

COMMITTEE V

Problems of Third World Development:
The Case of Africa

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WATER FOR DEVELOPMENT IN AFRICA

by

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In recent times, it has become common place to categorise the pressing problems of Africa to be poverty, famine, disease, over-population, to which is often added - deforestation, desertification, violence, misrule, lethargy, apathy, corruption, under-education, lack of good leadership - and an incredible list of many others with which Africa now tends to be labelled.

Against the background of the special interests of the ICF (International Cultural Foundation), it would seem appropriate that, in a discussion on Africa, at an International Conference on the Unity of the Sciences (ICUS), thought should be given to these development problems which affect the well-being of so many people, and solutions considered within the context of science as a tool for development. It is also relevant to focus attention on the subject of water which is linked, directly and indirectly, to most of the serious development problems which detract from economic and social progress.

Although recent unreliable rainy seasons and unrelenting droughts have somewhat drawn attention to the serious water problems of the Africa Region, the crucial importance of water to development, in the current situation of Africa, is still not sufficiently acknowledged. It is a fact that, water a vital environmental resource, is as indispensable to the well-being of a people as it is to the maintenance of the satisfactory quality of the environment which supports them.

More than any other environmental resource, water is of major significance in the development process: the sustained availability of water and its efficient

utilisation have a direct functional relevance to the improvement of agriculture, adequate food production and the prevention of famine; the effective management of water resources prevents the spread of certain infections and therefore contributes to the protection of people from some community diseases; the failure of rains and prolonged droughts are common features of the destruction of catchment areas and of the complex process of desertification. With a bit of imagination, even high birth rates and over-population can be seen to relate to severe demands for water and other basic human needs.

These are the big issues. But the little issues are as serious as they are dramatic. The fact is that, domestic and drinking water, an abundant environmental resource and an essential life-supporting commodity is unavailable, on a continuing, basis to a large proportion of mankind.

Water in economic and social development.

It is a fact of history that water, since ancient times has been managed for development and prosperity. Major rivers, the Nile, Ganges, Tigris and Euphrates, among them, contributed to, and directed the course of civilisation. Their subsequent mismanagement and the corresponding decline of economic and social progress testify to the important role which they played in development.

The demands placed on water in the development process are complex. Therefore, the efficient management of water resources is an essential pre-requisite for the utilisation of water to satisfy the various activities for which it is required. For the agriculture-based economy of Africa, water is an essential resource for irrigation as well as for rainfed farming.

Inland fisheries and aquaculture to provide protein, lake and river transport, so vital for land-locked countries (and there are 14 in the Region), hydroelectric power production, indispensable for countries without fossil fuels, mining, and even the simplest of industrial processes, all contributors to a sustained economy, depend heavily on water. Safe water supply and human waste disposal systems are also of key relevance to economic and social development and protection from diseases. No where in the world is the face of poverty so horribly bared as in communities where people are dusty and unwashed and unkempt. Such an experience of human misery diminishes us all. And yet, water, suitably applied, restores the dignity of mankind even to the poorest of human societies.

Problems related to water in development are not emerging into world consciousness from Africa and the non-industrialised regions for the first time. They have been faced, at some time in the past, by most countries in other regions, no matter their current status. The world has subjected the problems to study and, in most cases, found sound scientific solutions, implemented them and gained relevant, applicable experience for dealing effectively with them. Current constraints in applying the experience in the Africa Region would seem to lie in the formulation of suitable strategies and their implementation.

The Water Resources of The Africa Region.

In terms of the availability of water for development, Africa would seem to be richly endowed. In the world context, Africa has the Nile, the longest river, the Congo, the second largest river in terms of drainage area; Lake Victoria, the second largest lake, in area; Lake Tanganyika, excelled in depth

only by Lake Baikal; a chain of Rift valley lakes, and a series of large artificial impoundments.

But this picture of opulence in water resources is deceptive because Africa also has the vast Sahara desert and the Kalahari both of which have neither surface waters or precipitation. This uneven distribution of water resources is further complicated by the fact that 50% of the surface waters are in the Congo basin alone. Also, 75% of the water resources lie in the 8 principal river basins. And, in further contrast to the equatorial zone where annual precipitation is high, the extensive arid and semi arid lands are subject to periodic and prolonged, severe droughts.

The Africa continent lies wholly in the sun belt. Not suprisingly therefore, it has the world's highest level of evaporation. The coefficient of river run-off is the lowest among the continents with much of the annual precipitation lost to seepage and evaporation.

Ground water is not sufficiently documented. But there is evidence of groundwater aquifers in all regions. National quantitative estimates are few. Sudan is believed to have 1,564 billion cubic meters of which 146 cubic meters are extracted annually. Information on recharge is similarly scanty but it is estimated for Botswana to be 3150 million cubic meters with an annual withdrawal of about 18 million cubic meters. In coastal areas, salt water intrusion is a serious problem.

On the whole, from data available, which is far from complete, it would seem that the continent, with a drainage area of about 16,873 thousand square kilometers has a mean annual run-off of 2,440,349 million cubic meters.

From a comparison with the water resources of the other continents, it is quite clear that the availability of water per unit area is the lowest and there is more land than there is water.

This fundamental set-back contrasts sharply with a feature of advantage which is generally taken for granted in temperate zones. There, the fall of snow in winter regularly guarantees moisture for plants to emerge in the spring and continue growth into the summer and the autumn. The significance of the phenomenon and its essential relevance and contribution to the continued greening of the land is barely appreciated and acknowledged.

In the Africa situation, the converse is the general and one cannot help but notice the effect. In Sub-Sahara Africa, over the period equivalent to the winter of temperate regions, the dry harmattan winds suck all moisture from the atmosphere and the land. Under such a condition, not only crops, fodder and vegetative cover are threatened, but also the top soil is endangered by erosion and possible loss to the winds.

These constraints notwithstanding, the unevenly distributed water available in the Region has to respond to a complex of demands. Seen against such a complicated background, the agony of droughts and the threat of desertification from activities which are sometimes unavoidable, if life is to continue should perhaps be better understood by those who do not go through the experience.

Droughts and deserts.

Drought, the prolonged failure of the rains, is an expression of climatic systems and weather variations. It creates an atmosphere which enhances the

chances for desertification as a result of the negative effects of overgrazing, over-cultivation, and the de-vegetation of the land. The subject deserves to be noted in any discussion on water in the Africa Region.

Deserts are not new . The world has always had deserts in both the southern and northern hemispheres. The Sahara of Africa is only one of a series of deserts which include the deserts of Iran and the USSR, the Arabian desert, the Rajasthan of India and Pakistan, and the Takla-Makan and Gobi deserts of China and Mongolia. The Sonoran desert of NW Mexico stretches into South West of the USA. South America has the Atacama desert, the Kalahari is in Southern Africa, and, of course, the continent of Australia is mostly desert.

These natural deserts are no longer sensitive to the vagaries of inadequate rains and droughts. It is the arid and semi-arid areas adjacent to them that are gravely threatened. It is estimated that there is a total of 30 million square kilometers, 20% of the earth's surface that is arid and semi-arid land. It is the home of 600 million people in the USA, Canada, Mexico, South America, Africa, the Mediterranean region, India and Pakistan, Australia, China and Asia. Droughts are not limited to Africa but the effect in the Region tends to be very harsh. The 1982 drought experience affected the water levels of the Volta and Kainji Lakes and severely interfered with electric power production. It also created conditions which favoured bush fires and, forests and many cocoa and coffee plantations were destroyed. But, barely six months ago, drought also destroyed crops and livestock in southern USA.

Water for Agriculture and food production.

It needs to be understood that much of the food production in the Africa Region is carried out by small scale farmers on a subsistence basis. The

farming is largely manual and not mechanised; there is hardly any subsidy for fertilizers and other inputs, and the land which is cultivated is not particularly fertile. Cultivation, except perhaps for some water-based crops is totally rainfed, and upland rice is widely cultivated. This dependence on the rains automatically limits the number of crops possible in a year.

In contrast, and as a legacy from colonial times, much of the fertile land is given to large - scale cultivation, often subsidised, of cash crops. The cultivation of these crops - tea, coffee, cocoa, cotton, rubber, sugar cane, sisal - which did not contribute to the food that the people could eat, was vigorously encouraged and supported. The products were exported to the mother countries of the colonial powers. Much of the land continues to be covered by cash crops now needed for foreign exchange transactions. This dilemma over priorities in the use of available arable land for agriculture exists even now. Recently, in Ghana, with the fall in the price offered to farmers for sugar-cane, some have converted their land to farm rice.

It is rather interesting that to assist with the rehabilitation of the drought-stricken semi-arid regions of West Africa, aid projects concentrated again on a similar strategy of farming cash crops - cotton, (144,000 ha in Southern Chad), groundnuts, (400,000 ha in 1970 in Niger). However indications are that the trend is being reversed but there has been some concern over large areas, irrigated under aid which are no longer productive because of salinisation.

Traditional experience exist for the cultivation of the semi-arid zones of West Africa. The practice of shifting cultivation, guaranteed that the used land had a period of recovery. Traditionally also, much of the arid areas of the Sahel region were reserved for livestock which were moved around according to the

region were reserved for livestock which were moved around according to the distribution of seasonal vegetation. Such crops as were cultivated, including sorghum and millet, were selected for their resilience to the harsh quality of the land and their tolerance of scarce rainfalls.

Water and irrigation.

Irrigation is one area of agriculture where technology and techniques are well advanced. Africa is yet to enter this field for increasing food. It is estimated that the total area of irrigated land is about 8 million ha. Information available indicates that of 24 countries studied, the irrigable area varied from 28.4 thousand ha. to 1,500 thousand ha. The irrigated area itself was very small. The largest areas were in Egypt (2,940 thousand ha.), and Sudan (1,895 thousand ha.) Nigeria with a potential of 5,000 thousand hectares, Ghana, (1,200 thousand ha.) and Ethiopia (1,818 thousand ha.) in 1970, had only 20 thousand hectares 11 thousand hectares and 80 thousand hectares respectively under cultivation. Records indicate that South of the Sahara, only 2% of the cultivated area is known to be irrigated. From data available, it seems that only 7% (2,110,000 square kilometers) out of the total land mass of Africa (30,310,000 square kilometers) is arable land. Nevertheless, it is believed that the irrigated area can be tripled. In this connection, water management, and especially, drainage will require much attention. The bottleneck will be the cost of installing the physical infrastructure. Much of the science and technology needed already exists in the experience of others. For the Africa situation, water resources would need to be more accurately assessed, and particular attention paid to water-related parasitic diseases.

The proliferation of irrigation schemes and dams which are associated with them in endemic areas increases the potential for the spread of water-related diseases, such as schistosomiasis.

The impoundment of a river into a dam changes the riverine ecology and makes it possible for a variety of invertebrates, including aquatic snails (*Bulinus* spp. and *Biomphalaria* spp.) which are intermediate hosts in the transmission of schistosomiasis to become established. It then only needs an input from an infected person for a transmission site to be set up. The slow-flowing waters in weedy irrigation canals support similar fauna. If widespread irrigation is intended in an endemic area, the prospect of the possible introduction of schistosomiasis into the area should not be overlooked.

Planners of some past irrigation schemes, while providing large quantities of water for the crops to be irrigated completely ignored to do the same for the human workers. Because of the dependence of the workers on irrigation canal water for domestic and personal needs, the water soon became contaminated, and infection, widespread.

Worldwide, 200 million people in 74 countries are infected and 600 million more are at risk. Because it is a community disease, and mass treatment is necessary, it is difficult to control schistosomiasis. Studies over the years have indicated that an integrated strategy which combines water supply, waste disposal, reduction of contact with transmission sites, communication, and health education, among others, stands a good chance of success. In recent years, new drugs have shown promise and community awareness of preventive measures is improving.

On the Gezira irrigation scheme of Sudan, schistosomiasis became intense over the years. Through the Blue Nile Health Project, a multidisciplinary programme has been launched for control.

Energy from Water.

Over two decades ago, large dams were constructed on four major African rivers, the Nile, Zambezi, Volta and Niger for hydropower production. Since most countries in the Region do not have fossil fuel deposits, hydro-electric power generation has become a common substitute to meet energy needs. Zaire, Morocco, Algeria and Zambia each has more than eight projects in operation. There has been a considerable increase in the contribution of hydropower to the overall energy needs of the Region. Currently, Ghana exports electricity to neighbouring countries. Africa is estimated to have about 35% of the total world potential for hydropower production although the current installed capacity is only about 6%.

A major concern over the large hydroelectric projects has been the spread of schistosomiasis, malaria and similar water-related diseases which have become associated with them because of the influx of infected people into their basins. However, on the Volta dam, the destruction of the habitats of the aquatic stages of *Simulium damnosum*, the fly which transmits the worm responsible for onchocerciasis in the West Africa region has been a welcome bonus.

Water and fisheries

The potential for fish production from the water resources on the continent has

recently encouraged much aquaculture activities. But both the natural and the artificial lakes are also productive. Soon after the completion of the Volta dam, for example, the lake had over sixty species of fishes belonging to several genera. They were mostly species which had adapted to the changing ecology and included cichlids, characids, a large population of clupeids, Clarias, Alestes, Synodontis, Labeo, Lates species. Lake fisheries soon became established on commercial yields of a variety of freshwater fish including Lates and Tilapia species. In the years following the impoundment, extensive studies and research were carried out to find a suitable basis for the management of the fisheries.

Lake Victoria has been long known for its yield of large specimens of Lates niloticus and enormous quantities of Tilapia which are harvested regularly by the countries bordering it.

Inland waterways.

A further benefit contributed by water bodies to development is their use as waterways. The lakes and major rivers of Africa are reasonably navigable and are constantly in use, transporting people, agricultural products fish, timber petroleum products and other articles. Lake Victoria is reported to carry about half a million tons of shipping annually. Lakes Malawi and Tanganyika provide valuable links for land-locked countries. River Niger receives much of the agricultural products from the countries through which it passes. Nigeria has a 7000 kilometer of waterways which used to carry about 300,000 tons of cargo annually. and the Nile and several rivers in Cameroon and the Central Africa Republic are kept equally busy. But the Congo has the most extensive

transport system (13,000km) in the Region. Ghana and Egypt have established a viable transport system on the man-made lakes, Volta and Nasser respectively.

Water for industry.

Many of the industries in the Region make demands on water largely for the removal of wastes and effluents and they tend to be sited near water courses. Of concern, therefore, is the potential for gross contamination of surface waters by discharges from factories and plants including textile mills, pulp and paper plants, breweries, fruit and vegetable processing plants. Exact figures for the amount of industrial water consumed and the effluents discharged in the Region is not readily available. However much of the contamination of surface waters comes from sewage. Mining activities also use up a great deal of water in the cleansing and washing processes. Some serious contamination of rivers by wastes from iron mining has been reported. It is therefore encouraging to learn that much of the wastes from copper mines in Zambia are subjected to treatment before discharge.

In recent years technologies have been developed and used to treat waste before discharge into rivers. Where rivers have been polluted from long term misuse, in other regions, strategies have been devised to clean them. The examples of the Thames, Rhine and the Seine are available to provide needed experience.

Water and Deforestation.

Deforestation provides a ready example of resource degradation. The denudation of the land heralds severe soil erosion and upsets the flow of rivers. The danger to forests lies not so much in the the cutting of trees for firewood and

charcoal production as in the removal of large trees for exported timber. That type of activity opens up the forests for further exploitation of the land for other activities including farming.

Firewood and charcoal constitute the chief source of domestic fuel in the Region. Until an alternative and more convenient source of fuel, is found, the sober fact is that the forests will always be at risk. However fast growing fuel plants may be, they may not be enough to satisfy demands although they have the advantage of preventing soil erosion. A long term approach would be to encourage research into the use of solar energy, which is abundant in the Region and, really, inexhaustible, at the practical level. Politics notwithstanding, the effective use of solar energy would be a contribution to a realistic way of protecting the remaining forests which the whole world needs for a good environmental quality.

The destruction of forests over centuries has been widespread, world wide. The practice formed the basis for several well established agricultural practices. But the attraction of wood for its own sake has also been very strong in the past. Were it not so, perhaps the cedars of Lebanon would still be abundant. However land use malpractices present the greatest danger to forests and the retribution of deforestation has always been swift and severe as indeed has been seen in several parts of the Region.

A permanent reminder for the world should always be reminded of the sad experience of the USA in the 1930s. With increased mechanisation of wheat production, farmers on the Great Plains had to cut down their fallow time and move into cultivating marginal lands in order to make enough to keep up their payments. With the deforestation and over-cultivation, the land could not stand

two seasons of drought. And, in 1934, a rising wind carried away with it, 350 tons of dust the topsoil of the degraded farming lands of Kansas, Montana and the Dakotas.

Water for domestic supply.

All human communities have access to some form of water supply, otherwise they would not survive. In the Africa Region, the situation is far from satisfactory, especially in the rural areas. Governments, with outside help, have invested a great deal of effort and resources to improve water supply, but, the change is slow because of the sheer numbers of the people to be served. Of course, one cannot help but regret that a firm foundation was not laid and long-term infrastructures installed by the colonial powers at a time when populations of the countries were reasonably manageable, as had been done in the early days of the development in their own countries

The concern over water supply in the Africa Region centers around a number of issues. First, there is the uneven distribution of water sources and precipitation which means that some communities obtain limited amounts of water only by travelling long distances. The water is, even then, often of uncertain quality. Secondly, some of the supply strategies which have been followed in the past to improve domestic water supply have not been particularly effective or long-lasting in spite of the large sums expended on them.

A recurring feature of the rural domestic water supply drama has been the taboo against the use of surface waters, which are often labeled 'impure', by the experts, in contrast to ground water which is generally considered to be 'pure'.

They have been persistently ignored in favour of ground water. Perhaps with surface waters constantly under threat of contamination from industrial and agricultural waste and sewage, this reaction is understandable. The general principle is that surface waters cannot be used unless treated and, with the high cost of treatment processes, the number of people to be served has to be sufficiently high to justify the cost. However within the context of the constraints on water resources in the Region, it would seem that the place of surface waters as rural supply sources, however controversial the subject might seem needs to be re-appraised.

The fact is that , at least in most parts of the Region, rivers and streams constitute the most common sources of domestic water. There are situations where ground water is the only available source of water. and, that makes current projects to improve hand-pumps for raising water most relevant.

Indeed the siting of rural settlements is commonly determined by the nearness of streams and rivers. And yet, there is hardly any evidence of an outbreak of water-related epidemics or mass deaths from the use of such river water, by generation after generation of rural communities for water supply.

Nevertheless, implementers of water supply improvement projects would substitute bore holes to supply the people.

The fact is that, the domestic water supply problem in rural areas is not so much that the water available is 'impure' but simply that - there is never enough water at home for drinking, personal hygiene and domestic purposes.

A little reflection should show that there is an urgent need for the experts to

reconsider the position of surface waters as sources of domestic water supply, assessing each supply source on its own merit, so that water can be made readily available in adequate quantities, at home. Scientific studies have provided us with simple and low-cost water treatment technologies for improving the quality of the surface waters so used.

Certainly, an improvement of the quantity of water at home, could contribute to the prevention of some water-related infections. An essential role of domestic water supply, it should be recalled, is assist with the prevention of several water-related community diseases.

Infection with the diarrhoeal diseases which kill millions of children under five, annually, is overwhelmingly due to the ingestion of pathogens - viruses bacteria, protozoa, helminth eggs - from fecal material where sanitation is unsatisfactory and domestic water is not adequate in quantity. The pathogens enter the body through dirty and unwashed fingers, hands, pots and pans, clothes fruits and foods. Infection through drinking water is itself minimal.

It needs to be repeated that and constantly borne in mind - for much of the Region, getting water to people at home or close to home, in adequate quantities and on a reliable basis lies at the heart of the current rural water supply problem.

The important place of water in all aspects of the economic and social development of the Africa Region does not need emphasis. Efficient management of existing resources is essential to assure optimum benefits. Therefore,

there is need for planning as well as for capital inputs. Basic supporting

information becomes a pre-requisite for such an exercise. For example, there should be an accurate assessment of available surface waters and the distribution, quantities, extraction and recharge levels of ground water as well as the quality of both sources of water. As regards domestic water supply and waste disposal, a great deal more can be done through support for community initiatives, efforts and activities. For the use of water in irrigation to improve food production, the efficient removal of excesses of water, through drainage, is an important management factor. Fortunately, appropriate schemes and techniques such as sprinkler and drip irrigation devices are known. Where rivers are impounded to hold water for development activities, adverse environmental effects should be anticipated, and as much as possible, forestalled.

Science has answers to many of the problems related to water management. The essential factor remains how they can be effectively applied to the development process.

Apart from scientific knowhow, the availability of supporting financial resources should be a major consideration. In industrialised countries where agriculture for food production seems to have been greatly assisted with subsidised inputs, farmers yields have been very satisfactory. Especially, under the conditions of water and land constraints of the Africa Region, to undertake farming which would yield enough to prevent famine as well as protect the land for sustained use, farmers would need substantial help in the form of subsidised inputs, such as fertilizers, improved seeds, as well as suitable techniques to apply them effectively. Harvesting, transportation of products,

storage and marketing for instance, which may be relatively straightforward elsewhere, can be serious bottlenecks in the activities of farmers.

The root causes of the development problems of Africa and other developing regions are deep. They go beyond the better management of water, land and other natural resources. They require more than the capabilities of science, the wisdom of philosophies and fervor of religions to make any substantial impact. In the current materialistic aspirations of the world community, the way forward can be based only on a firm belief in ethics, morality and justice, plus - a rejuvenation of faith in the finer qualities of humanity.

And, it is the human being alone, suitably tuned and sufficiently compassionate, who can take that responsibility.

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