely done by the artisanal sector, not by the industrial sector.

Table 4: Wood Products

Description	Unit	Production 1989/90	1990/91	1991/92	1992/93
Industrial timber	M^3	62,733	66,150	64,544	43,405
Poles	No	15,303	60,819	82,838	30,014
Construction poles	M^3	52,084	50,012	36,650	24,739
Fuelwood	"	109,301	127,678	114,788	70,976
Charcoal	qntl	59,082	107,620	257,130	32,382

Source: Soil and Forestry Department files, MoNRDEP

Since ancient times, incense and myrrh have been important items of export to other countries. They are used in Catholic and Orthodox church ceremonies. They are also used in traditional medicines and perfumes. The amount of natural gums consumed within the country and exported in 1989/90 is given Table 5.

Table 5: Natural Gum Products and Marketing (1989/90)

	Items	Amount (quintals)	Value (Birr)
Internal consumption	Incense	10 955	5 642 888
	Gum arabic	52	4 827
	Myrrh	102	420
	Others	2 304	3 943
Total consumption		13 413	5 652 078
External trade	Incense	5 730	2 001 753
	Gum arabic	767	382 512
	Gum opoponex	712	642 086
	Myrrh	50	30 140
Total export		7 259	3 056 491
Total		20 672	8 708 569

Source: Natural Gum Production and Marketing Enterprise (1990)

3.6 Mineral Resources

Mining accounted for less than 3 percent of GDP and less than 2 percent of merchandise exports in 1985. Detailed geological maps are still unavailable for much of the country, but an increasingly important role for minerals is envisaged by the government. Nevertheless, the contribution of minerals was less than 1% to both GDP and exports in 1993. There are many areas in Ethiopia with favourable conditions for the exploitation of minerals, including metallic mineral deposits in Precambrian rocks, and oil and gas in sedimentary rocks. So far, activity has been concentrated in the Adola area in Sidamo, some 500 km south of Addis Ababa, where hand panning for alluvial gold (estimated 37 tons recovered over 50 years) has been going on. A recent total investment of nearly 200 million Birr in modern facilities has enabled 3000 tons of ore to be excavated each day. Extensive areas of alluvial gold have recently been discovered in Tigray and some panning is taking place. Current annual earnings are some 20 million

Birr. Tantellerite, which is used in the making of capacitors and alloys for in spacecraft occurs as tantalum pentoxide at Kenticha; 20 tons is presently produced per annum with possible future production rising up to 200 tons per annum.

There is a soda ash project at Lake Abyata in the Rift Valley capable of producing 20,000 tons per annum, which will be used in a caustic soda factory. 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 bee properly assessed. This is a major failing.

Oil and gas exploration has focused on the Ogaden where promising discoveries of natural gas have been made, and plans for exploitation are advanced. Concessions for exploration have also been given in other areas.

Significant investments will be required, however, to develop mineral exploitation to its full potential. Exploration, infrastructure and production facilities all require substantial investment.

Ethiopia also has many fossil bearing sites of great palaeotological importance for the scientific study of the prehistory of humans and other organisms. Since it is believed humans evolved in the African Rift Valley, these sites are of world significance, e.g. Adidar (Hadar) in the Afar Depression and Omo. More will be said about these in the next chapter.

Through the formulation of joint research programmes, these sites could become an asset for developing science in Ethiopia. They could also attract tourists both as sites and as resources for display materials in museums. So far, however, it is Californian museums that have developed because of these resources, the spin off from them to Ethiopia being relatively insignificant. A clear policy aimed at maximizing benefits for Ethiopia is required.

3.7 Water Resources

The Ethiopian Government is taking an integrated approach to water resources planning. This will be achieved through an appropriate balance between the use of surface water and ground-water resources to ensure the sustainability of use, the minimization of cost and the safeguarding of the environment.

3.7.1 Surface Water

Ethiopia is the "water tower" of Northeastern Africa. Except for the Awash and the Omo, all the large rivers originating in Ethiopia flow into neighbouring countries. Unlike in the past, Ethiopia is now taking genuine steps towards fostering close ties, joint planning and harmonious relationships among riparian countries.

The western part of the country drains into the Mediterranean Sea and the eastern part into the Indian Ocean. Out of 12 basins in Ethiopia, seven are drained by rivers that flow along or through international boundaries. Data for runoff are given in Table 6, which shows that 74 percent of the annual runoff of more than 110 billion cubic metres goes into the rivers that flow into the Sudan, Egypt, Somalia and Kenya.

Table 6: Annual Runoff from Major Drainage Basins in Ethiopia

Basin	Countries Sharing	Area in km^2	Annual runoff $x10^9 m^3$
Wabi Shebelle	Somalia	202 697	3.16
Abay (Blue Nile)	Sudan, Egypt	201 346	52.60
Genale-Dawa-Weyib	Somalia, Kenya	171 042	5.88
Awash	-	112 697	4.60
Tekeze-Angereb-Goany	Sudan, Egypt	90 001	7.63
Omo Gibe	-	78 213	17.96
Baro-Akobo	Sudan, Egypt	74 102	11.89
Ogaden	-	77 121	0.00
Afar	-	74 002	0.86
Rift Valley Lakes	-	52 739	5.64
Mereb-Gash	Sudan, Eritrea	23 932	0.88
Aysha (Gulf of Aden)	-	2 223	0.00
Total		1 160 115	111.10

Source: Ethiopian Valleys Development Studies Authority (1989)

3.7.2 Groundwater Resources

The general geology of Ethiopia comprises the following four groups of rock:

i) Precambrian lower, middle and upper complexes (23 percent)
ii) Upper Palaeozoic and Mesozoic sedimentary rocks (25 percent)
iii) Cenozoic sedimentary rocks (20 percent)
iv) Cenozoic volcanic rocks (32 percent)

In areas of the Rift valley and along border areas in the south and west the rocks are overlain by alluvial and lacustrine sediments. Depending on the location of these sediments in the hydrological system they may provide useable groundwater at a shallow depth. In the output zones the groundwater evaporates and deposits salts which can have value as minerals.

In the Precambrian systems, depending on location, some groundwater can be available for village water supplies from fractured rock aquifers.

The volcanics of Cenozoic age, mostly basalts, extend over large parts of the highlands adjacent to the Rift valley where they provide a good transmission of rainfall to recharge aquifers, produce springs and feed perennial stream-flows. High transmission rates provide good quality water. These volcanics probably account for the high fluoride content, sometimes exceeding 10 mg/litre, which appears in adjacent alluvial aquifers and lakes in the Rift Valley. The occurrence

of thermal springs in these areas shows that the groundwater has often travelled through considerable depths.

Because of insufficiency of hydrogeological data, the groundwater potential of the country is not known with any certainty. A preliminary water resources master plan study of the various basins estimates it to be 2.9 billion cubic meters. So far, only a small fraction of this resource is in use, mainly for local water supply purposes.

3.7.3 Irrigation and Power Potential

Ethiopia has a rich water resources potential, but water can be locally very short in many places. The irrigation and the hydroelectric generation potentials of the 12 major basins of the country are summarized in Tables 7 and 8 respectively.

Table 7: Irrigation Potential

Basin	Potential Gross Irrigable Area (ha)	Net Area Under Irrigation (ha)	% Utilized
1. Abay (Blue Nile)	977 915	21 010	2.1
2. Rift Valley Lakes	122 300	12 270	10.0
3. Awash	204 400	69 900	34.2
4. Omo-Gibe	450 120	27 310	6.1
5. Genale	435 300	80	0.02
6. Wabi Shebelle	204 000	20 290	9.9
7. Baro	748 500	350	0.05
8. Tekeze	312 700	1 800	0.57
9. Mereb	37 560	8 000	21.3
10. Ogaden	none	none	-
11. Afar	3 000	none	0.0
12. Aysha (Gulf of Aden)	none	none	-
Total	3 495 795	161 010	4.6

Source: Based on Tesfaye Gizaw & Kemal Zekaria (1989)

Table 8: The Hydroelectric Generation Potential (GWH/Year)

	Generation Potential	Utilized	%
A. Basins draining to the Mediterranean Sea			
1. Abay (Blue Nile)	70 036	715	1.0
2. Tekeze	8 969	-	0.0
3. Baro	19 826	-	0.0
4. Mereb	not available	-	-
B. Basins draining towards the Indian Ocean			
1. Genale	12 508	-	0.0
2. Wabi Shebelle	6 143	543	8.8
C. Rivers forming closed internal drainage basins:			
1. Awash	5 589	440	7.8
2. Omo	not available	-	0.0
3. Rift Valley Lake	12 240[4]	-	0.0
4. Afar	-	-	-
5. Ogaden	-	-	-
Total	135 311	1 698	1.25

Source: Based on Tesfaye Gizaw & Kemal Zekaria (1989)

4. This figure only refers to the Bilate-Segan part of the Rift Valley Lakes Basin.

3.8 Livestock Resources

Ethiopia has a livestock population which is the largest in Africa and the tenth in the world. Livestock in Ethiopia are the principal capital of the farmer (4.0 TLU per household). In 1984 the majority of the livestock, about 74 percent, were owned by cultivators and the remaining, about 26 percent, by pastoralists (Table 9).

Table 9: Ownership Distribution of Livestock Resources

	Cultivators		Pastoralists		Total
Type	10^6 TLU	%	10^6 TLU	%	million TLU
Cattle	17.4	76.6	4.4	55.7	21.8
Sheep	1.5	6.6	0.5	6.3	2.0
Goats	0.4	1.8	0.9	11.4	1.3
Equines	3.4	15.0	0.8	10.1	4.2
Camels	0	0.0	1.3	16.5	1.3
Total	22.7	100.0	7.9	100.0	30.6

Source: Ministry of Agriculture (1984)

The livestock population of the country was estimated to be 21.4 million TLU in 1984/85 which is less than the 1964/65 livestock population (27.5 million TLU). This is a result of the severe droughts that have occurred over the intervening twenty years.

Livestock are an integral part of nearly all farming systems in Ethiopia. They provide the draught power for the grain-producing highland farmers and the staple milk for pastoralists and semi-pastoralists. Livestock also provide milk and meat to both rural and urban populations. Their manure is an important fuel and fertilizer while hides and skins are important for local leather-based industries as well as for export.

Production from cattle has been estimated to be 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 litres a year, while meat consumption is 13.9 kg a year of which beef and veal contribute 6.4 kg a year, and sheep, goats, chicken and camels the rest.

Those regions where the greatest number of livestock live are heavily cultivated for crop production and as a result are largely deficient in livestock feed resources other than agricultural residues.

Pastures and rangelands are the main feed sources of livestock in the non-cultivable arid lowlands but they only supplement crop aftermath and residues in the heavily cultivated parts. In general the country is overgrazed and hence stocked over its carrying capacity. The situation could improve with changes in management that would entail cutting and carrying fodder instead of letting the

animals range freely, and thus reducing overgrazing and increasing biomass productivity.

The Ethiopian Rangelands cover some 500,000 square kilometres (about 42 percent of the country's total area) with altitudes below 1,700 m and averages in annual rainfall of less than 600 mm. Most of these rangelands fall into 5 regions which have been defined for setting up projects to help improve productivity. Their basic characteristics are given in Table 10. The carrying capacity of these rangelands is severely limited by the inadequate watering facilities and by a consequent inefficient utilization of the existing vegetation. Entrepreneurs among the Somali nomads of south eastern Ethiopia have responded to this by constructing deep, concrete lined ponds for storing rain.

Nomads, with a population of only about 3 million, are the users of rangelands (UNDP/RRC, 1984). But due to an expansion in irrigated crop cultivation in some of the traditional nomadic areas some traditional grazing lands have been lost. The most affected are the Afar and the Kereyu nomads who have lost close to 35,400 ha and 22,000 ha of their best dry season grazing areas respectively. In addition traditional grazing areas have been reduced for national parks (19,767 square kilometres), wildlife reserves (28,100 square kilometres) and sanctuaries (9,536 square kilometres). This situation has led to conflicts between nomadic communities and animosities towards the government organizations using these areas. The nomads have been forced to live in, and utilize, the marginal areas for livestock production. They have, therefore, become more vulnerable to droughts than in the past.

3.9 Inland Fishery Resources

Ethiopia is endowed with a number of lakes, reservoirs and rivers. The area of the major lakes is more than 7,000 km^2 and their maximum sustainable annual yield of fish (MSY) is estimated to be about 35,300 tons (Table 11) although present average annual production is only 4000 tons (Beyene Kebede and Lambourne, 1985).

Table 10: Ecological Characteristics of the Ethiopian Rangelands

	North	North-east	South-east	South	South-west	West
Bare Soil %	23	73	13	5	9	-
Grassland %	32	7	48	49	54	65
Shrub/Bush %	14	14	36	42	10	4
Woodland %	3	1	1	3	21	6
Moderately Cultivated %	19	3	1	1	-	25
Wet lands	-	3	-	-	-	-
Tsetse	No	No	No	Yes	Yes	Yes
Rainfall (mm)	200-700	50-700	100-700	100-700	1000-1400	600-1000
Surface water	poor	poor	poor	poor	good	mod.good
Area (km^2)	79 000	163 000	293 000	95 000	63 000	74 000

Source: The Ethiopian Valleys Development Studies Authority (1991)

The Rift valley lakes basin has over 25 fish species and accounts for about 50 percent of the total inland fish production. Some of the rivers have also a large potential for fisheries development.

According to the Ethiopian Wildlife Conservation Organization (1989), Ethiopian fresh water bodies are known to contain 101 species of fish among which 4 are endemic to the country. The most important commercial types of fish are Tilapia, Nile Perch and Cat Fish.

Table 11: Productivity of Ethiopia's Major Lakes and Rivers

Basin	No. of Commercially Important Species	Maximum Sustainable Yield, Tons/Year
Rift Valley Lakes	7	20 300
Lake Tana	2	15 000
Baro River	not identified	25 000
Other Rivers	not identified	not available

Sources: FAO (1984); Ministry of Agriculture and Settlement (1977); and Beyene Kebede and Lambourne (1985)

The demand for fish is seasonal particularly where Orthodox Christians predominate. In these areas fish demand can be high during Lent and other fasting days as shown in Table 12. However, the view that fish should not be eaten during fasting seems to be gaining prevalence, and this may affect fish consumption patterns in the future.

Table 12: Fish Consumption in Quintals in Fasting & Non-Fasting Times (1979/80 - 1981/82)

Season of the year	Average number of days	1979/80 Quantity	%	1980/81 Quantity	%	1981/82 Quantity	%
Lent	55	4 282	57	6 248	64	7 094	55
Other fasts	117	2 519	34	3 100	32	4 218	33
Non-fasting	193	701	9	413	4	1 544	12
Total	365	7 502	100	9 761	100	12 856	100

Source: Ethiopian Valleys Development Studies Authority (1991)

People living adjacent to water bodies where fish are available use them for food and exchange with other goods within their local areas. Fishing has also created job opportunities, for example, in the Lake Zway area in the Rift Valley primarily to satisfy the growing demand in Addis Ababa.

In addition to fishing some small groups, which are neither Christian nor Moslem, also hunt Hippopotami and Crocodiles for local use and trading in skins.

3.10 Apiculture

Ethiopia has very rich resources for the production of honey and beeswax as the large variation in the physical environment produces an equally large variation in

plants and thus also in flowers for foraging by honey bees. An estimate indicates that over 4.2 million traditional hives, 60 percent occupied by bees, exist in Ethiopia giving the country the largest bee population in Africa, where the total is estimated to be more than 5 million colonies (Ethiopian Valleys Development Studies Authority, 1991). The Central Statistical Authority (1986/87 & 1987/88) gives the number of occupied beehives in those two years as about 3.2 and 3.1 millions respectively.

The annual honey and beeswax productions have been estimated at 3,300 and 3,500 tons respectively. This makes Ethiopia one of the eight leading producers in the world. More than 90 percent of the honey produced is used within the country. Even so over 500 tons have been exported to seven large world markets over recent years. The total national income from honey and beeswax is estimated at Birr 120-150 million per year of which earnings from the export of processed beeswax accounts for about Birr 5 million in foreign exchange.

3.11 Floristic and Faunistic 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 fauna and flora.

3.11.1 Flora

The flora of Ethiopia is very heterogeneous and has a rich endemic element. It is estimated to contain between 6500 and 7000 species of higher plant, of which about 12 percent are endemic (Tewolde, 1991a). Endemism is particularly high in the high mountains and in the Ogaden. According to Brenan (1978) Ethiopia has the fifth largest flora in tropical Africa.

The Semien and Bale Mountains have been identified as areas of plant endemism of continental importance and provide the best examples of high altitude vegetation in Ethiopia. Their flora is diverse and the Afromontane representatives show affinities to South African, Eurasian and Himalayan elements. The southwestern broad-leaved evergreen forests show affinities to the Congolian forests of western Africa (Friis et. al., 1982). According to Vollesen (1986), the Ogaden region is characterised by a high diversity in *Acacia*, *Boswellia* and *Commiphora* species and contains about 25 percent of the plant species in the country.

Important as this natural flora is, it is in the diversity of plants which have been manipulated by humans that Ethiopia stands out in the world. Ethiopia is a very

important centre of crop genetic diversity and for this reason, it is one of the 12 Vavilov centres. It is the sole or the most important centre of genetic diversity for arabica coffee, teff, enset (*Ensete ventricosa*) and anchote (*Coccinia abyssinica*). It is the main centre of genetic diversity for noug (*Guizotia abyssinica*) and Ethiopian rape (*Brassica carinata*). It is one of the main centres for sorghum, finger millet, field pea, chick pea, cow pea, perennial cotton, safflower, castor bean and sesame. Because of genetic erosion in other parts of the world, it is now the most important centre of genetic diversity for durum wheat, barley and linseed (Edwards, 1991). The Plant Genetic Resources Centre of Ethiopia has been entrusted with safeguarding this crop genetic wealth. To this end, it already (February, 1994) had a collection of 53,625 accessions of 100 crop types in its gene bank (information received from Plant Genetics Resources Centre/Ethiopia). The centre realizes that a gene bank cannot preserve all genetic material and it thus keeps *ex-situ* living collections of arabica coffee and it is involved with a number of farming communities in the *in-situ* conservation of crop germplasm, helping them maintain their traditional genetic pool holdings being propagated free from the genetic erosion imposed by the modernization of agricultural practices.

3.11.2 Fauna

The faunistic diversity of Ethiopia is also high, reflecting the diversity in climate, vegetation and terrain. Although having fewer species of spectacular game animals than their lowland counterparts and the rest of lowland tropical Africa, the highland regions have, on a unit area basis, a larger number of endemic birds, mammals and amphibians. The eastern low-lying parts of the country have some species in common with Somalia, Kenya, Tanzania and Djibouti. The western and southwestern parts share their fauna largely with southern Sudan. According to information obtained from the Ethiopian Wildlife Conservation Organization, at present 240 species of mammals and 845 species of birds have been identified of which 22 species of mammals and 24 species of birds are endemic. This makes Ethiopia the richest in avifauna in mainland Africa. The endemic avifauna are dominated by highland species with at least 19 being normally found above 1000 m. Although very little study has as yet 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 invertebrates, but they are likely to contain at least the same proportion, if not more, of endemic species.

3.11.3 Wildlife Resources

Map 8 shows the areas designated as National Parks, Wildlife Sanctuaries, Wildlife Reserves and Controlled Hunting Areas. Of these, only two National Parks, i.e. Awash and Semien, have been gazetted. This has at times produced

legal ambiguities and problems for protecting the areas. The National Parks are the responsibility of the Ethiopian Wildlife Conservation Organization, a federal agency forming part of the Ministry of Natural Resources Development and Environmental Protection. The other protected areas are the responsibility of the Bureaus of Natural Resources Development and Environmental Protection in the Regions.

The exclusion of human activity from these protected areas is imperfect, and often very poor. Since the flora and fauna co-evolved with humans, in fact, complete exclusion is not desirable. Nevertheless, with the unstable period towards the end of the civil war and the stabilization of the country by the Transitional Government, much destruction has taken place in these protected areas.

The Afro-Alpine habitats are represented by the Semien and Bale National Parks. These parks provide sanctuary for the threatened Walia Ibex, Semien Jackal (also often called Fox or Wolf) and Mountain Nyala. They also contain habitats for a high proportion of the endemic birds. The Semien National Park is recognised by UNESCO as a world heritage site.

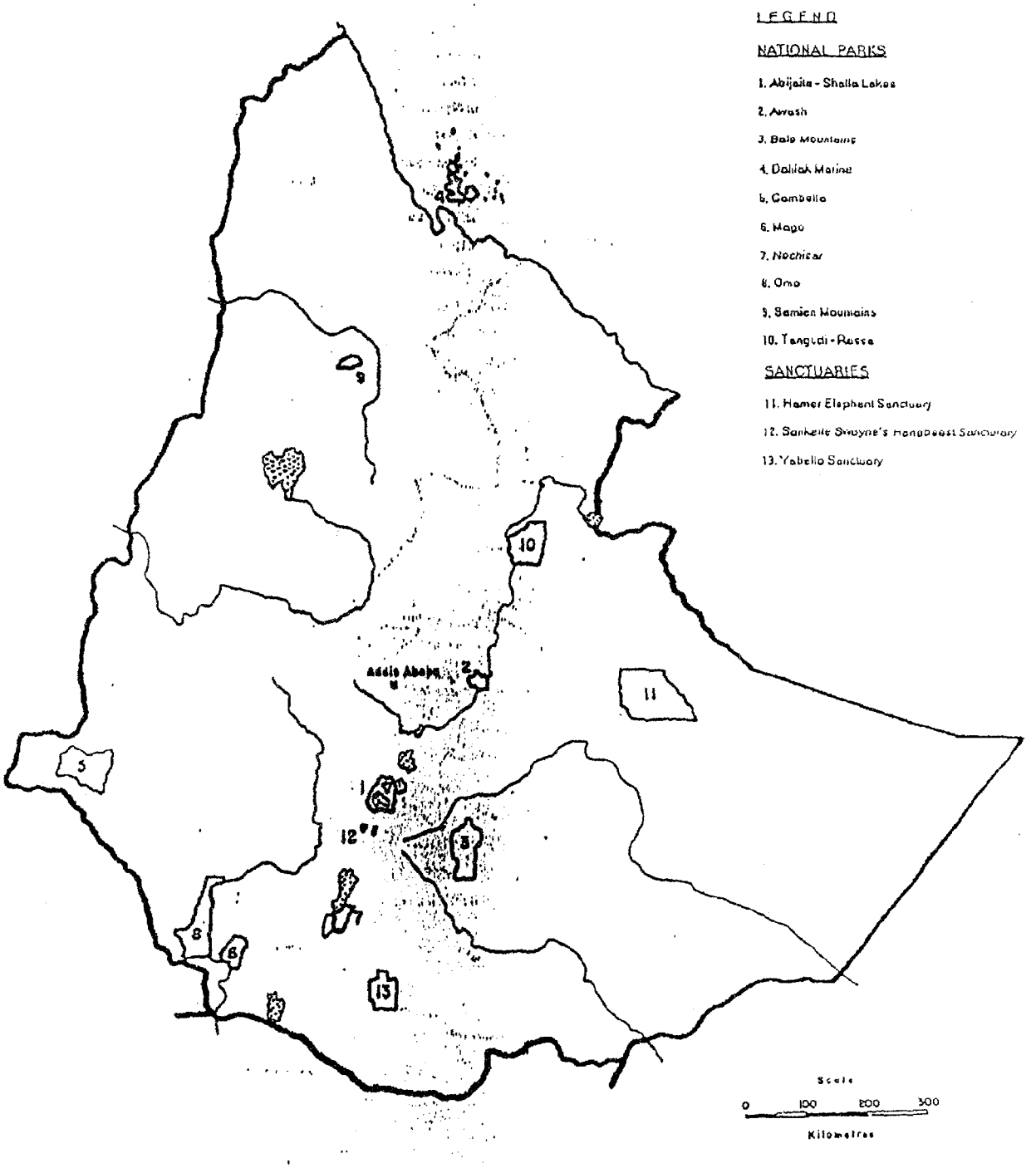
Lowland habitats, particularly those found in the Rift Valley Lakes regions and the Awash Valley are represented by Abyata-Shalla, Awash, Nechisar and Yangudi-Rassa National Parks. These are associated with a number of Wildlife Reserves and Controlled Hunting Areas. The large mammals given sanctuary in these areas are Somali Wild Ass, Grevy's Zebra, Beisa Oryx, Sömerring's Gazelle, and Swayne's Hartebeest. Two of these areas are particularly important for birds: a breeding colony of great white pelican is found in the Abyata-Shalla National Park and the threatened endemic, Stressman's Bush Crow, in the Yavello Wildlife Sanctuary.

The remaining National Parks and associated designated areas are found in the lowland regions bordering with Northern Kenya and the Sudan. These contain spectacular game animals including those which migrate across these borders, the most remarkable of which is the White-Eared Kob. This kob migrates in herds across the border, making it noticeable and vulnerable.

The most striking feature of the distribution of wildlife designated areas in Ethiopia is their complete absence from the most productive, and hence, the most widely used and thus threatened, vegetation types of the country. These are the Moist Evergreen Forest and the Dry Evergreen Forest. Bale national Park contains small patches of both types of forest. Outside this, the only other protected forest area is the very small Menagesha State Forest near Addis Ababa.

Map 8

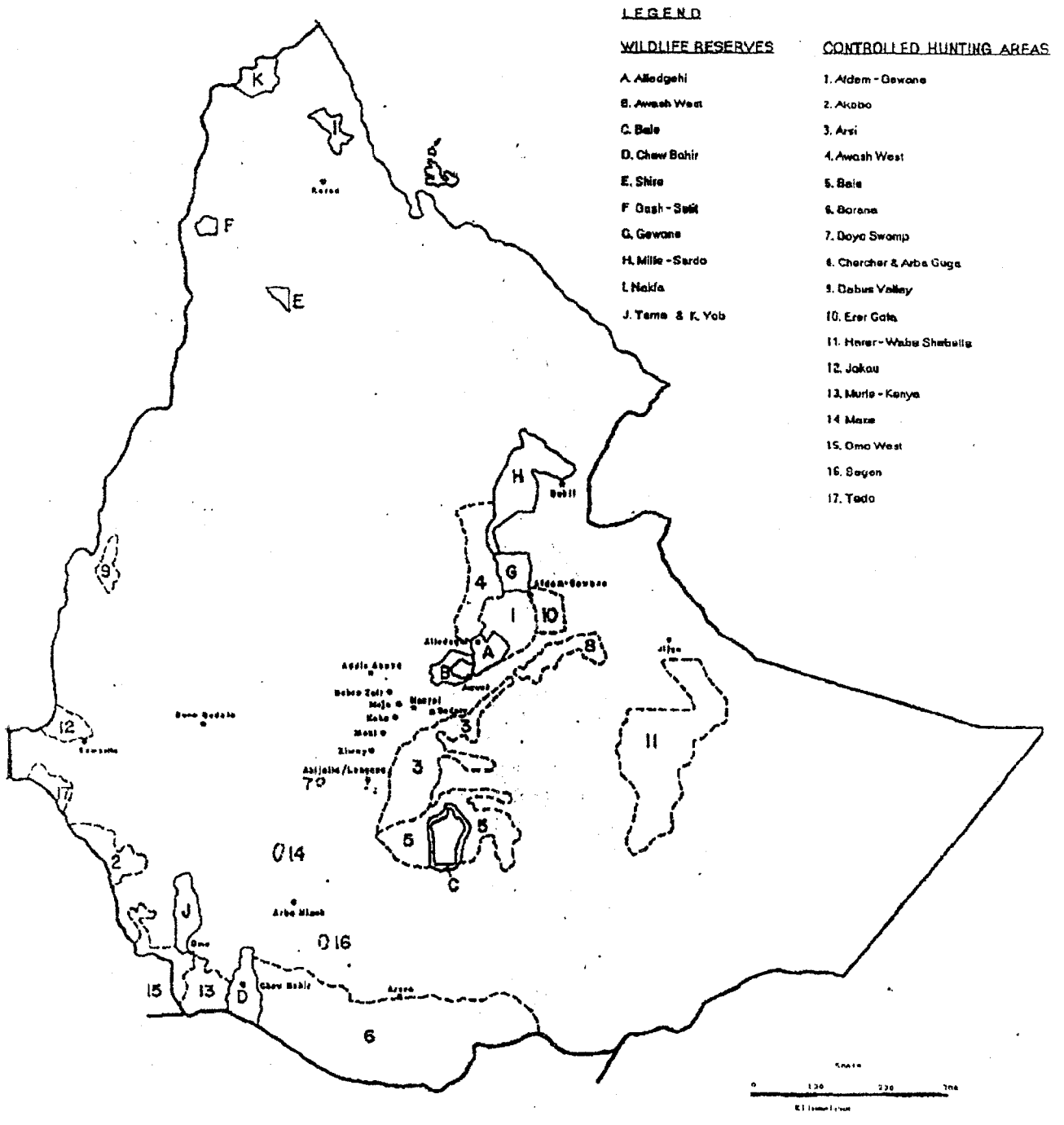
ETHIOPIA: NATIONAL PARKS AND SANCTUARIES



ETHIOPIA - UNCED NATIONAL REPORT: RESOURCE BASE

Map 9

ETHIOPIA: WILDLIFE RESERVES AND CONTROLLED HUNTING AREAS



The Moist Evergreen Forest areas include the most extensive closed forests still surviving in the country. They are associated with gene pools of arabica coffee and *Aframomum korarima* and contain other important plants and animals.

The Dry Evergreen Forest and its associated grasslands is home to a high number of endemic plants and birds and a few of the mammals. This vegetation type is dominated by agricultural activities and the remaining forests are now reduced to occasional small patches mostly around churches, holy springs and mosques. These are important reservoirs for planting material to help in rehabilitating the highlands of the country.

The Ogaden is floristically the richest part of the country with up to 25 percent of the species and a large proportion of the endemics. Apart from prospecting for petroleum and natural gas, the natural resources of this vast area have not been well studied. Except for two wildlife sanctuaries, there is no protected area in it. Because of the repeated droughts, wars and movements of population, pressure on the environment is high.

The importance of all these areas in the future rehabilitation and conservation of Ethiopia's environment for sustainable use should be recognised and more protected areas selected and designated.

The standard view on wildlife is that it is a foreign-exchange earner attracting tourists, who come nowadays mostly to see and take home trophies in the form of pictures. International tourism for Ethiopia has hardly been developed while internal tourism consists mainly of taking Addis Ababa residents to nearby weekend resorts.

3.12 Energy Resources

Ethiopia has both non-renewable sub-surface energy resources and renewable energy resources. To date, most energy comes from biomass resources. Development of hydro-electric power has been expanding but other more modern technologies for harnessing and using other forms of renewable energy have hardly started. Even the development of hydro-electric power had stalled owing to the effects of the civil war and now there is shortage of electricity expected to last until the Gilgel Gibe project is completed.

3.12.1 Sub-surface Energy Resources

Exploration for non-renewable underground energy resources has been stepped-up in recent years with some promising results: coal and oil shale occurrences have been confirmed in a number of regions; natural gas deposits of over 25

billion cubic metres have been discovered in the Ogaden; and geothermal energy resources totalling 700 MW have been found in four separate areas. Nuclear energy has not been a subject of serious consideration even though certain radioactive materials have been recorded. But since there are many untapped sources of more environment friendly forms of energy, there should be no need to consider nuclear energy in the foreseeable future.

Even though data are not available for the most recent findings, conditions seem to favour the development of underground energy resources parallel with the further development of hydropower.

3.12.2 Renewable Energy Resources

Table 13: Regional Overview of Renewable Energy Resources in Ethiopia (10^3 Tcal/yr)

Region	Primary solar radiation	Wind	Derived Energy Forest biomass	Hydro-power	Animal wastes	Crop residues
Arsi	43 985	115	24.7	7.6	7.4	5.1
Bale	204 955	567	119.2	38.8	1.7	1.2
Gamu-Gofa	59 480	151	60.2	38.9	2.2	1.5
Gojam	90 980	129	22.7	71.3	10.9	9.4
Gonder	130 035	160	18.6	33.7	6.5	6.0
Hararge	417 595	1 203	43.0	31.3	4.8	4.5
Ilubabor	67 895	105	142.4	46.8	1.5	3.0
Kefa	83 975	169	218.9	65.9	5.5	5.6
Shewa	137 570	343	38.5	60.5	24.5	18.1
Sidamo	194 610	518	97.5	37.9	7.1	10.1
Tigray	119 775	291	25.2	9.9	4.4	1.3
Welega	99 690	429	55.9	82.1	5.8	5.2
Welo	135 635	138	30.4	23.9	10.3	6.1
Total	1 786 180	4 318	896.6	548.6	92.6	77.1

Source: CESEN-ANSALDO/FINMECCANICA Group (1986a)

The largest renewable energy resource, primary solar radiation, is estimated to be nearly 1.8 billion teracalories (Tcal) per year. The five other derived resources of renewable energy are estimated to be able to supply about 5,900 million Tcal a year, only 0.33 percent of the primary solar radiation. The exploitable component of the primary solar radiation is assumed to be only 0.1 percent of the total. The estimated total exploitable energy, in view of sustainability and environmental protection, is, therefore, about 7.7 million Tcal a year.

Solar Radiation: The exploitable potential of the total primary solar radiation represents by far the largest portion (23 percent) of renewable energy resources, with the Hararge region, (now Somalia Region or Region 5, and the eastern part of Oromiya Region), accounting for over 26 percent of the total. The smallest, 1.3 percent of the total, is for Arsi region (now a Zone of Oromiya). Regional solar energy potential is directly related to surface area and sunshine hours and thus

to the occurrence of substantial areas of lowland characterized by low rainfall and relatively low cloud cover.

The average daily radiation reaching the ground varies from a high of 5.55 KWm/m^2 in February and March to a low of 4.55 KWm/m^2 in July with a mean of 5.20 KWm/m^2. The annual variation is thus small, allowing for a very efficient use of solar energy facilities.

Wind Energy: The potential for wind energy is estimated to be some 4.3 million Tcal/year, of which 5 percent is deemed exploitable. A significant amount (49.8 percent) of this exploitable potential is located in two regions: Hararge (29.7 percent) and Bale (20 percent).

3.12.3 Biomass Energy Resources

The three types of biomass energy resource in use in Ethiopia are wood, animal waste and crop residues. According to CESSEN-ANSALDO/FINMECCANICA (1986a & b), the possible annual production of energy from these is 896.6, 92.6, and 77.1 thousand Tcal respectively, or a total of 1.066 million Tcal. Although they constitute only about 14 percent of the total exploitable renewable energy resource, they are the most important in view of practical utilization dictated by the socio-economic and technological realities of Ethiopia existing and anticipated to continue into the near future (see Tables 14 & 38). The increasing pressure on these resources will also be the crucial determinant of environmental degradation for many years to come. Alternatively, success in managing them will be the crucial input to ensure sustainability.

Woody Biomass: As can be seen from Table 39, the total woody biomass energy stock was estimated by CESEN-ANSALDO/FINMECCANICA Group (1986a & b) to have been 12,965.3 thousand Tcal in the late 1970's. The regional distribution of the stock varies from a high of 2,549.3 thousand Tcal in Kefa to a low of 482.1 thousand Tcal in Gojam. Four regions (Kefa, Bale, Ilubabor and Sidamo) account for 54.6 percent of the total available woody biomass energy stock.

The annual production of wood from the total available forest biomass was estimated to be some 896.4 thousand Tcal per year. But a lot of destruction has happened since 1989, and thus though no recent estimates as yet exist, the situation is probably a lot more grim now. Most of this production (62 percent) is from the same four regions, which constitute only 27.6 percent of the total area and which support only 20 percent of the total population of the country. The second group of four regions, Hararge, Welega, Shewa and Gamo-Gofa, with 37 percent of the total area and 37.8 percent of the population, contribute 21 percent. The remaining regions which make up 35.4 percent of the area and 42.4

percent of the population have contribute only 17.2 percent to the estimated sustainable annual yield of woody biomass energy. All this is based on 1986 data. The Forestry Action Program (1993, vol. 2, Annex 1.3, p. 2) estimates the wood demand to have been 47.4 million cubic metres or, at an average of 600 kg./m^3, 28.44 million metric tons in 1992. The incremental yield has been estimated at only 13.8 million cubic metres, or 8.28 million metric tons. The major component of the demand (44.9 cubic metres) is for firewood. The consumption of firewood for 1990-91, given in the same report (Annex 6.1, p. 1) was only 33.858 million metric tons, or 56,430 cubic metres. The annual yield or incremental production estimate made by CESEN-ANSALDO/FINMECCANICA (1986b, p. 68) is 934,323 Tcal/yr, or at a factor of 3.500 Kcal per kg. of wood, approximately 267 million metric tons, or about 445 million cubic metres/year.

The above figures indicate the disparity between the distribution of the population and that of the available woody biomass resources. It has been suggested, as a rule-of-thumb, that 80 km is the maximum distance for an economically acceptable transport of wood by road to urban areas with high population concentrations. The highly dispersed nature of rural settlements dictates that wood-fuel availability be within easy walking distance for the vast majority of the population. This requires a new strategy in woody biomass production since even the little surplus that exists in south-western Ethiopia is unavailable for the fuel deficit areas of the country.

Table 14: Energy Supply and Consumption in Ethiopia 1984 (Tcal)

A. Primary energy

	Fuelwood	Dung	Crop residues	Bagass	Hydro-power	Crude oil
Gross supply	103686.6	10970.3	9768.0	72.5	658.5	7318.
production	103686.6	10970.3	9768.0	72.5	658.5	-
imports	-	-	-	-	-	7318.
exports	-	-	-	-	-	-
variation in stocks	-	-	-	-	-	-
Input to conversion	6194.8	-	-	-	658.5	7318.
petroleum refining	-	-	-	-	-	7318.
charcoal production	6194.8	-	-	-	-	-
power generation	-	-	-	-	658.5	-
Outputs from conversion	-	-	-	-	-	-
Energy losses	4757.6	-	-	-	98.8	754.
conversion	4757.6	-	-	-	98.8	754.
transport & distribution	-	-	-	-	-	-
Net supply	97491.8	10970.3	9768.0	72.5	-	-
Bunkers	-	-	-	-	-	-
Domestic consumption	97491.8	10970.3	9768.0	72.5	-	-
by sector						
agriculture	-	-	-	-	-	-
industry	6320.3	449.2	410.6	72.5	-	-
transport	-	-	-	-	-	-
public & commercial	-	-	-	-	-	-
households	91171.5	10521.1	9357.4	-	-	-
other	-	-	-	-	-	-
by type of settlement						
urban	7923.2	723.5	580.1	72.5	-	-
rural	89568.6	10246.8	9187.9	-	-	-
by region						
Arsi	3954.6	419.5	420.1	-	-	-
Bale	2990.1	168.0	207.8	-	-	-
Eritrea	5155.8	608.2	302.3	-	-	-
Gamo-Gofa	3358.6	233.1	275.9	-	-	-
Gojam	7316.7	1132.6	995.7	-	-	-
Gonder	7037.8	1013.2	902.9	-	-	-
Hararge	10697.4	680.0	722.3	-	-	-
Ilubabor	2641.3	276.4	286.0	-	-	-
Kefa	6553.6	754.6	741.1	-	-	-
Shewa	17640.5	2178.2	2031.9	72.5	-	-
Sidamo	8789.5	1051.5	1002.1	-	-	-
Tigray	5113.7	641.0	364.9	-	-	-
Welega	6232.7	634.3	665.1	-	-	-
Welo	8269.6	1130.9	793.2	-	-	-
Aseb Administration	214.2	5.6	3.3	-	-	-
Addis Ababa	1526.7	43.2	53.4	-	-	-

Source: CESEN-ANSALDO/FINMECCANICA Group (1986a)

Table 14 cont.: Energy Supply and Consumption in Ethiopia 1984 (Tcal)

B. Secondary Energy

			Oil Products								TOTAL
	Char-coal	Elect-ricity	lpg	Gaso-line	Avia. Gas	Jet fuel	Kero-sene	Diesel	Fuel Oil	Other	Pri & Sec. Energy
Gross supply	-	-	2.2	341.6		528.2	1151.3	1880.6	-		-
production	-	-	-	-		-	-	-	-		-
imports	-	-	-	464.2		528.2	1151.2	-	-		-
exports	-	-	-	-		-	-	1755.1	-		-
variation in stocks	-	-	2.2	122.6		-	0.1	125.5	-		-
Input to conversion	-	-	-	-	-	-	-	270.0	237.6	5.0	-
petroleum refining	-	-	-	-	-	-	-	-	-	-	-
charcoal production	-	-	-	-	-	-	-	-	-	-	-
power generation	-	-	-	-	-	-	-	270.0	237.6	5.0	-
Outputs from conversion	1437.2	720.4	58.0	1043.2	518.3	1779.7	3020.3	144.5	-		
Energy losses	-	91.0	-	-	-	-	-	197.3	147.7	-	-
conversion	-	-	-	-	-	-	-	197.3	147.7	-	-
transport & distribution	-	91.0	-	-	-	-	-	-	-	-	-
Net supply	1437.2	629.4	60.2	1335.2	49.6	795.3	251.2	2661.0	902.1	139.5	126563.30
Bunkers	-	-	-	-	0.03	102.8	-	14.0	154.4	0.37	271.70
Domestic consumption by sector	1437.2	629.4	60.2	1335.2	49.6	692.5	51.2	2647.0	747.6	139.1	126291.60
agriculture	-	1.85	0.43	42.7	0.5	-	0.13	212.2	2.2	16.8	276.81
industry	34.5	314.3	3.91	27.9	-	-	8.33	149.4	717.7	22.8	8531.44
transport	-	-	4.90	1212.1	49.1	692.5	7.80	1970.8	8.1	85.2	4030.50
public & commercial	-	120.0	1.59	-	-	-	0.84	-	18.6	-	141.03
households	1402.7	177.2	49.2	-	-	-	234.1	30.5	-	-	112943.70
other	-	15.9	0.20	52.5	-	-	-	284.1	-	14.3	367.00
by type of settlement											
urban	1002.9	629.4	60.2	1335.2	49.6	692.5	239.3	2629.0	747.6	139.1	16824.10
rural	434.3	0.0	-	-	-	-	11.9	18.0	-	-	109467.50
by region											
Arsi	37.4	4.47	0.09	13.1	-	-	0.13	45.0	1.86	4.06	4900.31
Bale	8.2	1.59	0.01	16.9	-	-	0.08	52.3	-	2.50	3447.48
Eritrea	72.1	79.7	1.70	165.3	6.05	206.6	66.0	170.1	164.6	5.22	7003.67
Gamo-Gofa	17.0	1.36	-	5.82	-	-	-	9.75	-	0.22	3901.75
Gojam	65.7	20.2	-	15.5	13.5	-	1.20	83.8	12.5	3.23	9660.23
Gonder	40.4	4.2	0.01	9.97	-	-	1.83	33.4	-	1.02	9044.73
Hararge	121.2	61.1	1.32	138.5	2.95	52.5	22.1	280.7	122.9	10.1	12913.07
Ilubabor	4.28	1.05	-	7.78	-	-	0.07	11.1	-	0.71	3228.69
Kefa	47.9	5.90	0.14	23.5	2.40	4.10	3.27	68.6	-	2.08	8207.19
Shewa	229.4	142.9	4.14	138.5	1.75	90.2	22.4	398.7	111.5	25.3	23087.89
Sidamo	154.3	12.2	0.21	38.0	-	-	5.69	70.8	10.3	4.18	11138.78
Tigray	54.2	5.03	-	39.8	-	-	1.16	16.6	-	3.80	6240.19
Welega	14.0	2.81	-	17.1	-	-	0.04	41.0	-	1.03	7608.44
Welo	72.0	6.21	0.99	44.6	-	-	2.30	143.6	6.82	4.72	10474.94
Aseb Admin.	10.3	8.91	0.77	42.7	1.75	11.5	0.35	392.9	0.10	7.81	700.19
Addis Ababa	488.8	271.8	50.8	618.1	21.1	327.6	124.2	828.7	317.0	63.1	4734.50

Source: CESEN-ANSALDO/FINMECCANICA Group (1986a)

Agricultural Waste Biomass: The total production of animal waste and crop residues is directly dependent on the extent of agricultural activity. The 1982/3 total biomass production for Ethiopia (not including Eritrea) was estimated by CESEN-ANSALDO/ FINMECCANICA (1986b) to have been 1,083,377 Teracalories. Of this, forest biomass constituted 896,600 Teracalories, or about 83%. Of the remaining, crop residues accounted for 69,382 Teracalories or about 6%, human waste accounted for 38,323 Teracalories or about 3.5% and animal waste accounted for the balance of 79,072 Teracalories, or about 7.5%. It is mostly cow dung that is used for fuel, and this amounted to 28,604 Teracalories or about 2.5% of the total biomass produced. The Forestry Action Program (1993, vol. 2, Annex 6.1, p. 1) has estimated the total consumption for fuel in 1990/91 of animal waste to have been 3.942 million, and of crop residues to have been 3.237 million metric tons, or 13,797 and 11,330 Tcal respectively.

Agricultural waste, consisting of dried cow dung and crop residues, as an energy source is most significant for Shewa, Gojam, Welo, Gonder and Tigray. According to CESEN-ANSALDO FINMECCANICA (1986b) on the average, agricultural waste (including agricultural residues, human waste and animal waste) constitutes 41 percent and 51 percent of the total biomass energy resources base and sustainable yield respectively for these five regions. Agricultural waste is least significant for Bale, Kefa and Gamo-Gofa, showing the inverse relationship between agricultural waste and woody biomass availability resulting from the regional competition between agriculture and forestry. In the high altitude areas of Shewa and Wello, agricultural residues and cow dung are virtually the sole sources of household energy, with less of agricultural residue, which is mainly used as feed, and more of cow dung, being used in the other northern regions.

CHAPTER IV

HUMAN RESOURCE BASE AND THE HUMAN SITUATION

The absolute size of a population, as well as its cultural, economic and technological settings are important in determining the impact of human resources on the development and environmental well being of a given country. The historical setting of a given country has a major impact on all these. Therefore, in this chapter, we will start by looking very briefly at the historical dimensions that have moulded the development scene and, in particular, at the scientific and technological tradition and the values contributing to, and the practices of care for, the environment.

4.1 The Historical Setting

Many volumes could be written on this theme. This is especially so because Ethiopia is a multi-ethnic and multicultural country with human impact going to the beginning of humanity. The historical sketch that will be of use in our context should, therefore, become selective and only sufficient to show the roots of the dominant phenomenon of a low level of economic and technological development, and of an aggressive land degradation syndrome. There could be many sketches of more successful histories of environmental development e.g. that of the Konso, Sidamo, Gurage and Hadiya areas. If these cultures had dominated, Ethiopia's environment would have been much better cared for. In order to tackle the prevalent degradation, we feel it is more useful, even if more depressing, to look at the dominant destructive syndrome. To understand this syndrome, the frame for selection of historical facts will be the interactions among development, environment, land management, technology, the values on democracy and the security of the individual to life and the fruits of labour.

4.1.1 The Historical Setting for Development

The historical setting of development in Ethiopia has been summarized by Tewolde (1990) and Tewolde et.al. (1993) and what follows draws on that summary.

Many tropical mountains are small in surface area and isolated (Tewolde, 1991b). Human populations on them may, therefore, not reach the numbers required for effective socialization exchange of technologies and ideas to take the society to continually higher levels of cultural, political and technological achievement. But where the land mass is large, there is no tropical area where the highlands above 1000 metres are now not dominant. Mexico, the tropical Andean countries and Ethiopia have had old indigenous civilizations with substantial agricultural and

technological achievements. The oldest remains of human and hominid technology are found in the African Rift Valley (Ref. Clark & Kurashina, 1980). From dating implements, it is clear that technology then moved polewards and upwards (Ref. Clark, 1975 & 1981).

Whilst in progress polewards at low altitudes the human technological centre can, on the whole, be expected not to run out of suitably large areas. But it is to be expected that, on the whole, areas higher up in altitude would soon become too small in size to foster the required level of socialization to stimulate further development. It is thus to be expected that mountain civilizations will tend to be easily arrested in their development and, in fact, following their arrest, to deteriorate unless contact with civilizations in extensive lowlands can be maintained. But, since lowland technological centres have been keeping moving further and further away polewards, civilizations of tropical mountainous areas have been too far away from their latitudinal equivalents to benefit from interaction and have thus been destined to deteriorate or even fade.

This inbuilt constraint on further development is exacerbated by immigration of peoples of markedly different technological tradition from the more extensive surrounding lower areas whose technological repertoire becomes largely irrelevant in the changed upland setting. The immigrants thus merely hasten the process of destabilization by triggering off reverses. The post-Axum history of Ethiopia would seem to illustrate this with occasional resumptions of development which have left us with the material cultural remains of Lalibela and Gonder and some lesser ones.

Ethiopia emerged into written history at about the 5th century B.C., approximately contemporaneously with the Roman Empire. The isolated Ethiopian mountain civilization did not have the possibilities for expansion and interaction that the Roman civilization had and it is probably because of this that the Roman civilization continued to develop much more than the Ethiopian civilization did though in the third century A.D., Ethiopia was considered to be one of the four greatest empires of the world (Kobishanov, 1981, p. 383). As would be expected of a mountain civilization, immigration by a lowland nomadic people, the Beja (Sergew, 1972, p. 207-208 & 221-22) destroyed the Axumite civilization. The previous tenuous contacts with equivalent lowland civilizations in the Mediterranean area were then discontinued by the rise of Arab nationalism which enabled the effective raids of Africans for slavery (Abir, 1968, pp. 1-3 & 8). This forced isolation on Ethiopia. As a result, Ethiopia stagnated with only slight up and down variations. Its surrounding lowlands are very dry and sparsely populated, which might have helped the Ethiopian civilization to remain dominant and to avoid, for over a millennium, complete destruction by immigrants and

conquerors. Or perhaps, as suggested by Merid Wolde Aregay (1976), a nomadic conquering people over-ran the country and established a ruling class.

Whether this theory is correct or not, what is certain is that the post-Axumite system of government in Ethiopia has been characterized by constant and continuing pillages. We have pillage and destruction of areas where battles were taking place because the authority of the king of kings was challenged. Such pillages have been recorded from Emperor Amde Tsyon's fourteenth century (Anonymous, 1965, p. 37, 100, 107, 108), through various centuries and emperors to Emperor Menelik's twentieth century (Wellby, 1969, pp. 173-226 & 324-359).

Whatever political conditions started the tradition of pillaging, the Ethiopian Empire, as an heir of Axum, was both technologically and socio-politically so much stronger than the more fragmented neighbouring peoples living at lower altitudes that it managed to continue unchallenged. If Ethiopia had not been isolated by latitudinal distance from equivalent civilizations, it would have had to compete to exist. This would have ensured that the state which advanced the most technologically would have had the upper hand. It is axiomatic that pillage and insecurity go together. An insecure society cannot be a technological innovator. Pillage would, therefore, have died a natural death. Even though a technological level of the post-Axumite Ethiopian civilization higher than that prevailing in the neighbouring lowlands thus made it possible to maintain pillage, this very pillage stunted overall development.

In spite of the prevalence of the violence of pillage, and in spite of the fact that the establishment was Christian, Moslem-Christian interaction in Ethiopia has been taking place peacefully and zealotry in either religion has, on the whole, led to proselytizing by convincing and converting, not by force. One exception to this rule occurred through foreign interventions. In the sixteenth century, when firearms were unknown in Ethiopia, the Turks armed a Moslem coalition under Mohammed Ibn Al Ghazi, (Tekle Tsadik, 1961. p. 43) and all the Christian highlands were ravaged. The Christians regained power through assistance in firearms and soldiers from Portugal (Tekle Tsadik, 1961, pp. 59-62) but the Portuguese were soon thrown out of the country. Now, in a country of almost equal Christian and Moslem citizens, there is no religious violence. The wars between Ethiopian emperors e.g. Amde Tsion (Anonymous, 1965) and vassal kings, even when the latter have been Moslem, would have happened irrespective of religion; the conflicting interests of the emperor and the vassal made these inevitable. At any rate, such wars took place between the emperor and Christian vassals as well.

It is estimated that more than 70 languages belonging to four major groups (Semitic, Cushitic, Nilotic and Omotic) are spoken in Ethiopia (Bender, 1976, pp. 1-14). And yet intolerance of other nations and nationalities is almost unknown. The past civil war has often been portrayed as one based on narrow nationalism. Now that it is over and we have the advantage of hindsight, it is obvious that it was a war of a popular struggle against over centralization of power and dictatorship.

The smaller nations and nationalities in the influence of the highland empire were too small to effectively compete with it, and too near to avoid it. Their leeway for socio-political experimentation was, therefore, limited by constant interferences and frequent raids, the last major campaigns being towards the end of the 19th. century.

4.1.2 The History of Land Management and the Environment

This multi-ethnic, multi-religious pluralist society thus stayed isolated and inward looking for more than a millennium (eighth to nineteenth century A.D). In this time, its economic base shifted from a mix of agriculture, manufacturing and international trade almost entirely to being limited to agriculture. During the Axumite period, feudalism is said to have been poorly developed (Kobishchanov, 1986). With the loss of trade production focused on agriculture and the production system became fully converted to a feudal system. According to Bahrey, (1954, pp. 125-126) there were 10 social groups in the feudal Ethiopia of his time, i.e. at the end of the 16th. century. These social groups consisted of the monks, the *debtera*, lay officials (including judges), men at arms giving personal protection to the wives of dignitaries and to princesses, the *shimaglle* who were the lords and hereditary landowners, their farm labourers or serfs, traders, artisans, wandering singers, and the soldiers who were called *chewa*. According to modern thinking, some of these categories are not true classes. But at least the *shimaglle*, the serfs, the *chewa*, the artisans and the traders constitute definite classes. Power was vested in the Emperor and those aristocrats he appointed to execute his power, and the power enforcing instrument consisted of a class of soldiers, the *chewa*. The means of agricultural production in theory belonged to the Emperor to the extent that he could disinherit any one, and, in practice to the *shimaglle* class, which included the aristocracy, whether involved in statecraft or not. The *shimaglle* managed the local environment, including the agricultural system, exacting services and produce from the serfs.

Towards the end of the 18th. century, internal population movement made much of the country ungovernable and the Emperors in Gonder felt the need to redistribute land both to cater for displaced aristocracy and to increase the ranks

of the *chewa*. They thus gave land to the *chewa* (Pankhurst, 1966, pp. 29-34) presumably as a lure to, and a reward for, fighting. This seems to have been accompanied by a swelling of the ranks of the *chewa* by the landless. Given the levelling effect of this widespread access to land, the *shimaglle*, the *chewa* and the serfs soon lost their distinctiveness. This process was speeded in the Era of the Princes in the early 19th. century by the breakup of the country into small warring principalities and the evergrowing demand for soldiers. By the end of the nineteenth century, therefore, the three classes, the *chewa*, the *shimaglle* and the serfs had all coalesced into the present day peasant. Because of the decisive brute force of soldiers and because of the legal basis emanating from the fact that the new land holding system was largely carried out on behalf of the *chewa*, and perhaps more importantly because, in the Era of the Princes, local defence from marauders was necessarily led by the *chewa*, the values of the new class, that of peasants, became predominantly those of the *chewa*, though some of the values of the *shimaglle* also crept in, and the term *shimaglle* now means an elder, with all the connotations of wisdom that age in Africa entitles.

This process of creating the new peasant class eliminated not only the serf and the *chewa* as a class, but also the bulk of the aristocracy. Only the royal family and the top members, i.e. the nobles, remained as a class opposed to the peasantry. Having shared their land with all the classes that finally became the peasantry, the distinction that remained even for the nobles was the royal favour empowering them to raise taxes for their own use from some areas designated as their *gult*. Owing to the discontinuation of minting money towards the end of the Axumite period, (Doress, 1956, p. 89) these taxes had to be raised in kind. Because centrally collecting taxes in kind to distribute later is clumsy, post-Axum Ethiopia had evolved the *gult* system through which the Emperor, and in times of imperial weakness whoever was ruling, gave the right to levy taxes in kind from specified villages. In northern Ethiopia, therefore, the aristocracy was left only with *gult* as a means of extracting produce, and only its share with all the peasants by way of access to land. It is true that because of his political position, an aristocrat in position of authority could obtain a larger than average share of land, but, theoretically he had to claim his share at par with the poorest of his/her related peasants.

Traditional land tenure in Africa is usually communal. The extent to which the privatization of land intimated by Bahrey (1954) went is not known. Even if it had become completely privatized, the process that created the peasant seems to have placed it back more or less into communal ownership.

This process of evolution of the Ethiopian peasant became dominated by the vandalous nature of the values of the *chewa*, (de Almeida, 1954, p. 45) and the egalitarian values of both the *chewa* and the serfs, imposed on both of them by

their lack of property, resulting in a land holding system with myriads of variations all having one important characteristic in common: claim to land is hereditary, and on both father's and mother's side. The right to a parcel of land enables its owner to keep off people and animals only when there is a crop in the field, the land reverting to communal ownership every time after harvest so that anyone can graze it and remove any organic matter, (e.g. cow dung or twigs for firewood) from it. Perhaps more importantly, any tree growing anywhere except within somebody's compound was there for the taking by anyone who wanted it. It is true that, usually, people do not cut down trees from inside someone's parcel of land. But the land is cultivated and, considering the annual crop cultivation system which is what is prevalent in most of Ethiopia, by definition, there cannot be many trees in the parcel of land. Anywhere outside the parcel of land is entirely communal. This killed all initiative to plant trees except in one's compound, and existing remains of forests soon became decimated. The evolution of this total lack of responsibility for uncultivated rural land was probably triggered by the relatively enlightened land reform of Emperor Iyasu I. This land reform, which occurred at the end of the eighteenth century, has been described by Mahteme Sellassie (1975).

Prior to that, southern and central Ethiopia had been taken over by the then nomadic Oromo. Forests, therefore, soon covered all the areas as these lapsed from cultivation. That is why virtually all the present day remaining Ethiopia forests (Chaffey, 1979) are either in Oromo speaking areas, or in neighbouring areas occupied by ethnic groups not involved in annual crop cultivation, e.g. the *Messengo*. The areas which cultivate perennial crops, e.g. enset and coffee, necessarily have a year-round control of a piece of land. This tenure has fostered the planting and looking after of trees.

In order to swell its fighting force the aristocracy, led by the Emperors, unwittingly brought about a change in the class structure of society and in land management. It also blunted its instrument of coercion, its *chewa* class, by changing it into a land bound peasantry. This meant that the government was always opposed to peasants organizing themselves; and yet, in the absence of organization, the peasantry could not evolve the capability to properly manage communal ownership. In short, the Ethiopian feudal government had to create the armed peasantry in order to withstand the outside world, but it also had to deny it organization in order to keep it docile and subjugated.

At the same time as the feudal highland Ethiopian state was adapting itself to the situation of having to withstand the outside world, the new conquerors of southern and central Ethiopia, the *Oromo*, were also undergoing change. Adapting to their new environment, they soon adopted the annual crop cultivation system of the agricultural highlands with all its faults. In so doing, they lost their

initiative against the highland feudal system and were soon conquered and their lands given to the conquering warlords and to their retainers, or recreated *chewa*, now renamed *nefteñña*. Most of this happened towards the end of the nineteenth century (Tekle Tsadik 1964, pp. 53-54) long after the *shimaglle*, the serfs and the *chewa* as classes had disappeared. The new land owning aristocrats had been recruited not only from the mismanaged agricultural background of the north but, equally importantly, from the fighting elements of the now diffuse aspiring aristocratic component of the peasantry which had, therefore, little interest in practical agriculture and land management. The feudal system re-established in central and southern Ethiopia, therefore, became divorced from intimacy with the land, and as incapable of caring for the rural environment as its counterpart in the north. As for the disinherited new serfs of the South, the alienation destroyed all initiative to care for the land. The net result was that in both the old feudal north and the newly established feudal center and south, land came to be used simply as a mine to provide whatever could be taken from it - all types of crop, fuel, building material, even animal manure. However, islands of good management remained in those areas which escaped total alienation from their original owners, e.g. Gurage, Sidamo, Hadiya, Kefa.

At about the same time as the evolution of the peasant, contacts with Europe, though still traumatic and resulting in major battles, e.g. those of Dogali, Adwa, Mai-Chew, grew and the aristocracy developed a new taste for European goods and services. This meant that towns arose. The land was, therefore, being mined not only to provide exports for buying firearms, a process which has been going on since the sixteenth century, or for supporting the aristocracy, but most importantly, also for feeding, housing and clothing the ever-increasing urban population. Calculating from data given by CESEN-ANSALDO/ FINMECCANICA (1986b), the human waste in 1982-3 amounted to 38,323 Teracalories, total crop production to 103,041 Teracalories, agricultural residues to 68,382 Teracalories, and the total forest biomass and human and animal waste to 1,083,377 Teracalories. The urban population of Ethiopia is about 15%. It would, therefore, mean that 15% of human waste, or about 2.8% of the organic matter that should have returned to the soil is being withdrawn annually. To this should be added the loss of fertility owing to the burning of animal waste. Over decades, this becomes a significant loss. Such a major and continuous short-circuiting of the nutrient cycle could not continue without serious consequences and the syndrome of reduction in soil fertility, more and more extensive cultivation of unsuitable land to compensate for this, followed by even greater reductions in overall production capacity made an ecological crisis inevitable.

4.1.3 The Historical Setting for Technology

The instability implied by the continued threat of pillage and the socio-political atmosphere inimical with scientific and technological developments undermined the status of artisans reducing them to despised and persecuted endogamous castes so that, let alone failure in the furtherance of technological development, the deterioration of what had existed became inevitable (Tewolde et.al., 1993). An example of the gravitation of the destitute in society into being artisans has been studied for the Biete Israel or Felasha.

Quirin (1977) traces the process which marginalized the Biete Israel from being a mainstream farming nation to artisans and finally to an endogamous inferior caste. In the Middle Ages, their land was first taken away and given to Christians unless, of course, they themselves became Christian. Lack of land then pushed them into being artisans, especially blacksmiths, goldsmiths, potters, builders, weavers, and rug makers. The establishment of the City of Gonder in their vicinity in the sixteenth century stimulated these crafts, especially that of masonry. The importance of the artisans to the city raised their status to tolerable levels though they were still considered inferior to the farmers and traders. The decline of Gonder in the Era of the Princes in the early 19th. century denied artisans employment except as blacksmiths making and maintaining the agricultural implements of the farming communities. This forced their diaspora into all of northern Ethiopia and induced an endogamy among blacksmiths as artisans scattered in the countryside, and within the small remnant communities of goldsmiths and silversmiths in the very few eclipsed remnants of previous towns, mainly Gonder, Axum and Adwa. The resulting virtual identification of the Biete Israel with blacksmiths and their endogamy prepared the ground for their type-casting.

It seems that the association of the forge with supernatural powers is old. In the acts of Abba Samuel of the Monastery of Wegeg, who dedicated his life to stamping out the pagan cult of Desek, the saint is said to have confronted single handed and only armed with a cross, an army led by the Desek cult leader and consisting of 400 soldiers with spears, shields and swords, 300 with bows and arrows, and, finally, 300 blacksmiths carrying bellows and hammers (Anon, 1968, p. 26).

That Ethiopia's technological development was arrested because of the marginalization of artisans may be objected to as artisans in many societies which have had a successful technological development were despised, e.g. in ancient Egypt, Mesopotamia, Iran, China, Japan, and Rome (Ghurye, 1979, p. 141-160). In India, where the whole population is organized into castes, the artisans, though generally of lower status, are usually not the lowest (Ghurye, 1979, p. 43-138). In

southern Arabia, which is an immediate neighbour of Ethiopia, the artisans were considered so inferior that they lived on the outskirts of towns. However, even there, they were not the lowest class as there was a still lower class which was not even allowed to enter mosques (Ghurye, 1979, p. 150). In many societies, e.g. ancient Egypt, Mesopotamian Iran, and Rome,though the guild nature of professions imposed endogamy, the basis was not one of inherent inferiority of the human being involved (Ghurye, 1979, p. 141-160). The lower status of artisans in these civilizations was thus not bad enough to become the totally demoralizing instrument that the Ethiopian caste system became. In England, where the industrial revolution took place, 'smithcraft was held in special esteem' (Ghurye, 1979, p. 155). In Confucius's China, artisans as a class came quite high up the social ladder, scholars coming top, followed by farmers, then artisans, then merchants and finally servants, with soldiers being classified as servants (Ghurye, 1979, p. 145). It is consistent with the social status of artisans that the Chinese crafts have had a high quality for millennia. It is instructive to note in this context that in Japan, though some types of artisans had a relatively high status, 'stone cutting and cutting of metal were relegated to the outcasts', but since the 1867-1878 revolution, all the common people, which include artisans, became one class (Ghurye, 1979, p. 146).

According to Merid (1976), the social status of artisans in the Axumite period of Ethiopia (300 B.C. to 900 A.D.) was good. He attributes the fall in their status in the Middle Ages to a conquest of the highlands of Ethiopia by a pastoralist or agrarian society which subjugated the urban society based on artisans and merchants and saw them as inferior, relegating them into a very low caste. The merchants, who of necessity lived in the coastal lowlands, were not routinely encountered by the new ruling class and thus escaped with a lower level of stigmatization. Whether the relegation of artisans in the highlands to their despised and feared caste arose in this way, or simply as a result of the collapse of commerce and thus also of craftsmanship resulting in the isolation of Ethiopia following the rise of Arab nationalism, it is certain that such an abused caste of artisans as existed in Ethiopia in the Middle Ages could not have achieved technological excellence. The artisans of Gurage are instructive in this context. The Gurage area in the southern part of central Ethiopia had, and still has, perhaps the best built houses and crafted furniture. Because 'Fuga [the artisan caste] rituals and beliefs, apparently, have been completely merged with the religious organization of the Gurage...' (Shack, 1969, p. 9), their position in society has not been as precarious as in the rest of Ethiopia even though they have still been believed to possess evil supernatural powers (Shack, 1969, p. 9-10). This would support the thesis that it is alienation of the artisans and pillage, one making the other more insiduous than it would have been on its own, that stunted the growth of Ethiopian technology.

4.2 Human Settlements and Infrastructure

The majority of the Ethiopian population lives in rural areas and is engaged in agriculture. The diversity of relief, climate and fertility of soil and endemicity of diseases has affected the settlement pattern of the population. The highest concentration of people is generally on the highlands where the climate is favourable for rainfed crop cultivation. They are also relatively free from vector-borne diseases, particularly malaria. The lowlands, however, constitute the larger portion of the area of the country (about 55 percent) but are mostly arid and contain only about 19 percent of the total population.

The level of urbanization is low. In 1992, the urban population consisted of 7,378,000 or only 14.3% of the total (CSA, 1992).

Domestic services are not well developed; only about 17 percent of the country's population receives clean and safe drinking water from properly constructed facilities. This is made up of 47 percent of the urban and 8 percent of the rural population. Average *per capita* water consumption has been estimated as 20 litres a day, falling as low as 6 litres a day in areas where water has to be carried considerable distances. The carrying of water and firewood is done mostly by women.

There are many factors which hinder the development of a clean and safe water supply system for a community. The very high rate of population growth and the shortage of financing are the most important constraints. Moreover, in the lowland areas, in particular in the Rift Valley, the water has a high fluoride content which reaches up to 25 ppm, up to ten times higher than the WHO standard maximum. The removal of fluoride from water is an expensive process which can not be easily adapted for poor rural areas.

The targets set for improved water supply during the UN-sponsored decade for "Drinking Water and Sanitation" (1981-1990) were 35 percent for the rural population and 85 percent for the urban. However, ostensibly because the 1984 census showed the population to be bigger than had hitherto been assumed, the target for the rural population had to be lowered down to 18 percent. The supply of potable water for rural areas improved from less than 0.01 percent of the population served in 1972 to 11.8 percent in 1990. For urban areas potable water reached 82.9 percent of the total 1990 urban population of which 30.3 percent had an adequate supply and 52.6 a supply low in quantity and quality. Of the total population of Ethiopia (about 51.5 million excluding that of Eritrea according to the 1992 estimate), about 25.5 percent had access to safe drinking water supply systems.

The development of sanitation facilities was far below that of water supply. Only 52 percent of the urban population outside Addis Ababa and 69 percent in Addis Ababa had sanitation facilities. Even thus, treatment of sewage had only been started recently for some of the effluent from Addis Ababa. Outside the capital sewage treatment was non-existent. In rural areas, it is estimated that only 4 percent had any sanitation facilities.

4.3 Health and Social Services

Although significant advances were made after 1974, in 1991 health service coverage still remained very low. It was estimated that recurrent budgets were 50 percent to 55 percent below those needed, and drug supplies were inadequate. In May 1984, 62 percent of health stations had only one health assistant instead of the three planned, thus making effective outreach impossible.

The increase over time in the number of health facilities was as given in Table 15.

Table 15: Number of Health Facilities (excluding those of the Armed & Policy Forces) between 1961/62 and 1990/91

Type of Health Facility	1961/62	1972/73	1981/82	1983/84	1986/87	1990/91
Health Stations	354	650	1 761	1 949	2 193	2 292
Health Centres	41	93	131	141	156	160
Hospitals	54	84	86	83	88	89
Hospital Beds	5 158	8 415	10 993	11 296	11 554	12 106

Source: Central Statistics Office (1961/62-1990/91), Statistical Abstracts

In 1974 the country had 1 doctor for 80,000 people, 1 nurse for 28,000 people and 1 health assistant for about 8,000 people. By 1990 there was 1 doctor for 30,000 people, 1 nurse for 14,000 people, and 1 health assistant for about 5,000 people.

The government's emphasis has been on basic health services such as vaccination and the result has been significant. For example, in 1973/74, only 3,037 people were vaccinated while in 1986/87 the number increased to 62,000.

4.4 Education

Modern education in its present form is a comparatively recent phenomenon. The Menelik II School established in 1908 was the first modern school. The lack of schools condemned the mass of the Ethiopian population to illiteracy which had a rate of more than 90 percent until recently.

The Ethiopian school system is composed of three levels, primary, secondary and tertiary (Higher Education). The first two levels of education are structured into six years of primary, two years of junior secondary and four years of senior secondary. Recent education statistics are given in Table 16 below. The figures do not include tertiary education. The decrease in 1989/90 is owing to the intensification of the civil war as it approached its end. Schooling has now increased and more than compensated for that decline; but precise statistical data are not yet available.

Table 16: Education Statistics

Schools	1986/87	1987/88	1988/89	1989/90
Government Schools	8 291	8 911	9 122	8 830
Teachers	67 525	70 538	78 949	76 669
Students	3 145 259	3 337 902	3 368 751	3 168 681
Classrooms	61 261	67 122	n.a.*	n.a.*
Non-Government Schools	796	798	800	752
Teachers	6 342	6 448	7 586	8 280
Students	333 609	348 881	360 255	362 795
Classrooms	5 411	5 625		

Source: Central Statistics Office (1986/87 - 1989/90), Statistical Abstracts.
* the majority of schools in the war ravaged areas of the North are conducted trees in the open or in tents and temporary shades made of tree branches.

A new education policy was formulated by the Transitional Government of Ethiopia in 1993. This calls for a greater integration between the traditional and modern systems of education. It also provides for a greater preparedness of the school leaver for self employment. Education has so far been provided free by the state. The new policy calls for cost charing with the cost recovery being minimal at the primary level and increasing up to the tertiary level, but not reaching full bearing by the student.

4.5 Demographic Development

The mortality rate in Ethiopia has decreased while there has been no decline in fertility. Consequently, the country is experiencing a rapid increase in population, raising the proportion of the young and thus providing the potential for future increases as well as raising the dependency ratio of the population as a whole. This has placed a high burden on the working age section of the population. The economic growth of the country has not kept pace with this increase in population.

4.5.1 The Growth of the Ethiopian Population

The first census ever to be held in Ethiopia was in May 1984, and showed that the Ethiopian population was 42.2 million and growing at an annual rate of 2.95 percent. The result surprised many people within and outside government circles

because the previous estimate had been given as 34.6 million. The census did not have a complete coverage of the country; only 85 percent of the people were enumerated while the estimation of the remaining 15 percent was based on sample surveys. This applied particularly to the northern areas of the country.

Before the first census, estimates of the Ethiopian population had been based on guesses and sample surveys. The wide divergence between the 1984 census and the previous estimates shows that the population of the previous years had always been underestimated. One major consequence is that all socio-economic indicators of development calculated on a per capita basis before the census had to be scaled down. Because of the divergence between the 1984 census and the corresponding estimate, the population of Ethiopia for the preceding years has had to be re-estimated taking the 1984 census as the base. The reconstructed estimates of the Ethiopian population are given in Table 17.

Table 17: Reconstructed Estimate of the Ethiopian Population 1935-1990 in millions

Year	Popu-lation	Year	Popu-lation	Year	Popu-lation	Year	Popu-lation
1935	15.3	1949	19.5	1963	25.1	1977	34.8
1936	15.6	1950	19.9	1964	25.7	1978	35.7
1937	15.9	1951	20.2	1965	26.3	1979	36.7
1938	16.1	1952	20.6	1966	26.9	1980	37.7
1939	16.4	1953	20.9	1967	27.5	1981	38.7
1940	16.7	1954	21.3	1968	28.1	1982	39.8
1941	17.0	1955	21.7	1969	28.8	1983	40.9
1942	17.3	1956	22.0	1970	29.4	1984	42.2
1943	17.6	1957	22.4	1971	30.2	1985	43.3
1944	17.9	1958	22.8	1972	30.9	1986	44.6
1945	18.2	1959	23.2	1973	31.6	1987	45.9
1946	18.5	1960	23.6	1974	32.3	1988	47.3
1947	18.9	1961	24.1	1975	33.1	1989	48.7
1948	19.2	1962	24.6	1976	34.0	1990	50.1

Source: Asmerom Kidane (1987)

Table 18 shows that since 1950 the rate of population growth has been above 2.

Table 18: Growth Rate in percent of the Ethiopian Population for Selected Periods

Date	Growth Rate	Date	Growth Rate
1935 - 1939	1.30	1960 - 1964	2.20
1940 - 1944	1.50	1965 - 1969	2.30
1945 - 1949	1.80	1970 - 1974	2.60
1950 - 1954	2.00	1975 - 1979	2.80
1955 - 1959	2.10	1980 - 1989	2.95

Source: Asmerom Kidane (1987)

If this trend continues, the size of the Ethiopian population could be more than 100 million by the year 2010 (Table 19).

Table 19: Projection of the Population Sizes of Ethiopia up to 2020

Year	Population (millions)
1984	42.8
1990	51.7
1995	60.6
2000	71.4
2005	84.9
2010	100.8
2015	118.9
2020	138.9

Source: Central Statistics Office, unpublished

The impact of this high rate of population growth on the environment will be negative. This will be more so when one takes into account that as much as 90 percent of the Ethiopian population is engaged in agricultural activities using a relatively undeveloped mode of production. On the other hand, negative feedbacks from the population pressure should make it easier to adopt conservation measures. For example, the planting of, and caring for, trees is dramatically increasing.

4.5.2 Demographic Structure

The high rate of population growth in recent years has affected the age distribution of the population. Table 20 shows this for selected periods between 1960 and 1985. The percentage of the population 14 years and younger increased from 42.7 percent in 1960-65 to 46.0 percent in 1980-85. In general a rapidly growing population will have a high percentage of young individuals. This will accelerate the rate of population growth and raise the proportion dependent on the working population and will thus also have a negative effect on the rate of saving, capital formation, domestic investment, and, in general, economic development.

4.5.3 Population Distribution

The size, growth rate and distribution of the population among the regions can be compared using the data from the 14 administrative regions that had been recognized until 1987 (Map 1A & Table 20).

The ranking according to the population growth rate of these regions in 1970 and in 1981 gives an identical order, which is, starting from the highest and going down to the lowest, Sidamo, Gojam, Gondar, Welo, Hararge, Kefa, Welega, Gamo-Gofa, Arsi, Bale and Ilubabor. The data are incomplete for Tigray, but considering its geographical affinity, it is likely to be similar to Gojam, Gondar and Welo.

Table 20: Age Distribution of the Ethiopian Population in Selected Years

Age	1960-65	1975-80	1980-85
0 - 4	.171	.184	.186
5 - 9	.135	.142	.149
10 - 14	.121	.124	.125
15 - 19	.100	.106	.106
20 - 24	.090	.089	.089
25 - 29	.071	.075	.074
30 - 34	.063	.062	.061
35 - 39	.054	.052	.051
40 - 44	.044	.044	.042
45 - 49	.035	.035	.034
50 - 54	.024	.029	.026
55 - 59	.021	.023	.020
60 - 64	.017	.015	.015
65 - 69	.012	.010	.010
70 -	.044	.011	.012

Source: Asmerom Kidane (1987)

Ostensibly because of the recurrent droughts and famines prevailing in the northern regions and relatively better natural resources in the Southwest, the previous Ethiopian government developed a resettlement policy from the North to the Southwest. However, even if it had succeeded, resettlement would have only been a short-term solution to the problem of population pressure. The figures in Table 21 show that the rate of population growth in the Southwest is increasing fast and it may not be very long before the currently better vegetated areas of the southwest are also overcrowded like those in the North. The only way out of this "time bomb" is to introduce comprehensive population and economic policies and programmes to make population growth and economic performance compatible and favourable for development.

Table 21: Population Size and Growth Rate in Ethiopia's Administrative Regions in 1970 and 1981

Population	1970		1981	
	Size (in millions)	Growth Rate (%)	Size (in millions)	Growth Rate (%)
Sidamo	2.62	2.54	3.4	2.86
Shewa	6.60	2.50	8.3	2.82
Gojam	2.03	2.44	2.8	2.76
Gonder	1.82	2.44	2.6	2.76
Welo	2.27	2.44	3.2	2.76
Harerge	2.95	2.41	3.7	2.73
Kefa	1.69	2.34	2.2	2.70
Welega	1.71	2.34	3.2	2.70
Gamo-Gofa	0.89	2.31	1.1	2.63
Arsi	1.19	2.28	1.5	2.60
Bale	0.72	2.28	1.0	2.60
Ilubabor	0.69	2.28	0.9	2.60
Eritrea	1.76	-	2.4	-
Tigray	1.51	-	2.3	-

Source: Based on Asmerom Kidane (1990)

4.6 Cultural Heritage

4.6.1 Range of Cultural Heritage

It seems accepted now that humans evolved in the African Rift Valley. Ethiopia has, therefore, been occupied by humans as long as they have existed. Fortunately, parts of the Rift Valley have had good conditions for fossil formation, with periodic volcanic activities that have made it possible to date these deposits relatively precisely. This has made the Ethiopian Rift Valley an area of prime interest in the prehistory of humans and, in general, of other organisms as well, e.g. Adidar (Hadar), Fejej, Omo, Konso, Kesem, Chorora.

Artifacts left by humans and their ancestral hominids found in Ethiopia, e.g. Hadar, Melka Kunture, are among the oldest known in the world.

Ethiopia also had important archaeological sites, some of them associated also with written history, e.g. Axum and Yeha, which go to before the Christian era, and some without written history to make interpretation easier, e.g. the megalithic sites to Tiya.

There are also many monuments of the early Christian era, e.g. the Monastery of Debre Damo with its Axumite architecture and about 300 scattered rock churches in Tigray, the magnificent 12th. century rock churches in Lalibela, the 16th. century castles of Gonder, and many other sites.

Ethiopia has over 70 ethnic groups (Bender, 1976, pp. 1-14) and a big range of environmental conditions. The agricultural systems and the material cultures are, therefore very varied.

4.6.2 Types of Cultural Heritage

The range of manifestations of the cultural heritage of Ethiopia can be summarized as follows:

4.6.2.1 Immovable

- Historic buildings, Monasteries, Mosques, Bridges, Monuments and Roads
- Historical and archaeological sites like Hadar, Omo, Yeha, etc.
- Ritual places.

4.6.2.2 Movable

- Jewelry

- Ethnographic and traditional objects like manuscripts on parchment, processional cross, chalice, etc.
- Archaeological findings.

4.6.2.3 Historical and Spiritual Heritage

- Oral Tradition
- Traditional Music
- Languages and folklore.

4.6.2.4 Traditional Technologies

- Traditional medicine
- Hunting objects
- Agricultural implements
- Paintings and design works
- Crafts and tools of craftsmanship
- Household goods and utensils.

4.6.3 Condition of the Sites, Monuments and Artifacts

A good inventory of the items of cultural heritage in Ethiopia has not been made let alone a systematic assessment of their condition. The condition of some of the major ones is, however, obvious even to the casual observer, and many of them are deteriorating fast. Many of the rock churches in Lalibela and elsewhere could easily cave in since they now leak when it rains. One hears of old historic churches of later date made of stone walls being pulled down to give way to new construction. Many jewelry and antique shops in Kenya, Europe, America, sell historic Ethiopian artifacts as defined by the Ethiopian law which gives 1850 as the cut off date for being historic. A worrying number of old manuscripts are being exported breaking the ban on their leaving the country without a permit given by the Ministry of Culture. The state of maintenance of manuscripts even in their churches and monasteries is also not always good enough.

This calls for a strategy of conservation and protection of sites and artifacts involving not only the government but also the whole public.

For this to be possible an inventory of all the important immovable items of cultural heritage is required. This should then be followed by a characterization and evaluation of the conditions.

A truly participatory system of conservation, in which the national government and lower level governments down to the village council is involved, should care for the items in their respective areas. Major items like the rock churches of Lalibela or the temple of Yeha would require national attention with local initiative joining

in. When what is to be conserved can be done by local initiative, bodies higher up should be involved only in monitoring and, when called for, providing expertise that is not locally available. If the central government tried to shoulder all the responsibility for caring for cultural heritage, it would find the job impossible to manage.

CHAPTER V

ECONOMIC DEVELOPMENT AND THE PRESENT USE AND CONSERVATION OF NATURAL RESOURCES

Natural resources can conveniently be classified into biological, crustal, and atmospheric components (see Figure 3). Owing to the fact that the Ethiopian economy consists largely of agriculture and cottage industries, there is an almost absolute dependence on biological resources, little use being made of crustal resources and none of atmospheric resources. Biological resources are being used even where crustal resources could have been, e.g. for construction and as fuel.

Except in the not yet satisfactory urban building industry, recently beginning to venture out also into the countryside, there is no use made of bulky, abundant industrial resources though in some parts of Northern Ethiopia traditional rural construction is with stone.

Of the scarce crustal resources, some platinum and gold and recently also some tantalum are exported, but it is of very little quantity. There is also gold circulating locally as jewellery. The contribution of crustal resources to the national wealth is, therefore, of little consequence.

The biological resources have to meet all the demand that the human and animal population make. This overloading of demand leads to a greater portion of the biological resources being used in an exploitative way, more and more as if they were non-renewable crustal resources, leading to exhaustion and environmental and human degradation. However some of the biological resources are used sensibly and the environmental deterioration, though accelerating, could be reversed with sufficient policy, technological and financial inputs in a spirit of full partnership of users in each locality.

The situation with regards to the biological resources should, therefore, be of paramount interest in Ethiopia and most of Africa, and the situation is depicted in figure 4.

The form of animal husbandry is nomadic or little different from that evolved in nomadic settings: the animals fend for themselves grazing in the range or on the same farmland that had either had its harvest removed or is awaiting ploughing up, as well as on land that cannot be ploughed up. They are prevented from grazing only when the crops are still in the field. No forage production is

undertaken to reduce the competition between animal grazing and crop production, though crop residues are used as supplementary dry season feed.

With the growth of exports and urban consumption, there has been a net outflow of soil nutrients from the countryside, and there has been very little fertilizer application to compensate for it. Imported health and related technologies have reduced infant mortality, but not enough to reassure parents into reducing child bearing. The increasing population needs increases in food supply, fuelwood and water. In Ethiopia, the most important use of domestic animals is in farming as draught and pack animals. The increase in the human population is thus correlated with increases in the animal population. More land is ploughed up for food production, resulting in greater devegetation and leaving less land for grazing and natural recovery through fallowing; but more animals are needed for increased work. The competition between humans and animals intensifies and both humans and animals use the biological resources as if they were there to be mined and exhausted.

Ethiopia has always supported a large population: but the people have been rural until the present century. The urban population is a net loss of labour that would have cared for the renewable resources of the rural areas but it still has to be included in the demand on these resources. It is not only its work but also its organic wastes that have been withdrawn from the rural ecosystem (see 4.1.2). It is also instrumental in the net outflow of nutrients abroad in the form of exported biological resources.

The Ethiopian (rural) environment has, therefore, got into a degeneration syndrome which starts with an accelerating de-vegetation leading to a loss of soil fertility, soil erosion, genetic erosion, disruption of the hydrological cycle, increased severity of the impact of droughts, and a further reduction in the ability to produce the food and other biological resources demanded by the increasing human and animal populations.

Given this setting, it is futile to think only of conserving genetic resources in national parks. When it becomes a matter of life and death for people or their animals, they will attach fortifications, let alone parks. The strategy for conservation should, therefore, concern itself with both economic development and care for the natural resources and, in general, for the environment.

We need to look at the economy in some detail to see how the natural resources are used and what problems the systems generating them encounter.

In short, in spite of its wealth of natural resources, Ethiopia is one of the poorest least developed countries in the world. How low is Ethiopia's economic development?

A low-level of economic development can manifest itself in various forms. The World Bank (1984-1989) uses low GDP growth, deteriorating terms of trade, high levels of debt to GDP ratio and dwindling foreign exchange reserves as indicators of a poorly functioning ill-developed economy.

Until Ethiopia was forcefully integrated with the rest of the world during the Second World War, its economy was roughly self contained, foreign trade, except for armament imports, being insignificant. Even now its agriculture, which is the most important of its economic sectors, is largely independent of the world economic system since it uses little in way of imported inputs. Even now, therefore, these indices of international economic performance should be interpreted with caution.

5.1 Gross Domestic Product as an Indicator of Economic Performance

5.1.1 Growth of GDP

In Ethiopia the major export commodity is coffee which, on the average, accounts for 65 percent of the foreign currency earnings, followed by oilseeds, and hides and skins. Over the past 25 years the price of coffee was fluctuating and in the past 7 to 9 years it has steadily decreased with an indication of improvement in the last few months. In an attempt to increase foreign exchange earnings, the previous government opted to increase the area under coffee. This meant the clearing of forests in the wetter forested areas of southern, western and south-western Ethiopia, which are the areas suitable for coffee production. Another importa[illegible]e of foreign exchange earnings used to be tourism. However, owing to the long civil war, which ended only less than 3 years ago, the historical sites of the north that attract most tourists have not been easily accessible and even now, the deterioration in infrastructure has been so bad that tourism is still constrained in spite of the present active reconstruction programme. Even access to other parts of the country has been, and still largely is, difficult. As a result, income from tourism is low. Nevertheless, there has been a marked improvement in the last 2 years.

One of the major requirements for a sustained increase in GDP as well as in *per capita* income is the availability of foreign exchange. Since this has not been substantial (World Bank, 1984 -1990), investment in the various sectors of the economy hardly increased in the period in question. The situation has markedly

improved in the last 2 years owing to improved access to aid and loans. Lack of security and stability, wrong priorities as well as mis-allocation of resources especially for armament, together with a highly centralized decision-making process contributed to all this economic problem. But it was also exacerbated by drought. Between 1972 and 1994, there have been five major crop failures (1973-74, 1984-85, 1987-88, 1990-91 and 1993-94) the worst one being that of 1984-85, when as many as 700,000 people are believed to have died from famine. The 1973-74 famine also killed as many as 250,000 people. These figures do not show the total number of deaths in those periods but only those which were in excess of normal mortality and were, therefore, attributable to famine. The major factor contributing to the recurrence of drought-induced famines is the low and decreasing rate of economic growth, especially that of the agricultural sector, accompanied by a high and increasing rate of population growth. To show this, the growth rates of the population and the per capita GDP for 1970-89 are given in Table 22 below.

Table 22: Population Growth and Per Capita GDP Growth for Selected Years

Period	GDP Growth Rate	Population Growth Rate
1970-74	4.1	2.3
1975-79	5.0	2.6
1980-84	2.5	2.8
1985-89	1.5	2.9

Source: Asmerom Kidane (1990)

The low rate of growth in the agricultural sector arose from insufficient government support to the sector. This was aggravated by pricing and marketing policies and other negative interventions which acted as disincentives for farmers. This resulted in people cultivating marginal lands and in some migrating from famine prone to relatively more fertile areas. The agricultural system was forced to become more and more inappropriately extensive rather than appropriately intensive.

Decision making is now actively being decentralized. The negative interferences in agricultural production and in the market have been stopped. As a result, food availability, though still far from adequate has greatly improved. A population policy has been formulated though, obviously, we will have to wait many years before we can judge its impact.

In the past, the industrial sector did not fare much better than the agricultural sector. Most of the existing factories are very old and use out-dated technologies. For the past 25 years, the amount invested in new industrial equipment has not been significant. Though factories are so few that their impact is limited, they are often environmentally unsafe. The performance of these factories was poor

because, besides being too few, they were shackled by an over-centralized management, and often ran short of raw materials, especially those that required foreign exchange payments. It should also be noted that most of them were in the light industry category, e.g. textile, sugar and food-oil mills. Therefore, they require inputs from the agricultural sector; this in turn requires intensive and extensive cultivation of land, implying a negative impact on the rural environment.

For the 17 years preceding May, 1991, the country was under a military dictatorship which professed socialist ideals and tried to establish a centrally planned economy. When a country follows a centrally planned economic system, the bureaucratic sector tends to grow fast. However, this sector contributes only a small share to the overall GDP. When that country is as underdeveloped as Ethiopia is, the impact of this type of unhealthy growth becomes very marked.

Because of the above reasons, the overall GDP grew rather slowly while *per capita* GDP even declined latterly. The overall GDP as well as the *per capita* GDP for selected periods is given in Table 23.

Table 23: GDP for Selected Years

Period	GDP* in million Birr	Annual Growth Rate %
1981/82	7 671.0	-
1984/85	7 703.9	-5.6
1987/88	9 912.8	1.8
1990/91	9 153.6	-0.1
1991/92	8 479.3	-7.7
1992/93	9 122.4	6.4
1993/94	9 654.8	5.8

* estimated at constant factor cost

Source: National Bank of Ethiopia (1973-1978) Annual Reports, augmented by information from Ministry of Planning and Economic Development

5.1.2 Sectoral Growth of the GDP

Besides the overall and *per capita* GDP figures, the sectoral GDP figures can be useful indicators of economic development. In general, when the economy of a country is growing, the industrial sector keeps growing and absorbing labour while employment in the agricultural sector declines. More than 80 percent of Ethiopians are engaged in agriculture and they cannot even feed their own population adequately.

Table 24 shows the GDP for the four major sectors of the economy.

The GDP attributable to the industrial sector increased by 8 percent while that attributable to the agricultural sector increased by 6 percent over 17 years, and

the shift of employment from the agricultural to the industrial sector was not substantial. This shows a very poor performance of the economy.

Table 24: GDP by Sector for Selected Years (in million Birr)

Period	Agriculture	Industry	Distribution	Others	Total
1981/82	3 807.7	1 312.5	1 264.0	1 586.8	7 671.0
1984/85	3 125.3	1 473.5	1 356.6	1 748.5	7 703.9
1987/88	3 923.7	1 604.9	1 596.1	2 068.1	9 192.8
1990/91	4 342.9	1 289.1	1 429.6	2 092.6	9 153.6
1991/92	4 169.2	1 226.4	1 371.2	1 712.5	8 479.3
1992/93	4 375.3	1 379.4	1 498.3	1 869.4	9 122.4
1993/94*	4 546.3	1 524.3	1 613.3	1 970.9	9 654.8

* estimate

Source: Ministry of Planning and Economic Development

The population growth in the agricultural (rural) sector was high. This was not offset by a commensurate growth in the industrial (urban) sector. This led to an increase in the ratio of population to land, causing overgrazing, deforestation, environmental degradation, reduction in agricultural production, and famines.

5.2 International Trade, Finance and Debt

Ethiopia's terms of trade have been unfavourable over the past 22 years. Its import bills increased while its export earnings remained low. This arose because the commodities exported by Ethiopia are primary agricultural products whose elasticity is less than unity implying that the consumers of Ethiopian export items can do without them when money is short, e.g. during the oil crises and during depressions. This can be seen from the data on the amount and value of major export (Table 25) and import (Table 26) items for selected periods.

Table 25: Value of Major Export Items (in million Birr)

Period	Coffee	Oilseeds	Hides & Skins	Others	Total
1975	152.7	83.9	34.5	198.3	469.4
1978	502.3	12.9	66.3	50.8	632.3
1982/83	495.9	15.4	77.3	221.0	809.6
1985/86	664.8	7.7	119.5	150.7	942.7
1988/89	626.7	11.0	123.5	157.0	918.2
1989/90	405.4	8.4	133.3	209.8	756.9
1990/91	268.5	3.6	92.2	207.8	572.1
1991/92	168.3	0.4	58.6	91.1	318.4

Source: National Bank of Ethiopia (1975-1992) Annual Reports

The figures in Table 25 show the importance of coffee for export, with its contribution to foreign currency earnings ranging from as low as 32 percent in 1975 to as high as 71 percent in 1985/86. During the period, there was little serious attempt at diversification of export commodities. Dependence on one crop as the source of foreign exchange earnings is likely to exert continuing uncertainty in the Ethiopian economy. This reduces both private and public

investments and adversely affects the government's ability to make effective long-term development plans. The advent of biotechnology in the industrialized countries which could possibly produce coffee in those countries could also spell doom for the economy. Diversification is absolutely essential for cushioning against unfavourable developments.

Table 26: Value of Major Import Items (in million Birr)

Period	Fuel	Capital and related goods	Consumer goods	Other Imports	Total
1975	141.7	506.2	647.9	197.2	1493.0
1978	198.0	744.7	942.7	161.0	2046.4
1982/83	397.0	576.9	463.4	315.6	1752.9
1985/86	252.5	742.2	869.8	346.5	2211.0
1988/89	212.9	822.7	648.8	416.0	2100.4
1989/90	225.1	703.5	512.3	383.3	1824.2
1990/91	210.4	964.3	642.5	313.1	2130.3
1991/92	249.3	661.7	625.8	274.1	1810.9

Source: National Bank of Ethiopia (1975-1992) Annual Reports

The data show that the amount of money allotted for the import of fuel reached a record high of 23 percent in 1982-83 after which it declined. The value of the import of capital goods (labelled as capital and related goods in Table 26) fluctuated, with a tendency to increase with time.

A balance of trade deficit is observed when the values of the total exports and total imports are compared (Table 27).

Table 27: Total Value of Exports, Imports and Balance of Trade (in million Birr)

Period	Exports & Re-exports (A)	Imports (B)	Balance of Trade A/B
1972/73	879.1	1 493.0	0.58
1977/78	699.2	2 046.4	0.34
1982/83	809.6	1 752.9	0.46
1985/86	942.7	2 211.0	0.43
1988/89	918.2	2 100.4	0.44
1989/90	756.9	1 824.2	0.41
1990/91	572.1	2 130.3	0.27
1991/92	318.4	1 810.9	0.18

Source: National Bank of Ethiopia (1972-1992), Annual Reports

In Table 27, the figures in the balance of trade column would show A/B = 1 when imports equal exports. Since the figures are all less than 1, the column shows that a balance of trade deficit occurred every year and that this deficit has been widening. This suggests that Ethiopia has been depending on external aid or external loans in order to close this widening trade gap. The external debt of the country is given in Table 28 below.

Table 28: External Public Debt (in million Birr)

Period	Total Allowed	Dis-bursed	Un-disbursed	Debt Service	Debt Service Ratio	Ratio of Debt to GDP
1984/85	6 375.0	3 336.4	3 038.6	281.5	24.8	33.6
1987/88	16 751.5	6 175.6	4 200.9	572.7	43.5	52.1
1990/91	-	7 497.9	n.a.	839.9	74.2	56.2
1991/92	-	7 937.0	n.a.	898.2	95.8	58.8

Source: National Bank of Ethiopia (1982-92) Annual Reports

The data in this table show that the amount of debt increased from just over a quarter of the GDP in 1982/83, to more than half in 1991/92. Inevitably, the Debt Service Ratio also increased. In 1982/83 the percentage of debt to GDP was 27.6 percent and this increased to 58.8 percent in nine years. This shows that the Ethiopian economy is in a crisis.

5.3 Foreign Exchange Reserves

The net Foreign exchange holdings in gold and other reserves are given in Table 29.

Table 29: Foreign Exchange Reserves (in million Birr)

Period	With the National Bank	With the Commercial Bank	Total
1976/77	648.6	161.8	810.4
1982/83	185.5	39.0	224.1
1985/86	445.1	134.1	579.2
1988/89	53.5	149.5	194.6
1989/90	-30.4	76.9	46.5
1990/91	137.5	150.8	288.3
1991/92	108.5	294.6	403.1

Source: National Bank of Ethiopia (1986-92) Annual Reports

The table shows a dramatic depletion of the foreign exchange reserves of Ethiopia. When the reserves of 1989/90 are compared with those of 1976/77 we observe a decline of more than 17 times. Had the foreign exchange reserves been adjusted for inflation the reduction would have been even higher. In 1990/91 and 1991/92, however, there were quick improvements the 1991/92 figure being nearly half of that of 1976/77. When the foreign exchange reserves are compared with the export earnings, the decline in export earnings till 1988/89 seems to be much less than the decline in corresponding reserves. This clearly suggests that there was a real increase in the price of imported goods. The decline in export earnings in 1990-92 was, however, very marked and the improvement in the foreign exchange reserve only reflects the improved availability of loan and aid.

5.4 Government Expenditure and Budgetary Balance

A low level of economic development is also reflected in government financing, especially in revenue and expenditure. Expenditures in excess of revenues result

in fiscal deficits and deficit financing leads to an inflationary spiral with a high rate of interest and an increase in cost of living indices.

The fiscal deficit is the result of a lower government revenue, which is a function of the tax base. Where there is a low level of economic development tax revenues will naturally be low. The tax collection mechanism is imperfect and tax evasion is very common.

The deficit in government revenue compared to expenditure for Ethiopia for selected periods between 1975 and 1992 is shown in Table 30.

Table 30: Government Revenue and Expenditure (in million Birr)

Period	Total Revenue (A)	Total Expenditure (B)	Deficit (A-B)
1975/76	983	1 200	-217
1980/81	2 184	2 678	-494
1985/86	3 526	4 398	-872
1988/89	4 698	5 726	-1 028
1989/90	3 560	5 332	-1 772
1990/91	3 179	4 861	-1 682
1991/92	2 633	4 060	-1 427

Source: Central Statistics Office (1975-86) Statistical Abstracts, and National Bank of Ethiopia 1988/89-1991/92 Annual Reports

The extent of budgetary deficit compared to that of 1975/1976 was the highest in 1989/90. The wide gap between revenue and expenditure is a manifestation of the reducing rate of economic development and excessive expenditures on armaments that occurred during the civil war. Another indication of the level of economic performance can be obtained through breaking down total government expenditure into recurrent and capital components (Table 31).

Table 31: Recurrent and Capital Expenditure of Ethiopia (in million Birr)

Period	Recurrent (A)	Capital (B)	B/A
1973/74	599	179	0.30
1982/83	645	163	0.25
1985/86	2 247	1 418	0.57
1988/89	3 786	1 940	0.51
1989/90	3 937	1 395	0.35
1990/91	3 644	1 217	0.33
1991/92	3 124	936	0.30

Source: Central Statistics Office (1973-89) Statistical Abstracts, and National Bank of Ethiopia, 1991/92 Annual Report

In an economy which is performing well, the ratio of capital relative to wages, salaries and other recurrent expenditures will be high. The data in Table 31 show this ratio to be low though it kept increasing until 1985/86. With the intensification of the civil war and the period of stabilization needed after that, the ratio slipped down again. Even the earlier increase was mostly owing to the cost of imported capital goods (see Table 26) whose prices have been increasing more than those of locally produced goods and not because the base of the economy had been improving.

The various economic indicators described above suggest that the economic performance of the nation has been far from satisfactory.

5.5 Agriculture

As can be seen from statistics released by the National Bank of Ethiopia (1991/92) agriculture is the dominant sector of the economy accounting in 1991/92 for about 50 percent of GDP and 76 percent of export revenue. It is estimated that it provides livelihood for 85 percent of the total population. This sector of the population is dominated by more than 7 million predominantly subsistence farm families who, on average, have a holding of 1.5 ha or even less per family to cultivate. These farmers occupy about 90 percent of the presently cropped land and produce around 95 percent of the agricultural output, including most food crops (cereals, pulses, oilseeds), coffee, and virtually all livestock. Cotton and sugar are grown primarily on state farms. Key agricultural indicators are given in Table 32.

Until 1991 Ethiopian agriculture had four different types of ownership of the means of production and thus also of management. These were:-

a) private peasant farms
b) producers co-operatives
c) state farms
d) settlement farms

Private peasant farms are the most important of these categories and in 1988/89 they accounted for 90.7 percent of the farmers (Table 32). Producer cooperatives, which had been created mostly by force, have now mostly disintegrated and, for 1990/91 and 1991/92, the Annual Report of the National Bank of Ethiopia shows no production for producer cooperatives. Settlements had also been forced, and settlers have mostly moved back to their original areas or to towns.

Total food crop cultivation showed an increase in the late 1980s when compared to early 1980s (Table 32). However, the peasant sector showed a decline in production. The recurrent droughts and famines together with the civil war were the most important reasons for this decline in agricultural production. Other contributing factors were wrong policies and priorities, and lack of inputs.

In the peasant farms, cereal production takes up the largest cultivated area, the most important crop being teff followed by maize and sorghum. In co-operatives wheat production had been the highest followed by maize and teff.

Food production is not adequate for the population. Expressed on a per capita basis, the 1988/89 production was only 151.1 kg a year. This is believed to be 25 percent below the nutritionally minimum calorie requirement for the population. If the total production and nutritional requirement are disaggregated, the North and North central regions are seen to be the poorest in terms of *per capita*

production and hence also in terms of calorie intake. For an appreciation of the situation, estimates of overall crop production in Ethiopia for 1978/88 are shown in Table 33.

Table 32: Total Food Crop Production 1982-83 and 1988-1989

Mode of Production	1982-83 Area '000 ha	1982-83 Production '000 q	1988-89 Area '000 ha	1988-89 Production '000 q
Peasant farmers	5 766	66 866	6 505	66 793
Producers co-ops	70	658	379	3 829
State farms	175	2 562	201	3 887
Settlements	13	165	-	-
Total	6 024	70 251	7 085	74 509

Source: Central Statistics Office (1982-1988), Statistical Abstracts

Table 33: Estimates of Overall Crop Production by Region in Ethiopia (1987-88)

Region	Area '000 ha	Harvest '000 q	Quintal/Hectare
Arsi	526.4	7 433.6	14.12
Bale	164.6	2 119.9	12.88
Gamo-Gofa	136.6	1 367.6	10.02
Gojam	902.2	10 293.4	11.41
Gonder	682.5	4 505.0	6.60
Hararge	357.6	3 959.7	11.07
Ilubabor	142.0	1 916.2	13.50
Kefa	313.6	4 499.4	14.33
Shewa	1 537.6	16 284.7	10.60
Sidamo	274.4	3 966.5	14.45
Tigray	n.a.	n.a.	n.a.
Welega	459.4	5 602.7	12.20
Welo	471.4	5 538.6	11.7
Total	5 968.3	67 487.3	11.31

Source: Central Statistics Office (1987) Statistical Abstracts

The above data indicate that despite a wide difference in land fertility among the regions, there is no significant difference in productivity among them. The low yield in Gonder reflects the occurrence of a drought in that year.

The overall picture is gloomy. Between 1979 and 1983 grain production declined sharply and all key indicators and indices showed sharply negative trends as can be seen from Table 34. As a result of this sharp decline in productivity and increase in population the country had to depend on increased food imports. Over the five years ending in 1984, Ethiopia imported around 285,000 tons of food grains annually. In 1985 food imports and food aid were around 1.5 million metric tons.

5.6 Employment in the Agricultural Sector

The great majority of the Ethiopian people are engaged in agriculture and as many as 80 percent may be under-employed or even unemployed except during the months of peak agricultural activity.

Table 34: Key Agricultural Indicators and Indices to 1984/85 using 1979/80 as the reference year

	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85
Major Crop Production	100	87	84	104	85	96
Area of Major Crops Harvested	100	94	93	101	95	85
Principle Agric. Exports (value)	100	87	81	83	95	81
Principle Agric. Imports (value)	100	101	112	113	136	144
Grain Imports (including food aid)	100	96	132	115	264	714
Total Population (estimated)	100	103	106	109	112	115
Domestically Produced Crops[1]	100	85	79	95	75	66
Equivalent per Capita Index	100	85	80	95	75	66

1 After allowing for seed and post harvest losses; excludes grain imports from aid and livestock products; includes an allowance for tubers, vegetables and enset.

Source: Based on IFAD (1987)

Table 35 shows the activity rates of the members of the population aged 10 years or above by sex and by administrative region. The economic activity rate or the economic participation rate is the percentage of the time the economically active members in the population aged 10 years and over give to economic activities. It should be noted that in the process of estimating the above rates housework such as house cleaning, grain cleaning, grinding, cooking food, collecting firewood or water, homestead maintenance, etc., were not considered. House keeping activities that are performed for pay are, however, included. If household activities had been included, the activity rates of women would have been much higher than those of men. Other studies (e.g. Tewolde et.al., 1993, p. 189-242) show that women do not get enough time even to sleep during the peak agricultural period, and that the compulsory religious holidays thus seem to serve an important purpose of maintaining health.

The activity rate seems to be somewhat overestimated especially for seasons of off-farm activity. An individual who has worked one or two hours per day is likely to have said that he/she is active. There seem to be high activity rates for both males and females. The data also suggest that the activity rate seems to be low in regions where the conditions for crop cultivation are relatively good, (Bale, Gamo Gofa, Welega) while in regions which are more arid, (Welo, Gojam and Gonder) it seems to be high.

The activity rate of women in Hararge seems to be greatly under-estimated. This is probably because the questionnaire left some of their activities out of consideration.

5.7 Mineral Resources

Mining in Ethiopia is in its infancy. Most of the country has not even been geologically mapped at a scale adequate to identify sites with potential for mining development. The mineral sector has been a neglected and a relatively unimportant part of the economy, reflecting in part, the frequent periods of political instability, the low level of industrial development and the inadequate infrastructure. However, a wide variety of mineral and construction material deposits have been identified in spite of the gaps in the geological information base. Gold is by far the most promising. Other minerals include metals — copper, zinc, nickel, tantalum and platinum; industrial minerals — salt, soda ash, potash, phosphate, feldspar, diatomite, bentonite, kaoline and lignite; and construction materials — marble, granite, limestone, basalt and sandstone.

Table 35: Mean Activity Rates by Region and Sex (1981-82)

Region	Male	Female	Average
Overall	.89	.47	.67
Arsi	.90	.43	.67
Bale	.88	.50	.69
Gamo-Gofa	.84	.49	.66
Gojam	.95	.82	.89
Gonder	.95	.46	.73
Hararge	.92	.10	.53
Ilubabor	.85	.57	.70
Kefa	.87	.30	.60
Shewa	.88	.43	.66
Sidamo	.84	.27	.57
Welega	.82	.73	.78
Welo	.94	.63	.79

Source: Central Statistics Office (1986) Rural Labour Force Survey

Geologically the most promising regions for gold and other metallic minerals are the areas of Precambrian rocks. These are found in Tigray and Gonder in the north, along the Sudan border in the west, particularly in Welega, and in Sidamo in the south.

5.8 Transportation

Pack animal and human porterage are the dominant forms of transport throughout the rural areas and even for the poorest sections of the population in urban areas. This segment of the transport sector has never been studied.

Modern surface transport in Ethiopia consists of roads and a railway, the latter contributing a mere 4 percent. The road system is one of the least developed in

Eastern Africa, and is heavily focused on radial links with Addis Ababa. Roads carry about 95 percent of inter-urban passenger traffic and 90 percent of inter-urban freight. The total length of all weather roads is about 18,600 km. Of this total asphalt covers 4,100 km (22 percent), while gravel is the surface on the remaining 14,500 km (78 percent) of road. There are also some 30,000 km of unclassified, low standard, earth roads most of which have been constructed by rural communities including through Food for Work programmes. It was estimated in 1977 that 75 percent of Ethiopia's farms were more than half a day's walk from an all weather road. The main highway system is maintained by a central highway authority while the earth roads have been built and maintained by rural communities.

Ethiopia uses three ports, Assab, Djibouti and Massawa on the Red Sea Coast as its main foreign import/export trading points. Ethiopia also has some inland water transportation on the larger lakes and some of the rivers. Most rivers, however, have rapids and falls which prevent them from becoming useful for transportation. The most important inland water bodies for transportation are Lake Tana in northwest, Lakes Abaya and Chamo in the south, and the Baro river in the west.

Since its inauguration over 45 years ago, the Ethiopian Airlines has developed competitive international services and a training school for pilots and mechanics which, in addition to meeting national requirements, attracts students from other countries. The airline's domestic service has also expanded steadily so that in 1989-90 it served 39 national and 40 international airports, the latter including 26 in Africa, 10 in Asia and 4 in Europe, and transported more than half a million passengers. It has a modern fleet of aircraft for both passenger and freight services. Air transport is often the most important and reliable means of travel and freight available for the more remote areas of the country.

5.9 Industry

During the 1960's this subsector was a major source of growth. Between 1963 and 1967, it showed an annual average growth rate of more than 16 percent, followed by 8 percent between 1967 and 1968. It's post-1974 performance was dominated by a low and unstable growth rate. Between 1975 and 1978 the major negative influence was the flaring up of the Somali war and the civil war that followed soon. This led to the closure of the manufacturing industries in Eritrea, which had accounted for about 40 percent of the output of the sector. Another contributing factor was the slow-down in the rest of the country because of political instability, coupled with transport problems that affected the distribution of output and the acquisition of raw materials. The time between the years 1979 and 1981 was one of revival with production reaching maximum capacity in most

manufacturing industries. Some 640 million Birr was invested establishing 14 new enterprises of which Birr 226 million (or 36 percent) went to finance a cement factory with an annual capacity of 300,000 metric tons. Another large scale investment was a textile factory with an annual capacity of 20 million square metres. All the new establishments were capital intensive and created employment opportunities for only 6,756 people.

Thereafter, however, the sector retracted due to the intensification of the civil war and the poor performance of agriculture which reduced the country's foreign exchange earning capacity and hence exacerbated the problems of availability of spare parts, imported raw material, and capital goods for new investment. By 1990/91, most of the non-military industries were functioning at their lowest level for twenty years. Since 1992, industrial production has been picking up and a number of new factories are now being constructed.

The manufacturing industry is small, accounting in 1990-91 for some 12 percent of GDP and contributing only about 15 percent of export earnings. About 75 percent of the value-added income from industry came from medium- and large-scale state owned enterprises, with the remainder contributed by small-scale private enterprises. There were some 200 public enterprises, the majority of which were located in the major cities of Addis Ababa and Asmera. They had 79,000 permanent employees in 1986/87, which was less than 0.5 percent of the economically active population. The state owned enterprises were dominant in beverages, tobacco, sugar, textiles, hides and skins, cement, steel bars for construction and metal sheets. There were a number of import-substituting industries, but these relied heavily on imported raw materials and spare parts. Private sector enterprises generally produced consumer goods for the domestic market.

5.10 Employment in Non-Agricultural Sectors

One of the major reasons for under-employment of labour in rural Ethiopia is the lack of employment opportunities in the non-agricultural sectors. Even though employment in manufacturing in absolute terms seems to be growing, industrial employment absorbs only a small fraction of the available labour force. Table 36 shows the situation.

Table 36: Employment in the Industrial Sector for Selected Periods

Period	Employees	Growth Rate
1972-73	54.9	-
1982-83	83.4	0.06
1984-85	88.1	0.05
1987-88	94.4	0.07

Source: Central Statistics Office (1972-1988), Statistical Abstracts

5.11 Employment in the Public Services Sector

Another major employer in Ethiopia is the government. This sector is probably second to agriculture in the number of people it employees. In spite of moves to privatize, most of the major industrial and even commercial establishments are still owned and controlled by the state and it is not always easy to distinguish between public servants and industrial employees. However, the picture is changing quickly.

As in the agricultural sector some of the workers in the public sector and in some state owned enterprises are under-employed.

If the disguised unemployment and underemployment in the public sector and in the agricultural sector were to continue to grow, the economy would collapse. This employment picture suggests the need to re-orient both the educational and the economic systems so that more school leavers can go into self-employment. It also suggests the need for a comprehensive population policy in tune with the economic reality.

All these avenues for improvement are being actively pursued. In response to these problems, the Transitional Government of Ethiopia has initiated a major liberalization of the economy. It has formulated a population policy and is implementing it. The school curricula have also been revised, but it is expected that an appropriate reorientation of the educational system will require much more effort in terms of appropriate educational materials production, teacher training and investment.

5.12 Distribution of Wealth and Income

Even though there has been little study on income differentials, the little that exists indicates a poor income distribution. The consensus is that normal *per capita* income in the urban areas is greater than that in the rural areas. The Ethiopian National Energy Committee's survey of energy (CESEN-ANSALDO/ FINMECCANICA, 1986a) has some information on the income differentials between urban and rural areas and its finding is given in Table 37. The data show that there are indeed large differences between urban and rural areas. The differences become wider when the urban areas are larger.

5.13 Natural Resources and Population Growth

Ethiopia's population, which is the second largest in sub-Saharan Africa after Nigeria, is growing fast. Ethiopia also has the largest livestock population in Africa, which exerts additional pressure on the renewable natural resources.

Given this setting, the present methods of resource use and management, which consist of tapping from nature with little compensatory inputs, are causing serious depletion at an accelerating rate. If unchecked, this could cause a serious impairment of the environment's ability to keep producing the renewable natural resources to maintain the population even at its current level of poverty.

Table 37: Income Differentials Between Selected Rural and Urban Areas

	Place	Population Size Number	Per Capita Income Birr/year
A.	Rural Village		
	1. Abogordo (Shewa)	464	207.11
	2. Egebuma (Harerge)	774	165.80
	Mean	669	135.73
B.	Small Town		
	1. Adi Abun (Tigray)	3 616	471.38
	2. Bale Wondege (Bale)	1 261	321.79
	3. Erer (Shewa)	2 811	623.93
	4. Tuga (Kefa)	3 741	496.93
	Mean	2 857	478.52
C.	Medium to Large Town or City		
	1. Addis Ababa (Shewa)	1 291 223	626.60
	2. Asmera (Eritrea)	265 605	694.70
	3. Jima (Kefa)	62 538	587.60
	4. Nazreth (Shewa)	75 000	615.40
	Mean	423 592	631.07

Source: CESEN-ANSALDO/FINMECCANICA (1986a).

5.13.1 Human Support Capacities

The demands for cropland, fuel, timber, forage and browse without adequate inputs, e.g. replanting, and without effective management are leading to an increasing depletion of the country's natural vegetation particularly from pastures, woodlands and forests. In 1984 the annual use of wood was estimated at 24 million cubic meters, some 60 percent in excess of the level sustainable given the present rate of unaided natural regeneration (FAO, 1988a, FAO, 1988b). Even though these estimates seem to have considered only the annual production from high forests ignoring the biomass produced in woodlands, grasslands, bushlands and agricultural areas, and are thus unduly alarmist, the situation is nevertheless bad. Even the more carefully based estimates of CESEN-ANSALDO/ FINMECCANICA Group (1986b) do not give room for optimism. It should be pointed out, however, that their figures give a standing biomass more than 14 times the size of the annual production, or an annual production of only 6.9%. Considering that forests with mature trees with much locked up biomass are not extensive in Ethiopia, and considering that much of the present vegetation consists of herbs and shrubs, this proportion should be lower. Since standing crop is easier to determine than the rate of production, it would thus seem that they have underestimated the latter. The Ethiopian Forestry Action Program (1993) shows that if appropriate steps are taken, the situation could be reversed within about a decade.

Whilst the soils in the Ethiopian highlands have a high inherent fertility, the very low level of fertilizer use to replace the nutrients removed with crops (see 4.1.2) and the steep and dissected terrain with extensive areas of slopes of over 15 percent coupled with the high intensity of rainfall have led to accelerated soil erosion reaching up to 400 tons/ha/annum. It is estimated (FAO, 1986) that of the 54 million ha in the highlands, serious degradation has occurred in 14 million ha and moderate degradation in 13 million ha, whilst in 2 million ha the soil has been made so shallow through erosion that cultivation is no longer possible. The reduction in soil depth and thus also in moisture holding capacity compounds the problems of drought in those areas of the country where rainfall is low and variable.

The major lakes of the country cover 7,000 km^2 and have a maximum sustainable yield of fish estimated to be about 35,300 metric tons. Over the past twenty years eating fish has increased in popularity in Addis Ababa and other urban centres in and around the Rift Valley Lakes area. It is also popular in Bahir Dar on the southern shore of Lake Tana. Catching fish in the Rift Valley Lakes has more or less kept pace with the increased demand in Addis Ababa. Elsewhere the fishing potential has hardly been touched and research and development to support this sector is still in its infancy.

5.13.2 Livestock Production and Support Capacities

Livestock are an integral part of nearly all the farming systems in Ethiopia. The most important uses of cattle are as draught animals for land preparation in the cereal growing wetter highland areas and as the sources of the staple food, milk, and as accumulated capital in the arid lowland areas inhabited by pastoralist and semi-pastoralist societies. In both cases small ruminants constitute one important form of capital. Meat and milk have a steady demand in urban areas.

In rural areas small ruminants are the main suppliers of meat and hides. Hides and skins are second to coffee as major foreign exchange earners.

Livestock numbers, and hence the ability of highland farmers to produce crops, have been severely affected by the recurrent droughts. The deteriorating environmental conditions have also adversely affected feed resources leaving the present national herd poorly nourished and prone to diseases. Veterinary and other livestock support services have not developed fast enough to cope with these problems.

Because the Ethiopian highlands support a large livestock population, the area experiences a severe deficit of animal feed. One estimate (Hurni, 1988) forecasts

that all pasture land will be fully utilized by 2005. The demands for crop and for grazing land are increasingly in competition.

A succession of droughts over the past 20 years has led to catastrophic livestock losses, as well as to a deterioration in the rangelands. The long-term dynamics of rangelands in relation to livestock depletion and recovery are still imperfectly understood. In certain areas the position has been exacerbated by the loss of rangelands to large scale irrigation, to national parks, and to encroachment by cultivators, placing increased demands on the remaining rangeland resources (Girma Bisrat, 1990).

5.14 Population Growth and the Demand for Energy

A fast growing population makes an equally growing demand for energy. Economists classify the demand for energy into two categories:

a) energy demand for the large scale production of goods and services, which is commonly referred to as energy for development; and
b) energy demand for household activities, which is referred to as energy for subsistence.

In Ethiopia, where more than 80 percent of the people live in rural areas, the major demand is for energy for subsistence.

The main form of energy in rural Ethiopia is traditional, consisting of fuelwood followed by animal dung and crop residues. From among modern forms, imported fuel oil and internally generated hydroelectricity are important though their contribution is much lower than those of the traditional forms (see Table 38). The major user of energy is the household, accounting for 89.4 percent of the overall energy consumption of the country. Industry and transport are distant second and third. While the household mostly uses traditional energy resources, modern industry (i.e. excluding cottage industries) and transport almost exclusively use petroleum products or electricity. Within a household the major use of energy is for baking and cooking while lighting ranks a distant third. Little energy is required for heating and virtually none at all for cooling.

A regional comparison of energy consumption (Table 38) shows that it is highly correlated with the size of the population and with the availability, or rather scarcity, of biomass fuel supply. However, the variation in per capita traditional energy consumption is not large; on the other hand there is a considerable variation in the consumption of modern energy, which is a function of the degree of urbanization.

In Ethiopia, energy expenditure constitutes a significant portion of the total expenditure of households. It is estimated that for every Birr spent by a household 4 cents go to energy. The estimated energy consumption is 2.69 G.cal per person per year or 2.1 kg fuel equivalent per person per day. Ethiopia has one of the lowest per capita consumptions of energy in the world.

The type, usage and distribution of energy that are being discussed do not include human and animal power even though this is the form of energy used in agriculture and in the homestead as well as in the bulk of rural transport. A lack of data has made this omission inevitable.

5.14.1 Trends in the Demand for Traditional Energy

The 1984 total energy consumption in Ethiopia was estimated to have been 139,000 Tcals. The total net consumption was mostly (94.8 percent) composed of traditional biomass fuels, the remaining (5.2 percent) coming from modern energy sources. Of the total net energy consumption, 86.7 percent was accounted for by the rural population, of which 95.4 percent was for household use. Traditional fuels contributed 99.9 percent of the rural energy consumption, with fuel wood being by far the most important source (81.8 percent), followed by dung (9.4 percent), crop residues (8.4 percent) and a small amount of charcoal. This picture will not have changed since 1984 except that, with the population increase, the demands for traditional energy resources will also have increased, putting more and more pressure on the dwindling forest resources.

Nine major hydro-power stations were commissioned during the last 50 years to provide a total of 1480 GWh per year of firm energy with an installed capacity of about 400 MW. In addition, power equivalent to 520 GWh/year is generated from various thermal stations in the country, bringing the total firm electrical energy available in 1990 to 2000 GWh/year.

The estimate of energy consumption of 2.69 G.cal per person per year already noted is about 7.66 quintals of biomass per person per year. This estimate is for 1984. It may not be reasonable to assume that this *per capita* energy consumption has remained constant over the past or that it will continue to be the same in the future. Usually one would expect either a one or two percent increase in per capita energy consumption per year or one would assume a zero percent increase. Given the critical energy shortage and the likelihood of a decline in per capita income, a decline in energy consumption of one percent per year is a conservative assumption. At this rate, by 1995 the per capita consumption of energy can be expected to reach a critical minimum. The total yearly energy demand for the years 1960-1995 was estimated (Table 38) taking the 1984 figures as a base and using this assumption.

Table 38: Per Capita and Total Energy Consumption in Quintals*

Year	Per capita energy consumption	Total energy consumption (million)*	Year	Per capita energy consumption	Total energy consumption (million)*
1960	9.74	229.9	1978	8.15	291.0
1961	9.65	232.6	1979	8.07	296.2
1962	9.55	234.9	1980	7.98	300.8
1963	9.46	237.5	1981	7.91	306.1
1964	9.36	240.6	1982	7.83	311.6
1965	9.27	243.8	1983	7.75	317.0
1966	9.18	246.9	1984	7.67	323.6
1967	9.09	250.0	1985	7.59	328.7
1968	9.00	252.9	1986	7.51	334.6
1969	8.91	256.6	1987	7.44	341.5
1970	8.82	259.3	1988	7.37	347.3
1971	8.73	263.7	1989	7.29	353.3
1972	8.65	267.3	1990	7.22	360.3
1973	8.56	270.5	1991	7.15	367.1
1974	8.48	273.9	1992	7.08	374.1
1975	8.39	277.7	1993	7.01	381.2
1976	8.31	282.5	1994	6.97	389.7
1977	8.23	286.4	1995	6.87	395.2

* Per capita times population size.

Source: CESEN-ANSALDO/FINMECCANICA Group (1986a)

The data in Table 38 show that if the above assumption is correct, the annual consumption of traditional energy is increasing by about 1.5 percent per year. The increase could be slowed down by a reduction in the growth rate of the population. A clear-cut population policy to achieve this and the use of alternative sources of energy are thus needed to safeguard the fragile equilibrium between population and natural resources. Since putting into effect an appropriate population policy and harnessing alternative sources of energy are long-term measures, the short-term solution should be the planting of trees. In most parts of the highlands, for example, planting *Eucalyptus* could reverse the situation in about 5-10 years, and as the Forestry Action Program (1993) has shown, this is realistic. A good population policy has now been formulated. If the investment for reforestation can be raised, the situation need thus not look unduly gloomy.

5.14.2 Regional Variation in Energy Supply and Consumption

While consumption of energy is related to the size of the population of a region, the available energy may not be correlated with the size of the population of an area. In fact, when we consider the stock of naturally produced biomass energy, it is negatively correlated with population size since human presence adversely affects the natural systems of biomass production.

Table 39 presents the amount of total woody biomass and its annual production of incremental wood, and the availability of biomass energy for each administrative region for the year 1980. These figures can be compared to those for the consumption of energy given in Table 40.

Table 39: Woody Biomass Stock (Availability) and Yield (Use) by Administrative Region (in '000 Tcal)

Region	Total stock	Energy annual yield	Per capita stock	Per capita annual yield
Arsi	346.8	24.7	0.23	0.02
Bale	1 836.7	119.1	2.00	0.13
Gamo-Gofa	764.4	60.1	0.67	0.05
Gojam	482.1	22.7	0.23	0.01
Gonder	534.9	18.7	0.29	0.01
Hararge	768.3	43.0	0.20	0.01
Ilubabor	1 707.3	142.4	1.94	0.16
Kefa	2 549.3	218.2	1.17	0.10
Shewa	604.6	38.5	0.07	0.01
Sidamo	1 621.1	97.5	0.47	0.19
Tigray	430.8	25.2	0.25	0.02
Welega	925.1	55.9	0.27	0.03
Welo	393.3	30.4	0.15	0.01
Total	12 965.3	896.4		

Source: CESEN-ANSALDO/FINMECCANICA Group (1986b)

Only four regions (Bale, Ilubabor, Kefa and Gamo Gofa) have sustainable large supplies of woody biomass energy resource available. All the other regions have depleted biomass energy resources. Exploitable agricultural wastes, including crop residues (69,372 Tcal) and cattle waste (28,594 Tcal) are estimated to be about 98,000 (CESEN-ANSALDO/FINMECCANICA, 1986b) per year. There is an increasing use of dung and crop residues for fuel, and it is expected that the use of dung for fuel will rise by 70 percent in the decade 1985-1995 (FAO, 1986). The burning of crop residues, a valuable source of animal feed, is placing further pressure on the grazing areas. The destruction of forests and woodlands leads to accelerated soil erosion. It is estimated that by the year 2005, the total energy requirement for the country will be 225,000 Tcal per year, which is 2.9 times the present yield of crop residues, 2.4 times that of animal wastes and one-fourth of the present stock of woody biomass in the country. If investment were to be available, this requirement for energy could be covered by hydroelectricity, as it is only about two-fifths of the country's total potential from this source of energy.

As could be expected the consumption of energy is highly correlated with supply and population. This may be verified by comparing the data in Table 39 with those in Table 40. The consumption of biomass energy thus seems to be higher for the most populated regions.

5.15 Trends in the Utilization and Conservation of Energy

The development of power supply from water resources has been steadily increasing since the establishment of the first dam (Abba Samuel Dam in 1952, Koka Dam in 1960, Fincha Dam in 1971, Melka Wakena in 1985 and Gilgel Gibe which is under construction at present). There are no comprehensive reports for the effects of dams built for hydroelectric generation on the environment.

However, the negative effects can be surmised from the disappearance of wildlife habitats. Human settlement has also been adversely affected. But since the dams are mostly in areas not densely populated, the hardship caused is minimal.

Table 40: Per Capita Household Energy Consumption (Demand) by Region

Region	Type of Energy: Traditional fuels Mcal	Traditional fuels %	Modern fuels Mcal	Modern fuels %	Total Population Mcal	Total Population %
Arsi	2 751.2	3.88	2.06	1.04	2 753.3	4.3
Bale	3 067.2	2.73	1.82	1.11	3 069.0	2.7
Eritrea	2 181.9	9.10	29.00	20.15	2 710.9	6.6
Gamo-Gofa	2 854.7	3.09	1.23	0.26	2 855.9	3.2
Gojam	2 790.4	7.64	2.88	2.26	2 793.3	6.7
Gonder	2 919.1	7.16	2.21	0.76	2 921.3	5.9
Hararge	2 716.0	10.20	7.46	10.50	2 723.5	10.8
Ilubabor	3 070.4	2.56	1.28	0.31	3 071.7	2.5
Kefa	3 105.8	6.50	2.31	1.66	3 108.1	6.2
Shewa	2 598.5	22.05	4.63	54.80	2 603.5	24.4
Sidamo	2 769.1	8.82	2.24	2.13	2 771.4	9.8
Tigray	2 427.1	4.94	2.44	1.00	2 429.6	4.9
Welega	2 794.5	6.02	1.40	0.94	2 795.9	4.6
Welo	2 645.0	8.29	3.21	3.16	2 648.2	7.4

Source: CESEN-ANSALDO/FINMECCANICA Group (1986a)

The positive aspect of the development of hydroelectric supply is the partial replacement of fuel wood by electricity in the urban areas, thereby contributing to a reduction in the rate of deforestation.

The gross hydroelectric potential of the country is over 500 million Teracalories per year.

Subsurface energy resources are being explored. Geothermal resources suitable for power production total about 700 MW. The Natural gas reserve is estimated to be 10 to 30 billion m^3. Oil exploration is underway.

5.16 Trends in the Utilization and Conservation of Water

5.16.1 Water Supply

The present infrastructure for water supply systems in Ethiopia is at a low level of development. In Ethiopia, the campaign launched by the United Nations General Assembly in 1980 to provide clean water for all by the year 1990 has fallen very far short of its target.

According to the Central Statistics Authority (1990), in 1990, clean water for domestic and municipal use was provided only to 27.2 percent of the total population of about 51.5 million. Out of the total estimated rural population of 44.1 million only 8.4 million (19 percent), and out of the total urban population of 7.4

million, 5.6 million (76 percent) is provided with safe water. The remaining population gets its water mostly from polluted streams and some from wells which are also often polluted.

5.16.2 Irrigation

At present about 4 percent of the potentially irrigable land is developed. Most of the development has been in the Awash Valley, which is the most accessible basin to Addis Ababa and has the best infrastructure to support irrigation development.

The spells of drought during the last two decades have led to increased interest in irrigation development. Irrigation is thus expanding in the Wabi-Shebelle and Genale Rivers and in the Zway-Meki area of the Rift Valley. There are also a number of proposals for further irrigation schemes in several of the other basins (Omo River, Rift Valley Lakes and Baro-Akobo) (Government of Democratic Republic of Ethiopia, 1990). Following the decentralization of governance, there now are a number of regional initiatives to develop irrigation, especially at the small and medium scales, building on existing traditional small scale irrigation systems, and augmenting them with the diversion of additional streams and the construction of earth dams.

Irrigation development in Ethiopia, as in other countries, has a number of ecological implications, because of its impact upon river regimes and downstream flows. Some of the adverse effects of irrigation development on the environment are discussed in the following paragraphs.

The development of medium and large-scale irrigation projects causes a displacement of the indigenous population engaged in nomadic or transhumant modes of life. Clear examples include the displacement of 60,000 Afar pastoralists from the Amibara Irrigation Project in the Middle Awash (MacDonald, 1990) and an unspecified number of Kereyou pastoralists during the establishment of the Metahara Sugar plantation in the Upper Awash. Large scale irrigation development projects in Wabi Shebelle and Omo valleys have also caused population displacements.

The expansion of irrigated agriculture makes surface water available all the year round and provides favourable condition for the maintenance of a high density of disease vectors, e.g. snails, mosquitoes and other insects. The massive mobilisation of uninfected highlanders without any resistance to the diseases into the lowlands and their settlement close to water bodies where disease vectors are prevalent increases the frequency of man-vector contact resulting in devastating epidemics particularly of malaria and schistosomiasis. Poor living conditions with

substandard individual and communal hygiene in the settlement areas may also expose the population to ectoparasites such as tungiasis and louse-borne diseases like relapsing fevers and typhus.

The congregation into relatively small areas creates concentrations of human and livestock populations causing severe depletion of natural resources such as fuel-wood and fodder. So far, 42,678 hectares of grazing land have been taken over by irrigation projects in the Awash River Basin without any significant replacement pasture land being given to the indigenous population. (MacDonald, 1990).

Irrigation often disrupts normal activities in other parts of the river basin ecosystem so that the gains in production through irrigation are made at the expense of production elsewhere. One of these problems is the impact of reduced water flows upon fishing through lower river and lake levels which can affect breeding (Government of the People's Democratic Republic of Ethiopia, 1990).

The effects of a rising ground water table and the associated build up of salinity and alkalinity for most areas under irrigation in Ethiopia have not yet been adequately compiled. However, there are examples in the Awash River Basin, where 70 percent of the total medium and large scale irrigated areas are found. Ground water table is reported to be rising at a rate of 68 cm/year in the Melka Sedi State Farm Banana Plantation (Endale Bekele & Kandiah, 1991); in the Amibara Irrigation Project in the same general area, about 4700 ha. of land have been lost through human induced salinity and alkalinity.

In some of the agricultural highlands, notably in Gojam, small scale peasant irrigation through diverting stream flow has been expanding. This is a healthy development and its environmental impacts are minimal. However, it often causes tension among communities living upstream and downstream the same river.

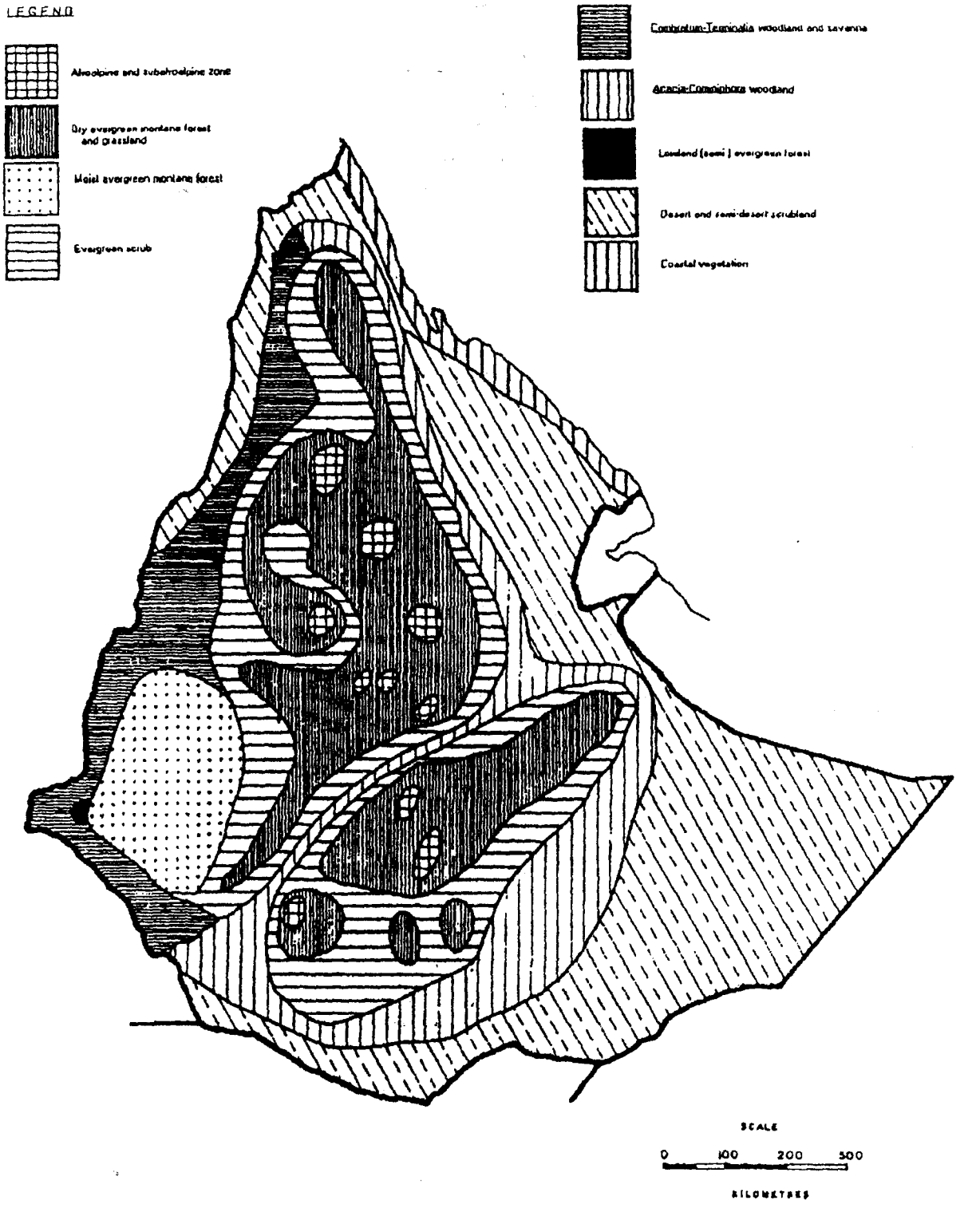
5.17 Trends in the Utilization and Conservation of Vegetation

For considering biodiversity and the utilization and conservation of biological resources the various vegetation types of Ethiopia have been grouped into nine major categories (Map 10). The following information on these vegetation types is largely based on Pichi-Sermolli (1957), Friis (1984), IUCN (1989), and Tewolde (1987).

The vegetation of Ethiopia has been greatly modified by humans. Humans evolved in East Africa. It is thus likely that for the last two to five million years there has been some human activity in Ethiopia and agricultural activities have a history of at least 5000 years. Most of Ethiopia's vegetation types have, therefore,

Map 10

ETHIOPIA: SIMPLIFIED VEGETATION MAP



been affected by humans for a very long time. Widespread deforestation started about 2500 years ago (Hurni, 1985). So even though Ethiopia was originally a relatively forested country it is highly unlikely that forests ever covered 40 percent of the total area of the country (87 percent of the area above 1500 m) as has been stated by FAO (1988a & 1988b) and others. In fact recent work (Tewolde, 1990; Aklog, 1990) have shown that Ethiopia has had little forest cover for many centuries. This does not detract from the present alarming rate of deforestation. At present deforestation has accelerated to the extent that only about 3.6 percent (4.7 million hectares, only 9 percent of the area above 1500 m) is covered by forests (IUCN, 1989). Deforestation is estimated to take place at the rate of 200,000 ha/year (FAO, 1981) with most of the remaining forests being confined to remnant patches in inaccessible areas. Of the remaining forests, 54 percent are in the western regions of Ilubabor (48 percent), Kefa, Welega and Gojam and 38 percent are in the southern regions of Bale (19 percent), Sidamo, and Gamo Gofa. Shewa region has 3.1 percent and Hararge only 0.6 percent, with Eritrea and the three northern regions of Tigray, Welo and Gonder accounting for only 4.1 percent. The woodland/Savannah region originally covered 371,900 sq. km (30 percent of the country) in the semi-arid and sub-humid regions surrounding the highlands. At present, only 7.6 percent of the total area is covered by this vegetation type.

The destruction of the vegetation means the loss of genetic resources of both plants and animals. This means the loss of useful plants, e.g. medicinal plants, and the habitats where the wild animals live, resulting in the immediate reduction in their number and the extinction of some or most of them. It also means the loss of the plant cover that maintains the soil and hence the dry season water supply to most of the rivers.

5.17.1 Desert and Semi-Desert Scrubland

This group of vegetation types is characterised by *Euphorbia scordifolia*, *Dactyloctenium aegyptium*, *Panicum turgidum*, species of *Commelina*, *Commiphora*, *Acacia*, *Zizyphus*, *Maerua*, *Cadaba*, *Boscia*, *Aloe*, etc. These are a combination of highly drought tolerant shrubs, some succulents and few grasses.

This is a very dry zone and hence vulnerable to wind and water erosion even with little or no pressure on the vegetation coming from grazing by domestic animals. Overgrazing, at least in places, is likely to occur even without domestic animals because, water being scarce, the areas around watering points become subjected to concentrated pressures even from wild animals. The vulnerability is further enhanced by the nature of the little that may exist by way of a soil, which is mostly alluvial and of poor structure owing to salinity. This salinity can become

a serious hazard under irrigated agriculture. In the Amibara Project, for example, 4,700 ha of land were lost through salinity by 1988/89. Much of the Afar Depression has deteriorated under heavy grazing. This has been exacerbated by irrigated crop cultivation competing with grazing felt most acutely during the driest season.

The Ogaden, subjected to the same economic use, is equally ravaged. This is especially true of the north eastern parts where perennial water is lacking. The situation improves westwards as one gradually approaches the plateau.

The plains around Maji and the lower Omo are the wettest of the arid areas. The human population is primarily nomadic and though failure of rains causes famines, the environment is not threatened with serious consequences of desertification.

The desert and semi-desert scrubland is the zone which is the most likely to be converted into a bare desert if either man's activities continue unabated or the region's climate becomes even marginally drier. The desertification process is very advanced in some areas. Considering the small size of the human population in these areas and its scattered nomadic mode of life, the deterioration can be reversed provided adequate research and investment for the implementation of the results can be made so that the irrigated agriculture, pastoralism and wildlife management is properly integrated.

5.17.2 *Acacia-Commiphora* (Small Leaved Deciduous) Woodland

The *Acacia-Commiphora* group of vegetation types is characterized by *Acacia tortilis*, *A. mellifera*, *Balanites aegyptiaca*, and species of *Acalypha*, *Barleria*, *Aerva*, *Combretum*, *Terminalia*, *Capparis* etc. These include drought tolerant trees and shrubs, with either small deciduous leaves or leathery persistent ones. The understorey is a combination of suffrutescents and grasses.

Along their lower altitudinal limits, the Evergreen Forests abut onto deciduous woodlands. The *Acacia-Commiphora* woodland occurs mainly in the southern and eastern parts of the country and in the Rift Valley. The zone occurs between altitudes of 900 and 1900 m. The larger animals occurring in this zone include Oryx, Zebra, Hartebeest, Kudu and gazelle. These deciduous woodlands have traditionally been grazing areas. However, it should be noted that this zone is sensitive to overgrazing since it is dry for as long as 10 months at a time. Recently rainfed agriculture supplemented by irrigation has been increasing, further enhancing its vulnerability.

The area of *Acacia-Commiphora* woodland has been deforested particularly in recent years due to the intensification of agricultural activity and for the supply of fuel wood and charcoal to population centres, including Dessie, Mekele, Nazreth, Addis Ababa and other major towns along or near the escarpment of the Rift Valley.

5.17.3 Lowland Semi-Evergreen Forest

The vegetation is characterised by *Acacia mellifiera*, species of *Combretum*, *Terminalia* and various grasses. These are small trees with leathery persistent leaves.

This type of forest has been described only recently (Friis, 1984). The forest occurs in Gambella between altitudes of 450 and 600 m, with a mean annual maximum temperature of 35-38°C and an annual mean temperature of about 28-30°C. The annual rainfall is between 1300 and 1800 mm. The forest occurs mainly on sandy soils, which are well drained. There is no information as to the status of the forest and the presence of animals within it. The Gambella National park, which occurs adjacent to the forest, contains a number of wild animals including the White-Eared Kob, Rhinoceros, Elephant, Giraffe, Lion, Cheetah, etc., and over 150 species of birds.

5.17.4 *Combretum-Terminalia* (Broad Leaved Deciduous) Woodland

The vegetation is characterised by *Combretum* spp., *Terminalia* spp., *Oxytenanthera abyssinica*, *Boswellia papyrifera*, *Lannea schimperi*, *Anogeissus leiocarpa*, *Stereospermum kunthianum*. These are small trees with fairly large deciduous leaves which often occur with the lowland bamboo *Oxytenanthera abyssinica*. The understorey is a combination of herbs and grasses. In some of the shallow valleys there are extensive areas of very tall grasses dominated by species of *Cymbopogon*, *Hyparrhenia*, *Echinochloa*, *Sorghum*, *Pennisetum*, etc.

This vegetation type occurs in the northwestern and western parts (Tigray, Gonder, Gojam, Welega, Ilubabor, Kefa) and in Gamo-Gofa and Sidamo in the south west of Ethiopia, along the Ethio-Sudan boundary. The upper altitudinal limit is about 1900 m and the lower about 500 m. The vegetation in this zone has developed under the influence of fire, and it is thus not affected heavily by controlled burning. Most of the areas under Broad Leaved Deciduous Woodland are very rugged. Ploughing in this terrain is very destructive, since following the dry seasons, the erosion rate is very high at the onset of rains. The areas in northwestern Ethiopia are the traditionally sorghum, sesame and cotton growing areas. The population in these areas is now increasing. The areas in Gojam, Welega and Ilubabor have had some shifting cultivation but have otherwise not

been much used agriculturally for a long time. Recently, however, there has been an intensification of agricultural activity together with increasing population due to schemes to settle people from famine stricken areas of the plateau.

The area has been deforested in recent years due to the intensification of agricultural activity and for the supply of fuel wood and charcoal for the major towns and cities. However, it is still perhaps the least affected of the wooded vegetation types.

5.17.5 Moist Evergreen Forest

Characteristic species include *Aningeria adolfi-fridericii*, *Podocarpus falcata*, *Trilepisium madagascariense*, *Albizia gummifera*, *Celtis africana*, *Polyscias fulva*, *Schefflera abyssinica*, *Bersama abyssinica* etc. These include the largest and commercially most important trees found in Ethiopia. The understorey often includes arabica coffee.

The moist Evergreen Forest occurs mainly in the southwestern parts of the plateau, i.e. southern Welega, Ilubabor and Kefa. The zone occurs at altitudes between 800 and 2500 m, with an average annual temperature of 18-25°C and an annual rainfall of more than 1200 mm, with rain most of the year, though it usually does not rain for at least 2 months (December-January). Some of the forests of southern Ethiopia (Sidamo and Bale) are intermediate between the Dry Evergreen and Moist Evergreen Forests.

Areas of seasonally impeded drainage and edaphic constraints are covered in tall grasses and sedges, e.g. *Hyparrhenia*, *Panicum*, *Cyperus*, and the whole vegetation tends to acquire savannah characteristics at its lower altitudinal limits.

For a long time, this zone has been known to have a high potential for timber production. But uncontrolled exploitation is reducing the size of the forest. This is also a zone with high potential for growing coffee, which is the most important foreign exchange earner for the country. Vast expanses of these forests have thus been thinned to give way to coffee plantations under shade. There are no big animals other than the Blue Monkey restricted to this zone. However, all the major forest species, including Elephant, Bush Buck, Giant Forest Hog, Wild Pig, etc. are found.

5.17.6 Evergreen Scrub

This vegetation type is divided into two subtypes: the Montane Evergreen Thicket and the Montane Evergreen Scrub.

The Montane Evergreen Thicket consists of a dense growth of small, evergreen shrubs, lianas and thinly spaced small trees. The shrubs, which form the dominant part of the vegetation are 2-3 metres high. Some deciduous shrubs and trees could be found among the evergreens. Suffrutescents and perennial grasses are found tangled with the shrubs, but they never form a complete cover of the ground.

The Montane Evergreen Scrub consists of a dense, dominant shrub stratum of evergreen plants 3-5 m tall. Trees project out of this shrub layer. Below the shrub layer, lianas, suffrutescents, herbs and perennial grasses are found.

These two types (i.e. thicket and scrub) often form a mosaic on the plateau slopes. The scrub usually occurs at lower altitudes and moister areas. Shrubs occurring in this vegetation type include: *Acokanthera schimperi*, *Carissa edulis*, *Euclea schimperi*, *Rhamnus staddo*, *Myrsine africana*, *Dodonaea angustifolia*, *Rhus* spp., *Calpurnia aurea*, *Jasminium abyssinicum*, *Osyris quadripartita*, *Ximenia americana*, *Protea gaguedi*. Trees include *Teclea nobilis*, *Croton machrostachys*, *Bersama abyssinica*, *Olea europaea* subsp. *cuspidata*, *Juniperus procera*, *Ficus* spp, *Euphorbia abyssinica*, *E. candelabrum*, *Dracaena* spp.: the dominant liana is *Pterolobium stellatum*. The scrub differs from the thicket in having more and larger trees which usually occur in small clumps. Thus vegetation type has been expanding at the expense of others. But even thus, it is disappearing from the vicinities of towns especially in northern Ethiopia owing to the high demand for firewood.

5.17.7 Dry Evergreen Montane Forest and Montane Grassland

The vegetation is characterized by *Olea europea* subsp. *cuspidata*, *Juniperus procera*, *Celtis kraussiana*, *Euphorbia ampliphylla*, *Dracaena* spp., *Carissa edulis*, *Rosa abyssinica*, *Mimusops kummel*, *Ekebergia capensis*, etc. These include small to medium-size trees, though some provenances of *J. procera* can get very big, and some others remain small. This vegetation type is associated with highland bamboo (*Arundinaria alpina*) and extensive areas of grassland rich in species including many legumes. The most important genera are *Hyparrhenia*, *Eragrostis*, *Panicum*, *Sporobolus*, *Eleusine*, *Pennisetum* for the grasses and *Trifolium*, *Eriosema*, *Crotalaria* for the legumes. These include a large number of endemics.

In the northern-most parts of the plateau the lower altitudinal limit of the Dry Evergreen Montane Forest is about 2100 m. In the western and central parts in the mountains of Gojam, Shewa, Welo and Tigray it is about 1900 m. The annual rainfall is 500-1500 mm and the average annual temperature is 14-18°C. The upper limit in these areas is about 3400 m. In Sidamo, Bale and Hararge, this

forest type occurs at altitudes between 1500 and 3200 m. At the lower limits, the annual rainfall is about 500-700 mm and the average annual temperature is between 20 and 25°C. In the intact combination of forest on the sloping land and grassland on the flatter areas in the valleys, the altitude, the temperature and the rainfall have created a suitable environment for man to live in. The majority of the Ethiopian population lives in this zone. This is the zone where sedentary cereal-based mixed agriculture has gone on for the longest time. These forests have diminished in size due to human interference. In most cases the forests have been replaced by bushlands on steeper slopes with thin soil. In northern Ethiopia, forests have virtually disappeared, with many of the mountain sides exposing bare rock. Springs and streams which used to have water all year round are now often dry in the dry season. The situation in the southern and eastern parts of this zone is slightly better, but the same fate will follow unless the destructive processes are halted. Many of the larger mammals and birds of Ethiopia occurred here, but now most of the larger mammals have been eliminated by human activity. These include among others, Elephant, Buffalo, Bushpig and Klipspringer. Examples of birds include Turaco, Lovebirds, Kingfishers, Ibises, Geese, etc.

5.17.8 Afroalpine and Subafroalpine Vegetation

The vegetation is characterised by *Erica arborea*, *Philippia trimera*, *Kniphofia* spp., *Helichrysum* spp., *Bartsia petitiana*, *Alchemilla* spp. *Crassula* spp., and giant *Lobelia* spp. These are a combination of small trees, giant herbs, shrubs, suffrutescents and herbs. Grasses are mainly species of *Festuca, Poa* and *Agrostis*.

This zone consists of areas which are, on the average, higher than 3200 m. These are the slopes and tops of the highest mountains in the country. The rocks are volcanic, being mostly basalts and trachytes. In absolute terms moisture is not limiting, since these mountains attract much rain, and the basaltic and trachytic bedrocks minimize internal drainage. The soil is often thin even though very rich in undecomposed organic matter. Grazing and barley cultivation, usually involving fires, are the major human activities threatening the existence of this vegetation type. The undecomposed organic matter and *Erica arborea* and *Philippia trimera* shrubs are often destroyed by human induced fires though the shrubs regenerate soon after the fires. Uncontrolled grazing by livestock is being intensified. Barley cultivation has encroached on the steeper and better drained lower parts of this vegetation type. The afro-alpine vegetation of the northern mountains has been more interfered with by man than that of the southern ones.

This vegetation type occurs in a fragile environment where the vegetation experiences a unique climate of summer every day and winter every night. It is also the upper catchment for many important rivers. The destruction of the

vegetation in such fragile environments could result in the extinction of its endemic animals. It is for this reason that in this vegetation type two of the most famous of Ethiopia's National Parks are found. The Simien Mountain National Park in northern Ethiopia, which has been accepted as a World Heritage Site since 1978, contains the endemics Walia Ibex, Simien Jackal and Gelada Baboon. Other animals found include Leopard, Caracal, Wild cat, Bushbuck, and about 400 bird species including the Lammergeier and Verreaux Eagle.

The Bale Mountains National Park in the southern part of Ethiopia is also in this zone although it extends to the dry evergreen forest at its lower altitudinal levels. There are about 46 mammal species including the endemics, Mountain Nyala, Simien Jackal, Menelik's Bushbuck, and others, such as, Leopard and the Olive Baboon. There are about 160 species of birds including 14 of Ethiopia's 24 endemics. There is also the endemic Giant Mole Rat.

5.17.9 Riparian and Swamp vegetation

This vegetation is characterised by *Celtis kraussiana*, *Ficus sycamorus*, *Mimusops kummel*, *Tamarindus indica*, *Maytenus senegalensis*, *Acacia* spp. *Kigelia aethiopum*, *Syzygium guineense*, etc. These are mainly trees which are associated with a wide range of shrubs, herbs and grasses. Swamps are dominated by sedges, grasses and herbs.

5.18 Trends in the Utilization and Conservation of Wildlife

A report compiled by Woodford (1990) for the Ethiopian Wildlife Conservation Organization has shown the importance of wildlife resources for the economic development of Ethiopia.

The importance of wildlife meat must be considerable for the partial cultivators and partial hunter-gatherers in south-western and western Ethiopia. These people live in areas where animal husbandry is difficult due to the lack of ready surface water and/or the presence of trypanosomiasis. Therefore they rely on wildlife meat as a source of protein. Using traditional techniques it is unlikely that they can cause a depletion of wildlife stocks seriously enough to cause extinction. Armed with modern weapons however, they undoubtedly have a serious impact on the regional status of many wildlife species.

At a national level wildlife meat is insignificant. It is not likely to be more important since religious taboos will prevent its use becoming widespread among the majority of Ethiopia's population. No attempt at Wildlife Ranching has thus been made.

The foreign exchange earnings of the 1989 fiscal year (based on estimates for 1989 but in some cases for 1987) of about 15.5 million Birr gives some idea of the importance of wildlife to Ethiopia's external trade. The most important income earner was the sale of licenses for hunting, not tourism. Hunting has now been temporarily halted to enable stock taking. But tourism is increasing fast and, in the long run, is expected to be the more important.

A crocodile farm was established at Arba Minch in 1985 with technical and financial assistance from FAO. This farm, which is now managed by EWCO, has two major objectives: The first is to produce skins for marketing overseas; the second is to replenish wild stocks of crocodile and in the future to supply other farms with hatchlings for rearing. Young crocodiles of 2 and 3 years of age are killed for their skins. The farm at Arba Minch has a target to produce 2,000 skins per annum, offtake starting in 1990. The expected income is Birr 280/skin and thus the gross income is expected to reach 560,000 Birr/annum.

5.19 Trends in the Utilization and Conservation of Livestock and Fisheries

Ethiopia has the largest livestock population in Africa, with 27 million heads of cattle, 24 million sheep, 18 million goats, 7 million equines and 1 million camels, adding up to 22.7 million Tropical Livestock Units (TLU). Of these, 20.6 million TLU or 75 percent are found in the highlands (Daniel Gamechu, 1988).

Both the farming and pastoral communities use livestock extensively in their subsistence life styles. Their potential for the export market, however, is poorly exploited. With improved management, livestock and products thereof can become important items of trade with the world.

Of the 66 million hectares of grazing and browsing land, 66 percent is in the lowlands where only 25 percent of the livestock are located. The provision of water could enable a better utilization of these grazing areas.

The estimated total sustainable offtake of fish from the lakes of Ethiopia is about 35,300 tons per year. The present offtake is small and there is a lot more room for increasing exploitation.

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ANNEX I

DOCUMENTS PRODUCED AT REGIONAL LEVELS

REGION 1 (TIGRAY)

Stage 1. In draft
Stage 2. In progress

REGION 2 (AFAR)

Stage 1. Development and Social Action Projects Suggestions: Afar Region. From a series of Trips through the Afar Region, July 5th - September 30, 1993, ARDO, Addis Ababa. (10 pages)
Stage 2. Not started

REGION 3 (AMHARA)

1) West Gojam

Stage 1. Natural Resource Assessment and Conservation Strategies of Western Gojam, November 1993, Bahir Dar. (339 pages)
Stage 2. Summary of the Natural Resource Assessment and Conservation Strategies of Western Gojam, November 1993, Bahir Dar. (57 pages)

2) South Wollo

Stage 1. A Preliminary Survey on Utilization and Conservation of Natural Resources in South Wollo, Dessie, October 1993. (152 pages with annexes)
Stage 2. In progress

3) East Gojam

Stage 1. Assessment Made on the Natural Resources Condition of the Region for the National Conservation Strategy, December 1991, D. Markos. (46 pages)
Stage 1. A study made on the Natural Resources Condition of the Region for the National Conservation Strategy. Based on selected 31 PA's, June 1992, D. Markos.
Stage 2. Proposal on Regional Conservation Strategy, October 1993, D. Markos. (41 pages)

4) South Gonder

Stage 1. Assessment of Natural Resources Development and Utilization for the National Conservation Strategy, Debere Tabor, July 1993. (167 pages with Annexes)
Stage 2. In progress

5) North Gondar

Stage 1. Report of Survey Results on some aspects of Natural Resources in N. Gondar Administrative Region, March 1993, Gondar (100 pages with annexes)

Stage 2. Some points on contemporary situation of Simien Mountains National Park, March 1993, Gondar. (13 pages with annexes)

Stage 2. Resource status, exploitation and conservation in N. Gondar Administrative Zone, August 1993, Gondar. (77 pages)

Stage 2. A synoptic description of Resources, Issues and Proposed Strategic frame works of zonal Conservation Strategies for N. Gondar, December 1993, Gondar (28 pages)

6) North Wollo

Stage 1. North Wollo Administrative Zone National Conservation Strategy, July 1993, Woldia. (81 pages and annexed document)

Stage 2. In progress

7) North Shewa

Stage 1. Profile for National Conservation Strategy, D. Birhan, October 1993. (138 pages)

Stage 2. Summary of National Resources Assessment and Conservation Strategy of N. Shewa, D. Berhan, December 1993. (26 pages)

REGION 4 (OROMIA)

1) Illubabor

Stage 1. A Survey of Natural Resource Development and Utilization in Illubabor, Jimma, November 1992. (267 pages)

Stage 2. Summary Report on Potential, Constraints of Natural Resource Use and Management for Illubabor Zone, September 1993, Mettu. (44 pages)

2) East Shewa

Stage 1. National Resources Conservation Status in East Shewa, Nazareth, February 1993. (164 pages)

Stage 2. Regional Conservation Strategy Framework and Programmes, July 1993, Adama. (44 pages)

3) West Shewa

Stage 1. Natural Resource Conservation Survey of West Shewa Administrative Zone, August 1993, Ambo. (86 pages)

Stage 2. Natural Resources Conservation Strategies and Programmes of West Shewa Administrative Region, September 1993, Ambo. (30 pages)

4) Wollega

Stage 1 Features of Natural Resources of Wollega Administrative Region in Amharic, Nekemte, September 1993. (153 pages with annexes)

5) East Wollega

Stage 1. Identification and Assessment of Resource Base for Conservation Strategy of East Wollega, Nekemte, November 1993. (217 pages)

Stage 2. Summary of the Identification and Assessment of Resource Base Conservation Strategy of East Wollega, Nekemte, December 1993. (28 pages)

6) West Wollega

Stage 1. Assessment on Natural Resources (inventory), Gimbi, November 1993. (180 pages)

Stage 2. Summary of Assessment on Natural Resources, Gimbi, November 1993.

7) Borena

Stage 1. Natural Resources Inventory Report, August 1993, Negele. (76 pages)

Stage 2. Summary Report of the Issues, Problems and Potentials for Natural Resources in Borena Administrative Zone, Negele Borena, December 1993.

8) North West Shewa

Stage 1. Regional Resources Conservation Status of North Western Shewa phase I, December 1993, Fiche. (99 pages)

Stage 2. In progress

9) Arsi

Stage 1. Report on Natural Resources Conservation Strategy for Arsi Zone, March 1993, Assella. (281 pages)

Stage 2. In progress

10) West Hararge

Stage 1. Regional Natural Resource Conservation Strategy, Asebe Teferi, September 1992. (326 pages)

Stage 2 In progress

11) East Hararge

Stage 1. Eastern Hararge Natural Resources Conservation Strategy, June 1992, Harar. (171 pages with annexes)

Stage 2. Eastern Hararge Natural Resources Conservation Potential, Policy and Action Plan Recommendation, October 1993, Harar. (88 pages)

12) Bale

Stage 1. A study on Natural Resource Conservation of Bale, July 1993, Goba. (86 pages with annexes)

Stage 2. In progress

REGION 5 (SOMALI)

1) Ogaden

Stage 1. Natural Resource Condition Study Report, December 1992, Gode. (266 pages)

Stage 2. Not started

2) Diredawa

Stage 1. Diredawa autonomous region Natural Conservation Strategy, August 1992, Diredawa. (101 pages with 29 additional tables)

Stage 2. In progress

REGION 6 (BENSHANGOL)

1) Metekel

Stage 1. A general Natural Resources Survey of Metekel Administrative Region, Part I, February 1993, Chagni. (72 pages)

Stage 2. A general Natural Resources survey of Metekel Administrative Region, Part II, February 1993, Chagni. (pages 73-130)

2) Assosa

Stage 1. A general Survey on Natural Resource Base of Asossa Administrative Region, January 1994, Assossa. (42 pages)

Stage 2. In progress

SOUTHERN ETHIOPIAN PEOPLE

REGION 7, 8, 9, 10 & 11

1) South Shewa

Stage 1. Natural Resource Conservation & Utilization in South Shewa, Volume I Main Report, December 1992, Zeway. (145 pages)

Stage 2. Natural Resource Conservation & Utilization in South Shewa, Volume II Summary, Problems and Recommendation, December 1992, Zeway. (27 pages)

2) Sidamo

Stage 1. Regional Conservation Strategy. Proceedings of the Conference Held at Awassa, June 22-24, 1992, Awassa, July 1992.

Stage 2. In progress

3) North Omo

Stage 1. Natural Resources Conservation and Development. An Assessment. Arba Minch, January 1993. (120 pages)

Stage 2. In progress

4) South Omo

Stage 1. Basic information on Natural Resources Use and Management of South Omo Administrative Region, Jinka, September 1992. (90 pages)

Stage 2. Papers Presented for Regional Conservation Strategy Workshop, Jinka, October 1992. (137 pages)

Stage 2. Report on Resource Issues, Problems & Potentials of South Omo Administrative Zone, Jinka, September 1993. (48 pages with annexes)

5) Hadiya Zone

Stage 1. Natural Resource Conservation and Utilization in Hadiya Zone, Vol. I, November 1993, Hossana. (88 pages)

Stage 2. Natural Resource Conservation and Utilization in Hadiya Zone, Vol. II, Summary Problems and Recommendation, November 1993, Hossana. (25 pages)

6) Kaffecho Zone

Stage 1. Natural Resources of Kaffecho Zone, November 1993, Bonga. (36 pages)

Stage 2. Summary Report of Natural Resources of Kaffecho Zone, November, 1993, Bonga (

7) Masha Zone

Stage 1. A study on the Natural Resources, cultural heritage, Environmental and Settlement Conditions of Shekecho Zone, Masha, August 1990. (12 pages)

Stage 2. In progress

8) Keffa

Stage 1. A report on the Status and Conservation of the Natural Resources of Bench Zone, September 1993, Mizan Teferi. (72 pages)

9) Kambata, Alaba amd Tembaro Zone

Stage 1. Natural Resource Potential, Use and Managment in Kambata, Alaba and Tembaro Zone: Volume I. Main Report. February, 1994, Durame (45 pages)

Stage 2. Natural Resource Potential, Use and Managment in Kambata, Alaba and Tembaro Zone: Volume II. Summary and Recommendations. February, 1994, Durame (15 pages)

10) Gurage Zone

Stage 1. Conservation Strategy for the Gurage Zone. December 1993, Welkite (63 pages).

REGION 12 (GAMBELLA)

1) Gambella

Stage 1. Report of the Natural Resource Conservation of Gambella Region, 1992, Gambella.

Stage 2.

REGION 13 (HARAR)

Stage 1. See East Harege

Stage 2. Not started

REGION 14 (ADDIS ABABA)

1) Addis Ababa

Stage 1.. Report on Conservation of Natural Resources in Addis Ababa Administrative Region, October 1992, Addis Ababa. (89 pages)

Stage 2. Not started

SUMMARY

Produced documents	-	57
In progress documents	-	12
Not started documents	-	5

ANNEX II

(a) LIST OF POLICY AND STRATEGY DOCUMENTS CONSULTED

The Peaceful and Democratic Transitional Conference of Ethiopia (1991) Transitional Period Charter of Ethiopia. Negarit Gazeta, 50th. year, No. 1, 1991.

TGE (1991) Ethiopia's Economic Policy during the Transitional Period (An Official Translation). Addis Ababa, November, 1991.

TGE (1993) Towards a Strategy of Economic Development in Ethiopia. Addis Ababa, December, 1993.

TGE (1992) Policy Framework Paper: Prepared by TGE in collaboration with the staffs of the IMF and the World Bank. Addis Ababa, September, 1992.

TGE (1993) A National Policy on Ethiopian Women: Office of the Prime Minister, Addis Ababa, March, 1993.

TGE (1993) National Population Policy of Ethiopia: Office of the Prime Minister, Addis Ababa, April, 1993.

TGE (1993) Ethiopian Forestry Action Programme: 3 Volumes, Ministry of Natural Resource Development, Addis Ababa, May, 1993.

TGE (1993) National Policy and Strategy for Plant Genetic resources Conservation and Development. Office of the Prime Minister, Addis Ababa, September, 1993.

TGE (1993) Health Policy of the Transitional Government of Ethiopia: Ministry of Health, Addis Ababa, September 1993.

TGE (1993) National Seed Policy: Ministry of Natural Resources Policy and Environmental Protection, Addis Ababa.

TGE (1993) National Policy on Disaster Prevention and Manage-ment, September, 1993

TGE (1994) Ethiopian Water Resources Code.

TGE (1994) Ethiopian Forestry Policy.

TGE (1994) Ethiopian National Policy on Agricultural Research.

In draft form:

Natural Resources Development and Environmental Protection Strategy

Wildlife Management Policy

National Energy Policy

National Education Policy

National Policy for Science and Technology

National Agricultural Research Policy and Strategy

National Strategy for the Conservation and Reservation of Cultural Heritage

(b) LIST OF LEGISLATION CONSULTED

Negarit Gazeta (1992) Proclamation 7 of 1992. A Proclamation to Provide for the Establishment of National/ Regional Self-Government, Addis Ababa.

Negarit Gazeta (1992) Proclamation 15 of 1992. A Proclamation to Provide for the Encouragement, Expansion and Coordination of Investment, Addis Ababa.

Negarit Gazeta (1992) Proclamation 33 of 1992. A Proclamation to Define the Nature of Fiscal Relations Between the Central and Regional Governments, Addis Ababa.

Negarit Gazeta (1992) Proclamation 52 of 1992. Mining Proclamation. Addis Ababa.

Negarit Gazeta (1993) Proclamation 41 of 1993. A Proclamation to Define the Powers and Duties of the Central and Regional Executive organs of the Transitional Government.

Negarit Gazeta (1993) Council of Ministers Regulations 120 of 1993. Regulation to Provide for the Issuance of Licences for Agricultural Investment Activities, Addis Ababa.

Negarit Gazeta (1992) Proclamation 15/1992. A Proclamation to Provide for the Encouragement, Expansion and Coordination of Investment. May 1992.

Negarit Gazeta (1994) Proclamation.... A Proclamation to Provide for the Conservation, Development and Utilization of Forests.