

**CHANGING TRENDS IN WATER POLICY FORMULATION IN NIGERIA:
IMPLICATIONS FOR SUSTAINABLE WATER SUPPLY PROVISION AND
MANAGEMENT**

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ABSTRACT

After almost sixty years of water resources development in Nigeria, it is regrettable that only 60% of the population has access to safe drinking water, and in rural areas less than 50% of the households have access to potable water. This has very serious implications for the economic development and social welfare of the people specifically and the country as a whole. First, there is the tremendous economic waste involved in people spending so much time and effort in search of water. Secondly, lack of water often means relatively low levels of personal hygiene and environmental sanitation. Thirdly, because water is needed for most productive activities, inadequate access to water limits the livelihood options of the people, particularly in rural areas. In recognition of the poor state of water management in the country and its implication for socio-economic development and environmental sustainability, the present democratically elected government has prepared a new national policy on water resources development. One cardinal objective of the policy is to provide potable water for the entire population at an affordable price. This study reviews the changing trend in the national policy framework for water resource management in relation to the motivation for policy design, knowledge capacity building, and the degree of compliance with the new principles and approach in Nigeria. The study also assesses the implication of the changing trends in policy implications to sustainable water provision and management in the country.

Keywords: Water policy, Water supply, Environment, Water resources management, Indigenous technology

INTRODUCTION

Nations, the world over, strive for studious planning, development and management of resources in order to meet the basic needs of people, over time, to live and maintain a life which is decent, healthy and respectable. These needs are in the areas of calorie and protein intake i.e. food in terms of quality and quantity wholesome water for domestic, industrial and other uses. The United Nations has defined the minimum levels of these basic requirements, which express decent, healthy and respectable life. A country's socio-economic development efforts particularly Nigeria could, therefore, be assessed against these minimum levels of basic requirements (Handidu, 1990).

In the last decade, particularly in the last half of the decade, the issue of sustainable water resources management has attracted the attention of the international community and policy makers in Africa. The issue of water resources management was for example addressed at the Millennium Summit (2000) which produced the Millennium Development Goals (MDGs), the World Summit on Sustainable Development (2002), the 3rd World Water Forum in Kyoto (2003), the Africa Ministerial Council on Water, and the programmes and actions articulated under the New Partnership for African Development (NEPAD) framework.

The new emphasis on water resources management in Africa is coming with a shift in the principle and approach to the management of water resources. It is now recognised that water is a commodity of strategic importance because of increasing demands and rising costs, coupled with diminishing supplies (Sharma et. al., 1996). Furthermore, it is recognised that it is no longer feasible in a long-term, cost-effective and environment friendly manner, to increase water supply by building additional dams and conveyance systems, sinking new wells, constructing desalinisation plants, etc. In addition, it is now recognised that solutions must be found at the user-end of the pipe, that is, improving water use productivity, reducing conveyance losses, reusing water and optimising allocation (Sanstrom, 1997). The underlying principle is that water is a scarce good with dimensions of economic efficiency, social equity and environmental sustainability. Therefore, it has both public and private characteristics, and hence there is an important role for public and private participation in efficient management and development of water, particularly communities that use water (Sharma et al., 1996; Karikari, 1996).

After almost sixty years of water supply development in Nigeria, it is regrettable that only 60% of the population has access to safe drinking water, and in rural areas less than 50% of the households have access to potable water (National Millennium Development Goals Report, 2005). Rural people in the country still depend very much on rivers, streams, ponds, and shallow wells for their water needs. During the dry season, some of these sources dry up and households have to invest a substantial amount of their resources to get water of doubtful quality. This has very serious implications for the economic development and social welfare of the people specifically and the country as a whole. First, there is the tremendous economic waste involved in people spending so much time and effort in search of water. Secondly, lack of water often means relatively low levels of personal hygiene and environmental sanitation. Thirdly, because water is needed for most productive activities, inadequate access to water limits the livelihood options of the people, particularly in rural areas (IDRC, 2002).

In recognition of the poor state of water management in the country and its implication for socio-economic development and environmental sustainability, the present democratically elected government has prepared a new national policy on water resources development. One cardinal objective of the policy is to provide potable water for the entire population at an affordable price. To achieve this objective, there is need to better understand the constraints and challenges of water supply in the country. Apart from addressing the issues of participatory governance, cost recovery and appropriate technology, there is also a need to take into consideration the values, attitude, preferences and capacities of the different stakeholders in the supply and management of water in rural areas. The new integrated approach to sustainable water supply requires greater knowledge and understanding of the technological, social, economic and ecological dimensions of water resource management and how they are inter-related. Developing the capacity to engage in integrated sustainable development planning from the community level to the highest national decision-making level, remain a major challenge in Nigeria and many other African countries.

This paper provides a review of the changing trend in the national policy framework for water resource management in relation to the motivation for policy design, knowledge capacity building, and the degree of compliance with the new principles and approach and the implications of this for sustainable water supply provision in Nigeria.

LITERATURE REVIEW

The challenge of sustainable water resources management, in line with the new principles and approaches, may be conceived in terms of some simple policy relevant questions: how much resources is available and who needs it? Who gets how much? At what cost? And at what price, if any? (IDRC, 2002). However, there are also deeper questions that also need to be addressed: who decides? By what procedures? What features of governance will most likely produce management decisions that are fair, effective and environmentally sustainable?

The answers to these questions are by no means trivial and they may vary for different communities or nations depending on their form of organising socio-cultural and political life. This is particularly true for the deeper questions: who decides? By what procedure? Douglas (1987) and Thompson et al. (1990) argued that it is possible to discern four fundamental forms of social organisation from which a large variety of ultimate forms of social and cultural life can be derived. Each of the four ways of organising socio-cultural life (usually called 'ways of life' or social solidarities), that is fatalism, egalitarianism, hierarchy and individualism, consists of specific ways of structuring social relations and a supporting cast of particular beliefs, values, emotions, perceptions and interests (Douglas et al., 2003; Thompson, 2003) as well as specific knowledge systems (Mabawonku, 2003). In the individualist social setting, actors view nature as benign and resilient – able to recover from any exploitation – and man as inherently self-seeking and atomistic. The individualist solidarity trust others until they give them reason not to and then retaliate in kind, and see it as only fair that those who put the most in get the most out. They think institutions that work with the grain of the market (that get rid of environmentally harmful subsidies, for instance) are what are needed. Their knowledge system is essentially scientific. In the egalitarian social setting, actors see nature as fragile, intricately interconnected and ephemeral, and man as essentially caring (until corrupted by coercive institutions such as markets and hierarchies). For the egalitarians, it is not enough that people start off equal, they must end up equal as well. Trust and levelling go hand in hand, and institutions that distribute unequally are distrusted, their knowledge system is described as the philosophical.

Generally, the answers to the deeper questions: who decides? By what procedures? What features of governance will most likely produce management decisions that are fair, effective and environmentally sustainable?, will determine the answers to the policy questions: how much resources is available and who needs it? Who gets how much? At what cost? And at what price, if any? We therefore conceive the water management process as a five stage

procedure. The first is the governance and decision-making stage. At this stage, the deeper questions are answered by both the policy makers and the general public. As explained earlier, the answers are determined by the 'ways of life' of the people, or their knowledge systems, cultural beliefs and values. The second stage in the water management process is the water balance modelling. It is at this stage that the question: how much resources are available and who needs it is answered. It involves the determination of the volume of water being available over space and time, the present and future water needs as indicated by population growth, industrialisation and changing habit of use, and the socio-economic and ecological implications of water supply and demand.

Management guideline development is the third stage in the water management process. At this stage the question, who gets how much is answered. It involves defining the priorities, goals, rules and capacity requirements. Specifically, it involves defining the policies, regulations and enabling environment as well as the mechanism for sharing water resources between competing interests. The next stage is the implementation stage, and it is the stage that decisions about cost and price are determined. Other issues such as funding, institutional or capacity building, environmental sustainability, and public awareness are tackled at this stage. The last stage is the water supply stage. It involves supplying water for different uses and evaluating the use of water and its implications such as the human dimensions of water supply, environmental sustainability, trans-boundary conflict of interests, and effects of economic and population growth.

The five stages in the water resources management process are interrelated and interdependent. Analysis of the management process may either proceed from the last stage to the first or from the first to the last. The direction of analysis is not important, but it is important to recognise the link between the five stages and to take linkages into consideration in the analysis. For example, analysis of the pattern of social solidarity of the key stakeholders or decision makers may be linked to information about the water balance and management guidelines. Similarly, analysis of the water balance information and management guidelines may be linked with the implementation process and water supply.

According to Olokesusi (1990), water supply situation in Economic Community of West African States (ECOWAS) is far from satisfactory. The following seem to be the major factors responsible for the inability of member states to satisfy the drinking-water needs of

their teeming populations. Water engineers and administrators in ECOWAS have been prone to thinking 'biggest', a series of small water schemes is nowhere near as proud an achievement as a massive structure, in other words the wrong scale of technology is being used. Unfortunately, the larger systems tend to carry with them a greater degree of vulnerability, since if they break down more people and more enterprises are adversely affected. In some states that are drought-prone, or do not have the infrastructural maintenance and repair support, the failure of one large water project can have immensely negative and sustained consequences. More important, perhaps, is the 'think big' syndrome of aid agencies and consortiums, which has affected the psyche and performance of the water-supply projects.

Trends in Water Policy Formulation in Nigeria

This section reviews the changing trend in the national policy framework for water resource management in relation to the motivation for policy design, knowledge capacity building, and the degree of compliance with the new principles and approach in the country. Two major policies have direct bearing on water supply provision and management: the National policy on Environment and the National Water and Sanitation Policy of Year 2000.

The National Policy on Environment

The problems associated with the lack of adequate potable water supply in the country threaten to place the health of about 40 million people at risk. According to the World Bank (1990), it would cost in excess of US\$10 million a year to correct such problems if ground and surface water contamination goes unchecked. The people most affected tend to be the urban and landless poor. In the long-term, the present level of environmental degradation could create health problems from water-borne diseases from most of this population. Many people are already affected by having to consume unsafe drinking water. Water contamination also places other resources at risk; fisheries and land resources, for example, have already been affected significantly. Most of the environmental pollution problems arise from anthropogenic sources, mainly from domestic and industrial activities.

It is based on the realisation of this fact and the importance the Federal Government of Nigeria (FGN) attached to adequate water supply that water resources management has always being part and parcel of the National Policy on Environment. The National Policy on the Environment (NPE) was launched by the then Head of State, General Babangida in Abuja

on 27 November 1989 (FEPA, 1989). The goal of that policy was to achieve sustainable development in Nigeria and, in particular to:

- Secure for all Nigerians a quality environment adequate for their health and well-being.
- Conserve and use the environment and natural resources for the benefit of present and future generations.
- Restores, maintain and enhance ecosystems and ecological processes essential for the functioning of the biosphere and for the preservation of biological diversity and to adopt the principle of optimum sustainable yield in the use of living natural resources and ecosystems.
- Co-operate in good faith with other countries, international organizations and agencies to achieve optimal use of transboundary natural resources and effective prevention or abatement of transboundary environmental pollution.

As outlined above, although no specific mention of water resources management is contained in the policy on environment as launched by the Federal Government, the environment as encapsulated include all natural resources including water.

Water Resources Management under the National Policy on the Environment

The turning point for water resources development and management in Nigeria could be traced as far back as 1960 after the severe drought of the 1960s. The Government's response to the catastrophe was the initiation of strategies for co-ordinated and effective water resources development, culminating in the creation of the Federal Ministry of Water Resources and the River Basin Development Authorities in the mid-1970s. The activities of these institutions were further strengthened in 1981 by the establishment of the National Committee on Water Resources, and by the Water Boards at the state level. These bodies were charged with taking an inventory, and ensuring rational and systematic planned management and conservation, of the country's water resources.

Strategies under the National Policy on the Environment

Implementation of the Nigerian National Policy on Environment depends on specific action directed towards major sectors and towards problem areas of the environment (FEPA, 1989). The management approach adopted in the policy is based on an integrated, holistic and systemic view of environmental issues. The programme activities of this policy are expected to establish and strengthen legal, institutional, regulatory, research, monitoring, evaluation,

public information, and other relevant mechanisms for ensuring the attainment of the specific goals and targets of the policy. It will also encourage environmental assessment of proposed activities which may affect the environment or the use of natural resources prior to their commencement. The strategies put forward for effective water resources management in the policy include:

- Promulgation of a national water resources law to co-ordinate water resources development.
- Formulation of a water resources master plan.
- Improvement of water use efficiency for sustainable development.
- Implementation of water conservation measures including inter-basin water transfer.
- Establishment and enforcement of national water quality and emission standards to protect human health and aquatic ecosystems and species.
- Establishment of environmental monitoring stations or networks to locate and monitor sources of environmental pollutants and to determine their actual or potential danger to human health and the environment.
- Continuous data collection for resources monitoring and management.
- Introduction of economic incentives.

Programmes to assess the available water resources of the country were strengthened to provide, among other things, data on:

- Hydrological features affecting surface water resources.
- The location of groundwater resources and their characteristics in terms of depths, yields, permeability, storage and recharge.
- Per capita water use and requirements.
- Changes in hydrological regimes resulting from human activities, such as water use or extraction, pollution and the effects of mining and lumbering.
- The management of small and large dams.
- Irrigation problems with regard to crop water requirements, salinity, drainage and pollution from fertilizers, pesticides and cultivation activities.
- Existing freshwater living resources.

As part of the strategies for the implementation of the National Policy on Environment in the water sector, a comprehensive national water resources master plan has now been drawn up with support, from the Government of Japan, through the Japan International Cooperation

Agency (JICA). For the first time, a decree on water resources protection and management has been promulgated (FGN, 1993), with the purpose of:

- Promoting the optimum planning, development and use of the Nigeria's water resources.
- Ensuring the co-ordination of such activities as are likely to influence the quality, quantity, distribution, use and management of water.
- Ensuring the application of appropriate standards and techniques for the investigation, use control, protection, management and administration of water resources.
- Facilitating technical assistance and rehabilitation for water supplies.

The National Water and Sanitation Policy of Year 2000

During the Water and Sanitation Decade of the 1980's a number of lessons were learnt.

- a) The most important one was that the sustainability of rural water and sanitation investments is dependent on the degree to which communities are involved in the decision making, funding and operation of the facilities. Rural water schemes are usually the responsibility of the *State Water Agencies* which in the past have provided fuel, operators, watchmen and repair services, but which increasingly are relying on the beneficiary communities to supply these. Tariffs for such schemes normally are not charged because the cost of revenue collection is generally overwhelming. Since these rural systems cannot be operated on a commercial basis, water supply agencies minimize their financial losses by limiting their services.
- b. The problems experienced in achieving adequacy in the rural areas prompted the Federal Government to commence a decentralization programme designed to make LGAs more autonomous and responsive to local needs, and technically and financially capable of providing services. The programme is intended to end dependency on the central government and "top-down" planning. This is being achieved by giving the country's 774 LGAs primary responsibility for planning and administration of their own development programme, increasing their budget allocations, and requiring communities to take the lead in decision making and implementing development projects based on their particular needs.

In year 2000, therefore, the Federal Government formulated a new National Water Supply and Sanitation Policy which was not subsumed under the National Policy on the Environment. This policy states *inter alia* 'the center-piece of Nigeria's water supply and

sanitation policy shall be the provision of sufficient potable water and adequate sanitation to all Nigerians in an affordable and sustainable way through participatory investment by the three tiers of government, the private sector and the beneficiaries.’ The policy document goes further to set water supply improvement standard for urban, semi-urban and rural policy objectives. The new broad policy objectives for water resources development and management in the country have been redefined to include formulation of a comprehensive and integrated policy for sustainable development of the nation’s water resources. The new policy would institutionalize multi-sectoral and integrated water resources management approaches that would promote national utilization and conservation of the resources based on equitable allocation and ensuring the protection of the ecosystem. Promotion and support for the provision of water and sanitation to guarantee adequate supply of portable water for all needs are given prominence in the policy.

Also the policy is designed to enhance the preparation of adequate regulations and legal framework that would guarantee full protection of the resources from pollution, and over exploitation. It would foster bilateral and multilateral cooperation to facilitate the equitable and rational development and exploitation of transboundary water resources.

The development of appropriate technical and managerial capacities and institutions that could support and sustain integrated water resources development in the country and the institutionalization of principle of stakeholder participation, decentralization, the participation of women, equity and economic values are also incorporated in the new policy.

There are also political challenges in the area of appropriate pricing, equitable allocation of water and sometime policy implementation are extremely linked to political pressures and dictates. Other challenges relate to institutional issues, and international issues, like proper definition of roles at all levels of government, which is still vague and which encourages duplication of efforts and multiplicity of agencies across sector.

The Need for a Better Policy

The inadequacies outlined above in the Nigerian Water Supply and Sanitation industry call for a well articulated approach to water supply and sanitation towards a systematic development of the industry over a defined period of time. The approach therefore should define an acceptable National Policy that will set up a planning process, research and manpower development, institutional structure, legal framework and financing strategy that

will meet the socio-economic requirements of the country. The major provisions of the policy are as follows:

Policy Objectives:

The centrepiece of Nigeria's water supply and sanitation policy shall be the provision of sufficient potable water and adequate sanitation to all Nigerians in an affordable and sustainable way through participatory investment by the three tiers of government, the private sector and the beneficiary.

Target

- i) The initial target is to meet the national economic target of improving service coverage from 40% to 60% by the year 2003.
- ii) Extension of service coverage to 80% of the population by the year 2007.
- iii) Extension of service coverage to 100% of the population in the year 2011
- iv) Sustain 100% full coverage of water supply and wastewater services for the growing population beyond the year 2011.

Consumption Standard

Separate water supply and sanitation considerations are made to match the three socio-economic profiles of the population as follows:

Rural water supply guaranteed minimum level of service of 30 liters per capita per day within 250 meters of the community of 150 to 5,000 people serving about 250-500 persons per water point.

Semi-urban (small towns) water supply represent settlements with population of between 5,000-20,000 with a fair measure of social infrastructure and some level of economic activity with minimum supply standard of 60 liters per capital per day with reticulation and limited of full house connections as determined by the beneficiaries/government.

Urban water supply 120 litres per capital per day for urban areas with populations greater than 20,000 inhabitants to be served by full reticulation and consumer premises connection.

Components of the Policy Objectives

The elements of the policy objectives include but are not limited to the following.

- i. Increase service coverage for water supply and sanitation nationwide to meet the level of socio-economic demand of the nation in the sector.

- ii. Ensure good water quality standards are maintained by water supply undertakings.
- iii. Ensure affordability of water supply and sanitation services for the citizens.
- iv. Guarantee affordable access for the poor o *basic human need* level of water supply and sanitation services.
- v. Enhance national capacity in the operation and management of water supply and sanitation undertaking.
- vi. Privatize water supply and wastewater services (where feasible) with adequate protection for the poor.
- vii. Monitor the performance of the sector for sound policy adjustment and development for water supply and sanitation.
- viii. Legislations, regulations and standards for water supply and sanitation.
- ix. Reform of the water supply and sanitation sector to attain and maintain internationally acceptable standards.

Policy Strategies

In order to achieve the policy objectives, the following strategies are enumerated relative to each of the elements of the policy objective:

- i. Increase service coverage for water supply and sanitation nationwide to meet the level of the socio-economic demand of the nation on the sector.
- ii. Undertake water supply and sanitation feasibility survey for all the states and the FCT to acquire baseline data for proper investment planning.
- iii. Rehabilitation and modernization of existing water supply works to restore them to their optimum operational capacity.
- iv. Expansion of existing urban water supply works to enhance capacities to meet over grown demand.
- v. Distribution network repair and renewal for all urban water supply schemes.
- vi. Comprehensive metering of all water supply schemes from abstraction through distribution to consumer connections.

The water policy also proposed important reform issues in water supply provision in the country. One of the reform issues is that water should be managed at the lowest appropriate level (appropriate being key and a function of the specific conditions in the concerned areas and communities). This principle promotes consumer appreciation for the value of water and sanitation investments. If local conditions and demand are taken into account in the planning, financing, implementing and operation of water supply and sanitation systems, the sense of

ownership and willingness of communities to share in the cost and operations and maintenance will be greatly enhanced, thereby increasing the sustainability of the systems.

Although the 2000 National Water Supply and Sanitation Policy stated that government shall sponsor capital investments for rural water supply, the level of provision of water in the rural areas is still very low. For instance, as shown in Table 2, the rural areas in Nigeria lagged behind in various sources of drinking water available to households, except the open public well, rivers/streams and rain water in which they have higher percentages compares to the urban areas in 2003 (see Table 1). This is not surprising considering the fact that, unlike in the urban areas, rural dwellers rely more on water from rivers, streams and ponds. Also, rain water is a major source of water for domestic use, especially for drinking in the rural areas. Among the geo-political zones, the south-west zone in which the study is based ranked low in terms of supply of piped water into dwelling yard, protected well in dwelling yard, protected public well and the use of rain water as sources of water supply. In the Western zone, it takes about 9 minutes from dwelling houses to major sources of water.

Table 1: Distribution of Households by Access to Water Supply and Sanitation Facilities (%)

Household Characteristics	Residence		Geo-political zone						Total
	Urban	Rural	North Central	North East	North West	South East	South South	South West	
Source of drinking water:									
Piped into dwelling/yard/plot	14.4	2.3	7.8	4.6	10.2	8.3	3.2	4.6	6.6
Public tap	18.5	6.2	8.1	9.7	11.8	11.3	4.6	18.8	10.6
Open well in dwelling/yard/plot	9.4	14.2	12.6	15.1	22.9	1.8	3.3	9.2	12.5
Open public well	6.7	21.2	9.4	30.8	25.0	1.5	5.2	12.7	16.0
Protected well in dwelling/yard/plot	6.7	3.7	5.5	1.8	3.3	10.8	7.0	3.5	4.8
Protected public well	24.4	16.3	11.5	5.3	12.1	33.1	35.8	25.6	19.2
Rivers/stream/spring/pond	8.1	29.9	38.1	19.4	11.3	16.7	34.8	16.8	22.1
Rain water	0.5	2.1	0.1	0.0	0.0	6.7	4.3	0.5	1.5
Tanker truck	5.9	1.9	5.9	4.4	0.6	7.3	1.4	4.2	3.3
Other	5.2	2.0	0.6	8.9	2.9	1.8	0.5	4.1	3.2
Total	100.0	98.8	99.6	100.0	100.1	99.8	100.1	100.0	99.8
Time to water source									
Percentage 25 minutes	64.9	51.4	51.1	58.2	62.1	59.4	45.8	59.4	56.3
Median time to source	4.6	9.9	10.0	9.4	6.5	4.9	14.8	9.2	9.4
Sanitation Facility									
Flush toilet	28.7	6.7	9.6	4.5	4.5	41.3	21.2	23.4	14.6
Traditional pit toilet	55.6	56.9	50.1	74.6	74.3	39.8	42.3	39.1	56.5
Ventilated improved pit (vip)	5.5	1.9	1.9	0.5	1.6	0.9	8.5	5.5	3.2
Latrine	9.7	31.6	38.0	20.1	19.2	17.6	19.7	30.7	23.7
Bush/Field	0.3	2.7	0.4	0.3	0.3	0.1	8.2	1.2	1.9
River	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0
Others									
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Persons per sleeping room	2.9	3.6	4.0	3.7	3.3	3.0	3.6	2.2	3.3

Note: percentages may not add to 100 due to missing cases

Source: After National Population Commission and ORC Macro (2004) Nigeria Demographic and Health Survey – 2003:20

Challenges and Impacts of Policies on Sustainable Water Supply Provision in Nigeria

The development of appropriate technical and managerial capacities and institutions that could support and sustain integrated water resources development in the country and the institutionalization of principle of stakeholder participation, decentralization, the participation of women, equity and economic values even though incorporated in the new policy have not

been implemented as should. Therefore, the expected improvements in potable water provision for the populace have not significantly improved. The situation is worse in the rural areas.

There are also political challenges in the area of appropriate pricing, equitable allocation of water and sometime policy implementation are extremely linked to political pressures and dictates. Other challenges relate to institutional issues, and international issues, like proper definition of roles at all levels of government, which is still vague and which encourages duplication of effort and multiplicity of agencies across sector.

The existing policy to supply water through boreholes especially in situations where there is no regular electricity supply to power the machines, as currently obtained in the some selected rural areas studied in Oyo State, Nigeria by Gbadegesin and Olorunfemi (2007), is counter productive. Given the fact that women and children are the ones mostly involved in fetching water, there is need to devise technologies for water supply which are women and children friendly. A challenge to the States' water agencies, therefore, is the capability to develop and install appropriate technologies to meet the basic water supply and sanitation needs of the millions of citizens who now lack them. These agencies should purchase and install electric power generators in all its waterworks and booster stations. Also, the agencies should ensure regular servicing and maintenance of all their equipment and machinery. It is therefore obvious that more manpower should be recruited into the technical divisions of the corporation.

Empirical studies (Olokesusi, 2004) have revealed that there are various types of innovative (indigenous) technologies for rural water supply in different parts of Nigeria. There is need to document these IKS in order to enhance concerted efforts not only at developing them by local engineers and technicians but also for government to fund research and development of these technologies. Some of these indigenous technologies include pot chlorination, solar disinfection, simple sand filters, nylon filters, *taggiri*, harvesting of groundwater and recharging of groundwater, among others.

A challenge to local engineers and technicians is to develop simple machines and tools that will be affordable to households in rural communities e.g. the simple sand filters or to the community at large e.g. solar disinfection. There is also the need for awareness campaign in rural areas on the use of these different methods. There is need for government to make this

method available to poor households by providing money for them to put up the harvesting apparatus in their houses.

As part of the appropriate technology strategy which should be emphasized in these austere times, the use of locally produced hand pumps, PVC pipes, protected well and mandatory rain-harvesting is strongly suggested. Rain water could easily be harvested if properly owners are mandated to provide gutters along building roof-eaves which should then be diverted into a covered concrete metal reservoir. Rain water harvesting has been practiced since early history, and it is suitable both urban and rural areas; and the quality of water collected is generally within the recommended limits for drinking water.

Apart from the issue of inadequate water supply in terms of quantity, the quality of the available quantity of water provided is another major problem. According to Habila and Kehinde (2003), an assessment of public water supply quality management in Nigeria reveals major inadequacies, notable among which are ineffective and uncoordinated regulation, inadequate resources, low prioritisation of water quality issues and poor data management. It shows that, although there exists national guidelines and standards on water quality, compliance with these is poorly implemented and monitored. Thus to deal with this situation, there is a need to: establish mechanisms for better co-ordination; carry out water supply quality management within the context of water resources management; implement a nationwide rapid water quality assessment as a precursor to developing more acceptable water quality surveillance criteria as well as appropriate protocol for periodic water quality assessment and; establish a national expert group on water quality for regular review of water quality issues and development of solutions for mitigating water quality problems. Thus water supply quality management will be more adequately handled and the safety of public water supplies assured.

CONCLUSION

Securing safe, reliable, reasonably priced water and sanitation services for all is one of the leading challenges facing sustainable development. There is widespread concern that poor water management will be one of the major factors limiting sustainable development during the next few decades.

Accessing water for the common good was the scope of the 2009 World Water Week. It is stated in it that the "critical challenge lies in the integration of water in development policy. Management that promotes efficiency and generates net benefits for the common good is needed. As always, the tremendous variation between countries and other relevant entities must be taken into account in the analyses". Furthermore, "effective policy formulation requires collaboration among several parties to ensure practical implementation and subsequent evaluation of results and performance. The role of government is to establish the framework and provide incentives that stimulate people and business to perform well. Authorities have a key role to balance self-interest with the common good and safeguard the functioning of life support systems".

The new principle and approach to water supply and water resource management, as seen in recent policies examined in this paper, has many far reaching implications for policy design and institutional building as well as policy implementation. For example, the change in principle may be regarded as a basic ideological shift. Generally, such ideological shift cannot be imposed on people since it depends on cultural belief and world view of the people (Wildavsky *et al.*, 1994). Consequently, there is need to have a better understanding of the values and ideological preferences of policy makers, bureaucrats and the general public. Secondly, a change from supply management approach to demand management approach requires a change in the manpower and institutional requirements for water resources management. While supply management approach with emphasis on building and construction of dams, boreholes, conveyance systems, etc, require predominantly engineering skills, the new emphasis on demand management with public and private sector participation will require expertise in social systems in addition to engineering skills.

Lastly, the new integrated approach requires greater knowledge and understanding of the technological, social, economic and ecological dimensions of water resource management and how they are inter-related. Developing the capacity to engage in integrated sustainable development planning from the community level to the highest national decision-making level, remains a major challenge in Nigeria and many other African countries. Sharma *et al* (1996) for example noted that in sub-Sahara Africa as a whole, the following institutional capacity problems are rampant: (i) people are unaware that water is a finite resource with supply constraints, that it has a scarcity value, and that there is a cost to using it; (ii) lack of understanding of the consequences of deforestation and land degradation on the quantity and

quality of water; (iii) inadequate capacity building and neglect of traditional knowledge bases as well as gender issues; (iv) management of water resources is highly fragmented among sectors and institutions and there is excessive reliance on public sector services; and (v) weak institutional and implementation capacities.

The implication of the foregoing is that if the new emphasis on water resources management in Africa and Nigeria in particular is to achieve meaningful results, there is the need to have a better understanding of the institutional capacity both in terms of skilled personnel and the available knowledge and understanding of the socio-economic, technological and ecological issues and problems that are involved. Better integration of water management into sectoral and land use policies, greater public participation in the formulation of water management policies and programmes and, above all, more effective measures to ensure that water is affordable to all.

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