Evaluating IWRM implementation success: are water policies in Bangladesh enhancing adaptive capacity to climate change impacts?

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Optimizing the capacity to adapt to climate change impacts has become a critical challenge for human societies. This article therefore evaluates how integrated water resource management (IWRM) approaches help enhance adaptive capacity to climate change impacts on water resources. An evaluative framework is derived from key IWRM principles and their roles in modulating adaptive capacity. This framework is then used to evaluate IWRM implementation in Bangladesh. The analysis draws on policy documents, interviews and a survey of policy makers. Results suggest that policy principles and implementation in favour of IWRM can be a source of success but also of failure for adaptive capacity. Recommendations for amending the concept with the aim of increasing adaptive capacity are outlined.

Keywords: adaptive capacity; water management; policy implementation; governance; Bangladesh

Introduction

The sustainable management of water resources represents one of the great challenges for the twenty-first century. A staggering 2.4 billion people still lacked adequate sanitation in 2006, and by 2030 an estimated 47% of the total world population will experience high water stress (World Water Assessment Programme [WWAP], 2009). Hydrological disasters are the most frequent natural hazards across the world, annually affecting an average of 39 million people (Vos, Rodriguez, Below, & Guha-Sapir, 2010). The concept of integrated water resources management (IWRM) has consequently become popular for mainstreaming the consideration of water issues in governmental and societal decisions. Although conceptions differ, IWRM essentially “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” (Global Water Partnership [GWP], 2000, p. 22).

Over the past decade, IWRM has assumed a paradigmatic position in many national water strategies (Savenije & Van der Zaag, 2008). Yet, this dominance raises significant questions for comparative research, primarily over how the concept is being defined and legally translated in different national contexts, and its implementation success in practice (Biswas & Tortajada, 2010). In parallel, new societal concerns have become prominent since the initial development of the IWRM concept, in particular with respect to the capacity of societies to adapt to global environmental change (Dietz, Ostrom, & Stern, 2003). With climate change impacts on water resources rapidly becoming a major policy...
issue (Organisation for Economic Co-operation and Development [OECD], 2011; WWAP, 2009), scholars and practitioners alike have become interested in evaluating how water management strategies can increase the capacity of society to respond to future environmental stresses, i.e. their ‘adaptive capacity’ (Engle, Johns, Lemos, & Nelson, 2011; Huitema et al., 2009; Medema, McIntosh, & Jeffrey, 2008).

This article examines how IWRM implementation contributes to increasing societal adaptive capacity to climate change impacts. It builds on an analytical-theoretical framework (Gain, Rouillard, & Benson, 2013) which focuses on how core dimensions in IWRM influence adaptive capacity. Here, we specifically seek to evaluate how IWRM implementation influences adaptive capacity to climate change impacts on water resources in one highly significant national case: Bangladesh. Bangladesh is exemplar of a country severely impacted by climate change, and has sought to institutionalize IWRM principles. This case provides a critical indicator of IWRM success in practice, while providing scope for policy “lesson drawing” (Benson & Jordan, 2011) worldwide. This article draws on policy documents, as well as interviews and a survey carried out by Gain and Schwab (2012) amongst 10 key policy actors.

The article is structured as follows. The next section briefly presents an evaluative framework that links IWRM and adaptive capacity. The third section provides an overview of the state of IWRM implementation in Bangladesh. The fourth section follows with a discussion on how IWRM implementation may influence adaptive capacity. The article concludes with a discussion of how IWRM can help meet the challenges posed by global environmental change, giving recommendations for amending IWRM with the aim of increasing adaptive capacity, and identifying lessons for water governance in other national and sub-national contexts.

IWRM and adaptive capacity

IWRM is rooted in attempts to integrate different aspects of water management (see Molle, 2006), and is therefore a complex, multi-dimensional concept. Essentially the concept consists of six main normative dimensions (Gain, Rouillard, & Benson, 2013). The primary idea in IWRM is of integration and coordination between public policies and human activities, in particular the development of different economic sectors (this is the first dimension). Greater coordination and partnership between governmental agencies is a fundamental prerequisite for IWRM. Two important objectives are to better link social and economic development with the protection of natural ecosystems, and to allocate water services optimally between human activities (GWP, 2012). Integrated management should be carried out at hydrologically relevant scales (the second dimension), e.g. river basins, so that human activities better take into account both the limitations posed by the natural environment and the impact that upstream activities have on downstream ones. Upstream land use, for example, should not exacerbate flooding downstream.

IWRM also calls for good governance (the third dimension), meaning that decisions should be accountable and transparent. In consequence, IWRM often promotes moving away from traditional command-and-control approaches towards more multi-level, multi-actor, decentralized decision making, usually institutionalized through task-specific river-basin organizations (Benson, Jordan, & Huitema, 2012). Stakeholder participation (the fourth dimension) is an important means for achieving long-lasting compromises between relevant practitioners, scientists, politicians, interest groups and the general public. IWRM encourages valuing water as an economic and a social good
(the *fifth dimension*) so that decision makers consider both the efficient allocation of resources and equity issues (e.g. ensuring access to water for marginal social groups) (GWP, 2012). Finally, demand management is a recurring idea within IWRM (the *sixth dimension*). It suggests that the sustainable use of water is better achieved by influencing users’ demand, thereby increasing efficiency in resource use, than by increasing water supply (GWP, 2012).

The relationship between the core ideas underpinning IWRM and adaptive capacity is complex, not only because of the multiple dimensions of IWRM but also because the concept of adaptive capacity is itself also diffuse and poorly understood (Engle, 2011). However, societal adaptive capacity can be related to five main determinants (Gain, Rouillard, & Benson, 2013):

- a manageable natural and social system with few foreseeable thresholds and surprises
- an adequate supply of resources, technologies, infrastructure, knowledge and skills that enable social actors to respond to evolving circumstances
- an effective innovation and capacity-building system based on adaptive cycles and experimentation of local and scientific knowledge
- a flexible decision-making system that enables local self-determination, while ensuring synergistic interventions and avoiding conflicting ones between scales
- accessible participatory mechanisms that support fair exchange between social actors and encourage the sharing of resources and power

In this light, linking the multiple dimensions of IWRM and adaptive capacity is necessarily a complex task. However, several key considerations may arise from such an approach, some of which are briefly outlined below but explored in more detail by Gain, Rouillard, & Benson (2013). Greater policy integration in IWRM is thought to be globally good for adaptive capacity in that it is usually based on regular, collective reviews of separate policies to identify synergies and conflicts and accordingly adjust policy goals and instruments. Such adaptive cycles, based on cooperation, encourage learning from past implementations and better consideration of interacting dynamics, thresholds, and unanticipated events. It is nevertheless possible that pursuing greater integration can reduce adaptive capacity, because reconciling different understandings and interests may take time (or be impossible). In addition, policy integration ideally aims for convergence, or an optimum compromise, which may conflict with the idea in adaptive capacity that diversity can increase the resilience of social-ecological systems. The focus in IWRM on managing at hydrologically relevant scales is globally inconsistent with the notion in adaptive capacity that natural but also social-political units are important scales for decision making. In addition, IWRM does not provide sufficient guidance on how to ensure synergies between scales, a key requirement for adaptive capacity. The ideas of good governance, stakeholder participation, and equity in resource access in IWRM are globally coherent with the self-determination, cooperation and sharing of resources inherent in adaptive capacity. However, the preferential use of river-basin organizations can conflict with the idea that decision making should not automatically prioritize one scale over others. Finally, by reducing resource use, demand management can increase the availability of resources, thereby increasing adaptive capacity. These linkages are explored in more detail in the next two sections by examining IWRM implementation in Bangladesh.
IWRM in Bangladesh

Bangladesh is dominated by the South Asian monsoon, which is responsible for the high variability in the temporal distribution of water, thereby creating two extremes: an abundance regime with an excess of water during the rainy season (from June to October) and a scarcity regime with no rainfall during the dry season (from November to May). Bangladesh lies in the delta of three large river systems (the Brahmaputra, Ganges and Meghna; see Figure 1), and is comprised of flood-plains in 80% of its land area. In an average year a quarter of the country is inundated, and up to 60% can be inundated in water-abundant years (Ministry of Environment and Forest [MoEF], 2009a). Major causes of flooding include high flows of transboundary rivers, high rainfall in the country, and a low-lying topography, exacerbated by spring tides in the Bay of Bengal and cyclonic surges (Das Gupta, Singh Singh Babel, Albert, & Mark, 2005).

Bangladesh ranks as the sixth most vulnerable country in the world for floods and the most vulnerable for tropical cyclones, but it also has severe regional water deficits during the dry season (MoEF, 2009a). Climate change may exacerbate these trends, especially in the monsoon-dominated regions (Gain & Hoque, 2013; Gain & Wada, 2014), as glacial and snow melt due to climate change induced temperature rise lead to increased summer flow in the river system in future decades (Gain, Apel, Renaud, & Giupponi, 2013), followed by a reduction in flow as the glaciers diminish (Immerzeel, 2008). Increased rainfall and river flow may lead to land and river-bank erosion and loss of land, increased sedimentation in river beds, drainage congestion, and waterlogging. Tidal floods from cyclones and storms in the Bay of Bengal have been a source of extensive damage and fatalities, a threat likely to worsen with climate change (MoEF, 2009a). In coastal areas, sea-level rise may submerge low-lying areas and lead to saltwater intrusion in groundwater aquifers and damage to wetlands and mangroves (MoEF, 2009a).

Figure 1. Map of Bangladesh and international river basins.
Bangladesh is one of the most densely populated countries in the world, and has a rapidly developing economy, with growth rates commonly above 6% over the last 15 years (World Bank, 2014). Moreover, Bangladesh is facing ever-growing challenges in managing water demand, supplying safe drinking water, improving water quality, reversing the decline of fisheries, and protecting natural ecosystems, in particular coastal wetlands and marshes (Water Resources Planning Organization [WaRPO], 2001). Groundwater is a particularly strategic resource because it provides 95% of domestic and industrial supplies and 70% of irrigation supplies, but it is vulnerable to seawater intrusion in coastal areas (Das Gupta et al., 2005). The Bangladesh government has recognized IWRM as an important approach for tackling water resource management (WaRPO, 2001). To present how IWRM has been interpreted in Bangladesh, the following section describes the national legal and institutional framework. IWRM implementation in Bangladesh is then analyzed based on the six dimensions of IWRM defined in the previous section.

The national legal and institutional framework

Bangladesh water policy is currently defined through three main documents (Gain & Schwab, 2012). The National Water Policy (NWPo), published in 1999, was the first step towards the initiation of the IWRM process (MoWR, 1999). It outlines the main decision-making processes for water management in Bangladesh. The National Water Management Plan (NWMP), published in 2001, identifies the main national objectives and strategies for water management for 2000–2025 (WaRPO, 2001). The National Water Act (Government of Bangladesh, 2013) was enacted in 2013 with the aim of better integrating the management, development, utilization and protection of water resources. A schematic representation of the institutional framework for water management in Bangladesh is shown in Figure 2. In total, the NWMP identifies over 40 agencies, including 35 related to the central government, involved in water management.

Six major organizations are involved in water policy making and implementation. The Ministry of Water Resources is the executive agency for all aspects of the water sector. The National Water Resources Council (NWRC) is a strategic decision-making body chaired by the prime minister and consisting of 47 members. There is no direct representation of environmental NGOs, charities or private companies; members include academics, government policy makers, water management authorities, and the association of development agencies in Bangladesh. As such, the council facilitates the coordination of water-related policies. Most decisions for national water management are taken by the executive committee of the NWRC, which is chaired by the minister of water resources and has 15 members, including different ministries and government bodies. It is supported by the Water Resources Planning Organization (WaRPO), the main organization responsible for developing national water policies.

Several organizations are responsible for implementing water-related projects and programmes. The Bangladesh Water Development Board is responsible for water projects throughout the country, for example inland and coastal flood control, land reclamation and development works (e.g. irrigation), and rainwater harvesting (Das Gupta et al., 2005). The Local Government Engineering Department is responsible for the development and management of small-scale (1000 ha and less) projects in flood control, drainage, irrigation, water supply and sanitation. The Bangladesh Agricultural Development Corporation is an autonomous corporate body, under the control of the Ministry of Agriculture, which primarily functions to establish suitable arrangements for farming, and

International Journal of Water Resources Development
is therefore involved in irrigation works. Various other public organizations are involved in water service provision or in water management decision making (Figure 2).

**Evaluating IWRM implementation**

Given this complex institutional context, what is the success of IWRM implementation in practice? Drawing on our six dimensions, we may first ask: *How well is policy integration encouraged in Bangladesh?* Prior to the late 1990s, much of the decision making was undertaken by the Bangladesh Water Development Board, and policies were formulated and carried out by its engineers and hydrologists (Gain & Schwab, 2012). The NWPo was introduced in 1999, with two major objectives: to bring about institutional change facilitating policy integration and decentralization of water resources management; and to develop an adequate legal and regulatory environment (Ministry of Water Resources [MoWR], 1999). One major achievement of the NWPo is the devolution of responsibilities for small-scale (less than 1000 ha) water resource projects to the Local Government Engineering Department. However, most policy-making and implementing powers have remained within national organizations, including for example river-basin planning, which is still centralized in WaRPO. Responsibilities and powers for the construction and management of different types of water infrastructure remain fragmented between several ministries and agencies, and achieving policy integration remains challenging because the decisions of coordinating bodies are loosely binding.

Second: *To what extent is water management carried out at the river-basin level?* In Bangladesh, hydrologic boundaries were not generally considered prior to the 1990s. Within Bangladesh, 173 catchments were identified in 1991 and grouped into 60 planning...
areas, subsequently further aggregated into 5 regions. Responsibilities for catchment planning are nevertheless maintained in the national organizations, NWRC and WaRPO. Internationally, a Joint Rivers Commission (JRC) was established in 1972 which provided the institutional arena for maintaining a dialogue between Bangladesh and India on Ganges River management issues. The decisions of the JRC are however only non-binding recommendations, to be considered for ratification by the governments of India and Bangladesh (Das Gupta et al., 2005). The agreement on the Ganges has proved inadequate during periods of water scarcity, and conflicts remain with respect to water sharing (Chowdhury, 2010; Rahaman, 2009a, 2009b). In 1999, the NWPo re-emphasized the importance of international river-basin cooperation, in particular through better exchange of data and information between riparian countries (Rahaman & Varis, 2009).

Third: How are accountability and transparency encouraged and achieved? Answering this question requires engagement with the broader social context. Despite remarkable economic and social development in recent years, Bangladesh remains a low-income country (World Bank, 2014) and institutionally fragile, with several political and social crises in its recent history, low levels of accountability of public officials, reported corruption, and lack of transparency in governmental decision making (Alam & Teicher, 2012; Araral & Yu, 2010; Marshall & Jaggers, 2008; Miazi & Islam, 2012). Low trust in governmental policies, including water policy, is consequently manifest amongst local people (Bhandari, 2013; Gain & Schwab, 2012). To reduce mistrust between political parties and the society at large, the Bangladesh government enacted the Right to Information Act in 2009, and has developed a programme to strengthen its implementation through proactive disclosure. The government has also relied on increasing public participation in decision making (see below).

Fourth: How well does stakeholder participation influence decision making, and help find a compromise or consensus between governmental and local communities’ priorities? According to Gain and Schwab (2012), the extent of stakeholder participation in decision-making processes has substantially increased, and is expected to expand further in the future. Before 1989, citizens at local levels were not involved in decision-making processes regarding water resources. However, changes began in 1990, with projects such as the System Rehabilitation Project, which allowed farmers to participate in water project planning. The range of projects expanded with time, now including for example the management of fisheries and wetland conservation (Sultana, Thompson, & Green, 2008). Participation guidelines were first published in 1992 (Duyne, 1998). The NWPo states that increasing public participation in water projects is one of its major goals (MoWR, 1999), leading to the formulation of new guidelines for participatory water management in 2000 (MoWR, 2000). According to these guidelines, stakeholder participation is to be ensured in different stages of the project cycle of water resource projects. But in spite of these developments, water user groups still consider themselves widely ignored in decision making (Gain & Schwab, 2012).

Fifth: Is water considered both an economic and a social good in Bangladesh, and if so, how? The Bangladesh policy framework does consider water both an economic and a social good. The NWPo recognizes the economic value of water for different uses, the existence of opportunity costs, and the importance of fully recovering costs (MoWR, 1999). In practice, however, no organization dealing with water pricing yet exists, although the recent National Water Act states that one should be established (Government of Bangladesh, 2013). The NWPo also highlights that access to water is a human right, that water should be affordable, and that a safety net for poor people should be implemented (MoWR, 1999). One objective of the National Water Act is to improve water rights, and
ensure the balanced distribution, protection and conservation of water resources (Government of Bangladesh, 2013). In particular, it reserves the right to allocate water on the basis of equitable distribution, efficient development, and in-stream ecological needs. No organization yet exists for managing water rights or protecting human rights regarding access to water.

Finally: Is there an active policy for reducing water demand? With its high population density, managing water demand, in particular access to safe drinking water, represents a major challenge in Bangladesh. While the number of households with access to improved drinking water reached 74% of the population in 2004, many people rely on wells which are vulnerable to arsenic contamination (Pal, Adeloye, Babel, & Das Gupta, 2011). The management of water demand will also be compounded by the vast expansion of irrigation associated with national policies for food security. Bangladesh policy for reducing water demand remains mainly regulatory (WaRPO, 2001), and while Gain and Schwab (2012) report that local stakeholders believe that regulations have helped in reducing water demand during water scarcity, they also highlight that regulations are often vaguely formulated and do not include explicit time frames for implementation, and therefore enforcement remains generally poor. The NWPo suggests the introduction of water pricing, cost recovery, and economic incentives for balancing supply and demand of water (MoWR, 1999). However, water rates for achieving full cost recovery have not yet been established, and are only planned to include flood control, drainage and irrigation projects (Gain & Schwab, 2012).

**IWRM implementation and adaptive capacity in Bangladesh**

We now turn to the relationship between IWRM and adaptive capacity in Bangladesh. The first dimension of adaptive capacity (recall the five principles outlined earlier) is the degree to which the natural and social system under study is ‘manageable’, with few foreseeable thresholds and surprises. Bangladesh has in many ways naturally unfavourable conditions regarding water management. As discussed earlier, the country is naturally highly exposed to hydrological extremes and the impacts of climate change, and remains politically and institutionally fragile. With about 8% of the catchment areas of the Ganges, Brahmaputra and Meghna river systems, Bangladesh is highly dependent on water management decisions taken by the governments of the upstream countries of India, China, Nepal, Bhutan and Myanmar. This is particularly problematic during the dry season, when water abstraction upstream can severely reduce water availability in Bangladesh (Pal et al., 2011; Rahaman, 2009a). Yet, sustained economic growth and experimentation with a host of climate change adaptation initiatives, including a national climate change strategy and action plan and community-based projects (presented in more detail below), suggest that the country is becoming more prepared.

The second dimension to examine is the availability of resources, technologies, infrastructure, knowledge and skills. IWRM does not offer clear guidelines on how to secure supplies of natural, technological and financial resources; it focuses on managing water demand, in part through economic instruments to increase economic efficiency (Gain, Rouillard, & Benson, 2013). With a young population and a rapidly developing economy, the country is experiencing increasing supply of and demand for water resources. Some USD 10 billion have been invested in technological development and infrastructure over the last 30 years to reduce vulnerability to disasters, for example through the setting up of early-warning systems and the construction of more than 6000 km of coastal embankments and polders and 2000 cyclone and flood shelters (MoEF, 2009a).
In the same time span, Pal et al. (2011) observe improvements in drinking-water supply, an 86% increase in irrigated area (for a current total of about 5 million ha), and a 46% increase in the area protected by flood embankments (for a current total of 5.4 million ha). The implementation of irrigation and structural flood protection has contributed to stabilizing farmers’ income and fostering economic development (Choudhury, Neelormi, Quadir, Mallick, & Ahmed, 2005), but they may also have increased the potential for large-scale disasters. For example, extended periods of drought can now result in widespread failure in (irrigated) food production, and extreme floods overtopping or breaching embankments can lead to more widespread damage, as observed during the 1994 floods (Pal et al., 2011).

Little attention was historically given to managing water demand and non-structural flood protection measures (e.g. ecosystem-based measures or spatial planning), all of which are usually considered more climate-resilient or at least complementing the use of structural measures. The NWMP is, in theory, encouraging greater uptake of these measures as well as adaptation policies (MoEF, 2009a, 2009b). While relevant projects already exist (e.g. the Coastal Afforestation Project; see Rawlani & Sovacool, 2011), several authors highlight that implementation still lags (Chadwick & Datta, undated; Das Gupta et al., 2005; Pal et al., 2011). A major issue remains high levels of poverty, which constrains the investment capacity of households and individuals (Choudhury et al., 2005) and is still poorly tackled by national and local policies (Hossain & Huq, 2013).

The third characteristic determining adaptive capacity is **whether there exists an innovation and capacity-building system that allows experimentation of knowledge and appropriate adoption of new practices.** In the literature on adaptive governance, adaptive cycles, based on collective learning amongst stakeholders, are often the preferred means to enable such pragmatic reform agendas (Medema et al., 2008). In Bangladesh, the NWMP asks for yearly evaluations of ongoing projects to optimize implementation, and, every 5 years, an evaluation of the NWMP itself and its objectives (WaRPO, 2001). However, the NWMP does not set up any specific research programme, and sees evaluation activities as largely internal to WaRPO. The National Adaptation Programme of Action (MoEF, 2009b) includes a specific objective of “capacity enhancement, research and knowledge management”, but priority actions mainly focus on agricultural research, information dissemination, and community participation in coastal afforestation. This policy document does not clearly present how collective learning will be achieved in practice.

The fourth dimension to examine is **whether the decision-making process in water management enables local self-determination, while ensuring synergistic interventions, and avoiding conflicting ones, between scales.** By following an IWRM approach, Bangladesh has strengthened the role of river-basin management and therefore the role of natural boundaries over political ones. The JRC for example has helped initiate much-needed political discussion and technical cooperation between Bangladesh and India, along with a treaty for the Ganges River (Das Gupta et al., 2005; Rahaman, 2009a, 2009b). The Bangladesh government intends to introduce a more structured approach, drawing on international river-basin planning to better anticipate crises and identify long-term common management objectives to reduce conflicts. So far, however, treaties have not resulted in significant changes in water management practices in these countries (Chowdhury, 2010; Das Gupta et al., 2005). Moreover, responsibilities for the implementation of water policies are divided amongst a multitude of national and local organizations, a situation similarly experienced in disaster management and climate change adaptation policies (Hossain & Huq, 2013). While this may run against IWRM, some level of institutional plurality can increase system resilience and adaptive capacity (Huitema et al., 2009).
In parallel, little guidance exists in IWRM policy on how to ensure synergies between scales, e.g. catchments, river basins, international river basins, multiple relevant political units, and individual citizens. Managing ‘vertical integration’ is nevertheless important to increase adaptive capacity. In Bangladesh, investment in water infrastructure in the past has relied significantly on foreign aid, which may have contributed to the reduced involvement of local communities and the poor accountability of the national administration and agencies (Chadwick & Datta, undated). Since the 1990s, the government has engaged in the progressive transfer of responsibilities to local institutions and the private sector, a change supported by key water policies (MoWR, 1999; WaRPO, 2001) and adaptation policies (MoEF, 2009a, 2009b). However, concerns remain regarding the financial capacity and know-how of local government in taking up these responsibilities (Das Gupta et al., 2005; Hossain & Huq, 2013).

The final dimension to evaluate is the quality of participatory mechanisms, which should support fair exchange between social actors and encourage the sharing of resources and power. It is noticeable that the main decision-making bodies for water management (e.g. the executive committee of the NWRC) are dominated by governmental members rather than civil society. With the IWRM process, the extent of stakeholder participation in decision making has increased as well as the importance given to equitable access to water and human rights. This was a welcome move towards empowering local communities and stakeholders, which can be beneficial for adaptive capacity. Greater self-determination at the local level may help in adapting national guidelines and strategic objectives to the local context and, in return, better inform future national policies. Community-based projects are becoming well established and are strongly supported by national adaptation policies (MoEF, 2009a, 2009b). However, defiance towards the government remains high in Bangladesh, and, as mentioned earlier, there is evidence that local communities and civil society still feel left out of the decision making process. Further evidence suggests that effective adaptation is also constrained by limited exchange of information between government and civil-society organizations (Thomalla, Cannon, Huq, Klein, & Schaerer, 2005) and by the structure of the dominant adaptation funds (Ayers, 2011). Consequently, a culture of collaborative working, fundamental for adaptive capacity, has yet to be developed.

**Discussion and conclusions**

The analysis suggests that IWRM implementation in Bangladesh has had a mixed impact on adaptive capacity. Past water management in Bangladesh has successfully led to considerable investments in irrigation and flood management, and the current economic context is favourable to continued investments in water technologies, infrastructure and capacity building. In that context, we observe that IWRM principles provide more guidance on how to utilize resources for water management than on how to generate them. Implementation of IWRM in Bangladesh has resulted in a diversification of technologies, infrastructure, knowledge and skills in water management, in particular related to non-structural measures and green infrastructure. Greater consideration has also been given to ‘horizontal integration’, which is positive for adaptive capacity since it aims to better coordinate investments across policies and sectors. Spatially, hydrological boundaries (e.g. river basins) were already considered back in the 1960s when the JRC was established. However, within Bangladesh, responsibilities for water management remain largely centralized in national agencies and ministries, and no collaborative venues based on catchment boundaries yet exist.
Recently, the Bangladesh government has opted for an agenda prioritizing the involvement of local institutions in water management projects. Such local ‘self-determination’ is deemed beneficial, at least theoretically, for adaptive capacity since local actors can build their capacities to act independently of other management or political scales. Ultimately, a balancing act is required between the centralization of powers and responsibilities around river basins and catchments and the independence and self-determination needed to build adaptive capacity (Rouillard, Heal, Ball, & Reeves, 2013). IWRM values bottom-up approaches, but mainly in the form of poverty alleviation, equity in resource access, promotion of human rights, and public participation, rather than in terms of self-determination. It is likely that realizing the first three will contribute to raising household and individual adaptive capacity (see e.g. Brouwer, Akter, Brander, & Haque, 2007; Choudhury et al., 2005). Regarding public participation, implementation of IWRM in Bangladesh has strengthened consultation procedures between government and civil society, created some collective knowledge, reduced some conflicts, and empowered some local communities. IWRM implementation has been less effective in promoting collective learning, a culture of experimentation, or collaborative work, all of which are fundamental to increase adaptive capacity.

What is the scope for lesson drawing on a worldwide scale? For developing countries, struggling with the demands of IWRM implementation and often competing social, economic and environmental considerations, Bangladesh shows that it is possible to establish new governance structures, which can contribute to improving water management practice and increasing adaptive capacity, in particular if they emphasize IWRM principles in favour of horizontal and vertical integration, stakeholder participation, equitable access to water, and human rights. Yet, these results also suggest that increasing adaptive capacity to climate change impacts on water resources solely through IWRM principles may have limited success, because policy integration needs to be embedded in a philosophy of self-determination and learning. Whether these lessons are transferable is, however, a matter for further comparative research, and academic and political debate.

While the Bangladesh case is, as previously discussed, highly significant on a global scale, any further investigations into the linkages between IWRM and adaptive capacity should compare the results with outcomes in other countries to formulate more generalizable theory. One means of developing such research could be to engage in wider comparative national testing using a large-N data-set and statistical analysis. Another approach could be to utilize other in-depth case studies by cross-comparing on the ‘dependent variable’, in this case adaptive capacity, to explore how different IWRM dimensions are shaping national responses. Such investigations would then provide policy-relevant lessons for countries as they grapple with IWRM implementation – research that will assume increasing value as the use of the concept expands worldwide in relation to climate change pressures.

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