

*FSS Discussion Paper No. 1*

**WATER RESOURCE DEVELOPMENT  
IN ETHIOPIA:  
Issues of Sustainability and Participation**

*Dessaegn Rahmato  
Forum for Social Studies*

**FORUM FOR SOCIAL STUDIES  
Addis Ababa  
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## **List of Acronyms**

AI & SC: Acres International and Shawel Consult

CRDA: Christian Relief and Development Association

DEPSA: Development Projects Studies Authority

DWSS: Department for Water Supply and Sanitation

EVDSA: Ethiopian Valleys Development Studies Authority

EWUCA: Ethiopian Water Works Construction Authority

FAO: Food and Agricultural Organisation

FDRE: Federal Democratic Republic of Ethiopia

IDD: Irrigation Development Department

IFAD: International Fund for Agricultural Development

INSTRAW: United Nations International Research and Training Institute for the Advancement of Women (Santo Domingo)

MoA: Ministry of Agriculture

MEDAC: Ministry of Economic Development and Co-operation

MNRDEP: Ministry Natural Resources Development and Environmental Protection

MWR: Ministry of Water Resources

NWRC: National Water Resources Commission

NGOs: Non-Government Organisations

ONCCP: Office of the National Committee for Central Planning

PMGSE: Provisional Military Government of Socialist Ethiopia

SAERP: Sustainable Agricultural and Environmental Rehabilitation Program

TGE: Transitional Government of Ethiopia

UNDP: United Nations Development Project

UNICEF: United Nations Children's Fund

**WAPCOS: Water and Power Consulting Services  
(India)**

**WHO: World Health Organisation**

**WRC: Water Resources Commission**

**WRDA: Water Resources Development Authority**

**WSSA: Water Supply and Sewerage Authority.**

# **WATER RESOURCE DEVELOPMENT IN ETHIOPIA: Issues of Sustainability and Participation**

*Dessalegn Rahmato*

## **Summary**

*This paper argues for a pluralist and integrated approach to water development in Ethiopia. While the emphasis of the paper is on water schemes for agricultural purposes (irrigation), the problem of rural water supply is also discussed though not in sufficient depth. Water policy should enable the development of different categories of irrigation systems, namely, large, medium and small-scale. However, the paper argues that given our past experience and the fact that large systems have failed both here and in many African countries, a concerted effort should be made to encourage small and user-based water development schemes. Such schemes are less costly, more sustainable, environment friendly, and do not involve human displacement, as is the case with large schemes. Moreover, small schemes provide beneficiaries the opportunity to manage them directly. The purpose of agricultural water development should be to increase social benefits, and to promote food security and poverty alleviation.*

*Stakeholders' participation in water projects is essential. Participation means the involvement of stakeholders in the planning, management and governance of water projects.*

## **Purpose**

The aim of this paper is to stimulate public discussion of Ethiopia's water resources and the strategy of water development that the country is preparing to follow. Ethiopia has not utilised its water resources adequately or wisely. As we shall see further down, the country lags behind many African countries in the development of irrigation schemes and of safe water supply. The emphasis in the

past has been on large-scale investments, but many of the water schemes constructed were *poorly* designed and had adverse environmental consequences. Moreover, in keeping with the top-down approach favoured by policy makers at the time, the planning and implementation of water development schemes was not submitted to public discussion, nor were stakeholders consulted on the matter. Policies were made in camera, and plans were executed by professionals without involving the communities concerned. This decision-making tradition, which is still with us today, has to change because without public participation and the input of the stakeholders themselves development programmes will not be sustainable. What is called for therefore is the *democratisation of the policy-making process*.



## **Introduction**

Water is a mobile resource: it falls from the clouds, seeps into the soil, flows through aquifers, runs along stream courses, and eventually returns to the clouds. This natural cycle is the basis of all life forms and of the economy of nature. Water may be "managed" in different ways: it may be harvested, extracted from the ground, diverted, transported, and stored. This makes it different from all other natural resources. However, each form of management that interferes with the natural cycle exacts a price, not just in economic terms but in terms of environmental damage and greater health hazards. Moreover, water does not occur alone, it is rather part of a complex ecosystem consisting of the land, plants, aquatic and other life forms. The improper and unregulated use of water by humans will not only damage the water source but the ecosystem as well. Thus investment projects designed to enable users to have secure access to water will have to be examined from the standpoint of cost and economic benefit as well as in terms of their long-term impact on the environment. To be sustainable, water management schemes should respect the natural "logic" of water systems, and the ecology of which water is an important element.

Water exists in different forms, each of which may have multiple uses. There is surface water which appears to be stationary as in lakes and ponds, running water in the form of rivers and streams, and ground water in aquifers or mixed with the soil. But each form of water does not exist alone or independently of the others; on the contrary, they are all inter-connected through a complex natural process. A water system or water regime denotes the inter-connection among the different forms in a given geographical location. Individuals may make use of one water source or another (or a combination), depending on the nature of their livelihoods and their proximity to the sources of water.

Water is a common property resource and is critical for sustainable livelihoods. To begin with, all households need water for domestic use, i.e. for drinking, food preparation, washing, cleaning, etc. Access to adequate, clean water will greatly contribute to improved health and better productivity. Secondly, there are distinct population groups whose livelihoods are water-based, en-

tirely or to a considerable extent; such groups include fishermen, and artisans such as tanners and potters. Thirdly, water resources can play a significant role in improving food security and household income. Irrigation is the most common means of ensuring sustainable agriculture and coping with periods of inadequate rainfall and drought. Fourthly, water is employed to generate power for use in industry, services, and by urban households. In Ethiopia (as well as many countries in Africa), power generation is a monopoly of the state. Finally, in the developed countries, water is an important asset for the leisure industry. The extent to which water resources will contribute to sustainable livelihoods will depend on availability, the nature of rights of access, the system of management and the technology with which the resources are exploited. Moreover, the specific relationship between livelihoods and water resources will determine the nature of the stakeholders and their interest in the resources.

This paper is less comprehensive than is suggested by its title. I shall focus primarily on water development for agricultural use and rural water supply. According to the Ministry of Water Resources' recent "Letter of Sector Policy" which describes the overall objectives of the water sector, water for agriculture and community water supply will be given priority by the present government. In line with this objective, the paper will examine stakeholders' involvement in the various phases of the development of irrigation and rural water supply schemes, including in policy and strategy formulation. Of particular concern will be the participation of what I wish to call *primary stakeholders*, i.e. communities and populations that are or should be *direct* beneficiaries of water development schemes.

The study is based on available documentary sources and published works, some of which were provided by MWR. It does not include fieldwork or consultation with stakeholders, actual or potential. As shown in the reference section, the documentary sources were limited to a few reports prepared for MWR by consultants. Many of the documents prepared for or by the former Water Resources Development Authority, Ethiopian Valleys Development Studies Authority, Water Resources Commission, and by Water Supply and Sewerage Authority were not available to the

author at the time of writing. It is my impression that some of these documents are lost, misplaced or otherwise inaccessible to researchers.

## **Water Resource Development in Africa**

Africa's river systems have been the target of development planners since the 1960s, and many of the major rivers of the continent have been dammed for irrigation, for power generation and flood control. Indeed, *river basin development planning* has been widely adopted in Africa, and often enough water resource development has come to be synonymous with river basin development (Adams 1992). Integrated river basin planning was pioneered in the U.S., and the basic objective was to co-ordinate water resource development in a given basin so that individual development schemes do not work at cross-purposes. The river basin, and not the individual farmstead, served as the unit of planning, the assumption being that what was good for the basin was good for the individual farm. Such planning exercise requires a powerful interventionist state, a strong central planning authority and an over reliance on physical engineering to solve all development and conservation issues.

River basin planning was adopted in Africa, essentially in truncated form, in part because it appealed to the authoritarian interventionist states that were then in power in many countries in the continent. Moreover, African governments and their willing donor agencies, which bankrolled many of the costly river basin schemes in the continent in the 1960s and 70s, were frequently seduced by the technological promise of large-scale water projects. Planners had high hopes and the objectives frequently sought were:

- to raise the level of food production;
- to increase the production of export crops and hence boost foreign earnings;
- to bring under cultivation what are considered to be unutilised lands;
- to fight against drought and the long dry seasons, both of which exacerbated the problem of food insecurity;
- to meet the energy needs of industry and urban settlements; and

- to satisfy the water needs of urban and rural populations.

The problem of food security has been keenly felt especially in the Sahel countries and Ethiopia, both of which have become increasingly drought prone. The food crises of the 1960s, 1970s and 1980s have drawn attention to the issue of environmental vulnerability and the need for its mitigation. In many of the drought prone countries, the concentration of the human population is relatively high and cannot be adequately supported by rain-fed agriculture alone. Thus, where rainfall is insufficient or unreliable, and rain-fed agriculture cannot fully support food production, water management schemes have been considered to be sound investments. Such investments, it is argued, will help stabilise agricultural production and promote food security.

But many water projects in Africa are performing poorly or have failed outright, often with damaging environmental consequences. In many instances, the benefits have gone to a small segment of the urban elite and not to the masses of needy peasants and pastoralists. Some of the reasons for this sorry record include poor planning and design on the one hand, and the lack of involvement of the primary stakeholders in policy formulation and project management on the other (Adams and Grove 1983, FAO 1986, Moris and Thom 1990). The loss of traditional farming and grazing land, population displacement and relocation, and the long term and, at times, irreparable damage to the environment are but some of the costs that communities have had to pay for the failure of water projects (Adams 1992). In Ethiopia, for example, four costly dams that were constructed in the 1980s had to be abandoned, and several irrigation schemes became unusable due to poor planning and the authoritarian approach to policy formulation and implementation that was characteristic of the government at the time (MWR 1997a).

Water is an indivisible resource, and in this sense too it is different from most other natural resources. Water users are thus interdependent, and water control and conveyance systems affect the interests of large numbers of individuals in one way or another. The interdependence of irrigation users, for example, cre-

ates an environment in which each user loses a little bit of his or her individual control over farm practices (see Bromley 1982). Some have argued that since water is a common resource and since its utilisation promotes user interdependence, its management should not be left to the responsibility of individuals. Such arguments have often been used as justification, at least in this country, for policies favouring state ownership and management of water projects both large and small.

### **Water Resource Development in Ethiopia**

The development of water resources for agricultural purposes on the one hand and rural water supply schemes on the other are the focus of our discussion in this section. Of the two sub-sectors, the first has attracted high levels of investment, and the second was neglected until the post-Imperial period. Even today, rural water supply programs, which affect the majority of the country's population, have not been given sufficient attention.

Modern water development schemes are a relatively new phenomenon in the country. The Imperial government took the first initiative in water resource development in the second half of the 1950s. Large-scale water projects for agricultural purposes and power generation were constructed from the end of the 1950s, and were concentrated in the Awash valley as part of the agro-industrial enterprises that were expanding in the area at the time. They subsequently spread to the Rift Valley and the Wabe Shebelli basin. Essentially, the government's interest at the time centred almost entirely on large-scale and high technology water projects: hydro-power dams, irrigation schemes, and water supply projects for Addis Ababa and a few major towns. Since then, all large-scale schemes in the country have been constructed at the initiative of the government, and managed by state or para-statal enterprises.

#### *Irrigation Schemes*

Until recently, the water potential of the country was not accurately known, and even today this is still a contentious area. There have been different estimates of the irrigation potential of the country, and the issue has not been satisfactorily resolved. One of

the earliest estimations was made by the World Bank (1973), which suggested a figure of between 1.0 and 1.5 million hectares. Recent estimates, however, place the figure somewhat higher. According to the Ministry of Agriculture (1986), the total irrigable land in the country measures 2.3 million hectares. The International Fund for Agricultural Development (IFAD 1987), on the other hand, gives a figure of 2.8 m, while the Office of the National Committee for Central Planning's 1990 figure, which is based on WRDA's estimations, is 2.7 m.. The Indian engineering firm Water and Power Consulting Services' 3.5 m ha. is the highest estimate so far and EVDSA accepted the figure and was using it in the early 1990s. Most of these figures are derived by adding up the irrigation potential of the country's eight river basins as shown in Table 1 below. Except for the Awash River and the Rift Valley lakes, all the other basins are part of the major trans-boundary river systems that drain out of the Ethiopian highlands and flow into the neighbouring countries of Sudan, Kenya and Somalia.

In the 1960s and 1970s, comprehensive reconnaissance and feasibility studies were carried out on the Abbai (Blue Nile), Awash and Wabe Shebelle river basins. In 1962, a German engineering team, and in 1964, the U.S. Bureau of Reclamation undertook extensive studies of the water resource potential of the Abbai River basin, the largest basin in the country. Both reports maintained that there were high hopes for the development of irrigated agriculture in the basin. The German study (Lahmeyer 1962), which was confined to the Gilgel Abbai basin, a much smaller area, suggested that the production of oil seeds, pulses and fodder crops, using the waters of the Gilgel Abbai, would be very profitable and earn high foreign exchange. The U.S. study recommended that small-scale irrigation should be greatly encouraged but that large-scale schemes would be too costly. It argued that without a co-ordinated water development program in the basin there would be no prospects for agricultural development in north-west Ethiopia. On the other hand, the Awash River basin attracted a good deal of local and international investment, and was the subject of numerous studies and surveys in the 1960s and 1970s (Dessalegn 1986). By the beginning of the 1970s, 100,000 *ha.* of land was under modern irrigation in the country of which about 50

percent was located in the Awash Valley (Wetterhal 1972). An extensive survey of the Wabe Shebelle basin, which was begun at the end of the 1960s, was completed in 1972. About the same time, a reconnaissance survey of the Tekezze and Mereb and Gash Rivers in the north of the country was under way. In brief, the imperial regime was keen to determine the water resource potential of the country's river basins and to invite foreign capital to invest in agro-industrial enterprises in these areas.

In the late 1980s, an Indian firm, WAPCOs, prepared a preliminary master plan for water development for the whole country (WAPCOS 1990). At present, water resource master plans have been completed for the Omo-Gibe and Baro-Akobbo basins, while plans for a similar undertaking are afoot for the Abbai and Tekezze river basins. A hydropower project is under construction on the Gilgel Gibe River. For the Wabi Shebelle basin, preparation of a master plan has been initiated, and the work is scheduled to be completed by the year 2000. Plans for a surface water study of the Awash basin, a survey of the Rift Valley, and a preliminary capacity assessment of the Genale basin are also in the pipe line, with completion targets set for 2000 (MWR 1996). On a smaller scale, pre-feasibility and reconnaissance studies of watersheds and subsidiary river valleys have been undertaken at the initiative of WRDA and EVSDA in the 1980s. These include the Birr and Koga watersheds, Gilgel Abbai, and the Borkena catchment. The main objective of all these ventures has been to determine the water potential of the country, assess the extent and nature of water utilisation, and recommend priority areas for the development of water resources.

Table 1. *WRDA's Estimate of Irrigation Potential (1986)*

<b>River Basin</b>	<b>Irrigable Land (Ha.)</b>
Abbai	760,000
Tekezze & Northern	200,000
Baro-Akobbo	600,000
Gibe-Omo	250,000
Rift Valley (Lakes)	50,000
Genale-Dawa	300,000
Wabe Shebelle	355,000
Awash	185,000
<i>Total</i>	<i>2,700,000</i>

*Source:* ONCCP 1990 (based on WRDA figures).

According to recent MWR data (cited in MEDAC 1999: 484-85), some 30 large and medium-scale irrigation projects with a combined command area of over 600,000 hectares have been identified in various parts of the country for development by the state since the 1980s. Of these, about 15 percent have already been completed. The largest water project to be constructed since the 1970s is the Alwero dam in the Gambella region, which has an irrigation potential of over 10,000 hectares, but which remains unutilised two years after completion. Feasibility studies have been completed on another 25 percent of the projects and the rest have been the subject of reconnaissance studies. These projects are separate from the large river basin projects for which comprehensive master plans are now being prepared.

In the pre-Revolution period, the chief purpose of irrigation was to provide industrial crops to the growing agro-industries in the country, many of which were controlled by foreign interests, and to boost export earnings. The main crops grown were sugar cane, cotton, sesame, fruit and vegetables. In the Rift Valley areas, some irrigation was used to grow food crops. There was a



shift of emphasis in the post-Revolution period though the earlier objectives were not abandoned. The Derg, like its predecessor, was keen to promote large-scale and complex water projects, however, other issues now came to play an important role. Initially, irrigation was seen as part of the modernisation and socialisation of the country's agricultural economy. Moreover, irrigation was considered an important investment for improving rural income through increased agricultural production, and for reducing the growing pressure on the land by bringing unused land under cultivation. Later, with the recurrence and continued threat of drought and environmental hazards, the justification for water management schemes expanded to include relieving drought and recurrent food shortages, and growing more food for the internal market to improve food security and the nutritional status of the population. In more recent years, the need to reduce the pressure on the environment and to promote sound soil and water conservation practices has become an added consideration especially in those areas which are particularly vulnerable to land degradation. Economists have often emphasised that irrigation will bring about higher income for farmers, higher employment opportunities, and increased foreign exchange earnings.

For much of the lifetime of the Derg, very little attention was paid to small-scale and traditional irrigation schemes constructed and managed by peasant farmers. With the nationalisation of industrial and agricultural enterprises, the government's emphasis was to promote high technology water development schemes managed by state-controlled agro-industrial and agricultural enterprises. It was only in the second half of the 1980s, as a result of the devastating famine of 1984/85, that the Derg began to show interest in small-scale water management schemes (see MoA 1986, Tahal 1988). The establishment of the Irrigation Development Department (IDD) within MoA at the end of 1984, a body entrusted with the development of small-scale irrigation projects for the benefit of peasant farmers, signalled a new approach to water development by the military government. However, progress was slow. From the mid-1980s to the fall of the Derg in 1991, IDD was able to construct some 35 small schemes (MoA 1993), of which nearly one-third were formerly traditional schemes used by peasants.

Table 2 shows the extent of irrigation in the country by the close of the 1980s. I should note that these figures should be taken with some degree of caution. Different sources give different figures, and one is not certain which is the more accurate. For example, ONCCP's figures for large and medium-scale irrigation schemes is given as 97,000 *ha.* (rounded); small-scale irrigation is said to cover 64,000 *ha.*, but the figure probably includes traditional schemes as well. ONCCP's estimation is based on 1989 data from WRDA records. On the other hand, EVDSA's estimate in 1992 was that only 160,000 *ha.* was under irrigation, and this constituted only 4.5 percent of the total irrigable potential of the country (CRDA 1996).

Table 2. *Existing Irrigation (late 1980s)*

Scheme	Area Irrigated (hectares)
Large and Medium	89,000*
Small Scale	10,000**
Traditional	69,000***
<i>Total</i>	<i>168,000</i>

*Source:* MoA 1986, 1992, 1993.

*Notes:* \*Figures as of mid-1980s. \*\*Includes micro-dams and pump schemes. \*\*\*Based on incomplete MoA inventory in 1990.

Whichever estimates we use, it is clear that even by the low standards of African countries, Ethiopia's use of its water resources is very limited. Less than 6 percent of the country's irrigable land is now under irrigation. In contrast, according to FAO data (1987), the three countries in Sub-Saharan Africa with the largest irrigation are Sudan (2.2 million *ha.*), Madagascar (1.00 m) and Nigeria (0.9 m). In the Sudan, 14 percent of the country's cropped land is under irrigation, while in Madagascar, the figure is 32 percent. In contrast, almost all the cropped land in Egypt is under irrigation. For comparison, irrigation in Ethiopia covers less than two percent of the country's cropped land. Assuming that all

the irrigated land is utilised to produce food crops (which in actual fact is not the case as the many of the larger schemes were dedicated to industrial crops), the contribution of irrigation to the production of food cannot exceed two percent.

The distribution of irrigation schemes in the country is quite skewed. Almost 74 percent of the irrigated area served by large and medium schemes is located in the Awash valley. However, as shown in Table 1 above, the Awash River basin contains less than 7 percent of the irrigable area of the country. In contrast, large and medium irrigation covers less than one percent of the Abbai basin, the largest basin in the country (ONCCP).

Under the Derg, irrigation schemes were divided into three categories depending on their size, operation and management. These were:

- Large-scale schemes: Over 3000 *ha*. Designed by NWRC and WRDA and constructed by EWWCA mainly for the benefit of State Farms.
- Medium: 200-3000 *ha*. Head works, main and secondary canals constructed by WRDA, and tertiary and farm canals by IDD. Managed by State Farms and other para-statal enterprises.
- Small-Scale: Upto 200 *ha*. Constructed by IDD mainly for the benefit of peasants organised in producers' co-operatives.

It is quite evident that irrigation development in Ethiopia did not attempt to involve the farming population. Modern irrigation by and large bypassed the peasant, and the technology involved and the operation and management of this technology was entrusted to a small technical and managerial elite working for large-scale foreign interests in the past and later for state or para-statal enterprises. On the other hand, there is a long tradition among peasant farmers of water management for small-scale agricultural use. As shown in Table 2 above, more than 40 percent of the irrigated land in the country is served by traditional schemes; the figure would be higher if a more accurate and more complete inventory was undertaken. The majority of existing traditional irrigation schemes are micro-level in size, serving a small group of

households usually not more than 20 to 30 in number (see Tahal 1988). But there are some schemes that serve a large number of beneficiaries. Many of these schemes are based on stream diversion, but some may be dependent on perennial springs. The water is transported by means of furrows, sometimes for long distances involving impressive engineering works. The diversion works are frequently rudimentary, and require frequent repairs, which involve great expenditure of labour on the part of the beneficiaries. These traditional systems may be described as forms of water user co-operatives. Each beneficiary has access to water on an equal basis, and equity in water distribution is a strong factor.

Traditional irrigation is a complement to rain-fed agriculture, and the crops grown are often horticultural crops and fruit trees. Peasants have a keen awareness of the benefits of irrigation and are willing to invest their labour in the construction and maintenance of the schemes. In parts of north Shoa, north Wollo, east Gojjam and the highlands of Harrage, the traditional systems still being utilised by peasants date back to the last century. Many of these schemes are managed by elected elders known as "water fathers" or "water judges" and this traditional management system has proved effective in many instances. In some cases, the irrigation schemes are managed by PAs. It is thus evident that peasants have proven ability to organise themselves and to manage small-scale irrigation systems. The labour and discipline necessary to maintain these systems over many decades is evidence of a high level of practical knowledge of water management in the rural areas. The Derg almost destroyed traditional irrigation schemes by confiscating them and handing them over to producer co-operatives.

The experiences of the Derg period are instructive in a variety of ways, and future water development policies should benefit by the lessons of the past and should avoid the mistakes that were committed. The two most critical mistakes of Derg water policy was that it did not encourage a pluralist approach in water development on the one hand, and it did not seek to involve the beneficiaries of water schemes in any way on the other.

Both in terms of choice of technology and scale of operations, the Derg's emphasis was on costly investments that required high management and maintenance costs. Except the grudging concession made to small-scale irrigation in response to the drought of the mid-1980s, water development policy favoured large and complex water projects. A pluralist water policy would have actively promoted the development of all types and classes of water schemes. This would have been less costly and more effective. Moreover, given the emphasis on complex and large-scale water projects at the time and their management by a small professional elite, the diffusion of new water management expertise among the farming population was out of the question and not actively sought in the first place.

By and large, most of the state-run water projects in this period were poorly operated and poorly managed. There was an inefficient use of water partly due to the lack of a consistent policy on water charges and to the low water rates that state and parastatal enterprises were made to pay. A number of water projects were poorly planned and designed, and as a result they were either abandoned much before the end of their life-span, or kept in operation with reduced efficiency and capacity. Other projects caused serious damage to the environment.

The Derg's programme of small-scale irrigation was in large measure a failure also. Many of the schemes that fell under the responsibility of MoA's IDD were originally owned and operated by peasants. They were taken over and upgraded by the government without the consent of the communities concerned. Quite often, such upgrading involved the transfer of the schemes to producers' co-operatives (PCs), with IDD managing the schemes for the benefit of the PCs. Peasants who earlier had access to irrigated water but who were unwilling to join the PCs were denied access to water and were relocated elsewhere.

Policy planning and implementation at the time was guided by a strong top-down approach. There were few occasions when stakeholders were involved in any aspect of water resource development. Neither the direct beneficiaries nor concerned institutions at the local level were consulted in the planning and implementa-

tion of water projects. Moreover, the management of the projects themselves were in the hands of party or government functionaries, and not in the hands of the beneficiaries themselves. The irrigation schemes lacked operational autonomy, and there was no sense of ownership on the part of the beneficiaries. Because of the association of irrigation with collectivisation, many peasants shunned irrigation and remained suspicious and reluctant to return to it even after the fall of the Derg.

### *Rural Water Supply*

Water supply services in Ethiopia are among the lowest in Africa. Moreover, the strong urban bias on the part of successive governments since the early 1970s has kept water supply investments in the rural areas quite low. According to WRC, by the beginning of this decade, only 19 percent of the country's population, and 11.5 percent of the rural population had access to safe water. According to MWR (1996), 19 percent of the rural and 80 percent of the urban population have access to safe water, and the total coverage for the country is put at 26 percent. The reason the urban figure is high is due to the high coverage for Addis Ababa; if we exclude the capital, the picture is rather dismal. According to another MWR document (1997b), prepared for the Ministry by the international accounting firm of Ernst and Young, the average water supply coverage for urban settlements excluding Addis Ababa is 31.3 percent. If we disaggregate this by population, the coverage for urban settlements with more than 50,000 people is 58 percent while coverage for those with 5,000 or less is 14 percent. The same document states that the average coverage for rural settlements is 15.2 percent and for the whole country 17.3 percent. Regionally, its findings were 34 percent coverage for Tigray, 14.3 percent for Oromia, 12.5 percent for the Southern Region, and 8.3 percent for Amhara Region.

Thus the great majority of Ethiopians uses unsafe and polluted water and as a result is commonly exposed to a large variety of water-borne diseases. This is all the more serious in that the rural population has virtually no sanitation facilities, while in the country as a whole only eight percent of the population has access to sanitation. Moreover, in terms of accessibility to health services

the country is in the worst possible situation when compared to countries in Sub-Saharan Africa (UNDP 1998). Conditions are even more critical if we bear in mind that access to safe water in our case does not mean access to *adequate* water. MWR defines "adequate" water supply to mean *20 litres of water per person per day and accessible within a range of 0.5 to 1.0 km from a dwelling place* (MWR 1996). The WHO standard, which was once adopted by WSSA, is 45 litres per person per day. Thus, most households with access to safe water do NOT get sufficient quantities of it for a healthy life. As we shall see below, the current level of per capita water consumption is far below the adequate level set by MWR. We should also note that in the rural areas safe water does not mean water that has undergone treatment: most households have access to potable water only from wells and protected springs.

Table 3 shows the extent of water supply coverage for Ethiopia and selected African countries.

Table 3. *Access to Safe Water in Selected African Countries (% of Pop.)*

Country	Urban	Rural	Total
Ethiopia	80.0	11.5	19.0
Kenya	61.0	21.0	28.4
Tanzania	75.0	40.4	52.1
Ivory Coast	100.0	75.0	82.8
Senegal	85.4	26.0	51.2
Zambia	76.2	42.8	58.9
Zimbabwe	100.0	13.5	35.5

*Source:* World Bank 1995 (figures for 1988-93). For Ethiopia: WRC 1990 figures.

Rural water supply services began in the late 1950s under the Imperial regime. However it was not until 1971 that a body responsible for all aspects of water use and development in the coun-

try, the Water Resources Commission, was established. True, the Awash Valley Authority was set up in 1962, but its duties were to plan and promote investment activities within the Valley. The Commission was given a wide mandate and entrusted with the responsibility of planning and utilising the country's water resources including water for home consumption. Up until the late 1970s, water supply schemes relied on motor driven boreholes, but since then other technologies have been employed, including hand-dug wells (with or without hand pumps), spring protection, and occasionally artificial ponds. However, water drilling, like other development undertakings, was carried out in rural communities which were close to the main road network; communities in the interior which were inaccessible by motor transport were largely ignored. The extension of the area of coverage in the Derg period was made possible by the expansion of the transport network.

Rural water supply became a high priority during the Derg period, and an accelerated growth in rural water schemes was registered in the later part of the 1970s. In the early 1980s, the government pledged to implement the UN initiated International Drinking Water Supply and Sanitation Decade, which in Ethiopia ran from 1984 to 1994, coinciding with the government's Ten Year Plan, which set an ambitious target for the provision of safe water supply to the rural areas. At the beginning of the 1980s, less than 6 percent of the rural population and 19 percent of the population in the twenty major towns had access to clean drinking water. At the end of the Plan period, the coverage for the rural areas was to reach 35 percent and for the urban areas 85 percent. While the record of achievement was not as high as planners had hoped for, considerable progress was made in the 1980s (see Table 4 below).

An important impetus for expanding the rural water supply programme in the country was the drought that hit the country in the 1970s and the 1980s. As part of their response to the environmental crises of these years, a considerable number of NGOs and several donor agencies became actively involved in rural water supply schemes. At present, some 38 NGOs, UNICEFF and number of bilateral organisations are closely involved in rural water supply. Table 4 provides data on the type and extent of water supply in the rural areas. It should be noted here that some of the



schemes are not functioning due to faulty installation or lack of maintenance. The magnitude of malfunction of water supply schemes is not known accurately though it is believed to be high. An official of MWR recently estimated that at any given time more than 60 percent of all systems are in various stages of disrepair, and thus in effect only 40 percent of the population covered by improved water systems has access to safe water (CRDA 1997: 51).

Table 4. *Number of Rural Water Supply Schemes, 1992*

Const. by	Borehole	Hand dug Wells	Spring	Other	Total
WSSA	873	2507	435	2	3817
NGOs	608	797	982	15	2402
<i>Total</i>	<i>1418</i>	<i>3304</i>	<i>1417</i>	<i>17</i>	<i>6219</i>

*Source:* Based on WSSA data cited in Estifanos Zerai 1996.

The Water Supply and Sanitation Authority (WSSA), a division within the Water Resources Commission, was established in 1981. Between then and 1992, WSSA was the principal agency responsible for water development in the rural areas and all urban areas except Addis Ababa. By 1990, a total of 210 urban water systems serving about 3 million people came under WSSA's responsibility. Likewise, the Authority was responsible for providing support and maintenance to over 6000 rural water schemes serving over 4 million people throughout the country (WRC). With the establishment of regional administration under the Transitional Government of Ethiopia in 1992, WSSA's functions were transferred to the Regions and water development programmes became decentralised. At present, the Regional administrations are responsible for the development, operation and maintenance of rural (and urban) water supply systems in their regions. WSSA has also been absorbed into the Ministry of Water Resources and become the Department of Water Supply and Sanitation (DWSS). However the relationship between DWSS (or MWR) and the Regions appears

rather unclear, and how the decentralisation of water development will be carried out in practice needs to be spelt out in more detail.

Among the main reasons given for the slow pace of progress in water supply services in the 1980s the following are noteworthy and are still relevant today: the lack of a comprehensive water legislation; inadequate investment resources; and the lack of a national water tariff policy. Moreover, there has been a strong urban bias in water supply programmes, and the rural areas have suffered as a result. On the other hand, the main reason for the poor record of sustainability of existing water schemes in the rural areas is the absence of beneficiary participation and community management.

The present government has expressed a strong commitment to rapid progress in the provision of safe water to the rural population. Experts believe that as things stand now the current rate of rural water supply development will at best merely keeping up with population increase (WRC). Some of the water schemes installed in the 1980s were damaged or destroyed during the last years of the civil war, and there was at the time of writing no reliable inventory of existing schemes in the countryside.

According to the five-year National Programme of Action (NPA) for Children and Women, extending from 1996 to 2000, the government has made promises to provide safe and dependable water supply services to 42 percent of the rural population. Per capita rural water consumption at the end of the five-year period is expected to reach 20 litres per day. The planned water coverage will increase the current rural coverage by 23 percent. In the five-year period, 25,632 new rural water supply schemes are expected to be constructed, and the main emphasis will be on hand-dug wells. Similarly, urban water coverage is to reach 95 percent in the same period. In the sanitation area, NPA hopes to avail sanitation facilities to 14 percent of the rural and 73 percent of the urban population; this is a 13 percent increase above the current level. The plan is to achieve an annual increase in coverage by 5 percent beginning in 1996 (Ethiopian Government 1995). The indicative financial requirement of the entire water supply and sanitation programme is estimated to be 363.5 million US dollars, of which 44

percent will be provided by the government and the rest by external support agencies.

There is also a plan by the World Bank to fund improvements in water supply services in 25 selected towns; the plan covers the period between 1998 - 2003. In this period, water consumption in the urban areas is expected to increase from 7 litres per capita to 15 litres per capita per day. The Bank's urban water programme is aimed at assisting the government to achieve its water sector objectives (World Bank 1996).

The goal of safe water for all the population could be achieved by the year 2040 provided that the present water coverage can be increased by 20 percent annually, a daunting task in all respects. According to WRC sources, the investment required to provide safe water to ALL the population in the rural areas within a twenty-year period will amount to 5 to 6 billion Birr. This is beyond the ability of the government to provide and the active support of donor agencies and NGOs will have to be sought if real progress in water supply is to be made and if Ethiopia is to catch up with some of countries in Africa.

### **Issues in Water Resource Development**

The experiences of Sub-Saharan Africa on water development in the last three decades have sparked a lively debate on the subject. The African experience is now being seriously re-examined both by specialists on the subject as well as the donors that were heavily involved in the financing of many of the projects (Adams 1992, Barghouti and LeMoigne 1990, FAO 1986 and 1987, Moris and Thom 1990). Interestingly enough, the debate has led to a new consensus over some of the important issues of the African experience.

It is now commonly accepted that Africa's water development program, which began in the early 1960s and which was heavily financed by such donors as the World Bank and USAID, has by and large been a failure. Even FAO, which has been promoting water development schemes in the continent for many years, now recognises the problem is deep-rooted and complex.

Many of the major dams and reservoirs are performing poorly and have failed to meet their original objectives. Few water projects have brought about improvements in agricultural production or increases in foreign earnings. On the contrary, large-scale undertakings have instead caused the flooding of valuable farmland, the displacement and relocation of large numbers of people, damaging environmental impact and increased health hazards, and the disruption of the natural flow of river systems affecting many people down-stream. Partly for these reasons, and partly due to pressure from environmental groups in the donor countries, the World Bank and other donors have now become reluctant to finance large-scale water projects. This is not to say that there have not been successful water projects in Africa: one could point to several such schemes, or ones that at least have not been plagued with serious problems. However, on balance, the story of modern irrigation in the continent is one of failed promises, disappointments and large-scale ecological damage.

#### *Environmental Impact*

There is now an extensive body of knowledge about the human and environmental impact of large-scale water control and storage (see literature in Adams 1990, Ch. 6). The impact of water impoundment is not confined to the problems noted above but has far-reaching consequences. Dams and reservoirs have inundated arable and pasture land as well as places of historical or cultural value to communities. It is interesting that in many instances land lost through inundation is either equal to or larger than the land that is brought under irrigation. There may thus be a loss in absolute food production, though the higher productivity that irrigation provides is supposed to compensate for this. Water impoundment has often deprived populations access to traditional common property resources. Flora and fauna also become submerged leading to the loss of biodiversity.

Reservoirs may change the local environment; the local vegetation cover may be replaced with other species, which may be of less value to the surrounding population. They may give rise to increased seismic activity, especially in fragile geological surroundings. The immense pressure applied by the vast mass of wa-

ter in reservoirs has been known to induce earthquakes of high intensity. Dams interfere with the flow regime of rivers, causing losses to communities down-stream; they have also been known to increase the incidence of flooding. Water impoundment has frequently been accompanied by serious health hazards. Increased incidence of malaria and schistosomiasis, for example, has been recorded in a number of water projects in various parts of Ethiopia. The Birr and Koga irrigation project was expected to exacerbate such health hazards as malaria, schistosomiasis and river blindness (AI&SC 1995). The Environmental Policy of Ethiopia, which was recently approved by the government, emphasises the control of environmental health hazards in the design and construction of dams and irrigation systems, such control to be undertaken through environmental impact assessment processes (FDRE 1992: 10-11). How actively this policy provision will be enforced and monitored remains to be seen.

One of the most serious environmental hazards caused by large-scale irrigation schemes is salination and the loss of valuable land caused by it. Poor water management and inadequate drainage invariably increase water salinity and waterlogging, and as the water evaporates a whitish salt residue is left on the soil. In its milder form, salination will decrease the productivity of arable land and pasture, but in more serious cases it can ruin the land for good. In South Asia, where irrigation schemes have been constructed on a massive scale, 1.5 million hectares of land is damaged and lost to agriculture every year (van de Laar 1994). India has the largest area of farmland under irrigation in the world, and by the mid-1980s, over 20 million hectares of agricultural land (or 36 percent of the country's irrigated area) was put out of production due to salination. The comparable figures for China are 7.0 million hectares (or 15 percent), for the U.S.A. 5.2 million hectares (or 27 percent), and for Pakistan 3.2 million (or 20 percent) (van de Laar). In Ethiopia, salinity caused by large irrigation schemes poses a serious threat to the land in the Awash Valley. In the 1980s, thousands of hectares of irrigated land in the middle Awash had to be abandoned due to salination and waterlogging after less than five years of irrigation farming (Mahmud Omer 1997).

### *Land Rights*

Modern water development schemes have often become arenas of multiple conflict, of which the following are worth noting. a) There is conflict among water users over water allocation, land rights, or maintenance issues. b) Conflict may arise between users and the authority responsible for the project over inappropriate design of infrastructure, peasant relocations, water charges, or management issues. c) Conflict between project beneficiaries and non-beneficiaries is often inevitable. The latter often question the justice of being excluded from the benefits of water projects. Indeed, project beneficiaries are frequently considered enjoying special privileges that are denied other households without any justification. d) Finally, there is conflict between donor agencies and the recipient country over design, management, environmental impact, and financial issues.

One of the most important issues that may be a source of conflict is the issue of land rights and land allocation. To begin with, water impoundment will displace large numbers of people who will lose their property and have to be relocated from their ancestral homes. For example, the Aswan High Dam is said to have displaced 120,000 rural people, the Akosombo dam in Ghana 84,000, and the Kariba dam in southern Africa 57,000 (Adams 1992: 132). In Asia, large-scale dam projects have displaced rural populations on a massive scale. The mammoth Three Gorges Dam on the Yangtze River in China, which is now under construction, will require the relocation of 1.8 million farmers and villagers. The series of dams planned for construction on the Narmada River and its tributaries in India is expected to displace over 250,000 people, some of whom are already being resettled elsewhere. Resettlement is a complex and costly undertaking, and few resettlement schemes in Africa or Asia have been successful. One of the most contentious issues is how to compensate peasants who have lost their farms or grazing land due to water impoundment (see Dessalegn 1994). For many people, displacement and relocation is a traumatic experience; it means not just losing one's property and assets but being driven away from one's ancestral home and the natural and cultural surroundings that one is strongly attached to. On most occasions, displaced people have been resettled in areas

that are much different, indeed much poorer than their original homes. In our own case, irrigation projects have led to the eviction of pastoral Afar from their traditional grazing areas in the Awash Valley, and, in the newer schemes, farming people have been or will soon be displaced.

Secondly, land allocation within irrigation schemes is often a difficult task, and different countries in Africa have adopted different methods of dealing with the problem. A wide variety of tenure arrangements have been tried, of which the following are some of the most important: freehold; customary tenure; short or long term lease; short or long-term contract; or simple tenancies (Bloch 1986). Some arrangements explicitly exclude business people, civil servants, or urban wage earners from access to irrigated land. In other cases, landholders in the irrigation area may be asked to share their land with some of the people displaced by the project in exchange for getting access to water. This was one of the options under consideration in the planned Birr and Koga irrigation scheme whose feasibility study was undertaken in 1993-94. The rationale was that landholders within the perimeter are being privileged, and that they should therefore compensate those who lost their property and were displaced from their homes through no fault of theirs. Each of these land holding arrangements has been justified on grounds of equity, but it is not unusual to find wealthy and politically powerful groups benefiting from irrigation projects at the expense of the poor and the under-privileged. Traditional land rights are subverted, and the poor in irrigated areas end up either losing their holdings or becoming dependent on the privileged groups. Without a sense of secure access to land, irrigation beneficiaries, particularly the poorer ones, will not make the most efficient use of their resources or their labour.

Because irrigated plots are very valuable, there is a tendency to divide and sub-divide them for lease to outsiders. This may lead to uneconomic plots and the inefficient use of water. It may also come into conflict with the equity basis of land allocation put in place by the irrigation authorities. Land rentals of this sort, especially if it involves outsiders such as urban businessmen or civil servants, will exacerbate the conflict between water beneficiaries and non-beneficiaries noted above. One of the points that was

discussed during the feasibility study of the Birr and Koga irrigation project noted above was whether peasants in the irrigation perimeter should be allowed to sub-divide their land and rent out plots to outsiders (see AI & SC 1995).

### *Small versus Large-scale Irrigation*

One area of consensus in the current debate is that water resource development programmes in Africa have not given sufficient attention to small-scale and peasant based irrigation experiences and technologies. According to the 1986 FAO study, small and indigenous irrigation schemes are the dominant form of irrigation in much of Sub-Saharan Africa. Out of the 34 countries with substantial irrigation programmes, small-scale irrigation covers over 74 percent of the total irrigated land in 17 of them. In Ethiopia, according to data available at the moment, small-scale and traditional irrigation serves almost half of the irrigated area in the country (see above). It is thus clear that small-scale irrigation is widespread and has a vital role to play. This is all the more so because, as we have seen, modern irrigation has had a very poor record, and because small schemes are less costly in the fullest sense of the term. Moreover, there is general agreement that the success of small-scale systems is also due to the fact that they are *self-managed* and dedicated to the felt needs of local communities. Indeed, small-scale schemes are defined as schemes that are controlled and managed by the users themselves.

It is important to emphasise that small-scale projects will not be sustainable just because they are small in scale. The small irrigation schemes built and managed by IDD in the 1980s had nearly the same problems and the same record of poor performance as the large schemes managed by State Farms. As noted above, traditional irrigation schemes make up by far the most dominant form of small-scale irrigation in the country, and a great majority of these are well managed and some have even been in constant use for well over a century. According to official sources (ONCCP 1990, MoA 1992), developing large-scale irrigation schemes cost in 1988 17,000 U.S. dollars per hectare while cost estimates for small-scale schemes ranged between 3000 and 3500 USD per hectare with diversion structure, and 900 to 1500 without diversion



structure. Actually, the cost to the government of small-schemes is very low as most of the necessary work will be done by the beneficiaries themselves.

The main advantages of small-scale irrigation are the following:

- they have much lower investment costs, and in a majority of cases these costs are borne by the community;
- they do not involve dams or storage reservoirs, hence no population displacement is involved;
- they are less demanding in terms of management, and operation and maintenance;
- they have no land tenure or resettlement implications;
- they have no serious adverse environmental impact;
- they allow a wider diffusion of irrigation benefits; and
- they permit farmers to learn irrigation techniques at their own pace and in their own way.

The reader may ask what exactly should be done to support small-scale irrigation? The following is offered as points for discussion and should not be seen as a blueprint for reform. To begin with, efforts should be made to enhance and improve the efficiency and productivity of traditional irrigation. For example, the most persistent problem of traditional river diversion schemes in this country is the impermanence and fragility of the headworks, which are almost always made of brushwood and earth, and which are often washed away during heavy rains and have to be frequently repaired. Peasants always complain that repairing the headworks requires too much labour. Improving the durability of the headworks and other infrastructure could contribute to efficiency and productivity. Secondly, peasants should have access to simple, cheap and environmentally friendly water technologies. Hand pumps, shallow tubewells and "shadoof" technology are widespread in Asia and West Africa but are hardly used for irrigation in this country. Thirdly, improving the marketability of irrigation produce will serve as an important incentive. This may require building access roads, offering better prices, and improving product quality.

These and similar measures of support will mean that NGOs and private enterprise will have to play a more active role. The responsibility of the state will then have to be to create the enabling environment for greater NGO and private sector interventions. Small, user-managed schemes work best if there is no state intervention or if such intervention is kept to a minimum. The state should focus on providing needed services such as credit and finance and on building up basic infrastructure. At present, numerous small-scale schemes have been planned for construction by the regional governments though few have been built since the fall of the Derg. In the Amhara region, SAERP has ambitious plans to build 540 small schemes with an irrigation potential of over 65,000 hectares over a period of ten years. Oromia region plans to construct 180 schemes with a command area of over 19,000 hectares over a five-year period (MEDAC 1999). Similar plans have been prepared by Tigray and the Southern region. While the idea of investing in small projects is laudable, the way the government is going about it is misguided. Once the government becomes involved in projects, however small, it tends to set its own terms and conditions, and this discourages user participation and management. As a general rule, the government should not be involved in small-scale irrigation except to provide technical (and technological) and financial support. It should provide the enabling environment to encourage user groups to build and manage their own irrigation schemes.

#### *Institutional Arrangement*

Until the early 1990s, the public agencies involved in the water sector included the National Water Resources Commission (NWRC), Water Resource Development Agency (WRDA), Ethiopian Water Works Construction Agency (EWWCA), Ethiopian Valleys Development Studies Authority (EVDSA), Development Projects Studies Authority (DEPSA), Water Supply and Sewerage Authority (WSSA), Water Well Drilling Agency (WWDA), and Irrigation Development Department (IDD) within the Ministry of Agriculture. All irrigation was the responsibility of NWRC, and the construction of all water project infrastructure was undertaken by EWWCA or international contractors. WRDA was mainly responsible for the design, implementation and operation of large

and medium-scale irrigation projects. In all cases, the end user was the Ministry of State Farms. IDD was entrusted with the planning and construction of small-scale irrigation, which were mostly utilised by agricultural co-operatives. Feasibility studies and planning of irrigation schemes was undertaken by EVDSA (which took over from VADA, Valleys Development Agency) and DEPSA. WSSA's responsibility was water supply services for urban and rural settlements. There was often much duplication of effort among these myriad, autonomous and semi-autonomous agencies and wastage of resources. In the early 1990s, all these agencies were placed under MNRDEP, which ended up making the Ministry a gargantuan monster.

With the creation in 1994 of MWR there is now a unified public agency responsible for water development. However, there is still considerable confusion and uncertainty regarding the Ministry's precise responsibilities and spheres of activity on the one hand, and its relationship with the regional authorities on the other. There is thus indecision and lack of initiative on the part of the Ministry. The decentralisation of water development, which is in place at present and which can serve as a viable alternative to the system in the past, must be based on a clear division of responsibility between MWR and the relevant authorities in the regional administration.

A unified and proactive public agency is necessary if the country's water resources are to be utilised efficiently and in a sustainable way. Such an agency should have the following duties: initiate and undertake studies and prepare broad plans for integrated water resource development; identify areas for public as well as private sector investment; set and enforce standards; and monitor and evaluate water projects. The argument of this paper is that greater emphasis should be placed on smaller irrigation undertakings, which would mean that the decentralisation of water development responsibility is necessary. Small schemes can be planned and managed by the direct beneficiaries at the community level; medium scale projects may be planned and implemented with the active involvement of the *woreda* administration. Rural water supply schemes need only involve the *kebele* administration and the local community. Thus decentralisation of water develop-

ment means that local authorities, by which I mean the *woreda* and *kebele* administrations, should play a more active role in planning and implementation. Decentralisation should also provide greater opportunities to the private sector, which could play an important role in the area of design, supply of technology and construction, as well as NGOs which would be encouraged to investment in small-scale water schemes both for agriculture and domestic use.

### *Ownership and Management*

Yet another issue which has generated a good deal of debate is the ownership and management of irrigation schemes (Sampath and Young 1990). The African experience has been dominated by state owned and managed irrigation systems. In view of this, questions are being asked whether private or co-operative forms of water management are more feasible and more efficient. Private systems are mostly small undertakings that make use of pumps and tube-wells and are operated by the owners themselves; these are, in other words, *individual schemes* (as opposed to group-based or co-operative ones) belonging to and managed by individual households. The technology is relatively simple and affordable, and management is far less complicated. There is a growing body of opinion that argues that private sector irrigation has great potential and should be actively supported (Brown and Nooten 1992; see also Barghouti and LeMoigne). The World Bank is keen to see private schemes expand in Africa and has recently been encouraging governments to create the necessary policy environment.

However, the issue is far more complicated than the proponents of private schemes suggest. Pump irrigation is the only form of irrigation that is convenient enough to be wholly owned and operated by private individuals. The technology, however, is only feasible on land with a sufficient supply of sub-surface water, or along the banks of rivers or lakes. In many instances, private pump schemes are developed close to modern irrigation systems and utilise the infrastructure of these systems. It is thus obvious that the scope of private irrigation is fairly limited. Moreover, as the Asian experience indicates, the unrestricted expansion of private schemes will lead to the depletion of aquifers and the loss of valuable water resources on which many rural communities de-

pend. Private pump schemes employed to get access to water for human consumption have given rise to serious health hazards which are now affecting a wide section of the rural population in some of the countries in south Asia.

### *Integrated versus Sectoral Approaches to Water Development*

We have noted above that water is a mobile resource. We should add here that water is also used for multiple purposes: for irrigation, domestic consumption, fishing, power generation, ecosystem maintenance, and for leisure. The mobility of water and its multiple uses means that water resource issues can never be purely local. There are likely to be a multiplicity of stakeholders with competing interests. Thus a dam built at one point on a river course may adversely affect the interests of domestic water users, livestock herders, farmers, artisans and fishermen downstream or at another point in the river regime. Water resource issues in other words need to be seen from a wider perspective both in terms of space and livelihoods.

In view of this, an *integrated* rather than a sectoral (or local) approach to water development is more preferable. The sectoral approach is not particularly concerned about water mobility and user diversity; it puts greater emphasis on local-level water resource issues and local-level water users' interests. The integrated approach is based on a recognition of the mobility of water resources; it attempts to meet the demands of this mobility and the needs of the diversity of interests involved. Stakeholders' interests may be economic, social, legal, institutional, ecological or cultural; these interests will vary spatially and temporally. The mobility of water resources means that the watershed or water system, and not just the water point, must be taken into account when water development schemes are planned. The water point is the site on which a water scheme is constructed; this may be an aquifer or a location on a river course. But a water point is part of a larger water system or water regime.

Different individuals, households and social groups will have different levels of livelihood/ water resource relationships. Some households depend entirely or mainly on water-based liveli-

hoods, others need water resources for livelihood diversification. But above and beyond that, water is an essential element of household consumption, and lack of access to or poor quality of water will affect the health, productivity and workload of individuals, and, especially women. Water-based health problems have a differential impact on social groups, with the poor, children and women suffering disproportionately from such water-borne diseases as cholera, and intestinal and diarrhoeal diseases. The integrated approach to water development, while it may not provide all the answers, is more likely to address the issues involved in livelihood/water resource relationships much better than the sectoral approach.

#### *Social or Economic Benefits*

Finally, a major question that has attracted a good deal of debate is: what criteria should be used to evaluate water development schemes, especially large-scale irrigation, and what should be the justification for promoting such schemes? The conventional approach relies heavily on economic arguments. Irrigation projects, it is argued, are meant to provide increased *economic* benefits, and in Africa this has often meant the production of more export commodities to earn more foreign exchange. Donors such as the World Bank emphasize that economic efficiency and the economic rate of return should be the main criteria for evaluating agricultural water projects. Economic efficiency is determined by the narrow measure of expenditure and revenue.

However, such a narrow view of the benefits of water development schemes is now being challenged. For countries that are frequently exposed to drought and other environmental crises, where loss of life from food shortages and other disasters is high, the notion of "economic rates of return" makes little sense. In these circumstances, greater weight should be given to *social* benefits, which, because they are very often not quantified, are not usually included in the evaluation of water projects. Water projects should be judged successful if they promote food security, if they contribute to poverty alleviation, increase employment opportunities or in other ways promote rural welfare. These forms of social benefit do not often appear in the economic equation.

In Ethiopia, in particular, which has had a long history of environmental crisis and food insecurity, and where rural poverty is a major concern, agricultural water schemes should be justified on the grounds of increased social benefits. In our condition, therefore, the social criterion for water programmes is much more meaningful than the narrower economic criteria noted above. In other words, agricultural water policy should give greater emphasis to the problems of food security and poverty alleviation. It follows therefore that in the formulation of water development strategy, priority should be given to areas with frequent drought history and areas that are vulnerable to recurrent food shortages.

In conclusion, the new thinking on water resource planning in Africa is, in principle, in favour of a *pluralist strategy* of development. It does not reject large-scale projects, provided that they are thoroughly and carefully planned, taking all relevant problems and issues into account, that they have no adverse effect on the communities concerned or on the local environment, and that their benefits are shared by the surrounding population. However, there is general consensus that small-scale and user-based schemes have greater advantages, are less costly and more sustainable. Such schemes should therefore be given greater emphasis by policy planners. Moreover, the new thinking makes a strong case for community ownership and management of water projects. Finally, the purpose of agricultural water development programmes should be to increase social benefits and to meet critical needs, such as, in our case, food security and poverty alleviation.

### **Stakeholder Participation in Water Development**

In broad terms, stakeholders are defined as individuals, organisations, public sector agencies and donors that are concerned with water resources and have an interest in their development (Le Moigne et al. 1994). The definition can be broad or narrow depending on the kind of water development schemes under consideration. The larger the water project in question, the higher the number of stakeholders involved. The Ministry of Water Resources is the main public body charged with the preparation of studies, plans and guidelines, and the formulation of policies and

strategies for the allocation and utilisation of trans-regional and trans-boundary water resources in the country. The Regional administrations are responsible for the implementation of these plans, policies and strategies within their jurisdiction. There are also a number of public sector agencies, which are in one way or another concerned with water resources issues and activities. If the definition of stakeholder is set broadly, it will include all these public agencies (federal and regional) as well as individuals and NGOS at the local level.

In view of the fact that the focus of this report is on agricultural water projects and rural water supply, and also because of our preference for small-scale and user-based schemes as suggested above, the definition of stakeholder will have to be somewhat narrower. In this view, stakeholders will include water users and their local organisations, NGOs involved in local development schemes, and the relevant branches of local administration. Where appropriate, the private sector may also be considered as a stakeholder. We need to avoid defining the concept too broadly because of the danger of promoting outside intervention in local water development and a top-down approach; this will deny the main stakeholders the chance to have a say in water development activities. The paper thus will focus in particular on water users whom I shall refer to as the *direct* stakeholders to distinguish them from the others that I will call *secondary* stakeholders.

### *Stakeholders*

Let us look briefly at some of the important stakeholders in rural water projects.

*The Community* or direct stakeholders. All too often rural communities are blamed for not taking an active part in water projects, for lacking the necessary technical expertise to run such projects, and for showing a lack of ownership or responsibility. There have been irrigation or water supply schemes that have been damaged and unusable when left to the management of communities. Community participation has become an unpopular word, especially among government agents, because of these and similar reasons.



However, this is a biased view and the criticism is unjustified. First, we must take into account the history of state-peasant relations in this country. Peasants have had ample experience of ill-advised state policies, unfulfilled state promises, and the alienation of individual or community resources by the state. There have been numerous cases where state initiatives have taken advantage of peasants. In the long relationship between the government and rural communities, the outcome has frequently been unfavourable to the latter. Secondly, the approach of government agents in the rural areas has invariably been top-down. Peasants have been given to understand that they are in no position to run development projects, that they do not have the technical expertise to manage them, and that therefore their participation is not needed.

On the other hand, there is ample evidence that there are a variety of local schemes that have been successfully managed by peasants themselves. Traditional irrigation schemes are one good example. Here, communities have evolved simple but effective management structures that involve all the users and that have sustained the schemes for many decades. Another example is community managed pasture and forest resources. In the past, before the radical reforms of the Derg, there were a number of forests that were owned and managed by communities. In each case, there were mechanisms for maintaining the schemes, resolving conflicts, and sharing the benefits. To tap the resources of traditional participatory expertise, development agents have to understand the dynamics of the communities concerned, treat the people as equals and co-partners, and make use of their traditional knowledge. To achieve this, development agents have to win the trust of the communities and assure them that the schemes being planned in their area will benefit the majority of them.

*Community organisations.* Some water development schemes may best be managed by peasants' organisations, such as Peasant Associations, or Service Co-operatives. In some instances, traditional community organisations, such as the *qire'* or *idir*, may be able to play an active role. Peasant organisations could provide the needed management structure at the local level, and can be co-partners with the government or NGOs. However, at present, the

PAs have been dissolved in many parts of the country and have been replaced by the *Qebelle* Administration, which is in effect the lowest unit of the government structure. Although the government's rural policy does recognise the importance of Peasant Associations, the organisations are either inactive or moribund in many parts of the country. On the other hand, the government is encouraging the growth of multi-purpose rural co-operatives. The old Service Co-operatives are by and large inactive, though in some parts of the country they are still functioning. There are at present plans to re-organise and revitalise the co-operative movement. When both these institutions, ie. Peasant Associations and co-operatives, become revitalised, they can become important stakeholders, especially in medium and small-scale irrigation schemes.

*Government agencies.* With the administrative decentralisation introduced as part of the political reforms of the present government, a good deal of water development initiatives, in particular small-scale irrigation, and rural water supply have devolved to the Regional administrations. Decentralisation in this case has advantages and disadvantages. On the plus side is the fact that local authorities will have the opportunity to determine the needs of their areas. The central government is too far away and cannot adequately plan what is beneficial for each local area. Local authorities are placed closer to the people and should be better equipped to understand local needs and priorities. On the other hand, the Regional bureaux responsible for water development are short of trained and technical staff, and there is a lack of clear policy and co-ordination.

The government's involvement in water development in the past has suffered from many shortcomings. There is first of all unnecessary red-tape. Plans are not executed in time, and projects take much too long to implement. Secondly, there has been a lack of technical competence on the part of the implementing agencies. Thirdly, there has been a lack of water policy and strategy, and guidelines on water development schemes and their management have been either unavailable or not clear and comprehensive. Fourthly, as has been noted above, the government has frequently used a top-down approach, and has not made efforts to win the

confidence of the direct stakeholders. Indeed, the strong arm methods used at the time of the Derg and the damaging rural programmes which frequently accompanied water development (such as confiscating community water sources for use by co-operatives, etc.) were responsible for alienating peasant communities. Many of these bad practices are still with us today.

*Non-Government Organisations (NGOs).* As shown above, NGOs have played an important role in water development schemes, especially in rural water supply and small-scale irrigation. According to recent estimates, NGO water activities have benefited about 4 million people, mostly in the rural areas (CRDA 1996). Spring development, boreholes and hand-dug well construction make up the bulk of NGO water supply activities; this has taken up 70 percent of their investment in water. In the irrigation sector, Lutheran World Federation and a few others have invested considerable resources although it is not clear how successful their investments have been and how they have benefited the local population. It is also difficult to gauge to what extent NGO water investment remains sustainable. There is at present no mechanism for monitoring the activities of NGOs in the water sector. While we recognise that NGOs have an important role to play in water development, especially in rural water supply and small-scale, farmer-managed surface irrigation, it is important that the government provide clear guidelines regarding their participation in the water sector. There should also be periodic and independent evaluation of NGO activities and performance in this sector.

*The Private sector.* The private sector at present has a low profile in the water sector. Apart from a few businesses that sell water drilling equipment, there is hardly any private activity in water development. Irrigation and rural water supply schemes do not lend themselves to private initiative, at least in this country. In the Indian sub-continent, private pump schemes are very common, but because such schemes have not been sufficiently regulated, they have over used the sub-surface water sources and this has led to the lowering of the water table with serious consequences. In this country, the private sector can play a role in the manufacture, merchandising and distribution of pumps, tubes and similar equipment, though at the moment its contribution is insignificant.

### *Management and Governance*

There is general agreement in the literature that management is an important element in all water development schemes, determining success or failure. Quite frequently in Ethiopia, planners have emphasised the agronomic, engineering or technical aspects of water projects, and most of the important decisions have been made by technical experts, with little regard to issues of management and beneficiary participation. Moreover, where participation has been tried it has meant peasants following rules laid down by the authorities (or NGOs and donors), and providing labour for rural projects either free or in return for food-for-work. The guidelines may require peasants to set up user bodies and elect officials, both of which have little say in project management. Participation of this sort has rarely involved participation in decision-making or in management. In brief, such practices have proved counter-productive, and have contributed to the failure of many water schemes. If water projects are to be managed efficiently and are to be sustainable, it is important to promote beneficiary participation based on new principles. As a contribution to this effort I shall present an alternative option for consideration.

The principle underlying this option is that the main stakeholders should be actively involved in the management of water projects on the one hand, and on the other in the formulation of the rules and responsibilities governing the operation of such projects. There are two elements involved here, *management* and *governance*. Management refers to the day-to-day operation of projects, whereas governance involves the establishment of working rules and responsibilities, the choice of conflict resolution mechanisms, the selection and control of technical staff, and mechanisms for accountability of users and officials. Government bodies may issue uniform rules that deal with problems common to each category of water projects, but to deal with the specific problems that arise in specific conditions, working rules are necessary. Management is concerned with the routine decisions at the operational level, while governance is concerned with formulating the working rules common to the entire project itself. **The direct stakeholders should be closely involved both in the management and govern-**

**ance of water projects.** Participation in management without participation in governance is of limited import, and will NOT ensure the sustainability of the projects.

Participation is thus on two levels: participation in management and in governance. This will require the crafting of both management and governance structures. Stakeholder participation thus involves the development of effective participatory structures or institutions, and the task of water policy is to encourage these forms of institutional development. Such institutional development is a long-term process that requires patient work with beneficiaries.

#### *Stakeholder Participation in Irrigation Schemes*

If an irrigation scheme is to be sustainable users must be assured of water security and equality of use rights. Water security, like land tenure security, requires that users must have reliable and timely access to water adequate for their needs. Equality means that there should be no discrimination among all users, and those located at the head-end and tail-end of the irrigation perimeter should have equal access at all times. These objectives can be met only through effective and participatory governance and management.

In Ethiopia, as in the rest of Africa, many irrigation projects have proved to be unsustainable. This has usually meant that they have failed to produce the net benefits that planners had set for them. Oftentimes, the projects incur heavy losses and are maintained only because of large state subsidies. The lack of sustainability, especially in government sponsored small-scale projects in Ethiopia, has been attributed to many causes. According to MoA (1992), projects have been unsustainable because of insufficient participation by beneficiaries, and because of insecurity of land tenure. In addition, peasants in irrigation schemes were organised into producer co-operatives, which were allocated more land than they could use. Hence some of the land in the irrigation perimeter remained unused and the irrigation infrastructure deteriorated as a result. Co-operativisation was unpopular with peasants and many were reluctant to invest their labour and energy in the irrigation venture. To these we should add the attitudes of gov-

ernment officials and development agents to peasants, and the working relations of the former with the latter. All too often, state agents harbour strong paternalist attitudes towards peasants. There is frequently a tendency on their part to define the rules and set the guidelines governing irrigation schemes without involving the peasants. State agents invariably expect peasants to uphold the rules and guidelines, and to dance, as it were, to the music played by officialdom. In these circumstances, peasants are reluctant to become participants, and the schemes end up being administered bureaucratically and hence inefficiently.

If the mistakes of past practices are to be avoided, and the effective participation of irrigation beneficiaries is to be promoted, then there should be *transparency* among public agencies and public officials involved in irrigation development. The attitudes and working relations of state agents should inspire confidence and trust among the intended beneficiaries who should feel secure that decisions harmful to their interests are not imposed on them. The democratic process of decision-making and the rule of law should be respected.

The participation of the direct stakeholders in the management and governance of irrigation schemes may be effected in several ways, depending on the nature and size of the schemes in question. In some instances, the PA, co-operative or similar peasant organisation may be delegated to manage the scheme on behalf of its members if the beneficiaries are made up of all or most of the members. This is an unsatisfactory arrangement and may eventually lead to bureaucratic management. Alternatively, management could be entrusted to a body designated by the direct stakeholders, but decisions of a governance nature should be made either in a general meeting of all beneficiaries or through their representatives. The management body may be a committee elected by the water users who themselves may be organised into a water users' group or association. It is important to stress that the nature and form of the institutional structure for both management and governance should be defined by the direct stakeholders themselves. Though I was unable to examine it, WSSA I understand has prepared and distributed detailed guidelines for water committees; this will not promote stakeholder participation, it will only encourage bureaucratic intervention.

There will be social, economic and gender differentiation among the irrigation beneficiaries. Some will be poor, others well-off. There will be female-headed households some of whom may fall in the category of the poor. In some cases, the differences may be cultural or religious. Whatever the causes, differentiation will pose a problem to full and equal participation by beneficiaries. Poorer households, women and marginal groups may be dominated by the more active and the more well-to-do elements. In general meetings, the former elements may not be able to express their views more forcefully and as a result the interests of the active ones may prevail. Elected leaders may take advantage of their position to gain additional benefits. All these could lead to undemocratic practices and discriminatory allocation of water and other benefits.

On the other hand, irrigation could have adverse effects on some groups in the community or among the beneficiaries unless remedial measures are taken. These groups might in some cases be opposed to the projects themselves. For example, in an interview with women during the survey for the Birr and Koga Irrigation Project in 1994, many respondents were not enthusiastic about the prospects of irrigation. They feared that with the extension of the cultivation season that irrigation will require the burden on women would become heavier. To lighten this burden, they suggested, the irrigation scheme should cater to their needs by providing, for example, easy access to basic facilities such as water supply, flour-mills, and fuelwood. In brief, different groups of beneficiaries have different needs, which will have a bearing on the process of management and governance.

These are important issues to take into account in formulating policies on participation. There must be mechanisms for making leaders accountable, for redress of grievances, and for democratic decision-making. In the final analysis, it is through their own efforts that beneficiaries will be able to overcome the problems that will arise and frequent interventions by state agents, which was common in the past and is still common today, will only aggravate the problems.

### *Stakeholder Participation in Rural Water Supply*

As in irrigation projects, user participation has been found to be a significant factor in the sustainability of rural water supply schemes. The available evidence suggests, for example, that boreholes, hand pumps or other water systems constructed by NGOs are more likely to be sustained if they are managed by communities (see Solomon Gebre 1994). In the UNICEF assisted rural water supply schemes, beneficiaries strongly felt that communities should be involved in the management and maintenance of the technologies in use (Alula et al. 1986). Community management was also identified as one of the two key factors in the success of rural water supply schemes by WRC, the other being technology choice (WRC 1993). Without community participation, rural water facilities will not be sustainable, and it would be unrealistic to expect a government agency to manage and maintain such facilities scattered throughout the rural areas.

### *Gender Issues*

One of the factors that makes the case of rural water supply different from irrigation schemes is the strong gender interest that is involved. In most of the rural areas women are the primary water carriers and users. Women spend many hours each day fetching water. Often the sources of their water are unprotected springs, or polluted streams or ponds. By virtue of their household functions they use more of this polluted water than the rest of the household, and therefore they are most vulnerable to water-borne diseases. Thus the development of safe water supply is of particular benefit to women. Access to safe water within easy reach of the household means women can save time, labour and effort, which they can employ in more productive agricultural and income generating activities. Safe water will also mean they and their children will be protected from many water related diseases.

Women should therefore be involved in the planning, operation and maintenance of rural water supply schemes. UN based women's advocacy groups insist that women should have a say in all aspects of rural water supply development. Women should have a say in the choice of technology, and should be trained in the ba-



sic maintenance of the technologies involved (INSTRAW 1988). In our case, community involvement has not been conceived to include planning and choice of technology. It has been restricted for the most part to management and maintenance. The evidence suggests however that while UNICEF and some of the NGOs have made considerable efforts to involve women in water supply schemes, the level of their participation has not been very satisfactory. Due to social, economic and cultural reasons, women tend to be less active in water users groups, and more reluctant to be drawn into them. In part this is because women have multiple responsibilities and have very little time to spare. This problem should be examined carefully, and ways should be found to enable rural women to play a more active role in the management of water supply systems. It is also important to give women the opportunity to have a say in the design of water facilities and in the choice of technology. Perhaps one way of dealing with the problem is to provide a select group of women in each community local-level training on all aspects of water supply, including management and maintenance, during the planning of water supply schemes.

WSSA guidelines state that at least two women should be included in all water committees formed to manage water supply schemes. However, the experience to date is that a few women among many men will inhibit the women from playing an active role. It is therefore important to have all or most water committees made up of women only; in this way, women will become wholly responsible for water supply. An all-woman water committee will enable women to play an active role in the management and sustainability of water supply projects. However, we should note that women's involvement in community responsibilities increases their social and family burden. One of the main reasons why women are reluctant to be involved in community initiatives is that this is an additional responsibility. Without reducing their household burden and the burden involved in agricultural production, it is unrealistic to expect them to play a more active role in water management schemes.

## Conclusion

As was noted above, water development policy should adopt a *pluralist* approach and promote large and small-scale water resource projects. But given our own past experience and the investment resources at the country's disposal, policy should place special emphasis on the development of small-scale projects. It has been noted above that dams, reservoirs and complex canal systems of large projects will take away valuable land, which now supports farming, grazing and forestry. The arguments in favour of this position have been given above, and there is no need to repeat them here. Briefly, they are that smaller schemes are less costly, more environmental friendly, and are free from many of the problems associated with large-scale projects. To these we should also add that smaller schemes can be managed with existing peasant knowledge. Such knowledge should form the basis for progress towards more advanced technical knowledge. In this connection, one important area in which the state can play an active role is research on low-cost and environmentally sensitive water technologies. The state should promote *innovative technologies* that are small-scale, efficient and locally managed. Some of these technologies are already available but others have to be developed.

Water policy should also define investment priorities for water development. This paper argues that the *development of water systems for human use, in particular rural water supply, should be given high priority*. On the other hand, in developing water for agricultural purposes, one should place greater emphasis on considerations of drought mitigation and poverty alleviation. Robert Chambers has argued on the basis of the Asian experience that with sound management and careful planning canal irrigation *can* improve the livelihood of the rural poor (Chambers 1988). There is also a need for comprehensive water legislation. Such legislation should, *inter alia*, define water use rights, regulate water quality and pollution, and set uniform water rates and charges.

Many government officials in the water sector believe that Ethiopia's irrigation potential is vast and that if only this was utilised effectively it would solve the country's food problems. This view is often echoed by international consultants commissioned by

the government to draw up river basin development master plans. How accurate is this estimation? What exactly is meant by irrigation potential? There has been very little discussion of these and similar issues and I believe it is time to examine them seriously and attempt a more careful assessment taking into account such factors as cost, technology and management. Some of the country's rivers flow through very rugged terrain and it would require enormous cost to dam and utilise their waters for agricultural purposes. It is not accidental that most of the existing irrigation schemes are located in the Awash River basin, which, according to one opinion, is the only river basin suitable for large-scale irrigation development (see discussion in Dessalegn 1986: 75-80).

According to MoA, the potential for small-scale irrigation in Ethiopia is 352,000 hectares. This is based on estimations of surface run-off, and the potential from sub-surface water is not clearly known. Assuming a rate of expansion of small-scale schemes of about 5 percent per year, which is an optimistic estimate, it will take 20 years to fully utilise this potential. The case regarding large-scale schemes is more difficult, and progress will be slow. If we take the very high figure of 3 million hectares as the irrigable potential of the country, it would seem at first sight that irrigation would extend the cultivable area by about 20 percent. But this is not true in actual fact. Much of the land that would be brought under irrigation is already used for rain-fed agriculture. The main advantage of irrigation would thus seem to be to enable farmers to benefit by an additional harvest. However, an additional harvest will mean high labour demand, which, under present circumstances, the peasant family will find hard to supply. I believe therefore that even if we adopt a very optimistic scenario, irrigation will not significantly increase the volume of food production in the country. The contribution of irrigation to the country's food needs in the next twenty years will perhaps be in the range of 6 to 10 percent. The main benefit of irrigation will thus lie in mitigating the adverse effects of drought especially in the vulnerable areas of the country.

In the case of rural water supply, there should be greater commitment than has been shown so far by the government to accelerate the pace of progress. Safe water has multiple benefits

which extend into the spheres of health, education, the environment, economic production, and cultural and gender matters. The rural population with access to safe water is now small, and a concerted effort is needed to expand the service to a larger segment of the population within a reasonably short time. The involvement of government, NGOs and communities in this endeavour is essential.

At present, the government has no clear policy on water tariffs for rural settlements. Users often obtain water free of charge though in some cases there is a small fee for the service. In the urban areas, on the other hand, tariff rates vary according to the source of water used, and from one municipal authority to another. However, tariff rates are said to be cheaper in Addis Ababa and the bigger towns than in smaller urban settlements. Moreover, water from home taps costs less than water from public fountains. In other words, the poor pay more for the same quantity of water than the rich. It is believed that water tariffs do not cover the cost of operation and maintenance, nor of the cost of new investments. This argument has been used to justify higher tariff rates. However, there has not been much discussion of the repercussions of such a decision on users, especially on poor households.

With regard to stakeholder participation, the key issue that needs to be borne in mind is that there is **no alternative to community management** of water development schemes. The involvement of the direct stakeholders in the planning, implementation, and governance and management of water resource projects should therefore be clearly spelt out in water policy. The experiences of the past in this country as well as those of African countries have clearly demonstrated that community managed water projects have had a better chance of success than those that were bureaucratically managed.

The goal of water development strategy should be to **forge a partnership** between government and rural communities, between the state and the direct stakeholders so that both support each other in promoting and sustaining water resource projects. The task of making water development a success rests primarily on the joint responsibility of rural people and the state. Government should recognise the potential and autonomy of rural communities.

It should respect the knowledge and experience of the rural population, and employ this knowledge and experience as the basis for the dissemination of new skills and new technology. The breakdown of barriers between government agencies and communities should be part of the process of empowerment of rural communities, and in this, local branches of government (or the secondary stakeholders) have a great responsibility. Easy access of direct stakeholders to state officials, to information, and to needed services will greatly improve the users' tasks of management and governance of water schemes.

Special effort should be made to empower women and to ease their burden of work. The government's policy on women specifically provides that women should participate fully in and benefit from all development activity. It also states that rural women in particular should have access to social services, which includes water services though this is not expressly noted, and ways and means should be found to lighten their work load. Rural women have a much stronger interest in the sustainability of water supply schemes, and they should be provided all the necessary assistance, including technical training, to enable them to be involved in the management and maintenance of the schemes. In the case of irrigation schemes, women headed-households face the threat of marginalization unless such households are represented in the decision-making bodies of the schemes. Other women may also be disadvantaged because irrigation will entail a heavier burden on them. In such circumstances, the empowerment of women should include mechanisms for meeting the special needs of women, and training and assistance to enable them to play an active role in the existing decision-making structures. Water supply programmes should be integrated with all women's community development activities.

Water is a renewable resource: rivers, lakes, springs, and other water sources are all periodically replenished by natural processes. However, this does not mean it is inexhaustible; on the contrary, water is a finite good. Moreover, water is a vulnerable element liable to be easily polluted, wasted or in other ways damaged, with long-term consequences for human livelihoods and the environment. Man-made water regimes should therefore take into

account the natural dynamic of water systems and disturb the delicate balance between water and the ecosystem as little as possible. What is required, in other words, is a *new water consciousness* that recognises that to be sustainable water schemes should be resource friendly, and that water users should have sufficient knowledge and respect for the resource which is so vital for their lives.

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Note: Following customary usage, Ethiopian authors are listed alphabetically by their first names.

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