INTEGRATED WATER RESOURCES MANAGEMENT IN AFRICA: ISSUES AND OPTIONS

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INTRODUCTION

The Economic Commission for Africa recognises water and it's prudent management as a key to reversing the downward spiral in human welfare resulting from a combination of rapid population growth, stagnating per capita food production and accelerating environmental degradation across the African continent. The ECA has specifically created the Food Security and Sustainable Development Division to address these issues.

Background

Africa has over 50 significant water basins spanning nearly all the countries. For 14 of these, practically their entire national territories fall within shared river basins. There are also large inland water bodies such as lakes Victoria, Chad and the Kariba. In Sub-Saharan Africa (SSA), international river basins constitute the principal source of water resources. About one-third of the world's international river basins are found in SSA. Thirty five countries in the region share the 17 major river basins. Furthermore, international rivers also include 11 river basins between 30,000 and 100,000 sq. km. There are a number of important considerations associated with these international rivers that have implications for long-term management of water resources.

Water activities are often split among a number of ministries and departments at the national level. The fragmentation of responsibilities among sectoral ministries and administrative agencies hindered coordination and impeded attempts to integrate water management activities. There is a need for capacity building within institutions to develop financially viable systems, to design policy structures which can respond to economic situations and avoid duplication of responsibility.

Due to many external assistance, the role of national hydrological services are limited i.e. the local water resources engineers and hydrologists activities were reduced to collection and analysis of data with limited resources. As such the Governments should give more opportunities to local who possessed the required technological knowledge and less on long-term technical expatriate support.

Water-related conflicts in the country involve not only competing water claims but also conflicts arising from the interactions between forest, land, and water.

Objectives

The broad objectives of water management cover the utilisation and development of water resources in an efficient, environmentally sound, equitable and reasonable manner in order to satisfy society's demand for water, water-related goods and services, as well as to safeguard the ecological functions of water resources.

The proposed six programme areas for freshwater sector as adopted by the International Conference on Water and Environment held in Dublin, Ireland in January 1992

(a) Integrated water resources development and management:
(b) Water resources assessment:
(c) Protection of water resources, water quality and aquatic ecosystems:
(d) Drinking water supply and sanitation:
(e) Water and sustainable urban development:
(f) Water for sustainable food production and rural development:

Scope

Integrated planning of water resources should involve socio-economic, environmental and technical aspects into a decision-making framewor. Almost all activities which take place in a catchment area and the river basins that could adversely affect the conditions of aquatic ecosystems in terms of water quality and quantity, biological communities and the integrity of aquatic ecosystems are subject to an environmental impact assessment (EIA) in most countries.

Inter-basin transfer could be the long-term solution to drought hazards in certain parts of Africa while ground-water recharge could help in increasing irrigation. Although the benefits that can be derived from regional transfers involving a large number of countries is recognised, there is a need to solve problems of national, bilateral and multi-lateral policy issues, and to enhance co-ordination in the management of the inter-basin water transfer systems.

There are indeed major policy decisions that need to be taken to bring the concept of integrated management of water resources into reality. The four main principles need to be applied in taking action to achieve integrated water resources development and management include;

(a) Freshwater is a finite and vulnerable resource essential to sustain life, development and the environment:

Its sustainable management demands a holistic approach, linking social and economic development with protection of natural ecosystems. close links should be maintained between land and water uses across the whole of a river basin or a groundwater aquifer.

(b) Participatory approach:

involving users, planners and policy-makers at all levels involving raising awareness of the importance of water among policy-makers and the general public. Decisions at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects.

(c) Role of women:

Positive policies to equip and empower women to participate at all levels in water resources programmes is required.

(d) Water has an economic value:

failure to recognise the economic value of water has led to wasteful and environmentally damaging uses of resources.

GENERAL SITUATION

1. **Water resources assessment and availability**

Distribution of water in major parts of Africa is characterised by complex patterns and striking paradoxes which exhibit an abundance of rainfall over the equatorial zone contrasted by extensive and extreme aridity of the Sahara desert in the north and the Kalahari desert in the south.

About 50 per cent of the total surface water resources of the continent are in one single river basin i.e. the Congo basin and 75 per cent of total water resources are concentrated in eight major river basins i.e. the Congo, Niger, Ogoague (Gabon), Zambezi, Nile, Sanga, Chari-Logone and Volta

In Africa, only a minimal amount can currently be used as viable fresh water. Besides, several rivers and lakes have undergone marked reduction in flow rates and surface area. Groundwater wells are also constantly threatened by desertification and their consequent depletion has accelerated the migration of pastoralists into marginal lands. The encroachment of people into forest regions and the indiscriminate clearing of forests has led to soil erosion resulting in the deterioration of water quality and reduction of the storage capacity of reservoirs and their life span.

In the past 20 years, available fresh water resources in Africa have greatly reduced due to severe and prolonged droughts. Water pollution resulting from industrial effluent, urban runoff, sewerage and agro-chemicals are on the increase and continue to deteriorate freshwater quality and affect its quantity. The sharp decline in availability of fresh water supply due to hydrologic, climatic and environmental changes is visible even in the Congo-Zaire basin.

The meteorological and hydrological services in the region are not efficient due to government’s limited budget. As a consequence, there is insufficient data to support water development projects and the development of national plans for water resources management.

Rivers are the main sources of fresh water in the region. However, several of the rivers and lakes in Africa are undergoing a marked reduction in flow rates with Lake Chad facing the most serious problem. Groundwater constitutes about 20% of the total water resources of the continent and provides limited supplies for drinking and for small-scale irrigation. However, in some countries it is the main source of supply.

2. **Water uses and management**

Generally, the major water-consumptive uses in Africa are for agriculture activities and human settlements. However, there has been an increasing use of water in the industrial sectors which is affecting water quality. It is predicted that by the year 2025 several African countries will experience water scarcity. As it stands now, 11 countries are experiencing water stress and 15 countries suffer water scarcity conditions.

The water issue has been marginalized in the development plans of most African countries. At the same time, rapid population growth, expansion of irrigation areas and industrialisation have put pressure on the available water resources

Water and agriculture

It is recognised that there is a need to increase food production in Africa through improved irrigation and water resources management. Africa fresh water resources is primarily drawn for agriculture purposes which represents 85 per cent of the total withdrawal, and this figure varies considerable between the various parts of the African continent. In arid areas, where irrigation plays an important role in agriculture, total water withdrawal is the highest.

In the context of African large-scale irrigation, inter-basin water transfer and high-technology desert-irrigation do not appear to be viable options to solve the problem of famine and food-aid dependence because of the relatively high-cost involved that is beyond the means of most governments.

For developing countries of Africa, a major portion of the needed increase in food production is expected to come from existing irrigated and rainfed lands through increasing yield per unit area and yield per unit of water consumed. FAO's International Action Programme on Water and Sustainable Agricultural Development puts emphasis on increasing water use efficiency through modernisation and improvement of existing irrigation schemes and rehabilitation of waterlogged and salinised irrigated lands

In the drinking water supply and sanitation sector, the Decade (1981-1990) had seen some progress made to provide more of the African population with safe drinking water and sanitation facilities. Notwithstanding some major efforts made by African governments three quarters of the rural population still remain with no access to clean and reliable water sources and less than 20 per cent have sanitary disposal facility. The general situation depicts that there has been a widening gap of the unserved population with water supply in addition to a worse situation in sanitation.

One of the reasons why water resources development in Africa did not progress well is essentially attributed to the low priority accorded to the sector. In addition, even where water

development activities were being undertaken, a comprehensive multi-purpose integrated development approach was not adopted. Consequently, disjointed planning which did not take into account complementary activities has given cause to past failures. Emphasis was often given to hydropower development at the expense of other water development sectors. In fact, the 1988 interregional meeting on river and lake basin development notes that river basin planning has invariably been the prerogative of most energy and irrigation agencies and as such did not encompass other aspects of economic and social dimensions to realise sustainability. Africa's future development orientation should be based on integrated and multi-purpose strategy. This puts the adoption of a comprehensive approach with a balance mix of policy measures including water management, as well as legal and institutional frameworks to serve the sectoral and national development objectives.

Water and human settlements

Urbanisation heightens the relationship between available water quantity and water quality. Cities are faced with mounting cost of water shortages, water treatment, well deepening and development of new sources. They not only have limited means to expand the supply of water and maintain its quality but also need to expand water supply services to meet the ever increasing needs of industry and to support growing population. Consequently there is an alarming widening of the gap between water demand and supply and between consumption and potentially available safe water resources.

While water management policies are essential for economic development and human settlements, policies are not sufficient by themselves: African countries' managers must be provided with the tools and capacities with which to make the policies work. This will require the development of appropriate planning, implementing and management tools as well as the introduction of mechanisms to generate and manage increased revenue for water resource development activities. The availability of professionals who can address such critical areas as integrated water resource planning and management and operation and maintenance of water related infrastructures and services is also a pre-requisite. These will be some areas where African countries should focus on in the next decade.

Sound management of water resources will need to embody the concept of equity and give priority to the satisfaction of basic needs. It is imperative that existing facilities be utilised and maintained to the optimum, so that water losses are minimised and available supply capacities are fully used. There is need to give emphasis to water demand management, through techniques such as water saving, plumbing fixtures, flow control devices, educational programmes and progressive tariffs based on the marginal cost of water. Water resource management must redress the disproportion in investment for water supply and wastewater removal infrastructure. In this context, there is considerable scope for reusing wastewater for a variety of purposes, to the potential benefit of sustainable development practices, subject to social/cultural acceptability of the process.

Resource mobilisation

Four potential sources of funds exist for water supply development programme. These are government budget, international assistance, institutional funding within the country and the communities themselves. The obvious source of funds would be a revolving fund, sustained exclusively by the contributions of beneficiary communities at a level adequate to ensure

reapplication of investments for expanding coverage and for operating and maintaining existing facilities.

Inadequate cost recovery procedures have, sometime, hampered the ability of water supply agencies to become self-financing. The establishment of an adequate tariff structure and of effective mechanisms for assessing and collecting charges is a prerequisite to reverse the trend.

Water tariffs should ideally be established on an incremental basis, where the initial quantity of water to be consumed for basic needs is charged at a nominal rate, but the rate increases with the overall quantity consumed.

Water and ecosystem functions

Dams structures control the volume and timing of water flow and resulted in major disruptions to aquatic habitats, declining fish stocks and significant loss of biodiversity. There is evidence that flooding is worsening in some regions due to excessive canalisation of rivers and loss of wetlands that act as natural sponges. Much of the damage caused by large water engineering projects and misuse of water resources could be reversed, given time, political will and finance. The fundamental problem despite all the effort put into storing and transporting fresh water is the supply solutions which have not kept pace with rising demand. This suggests the need for alternative approaches if future demands are to be met in a sustainable way (Global change and sustainable development: critical trends, UN, E/CN.17/1997/3, 1997).

Pollution issues

Major water pollution include: (i) contaminated water that people drink and that industry uses; (ii) eutrophication of water bodies by agricultural discharges; (iii) contamination of groundwater by nitrates; (iv) chlorinated chemical waste by-products getting into the food chain; (v) heavy metal pollution as a result of agricultural, industrial and mining activities. It is found that for West Africa, virtually all domestic sewage and industrial waste are discharge untreated into the nearest streams.

3. **Problems and constraints**

It is noted that in terms of resource potential, Africa is one of the richest continents in the world and it is well recognised that water resources plays a key role in the social and economic development of African countries. Africa is the driest continent with vast expanses of desert and drought-prone areas. Its varied climatic and ecological zones provide great potential for the production of a variety of crops and livestock development. Notwithstanding some major undertakings in various water development multi-purpose programmes hardly a dent has been made to bring the available water and natural resources to productive use. Thus, the region suffers from gross under utilisation of its water resources potential.

There are many problems constraining integrated water resources use and management. Some major issues are highlighted in subsequent paragraphs.

Population pressure The 1997 population in Africa of 760 million is increasing at an average rate of about 3 per cent per annum, and is expected to reach 867 million by the year 2000. This high population growth rate far exceeds the development pace and is putting pressure on land

and water resources

Water Resources Data Data are prerequisite for water resource development planning, design, operation and maintenance. This aspect while being fundamentally important has not been given the attention it deserves.

Water Scarcity From the regional water picture, it is evident that there are parts of the continent where there is water crisis: (a) on permanent basis because demand is outstripping available resources e.g. North Africa; (b) on seasonal basis, in the dry season e.g. Ghana; (c) because water resources are deficient e.g. Sahel (d) because of persistent or recurrent drought e.g. lake Chad basin, Ethiopia. One or more of the above conditions effects almost all African countries. With increasing population the use of water in agriculture, industry and human settlement the available fresh water resources will be significantly reduced The 1993 Population Action International Study projects that by 2025, fifteen countries in Africa will face water scarcity and another eleven countries will be water stressed. There is a major challenge for countries to launch water harvesting and conservation programmes, minimise losses through improved management and efficient use, recycle used water, develop non-conventional sources, and encourage use of inferior quality of water for irrigation and industry. Where feasible, transfer of water from those regions with excess water to the water-deficient regions can also be an option.

Institutional Aspects

- Co-ordination

Institutions for water resources planning and management have their responsibilities fragmented among various sectoral ministries and administrative agencies has resulted in proliferation of authorities and uncoordinated planning for water development giving way to overlap of activities and waste of scarce resources.

- Comprehensive Water Policy and legislation

The major problem related to lack of co-ordination of water sector activities is partially attributed to the absence of comprehensive water policy accommodating integrated water management in the context of harmonising national economic development plans and water sector plans.

- Water pricing and cost recovery

Water resources development and planning has been the responsibility of governments in several African countries but the governments did not have the financial and institutional capability to install, operate and maintain the water facilities.. This has led to facilities and water infrastructures remaining poorly maintained and even collapsing such that the performance of the sector as a whole remained grim. Despite moves being taken by some countries, there is still lack of appreciation to accepting water in addition to social importance has an economic value which must be treated in all its competing uses. This has affected sustainability as funds for operation, maintenance, expansion and rehabilitation of projects in particular for drinking and irrigation purposes have not been fully recovered. Thus the issue continues to be one of the major underlying problems constraining water resources development.

- Operation and maintenance

In many African countries several projects for water supply and irrigation purposes are not operating as designed. This is to a large extent due to poor operation and maintenance. Many systems lose considerable amount of water through leakage and seepage that would cost money and often lead to further deterioration of systems. Left under such conditions over prolonged time would involve very huge repair and rehabilitation costs or alternatively collapse. This situation remains as one of the major problems particularly in remote areas of rural Africa.

- Human Resources Development

The shortage of adequate human resources with skills and experience in the scientific , technical, economic, financial and managerial functions required for proper conservation, development and management of water resources at all levels has been a crucial constraints to effective performance of most water agencies.

- Regional Co-operation on transboundary basins

Out of 57 transboundary river/lake /groundwater basins in the region, only a handful have some kind of co-operative arrangements having certain degree of responsibility for development of common resources. Even the existing basin institutions have been constrained by some or all of the following: (a) absence of clearly designated and mandated agency to act on behalf of the riparian countries, (b) technical and managerial weaknesses at the level of the secretariat of the basin authorities, (c) inadequate funding by member States of the basin authorities, (d) inability to mobilise external funds for pre-investment studies and for investment; and (e) politicization of the selection of key personnel.

The above being the underlying problems of existing institutions, the most serious problem is the total absence of common co-operative mechanisms on which the development of transboundary water resources for socio-economic development of riparian countries on an integrated and equitable basis could be addressed. As most countries of the region are riparian to one or more river basins and since about 40 per cent of the area in Africa falls within transboundary basins, the problem pervades a large portion of the continent and remains to be a serious impediment to water resources development.

- Integrated Land and Water Management

Lack of proper linkages between the water agencies and economic sectors and the lack of appreciation of the impact of water management on land and vice versa are major causes of ineffective management. The environmental impacts of water and land development on each other have not been taken as integral parts of such development.

Technological Aspects

There are wide ranges of technological options for water conservation, use and management. There are at the same time limitations of know-how and skill, management capability, finance and adaptability. In Africa both the drinking water supply as well as the irrigation aspects of consumptive water uses are constrained by the problems related to technology.

Environmental Degradation

In high rainf all, high productivity zones, increasing land pressure and fragmentation of land holdings have resulted in fertility decline of arable lands. In low rainfall and drought-prone areas, over-grazing by cattle beyond carrying capacity and shifting cultivation by increasing encroachment of marginal lands continue to undermine the already fragile ecological balance. Over the past three decades, Africa's semi-arid lands have come under pressure of people and livestock at a rate considerably faster than the more fertile areas. Consequently, conditions of hunger, and even famine are increasingly becoming evident in these areas as is the occurrence of drought. This has set in motion endemic poverty and degradation of land and water resources, which continue, unabated.

Floods and Droughts

Many parts in Africa are subjected to floods which causes damage to crop, homesteads and cattle. There are recurring floods and peak floods in wet seasons sometime with catastrophic consequences. In 1988 there were serious floods in Kenya, Nigeria, Gabon and Sudan that led to loss of life and dislocation of economic activities. Between February 1989 and September 1990, 26 floods was recorded in various countries in the African continent. The problem necessitates the incorporation of resources development planning. The need to implement soil and water conservation measures in these regions remains indispensable.

Lack of Follow-up

There have been many international initiatives and strategic development approaches which were discussed at various fora like the 1977 United Nations Water Conference, the 1992 Dublin Conference on Water, the 1992 Rio Summit on Environment and Development and the 1995 ECA/WMO Conference on Water Resources Assessment. However participation at some of the meetings and conferences was not at a policy-making level and consequently the issues did not get political support. As a result, there has often been lack of follow-up and implementation of the initiatives for water resources development and management.

PART II. SUGGESTED OPTIONS FOR PROMOTING INTEGRATED MANAGEMENT OF WATER RESOURCES

1. Institutional and legal Infrastructures for planning and management of water resources

The ultimate goal of the Mar del Plata Action Plan (MPAP) of the United Nations Water Conference 1977 was to bring about a better economic and social progress through accelerated development of water resources. This can be achieved by means of appropriate institutional and legal infrastructures set up for orderly administration, planning and management of water resources. The emphasisare on the need for harmonisation of water activities among all national institutions responsible for water affairs and for each country to review the water legislation and enhance co-ordinated planning..

To improve the situation, several countries in Africa including Egypt, Ethiopia, Ghana, Chad, Lesotho have carried out institutional and legal reforms either on their own or forced by circumstances to effect changes. In this respect some countries have strengthened their water institutions , others created new ones like central policy-making and co-ordinating bodies and

semi-autonomous public agencies; others have reassigned functions among institutions and still others have reassigned ministerial responsibilities for water agencies.

Regional evaluation of institutional and legal infrastructures

A study in 1990 on institutional and legal infrastructure reported that the recurring infrastructures existing then at the national level revealed four main types.

(a) Type I: Within this institutional infrastructure, policy continue to be fragmented in various ministries dealing with water and expressed in legal enactments or administrative directives of agencies operating under these Ministries. Examples of this type were in Ghana, Lesotho, Sierra Leone and others.

(b) Type II: In this type of infrastructure there is an overall policy making and co-ordinating body for water under a Ministry which has responsibilities other than water. The Ministry of Water Resources, Forestry, and Fisheries in the Gambia was an example. Others were in Uganda, Zambia and Malawi.

(c) Type III: In this type, a ministry solely for water resources has been set up to direct the policy for planning and management of water resources. Examples were: Burkina Faso, Kenya and Nigeria. Ethiopia was included in this category as of 1996.

Overall policy-making and co-ordinating bodies for giving central direction to water resources utilisation and conservation still are not established in many countries. Demand management mechanisms are weak because of absence of relevant rules and regulations for water allocation . In addition, the service situation lacks sustenance to justify setting appropriate tariffs. There are also cultural, religious and other factors against implementing water tariffs.

Lack of inadequate funds and trained personnel has resulted in unsatisfactory operation and maintenance of water supply and sanitation systems. Mechanism for integrated multipurpose development of river basins as a basis for socio-economic development remains undefined.

The weakness in institutional infrastructure due to inadequate policies and legislation to guide the multi-dimensional aspects of water resources and its consequence in poor management and proliferation of authorities and duplication of efforts continue to undermine implementation of water resources development programmes. The strengthening of water development institutions including the adequacy of policies and planning is indispensable for development in the near future. The priority target for the future must be building up national capabilities for proper planning, execution and management of water programmes.

Water sector planning

The weaknesses; insufficient cross-sectoral harmonisation, and reconciliation with the national development targets at the macro-economic level. The problem of planning and implementation is a major difficulty. Through Structural Adjustment Programmes (SAP) of the IMF and the World Bank provision for indirect opportunity to deal with some of the weaknesses of the water sector plans was given. Consequently, the water sector like the other sectors is being reviewed in terms of objectives, targets, plans and resources in order to determine what can be funded having regard to the national resources, and investment funds that can be expected from external

sources.

Mobilisation of financial resources

It is noted that, in spite of some financial disbursements from the international community, the levels of achievement have been much below what was estimated at the time of the UN Water Conference in 1977.

Human resources development

One of the most urgent training needs for the water sector is in project planning and preparation at the micro-economic level, water resources sector planning and their relation to national development planning at the macro-economic level. There are avenue sto improve the human resources situation at the regional level..

3. **Appropriate technology**

"Appropriate technology" may be defined as a method or technique adopted to provide a socially and environmentally acceptable standard of service or quality of product. From this standpoint, desalination in the North African coastal area and recycling of water are seen as appropriate technology.

For better success to be achieved, there is a fundamental need to consider the building up of the technological capacity within the countries in Africa to solve national problems in the field of water resources development, without undue dependence on imported technology or raw materials. The difficulty is that the technological capacity is not evenly distributed over the region. Special attention is necessary in the techniques of irrigation methods, and in the maintenance and operation infrastructures as well as in the areas of improving irrigation efficiency.

There is a need to establish linkages between research and centres of excellence in the countries of the region is essential. The promotion of inter-country technical assistance programmes within Africa and the countries of the South is necessary to build the internal capacities of less equipped countries in the areas of planning, design, operation of water development projects in the region.

4. **Private sector participation**

Public water schemes have been found to have lower productivity than those developed by individual users or users' groups. The recovery cost operation and maintenance costs is a financial and economic issue. It is unlikely that cost recovery objective will be reached without a formal and effective participation of users in management of the project and experiences in southern Africa have demonstrated the positive influence of this participation (FAO, 1996).

The private sector range from the individual family to small NGO projects and up to large-scale corporate investors. This private sector initiative has been translated into a successful and increased performance of water resources management especially in irrigation schemes. Private agents who manage the entire water scheme or the essential services to water users are free from normal government procedures and thus, are able to apply private sector procedures in the provision of efficient, cost-effective and timely services to farmers. This service-oriented

approach to management has helped to ensure the maintenance and efficiency of water development projects to serve the market and to adjust to change. Besides water management, they are also essential as a source of finance and technical expertise.

Governments are responsible for the provision of basic infrastructure such as roads and private sectors will be granted contracts to develop the remaining of the system. This scenario will only happen if the investments are profitable and secure, thus the necessary political will and investments in infrastructure is needed. This can be achieved by introducing sound macroeconomic policies to promote investments and profitability of water resources development projects and to accompany these policies with a high-quality technical support.

5. **Community participation**

In sub-Saharan countries, there is a decreasing rate in the execution of new water supply and irrigation projects. This is further compounded by the failure of existing schemes because of lack of proper operation and maintenance. As a consequence, communities are without proper service facilities particularly in drinking water and sanitation. Community involvement and public participation could be seen as a way to assist in salvaging this situation in Africa.

Efforts have been made to involve communities in water supply and small-scale irrigation as well as in soil conservation and tree planting activities. Although there are cases with successful results, some did not materialise, mainly because of limited technical and administrative capabilities of the organisers and lack of political support.

The micro-dam project in Ethiopia and the soil conservation programme in Lesotho are good examples of water development activities where communities are heavily involved. Needless to say that the Egyptian experience on community involvement and participation in irrigation and other water development schemes is very prominent. In several countries of the Africa region like Kenya, Tanzania, Uganda numerous water development activities have been implemented with community involvement.

Community participation should be orientated towards making the communities have sense of ownership and responsibility. Involvement of the community in water supply projects and the training of grassroots-level technicians have proven successful in many African countries and has helped to reduce investment costs by about 40 to 50 per cent. In addition, experiences indicate that public participation provides the basis to promote health care and mass education programmes with respect to proper water use and storage practices and also in the areas of management, personal hygiene and human waste disposal. Internal dynamism has to be brought to the task of rural poverty alleviation. It would be a valuable venture for countries in Africa to exploit the skills and creativity of their rural communities and mobilise their participation by activating their productive potential. Self-reliance should be promoted to attain sustainable development in water activities and bring about food security.

Under the prevailing situation in Africa, where there is a remarkable shrinkage of financial resources, increased beneficiary participation can be perceived as a challenge to counter the onslaught of poverty. Where participatory mechanisms at the grass-roots level exist in the form of peasants associations, co-operatives or women groups as is the case in many countries of the regions, these could be used as entry points for fostering participation. On the other hand in countries where nucleus organisations do not exist, bringing together the beneficiary

communities to participate in development projects can develop them. The community should be mobilised as agents of change concerning the proper use of water and sanitation for improved health. Where women are to assume this additional task, it would be necessary to develop mutual understanding and respect between family members. This effort should not be seen as a competition between men and women but rather should develop harmoniously on the part of a community towards working together to the objective of having sustainable development. Such mobilisation of people can be spurred spontaneously or ignited through trained animators.

In recent years NGOs and bi-laterals through community participation have successfully implemented numerous water development activities in many countries in Africa, namely, Ghana, Ethiopia, Lesotho, Kenya, Senegal, Mali, Cameroon, Mozambique, Guinea and others. Varying degrees of success were achieved under diverse circumstances and needs.

Gender Issue

The role of women as the group who are custodians and guardians for food and water requirements for the household should be taken into account by the planners and designers of water schemes.

6. **Partnership**

The role for water resources development rests with national governments. Experience shows that in many African countries the financial managerial and technical capability is unable to support accelerated development of integrated water resources in the multi-sectoral activities. It is noted that water activities are implemented in partnership with external support agencies including United Nations specialized agencies like FAO, WMO, UNICEF, WHO UNESCO, UNEP etc., the donor community and financing bodies like UNDP, WB and the ADB.

The type and degree of partnership and assistance required varies from country to country. It is therefore, necessary for countries to identify their specific areas of need. In this regard, the assessment of indigenous capacity before resorting to external support is essential. It is also necessary for countries to carefully study the impact of partnership and weigh the absorption capacity of technical and financial assistance. The need to evaluate the cost effectiveness of partnership and the possibility of continuing the activity within their own resources after the project phases out is a matter that requires a careful consideration.

CONCLUSIONS AND RECOMMENDATIONS

In most countries, there is a gross under-utilisation or inefficient utilisation of water resources hence there is a need to put land and water resources potentials to productive use. Development should proceed on basis of sound policies and proper planning strategies that take into account the interfaces and interlinkages with the national socio-economic development perspectives. The exercise should seek to achieve cross-sectoral harmonisation and reconciliation with the national development targets at the macro-economic level. It is with this objective in mind that the following general conclusions and recommendations are drawn.

Africa is a region with complex patterns and striking paradoxes of climate, physiography, economy, social, cultural and political features. The countries of the region are at different levels of development. Given such circumstances, it would neither be possible nor desirable to

recommend a single national water development strategy as a comprehensive model. What is obviously lacking is national efforts to develop their own new approaches and strategies suited to their condition in guiding the future courses of action.

The question of maintaining equilibrium on the extent of centralization or decentralization of responsibilities being left for local and national adaptation, there has been a generally successful trend initiated during the United Nations Water Conference in 1977 to designate some national focal point, or centre with responsibility for the management of water resources. This effort should be revived with appropriate resource allocations being provided to enable effective co-ordination and harmonisation of water activities. Another useful instrument to assist in the implementation of multisectoral programmes in a coordinated manner that many countries are adopting as a basic planning unit, is the hydrologic geographical unit or the river basin unit.

Water use efficiency is a subject of concern to majority of the countries. The problem is of particular significance in agriculture and more so in irrigation which has a heavy demand for water. Where appropriate, irrigation development and expansion should take into consideration the possibilities of adapting necessary design and operational factors to incorporate the use of marginal quality of water from effluent or brackish sources into existing and future schemes.

There has been a growing concern in many countries of Africa for the control and mitigation of flood damages and associated disasters. Whereas the causes of flood may be varied, there are strong linkages between land and watershed management in upper catchments, land use policies in flood-prone areas and the costs of flood damages and of its prevention. This obviously places the subject within many national water strategies.

Sub-Saharan Africa suffers most from poor economic performance, recurrence of drought and crop failures which leads to the onset of famine and mass exodus of people. Despite the prevalence of water scarcity in the region, rainwater that is received has mostly been allowed to flow uncaptured. It is therefore, recommended that all countries adopt and replicate successful water harvesting technologies for increasing the command areas of small-scale irrigation in parallel with the larger water development and irrigation schemes envisaged in their national development plans.

Closely linked to the economic difficulties, which several countries in Africa are going through, is a common problem of maintaining water systems in a state matching design criteria and meeting operational and efficiency requirements. This applies to all sectors in particular to drinking water and irrigation infrastructures. Emphasis on rehabilitation of inefficient systems, reduction in wastage and unaccounted for water, recycling and reuse of water, and improved operation and maintenance can be more cost-effective approaches than investing in new services.

The provision and expansion of domestic and municipal water supplies, together with hygiene education is considered to be one of the contributors to the social well being of a community. In Africa, 65 per cent are without water supply service and proper sanitation. To improve this, efforts in the water supply development in both rural and urban areas should accelerated and complemented with effluent treatment and disposal services particularly in the urban centres.

Water is a comodity and the cost of providing water services to userss must be met by the beneficiary communities. In applying the principle of cost recovery or a degree of financial autonomy in a scheme, two important points need consideration. The first is the guaranteeing of

reliability of the supply system for users to accept the principle, and secondly the ability to adjust charges to meet the cost of supply.

With the institutional and administrative changes that have been introduced to keep pace with water management, all countries are discovering the need to adapt their legislation to match more dynamic and more demanding circumstances. Of equal importance to the formulation of appropriate legislation is the need to establish mechanisms to enforce its provisions. Redesign of legislation and the mechanisms for its effective application are invaluable to meet present and future water management needs. The countries need to adopt a comprehensive approach with a balanced mix of policy measures in different fields, including water management, sectoral and macro policy as well as legal and institutional frameworks.

Adequate human resources, with training, skills and experience in the scientific, technical, managerial and administrative functions is essential for the development, conservation and management of water resources. There is need for training in planning, project identification and preparation, project implementation, project monitoring and evaluation. A cost-effective way to train technicians on a continuous basis may be to set up training schools that can train technicians for the various sub-sectors of water.

A promising trend towards a more positive involvement of local communities in the conservation and management of their natural resources and the environment has been observed. This mobilisation of popular participation, with able organizers and appropriate information support, may offer a great opportunity for sustainable management of resources.

The United Nations Water Conference represented a unique assembly of knowledge and experience in all the water related fields. It provided a frame of reference that is still valid. Based on the developments over the years and in line with Agenda 21 there are a number of areas requiring action which should be incorporated in the individual national water strategies.

Increasing population growth continues to set a heavy demand on land and other natural resources and induce conflicting and competing water uses because of changing needs. Environmental degradation is becoming increasingly visible. Basically, the emphasis should focus on the management of land and water as finite resources and on the co-ordination and integration of water, land-use, and population policies for sustainable development.

The weaknesses in the linkages between water sector planning and national planning at the macro level and project planning at the micro level persists. The Structural Adjustment Programme (SAP) which most countries in the region are implementing is putting pressure on them to appropriately relate the water plans with National Development Plans in view of SAP's requirement to balance the internal and external accounts

The meteorological and hydrological services are in urgent need of rehabilitation and expansion. The UNESCO/WMO National Evaluation of Water Resources Assessment activities and the UNDP/World Bank Sub-Saharan Africa Hydrological Assessment have identified actions that should be taken in each country

As a result of the debt burden and economic difficulties of the African countries, investment funds for water projects have diminished. Operation and maintenance funds have either been curtailed or removed under the Structural Adjustment Programme. The flow of external

investment funds has been slowing down since 1983 partly as a result of the difficulties of meeting debt service obligations. The problems call for:

a) the development and introduction of practical measures towards scheme autonomy and cost recovery in conjunction with greater efficiency and reliability of water supply to the various users.

b) increased attention needs to be given and investment funds to be made available to undertake measures to improving water use efficiency and to reducing wastage and damage to natural resources by rehabilitating infrastructures.

A strong emphasis should be accorded to overall planning for drought conditions and to water conservation in water scarce areas and for the mitigation of flood damages.

International support

The international community has been following closely and supporting activities geared to the use and development of water resources in Africa and more so to its implication on the nexus issues of population, environment and food security.

The establishment of a collaborative mechanism to maintain close linkages by means of strengthening the capacity for the management of water resources through the national co-ordinating bodies (National Water Resources Centres) and the corresponding regional and global arrangements and programmes in support of these efforts is central.

Within the United Nations system, global level co-ordination and co-operation is being maintained by the ACC Inter-secretariat Group for Water Resources. The ACC will continue its activities with a more dynamic force injected by the Secretary General's Initiative on Africa. Inter-agency efforts will be concentrated on agreed action programmes concerning water for sustainable agricultural development, water resources assessment, water quality, human resources development, and water resources management, based on the outcomes of the regional assessments carried out for the formulation of the proposed strategy into the 21st century. In fact all agencies have committed themselves to assist African countries in their development programmes for health, household water security and food security that stand high in the Secretary-General's Initiative on Africa.

At the country level, the main issues relating to partnership is the problem of co-ordination and control of the inflow of technical and financial assistance. In order to regularize situations, it is recommended that (a) all external assistance for partnership programmes should be channelled through governments' normal budget and reporting system. Donors/partners should also make every effort to provide the requested information to governments in timely, complete and accurate manner. (b) Governments should undertake a review monitoring and evaluation of their on-going technical assistance programmes and projects for purposes of accountability and cost effectiveness and to determine whether those could be realised within own resources. (c) Governments should strengthen their capacities on the basis of their assessed needs and priorities and take concrete action in terms of training, financial and equipment requirements. (d) A rigorous follow-up technical and financial assistance should be undertaken through an established co-ordinating mechanism.

Human settlements

Supporting a sustainable development policy on water in human settlements should include

1. the promotion of a wide range of technologies that are both affordable and easy to maintain;
2. the establishment of community managed water facilities, with due emphasis on gender focused consultation and involvement in planning, implementing, operating and maintaining facilities;
3. the need for governments to work as enablers and facilitators of services provision, in close partnership with non-governmental organisations, private sector and community organisations;
4. the wide use of information, education and communication strategies to maximize the benefits of basic services; the improvement of methods of recovering the cost of service facilities through appropriate revenue-generation mechanisms; and
5. ensuring the co-ordination of water supply planning with overall human settlements planning as well as with overall economic development planning.

Access to reliable data

Despite problems in finding resources for data gathering, there have been some encouraging signs. As part of the Southern African Development Community protocol on water resources, there was agreement between member States to create a water sector dealing with integrated water planning and development of shared river basins.

Policy Options

Low-income countries with low water stress

Countries endowed with land and water resources may have the opportunity to increase agricultural production and exports in the world market from either irrigated or rain-fed agriculture. Countries with relative water scarcity, and high level of evaporation, agricultural production is possibly best directed into high-value, low water-intensive products.

Some poor countries lack adequate access to what little water they have, and development assistance could help them in using that water wisely. Countries are urged to give high priority to investment for wastewater treatment and reuse, and to formulate and implement pollution monitoring and control policies as preventive and complementary measures to water supply policies.

Low-income countries with high water stress

Water resources will become a major limiting factor for socio-economic development unless early measures are taken towards restructuring production and consumption patterns away from the wasteful and low-value water-intensive uses. Achieving sustainable use of water resources for most countries in this category will require that per capita water use decreases as population increases.

Countries are urged to give highest priority to the formulation of economic and regulatory measures designed to increase irrigation efficiency and optimize water allocation among various uses.

Countries should increase wastewater treatment and reuse, and should control pollution from agricultural chemicals through land management and integrated pest management measures.

These countries may need to adopt the following strategies:

(a) to develop educational and information infrastructure necessary to improve the skills of the labour force required for the industrial transformation that needs to take place; the case of Mauritius can serve as an example in this regard;

(b) to shift to more high-value, less water-intensive crops, and develop the associated agricultural industries to process more of the products, thus raising the value-added components in their countries.

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ABBREVIATIONS AND ACRONYMS

ACC	-	Administrative Committee on Co-ordination
ADB	-	African Development Bank
DIESA	-	Department of International Economic and Social Affairs
DTCD	-	Department of Technical Co-operation for Development
ECA	-	Economic Commission for Africa
EIA	-	Environmental Impact Assessment
ESA	-	External Support Agencies
FAO	-	Food and Agricultural Organisation of the United Nations
IAP-WASP	-	International Action Programme on Water and Sustainable Agricultural Development
IDA	-	International Development Association
IDWSSD	-	International Drinking Water Supply and Sanitation Decade
IFAD	-	International Fund for Agricultural Development
IMF	-	International Monitory Fund
KM	-	Kilometers
MM	-	Millimetres
M^3	-	Cubic Meters
MPAP	-	Mar del Plata Action Plan
MW	-	Mega Watts
NGO	-	Non-Governmental Organisation
SAP	-	Structural Adjustment Programme
SSA	-	Sub-Saharan Africa
UNCHS	-	United Nations Centre for Human Settlements (Habitat)
UNDP	-	United National Development Programme
UNEP	-	United Nations Environment Programme
UNESCO	-	United Nations Educational Scientific and Cultural Organisation
UNICEF	-	United Nations Children's Fund
UN System	-	United Nations System
WB	-	World Bank
WHO	-	World Health Organisation
WMO	-	World Meteorological Organisation