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# The effectiveness of water resources management in Pra Basin

Albert Ebo Duncan[a,*], Nanne de Vries[a] and Kwabena Biritwum Nyarko[b]

[a]*Department of Health Promotion, Faculty of Health Medicine and Life Sciences, Maastricht University, P.O. Box 616, 6200MD Maastricht, The Netherlands*

**Corresponding author. E-mail: a.duncan@maastrichtuniversity.nl*

[b]*Department of Civil Engineering, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana*

## Abstract

Integrated water resources management (IWRM) has been criticized yet it is the dominant approach to water resources management in developing countries. The criticism emanates from the manifold of unfounded assumptions made during implementation on issues such as availability of technology and infrastructure, privatization and sustainable financing, human resource capacity, government interference, etc. The Pra Basin has been implementing IWRM since 2011. The basin houses nine out of the 17 artificial reservoirs constructed in Ghana for drinking water supply. It is therefore prudent that the basin's water resources are given extra management care to ensure sustainable water quality and quantity for growth and development. However, much uncertainty still exists about whether the best water management system is being practiced, whether the system is working well, or needs improvement. This study examines the effectiveness of water resources management in the Pra Basin of Ghana. This study used interviews, field observations, and documents such as Pra Basin IWRM plan, the national IWRM plan, etc. to assess the effectiveness of IWRM in the Pra Basin. The result of the study showed that IWRM although appropriate for the basin had implementation gaps. These gaps are potential contributors to deteriorating water quality.

*Keywords:* Effectiveness; Ghana; Management; Pra Basin; Uncertainties; Water resources

## Introduction

Water resources management can be defined as a process of planning, allocating, developing, and managing the optimum use of water resources. The management could be a traditional/unintegrated or an integrated approach. The unintegrated approach is associated with the building of dams and irrigation schemes without thinking about the downstream social and ecological impact (Merrey, 2008). Furthermore, the unintegrated system is fragmented and fails to recognize the interdependence (integrated) nature of water resources management. This failure leads to conflicting interests among

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water governing bodies as well as the development of water policies, without considering the implications of such policies on other water users and without any consultation across sectors and institutional boundaries (Jønch-Clausen & Fugl, 2001). The integrated approach is defined as a 'process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems' (GWP, 2000). Integrated water resources management (IWRM) addresses the interdependence nature of water resources management by bringing on board water users at all levels (Lenton & Muller, 2009), to address all potential trade-offs and the different scales in space and time (Pahl-Wostl, 2006). IWRM is projected with a high potential of generating resultant benefits such as water security, sustainable socioeconomic development, sound ecology, and environmental flows. Most developing countries are implementing IWRM, yet it is criticized on the basis that it is not fully implemented and therefore the benefits are not realized. Ghana has been implementing IWRM since 2011 in the Pra Basin. This study examines the effectiveness of IWRM in the Pra Basin (Figure 1).

The Pra Basin cuts across four out of the ten regions in Ghana. It covers about 55% of the Ashanti region, 23% of the eastern region, 15% of the central region, and 7% of the western region of Ghana. The total basin area is approximately 23,200 $km^2$ and lies within latitudes 5° N and 7° 30′ N, longitude 2° 30′ W, and 0° 30′ W in south-central Ghana. The relative humidity is around 70% to 80% throughout the year. The annual rainfall range is between 1,300 mm and 1,900 mm with an annual mean value of 1,500 mm. Over 63% of the population are involved in agriculture. The remaining 30% of the population are involved in mining and short-term employment such as daily labor on farms. The Pra Basin houses nine out of the 17 constructed water supply reservoirs in Ghana but 42% of households in the basin do not have access to potable water (Pra Basin, 2012). In addition, there is a high level of illegal mining in and around the water resources. Considering the low accessibility to potable water and the high level of illegal mining in the basin, it is important to have effective and efficient water management in the Pra Basin.

This study, therefore, examines the effectiveness of the IWRM implementation in the Pra Basin by assessing how it has addressed the needs of the basin by addressing the following questions: (1) Is the IWRM the appropriate management option? (2) What is working well? (3) What is not working well?

To address the research questions, data were drawn from interviews, field observations, Pra Basin IWRM plan, the national IWRM plan, and policy documents including annual reports of the Water Resources Commission (WRC) and other related government agencies. The field observations were carried out to get first-hand information of the developments in the basin and also to acquaint ourselves with the things which might be important for the success of the water management system but were not captured in the development framework for action in the basin. Eight towns which were used as monitoring stations for the baseline data collection for the basin in 2011 were visited. The paper draws data based on empirical evidence from (a) five interviews with opinion leaders and a retiree of a relevant state institution, (b) 14 interviews with government agencies and organizations: eight Environmental Health Officers (EHOs) from the District Assemblies, two Ghana Water Company Limited (GWCL) workers, and one each from the Hydrological Services Department (HSD), Meteorological Services Department (MSD), Community Water and Sanitation Agency (CWSA), and the Environmental Protection Agency (EPA). Before providing answers to the above questions, this paper first presents relevant cases of IWRM implementation, and then proposes a framework for IWRM implementation, before analyzing the data gathered and drawing conclusions.


Fig. 1. Pra Basin map.

## IWRM: implementation, benefits, and challenges

This section focuses on IWRM, the motivation behind its introduction, its benefits and challenges through the assessment of implementation in different regional backgrounds but focusing largely on the Africa region. Then, finally, we establish the implementation framework for assessment.

### *Implementation*

The framework for implementing IWRM has largely been based on the definition proposed by Global Water Partnership (GWP). As defined earlier, GWP explains that IWRM when fully implemented

should promote coordination in the development and management of water, land, and related resources with the resultant effect of maximizing the economic and social benefits in an equitable manner without compromising the sustainability of the vital ecosystem. Many reasons have been assigned as to why IWRM is the best management option for the water crisis today and for future water security; three stand out. First, is its potential to integrate the natural system and human system (Jønch-Clausen & Fugl, 2001). According to Jønch-Clausen & Fugl (2001), the approach has the potential to integrate: (1) land and water management, (2) surface water and groundwater management, (3) quality and quantity of water resources management, (4) upstream and down-stream water-related interests, (5) freshwater management and coastal zone management, (6) holistic institutional framework, (7) water into the national economy, (8) water resources planning with poverty alleviation, (9) cross-sectoral plan into the national policy development, (10) water resources planning into national security and trade policies, (11) different management levels, (12) all relevant stakeholders into the planning and decision-making process. The second is that it has been proposed as the management option to address the water crisis. IWRM is the most appropriate management option to address the challenges facing the multifunctional, multi-sectoral, multi-regional, degraded physical landscapes and declining water quality and quantity, finite, figurative and uneven distribution of water resources across the globe (Jønch-Clausen & Fugl, 2001; Swatuk, 2005; Biswas, 2008; Agyenim & Gupta, 2012). Third, in IWRM, water management is decentralized to the lowest level to ensure greater, efficient and effective stakeholder participation at all levels. The participation at all levels, especially that at the lowest appropriate level, is anticipated to strengthen decision-making, enhance local input, and maximize the benefits of the water resources and ensure its security for present and future generations without compromising the sustainability of the ecosystem.

Even though IWRM has been projected to address the multiple competing and conflicting uses of water resources (Jeffrey & Gearey, 2006), its implementation has been marred by controversies. This is not to downplay the benefits of IWRM implementation. IWRM has often been referred to as the Dublin–Rio principle: it is built on the recommended actions proposed from the Dublin conference to address the challenges facing water resources management and the 'solution manual' to address the identified challenges from the Earth summit (Mitchell, 2005). One of the main challenges of implementation is centered on the synchronization of the proposed solution (Dublin principles) and the outline plan/program to achieve the expected outcomes (Muller, 2010). According to Muller (2010), the Rio conference on environment and development outlined some guidelines building on these Dublin principles, including (1) integrated water resources development and management, (2) water resources assessment, (3) protection of water resources, water quality, and aquatic ecosystem, (4) drinking water supply and sanitation, (5) water and sustainable urban development, (6) water for sustainable production and rural development, and (7) impact of climate change on water resources. The Rio United Nations Conference on Environment and Development recommended integrated (I) water (W) resources (R) management (M), and development (D) (IWRM&D) and not IWRM as the way forward in water governance. The development component has been eliminated completely in the new management system (IWRM) (Muller, 2010) but Jønch-Clausen & Fugl (2001) claim the 'M' in the IWRM represents both management and development. The absence of the 'development' or the inability of implementers to discern the real meaning of 'M' is suggested to have negatively affected IWRM implementation especially in developing countries (Muller, 2010). From the discussions so far, it is clear that there are still unanswered questions when it comes to IWRM and its implementation. In the same way, there are definitely benefits and challenges.

*The benefits*

Regarding the benefits, IWRM creates a platform for an effective, efficient, and reliable network of all relevant stakeholders (Dube & Swatuk, 2002). For example, the implementation of IWRM in Southern Africa created a global network of water resources managers such as international non-governmental organizations (INGO), international governmental organizations (IGO), private foundations and think tanks to share experience, ideas, etc. (Swatuk, 2005). It decentralizes the water management system which (a) ensures proper stakeholder involvement in decision-making, (b) ensures efficient use of natural resources, (c) ensures equitable distribution and access to natural resources (Ribot, 2004; Saravanan, 2009); reduces fragmented management roles and decision-making (Moriarty *et al.*, 2010; Giordano, 2014); helps in the identification of local problems for redress; reduces conflicts to the minimum and improves coordination and integration by strengthening existing laws and policies to fit into the development framework of nations/states/regions. The success of IWRM is partly dependent on the explicit recognition of the link between development and management of water resources and the need to tailor implementation to meet the challenges of a basin. In other words, setting up the management or development scheme should be based on the pending needs of the community, basin, or state at the time; making a conscious effort to ensure that the output does not negatively affect other related components of the environment. The evidence is available in Mexico, Denmark, Japan, South Africa, Tunisia, Mozambique, Zimbabwe, Algeria, etc. just to mention a few places.

In Mexico, water reforms were to address the water stress and deteriorating water quality which led to the drying up of Lake Chapala. Government interventions focused more on institutional development and management innovations to support their long-term infrastructural development (Muller, 2010). Huge investments were made in the area of wastewater treatment to address the deteriorating water quality; in the end, the quality of water improved and drinking water was restored for about 16 million people. Similar reforms in Denmark also yielded fruitful results (Lenton, 2009); however, in the Denmark situation, local administrative institutions and not river basins were involved. Japan is very susceptible to destructive typhoons and flooding. To address the situation, it rolled out a combination of sound institutional regulation, strong work ethics, and appropriate technology: well-managed regulation of flows and construction of a series of networked large storage reservoirs. This ensured a regular supply of water and prevented flooding (Louati & Bucknall, 2009). A study by Lenton & Muller (2009) indicates that in apartheid South Africa, water development was carried out at the expense of water management due to political challenges at the time. Even at the time, the water development was narrowed to support the rich farming communities to the detriment of broader development priorities of the water sector. However, after the apartheid era, water reforms were linked to the country's planning framework which supported broader water sector development priorities. What resulted from the post-apartheid innovations was a good platform and strong coordination between government and industry in the management of wastewater. Access to domestic water and industry was also improved. Tailoring IWRM to meet basin needs resulted in the trans-boundary agreement in which Mozambique willingly gave permission to Zimbabwe to draw water from the Pungwe River which passes through Mozambique (Gumbo & Van der Zaag, 2002). A similar agreement was also reached between Tunisia and Algeria and among Tunisia, Algeria, and Libya on a common aquifer (Louati & Bucknall, 2009). A study by Louati & Bucknall (2009) revealed that Tunisia, even though it is one of the countries in the Mediterranean basin least well-endowed with water resources and with the imbalanced spatial distribution of water resources, had never experienced drought or flooding

until after 1758. Meanwhile, an effort to address this situation in the past did not yield any fruitful results. To tackle the problem, the government invested heavily in infrastructural development such as the construction of dams. This did not only reduce drought and flooding but also enhanced water storage and transfer. The experiences discussed above are all addressing specific needs: this is how IWRM should be implemented. On the contrary, certain external and internal factors such as donors, politics, etc. have sometimes been allowed to be the implementation determinants instead of the needs identified in most developing countries.

*The challenges*

Giordano & Shah (2014) argue that IWRM implementation is mostly donor motivated instead of solving a basin problem as popularly projected. Citing the case of Tanzania water resources challenges, they indicate that the main challenge at the time was water development and provision. However, because Tanzania's budget was heavily donor dependent, they rather implemented IWRM with state ownership of water resources, water-withdrawal permits, water taxes, river basin organizations, and water user associations at the expense of what their water policy identified as their need. Dube & Swatuk in, 2002 reported that the selection of the Mazowe catchment in Zimbabwe for pilot projects by donors was predetermined because the choice was to secretly adopt the framework, management experience, and interests of white commercial farmers at the expense of indigenous commercial farmers.

Highlighting the importance of awareness creation in IWRM implementation, GTZ (2000) explained that low levels of public awareness impact negatively on stakeholder participation. Inguane *et al*. (2014) reported how lack of awareness impeded the success of the systematic processes employed by Mozambique in implementing IWRM. In their study, they explained how Mozambique created the enabling environment through the establishment of water law, water policy, and other relevant bodies such as Regional Water Administration (RWA), Stakeholder Consultative River Basin Committees (SCRBC) and the River Basin Management Unit (RBMU), but still failed to achieve most of the outcomes. According to Inguane *et al*. (2014), the expectations were that the enabling environment would help increase coverage and user participation; however, most of these projections did not materialize.

There are challenges when it comes to funding and releasing of funds to the lowest appropriate levels of operation. The absence of reliable and unbiased state funding, and unsustainable funding provided by donors in developing countries (Shah & Van Koppen, 2006), has been a major hindrance to implementation in most developing countries. In addition, the absence of skilled human resources has been identified as one of the major constraints in the implementation. Regarding funding, studies such as that conducted by Gallego-Ayala & Juizo (2011) showed the abnormally slow pace of the water sector reforms in Mozambique due to financial constraints in the country. Swatuk (2005) showed donor funding for irrigation projects in Zimbabwe was stopped due to political instability. Operating at the basin level requires the release of money to the lowest level for efficient and effective operation; however, this is a big challenge in Africa (Inguane, 2010). The absence of skilled human resources is a major challenge to IWRM implementation in Africa (van der Zaag, 2005).

Another area of concern is the institutional framework. The creation of new institutions and their decentralization has generated some operational challenges. For example, Keohane & Nye (1993) reported implementation challenges due to the creation of new institutions. These challenges become more pronounced when especially the supervision over the institutions in question have a different boundary of operation (Tapela, 2002). First, even though South Africa created new institutions using

the bottom-up approach, they still had serious operational difficulties (Dovers, 2001; Swatuk, 2005). Similarly, in Zimbabwe, the creation of Catchment Council (CC) and Sub Catchment Council (SCC) has done little for the devolution of authority, such as stakeholder participation, institutional resilience, etc. (Tapela, 2002). Second, regarding the challenges of a new institution having oversight responsibility for existing ones, the Zimbabwe scenario is a case in point. In Zimbabwe, the Catchment Council (CC) overlaps with many political and sectorial jurisdictions. As explain by Dube & Swatuk (2002), there is a great tussle between a network of government and non-governmental organizations such as the Department of Natural Resources, the mines, urban councils, etc. in submitting to the directives of the CC. They explain that the tussle is further strengthened through the assigning of responsibility. Whereas the overall responsibility for the CC is to manage all water resources, they are to focus on the commercial use of surface water at the catchment level while the Local Government Ministry takes care of rural water. What remains unanswered is what constitutes water resources as far as Zimbabwe National Water Authority is concerned? The intervention put in place to save the river basins in Zimbabwe resulted in a crass scramble for authority among farming communities (Swatuk, 2005). A study by Inguane *et al.* (2014) shows that the transfer of power or authority from central government or state to the lowest (basin) level of operation in Mozambique followed a de-concentration approach. They further explain that de-concentration is the weakest form of the decentralization process because it does not transfer full powers such as planning, management, funding, etc. to the lowest level, yet that is what most developing countries adapt.

Also of concern are the conflicting issues associated with the concept of IWRM. The conflicts could be internal or trans-boundary. Internal conflicts could be at the local scale with complex interactions and feedbacks among a wide array of variables from both human and natural systems (Heleman, 2015). It may also arise from overdependence on the same volume but continuously deteriorating water resources by the growing population, industry, and urban development (Robinson, 2002). Other internal or local conflicts are linked with roles and devolution of powers. A typical example is reported by Swatuk (2005), between wetland conservationists and farmers using the wetland for farming. He also reported conflicts among upstream pastoralists, irrigators, and farmers in Tanzania.

For the purpose of streamlining the mode of assessing IWRM implementation in the Pra Basin, we proposed a framework (Figure 2) based on the explanation of IWRM implementation being a process. This theoretical framework (Figure 2) can be described as an assessment and implementation framework. It can be used to assess an existing management system and based on the gaps identified; measures can be put in place to address them. It can also be followed, as explained after this paragraph, for implementing a new policy. It must be emphasized here that, all over the world, and in almost every country, city, town, or village, water is being managed; what we are not sure of is whether the management is effective or not? In this regard, Figure 2 can be used to assess systems of such nature, outline the gaps, and propose solutions. Before explaining the processes taking place at each level of the framework we first want to explain the significance of the different arrows and their role in processes.

All rectangles are labeled from A to N. There are arrows which connect the various rectangular boxes in the framework. One way of distinguishing the arrows is by their heads. There are unidirectional and bidirectional arrows. The other way to differentiate them is by their solid and broken lines. If the arrow is solid and unidirectional it signifies operational flow. The unidirectional broken arrows indicate feedback. These feedback messages are for adjustment and improvement in operations. Unfortunately, these feedbacks are mostly underestimated by policymakers, basin officers, and engineers (Pahl-Wostl, 2006) even though they are very critical for shaping the implementation framework. The broken lines with double arrowheads

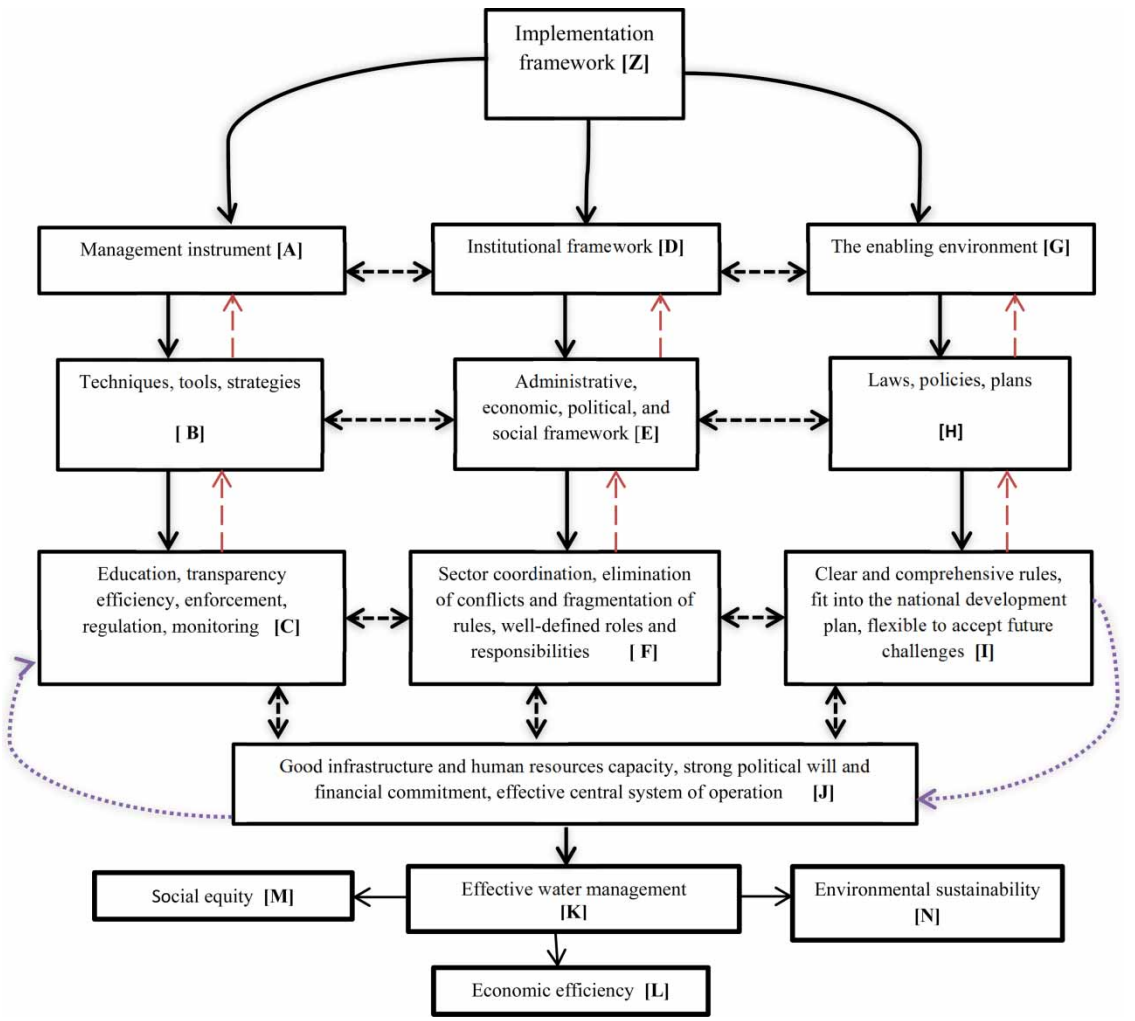


Fig. 2. IWRM implementation framework.

represent the sharing of expertise, coordination, information flow, awareness creation, and transfer of resources. The implementation framework [Z], starts with the creation or reviewing of existing management instrument [A], institutional framework [D], and the enabling environment [G].

Connecting rectangles [C], [F], and [I] to [J] are broken double-headed arrows which are in turn joined by a broken unidirectional arrow to form a loop. The bidirectional arrow at this stage indicates that for effective and efficient actions to take place in [C], [F], and [I] the elements in [J] must be available, in good condition, and sustainable. It also implies that for an effective water management system to yield [L], [M], and [N], the bidirectional flow must be maintained.

IWRM is a process and not a one-time action. The three pillars for implementation, namely, the institutional framework, the management instrument, and the enabling environment must always be well established for a successful take off. In a situation where these are not present, systematic effort must be made to create them before taking off. Where they are present but weak, they must be strengthened.

*The enabling environment*. The creation of a clear, comprehensive, and flexible legal framework which can accept future changes in a holistic manner is very critical in ensuring good management of water resources (Salman & Bradlow, 2006). Where there is an existing legal framework, they should not be abandoned but rather reviewed and strengthened (Butterworth *et al*., 2010). Where new ones need to be created, efforts must be made to involve all relevant stakeholders. However, caution should be taken in the kind of consultants engaged. All stakeholders and consultants involved with the whole process should be familiar with the concerned environment in that these laws must be applicable in the local community where they are to be implemented. A situation of this kind happened in Kazakh where foreign consultants were contracted to draft their water law. Because the consultants were not familiar with the Kazakh environment, they drew up the laws along European Water Directive Framework which led to implementation challenges (Warner *et al*., 2009). Measures must be put in place to ensure that all grievances, controversies, conflicts, etc. which arose during the formulation of the legal and regulatory framework are strategically and effectively addressed. There is also the need to reduce donor or external influence to the minimum on the legal and regulatory framework planning and decisions especially in developing countries (Shah & Van Koppen, 2006). Finally, 'the role of government in the formulation of water policy, the enactment, and enforcement of the water resources legislation, the separation of regulation from service provision functions' (Jønch-Clausen & Fugl, 2001) must be well spelled out.

*Institutional framework*. This deals with the setting up of the social, political, economic, and administrative tools required for the management of water resources. It is at this point that a platform is created to share ideas, experiences, and expertise to facilitate the creation of a management structure (Hassing, 2009). The expectations are that because almost all relevant stakeholders are brought on board at this point, all unpredictable conflicts will be eliminated and coordination strengthened through the creation of directorates, commissions, and task forces with well-defined roles and responsibilities. The river basin authority is to link all the top and bottom relevant stakeholders by providing, receiving, and sharing information and ideas.

*Management instrument*. This develops the management 'toolbox' with a practical instrument to be used by water resources managers (Jønch-Clausen & Fugl, 2001). The instrument will require some level of skills to strategically make it useful or beneficial. Attention should be paid to these factors: information management; transparency; coherent and consensus-based planning; social change tools on public awareness creation; conflict mediation; regulatory instrument and enforcement framework; formulation of economic instruments for behavior change; water resource management (WRM) plans; assessment of water resources issues; management of water use behavior and water use efficiency (Hassing, 2009) for efficient work delivery. It is expected that adherence to the three pillars of implementation and their network, as shown in Figure 2, with good infrastructure, skilled human resources, strong political will, and sustainable financing, an effective water management system which will ensure social equity, economic efficiency, and sustainable environment could be achieved. Note that the emphasis is on focusing on the problem as discussed earlier but addressing the problem from an integrated perspective.

## Historical perspective of water resources reforms to IWRM adoption in Ghana

Ghana remained a British colony until 1957. Before then, water resources management was by customary rules. Water was a free common good with ownership vested in stools and communities (Agyenim & Gupta, 2012). By tradition, customary laws were established by chiefs and elders and officially presented to the entire village or community to determine the punishment for their violation. In that era, the people were not just obedient to these regulations but also ensured this knowledge was transferred to their children and unto the next generation – through durbars by the traditional authority which is occasionally enhanced by the family, specifically the women. Community members would monitor the behavior of their fellow community members and outsiders. Where the use of or activities around the water upstream affected other communities downstream, the different traditional boundaries necessitated leaders to sit together and resolve issues although not without a few 'ugly' conflicts (Fatawu & Allan, 2014). The customary rules were strengthened with taboos and prohibitions and backed by sanctions (Agyenim & Gupta, 2012).

As Britain gained full control over the Gold Coast in 1902, new rules and regulations were introduced to suit their system of governance. The laws introduced at the time focused more on economic gains at the expense of water and environmental security. For instance, the river ordinance introduced in 1903 was for the exploitation of minerals in Ghana and, as a result, the law was limited to the rivers which were assessed and confirmed to be rich in minerals (Botchway, 1998). The laws although well-structured lacked clarity on their execution with conflicting and overlapping roles. From that time, Ghana started experiencing a pluralist legislative framework for water management. Since 1902 to the present day, water resources management has evolved through different management systems, each one with its own drivers and constraints. The period after independence, from 1957 to 1980, saw the government embark on various water reforms. The main areas included: (1) developing water for electricity generation, (2) managing water for provision, distribution, conservation and supply to the public for domestic and industrial purposes, (3) establishment, operation, and control of sewerage systems, and (4) developing water for irrigation farming. However, almost all reforms, except that for electricity generation, could not be sustained because they were state-funded: and at the time, the state was in economic shambles. For example 1,879 out of 5,500 boreholes drilled in 1979 were out of order by around 1990 as a result of government inability to release the subvention for their maintenance as planned (http://www.gwcl.com.gh/gwcl_history.pdf). The argument of this paper is that introducing reforms or policies is just not sufficient; they must be effectively and sustainably implemented to achieve the expected outcomes.

From 1990 to date, water reforms in Ghana have taken the IWRM approach. Ghana's IWRM plan was initiated through sub-regional agreement and national processes (WRC, 2012). At the sub-regional level, the IWRM concept was unveiled in a ministerial conference in Ouagadougou for West Africa in 1998. The conference was to create a uniform platform for all Economic Community of West Africa States (ECOWAS) member countries to agree on the way forward. Two areas were identified to facilitate the adoption and implementation and these are: (1) creation of awareness among member states on the need to change from the traditional system of managing water to IWRM and (2) unconditional acceptance of the Ouagadougou proposal on IWRM by ministers in charge of water in the member states. As one of the member states at the Ouagadougou conference, Ghana fully supported the proposal.

In Ghana, the current water institutional reforms are deeply rooted in IWRM. It involves the creation of a hierarchical organizational structure for water management based on the separation of regulatory and operational functions, and the delegation of operational functions to the lowest appropriate level

(Tapela, 2002; Inguane *et al*., 2014). Unlike Mozambique and Tanzania where the water reforms followed the usual pattern of creation /amendment and approval of water law, Ghana's case was different. It started with the creation and approval of a commission: the Water Resources Commission (WRC) in 1996.

The reforms were further strengthened by the introduction of other key regulatory documents such as the Public Utility and Regulatory Commission (PURC) Act 538 for economic regulation of water and electricity utilities in 1998, and the 2007 National Water Policy (WRC, 2012). Other supporting institutions and legislative instruments are: the Environmental Assessment Regulation of 1999 (L. I. 1652) for regulating and granting permits for projects with impact on the environment and water resources (surface and underground); water use regulations 2001 (L. I. 1692) for water abstraction, diversion, damming, and other water uses such as transportation and agriculture. These regulations operate at three levels, namely, the policy, organizational, and operational level. At the policy level, a water directorate is to guide and facilitate the implementation of Ghana's national water policy (NWP) through the Water Sector Strategic Development Plan (WSSDP). WSSDP is a framework for implementing government of Ghana's vision in the water and sanitation sector. WSSDP objectives are firmly embedded in the national development plan, i.e., Ghana Shared Growth and Development Agenda (GSGDA, 2010–2013) and the National Water Policy (NWP). The NWP is structured in three sub-management categories and these are urban water supply, rural water supply, and the national IWRM, the focus of this discussion. The aim of introducing IWRM is to ensure: elimination of conflicting sector policies, elimination or reduction in institutional fragmentation, and broader stakeholder participation (increase user involvement in water resource management) and maximization of water benefits and security for today and the future (Swatuk, 2005; Inguane, 2010). As a policy direction to manage Ghana's water resources through the integrated approach using the river basin as the operational unit, the Water Resources Commission (WRC) has been able to define six basins with the Pra being the fourth.

## The findings: IWRM implementation in the Pra Basin

Following the IWRM framework proposed, this section assesses the implementation in the Pra Basin and draws a conclusion.

There are many proposals for creating a robust enabling environment; the implementation in the Pra Basin followed the approach recommended by Salman & Bradlow (2006). They recommend the following steps: (1) reviewing existing rules to cover all water resources management issues; (2) developing a comprehensive legislation with a well-defined role for government agencies; (3) having a legislative framework which addresses the needs of the state and supports its policy implementation; (4) establishing clear and well-defined rules for public ownership of water projects; (5) creating or strengthening the administrative and technical capacity for implementation; (6) putting measures in place to ensure enforcement of technical and administrative provisions; and (7) bring all relevant stakeholders to participate in the planning and decision-making process (Salman & Bradlow, 2006) to enhance coordination and avoid conflicts. In that regard, some existing regulations such as the Environmental Protection Decree (NRCD 239) was reviewed in 1994 resulting in the Environmental Protection Agency Act (490). In areas where new acts such as the WRC Act and PURC Act were introduced, their roles were clearly defined. As discussed under historical reform of water resources above, all the new acts developed fit into the WSSDP which synchronizes with the national development plan.

In addition, the reviewed legal instruments were housed in corresponding institutions which were upgraded whereas new institutions were created for the newly created legal instruments. The Pra Basin was formed as the operational unit with a River Basin Board (RBB). The complex nature of the basin led to its categorization into three sub-basins. The first is the Upper Pra sub-Committee which has the responsibility of managing the rivers Offin, Anum, and Oda, including Lake Bosomtwe. The second is the Birim sub-Committee in charge of the Birim sub-basin. The third is the Lower Pra sub-Committee charged with the management of the sub-basin between Twifo-Praso and Cape Coast.

There is a Pra-Offin basin office in Kumasi which hosts the Upper Pra sub-Committee whereas the Birim sub-Committee is hosted by a different basin, the Densu basin office. However, the secretariat of the Lower Pra sub-Committee is yet to get office space in Shama Municipal Assembly. The Pra-Offin basin office is operational with a workforce of three: a basin officer, a field assistant, and a secretary. They have office accessories and a pick-up car for their day-to-day activities such as project monitoring. Each basin sub-committee is to have representation from the Municipal, Metropolitan, and District Assemblies (MMDAs); the Regional Coordinating Councils, each of the Regulatory Institutions in charge of mining, forestry, environment, etc.; each of the major water users (domestic water supply, agriculture, and mining); the traditional rulers; civil society groups that are active in the sub-basin; women/youth groups. The summary of the operational framework for the basin is presented in Figure 3.

*Water resources assessment and evaluation*

The Water Evaluation and Planning (WEAP) system was used to gather data on available water resources to help demand projections and inform decision-making on water resource planning in the basin. Based on the data gathered, a description of the related challenges was outlined. After this, a consultative process was carried out to involve all relevant basin-based stakeholders. The stakeholders were selected based on their specific interest/knowledge of water resources management. They included planners from the District Assemblies, Government Departments, representatives from the mining industries, representatives from major water users, NGOs, CBOs, etc. (Pra Basin, 2012). The assessment and evaluation were done in the form of a workshop using the Strategic Environmental Assessment (SEA). SEA is a systematic process of evaluating the environmental effects of a policy, plan, or program with the opportunity of proposing alternatives where there is the need and documenting the findings for use in decision-making. A total of three workshops were conducted in Kumasi in the Ashanti region of Ghana. In all the workshops the representatives from WRC took on the roles of facilitation and

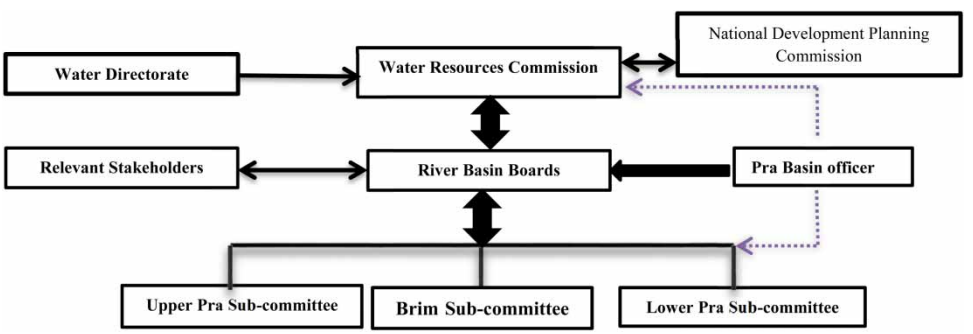


Fig. 3. Operational structure of Pra Basin (adopted and modified from Pra Basin IWRM plan).

documentation. In the first workshop, stakeholders brainstormed and discussed the data gathered in relation to the challenges in the basin and categorized the identified problems into five groups. Stakeholders used the second workshop to prioritize/rank the various problems and develop their plan of action (Table 1). In the prioritization, water for domestic use and environmental flow were given the highest priority, followed by irrigation water demands and livestock use, in that order. The action plan was subjected to a rigorous scrutiny to ascertain its sustainability and approval in the final workshop. The problem areas were identified and ranked as (1) inadequate water supply to meet the demand for domestic, commercial, agricultural, and industrial purposes (including mining); (2) land degradation from deforestation, agriculture, mining, settlements, etc.; (3) water quality deterioration from household, commercial, industrial (including mining), and agricultural wastes; (4) insufficient response to climate variability and change; (5) weak institutional capacity in terms of human resources, funding, logistic, reliable data, information, etc. The objectives drawn to address the problems are: (1) to secure the available water resources through efficient water use; (2) to improve water conservation and ecosystem health through effective protection and regulation of land and water resources; (3) to mitigate the suffering and economic loss of communities through adaptation to climate variability and change; (4) to strengthen human and institutional capacities to carry out key IWRM mandates. The actions drafted to address the projected objectives are presented in Table 1.

## Discussion

### *What is working well?*

One of the basic but most important stages in the management of water is the streamlining of roles and responsibilities (enabling environment) to reduce conflicts and enhance efficiency among different water uses and users. There is a water policy which clearly separates the management of water into the urban water supply, rural water supply, and integrated water resources management. The establishment of the enabling environment, institutional framework, and management instrument before field implementation was a plus. To further avoid conflicts and overlapping roles, the well-defined laws and roles were assigned to specific responsible organizations for execution (institutional framework). The implementers were quick to respond to the complex nature of the basin with the creation of sub-basins to efficiently address their needs. The composition of the basin board has almost all relevant stakeholders including traditional authority. The use of SEA at the operational level to introduce local knowledge was very innovative; it ensured the effective participation of stakeholders in the identification of the basin problems. The identified problems were strategically prioritized with specific objectives and key actions to address each of them. For administrative purpose, the Pra-Offin basin office is currently operational and has been equipped to an extent with the necessary logistics. In the area of capacity building, the commission has made provision in its plan for the training of relevant stakeholders as well as awareness creation through public education.

### *What is not working well?*

Despite the resources and the effort invested in the creation of new institutions and revitalization of existing ones, the new water management system suffers from several major drawbacks. One such

Table 1. Thematic areas, objectives, key actions and implementing entities.

| Thematic area | Strategic objective | Key actions | Implementing entities (lead agency + collaborators) |
|---|---|---|---|
| 1. Water use efficiency and conservation | 1. To improve water conservation and ecosystem health through effective protection and regulation of land and water resources | 1. Support the development and implementation of targets and benchmarks for efficient water delivery by water use institutions (e.g., GWCL, CWSA, and GIDA)<br>2. Enforce and monitor the water permitting regulations<br>3. Promote rainwater harvesting and use of underground water<br>4. Dams for water conservation | PBB/WRC + MWRWH, GWCL, CWSA, GIDA, NGOs |
| 2. Catchment protection and water quality conservation | 2. To secure the availability of water resources through efficient water use | 1. Create and sustain awareness of the value of water as a scarce resource, and threats to water and other natural resources<br>2. Implement the buffer zone policy so as to retard silting of streams and pollution of water bodies. Support MMDAs to enact bye-laws for enforcement of regulations on water and environmental management<br>3. Set up effective monitoring and assessment of water resource availability and use, and resource quality<br>4. Promote integration of tourism development in the basin IWRM work programs to boost local economies | PBB + MMDAs, chiefs and communities' leaders, forestry, EPA, HSD, WRI, media, tourist authority, MOFA, Chamber of Mines, NGO |
| 3. Adaptation to climate change impacts | 3. To mitigate the suffering and economic loss of communities through adaptation to climate variability and change | 1. Create public awareness of climate impacts (including the dangers of settling in flood-prone areas)<br>2. Improve flood management through catchment conservation and protection so as to retard surface run-off | PBB/WRC + NADMO, EPA, HSD, WRI, MMDAs, forestry, MOFA, NGOs, chiefs and communities' leaders |

(*Continued.*)

Table 1. (*Continued.*)

| Thematic area | Strategic objective | Key actions | Implementing entities (lead agency + collaborators) |
|---|---|---|---|
| | | 3. Support development of participatory disaster preparedness and management programs<br>4. Strengthen basin-level information dissemination to facilitate adaptation (e.g., early warning systems) | |
| 4. Institutional and human resources capacity development | 4. To strengthen human and institutional capacities to carry out key IWRM mandates | 1. Set up effective basin institutions (Pra Basin Board, water users' associations, a forum of chiefs, etc.)<br>2. Provide logistics for the efficient running of the basin institutions (secretariat of PBB) and enforcement of regulations<br>3. Support education and training in IWRM at all levels<br>4. Facilitate the preparation of annual basin and community work programs for implementation<br>5. Set up inter-sectorial collaboration mechanism and forum of local actors<br>6. Coordinate the development of a detailed basin-level data and information management system (e.g., functioning website for PBB)<br>7. Monitor and evaluate annual basin work program | WRC/PBB + MMDAs, GES, KNUST, NGOs, chiefs and communities' leaders |

*Source*: Pra Basin Management Plan.

drawback is the inability of the implementing entities to translate their roles on paper into practice. For example, objective 4 and key action 6 indicate that there will be detailed basin-level data and information management system. These data and information management system, according to Agyenim & Gupta (2012), has been created by the commission at the national level and has resulted in collaboration between the commission and the data providers such as the Hydrological Services Department (HSD); however, interviews with the HSD and the Meteorological Services Department (MSD) revealed that although these arrangements exist on paper, they are not operational. The interviewees blame the situation on lack of logistics, break down of their equipment and the absence of trained personnel for the data collection. This information raises questions about the five million Ghana cedis budget allocation purposely earmarked to support the set-up, rehabilitation, and upgrading of the hydro-meteorological monitoring

networks in the country (WRC, 2012). There is, therefore, no platform for data and information sharing among the sectors at the local level as claimed (Table 1). In addition to the aforementioned challenges, non-payment of the allowances of the data collectors in an institution like the HSD has resulted in them vacating their posts. Similarly, the five million budget allocation for the procurement of vehicles, construction/rehabilitation/expansion, and equipping of water/ecological laboratories to strengthen water quality monitoring and data assessment and development of water quality guidelines are also yet to be fully disbursed to the respective agencies (WRC, 2012). For instance, regulatory enforcers like the Ghana Environmental Protection Agency (EPA) complained of the constraint of logistics. Furthermore, harmonization of the working distance for the buffer zone policy is still pending at the time of the interview. This has become a major setback to the implementation of the buffer zone policy.

In the area of awareness creation, education, and training, there is more to be done especially in the training of the MMDAs (environmental health officers (EHO)) who serve as the focal point of the WRC at the district level (WRC, 2012). The Offin-Pra basin officer in an interview explains how they work with the EHOs and the training they offer them. However, six out of the eight EHOs interviewed in the basin had no idea of their capacity as representatives of the WRC at the district level let alone knowing their mandate in that capacity. The opinion leaders interviewed claimed that they have no knowledge of the IWRM in the basin. From 1998 to 2003, the Water Resources Information Services (WRIS) was established to handle training in data collection networks and assessment techniques (Agyenim & Gupta, 2012). Their mandate is yet to be seen in this basin.

Another drawback has to do with the make-up of the basin board. The composition of the basin board and their availability for decision-making during project implementation is very crucial for the success of IWRM. Unfortunately, the board is not operating and functioning as expected. The challenge is that most of the board members/implementing entities such as EPA, HSD, MSD, and WRIS operate offices either at the national or regional level which does not favor the river basin concept. The river basin by design operates more effectively at the district levels. Any river basin activity that focuses on achieving an effective resultant output must necessarily be carried out in the local environment where the actual problem was identified. In this context, the lowest appropriate operating level is district level, where all relevant stakeholders at that level can be brought on board and properly coordinated. The absence of such implementing entities at the district level has affected activities like monitoring in the basin. For example, EPA is to collaborate with the minerals' commission, forestry commission, and the water research institute in monitoring activities in the basin; however, they are constrained by logistics, as indicated above. All of the opinion leaders are of the view that the authority they had over water resources has completely been taken away from them thereby making their representation on the basin board irrelevant. They further assert that they do not see themselves or their contribution making any impact considering the composition of the board. The logistical constraints and small technical staff have also created a gap for illegal mining at the blind side of the River Basin Board (RBB).

Even though in Table 1, the specific actions to address the problems are well outlined with their responsible implementing organization, there are no timelines. Timelines are among the important factors to use in performance assessment. For example, it will be very difficult to assess an objective such as that of thematic area 3 and key action 2 which talk about improving flood management through catchment conservation and protection to retard surface run-off without any timelines. In addition, there is not a single key action under any of the four objectives which indicate how such actions can be achieved. Actually, illegal mining (galamsey) is identified through field observation

as an important determinant in the management of water in the basin yet the framework was silent on it. In almost all areas where water resources are managed well the water policy is developed before the creation of the enabling environment, management instrument, etc.; however, it is the opposite in the Pra basin, therefore there are gaps in the framework. From the discussion so far, we can say that the Pra basin framework visually (on paper) resembles the proposed framework, but, in practice, they are apart.

*Is the IWRM the appropriate management option?*

IWRM being an appropriate management option means it has proven practically potent to address the needs of the basin. The entire process from the national level to the Pra Basin shows government commitment and confidence in the IWRM concept. This is a good sign for implementation. The RBB in using the basin plan was able to identify almost all the problems or challenges and also categorized them in order of priority. The concept is appropriate, however cannot be ascertained by just the views expressed above but rather how such views are addressed practically. It must be emphasized here that commitment or willingness to do something does not automatically translate to the ability to it. Government commitment and confidence in the IWRM principle should translate into funding, infrastructure, human resource capacity building. However, this has not been the case in the discussions so far. Government funding for WRC activities is unreliable (Agyenim & Gupta, 2012), meanwhile it is common, but still strange and unacceptable, as the government demonstrated such unreliability during the post-colonial water reforms. The consequences of this coupled with some inefficient management practices, for example, the absence of training for EHOs, shows that the Pra basin needs improvement for the management system to work. The system is capital intensive and must be seriously considered in the implementation process. Since the system is not fully implemented because of the financial and management inefficiencies, the benefit of achieving water use efficiency and conservation through catchment protection and water quality conservation has not been fully realized. Addressing factors such as creation of a desk for IWRM at the District Assemblies; incorporating IWRM into the training curriculum of the EHOs; conducting a proper behavioral study to identify illegal miners' reluctance in vacating illegal mining sites; identifying the various pollutants directly relating to illegal mining since the rivers in the basin serve as the raw water sources for drinking water treatment plants; making illegal mining a major determinant in the assessment of water quality, can help improve the functioning of the system.

## Conclusion

The IWRM implementation in the Pra basin, to a large extent, conforms to the selected general framework even though there are implementation gaps. Overall, it can be concluded that the creation of the enabling environment, the institutional framework, the management instrument, and the problem identification in the basin was well conducted. However, there are questions when it comes to the appropriateness of the IWRM for the Pra basin. The questions center on: (1) the translation of the framework on paper into practice; (2) some major stakeholders still not operating at the district level; (3) staff strength and logistical constraints; (4) absence of timelines in all the actions; (5) opinion leaders not counting themselves as part of the actual participation; and (6) how these actions will be achieved.

The establishment of the water policy during the creation of the enabling environment may have contributed to the ineffective functioning of the new water management system. The current framework needs improvement in the areas where questions have been raised if it means to function well. The observations made are not sufficient to scientifically declare the water resources polluted; the quality of the water resources has to be assessed scientifically.

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