

Understanding the Extent of IWRM Implementation in Nigeria: A Literature Review

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Abstract: Nigeria is rich in water resources in the South but relatively poor in the North. Increasing watershed degradation and decreasing water quality, among other factors have posed serious management challenges. Integrated Water Resources Management (IWRM) is seen as a promising approach to ensuring the sustainable management of Nigeria's water resources. Despite the acceptance of IWRM, the extent of its implementation at the river basin level in Nigeria is poorly understood. This paper uses a secondary data analysis to obtain a better understanding of the extent of IWRM implementation at the river basin level in Nigeria. Findings show that IWRM implementation in Nigeria is limited and constrained by the regulative forces. To improve implementation, the paper suggests the need for institutional reforms in which IWRM elements are adequately embedded in relevant legal and regulatory frameworks in Nigeria.

INTRODUCTION

While Nigeria cannot be isolated from the water crisis discourse, many studies have reviewed and criticised Nigeria's experiences of river basin management. The main criticisms are that: basin activities have focussed more on water resources development especially on the construction of large-scale dams and formal irrigation projects (Carter, 1995), there is a significant functional overlap and a lack of co-ordination as well as co-operation in the Nigerian water sector (Akpabio *et al.*, 2007; Akujieze *et al.*, 2003) and there is a lack of stakeholder involvement especially the non-state actors in basin-based water resources development and management (Adeoti, 2007). The literature has also revealed that some functions relating to: water allocation (Carter, 1995), pollution control (Jaji *et al.*, 2007; Akujieze *et al.*, 2003), wetland management (Uluocha and

Okeke, 2004), irrigation system development and management (Akpabio *et al.*, 2007; Adekalu and Ogunjimi, 2003), integrated basin planning (Carter, 1995; Adams, 1985; Akpabio *et al.*, 2007), groundwater development and management (Akujieze *et al.*, 2003), cost recovery of irrigation water services (Akpabio *et al.*, 2007) and data management (Akujieze *et al.*, 2003) are insufficiently addressed in the river basins.

The occurrence of these problems has been linked to: the presence of a plethora of organisations involved in water resource management in Nigeria (Carter, 1995; Akpabio *et al.*, 2007), weak legal and administrative arrangements in the water sector (Akpabio *et al.*, 2007; Akujieze *et al.*, 2002), inadequate human capacity in groundwater development and management (Akujieze *et al.*, 2003), inadequate funding of basin water projects (Akpabio *et al.*, 2007; Okafor, 1985; Adekalu and Ogunjimi, 2003), the poor attitudes and behaviour of

basin managers to water resource management (Okafor, 1985), corruption (Akpabio *et al.*, 2007) and political interference in river basin activities (Barrow, 1998; Adams, 1985; Akpabio *et al.*, 2007). Some suggested solutions to these problems include: moving water resources development and management from a basin-wide approach to a state-wide approach (Barrow, 1998), introducing best practices from other jurisdictions (Carter, 1995), evolving measures to check indiscriminate dumping of wastes into water bodies (Jaji *et al.*, 2007), developing effective irrigation management systems (Adekalu and Ogunjimi, 2003), putting in place the right legal and regulatory frameworks aimed at improving basin managers' operational capacity (Akpabio *et al.*, 2007; Uluocha and Okeke, 2004) and providing adequate legal instruments that incorporate other water stakeholders, especially, the non-state actors, in basin-based water resources development and management in Nigeria (Adeoti, 2007).

Despite the suggested interventions, the Nigeria water sector is yet to respond to meeting its water-related targets. However, one of the major areas weakly addressed in the literature is the provision of comprehensive information that illustrates the extent of implementation of Integrated Water Resources Management (IWRM) as an approach to improve basin-based water resources development and management at the River Basin level in Nigeria. Developing a quantitative illustration that offers a better understanding of the extent of IWRM implementation in Nigeria to guide decision making is therefore, the task of this study. It does this by drawing upon scattered evidence reported in a range of available documentary sources. The findings of this study contribute to the IWRM literature and the policy and practice domain of IWRM in Nigeria. Also, the paper's methodological pathway could be used to do a literature-based assessment of the extent of IWRM implementation in other countries that are parties to IWRM towards a cross-country comparison which at present is lacking in the literature.

MATERIALS AND METHODS

Approach to data collection and analysis: The secondary data used for this review were derived from qualitative information available in the literature. The literature was retrieved for review and analysis from SearchPoint, Scopus and Google Scholar. The time period searched spans all years available in the databases up to 2011. To identify those publications needed to understand the extent of IWRM implementation at the river basin level in Nigeria, a search was carried out using the query 'integrated' and 'water' and 'resources*' and 'management' and 'Nigeria'. A total of 57 publications consisting of peer-reviewed and grey literature was

obtained using this query from SearchPoint, 25 publications from Scopus and 23,200 from Google Scholar. Since, Google Scholar returned the largest hit, considering time constraints and given the multitude of potential publications to be reviewed, the first 150 hits were considered. It is important to highlight that the literature has no specific guidance on how much hit is acceptable. In the medical literature the first 50 results are considered (CEBC., 2010). Other authors (Knox *et al.*, 2011) have also considered a maximum of 50 returned results per search in their study. However, due to the use of multiple search engines, duplications were noticed. After eliminating duplications through simple comparisons (e.g., of titles and authors' names) and following a quick review to determine relevancy (e.g. by looking at title/abstract, making a quick scan through the main text) those that did not match the requirement of this review were eliminated. The final sample of publications reviewed consists of 22 peer-reviewed journal articles and 2 grey literatures.

The process of obtaining evidence from the publications obtained followed the inductive-deductive approach. The inductive approach seeks to identify theoretical constructs from the data, while the deductive approach seeks to understand the data in terms of pre-existing theoretical concepts (Ryan and Bernard, 2003; Carrera-Fernandez *et al.*, 2013). Although, both induction and deduction have their weaknesses (Cohen and Manion, 1985), both approaches were used in an integrated manner. However, the dominant approach followed was the deductive approach because of the theoretical framework which this paper adopted to serve as a guide. This study submits with others (Carrera-Fernandez *et al.*, 2013) that it is possible to combine these two approaches in a study, thereby capitalising on their strengths and minimising their weaknesses. The analysis and interpretation of the qualitative data were grounded in the hermeneutics paradigm of qualitative research. Hermeneutics provides a useful pathway for the analysis of texts to seek understanding (Robson, 2011). The main goal of hermeneutics is to understand the meaning of texts in reference to the whole sentence and to reconstruct the shared meaning. This implies that in hermeneutics, the researcher also draws on their own experiences to understand those constructs of others (Singh and Dickson, 2002; McQueen and Knussen, 2002). Following the adoption of the hermeneutics philosophy, the texts in the publications obtained were reviewed to understand what they say on the extent of IWRM implementation at the river basin level in Nigeria and the forces influencing their implementation. The discussion and conclusion of this study are based on a secondary analysis of the qualitative data obtained. Although, the publications reviewed have been collected from various international sources, they primarily come from the Nigerian context.

Table 1: Evaluating criteria (Modified from Hassing *et al.*, 2009)

Descriptions	Score
Issue not addressed (with the use of phrases like; lack of, absence of, non-existence of, or not available or followed)	0
Issue poorly addressed, that is the issue has many gaps in quality and coverage (with the use of words like; insufficient, poor, inadequate, little or weak)	1
Issue moderately addressed, that is the issue has some gaps in quality and coverage (with the use of words like; some, moderate, reasonable)	2
Issue largely addressed, that is the issue operates at realistic goal levels (with the use of words/phrases like; presence or existence of, adequate, available or followed)	3

Hence, the analysis undertaken in this paper may be considered as a secondary data analysis, while the interpretations presented are based on a secondary analysis of the qualitative data obtained.

Drawing on a critical review of the literature (Hassing *et al.*, 2009; FAO., 2006; GWP, 2009a; Owen *et al.*, 2010), a three-dimensional framework of enabling institutional environment of legal and regulatory frameworks with IWRM principles and approaches embedded, organisational structure for implementing legal and regulatory frameworks and presence of sound management tools is required to support the transfer of IWRM from theory to practice. This three-dimensional framework was applied as a theoretical lens to undertake a critical review of the IWRM literature to understand the extent of IWRM implementation at the river basin level in Nigeria. The review also employed the four key principles (and approaches needed to implement these principles; e.g., data collection, water law enforcement, etc.) for water management from the Dublin-Rio statements as a guide. Since, river basins in Nigeria have organisational structure in place, in the form of the River Basin Development Authorities (RBDAs) (Adeoti, 2007; Akpabio *et al.*, 2007; Olajuyigbe, 2010); two important areas which invariably coincide with the three-dimensional framework, were focussed on in the review: literature evidence illustrating the inclusion of IWRM principles and approaches (or IWRM elements) in the legal and regulatory frameworks and also their application in practice

In distilling the extent of IWRM implementation (with respect to each of the IWRM elements) in Nigeria from the literature, this study focused on findings rather than on researchers suggestions. In the processing, the “statements” obtained were translated into quantitative data via a 4-point Likert scale by comparing and classifying the collected qualitative data of each performance description with a set of evaluating criteria as illustrated in Table 1. In the analysis, the “qualifying word/phrase” obtained was as used by the researchers of the literature reviewed (or reworded to obtain a clearer phrase where necessary). For example, if the researchers state(s) a “lack of groundwater data”, the qualifying word here is “lack”. To translate “lack of groundwater data” into quantitative data, the word “lack” was compared with the set of evaluating criteria in Table 1 and as shown in that table has a score of “0”. In the same way, a performance description described as “inadequate ...” when compared (Table 1) has a score of “1”. This

procedure was followed for all the qualitative data obtained from the reviewed literature. After scoring, all the identified IWRM issues that are related were given the same code. For example, all issues relating to integrated planning, the first IWRM principle were coded as “a”. All issues (or performance descriptions) relating to non-government stakeholder participation were coded as “b” and so on.

To determine the total average quantitative score of each IWRM element or category obtained from the data, the total score of each IWRM element was first determined and then divided by the total number of IWRM performance descriptions obtained from the data. For example, the total average quantitative score of integrated planning (say, X) was obtained by summing all the specific scores (say, i) for integrated planning-related issues (as represented by the code “a”) divided by the total number of integrated planning-related performance descriptions or by the total number of “a” codes (= n). This is mathematically expressed as:

$$X = \frac{\sum_{i=1}^n a_i}{n}$$

The total average score obtained was plotted on a radar chart to provide a graphical illustration of the relative extent of implementation of each of the IWRM elements. An octagram was obtained in this case because eight IWRM elements or categories were obtained from the results of the qualitative data analysis carried out. A radar chart is justified for providing this illustration, because it does not serve as a basis for comparing one performance indicator with another (Wisker, 2001) but simply illustrates the extent of application on a 4-point scale. The lowest score, (0), suggests that the IWRM element or indicator under consideration is not addressed, while the highest score, (3), indicates that the IWRM element or indicator is largely (or fully) addressed.

RESULTS AND DISCUSSION

The qualitative data obtained from the literature reviewed are illustrated in Table 2. Although, the reviewed literature presented both empirical and perceived evidence, both have provided a useful insight into understanding the extent of IWRM implementation

Table 2: The qualitative data obtained from the reviewed literature

Researchers	Focussed river basin(s) in Nigeria ^a	Data description ^b (in parenthesis are the code and score)	Type of literature
Carter (1995)	Komadougou Yobe	Inadequate databases (d, 1); Lack of integrated, basin-wide planning (a, 0); Lack of recognition of informal water uses (a, 0); Lack of policy on water allocation (g, 0); Absence of integrated water management policy (g, 0); Excessive focus on capital-intensive irrigation schemes (a, 1)	Peer-review
Olubode-Awosola <i>et al.</i> (2006)	Ogun-Oshun	Poor cost recovery from irrigation schemes (c, 1); Inadequate funding and deteriorating irrigation infrastructure (c, 1)	Peer-review
Jaji <i>et al.</i> (2007)	Ogun-Oshun	Polluted river course (above WHO limit) (c, 1)	Peer-review
Oyebande (2006)		Failure to recover cost (c, 0); Lack of decentralised decision-making process (e, 0); Lack of stakeholder participation (b, 0)	Peer-review
Akpabio <i>et al.</i> (2007)	Cross	Integrated management not in place (a, 0); Meteorological services (not effective or reliable) (d, 1); Policy lacking in coordination definition (g, 0); Power of enforcement and regulation is absent at river basin level (h, 0); No by-laws at river basin level (g, 0); Roles and responsibilities are inadequately harmonised by the regulatory frameworks (g, 1); Low level of user participation (b, 1); Very weak water policy, legal and administrative arrangements (g, 1)	Peer-review
Oteze (2006)		Lack of data (d, 0)	Peer-review
Adeoti	Benin-Owena	Lack of law, policy and administrative framework on stakeholder participation (g, 0); Lack of non-State actors' involvement in practice (b, 0); Regulatory documents lack definitions on non-state stakeholder participation (g, 0)	Peer-review
Medugu <i>et al.</i> (2008)		Policies lacking in combating desertification and mitigating the effects of drought (g, 0)	Peer-review
Akujieze <i>et al.</i> (2003)		Lack of database relating to groundwater (d, 0); Absence of regulation and legislation on groundwater (g, 0); Poor human capacity building on groundwater development and management (f, 1)	Peer-review
Uluocha and Okeke (2004)		Lack of data on wetland health (d, 0); Poor wetland management (a, 1)	Peer-review
Adams (1985)	Upper Benue and Sokoto-Rima	Lack of integrated basin planning (a, 0); Failure to resettle reservoir evacuees adequately (a, 1); Large scale irrigation projects proved uneconomic (a, 0); Little efforts in the field of watershed management (a, 1)	Peer-review
Akpabio (2007)	Cross	Water law ineffective to resolve the issues of control, ownership, management and protection of water resources (g, 0); Lack of coordination among various organisations within the water sector in practice (a, 0); Water resource still being treated as a free good (e, 0); Lack of water rules enforcement in practice (h, 0); Powers of enforcements and regulations are absent in the legal frameworks (g, 0)	Peer-review
Nwankwoala (2011)		Inadequate planning and management of groundwater resources (a, 0)	Peer-review
Goldface-Irokalibe (2008)		Lack of inter-sectoral coordination (a, 0); Weak database management (d, 1); Water laws lack provisions and mechanisms for inter-sectoral coordination, tariff setting and conflict resolution (g, 0)	Grey
Olajuyigbe (2010)		No articulate water policy in Nigeria (g, 0)	Peer-review
Adeoti (2010)		No sub-basin management structure in practice (a, 0); Lack of legal recognition for water management at the sub-basin level (g, 0)	Peer-review
Goni (2006)		Policy inadequacies to ensure effective water resources management (g, 1); Lack of data for planning (d, 0); Lack of community participation (b, 0); Poor cost recovery (c, 1)	Peer-review
Commission of the European Communities		Presence of upstream/downstream conflict (h, 1); Top-down management approach without beneficiaries involvement (b, 0); Little cost recovery, poor asset management (c, 1); No effective data collection or monitoring system in place (d, 0); Lack of groundwater data (d, 0); Presence of overlapping responsibilities and no actual accountability (a, 0); Lack of ability to develop water management plans (f, 0); There is little or no enforcement to prevent pollution (h, 1); No catchment management (a, 0); There are erosion and flooding problems (a, 1); Some basins are not truly along hydrological boundaries (a, 1); No clear separation between resource manager and service provider (e, 0); No provision in the law for private sector involvement and communities as important stakeholders (g, 0); Present laws lack proper provisions and mechanisms of inter-sectoral coordination, tariff setting and conflict resolution (g, 0); Regulatory machinery within the water sector is weak (g, 1); Uncoordinated approach to water law administration (a, 0); The water laws fail to recognise the need for stakeholder participation (g, 0); Dams are poorly managed (f, 1); No dam rule curves (d, 0); Lack of consideration to downstream users, especially with respect to dam construction (a, 0)	Grey

Table 2: Continue

Researchers	Focussed river basin(s) in Nigeria ^a	Data description ^b (in parenthesis are the code and score)	Type of literature
Akpabio (2008)	Cross	Insufficient understanding of IWRM (f, 1); The water law lacks definition conveying full bureaucratic autonomy to the RBDAs (g, 0); Coordination among various organisations within the water sector and other sectors is non-existent (a, 0); The water law lacks clear measure for ensuring and enforcing accountability (g, 0); No effective powers for regulating and enforcing water resources exploitation in the basin (h, 1)	Peer-review
Egbu (2000)		Needs for improvement in institutional capacity (f, 1); Lack of economic measures for pollution management (c, 0)	Peer-review
Bichi and Anyata (1999)		Uncontrolled wastes discharges-industrial and domestic in rivers (a, 0)	Peer-review
Thomas and Adams (1997)	Hadejia-Jama're and Komadougou-Yobe	Many of the river basin boundaries follow political (or state) borders rather than hydrologic boundaries (a, 1); Poor planning at the river basin level (a, 1); Poor sensitivity to the spatial and temporal complexities of flood plains (a, 1)	Peer-review
Ajibade (2004)		Problem of river pollution (a, 1)	Peer-review
Mitchell (1994)	Sokoto-Rima	Integrated approach is not being followed (a, 0)	Peer-review

^aThere are twelve river basins in Nigeria (Adeoti, 2007, 2010; Olajuyigbe, 2010 for the same emphasis); ^b Some of these may be applicable to other river basins in Nigeria. This is because as also noted by Akpabio (2008), the RBDAs in Nigeria work with uniform mandates and objectives which is consistent with the legal instrument setting them up-the River Basins Development Authorities Decree No. 35 of 1987

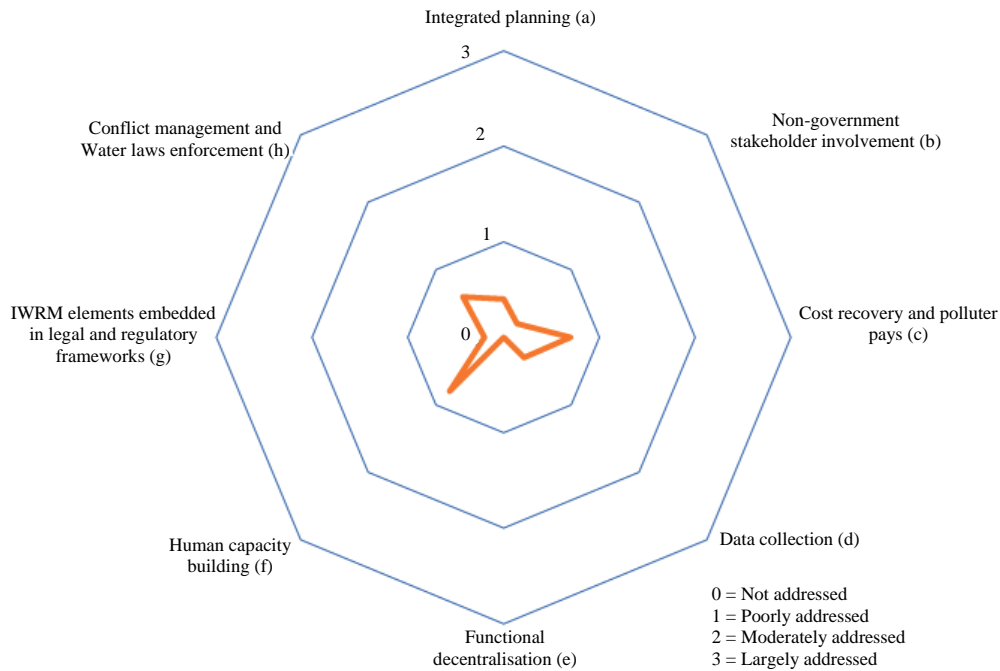


Fig. 1: The extent of IWRM implementation in the water resources sector in Nigeria

at the river basin level in Nigeria. Figure 1 summarises the results of the secondary data analysis carried out using the three-dimensional framework and the IWRM elements as a guide. As shown in Fig. 1, IWRM is reflected in a limited way in water resources development and management in Nigeria. Drawing from the IWRM literature (ICWE., 1992; GWP, 1999, 2000; Salman and Bradlow, 2006; Jaspers, 2003; Nyambod and Nazmul, 2010; Hirji and Davis, 2009).

Principle I of IWRM argues that water resources are finite and further emphasises the need to have an integrated approach to their development and management. In the case of Nigeria, the level of application of this principle is very low as indicated by item (a) in Fig. 1. As it is, the important role that an integrated water management approach plays in socio-economic and ecological development is out of focus in Nigeria. This situation will further be worsened by the multitude of threats facing Nigeria in the water resources

sector. These threats include that of climate change, desertification, temporal and spatial rainfall variability, the cycle of droughts and floods and significant growth in population, urbanisation as well as environmental and watershed degradation. The population of Nigeria is put at 150.4 million (in 2010 estimates) and is expected to exceed 180 million by 2020 and reach 225 million by 2025. This rapid increase in population, coupled with urbanisation, poor land use and unregulated sanitation and wastes disposal will take its effect on water resources at both the qualitative and quantitative levels. Without doubt, increasing population and expanding economic activities will cause the demand for water to rise. Likewise with increasing urbanisation and economic growth as well as temperature rise, per capita demand for water will also increase. Hence, there is a need for integrated water resources planning in Nigeria. As Fischhendler (2008) puts it, a higher degree of integration will allow for more optimal water resources development and management.

Principle II emphasises that water development and management should be based on a participatory approach, involving the direct water users, the indirect water user and the potential water users at all levels. The principle further argues that real participation occurs when stakeholders are part of the decision-making process and participation is achieved at a level more than consultation. It encourages achievement of a long-lasting consensus and common agreement. The principle also encourages governments to create room for a participatory approach to work by putting in place necessary participatory mechanisms and to enhance capacity for women and other marginalised groups. These are to be done while ensuring that water management decisions under a participatory approach are taken at the lowest appropriate level. According to FAO (1995), institutional arrangements must ensure that stakeholders are involved in all aspects of policy formulation and implementation, with enhanced roles for private sector and other community groups. As illustrated in Fig. 1, item (b), the extent of application of this principle to water resources management in Nigeria is generally poor. Rahaman *et al.* (2004) comment that “[s]takeholder participation is one of the most important issues in IWRM” (p. 571) while Moriarty *et al.* (2010) posit that a meaningful involvement of water stakeholders in decision making can only be created by informed institutional frameworks. In the literature, little is known about the field level involvement of the local governments and the critical role of the private sector in IWRM-based water management in Nigeria. But with increasing water scarcity and competition among different water uses and users, IWRM posits to combine both a top-down with a bottom-up approach. This will involve a combination of roles, competencies and responsibilities among the water stakeholders. In view of this, bringing communities who

have stake in the resource into decision making is therefore crucial to achieving a sustainable solution for water resources management (Goldin *et al.*, 2008). In the case of Nigeria, as observed by Allen and Leigh (2010), greater stakeholder involvement is required in the planning, development, operation and maintenance of water projects. But because key stakeholders are not involved in Nigeria as pointed out by Onosode and Ogban (2010), this has resulted into project duplications in most cases. It is anticipated that non-government stakeholder participation in Nigeria will ease water laws enforcement and create a favourable environment for implementing cost recovery and polluter pays principle. With stakeholder participation, a sense of ownership is felt (Jembere, 2009). It is also argued that local communities can provide an important indigenous knowledge database and ideas that could lead to implementable solutions to water problems (Ako *et al.*, 2010). As it stands, these benefits may not be captured in the case of Nigeria.

Principle III stresses that women play a key role as providers and users of water and through these activities exert influences on the water environment and its associated ecologies. It argues further that special efforts should be put in place to ensure women’s participation in water resources management at all organisational levels. The principle recognises women as water users that should be given increased access to decision-making and increased participation in water resources management. And also, the need for the water sector to be gender sensitive. As corroborated others (Rahaman *et al.*, 2004; Martinez and van Hofwegen, 2006), women play a vital role as providers and users of water and guardians of the living environment. Although from the various literature reviewed (Table 2), the extent of implementation of the inclusion of women in water resources management in Nigeria is weakly known. However, this study submits that in all cultures in Nigeria, women are primarily responsible for the provision, use and management of water which is more or less part of their daily work activities. Lack of water has a positive feedback loop on poverty, exacerbating gender inequalities in employment and education (Nyambod and Nazmul, 2010). This partly explains the growing incidence of poverty among women in Nigeria. This is because they devote much of their useful time in search of water for household use at the expense of other income generating opportunities. As Goldin *et al.* (2008) point out when women are unable to influence decision-making processes that affect their everyday living, their economic and social opportunities can be limited. Women’s activities in water provision, use and management should entitle them to be recognised by the legal and regulatory frameworks in Nigeria for better and efficient water resources management. But as it is literature evidence indicates that the institutional frameworks for water resources management in Nigeria

do not focus on gender recognition and the involvement of women in water management, decision making and the implementation of water-related issues. Hence, not gender sensitive.

Principle IV argues that water has an economic value in all its competing uses and should be recognised as an economic good. In a subsequent revision, Section 2, Chapter 18, paragraph 18.17 of Agenda 21 of Rio posits that water should also be considered as a social good (UNICEF Nigeria, 2010). Principle IV also emphasises the need to recognise the opportunity costs involved in allocating water. And more importantly, to value water as a means for rational allocation and to charge for water as a means of creating incentives for efficient use; place full value on water which should consist of its use (or economic) value and the intrinsic value; apply the full cost of providing water which should consist of its full economic cost and other associated externalities; apply the concept of cost recovery, manage water demand and supply through the use of economic instruments that treat water as an economic good and recognise the need for water resources management agencies and utilities to be financially self-sufficient without jeopardising the need to treat water as a social good while at the same time guaranteeing access to the disadvantaged groups in a transparent manner. As pointed out by Blanco (2008), water use charges should function as an economic instrument to achieve the efficient allocation of the resource among the designated uses and to continuously serve as an incentive to users to manage their consumption of water wisely. As indicated in Fig. 1, item (c), the application of cost recovery and polluter pays principle to basin-based water resources development and management is poorly addressed in Nigeria by the RBDAs. This will indirectly affect water management sustainability, revenue generation and investment in water infrastructure.

Aside from human capacity building which seems to be rather fairly implemented, the implementation of data collection, functional decentralisation, conflict management and water laws enforcement and the inclusion of IWRM elements in the legal and regulatory instruments is weakly addressed (Fig. 1). As argued by McDonnell (2008), data is an important component of the enabling environment needed to implement IWRM. Although the implementation of IWRM brings data availability to the fore; unfortunately, the situation of data gathering and management at the river basin level in Nigeria has not been offered due attention by the RBDAs as illustrated in Fig. 1, item (d). A direct impact of poor data availability, especially, at the river basin level is that management ability to identify water problems, conflict areas and vulnerabilities and understand appropriate solutions to apply could be jeopardised. Also, the ability of the basin operators and other water stakeholders to

establish water priorities and objectives and resolve water conflicts could be seriously affected. As it is in the case of Nigeria, the possibilities for truly integrated water resources management are limited.

In the case of functional decentralisation (that is between the RBDAs and the Federal Ministry of Water Resources-the regulatory body), literature evidence shows that the issue is not addressed in Nigeria (Fig. 1, item (e)). This indicates that functional decentralization is neglected in Nigeria. Since, the RBDAs are formal entities, this is possible because the enabling legal and regulatory frameworks and administrative mechanisms do not set out necessary guidelines to promote functional decentralisation, private sector involvement and support to develop local level capabilities needed in the management of water resources. For example, the Federal Ministry of Water Resources that has the overall responsibility for policy advice and formulation, data collection, monitoring and planning, development, management and coordination of water resources in Nigeria is also involved in service provision functions, such as the construction, operation and repair of hydraulic works and the supply of raw water (Onosode and Ogban, 2010). These service provision functions are also part of the functional mandates of the RBDAs. However, with a lack of functional decentralisation, the issue of fiscal decentralisation is also out of consideration. As argued by Moriarty *et al.* (2010), a real decentralised decision making can only occur with decentralised financing. Therefore, to redress poor water management, environmental degradation and poverty issues in Nigeria, as pointed out by Martinez and van Hofwegen (2006), the decentralisation of IWRM responsibilities to the local governments, the RBDAs and other local stakeholders is therefore vital. This viewpoint is in agreement with Ahmad (2003) who assert that:

“[d]ecentralisation of water management is another key to proper water management which can provide the necessary framework for ordinary people to participate in water management, contributing to the development of water resources in both quantitative and qualitative terms as well as to an effective, equitable and sustainable water allocation to its various uses. In particular, it would facilitate poverty reduction interventions ...” (p.270)

As of 2004, about 54.4% of the Nigerian population was estimated as living below the poverty level (NBS., 2009). This percentage is expected to increase with increase in poor water resources management because of the intricate link between water availability and socio-economic development in an

agrarian society, like Nigeria. But as shown in Fig. 1, item (e), functional decentralisation is neglected in Nigeria. Hence, the possibility of using water resources to address poverty will be rather missing in the case of Nigeria. The participation of local governments which Butterworth *et al.* (2010) describe as “a crucial entity in IWRM” (p. 76) because of their mandates that relate to direct services provision, planning and development will be rather missing in the water resources management framework in Nigeria. Also, weak human capacity building, as illustrated in Fig. 1, item (f) will also impact the way water is used, managed and protected in Nigeria. Curtis (2010) discovers that there is a growing shortage of technical expertise to govern water resources, plan projects, supervise water contracts, operate and maintain plants, monitor and evaluate deliverables in Nigeria. This situation has resulted into poor estimates of quantity, quality and availability of water resources in the river basins and consequently, the estimates are little used for planning or design. Although, the development of human capacity is a long-term effort, complex in nature and very resource demanding (Jaspers, 2003), it is argued that at a certain moment in time a sufficient amount of relevant technical, organisational and administrative capacity has to be available to facilitate and sustain IWRM implementation. Also, it is increasingly becoming clearer that water management is highly unstructured and complex which could be attributed to the complex nature of the physical river systems, the exchange of surface and groundwater and vice versa, the interaction between upstream and downstream uses and users, quality and quantity and the continuous exchange among environmental elements including humans and the ecosystems. Aside from these, managing stakeholder participation, water dispute, water for biofuel production and the growing climate threats as well as rainfall and runoff variability are other complex systems. This is coupled with the fact that different aspects of the water resources development and management functions will be implemented by different personnel and through different bodies of knowledge (Jaspers, 2003). However, to manage these complexities will no doubt require adequate human capacity. As expressed by Jembere (2009), IWRM is a participatory process and requires sufficient human capacity to facilitate its implementation and minimise conflicts on the stakeholder platforms. However, it is evident in the literature reviewed that institutional frameworks relating to water in Nigeria are silent on human capacity building, a critical part of IWRM. Therefore, where institutional mechanisms are inadequate, the sustainability of water resources management is threatened and Nigeria cannot be an exception. If water governance is to be improved in Nigeria, then an investment in human capabilities in IWRM must be given

an adequate institutional consideration. But as it is the extent of implementation of human capacity building with respect to water resources management in Nigeria is still poor. This will impact system self-training and retraining opportunities. As Jembere (2009) puts it, with a poor capacity building initiatives for IWRM, the likelihood of its success is low. And Nigeria cannot be an exception.

Since, water resources in Nigeria are partly managed along the hydrologic boundaries, the overall implication of this weak IWRM implementation is that the water sector in Nigeria may have difficulty responding to its water functions. This submission is in agreement with the view of other scholars (e.g., Akorede, 1997; Akujieze *et al.*, 2003; Ulocha and Okeke, 2004). For instance, of the estimated population of 150.4 million, about 56% of the population are without access to potable water supply (FMWR., 2012) while over 67% of the population are without access to improved sanitation (Unicef Nigeria, 2010). Why IWRM has not worked in the case of Nigeria is undoubtedly related to the fact that these principles and its supporting approaches are yet to be given legal and regulatory backing as revealed in Fig. 1, item (g). This indicates that they are clearly not locally rooted. This paper submits that the observed weaknesses in institutional frameworks due to inadequate legal and regulatory frameworks to guide the multi-dimensional aspects of water resources and the resource managers and users will continue to undermine IWRM implementation. However, due to these weaknesses, structures for conflict management and water law enforcement are less operational in Nigeria as shown in Fig. 1, item (h). With poor conflict management and water law enforcement, this will create disincentives for efficient water resources management, leading to resource abuse and overexploitation as common in Nigeria.

Drawing on the data obtained from the literature reviewed (Table 2) reveals that the extent of implementation of IWRM to improve water resources use, development and management at the river basin level in Nigeria is constrained by inadequacies in the legal and regulatory instruments. This finding suggests that the IWRM elements are not fully embedded in the legal and regulatory instruments in Nigeria (Fig. 1, item g). However, according to Lankford and Hepworth (2010), IWRM will require appropriate policies and legislative instruments for its practical implementation. Sharma *et al.* (1996) also maintain that appropriate and enforceable water resource legislation is a pre-requisite for the effective application of IWRM to water resources management. This agrees with the view of others (Hassing *et al.*, 2009; Durham *et al.*, 2002) who assert that IWRM should be clearly embedded in the appropriate legal and regulatory instruments in order to encourage its

implementation. Therefore, the findings of this review and analysis are that: the extent of IWRM implementation at the river basin level in Nigeria is limited and the provisions of the legal and regulatory instruments in Nigeria needed to support the transfer of IWRM from theory to practice are inadequate. The latter finding supports others (e.g., Yamakawa *et al.*, 2008; Ellison, 2007; Greenwood and Holt, 2008; Grigg, 2008; Hukka *et al.*, 2007; Ako *et al.*, 2010) who assert institutional issues are the greatest challenges in water management. This is because institutions not only specify actors and their roles, they also create frameworks that enable or constrain actions.

Although, the RBDAs do not act in isolation, there is a paucity of data in the reviewed literature illustrating the effects of informal rules on IWRM implementation and also the impact of other water-related organisations (national and international) on IWRM implementation at the river basin level. Thus, the question of why the IWRM elements identified in this review and analysis (Fig. 1) is not fully implemented at the river basin level in Nigeria has only been partially answered. The literature has only revealed the presence of the regulative institutions as a constraining force. This suggests that an in-depth understanding of the forces influencing IWRM implementation would first be needed, before following it up with suggestions which might help to improve implementation. In order to realise this, the findings of this study will also serve as a useful guide.

Implications for policy development: In terms of implications for policy development, this study offers a useful insight into the state of IWRM implementation in Nigeria. As the data suggest, IWRM implementation in Nigeria is limited and constrained by the regulative forces. To effectively implement IWRM to water resources management, the literature (e.g., GWP, 2009b; Lankford and Hepworth, 2010) has argued that appropriate and enforceable legal and regulatory instruments are an essential prerequisite. Therefore, since, the implementation of IWRM begins with policy and legislative (or institutional) reform and then progresses to its field-level implementation, this suggests that the policy makers in Nigeria should recognise the need to embed the IWRM principles and approaches (or elements) in relevant legal and regulatory frameworks. The process will entail fully incorporating IWRM elements in the policy instrument for water resources management in Nigeria. As emphasized by other scholars (e.g., Owen *et al.*, 2010; Nyambod and Nazmul, 2010), the IWRM implementation process should begin with a water policy to fully reflect the IWRM elements and to put the policy into practice would require the reform of water laws. Also, GWP (1999) puts it that the statements of policy instruments are relevant to the application and

enforcement of legislation. Although, Nigeria has a 2009 draft water policy in place, a review of this document indicates that the IWRM elements are not fully incorporated in the document. For example, the document is silent on some aspects of integrated planning, non-government stakeholder participation in basin-based water resources management, women inclusion, cost recovery in other sub-sectors aside from the drinking water sub-sector, the social value of water, the body to implement the polluter-pays principle, etc. This suggests that a revision of the 2009 draft water policy document is needed in Nigeria. While the literature agrees that policy instruments are essential to enable IWRM implementation (FAO, 1995; De Stefano, 2010), it has also been argued that this instrument would require legislative supports (Saravanan *et al.*, 2009). Thus, in the case of Nigeria, this would require the reform of the River Basins Development Authorities Decree No. 35 of 1987 and the Water Resources Decree No. 101 of 1993 to ensure that they are fully IWRM rooted.

CONCLUSION

The challenges facing the water resources sector in Nigeria have called for the implementation of integrated water resources management which integrates all available water resources to meet the water demand of the different water use sectors. Despite accepting the IWRM approach and managing its water partly along the hydrologic boundaries, this study has found that IWRM is weakly applied to water resources management in Nigeria. Literature evidence indicates that its implementation is constrained by inadequacies in the legal and regulatory instruments in Nigeria. To alleviate this situation, the paper suggests an institutional reform in which IWRM elements are adequately embedded in the extant water-related legal and regulatory instruments in Nigeria.

However, in order to do this effectively will require an in-depth understanding of the impact of informal laws relating to water resources and other water-related organisations (national and international) on IWRM implementation at the river basin level in Nigeria. This would enable the RBDAs and all other stakeholders to play their respective roles in the use, development and management of Nigeria's water resources at the river basin level.

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