ABSTRACT

The provision of sustainable access to safe and sufficient water and water resources to meet the cultural, social and economic needs of all Nigerians in a way that will enhance public health, food security, poverty eradication while maintaining the integrity of freshwater ecosystems of the nation is a major objective and goal water resource management in Nigeria.

The vehicle of the nation’s integrated water resources management is identified as the River basin development Authority (RBDA) contributing optimally to the socio-economic activities of the nation by comprehensively planning, facilitating and creating the enabling environment for integrated conservation, development and management of various water-uses for the preservation of the quality and quantity of freshwater ecosystems. This paper take a critical look at the past, present and future management of river basin in Nigeria. Private sector involvement in the management rather than the existing government-based management is emphasised in this paper.

INTRODUCTION

The Federal Republic of Nigeria is located in west Africa between latitudes 4° north and longitude 2° and 15° east, with a total land area of 923.8 X 10^3sqkm bordered on the east by Chad and Cameroon, on the north by Niger, on the west by Benin and on the south by the Gulf of Guinea. The principal geographic feature is the Niger River which with its left bank tributary of the Benue River drains 60 percent of the country and forms an extensive delta at the south. Overall relief is very gentle, ther being a gradual loss of height from about 500m in the north to the coast.
Nigeria is situated entirely in the tropics where its climate is semi-arid in the north gradually becoming humid in the south. Annual rainfall varies from over 4,000 mm in the south-east to below 250 mm in the extreme north-east. It is also highly seasonal with the wet season of July to September.

Nigeria is divided into six main hydrological basins. Geographical, in the far south are low-lying swamp forests, followed in a northerly direction by generally flat dense rain forests, hilly shrub lands in the middle belt, relatively flat savannah grasslands, and semi-arid areas in the far north. The central part of the country is marked by crystalline rock outcroppings and gently rolling hills.

The average rainfall is about 500 mm/year in the north (occurring April, through September), increasing to about 3,000 mm/year in the south (occurring March through October). The country is noted for its two major river systems: the Niger entering from the Northwest, and the Benue entering from the Northeast which together with their many tributaries drain half the land area of the country. The two rivers meet at Lokoja, then move in a southerly direction into an extensive delta before discharging into the Atlantic Ocean. Other rivers flow directly into the ocean or into Lake Chad. Many rivers in the north are intermittent, having water in them only in the rainy season, but the majority of the rivers in the south are perennial, flowing all year round, and are important sources of drinking and irrigation water.

Many people take it for granted that the river basin is the natural geographical unit for the planning and management of water resources. However, the river basin is not a natural political basis for planning. Policy is an outcome of political processes, not hydrological processes, although it is obviously heavily influenced by them. Solutions to water problems often tend to be influenced or determined by other systems or decisions from outside the basin.

The range of functions laid down for the River Basin Development Authorities (RBDAs) in 1976 was extraordinarily wide. They encompassed irrigation, flood control, watershed management, pollution control, fisheries and navigation as well as activities remote from water resources, such as seed multiplication, livestock breeding and food processing. Their remit also covered a number of activities to be shared by state agencies, such as the provision of agricultural services and rural electrification. However, in practice these hopes were not realised. The RBDAs have tended to concentrate on large scale single purpose projects, particularly irrigation schemes.

The issue here became one of competition between the RBDAs and the various state authorities. In other words, the interface was not managed properly, the roles, functions and co-ordinating mechanisms not defined clearly, and quite obviously far too much was attempted. As a result the original goals and objectives were not attained and the erroneous notion developed that the river basin approach was a disaster.
RIVER BASIN MANAGEMENT IN NIGERIA

In 1975 when the defunct Federal Ministry of Water Resources was initially created, the responsibility of nationwide river management administration has not been attached to the said Ministry, while the Federal Inland Water Department for inland navigation is still responsible for the management of the Niger and the Benue. Prior to August 1993 when the water Resources Decree 101 was promulgated, there was virtually no single agency who is responsibly for an integrated river management on use and conservation of the water resources and river systems. Currently, in Nigeria we have the following river basin development authorities (RBDAs).

Anambra-Imo River Basin Development Authority
Benin Owena River Basin Development Authority
Chad River Basin Development Authority
Cross River Basin Development Authority
Hadejia-Jama’are River Basin Development Authority
Lower Benue River Basin Development Authority
Lower Niger River Basin Development Authority
Niger Delta Basin Authority
Ogun-Osun River Basin Development Authority
Upper Benue River Basin Development Authority
Upper Niger River Basin Development Authority
Niger Delta Basin Authority
Sokoto-Rima River Basin Development Authority

River runoff over Nigeria is definitely seasonal with the wet season occurring between July and September in general; accordingly, the dam and reservoir are basically required to utilised the surface water throughout the year for irrigated agriculture, domestic and municipal water supply and hydropower generation. As of 1991, the number of dams as completed or under construction has reached 160 sites with a total effective storage of 30.7 x 10^9 cu.m:

<table>
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<tr>
<th>NW</th>
<th>NE</th>
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<th>CE</th>
<th>SW</th>
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<th>TOTAL ( % )</th>
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<tbody>
<tr>
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<td>HA-VIII</td>
<td>HA II</td>
<td>HA-III/IV</td>
<td>HA-VI</td>
<td>HA-V/VII</td>
<td></td>
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<tr>
<td>10</td>
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<td>71 (44)</td>
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<tr>
<td>9</td>
<td>6</td>
<td>18</td>
<td>21</td>
<td>21</td>
<td>8</td>
<td>83 (52)</td>
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<td>2</td>
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<td>20</td>
<td>23</td>
<td>32</td>
<td>35</td>
<td>32</td>
<td>18</td>
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<table>
<thead>
<tr>
<th>Number of Dams</th>
<th>Irrigation</th>
<th>Water Supply</th>
<th>Hydropower</th>
<th>Total</th>
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<tr>
<td></td>
<td>10</td>
<td>9</td>
<td>1</td>
<td>20</td>
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<tr>
<td>Irrigation</td>
<td>1,725</td>
<td>44</td>
<td>11,500</td>
<td>13,269</td>
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<td>5,885</td>
<td>66</td>
<td>7,050</td>
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<td>Hydropower</td>
<td>489</td>
<td>441</td>
<td>49</td>
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<td>Total</td>
<td>2,225</td>
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<td>2,364</td>
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<tr>
<td>Reservoir Capacity (10^9 cu.m)</td>
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<td>0</td>
<td>1,053</td>
</tr>
<tr>
<td>Irrigation</td>
<td>11,164 (36)</td>
<td>905 (4)</td>
<td>18,599 (60)</td>
<td>30,668 (100)</td>
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<tr>
<td>Water Supply</td>
<td>1,095 (4)</td>
<td>2</td>
<td>1,097 (4)</td>
<td>1,095 (4)</td>
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<tr>
<td>Hydropower</td>
<td>10,079 (60)</td>
<td>1,097 (4)</td>
<td>1,097 (4)</td>
<td>1,097 (4)</td>
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<tr>
<td>Total</td>
<td>13,269 (100)</td>
<td>2,364 (100)</td>
<td>2,364 (100)</td>
<td>2,364 (100)</td>
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</tbody>
</table>
For the hydro power, the large-scale dams and reservoirs at Kainji and Jebba along the Niger and at Shiroro along the Kaduna have been constructed by the NEPA, while the NESCO is operating the local mini-hydropower in the Jos Highland with the construction of nine small-scale water storages. General observation indicates that the hydropower generation as mentioned above is well-functioned in spite of the obsolescence of equipment.

The water storage dams for irrigation and water supply have been constructed throughout the country. In the North Region, there are many large-scale dams constructed since the onset of Sahelian drought which occupy their active reservoir capacity of 7.7 x 10^9 cu.m or 63 percent of the nation’s total for these objectives. The central and South-West Regions have in general many medium and small-scale dams with some large-scale ones, while there are only small-scale dams with the function close to diversion dam in the South East Region. It maybe noted that the current water use rate of these existing reservoirs is quite low at 10 to 20 percent in general because the downstream facilities for conveyance and distribution have been in slow progress for construction mainly due to the lack of reservoir water operations rule.

**Water Supply**

Water supply schemes in major cities were started in Abeokuta (1911) by the colonial administration with a key role that the improved water supply could play in the elimination or control of common diseases and in the raising of health level and general welfare of people. By 1970, there were 261 urban water supply undertakings. Since early 1970s, the Governments have invested heavily in urban water supply schemes including the reservoir construction and borehole sinking for State capitals. At this stage, it may be understood that inadequate water supply remains as one of the major problems in urban centres, in fact, the supply of improved water can be said to be adequate in none of them.

Until recently, virtually all the States gave a relatively low priority to water in their rural development efforts, and in many areas, the rural people regards water more in terms of convenience than of health benefits. Many tube wells were sunk in the North Region in the 1940s to early 1960s without active involvement of the local people; thus, the people were not made to accept to take care of them. With the establishment of RBDAs in 1976 and DFRR in 1986, a new era opened in the provision of rural water supply, and a great number of boreholes have been sunk in various parts of the country. Because of inadequate supply, technical problems and peoples’ ignorance, many of the inadequate supply, technical problems and peoples’ ignorance, many of the rural communities served in this way have not derived the maximum benefits.
Currently, separate water supply considerations have been made for three socio-economic profiles of the population – urban (more than 20,000), semi-urban (5,000 to 20,000) and rural (less than 5,000) according to the access and extent of such amenities as electricity, pipes water and paved roads. Urban systems typically use surface water and groundwater source with the piped system, house connection and yard taps, in which the surface sources require the treatment plants. Semi-urban is mainly based on the use of mechanised deep well schemes with piping to yard taps and public standpipes. Rural water supply generally includes the use of handpump-equipped boreholes and wells.

PROBLEMS AND CONSTRAINTS

Reservoir Water Operations

Excessive reservoir capacity against its inflow:

This is applicable to some dams in the North Region and has been the result of insufficient feasibility study including hydrological analysis and project planning.

Large evaporation loss from reservoir surface:

In the North Region where the rather flat topography created the extensive reservoir area, the evaporation amounts to 20 to 30 percent of the active reservoir capacity, and this may hamper the effective utilisation of the limited scarce resources.

Downstream release of reservoir water:

It appears that there is the lack of consideration on the reservoir water operations to satisfy the downstream requirements other than the Government public schemes. A critical example is the Hadeja-Nguru wetland which requires the artificial flood release from the upstream dams in the wet season to maintain various water use of the indigenous activities.

Water availability of existing reservoirs:

The JICA Team in 1995 attempted to evaluate this on a preliminary basis taking into account the carry-over for dry year, excessive evaporation loss and downstream water demand. In particular, a preliminary analysis of the reservoir operation for 11 representative cases in the North and Central-East Regions was conducted to estimate the after availability, on the base of which the following have been compiled:
BASIN RESOURCES PROTECTION

(unit: 10^5 cu.m)

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<tr>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>HA-VIII</td>
<td>1,750</td>
<td>5,940</td>
<td>940</td>
<td>2,340</td>
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<td>50</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>HA-III/IV</td>
<td>980</td>
<td>2,120</td>
<td>790</td>
<td>1,620</td>
<td>890</td>
<td>60</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HA-V/VII</td>
<td>580</td>
<td>1,120</td>
<td>380</td>
<td>1,160</td>
<td>490</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td>2,340</td>
<td>5,940</td>
<td>940</td>
<td>2,340</td>
<td>1,030</td>
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</tbody>
</table>

Possible Water Use

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<th>CW</th>
<th>CE</th>
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<tr>
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<td>270</td>
<td>330</td>
<td>200</td>
<td>350</td>
<td>30</td>
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<tr>
<td>Water Supply</td>
<td>270</td>
<td>730</td>
<td>80</td>
<td>260</td>
<td>50</td>
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<td>downstream Environment</td>
<td>56</td>
<td>36</td>
<td>84</td>
<td>69</td>
<td>86</td>
<td>120</td>
</tr>
<tr>
<td>Total</td>
<td>1,030</td>
<td>890</td>
<td>490</td>
<td>380</td>
<td>330</td>
<td>50</td>
</tr>
</tbody>
</table>

Water Use Rate: 2/1 (%)  
54

Slow Utilisation of Reservoir Water

As is explained in the above table, the nationwide water availability of existing reservoirs for irrigation if 3,760 x 10^6 cu.m and for water supply 1,310 x 10^6 cu.m. on the other hand, the assumed nationwide water use for irrigation and water supply at this stage if 350 x 10^6 cu.m and 620 x 10^6 cu.m respectively. Comparison of the both figures indicate considerable gaps between the construction of dams and the actual water use in the downstream service areas which may imply unfavourable return from the huge investment for the dams.

Dam Safety

There are apparent technical defects at many of existing dams including the seepage through dam foundation works, shortage of spillway flood capacity, decrease of effective storage due to excessive sediment inflow, damages of gates and valves due to reckless operations, extraordinary vegetation growth and severe erosion on dam slopes, extensive aquatic weed development over the reservoir area and so on. When nothing is done for these dam safety problems and related upkeep of dam functions, such dams may constitute a significant potential hazard to the downstream people and societies.

Operation and maintenance (OM)

While OM for large-scale dams is being carried out to a certain extent, many of the small and medium-scale dams are facing the difficulties due to the lack of technical data, equipment, access road, etc. for OM.

THE WAY FORWARD

The programs that transfer existing Government-managed water system to private firms, financially autonomous utilities and water users associations should be implemented as in other developed and developing countries, particularly in the Asian countries where the tradition of farmer-managed water service systems is
centuries old. As a matter of fact, the recent countries’ experiences suggest that there are indeed many scopes for achieving more efficient patterns of the water use through the reliance on decentralised mechanisms to deliver the required services.

ACCOUNTABILITY AND FINANCIAL AUTONOMY

Setting prices at the right level is not enough and the prices need to be paid if they are to enhance the efficient allocation of water resources. It has been commonly analyses that the non-payment and non-collection of water fee reflect two problems: (1) weak incentives to collect and (2) limited willingness to pay due to poor services.

In many cases of Nigeria, the record of non-and poor-collections may be attributed to (1) the lack of political determination to enforce collection and (2) the limited motivation of agencies to collect because they are not required to cover the costs; subsequently, the failure to recover the costs and reinvest in the systems has led to a vicious cycle whereby the services is declining with collecting as spare parts and essential input materials run out, and the consumers have in turn become less willing to pay for the poor quality services provided. Conversely the high collecting rates often reflect the decentralised management and enforced financial autonomy and accountability of water entities, that in turn deliver the high-quality service for which consumers are willing to pay.

The urgent need in restructuring the public services agencies such as River Basin Development Authorities (RBDAs) and State Water Associations (SWAs) in Nigeria. The restructuring should include their conversion into financially autonomous entities with the effective authority to charge and collect the water fees as well as the freedom to manage without political interference, and, these entities need to work under a hard budgetary constraint which enhances the incentives for efficiency and revenue generation.

USERS PARTICIPATION

The participation of users in managing and maintaining the water facilities and operations usually brings many benefits. It is of great importance that the local participation in planning, operating and maintaining the irrigation facilities and waterworks to supply water and sanitation increases the strong likelihood that these may be well-maintained and contribute to the community cohesion and empowerment in such ways that can spread to other development activities. This justifies the need to consistently promote the organisation and strengthening of water users associations as a means to enhance the participation and effectiveness in water management. In addition, the government benefits directly; financial and management burdens on
the Government that result from administering the water allocation can be reduced through the users participation in both urban and rural areas. Depending upon the social context and local conditions, such users participation can progressively increase in intensity over the project cycle, from the consultation at the design stage to the actual operation and management of some parts of the system.

Water Users Associations

The hierarchical Government control system is remarkably typical in the development and management of large- and medium-scale irrigation projects. In Nigeria, the Government has designed and built the irrigation systems based upon its needs without consulting those who use the system. The weakness of this approach has been in maintaining these systems over the long term. It has been pointed out that the irrigation agencies have concentrated upon building new systems at the expense of maintaining existing ones, therefore, once built, many agencies are not able to perform the necessary OM. The agencies that levy a water charge to pay for OM have difficulty collecting it because the farmers are unwilling to pay for poor service, and the subsequent Government subsidies to pay for OM are often diverted to pay for new construction.

For these and other reasons, the movement to include the farmers in irrigation management is recently seen in Nigeria as a favourable way to stabilise most of the irrigation systems.

One possible approach is to increase the users participation which improve the information flow, establishes a sense of the ownership, and gives the farmers proper incentives to ensure the system sustainability.

The following examples show some approaches in introducing the private sector incentives.

Forming the Water Users Association

Many examples demonstrate the effectiveness of water users associations in managing small-scale irrigation systems and tertiary canal networks where the associations to either already existed or were newly developed. A good example is seen in the Philippines where a half of the irrigated area is under the farmer-owned and managed communal irrigation systems.

As mentioned above, the Government can play an important role in fostering the users participation by providing the technical training for water users associations and community or institutional organisers. In addition, it has been common in many developing countries that local and national NGOs are undertaking a wide range of the water-related functions, from developing projects for rural water supply
and small-scaled and minor irrigation to fostering the water users associations for water management purposes.

Many NGOs stem from the local initiatives and operate as the independently funded and self-managed groups therefore, they may bring, fresh views, new ideas and participatory working methods to other areas of the development policy and practice. Much of their interest in and experience of local conditions. They have been particularly active in promoting the interests of poor and disadvantaged groups through articulate and forceful advocacy and service provision.

Transferring control to water users association

Transferring the Government-owned and managed systems to the water users associations is more complicated because the farmers may be reluctant to take on what they perceive to be the Government responsibility. Many of the systems need to be rehabilitated before the farmers will take them over; however, these transfers may lower the financial burden on the Government and increase the farmers sense of ownership.

Conclusion.

For effective and sustainable river basin management in Nigeria, the paper propose that the RBDAs should be restricted from the management of operation and maintenance of water system. The programs that transfer existing Government-managed water system to private firms, financially autonomous utilities and water users associations should be implemented as in other developed and developing countries.

REFERENCES


Emielu S A (2000) Senior Secondary Geography, Geographical Bureau, Ilorin Nigeria
