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## Reconciling IWRM and water delivery in Ghana – The potential and the challenges

Nana Amma Anokye<sup>a,1</sup>, Joyeeta Gupta<sup>b,\*</sup>

<sup>a</sup> VU University, Amsterdam, The Netherlands

<sup>b</sup> VU University Amsterdam and UNESCO-IHE Institute for Water Education, De Boelelaan 1087, 1081 HV Amsterdam, The Netherlands

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### ABSTRACT

The key elements of integrated water resources management include a holistic integrated approach and the main principles of public participation, the role of gender and the notion of recognising the economic value of water. This paper investigates how these notions play out in the context of providing water to the rural communities in the Densu basin in Ghana. This investigation is based on a content analysis of the relevant policy documents and interviews with state agencies and local stakeholders. The paper concludes that there is a conflict between the IWRM goal of integrating all water uses and sectors in the management of water resources and focusing on the prioritisation of water delivery services. However, three of the IWRM principles can be used in implementing water delivery. While Ghana has adopted IWRM, it clearly prioritises water delivery. At basin level, the IWRM planning process does not take water delivery into account and water delivery is conducted independent of the IWRM process. Although the participatory and gender approaches are being implemented relatively successfully, if slowly, the ‘water as an economic good’ principle is given less priority than the notion of the human right to water as local communities pay only 5% of the capital costs of water delivery services. The impact of the rural water delivery services has been positive in the Densu basin in seven different ways; and if this helps the rural community out of the poverty trap, it may lead to economically viable water facilities in the long-term.

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### 1. Introduction

Globally 1.1 billion people do not have access to safe drinking water (GWP, 2000; Prokopy, 2005; WHO/UNICEF/WSSCC, 2000; World Economic Forum Water Initiative, 2009; World Water Council, 2009). The poor in developing countries living especially in rural and peri-urban areas are the most affected. Thirty-eight per cent (38%) of Africa's population does not have access to safe drinking water (Nedjoh et al., 2003; WHO/UNICEF/WSSCC, 2000).

A key humanitarian priority is trying to provide access to water for drinking and for agricultural purposes in rural areas in the world (UN-Water, 2008; World Economic Forum Water Initiative, 2009). At the same time, theoretical developments suggest taking a comprehensive perspective on water through the adoption of an integrated water resource management (IWRM) approach to the management of water resources and services (Adeel, 2004; Chancellor et al., 2003; Funke et al., 2007; GWP, 2000; Jønch-Clausen, 2004). However, a key question is: Can integrated water resource management be reconciled with the priority that needs to be given to the provision of water services? How can and do developing countries like Ghana reconcile these conflicting approaches?

Against this background, this paper examines the role of specific principles of (IWRM) in water delivery, and the integration of the water delivery sub-sector in the planning of water resources management. The research question can be divided into five sub-questions: How important is water delivery? What are the main issues in IWRM? What is the relevance of IWRM and its principles to water delivery? How are the principles of IWRM with respect to rural water supply treated at the policy level in Ghana and at the local level? To what extent has the rural water delivery system in the Densu basin improved the social and economic welfare of the people?

It addresses these research questions by drawing on data gathered through a literature review on IWRM and underlying principles as well as content analysis of policy documents including legal documents, plans, manuals and guidelines of relevant government agencies in Ghana. The paper also draws on data based on empirical evidence from (a) 149 interviews with officials of state agencies, NGOs, and local stakeholders including local water agencies and households in the Densu basin in Ghana (Anokye, 2010); and (b) attending basin board meetings and a workshop on ‘Strategies for implementing the Densu basin IWRM Plan’. The Densu basin is selected because it is the first of the three pilot basins where attempts are being made to implement IWRM in Ghana by the Water Resources Commission (WRC) as well as where the provision of water services is of critical importance. The research is based on the single but layered case study approach which looks

\* Corresponding author. Tel.: +31 20 5989548; fax: +31 20 5989553.

E-mail addresses: [naanokye@yahoo.com](mailto:naanokye@yahoo.com) (N.A. Anokye), [joyeeta.gupta@ivm.vu.nl](mailto:joyeeta.gupta@ivm.vu.nl) (J. Gupta).

<sup>1</sup> Present address: University of Cape Coast, Ghana.

at the different layers of governance in a longitudinal manner (Yin, 2009). Most comparative studies do not examine all the levels of governance (De Stefano, 2010; Tippett et al., 2005); our study attempts at that. This paper first presents a theoretical framework for analysing the issues relevant to the research question, and then presents data from the case study, before analysing the information generated and drawing conclusions.

## 2. The relation between IWRM principles, public participation and water delivery

### 2.1. Introduction

This section focuses on the theoretical relationship between IWRM principles and water delivery. The questions addressed are: How important is water delivery? What are the main issues in IWRM? What is the relevance of IWRM and its principles to water delivery?

### 2.2. The importance of water delivery

Improving water services and uses in developing countries is essential for increasing hygiene and sanitation services that affect the productive lives of people, and easing the burden and drudgery of those who have to collect water from far and unsafe sources. Such improvements enhance the ability of women, as the main actors in household water supply, to live in dignity. It reduces morbidity and mortality. Lack of safe drinking water exposes people to water borne and water related diseases. Diarrhoea caused by unclean water is one of the world's greatest killers, claiming 1.8 million lives every year (World Water Council, 2009) and the lives of five times as many children as HIV/AIDS (World Economic Forum Water Initiative, 2009). The recommended minimum amount of water for basic needs varies between 20 and 50 litres per person per day (lpd) (Abrams, 2001; UN, 2009). This varies from country to country. In rural Ghana it is 20 lpd (CWSA, 2007); for rural South Africa it is 25 lpd (Funke et al., 2007); and 55 lpd in India (CapNet, 2003). Access to water is not just about litres per day, but also about distance to the water source. Optimal access implies multiple taps in the residence of the individual, intermediate access implies a tap on the plot of the individual, basic access implies a distance of 100–1000 m (which implies a collection time of 5–30 min) and no access refers to situations where the water source is more than one kilometre away from the individual (Kennedy, 2006).

Ghana is predominantly rural; about 56.6% of its population live in the rural areas.<sup>2</sup> These rural people are the most deprived in terms of access to safe drinking water and other socio-economic infrastructure (Nedjoh et al., 2003). The national coverage for drinking water supply in both rural communities and small towns in Ghana was estimated at 52.86% at the end of 2006 and the population served was 7,604,478 out of the 14,386,840 residents (CWSA, 2007).

The essential components of water coverage within the National Community Water and Sanitation Programme of 1994–2008 are outlined as follows:

- There should be a water facility which provides all year round potable water to community members;
- Each person should have access to a minimum of 20 l of water per day;
- Each spout of a borehole/standpipe should serve 300 persons and a hand-dug well should serve 150 persons;

- The maximum walking distance to a water facility should be equal to or less than 500 m; and
- The water system should be owned and managed by the community through established structures (CWSA, 2007; MWRWH/CWSA, 2008).

Prioritising access to safe drinking water is vital since all the health benefits of an improved water supply can be lost if more than a quarter of the people do not have access to it (Chancellor et al., 2003). The global community acknowledged this problem, and one of the targets of the United Nations (UN) Millennium Development Goals (MDGs) is to reduce by half the proportion of people without access to safe drinking water by 2015; with 1990 as the base year (World Economic Forum Water Initiative, 2009).

Such prioritising can be traced to the basic needs approach to development which was formulated in the 1970s. Essential services such as safe drinking water, sanitation, health and educational facilities were to be provided by governments possibly with the help of donors. Communities were expected to take part in the provision of these essential services (Burkey, 2002; Nelson and Wright, 1995). The basic needs approach contributed to the argument for community participation in rural water delivery in the 1980s. At the same time donors argue in favour of allowing private sector management of the water supply; this is leading to the promotion of public–private partnerships and individual government spending on rural water supply had dropped (Kleemeier, 2000).

The first UN conference on water in 1977 in Mar del Plata considered access to clean water as essential for healthy survival. The conference focused on how water supply could meet socio-economic needs. It therefore made the provision of safe drinking water a key priority by recommending the period 1980–1990 as the International Water Supply and Sanitation Decade (Kleemeier, 2000; Snellen and Schrevel, 2004). The Action Plan of the Mar del Plata Conference was the first internationally coordinated approach to managing water (Rahaman and Varis, 2005). However, the Water Supply and Sanitation Decade came to an end without making a major contribution to addressing the problem (Abrams, 2001). In 1992, both the United Nations Conference on Environment and Development and the Dublin Conference on Water and Environment made clear that one of the most appropriate ways to manage water was to adopt integrated water resources management (IWRM).

### 2.3. IWRM and its key principles

There are varying definitions of IWRM (Cardwell et al., 2006; Jeffery and Geary, 2004; Newson, 2000; UNDP, 1990) but the most widely cited definition is that of the Global Water Partnership (GWP) (2000). It states that “IWRM is a process which promotes the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystem” (GWP, 2000, p. 22). The GWP definition sees IWRM as a unified process directed toward the achievement of a common goal. This goal is maximisation of economic and social welfare while ensuring equity and sustainability of vital ecosystems. ‘Safe, adequate and sustainable water supplies for all’ is one of the main social goals. There is a general theme of coordination, sustainability and maximum utility implied in the different definitions.

Two concepts come into play with the adoption of IWRM: “integration” and “sustainability”; integration of both natural and human systems within and between themselves (Bandaragoda, 2005; Jönch-Clausen, 2004). Biswas (2004) observes that different

<sup>2</sup> Calculated based on figures from Ghana Statistical Service (2002, p. 3).

authors consider different issues that should be integrated in the IWRM process. Within the natural system integration is required between land and water resources; freshwater and coastal zone; surface water and ground water, upstream and downstream; “green water” and “blue water”; and water quantity and quality (Bandaragoda, 2005; GWP, 2000; Lundqvist et al., 1985 cited in Dungumaro and Madulu, 2003). Within the human system integration is required between demand and supply, across various water use sectors and among stakeholders (Bandaragoda, 2005; GWP, 2000; Jøneh-Clausen, 2004; SIDA, 2000 cited in Dungumaro and Madulu, 2003). Integration should be undertaken in a sustainable manner to ensure balance between resource use and resource protection (Cardwell et al., 2006; Dungumaro and Madulu, 2003; Funke et al., 2007). The need to address, embrace and relate these issues and dimensions holistically so that sustainable solutions can be brought about (Thomas and Durham, 2003) makes IWRM an ideal but complex concept to implement.

The reason for integration is that the many different uses of water resources are interdependent and therefore need to be considered together in their management. The different uses include: water for people (water delivery), water for food, water for protecting vital ecosystems, and water for industry and other uses. However, securing water for people is crucial given that water is needed (a) for drinking to keep the human organism alive; (b) for bathing and personal hygiene; (c) for waste disposal through sewers; and (d) for cooking and cleaning including laundry for a healthy and dignified life. Whilst management and planning of water delivery has to be integrated with that of other uses or sectors ‘water for people’ is universally accepted as having priority in water resource allocation (GWP, 2000).

The key principles of IWRM on which there is consensus are derived from the four Dublin principles; however, our focus is on the last three as they are relevant to water delivery. These are:

- “Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels;
- women play a central part in the provision, management and safeguarding of water; and
- water has an economic value in all its competing uses and should be recognised as an economic good” (GWP, 2000, pp. 13–14).

### 2.3.1. Participatory approach

IWRM stresses the importance of involving all stakeholders: authorities, organisations, the public and private sectors, non-state actors and civil society in the management of water resources. It also involves raising awareness of the importance of water among policymakers and the general public (CapNet, 2003; Snellen and Schrevel, 2004). Participatory approaches also mean that decisions are taken at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects, as decisions arrived at might cater more for the needs of the public (Irvin and Stansbury, 2004).

Public participation in decision-making and implementation is important because it is expected to promote efficient, effective, equitable and sustainable water projects (Allen, 2007; Harvey and Reed, 2006; Kapoor, 2001; Kleemeier, 2000; Tandia, 2006) (see Fig. 1). These projects are effective as there is support from the public and the public will likely help with the implementation. These projects are equitable as participation enhances equity. Water equity includes the security and ease with which water is accessed, how much people have access to for basic needs or livelihoods, and the price of water (Prokopy, 2005). In designing participatory approaches, a key issue is ensuring that there is no gender bias in the participants. Good quality participation leads

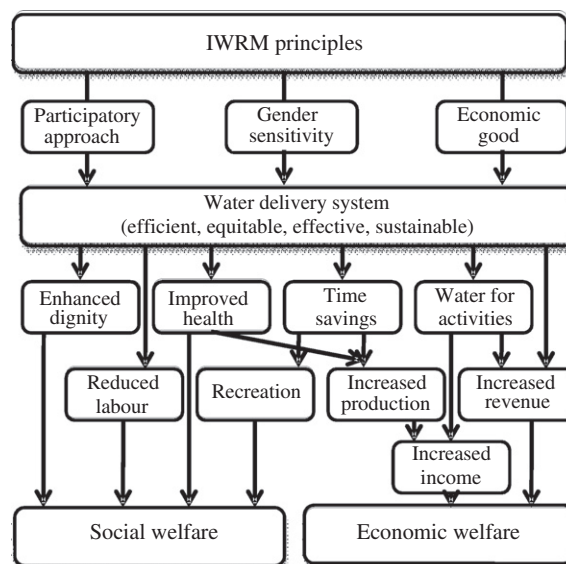


Fig. 1. The application of IWRM principles to the water delivery system to enhance social and economic welfare.

to development which empowers and enables local people to develop skills and gain confidence and knowledge to manage and evaluate issues which have to do with their lives (Capnet, 2003; Chambers, 1997, 1995; Oakley, 1991; ODA, 1995; Sharp, 1995). These projects are likely to be sustainable projects in the sense that the community will try to maintain these as they have a sense of ownership and interest in the outcomes of projects (Bamba, 2006; Bekbolotov, 2007; Jonsson, 2005; Kleemeier, 2000; Mostert, 2003; Narayan, 1995; Pahl-Wostl, 2002; Prokopy, 2005). These three impacts are likely to make the projects efficient. Effective water projects produce health-related, economic and environmental benefits, among others (Narayan, 1995).

Conversely, lack of community participation in the management of the water supply system was thought to be the cause of the high number of poorly functioning rural water supply facilities in the 1980s. An estimate for rural water systems in sub-Saharan Africa which were not functioning in the mid 2000s is 35% (Harvey and Reed, 2006). In Ghana by 1992 almost 30% of the improved rural water supply systems were no longer operational. This was partly attributed to the lack of community participation in the management of the supply system (Sarkodie, 2003).

At the same time, effective participation is hampered by lack of proper representation on decision-making bodies; and inadequate financial resources (Kujinga, 2002). There might be exclusions of some members of the public from the decision-making process because of the difficulty in having full representation of all sections of the public (Buchy and Hoverman, 2000; Rydin and Pennington, 2000). Frequently well organised interest groups and people living near the location of projects are over-represented (Botes and van Rensburg, 2000; Mostert, 2003; Njoh, 2002). Participatory processes are found to be time consuming and delays may hamper the interest of the public (Botes and van Rensburg, 2000; Irvin and Stansbury, 2004; Njoh, 2002; Oakley, 1991). Where there is competition between groups for resources and power, conflict is likely to develop. Differences in visions and objectives of engaging in a debate could also account for conflict among stakeholders (Botes and van Rensburg, 2000; Mohan, 2002; Njoh, 2002; ODA, 1995). There are also doubts as to whether managing water through local communities helps to achieve the goals of increased sustainability and improved equality of access for the poor to adequate supply of water (Clever and Toner, 2006).

All this implies that the participation process, although important, needs to be designed carefully taking contextual issues into account if the anticipated gains are to be realised.

### 2.3.2. Gender sensitive approach

Generally women play a central role in the collection and use of water in the developing countries. However, they are often not viewed as active participants, but rather as the passive beneficiaries of improved infrastructure and, hence, are left out of the decision-making processes. Cultural practices within communities either ignore or impede female participation in water management (Resurreccion et al., 2004). Their participation is also impeded by lack of time and mobility due to their heavy workload and multiple roles (Mjoli, 1998).

However, since women may be the biggest beneficiaries of water services, as such services reduce the time and labour they spend in the collection of water, involving women in the management of these services is critical. The benefits of the participatory approach, mentioned above, may be lost if the differential roles and impacts of the different sexes are not adequately accounted for.

The gender sensitive approach requires that the different roles and responsibilities of men and women are taken into account in decision-making and the complementarity of the roles and responsibilities of men and women is mobilised to the best effect. The creativity, energy and knowledge of both genders contribute to making different water schemes work better, and the benefits and costs of water use are more likely to accrue equitably to all groups (World Water Vision, 1999). It focuses on the social realities during the design and throughout implementation of water delivery systems. The gains of adopting a gendered approach are efficiency, effectiveness, equity and affordability (World Water Vision, 1999) (see Fig. 1). Increasing evidence suggests that water supply services are more sustainable when women have significant on-going responsibility for these services. Women are generally more motivated to install improved water supply and sanitation facilities; they are also more committed to their proper operation and maintenance. This is simply because of self-interest as they are adversely affected by poor water supply and sanitation facilities (Chancellor et al., 2003; Mjoli, 1998; World Water Vision, 1999). A gendered approach thus becomes an important approach to give more opportunities to women and to have men share the burden and recognise women as equal partners (World Water Vision, 1999). This approach calls for empowering women through training, and enhancing their opportunities for participation in decision making, as well as adopting gender justice principles.

### 2.3.3. Water as an economic good

Since water is a scarce commodity, economists favour viewing water as an economic good. The use of markets and prices ensures sustainable and efficient usage, minimises wastage, and ensures cost recovery, among others. This is based on the principle that people respond rationally to financial incentives and disincentives (CapNet, 2003; Grimble, 1999; Lamoree and van Steenberg, 2006). Pricing can help maintain the sustainability of the resource by reducing demands on the resource base, and reducing pollution loads due to recycling of industrial water. It can improve managerial efficiency due to increased revenues (Rogers et al., 2002). Managing water as an economic good is an important way of achieving efficient and equitable use (see Fig. 1), and encouraging conservation and protection of water resources as well as generating resources for funding the water supply system (Snellen and Schrevel, 2004). Pricing of an environmental resource also serves as a tool to establish 'ownership' of the resource through user participation (Welle, 2001).

On the down-side, promoting the notion of water as an economic commodity shifts the public perception away from a sense of water as a common good, and from a shared duty towards its sustainability (Rahaman and Varis, 2005). Second, empirical evidence shows that charging for water supply or applying demand management through cost recovery is problematic (Grimble, 1999; Lamoree and van Steenberg, 2006). Water is not a typical or an ordinary economic good and because of its specific characteristics it is difficult to apply economic theory to it. The application difficulties concern pricing, measurement, and indicators. Third, there are arguments that water should be free for the people that cannot afford to pay. If water for basic needs and domestic use is treated as an economic commodity; it is likely to have serious consequences particularly for the poor without alternative sources or substitutes (Grimble, 1999). The poor pay a great deal for water relative to their income. Paying for water or capital cost contribution may then serve as a barrier preventing the poor from accessing safe drinking water (Rahaman and Varis, 2005; Schouten and Moriarty, 2003). However, the counter argument is that pricing water can improve equity. The argument is that higher water rates allow utilities to extend services to those currently not served and those currently forced to purchase water from vendors at very high prices (Rogers et al., 2002).

Politically, water is recognised as an economic good in many international conferences (e.g. the 1992 Dublin Conference and the Second World Water Forum and the Ministerial Conference in The Hague 2000). Nevertheless, it is important to recognise the basic right of all human beings to have access to clean water and sanitation at an affordable price when considering water as an economic good (Agenda 21 of the Rio Earth Summit, 1992; CapNet, 2003; Snellen and Schrevel, 2004). The issue of water as a human right is currently being discussed within the UN Human Rights Council and in July 2010, the UN General Assembly adopted a declaration on the human right to water and sanitation (Gupta et al., 2010).

## 2.4. The IWRM and water delivery link

The concept of IWRM calls for a holistic approach; prioritising water delivery calls for a sectoral approach focusing and concentrating limited resources on one key issue. This holistic approach and sectoral prioritisation approach appear to be irreconcilable. But these two can be reconciled; if the priority given to water delivery tries to ensure that other ecological, economic and social goals are not compromised.

Linking the principles underlying IWRM to water delivery is easier. At least three of the principles can be specifically linked to water delivery as shown in Fig. 1. The use of a participatory approach and a gender sensitive approach should be able to lead to a more effective, equitable and sustainable water system that enhances human dignity, reduces labour, improves health, and leads to time savings that can be invested either in recreation or increased productivity, the latter of which also leads to increased income. Water delivery also implies increased use of water for other rural activities which may also lead to increased income. Treating water as an economic good may also contribute to these end goals to the extent that ultimate users are able to pay for water services.

One can also relate the three specific IWRM principles to the decision making and implementation processes in rural water delivery. This is expanded on in Table 1.

There is thus the need to increase access to safe drinking water. Applying the principles of IWRM is likely to enhance access to safe drinking water. However, pricing water may have serious consequences for the poor who might not have the purchasing power. There is also the need for integration whilst focusing on prioritisation of water delivery.

**Table 1**  
Elaboration of how IWRM principles can be applied to the water delivery system.

IWRM principles	Role of women	Water as an economic good
<i>Rural water delivery</i>		
Decision making process		
Expression of demand for and willingness to contribute to managing water		Expression of demand is influenced by willingness to and/or ability to pay
Selection of technology and siting of facility	Women's (domestic water collectors') involvement is important in facility siting	Technology selection is influenced by its costs
Selection of members of local water committee	Recognition of women as key actors in water delivery	
Deciding on mechanism used to collect capital cost contribution	Gender cost sharing	Local decision on capital cost
Setting of water tariff		O&M cost
Deciding on mechanism used to collect water tariff	Sensitive to gender roles	Local decision on O&M cost
Implementation		
Training & capacity building	Gender mainstreaming	
Mobilisation of capital cost contribution	Women's involvement has great impact	Local decision on capital cost
Mobilisation of O&M cost contribution	Women's involvement has great impact	Local decision on O&M cost
		Opportunity cost
		Economic externalities
Management and/or implementation of O&M activities	Gender balance	

### 3. Case study of Ghana and the Densu basin

#### 3.1. Introduction

Having presented a conceptual link between IWRM and water delivery, this section focuses on Ghana's water policy and the implementation of IWRM principles in rural water delivery in the Densu basin. It looks at the extent to which the IWRM principles are considered in rural water delivery policies. It answers the question: How are the principles of IWRM with respect to rural water supply treated at the policy level and at the local level? This question is addressed by presenting the national water policy as it pertains to water services and IWRM, and the roles played by the key actors in the Densu basin.

#### 3.2. The national policy of Ghana

Improving access to potable water is one of the key priorities in the national water policy of Ghana. This policy is based on the Growth and Poverty Reduction Strategy (GPRS) I and II, which drives the development agenda. The GPRS II is informed by Ghana's commitments to the MDGs and the underlying obligations set out in Ghana's Constitution. Ghana is therefore working towards achieving the MDG target set for the improvement of access to safe drinking water. Both GPRS I and II highlight the provision of safe drinking water (MWRWH, 2007, p. 9). The broad principles underlying the national water policy that are of particular relevance to water services and IWRM conform to the GPRS. These include:

- The fundamental right of all people without discrimination to safe and adequate water to meet basic human needs;
- subsidiarity in order to ensure participatory decision-making at the lowest appropriate level in society;
- improving equity and gender sensitivity; and
- meeting the social needs for water as a priority, while recognising the economic value of water and the goods and services it provides (MWRWH, 2007).

In the light of the above principles the policy seeks to:

- Ensure sustainability through cost recovery of water projects, taking into account the basic right to a threshold level of sup-

plies, especially for the poor who cannot afford the full cost of supplies;

- encourage District Assemblies (DAs) to meet the contribution to the capital cost of water projects by poor and vulnerable communities;
- ensure participation of all stakeholders, including the private sector, local communities, particularly women, in decision-making on water related issues;
- increase the involvement of the private sector in the provision of water in urban and rural communities and ensure the facilitative role of government agencies;
- promote an equitable demand responsive approach where communities express demand by participating in making informed decisions on choices of service that fit their needs;
- support the development of skills related to various water management functions at all levels;
- strengthen and ensure sustainability of on-going community management, operation and maintenance of facilities;
- adequately empower and equip water management institutions and DAs with appropriate tools and sustainable resources to assume a central role in supporting community management of water;
- accelerate the representation of women at all levels and in all spheres of water management activity; and
- empower women through training at all levels to perform their roles in partnership with their male counterparts.

In line with the government's decentralisation policy the National Community Water and Sanitation Programme (NCWSP) was launched in 1994. The NCWSP emphasises community ownership and management, which entails community participation in the planning, implementation and management of water facilities in the belief that, as custodians, communities will ensure the sustainability of the water supply systems. The policy on the decentralised delivery of water services aims to support DAs (a) to develop, and contribute to financing district water and sanitation plans; (b) to actively promote and market water projects at the community level with support from Regional Water and Sanitation Teams (RWSTs); and (c) in the monitoring and supervision of water services. Under the NCWSP, water projects are required to recognise and protect the specific needs and roles of women, men and children and the physically challenged. The reason being that women

and men use water in different ways and share the burden of collecting water disproportionately and therefore mainstreaming gender issues and concerns are important.

### 3.3. The policy structure in the Densu basin

The Water Resources Commission (WRC) established by *WRC Act 522 (1996)* to regulate and manage water resources within river basins, is responsible for IWRM planning within river basins in cooperation with district assemblies and water service providers (WRC, 2007a). However, the WRC focuses on protection of water resources and regulation and not water delivery services. Hence the WRC collaborates with specific water related agencies in planning and management of water resources to ensure availability of good quality raw water (WRC, 2007a). The link between WRC and the DAs is more on protection and regulation of water resources than delivery services. Nevertheless, the WRC provides information on the availability and quality of water sources to the Community Water and Sanitation Agency (CWSA).<sup>3</sup>

The *Local Government Act 462 (1993)* delegates planning of water and sanitation services and implementation of plans and programmes to DAs. The planning in the districts is based on coordination and guidelines of the National Development Planning Commission (NDPC), which also monitors implementation of the district plans (*Act 479, 1994; Act 480, 1994*). The district plans including water delivery services plans are submitted to the NDPC through the Regional Coordinating Council (RCC). The WRC, on the other hand, submits its (IWRM) plans to the Water Directorate of the Ministry of Water Resources, Works and Housing (MWRWH). The MWRWH, in turn, submits its sector plans to the NDPC (see Fig. 2 for illustration of relationship between the water agencies). It is not clear as to how IWRM planning as a basin-wide activity is to be addressed in district planning. The DAs' plans address water delivery services, but these plans are not yet linked to the basin-wide IWRM planning. The IWRM plan that has been developed for the Densu basin by the WRC and the Densu Basin Board (DBB) focuses on water protection and does not cover water delivery services.

The DBB is a coordinating and management board of water resources in the Densu basin. It was established by the WRC and it constitutes a broad spectrum of representatives of stakeholder organisations within the Densu basin, including district and regional authorities, NGOs, ministerial departments and the Ghana Water Company Limited (GWCL) which is the water service provider to urban areas. Missing on the board is the CWSA, the key agency in the supply of potable water to rural areas in the basin (WRC, 2007b).

The CWSA is the statutory body established by *CWSA Act 564 (1998)* mandated to facilitate the provision of safe drinking water and related sanitation services to rural communities and small towns in Ghana. It is required to assist and coordinate with NGOs engaged in the development of the rural community and small town water supply; collaborate and cooperate with public and private bodies whose activities relate to the provision of safe water in rural communities and small towns. The CWSA is decentralised with an office in each region. The Densu basin covers parts of the Eastern and Greater Accra Regions in Ghana (see Fig. 3) so there are two offices serving the Densu basin. The RWSTs from the regional offices of the CWSA directly support the DAs to plan, implement and manage safe water services.<sup>4</sup> The NCWSP is implemented through the DAs. External donors provide financial, technical and logistical support for the implementation of the NCWSP. They also participate in policy dialogue, lessons sharing, monitoring and evaluation. NGOs, commu-

nities, or any private body who wants to provide safe water to rural communities is required to pass through the Regional CWSA in order to follow the existing guidelines which include a demand-responsive approach; community ownership and management; and community contribution to capital cost.<sup>5</sup>

The DAs have District Water and Sanitation Teams (DWSTs) which comprise three officers: Community Development Officer, Environmental Health Officer and a Technician. They encourage the communities to apply for potable water and facilitate their ownership and management of the water facility. Water and Sanitation (WATSAN) committees are local agencies that operate and manage small community-point sources (hand-dug wells and boreholes). Water and Sanitation Development Boards (WSDBs) are local agencies that operate and manage small town-piped schemes. Policy requires that women's involvement is at least 40% on the WATSAN committees and WSDBs.

The DWST shortlists the communities who are to benefit from those that apply based on: (a) presence of a WATSAN committee; (b) existence of a bank account and the amount of money mobilised; (c) existing community initiated development projects; (d) interest of the elders of the community; (e) absence of conflicts such as in relation to land, chieftaincy and ethnic disputes; (f) population size; (g) existing facilities such as for the provision of water and schools; and (h) current community economic activities. The policy is to consider communities which are actually in need of the facilities and those that show ability to contribute, maintain, operate and manage the system.<sup>6</sup> The DAs make a final selection of communities at a general meeting of the assembly during which the representatives of the communities (assembly persons) are present. The final selection is based on established general criteria agreed upon by all parties. These include: (a) the choice of service based on readiness to pay 5% of the capital cost of the facility and acceptance of the responsibility to manage, operate and maintain the system; (b) demonstration of effective demand in terms of willingness to contribute to capital cost backed by evidence of financial strength (bank statement); (c) payment of half (2.5%) of the capital cost contribution before drilling; and (d) commitment to make land available and transfer ownership to the community (CWSA, 2007).

At the preparation stage CWSA launches the project at the regional level in the presence of all regional and district political heads, donors, opinion leaders, CWSA staff and stakeholders. CWSA organises workshops to inform stakeholders. At the district level the DA explains the benefits of the project and specifies the role of each stakeholder. At both the regional and the district levels the processes and procedures are explained. These include community contribution to capital cost of the water facility; and community responsibility for the operation and maintenance of the facilities after handing over.<sup>7</sup>

A similar event takes place at the community level where the District Assembly sends a group and explains to communities their roles and that of other stakeholders. They begin by sensitising the communities to the benefits of potable water; such as reduction in water borne diseases. Again all the processes and procedures are made clear. Different types of facilities as well as their costs are also explained.

The funding generally comes from the government, communities, religious bodies, Non-Governmental Organisations (NGOs) and several foreign donors.<sup>8</sup> Some communities are so deprived

<sup>5</sup> Interviews 22, 23 (2008).

<sup>6</sup> Interview 43 (2008).

<sup>7</sup> Interview 43 (2008); (CWSA, 2007).

<sup>8</sup> Some of these donors are Danish International Development Agency (DANIDA), World Bank, Kreditanstalt für Wiederaufbau (KfW) (German Development Bank for Reconstruction), European Union, Japan International Cooperation Assistance (JICA), Canadian International Development Agency (CIDA) and the World Vision International (WVI).

<sup>3</sup> Interview 1 (2008).

<sup>4</sup> Interview 22 (2008).

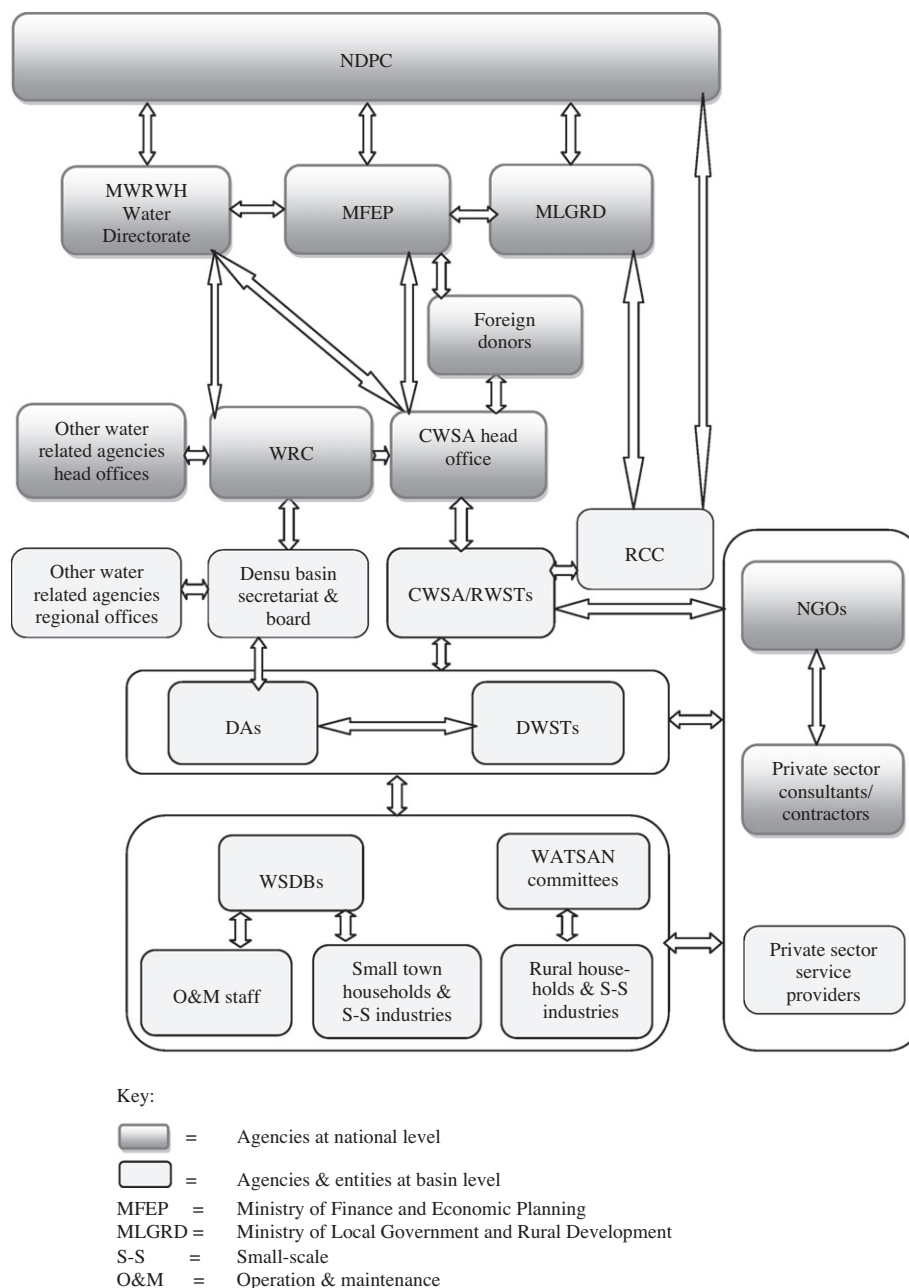


Fig. 2. Relationship between agencies in IWRM and water delivery at national and Densu basin level in Ghana.

that they cannot contribute the 5% of the capital cost. In such a situation the DA is required to contribute on their behalf thus increasing their contribution from 5% to 10%. However, the DAs are often unable to do so.<sup>9</sup> The rural water supply is heavily funded by foreign donors. External agencies (foreign donors and NGOs) contribute 90% of the capital cost.<sup>10</sup>

### 3.4. The practice and perceptions

Communities led by the opinion leaders (assembly person, chief and elders) meet and discuss their interest in the programme. They select the type of facility and the number that gives them the highest service level that they want, can afford (the 5% capital cost), and

can operate and maintain. They then apply to the DA. There are basically three types of water facilities or technologies with different capital costs and one of each serves different sizes of population. These are:

- Hand-dug well fitted with hand pump costs GH¢ 3000,<sup>11</sup> serves a population of 150. This type is not suitable for places with low water tables as they become dry during dry seasons and are therefore not reliable at such places.
- Borehole fitted with hand pump costs GH¢ 6000 and serves a population of 300.
- Small town-piped scheme, the cost varies and depends on the network. It is constructed for populations above 3000.<sup>12</sup>

<sup>9</sup> Interviews 43, 45 (2008).

<sup>10</sup> Interview 22 (2008)

<sup>11</sup> Exchange rate is GH¢1.40 to US\$1.00 (2009; at the time that the interviews were conducted).

<sup>12</sup> Interviews 43, 46 (2008/2009), but CWSA (2007) gives a figure of 2000.



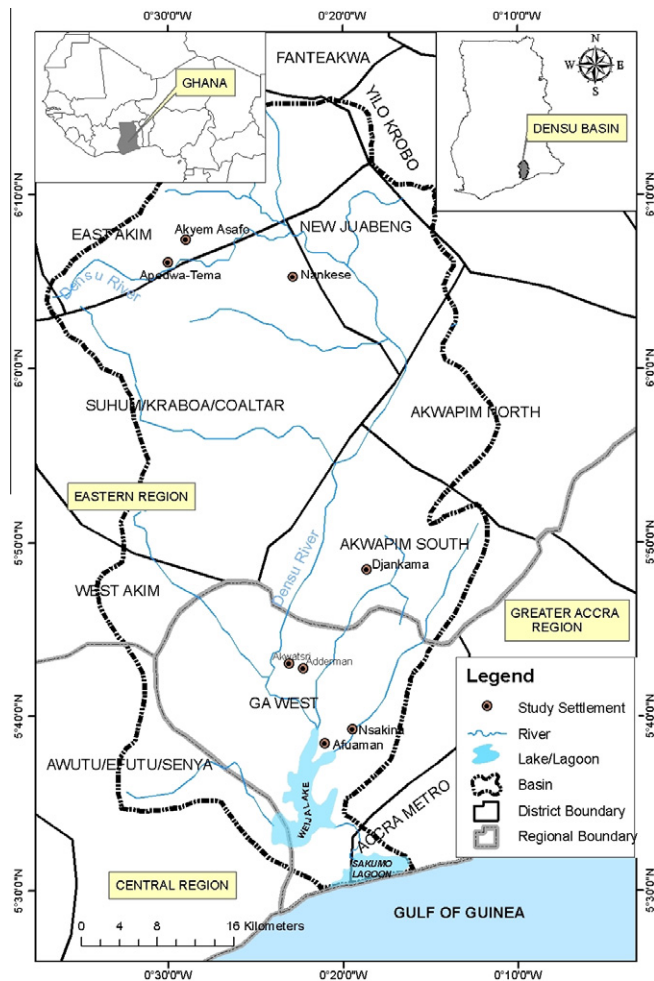


Fig. 3. Map of the Densu basin in Ghana.

Though the communities are involved in siting the water facilities, the final decision is taken by the chief and his elders and WATSAN committee members but they are guided on engineering and technical issues by consultants (hydro-geological firm) and the CWSA.<sup>13</sup> For the Nankese (in the Suhum–Kraboa–Coaltar (S–K–C) District) piped scheme, the chief, his elders and the WSDB members planned the network distribution of the pipe lines and selected where to site the point sources. WSDB members, the chief and his elders were involved in the siting of the pumping machine and borehole<sup>14</sup> (see Photo 1).

The communities select their WATSAN committee members and WSDB members publicly by election under the supervision of the DWST. However, in few cases the members are selected by consensus. At Apedwa-Tema in the East Akim District the WATSAN committee members were appointed by the community. This is because they see them as being capable of managing the system as they have been in the lead organising the community.<sup>15</sup> The WATSAN committee and WSDB meet and select their leaders. They mobilise funds to cover the 5% capital cost and commitment fee. They open a bank account where they deposit any money collected.

The CWSA in conjunction with the DA/DWST select a consulting firm to give the WATSAN committees and the WSDBs training. The training covers:

<sup>13</sup> Interviews 52, 53, 73, 74 (2008); 54 (2009).

<sup>14</sup> Interview 53 (2009).

<sup>15</sup> Interviews 44 (2008); 54, 102, 103 (2009).



Photo 1. Nankese WSDB at pump site of small town-piped system (fieldwork, 2009).

- (i) Financial management – how to (a) prepare simple accounts; (b) transact business with the bank and save with the bank; (c) render accounts as well as record keeping;
- (ii) Leadership training – (a) on how to take minutes of meetings; (b) in gender mainstreaming; (c) on how to organise community meetings and to meet frequently; (d) in community mobilisation; and (e) in data collection; and
- (iii) Fund raising and maintenance of facilities.

During the training the committee is given record keeping books. Pump attendants or caretakers and hygiene officers are given further training on how to carry out minor repairs and hygiene education respectively. Special training is given to women WATSAN members to acquire special skills in order to combine their responsibilities as wives and as WATSAN committee members.<sup>16</sup>

The communities are free to use whatever means they are comfortable with to raise funds for the 5% capital cost. The WATSAN committee together with the chief and his elders decide on the mechanism to use and inform the community. In the communities studied, all levied each household. Community contribution varies but 5% is the standard. Some in addition provide materials and unskilled labour. They clear bushes to make paths/way for siting of water facilities.

Communities pay for the entire operation and maintenance cost of facilities. They decide on how much to pay and set their own rules for collecting payments. For all the communities studied the rule is ‘pay-as-you-fetch’. With this mechanism the communities pay the caretaker each time they collect water from the point source.<sup>17</sup> There is an understanding among the community members of the need to pay for water for financing the upkeep of water facilities. The WATSAN committees and the WSDBs see the payments as a means to accumulate local funds for operation and maintenance.<sup>18</sup> This is because communities have difficulties to make ad hoc contributions when there is a breakdown of the facility.

In all the communities the price for an 18 l bucket is 5 Gp and for a 22 l container locally called ‘agbaa’ is 10 Gp. However, at Nankese in the S–K–C District of the Eastern Region, at the time of study (2009) the WSDB members were planning to increase the prices because their operating cost was high and the amount

<sup>16</sup> Interviews 22, 23, 43, 45, 46, 52, 53, 54, 55, 57 (2008/2009).

<sup>17</sup> Interviews 52, 53, 54, 55, 56, 57 (2008).

<sup>18</sup> Interviews 52, 53, 54, 55 (2008).

of money collected could not cover it. The technology type is small town-piped scheme which uses electricity for pumping. The electricity bill raises the operation cost.

The work of the WATSAN committee members is voluntary but the WSDB members of small town-piped systems are on monthly allowances. The WSDB at Nankese employs an attendant at each of the point sources and a revenue collector goes round the point sources and collects the daily sales. The attendants are paid commissions on the sales they make. The revenue collector, accountant, technician and security guard are paid monthly wages.

The pump attendants or pump caretakers most of whom are women are in charge of the daily maintenance of the pumps. They clean the pump sites and take care of the facilities and carry out minor repairs. Repairs beyond them are fixed by area mechanics at a fee.

### 3.5. Inferences

The above information can be related to the conceptual framework presented in Section 2 as shown in Table 2. The Table shows that at national level the principle of the participatory approach and a gendered approach has been accepted; but instead of accepting the idea of water as an economic good as a principle, the national policy has adopted the legal right to water. Having said that, it does emphasise partial cost recovery as a policy. Accordingly national policy emphasises the participatory approach and empowerment of women.

At the Densu basin level, the integrated water resource management plan does not take rural water delivery into account, nor does it include the rural water delivery actors as a stakeholder. Water delivery services plans are not yet linked to the basin-wide IWRM planning. The IWRM plan that has been developed for the Densu basin by the WRC and DBB focuses on water protection and does not cover water delivery services. These combined with the absence of CWSA, a key agency in the supply of potable water to rural areas in the basin, on the basin board leave a gap between the basin-wide IWRM planning and rural water supply. There are thus no links made between IWRM and the water delivery goals! This implies that IWRM approaches at regional level fail to prioritise or even include rural water delivery; and rural water delivery is undertaken independent of the IWRM approaches.

The Densu basin water supply policy, however, attempts to implement the participatory approach and the gender sensitive approach. Communities are empowered in that they have decision-making roles. They make informed choices about the type of technology that they want and can support, and the type of management systems needed to sustain the water supply facilities. Communities have the opportunity to decide where to locate point sources of the water facilities. They also decide on how to raise funds. WATSAN committee members, WSDB members and to some extent the chiefs have more say in decisions taken than the community members as they represent the communities. This can hamper participation if they are not accountable to the communities that they represent.

The policy approaches the notion of water as an economic good with caution and takes into account that the local communities may not be able to pay. As such, local communities are only asked to pay for 5% of the capital costs and the costs of operation and maintenance. Such costs are perceived by communities and the local water agencies as financing the upkeep of water facilities and not as payment for water per se. But those that use the potable water in their businesses recognise the economic value of water, because it serves as an input in their economic activities and they receive direct economic benefit from the use of water.

## 4. Analysis

### 4.1. Introduction

This section discusses rural water delivery in the Densu basin and the realisation of social and economic goals. It addresses the question: To what extent has the rural water delivery system in the Densu basin improved the social and economic welfare of the people? The section relates the situation in the Densu basin to the framework developed in Section 2.4. It then assesses the water delivery in the basin with regard to the region's social and economic goals and how it can be improved.

### 4.2. Rural water delivery and social and economic welfare

There are many effective and sustainable water delivery facilities. This is partly due to the participatory roles played by local agencies and the DWSTs and the availability of local skills to operate and maintain the facilities. As of December 2006, 17,038 WATSAN committees; 345 WSDBs; 20,617 caretakers; and 1687 area mechanics have been trained nationwide by the programme (CWSA, 2007; CWSA website, 2010). Pump attendants who have been trained by the water delivery projects carry out minor repairs; and area mechanics that have been trained carry out major repairs. These are local people who live in the communities. There are spare part outlets available where parts needed for the pumps can be purchased. The WATSAN committees carry out routine maintenance of the pump. They mobilise funds and save with the bank to have money for repairs and maintenance. Frequent monitoring of the facilities by DWST and CWSA has also contributed to the sustainability of the facilities.

The national rural water supply coverage has increased from an estimated 27% in 1990 (MWRWH/CWSA, 2008) to 57.14 in 2008 (CWSA website, 2010) (see Table 3).

Those who received training have developed their skills in accounting, book keeping, minutes taking, records taking, leadership skills, and, among others, have their self-esteem and efficacy increased.<sup>19</sup> Capacity building in the water delivery scheme, besides contributing to the sustainability of the water delivery scheme improves the social and economic life of the people. There is evidence of skill transfer. Some of the WATSAN members apply the skills they acquire in their own businesses; such as record keeping; and in transacting business with the bank and savings in the bank. This enhances their businesses. The skills acquired by area mechanics enable them to acquire other jobs.<sup>20</sup>

The water facilities have provided sources of livelihoods for some local people. They use the water for economic ventures such as palm oil extraction and gari<sup>21</sup> processing at Djankama in the Akuapem South Municipality of the Eastern Region; "chop bar" (indigenous restaurant) operators; "iced water" vendors at Nankese in the S-K-C District of the Eastern Region.<sup>22</sup> Perceptions of officials<sup>23</sup> in the Eastern Region (greater part of the Densu basin lies in the Eastern Region) also indicate that the number of small-scale enterprises that rely of water as one of their main inputs has gone up partly due to increase coverage of water supply. However, data on small-scale water-based industries is scanty. The number of small-scale food processing enterprises increased from 130 in 2006 to 220 in 2009 in the S-K-C District. These are mainly gari, palm oil, palm kernel oil and corn dough processing

<sup>19</sup> Interviews 52, 53, 55 (2008); 54 (2009).

<sup>20</sup> Interviews 52, 55 (2008).

<sup>21</sup> Grated roasted manioc.

<sup>22</sup> Interviews 85 (2008); 120 (2009).

<sup>23</sup> Conversation with the Eastern Regional Manageress of NBSSI; District Planning Officers of S-K-C District and NJM Assemblies (2009); interviews 43, 45 (2009).

**Table 2**  
The implementation of the Dublin principles and integration of IWRM ideas at national and Densu basin level.

Application in Ghana	Three Dublin principles		
	Participatory approach	Gendered approach	Economic good
National policy <i>principles</i>	Principle of improving equity and gender sensitivity; partly supported by the principle of subsidiarity		Only partially accepted; instead a fundamental right to water has been adopted; a basic right to a threshold of supplies
National policy	Adopted as a policy approach, not a principle; support development of skills and community management	Empower women through training and accelerate their representation in management activities	
Densu basin IWRM policy	IWRM plans at Densu basin level by the Densu Basin Board focuses on water protection, not water delivery services. Thus, no links between the two. Although it includes many stakeholders, it excludes the agency in charge of potable water supply to rural areas. Hence, the IWRM principles do not directly apply to supply and worse, do not prioritise water supply. Water supply activities are carried out by a separate agency		
Densu basin water supply policy	The need of the communities, combined with their ability to manage systems are critical factors in decisions regarding the establishment of water delivery systems	Local water supply bodies (WATSAN committees and WSDBs) have a 40% involvement of women.	The willingness of communities to pay 5% of capital costs and the responsibility for maintenance is critical factor in decisions regarding the establishment of water delivery systems. However, where communities cannot pay even 5% of the capital costs, the local government is expected to cover this short-fall, but they are also tight for resources.
Practice and perceptions	The communities are trying to implement participatory approaches	Capacity building for women is being organised; and their participation encouraged	There are practical processes being developed to encourage fund raising for the capital costs and maintenance is often funded by the pay-as-you-fetch rule.

establishments. Akpeteshie<sup>24</sup> distillers also increased from 307 in 2006 to 600 in 2009 in the same district (S–K–C DA, 2010). Table 4 gives an idea about the increase in water related small-scale enterprises in the Eastern Region. This demonstrates the link between meeting the basic rights of local people and in the process enhancing the economic welfare of the local people.

In some of the communities, Adderman and Akwatsri in the Ga West District of Greater Accra Region, the livelihoods of members are improved as a result of reduced incidence of water borne and water related diseases. Their improved health is due to their accessibility to safe drinking water provided by the rural water delivery scheme. They do not get sick often and are able to attend to their work. Their productivity is increased as well as income. Their social life as well as economic life has improved.<sup>25</sup> Table 5 uses reported cases of water borne and related diseases as a proxy for the incidence of water borne and related diseases to show improved health in the two main regions in which the Densu basin lies since the inception of the NCWSP in 1994.

Before the communities were supplied with water facilities, women and children spent hours hauling water from distant sources, using time that might otherwise be spent on more productive activities. A community called Miawani in the Eastern Region used to travel 15 km to fetch water in the dry season. They used to set off at 2 am with lanterns. Again at Adwumapa in the Eastern Region, the community no longer walk long distances to fetch water after the provision of the water facilities. Time for searching for water is reduced and the quality of water has also improved. The women have more time for their productive activities; children spend more hours in school. Government workers such as teachers do not refuse postings to such communities.<sup>26</sup>

**Table 3**  
National rural water supply coverage (1990–2008). Sources: Based on MWRWH/CWSA (2008); CWSA website (2010); de Largentaye (2007).

Year	Coverage rate (%)
1990	27.0
1999	30.0
2001	41.0
2002	41.3
2003	46.4
2004	51.1
2005	51.9
2006	52.9
2007	55.0
2008	57.14

These results are in line with those of an impact assessment study carried out in rural and peri-urban settings in Southern Ghana including the Ga West and East Akim Districts. Based on the beneficiaries own perceptions as well as from comparison with control communities the study concluded that provision of safe drinking water has made a significant difference to people's daily lives (a) reducing workload, time and stress associated with fetching water; (b) improved health and hygiene; and (c) having a range of more indirect impacts on schooling and income generation (CWSA, 2008).

In spite of the above, some WATSAN committees are not able to keep enough funds for O&M of water facilities. The water facility at Nsakina in the Ga West District of Greater Accra Region is not functioning because of poor mobilisation of resources.<sup>27</sup> Some communities could not accumulate enough funds because of the low motivation of their WATSAN committee.<sup>28</sup>

<sup>24</sup> Local gin.

<sup>25</sup> Interviews 46 (2008); 132, 136 (2009).

<sup>26</sup> Interviews 22, 124, 129 (2009).

<sup>27</sup> Interview 46 (2008).

<sup>28</sup> Interview 46 (2008).

**Table 4**

Cumulative no. of water related enterprises registered with the national board for small-scale industries, eastern region. Source: National board for small-scale industries, eastern region (2011).

Economic activity	2004	2005	2006	2007	2008	2009	2010
Filtered sachet water production	4	6	9	12	14	18	25
Soap making	2	4	5	6	6	6	6
Total	6	10	14	18	20	24	31

**Table 5**

Reported cases of water borne and related diseases as percentage of all reported cases of diseases (1990–2009) (%). Source: Calculated based on figures obtained from the Centre for Health Information Management, Ghana Health Services (2010).

Region/Diseases	1990	1995	2000	2005	2009
<i>Eastern region</i>					
Diarrhoeal diseases	6.592	4.237	4.359	3.725	3.546
Schistosomiasis (Bilharzia)	0.544	0.358	0.213	0.159	0.140
Guinea worm	0.769	0.015	0.014	0.002	0.00004
All other diseases	92.095	95.39	95.414	96.114	96.313
Total	100.00	100.00	100.00	100.00	100.00
<i>Greater Accra region</i>					
Diarrhoeal diseases	6.584	4.333	4.090	3.835	3.090
Schistosomiasis (Bilharzia)	0.151	0.123	0.049	0.032	0.039
Guinea worm	0.2116	0.0019	0.0021	0.0002	0.000
All other diseases	93.0534	95.5421	95.8589	96.1328	96.871
Total	100.00	100.00	100.00	100.00	100.00

The very small and poor communities are unable to raise money for the 5% capital cost and, hence, cannot afford a potable water facility. The DAs are hard pressed and are not able to pay for such communities.<sup>29</sup>

#### 4.3. Inferences

The incremental achievement of water supply to the communities using a gendered, participatory approach, has had, at least, seven benefits for the communities: First, communities have the power to select members of WATSAN committees and WSDBs therefore select those they know can do the work and also represent them; Second, WATSAN committee and WSDB members, pump attendants and others were trained in relevant skills – which both improved the direct functioning of these people in the water related projects; as well as had spill-over effects that could be used in their daily lives and occupations. Third, communities were empowered to select the most appropriate type of facility taking into consideration the 5% capital cost and how much they can afford; and the type that can offer them good services and can be easily maintained. Fourth, the limited implementation of the notion of the economic value of water has (a) helped to pay for the O&M of the water supply (for repairing facilities, paying for services and buying spare parts); (b) provided a sense of ownership and community responsibility; and (c) has taken into account that local communities do not have much resources. Fifth, the participation in economic activities has been enhanced as a result of (a) availability of water for economic activities (see Section 4.2); and (b) having more time for productive work from time saved from searching for water and improved health. Sixth, there is improved health with the reduction of water borne and water related diseases (see Section 4.2), making more time for productive activities

<sup>29</sup> Interview 43 (2008).

and reduced medical costs (indirect economic benefit). Seventh, children have more time for schools; and schools have better teachers – as the availability of water is often a condition for teachers to go to villages.

## 5. Conclusion

This paper set out to understand if the principles of IWRM and water delivery services can be reconciled taking into account the situation in Ghana. Theoretically speaking, IWRM calls for taking a holistic, comprehensive approach that takes economic, social and ecological goals into account. However a water delivery service perspective calls for focusing available resources on meeting priority goals. Theoretically, thus there is a conflict. Having said that, the key principles of IWRM can possibly be also applied to water delivery services and these theoretical links have been elaborated on in this paper.

The paper then examined the situation in Ghana. Ghana has adopted the IWRM concept, but has also prioritised water services. Its national water policy has adopted the participatory principle and the principle to take a gender sensitive approach; however, although it sees the importance of cost-recovery, it has adopted the right to water as the over-riding principle.

The national programme for rural water supply is implemented at the lowest level by the District Assemblies through the District Water and Sanitation Teams set up by the programme and WATSAN committees and WSDBs formed by communities. District plans which include plans for the water delivery sub-sector are conducted at the district (local) level with guidelines from the NDPC. These plans are coordinated by the NDPC through RWSTs, RCCs and CWSA-national.

Though IWRM forms part of the national water policy, its emphasis on integration and coordination of all water sub-sectors including the rural water delivery sub-sector is not practised. It is difficult to focus on prioritisation of water delivery whilst coordinating with other water sub-sectors and other issues of IWRM. IWRM planning and water delivery services planning are not linked especially at the basin and local level. This leaves a gap between the IWRM principle of integration and water delivery services at the local level.

However, the implementation of the participatory approach and the gendered approach, as well as the translation of the concepts of the human right to water with cost-recovery in terms of a limited community contribution to the capital costs of water services has led to at least seven identifiable welfare benefits. But, this may not be sustainable in the long-term, since much of the financial costs are presently covered by donors. It is hoped that the welfare benefits in terms of improved education, skills, health and economic benefits will lead to the generation of the resources needed to help communities out of the poverty trap and be more able to finance the system.

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