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Emerging Pillars for IWRM Implementation in Bangladesh

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ABSTRACT: Since the early 1990s, the IWRM approach has been performing for improving the water sector through minimising the water crisis in Bangladesh. Therefore, Bangladesh has developed three pillars (e.g., enabling environment, institutional arrangement, management instruments, etc.) favouring IWRM to meet the desired goal. Despite the ability to adequately address the cross-cutting and multiple issues of the water sector of Bangladesh, the IWRM approach is getting more complex day by day because the steps taken under the pillars may not work correctly. Given above, an attempt has been made to analyse how the existing contradictions in IWRM pillars (designed by Bangladesh) affect IWRM effectiveness. Using document analysis and semi-structured interviews, this paper provides an understanding of existing inconsistencies of IWRM pillars and the necessity of enhancing IWRM pillars for increasing IWRM implementation effectiveness in Bangladesh. The implementation challenges of the policy networks (policy, plan, strategy etc.) and implementation networks (water projects) made to ensure enabling environment affect IWRM effectiveness. Institutional power and responsibility are not defined in the policy rules and regulations correctly, causing problems in the institutional arrangement, which has affected IWRM effectiveness. Database related issues about the management instruments are also responsible in this regard. Necessary strategies and measures as per network management are recommended to enhance IWRM tools by resolving irregularities and improving IWRM effectiveness in Bangladesh.

KEYWORDS: IWRM, Enabling Environment, Institutional Arrangement, Management Instruments, NWPo, Water Act, Network Management

I. INTRODUCTION

Bangladesh's water sector faces severe flooding, sedimentation, riverbank erosion, water scarcity and abundance, intrusion salinity, water pollution, arsenic contamination, and various cyclonic disasters (Alam & Quevauviller, 2014; Rasheed, 2011). These crises are rising due to geographical location, physiographic and soil conditions, hydrological cycle, land use pattern, and complex river systems (Rasheed, 2011; Rashid, 1991). Therefore, the Integrated Water Resources Management (IWRM) approach has been performing since the early 1990s to reduce these challenges to ensure water sector improvement in Bangladesh. The Government of Bangladesh (GoB) has already taken several steps favouring IWRM implementation. Among these are the defining IWRM pillars in Bangladesh, like enabling environment, institutional framework, and management instruments (Das Gupta et al., 2005; Garcia, 2008). The policy at all levels and legislation are included in enabling environment, whereas the institutional framework is a structure by which policy, strategy, and legislation etc., are implemented. On the other hand, several elements, and methods for making plans and making decisions are categorised as management instruments. Although attempts have been made to develop the water sector of Bangladesh by outlining three tools, it has been hampered for various reasons.

Contradictions in the policy, plan, and strategy for enabling environment affect IWRM implementation in Bangladesh (Barua & Van Ast, 2011; Rasheed, 2011; WARPO, 2020). Several difficulties and inconsistencies have been created during their development process, as some important Bangladeshi water actors are not involved (Gain et al., 2017a). A top-down approach has been used to develop them that prevented local actors from affecting and the cost of foreign actors (World Bank, 2017). Remarkably, the policy could not absorb multidimensional concepts that were the sources of a few inconsistencies of policy contents (Gain et al., 2017a). Community stakeholders and industrial actors did not have the opportunity to contribute to the policy development process due to their absence. Rules and regulations play a vital role in performing institutional responsibilities. However, the existing inconsistencies in the rules and regulations usually caused by the policy development process hamper IWRM effectiveness (Hossain et al., 2016; MoWR, 2013). Enabling environment and institutional activities are being hindered because the databases created under management instruments are not very easy to access and are not rich enough.

In the view of above points, to resolve Bangladesh's water sector's problems, the existing IWRM pillars need to be improved and adjusted by offering suitable strategies and measures. The research focuses on understanding the inconsistencies in IWRM pillars

that are challenging for effective IWRM implementation in Bangladesh. Also, to know how to mitigate these challenges to make IWRM tools more realistic. Based on these, the aim and objectives of this paper have been fixed.

II. AIM AND OBJECTIVES

The paper aims to analyse the existing constraining conditions of IWRM tools that affect the effectiveness of IWRM implementation and how to enhance these for improving IWRM effectiveness in Bangladesh. The specific objectives of the paper are to:

1. Identify existing constraining conditions of IWRM pillars that reduce IWRM effectiveness in Bangladesh.
2. To find out suitable strategies how to enhance IWRM pillars favouring IWRM effectiveness.

III. DATA AND METHODOLOGY

Interviews and document analysis were both used in this study. In-depth semi-structured interviews with 30 water professionals and experts were completed, including crucial informants from government organisations (25) and NGO representatives (5). Interview respondents were asked to focus on the constraining conditions of IWRM pillars that affect IWRM implementation and the suitable ways to improve those pillars for increasing IWRM effectiveness in Bangladesh. Interviews were undertaken with water management professionals and experts of significant water institutions[1]. In addition to the interview, documents were collected from professional water management organisations, government agencies, private institutions, relevant non-governmental organisations (NGOs), and funding bodies where appropriate. Materials include government notifications, public records, various policies from the national organisation in detail by referring to multiple government publications and reference books, journals, published data from time and other statistical data, media reports etc., regarding water resources management of Bangladesh. To maintain the anonymity of study participants, quotes from interviewees are attributed numerically based on their place of, e.g., WARPO 1, BWDB 1, CEGIS 1 etc.

IV. IWRM CONCEPT AND PILLARS

IWRM is the dominating policy paradigm in water resource management and is widely applied internationally (Gain et al., 2012). IWRM is *"a process which promotes the coordinated development and management of water, land and related resources, to maximise the resultant economic and social welfare equitably without compromising the sustainability of vital ecosystems"* (GWP, 2000, p. 22). Given this definition, IWRM is an open and flexible procedure for various cross-sectoral stakeholders to solve specific water challenges (Biswas et al., 2005; Dare & Daniell, 2017; Dare & Lukasiewicz, 2019; Gain et al., 2013; Rahaman & Varis, 2009). IWRM provides the mechanisms and drives to improve water management and governance activities, reforming water agendas according to country development needs (Biswas, 2004; Gain et al., 2013; Rouillard et al., 2014).

IWRM uses three 'pillars' of implementation, which capture IWRM tools (Biswas, 2008; GWP, 2000). The first pillar is the *enabling environment*, the policies, legislative framework, and financing structures that support the implementation of IWRM. A proper enabling environment is essential to both ensure the rights and assets of all stakeholders (individuals as well as public and private sector organisations and companies) and also to protect public assets such as intrinsic environmental values (Alam & Quevauviller, 2014; Albert, 2001; Das Gupta et al., 2005). The Government of Bangladesh has formulated different policies, Acts, and strategies[2] since 1990 to create enabling situations to implement IWRM (WARPO, 2015). Several national development objectives (i.e., alleviate poverty, food security etc.) have been considered to make these policies in the water sector of Bangladesh (Barua & Van Ast, 2011; WARPO, 2020).

[1] Water Resources Planning Organization (WARPO), Local Government and Engineering Department (LGED), Bangladesh Water Development Board (BWDB), Institute of Water Modelling (IWM), Ministry of Environment and Forest (MoEF), Centre for Geographic Information Systems (CEGIS), NGOs and academic institutions.

[2] Flood Action Plan (FAP, 1989-95); National Environmental Policy (NEP, 1992); Bangladesh Water and Flood Management Strategy (BWFMS, 1995); the Ganges Water Treaty (GWT, 1996); National Policy for Safe Water Supply & Sanitation (NPSWSS, 1998); National Fisheries Policy (NFP, 1998); National Agricultural Policy (NAP, 1999); National Water Policy (NWPo, 1999); Guidelines for Participatory Water Management (GPWM, 2000); National Water Resources Database (NWRD, 2001); National Water Management Plan (NWMP, 2004); National Policy for Arsenic Mitigation (NPAM, 2004); Coastal Zone Policy (CZP, 2005); National Adaptation Programme of Action (NAPA, 2005); Regional Technical Assistance (RETA, 2009); Bangladesh Climate Change Strategy and Action Plan (BCCSAP, 2009); Master Plan for Agricultural Development in Coastal Region of Bangladesh (MPADCRB, 2013); Sixth Five Year Plan fy2011-fy2015: Accelerating Growth and Reducing Poverty. Groundwater Ordinance (1985), Water Resources Planning Act (1992), Bangladesh Environment Conservation Act (1995), Water Supply and Sewerage Authority (WASA) Act (1996), Environment Conservation Rules (1997), BWDB Act (2000) and Bangladesh Water Act (2013). The Disaster Management Act (DMA, 2012), Integrated Small-Scale Irrigation Policy (ISSIP, 2011), the Cyclone Shelter Management Policy (CSMP, 2011), The Jalmahal Management Policy (JMP, 2009), Coastal Development Strategy (CDS, 2006), the Coastal Zone Policy (CZP, 2005), Guidelines for Participatory Water Management (GPWM, 2000), National Water Policy (NWPo, 1999), National Agricultural Policy (NAP, 1999), National Policy for Safe Water Supply & Sanitation (NPSWSS, 1998); National Fisheries Policy (NFP, 1998), Environmental Conservation Rules (ECR, 1997), Bangladesh Water and Flood Management Strategy (BWFMS, 1995), Environment Conservation Act (ECA,1995), National Forest Policy (NFP, 1994), National Environmental Policy (NEP, 1992), Groundwater Management Ordinance (GMO, 1985) and Bangladesh Forest Act (BFA, 1927).

The second pillar is the *institutional framework*, the organisations and networks developed to implement IWRM. Institutional development is critical to formulating and implementing IWRM policies and programmes (Das Gupta et al., 2005). Many central government institutions[3] are currently working to construct an enabling environment in the water sector to meet IWRM goals in Bangladesh (NWMP, 2004). These national institutions made a robust institutional framework for ensuring enabling environment (WARPO, 2015).

The third pillar is *management instruments* which capture the discrete methods, processes, and procedures that enable IWRM to be implemented, providing information to help decision-makers make rational and informed choices between alternative actions (GWP IWRM Toolbox, 2001). The government of Bangladesh has taken some principal documents as management instrument tools supporting planning policy and making decisions within the IWRM network for developing the water sector of Bangladesh, i.e., setting up NWMP, NWRD and MIS for WARPO. Three IWRM tools could be improved by adjusting different rules of existing IWRM and ensuring resource availability among involved network organisations. Also, network management can help by offering strategies in this regard.

EXISTING CONTRADICTIONS OF PILLARS THAT AFFECT IWRM EFFECTIVENESS IN BANGLADESH

Though the concepts and tools of IWRM are appropriate in Bangladesh, these are not fully implementable due to existing inconsistencies of IWRM pillars, including a lack of sectoral and organisational coordination, staffing and citizen participation (WARPO, 2001). To better understand the strengths, challenges, and opportunities of the IWRM pillars in Bangladesh, this research critically uses the three IWRM pillars to analyse current IWRM practises. Specifically, the analysis aims to determine the relationship between the activities of three pillars with IWRM implementation.

A. Enabling Environment and IWRM Effectiveness in Bangladesh

The existing water resource management policy, plans, guidelines and legislative framework have delivered an enabling environment that supports the effective implementation of IWRM in Bangladesh. As previously discussed, since the 1990s, the Government of Bangladesh has legislated a range of water policies[4] to enable the implementation of IWRM and hence promote sustainable development (Ministry of Environment and Forest (MoEF), 2005, 2009; Ministry of Planning (MoP), 2011; Ministry of Water Resources (MoWR), 2005). A legislative framework that reflects water rights issues, water quality, and water management has been established[5], enabling the National Water Policy (NWPo) implementation in Bangladesh (Barua & Van Ast, 2011; Rasheed, 2011; WARPO, 2020). Approved in 1999, the NWPo was a practical and reasonable step towards institutionalising IWRM by considering and incorporating basic IWRM principles (Gain et al., 2017b; Rasheed, 2011; WARPO, 2001). In 2013, the Government of Bangladesh (GoB) legislated the 'Bangladesh Water Act 2013', enabling integrating the development, management, utilisation, and protection of water resources (MoWR, 2013).

The Water Act 2013 is the latest and the most crucial water policy in Bangladesh, incorporating content from previous water regulations (e.g., NWPo) and supersedes all previous water-related policies and Acts[6] (WWF, 2015). The Act provides a solid

[3]National Economic Council (NEC), National Water Resources Council (NWRC), Planning Commission, Ministry of Water Resources (MoWR), Ministry of Environment, Forests (MoEF), Department of Environment (DoE), Department of Forest (DoF), Water Resource Planning Organization (WARPO), Bangladesh Water Development Board (BWDB), Ministry of Agriculture (MoA), Bangladesh Agricultural Development Corporation (BADC), Department of Agricultural Extension (DAE), Soil Research Development Institute (SRDI), Department of Fisheries, Local Government and Engineering Department (LGED), Bangladesh Haor and Wetlands Development Board (BHWDB), Ministry of Local Government, Rural Development and Construction (MoLGRDC), Ministry of Irrigation Water Development and Flood Control (MoIWDFC), Barind Multipurpose Development Authority (BMDA), National Water Resources Council (NWRC), Joint Rivers Commission (JRC), Institute of Water and Flood Management (IWFM), Institute of Water Modeling (IWM), Flood Forecasting Warning Centre (FFWC), Flood Plan Coordination Organization (FFCO), Bangladesh Inland Water Transport Authority (BIWTA), Department of Public Health Engineering (DPHE), Dhaka Water Supply & Sewerage Authority (DWASA), Chittagong Water Supply & Sewerage Authority (CWASA), River Research Institute (RRI), Ministry of Land (MoL).

[4]Flood Action Plan (FAP, 1989-95); National Environmental Policy (NEP, 1992); Bangladesh Water and Flood Management Strategy (BWFMS, 1995); the Ganges Water Treaty (GWT, 1996); National Policy for Safe Water Supply & Sanitation (NPSWSS, 1998); National Fisheries Policy (NFP, 1998); National Agricultural Policy (NAP, 1999); National Water Policy (NWPo, 1999); Guidelines for Participatory Water Management (GPWM, 2000); National Water Resources Database (NWRD, 2001); National Water Management Plan (NWMP, 2004); National Policy for Arsenic Mitigation (NPAM, 2004); Coastal Zone Policy (CZP, 2005); National Adaptation Programme of Action (NAPA, 2005); Regional Technical Assistance (RETA, 2009); Bangladesh Climate Change Strategy and Action Plan (BCCSAP, 2009); Master Plan for Agricultural Development in Coastal Region of Bangladesh (MPADCRB, 2013); Sixth Five Year Plan fy2011-fy2015: Accelerating Growth and Reducing Poverty.

[5]Groundwater Ordinance (1985), Water Resources Planning Act (1992), Bangladesh Environment Conservation Act (1995), Water Supply and Sewerage Authority (WASA) Act (1996), Environment Conservation Rules (1997), BWDB Act (2000) and Bangladesh Water Act (2013).

[6]The Disaster Management Act (DMA, 2012), Integrated Small-Scale Irrigation Policy (ISSIP, 2011), the Cyclone Shelter Management Policy (CSMP, 2011), The Jalmahal Management Policy (JMP, 2009), Coastal Development Strategy (CDS, 2006), the Coastal Zone Policy (CZP, 2005), Guidelines for Participatory Water Management (GPWM, 2000), National Water Policy (NWPo, 1999), National Agricultural Policy (NAP, 1999), National Policy for Safe Water Supply & Sanitation (NPSWSS, 1998); National Fisheries Policy (NFP, 1998), Environmental Conservation Rules (ECR, 1997), Bangladesh Water and Flood Management Strategy (BWFMS, 1995), Environment Conservation Act

basis to the NWPo to support IWRM by granting water resource rights to user groups, organisations, and associations, facilitating the best possible use of water resources and nature conservation (Alam, 2014).

Although the Bangladesh Water Act 2013 positively facilitates effective IWRM implementation, some aspects of the Act could obstruct good water governance in Bangladesh. So, Gain and colleagues (2017) identified critical challenges to good water governance in Bangladesh, including contradictions between the latest Water Act and previous water and related policies, unclear policy documentation about the mandate and powers of individual water institutions, and unclear guidelines in the newest Act about financial mechanisms and the responsibilities of key water bodies. For instance, there is no indication about non-point water pollution and drinking water provision in the current Water Act. However, that was adequately addressed in the previous NWPo (1999) and the National Policy for Safe Water Supply & Sanitation (NPSWSS, 1998), respectively.

Similarly, due to the lack of specified control and instructions in recent policy documents, individual water institutions cannot fulfil their scope and responsibilities (Chan et al., 2016). According to the Water Act (2013), WARPO is the main body and officially responsible for implementing the Water Act 2013 through planning, designing, monitoring, and supervising all water projects throughout Bangladesh. However, WARPO cannot adequately fulfil this responsibility due to its lack of a proper mandate and institutional capacity to handle the required inter-ministerial coordination of water-related matters (MoWR, 1999; Rouillard et al., 2014). Although the Water Act (2013) has some provisions for enforcement (e.g. compliance orders, protection orders, removal orders, imprisonment and fines etc.), there is a lack of precise specifications provided, which leaves the Act open to interpretation (Chan et al., 2016). Without the proper functioning of individual water institutions, sustainable water resource management is not possible. Only by establishing appropriate and well-defined powers and responsibilities for water institutions can the IWRM goals be met.

B. Institutional Arrangement and IWRM Implementation in Bangladesh

Many central, regional, and local government institutions[7] are working to construct and strengthen the IWRM enabling environment, providing a solid framework supporting Bangladesh's water governance (Gain & Schwab, 2012). These institutions are all connected by exchanging resources (e.g., skilled human resources, knowledge, equipment etc.). They are guided by the Ministry of Water Resources (MoWR) rules of IWRM (WARPO, 2015). Several water-related institutions (30 ministries and 35 departments) are trying to implement the Water Act (2013) through improved integration and coordination (Chan et al., 2016). WARPO and NWRC, for instance, are playing a positive role in this implementation process. Several institutions have adopted trans-disciplinarily approaches to facilitate sharing different water knowledge across the Bangladesh water sector (Gain et al., 2015), including DeltaCap and the Institute of Water and Flood Management (IWFM). Similarly, several institutions have adopted catchment-scale planning to properly execute the current Water Act (MoWR, 2013; WARPO, 2015). Barind Multipurpose Development Authority (BMDA) and the Local Government and Engineering Department (LGED) jointly adopted economic principles that considered gender issues for accessing safe water to marginal people and sectors. LGED, including its selective representative, works directly with project implementation to increase people's water resources management participation. Recently, WARPO and BWDB considered environmental and ecological aspects in their institutional setup for managing water resources efficiently (Hossain et al., 2016; MoWR, 2013).

Despite these recent improvements in the institutional framework, there remain many challenges for implementing good water governance in Bangladesh, including the continuing poor interaction and coordination among water institutions; insufficient institutional mandate, power and guidance; and a lack of institutional infrastructure, including transparency and accountability (Bandaragoda & Babel, 2010; Chan et al., 2016; MoWR, 2013). WARPO, for example, is responsible for the implementation of the Water Act (2013) but is hampered by a persistent inter-ministry coordination gap, high levels of uncertainty, including an unclear mandate, while also suffering from chronic shortages in the specialist workforce and financial resources (Alam & Quevauviller, 2014).

At the same time, a comprehensive water governance approach is limited by the inadequate representation of all interests. The NWRC is the highest decision-making body for water planning headed by the Prime Minister. However, in the NWRC, the

(ECA,1995), National Forest Policy (NFP, 1994), National Environmental Policy (NEP, 1992), Groundwater Management Ordinance (GMO, 1985) and Bangladesh Forest Act (BFA, 1927).

[7]For example: National Economic Council (NEC), National Water Resources Council (NWRC), Planning Commission, Ministry of Water Resources (MoWR), Ministry of Environment, Forests (MoEF), Department of Environment (DoE), Department of Forest (DoF), Water Resource Planning Organization (WARPO), Bangladesh Water Development Board (BWDB), Ministry of Agriculture (MoA), Bangladesh Agricultural Development Corporation (BADC), Department of Agricultural Extension (DAE), Soil Research Development Institute (SRDI), Department of Fisheries, Local Government and Engineering Department (LGED), Bangladesh Haor and Wetlands Development Board (BHWDB), Ministry of Local Government, Rural Development and Construction (MoLGRDC), Ministry of Irrigation Water Development and Flood Control (MoIWDFC), Barind Multipurpose Development Authority (BMDA), National Water Resources Council (NWRC), Joint Rivers Commission (JRC), Institute of Water and Flood Management (IWFM), Institute of Water Modeling (IWM), Flood Forecasting Warning Centre (FFWC), Flood Plan Coordination Organization (FFCO), Bangladesh Inland Water Transport Authority (BIWTA), Department of Public Health Engineering (DPHE), Dhaka Water Supply & Sewerage Authority (DWASA), Chittagong Water Supply & Sewerage Authority (CWASA), River Research Institute (RRI), Ministry of Land (MoL).

Ministry of Industry is not represented, inhibiting its capacity to put tighter controls on wastewater quality and water use (Hossain & Bahauddin, 2013). The LGED is responsible for implementing small-scale water projects (more than 60% of all water projects in Bangladesh); however, its capacity is hindered by the lack of funding, skilled human resources, appropriately scientific and technical knowledge and low access to modern technologies (Islam et al., 2020; Pandey, 2020). Additionally, insufficient consideration of community interests obstructs effective IWRM implementation, as the World Bank (2017) established. It also identified that community groups did not feel that their views were considered during policy-setting processes, further exacerbated when complaints were not addressed effectively.

Several other things weaken implementation. First, due to the lack of transparent accountability mechanisms among related institutions, high-cost water projects are unsuccessful, despite various international development agencies and donor banks contributing technical capacity and resources (Hossain & Bahauddin, 2013; Huq et al., 2015). In addition, NGOs are not well represented within governance mechanisms, although they are experienced in on-ground water stewardship and can report back on community and stakeholder issues (Gain et al., 2017b; Megdal et al., 2017). For instance, according to the Bangladesh Water Act 2013, only one representative from the NGO sector, selected by the Prime Minister, is e a member of the NWRC and the Executive Committee. As a result, the effective implementation of Bangladesh water programs is hindered due to insufficient NGO representation in water policy development and water governance (Gain et al., 2017a; Megdal et al., 2017; World Bank, 2017).

While there are relevant institutions for IWRM in Bangladesh, their efficacy is significantly hampered by the lack of coordination amongst water actors, the lack of capacity and resources, including knowledge and experience, and the contradictions of institutional mandate and power. The above complications related to institutional arrangement hinder the effective implementation of IWRM. Still, the critical reasons behind these complications are that the institutions do not receive the required information. In the next section, an attempt has been made to explain how various water databases affect the implementation of IWRM.

C. Management Instruments to Properly Implement IWRM in Bangladesh

The management instrument is a systematic way of collecting and formatting all the data related to the water sector, which is crucial to support decision-makers in selecting rational and knowledgeable IWRM implementation methods (GWP, 2000). The management instrument plays an essential role in the policies, plans and strategies developed to create the enabling environment required to implement IWRM. Through WARPO and the BWDB, the Government of Bangladesh has approved the necessary documents to support policy and decision-makers implementing IWRM (e.g. setting up National Water Management Plan (NWMP), National Water Resources Database (NWRD) and Management Information System (MIS) (MoWR, 1999; WARPO, 2020). In addition, WARPO is attempting to increase access to crucial water management data through the development of several Memorandums of Understanding (MoU) with key organisations such as LGED, BWDB, the Bangladesh University of Engineering and Technology (BUET) and the Centre for Environmental and Geographic Information Services (CEGIS). However, more MoUs are needed to ensure the required data is readily accessible to all participating institutions (Alam & Quevauviller, 2014).

This analysis of IWRM implementation in Bangladesh has identified challenges that obstruct effective implementation, including that agency have flawed mandates, fragmentation and insufficient skills and resources. Despite these challenges, there are opportunities for improving IWRM in Bangladesh by supporting good water governance, ensuring a robust enabling environment, a transparent institutional balance, and effective management instruments. The discussion shows that IWRM implementation in Bangladesh is becoming more successful due to improving water management approaches. However, more water governance system is needed to underpin and enable sustainable water management programmes.

Many actors are involved in this network; most are government actors practising more power than private and NGO sectors to resources distribution and other activities. Significantly, local level NGOs and marginal private industry are not getting access within the network due to unfavourable entry rules. Also, exits options to depart from the network are not reasonable to the member involved. MoWR is working as dominating actor in this network. In contrast, WARPO functions as a coordinating body with fewer powers than MoWR or NWRC to exchange resources and decision-making. About 35 central governmental organisations of 13 ministries are involved within the network. More donor's dependency due to the limitation of ADB is also an essential characteristic of this network. Besides, the actor selecting process is not acceptable still now, and there is no temporary institutional arrangement facility to improve interactions among actors.

Additionally, there is no scope for emergency problems related to water crises, e.g., cyclones, tornados, etc. A high level of interdependency among actors within the network is a critical nature of this network. Maximum actors involved within the network are identified as policy community types in terms of membership. In contrast, this could be considered an issue network in terms of integration, resources, and power practices.

V. ENHANCEMENT OF IWRM PILLARS IN BANGLADESH

Network management can provide an actual effort for reducing existing contradictions of the IWRM pillars. This could be done by ensuring the inclusion of crucial actors who always work in the water sector. This approach can work by enhancing the cooperation of actors working for enabling environment. In general, this approach can play an essential role in ensuring the enabling environment required to increase the IWRM implementation effectiveness. Network management approaches can improve IWRM pillars in two ways; network constitution approach and process management (Klijn & Koppenjan, 1999; Klijn & Koppenjan, 2000). The process management approach can guide the interactions and cooperation of actors involved in pillar better and more comfortable. Since the actor's problem is an obstacle to improving pillars, this approach addresses their problems. It emphasises their collective opinions and perceptions, which can enhance the existing pillars. In addition, the approach can provide some ways to solve the problems of cooperation and interaction of autonomous organisations working favouring three pillars (Klijn, 2009; Koppenjan & Klijn, 2004).

On the other hand, the network constitution approach can point out ways to increase the cooperation and interaction of the actors involved by adjusting the institutional features (Kikert et al., 1997; Klijn & Koppenjan, 2000). This could be to ensure a balance of power by enhancing the relationship between the actors in the policy by including essential actors. This approach can make policy improvements by adjusting the existing rules and regulations of the pillars. Also, the method can help the government in reframing the perception of current problems in IWRM pillars. The following steps can be considered for IWRM pillars improvement in Bangladesh under the Network Management Approach:

In this research, the following recommendations as per network management can be offered for improvement of the existing IWRM network for better water resources management in Bangladesh:

- Rules and regulations could be adjusted to easy access of NGOs and private sectors within the existing network. Significantly, entry rules and exit points actors or stakeholders could be adapted according to crisis demand.
- We need to select specific actors and motivate them to participate in the policy network with sufficient resources to exchange and distribute.
- Several actors' perceptions should be incorporated for finding feasible solutions after defining the problem through knowledge sharing and increasing awareness among actors. The central actor can offer a temporary institutional arrangement for improving interactions among actors and maintaining strategies.
- The central actor could launch new actors for changing power relationships among actors.
- The central government can reframe the perceptions about problems through performing radical action.
- The Guidelines for Participatory Water Management (GPWM) can play a vital role in Stakeholder's participation.
- Water professional's cadre system should be adequately maintained and considered in decision-making processes, but a thorough lesson could be needed to finalise the whole process.
- A central actor should make a joint Plan and strategy for different river basins within co-riparian countries, mainly; long term strategies for flood and water pollution on an emergency basis would be suitable for our country.
- The central government should expand non-structural disaster management systems because of the expensiveness of the structural measure.
- The cross-cutting issue should be avoided in planning and management procedures. Moreover, a budgetary year could be shifted from January to December instead of July-June for avoiding monsoon and pre-monsoon activities to increase the success rate of projects and reduce public harassment. Besides, the emergency budgetary allocation should be quicker to recover situations in any crisis events, i.e., flood, river erosion, cyclone, tornado, etc. As a developing country, Bangladesh must depend on foreign loans, which could be avoided step by step through increasing internal sources and minimising the cost of all projects by ensuring quick resources mobilisation at all levels.
- Further qualitative and quantitative research on the water crisis in Bangladesh could be a practical step to get real and update information. It would be possible to examine enabling and constraining conditions to shape activities of NGOs and private sectors in the water sectors of Bangladesh. Establishing collaboration programs for education, research, and training in water resources management between international and regional organisations is necessary.
- Finally, the policy network approach has been used in this research and inclusion of need analysis and policy network approach could be better options to address the same problem in the context of Bangladesh.

VI. CONCLUSION

The IWRM pillars are must necessary and effective for better and sustainable water management practice in Bangladesh. The pillars were not initially suitable for Bangladesh's perspective; however, ongoing policy, Plan, and strategy have been executed through different projects that significantly consider social and environmental phenomena. Furthermore, the government of Bangladesh is trying to ensure the principles of IWRM (equity, efficiency, environmental sustainability) during implementation projects regarding water resources management by strengthening the institutional arrangement, enabling environment and management instruments. The existing policy, Plan, guideline, and legislative framework have been ensuring promoting

environment and reducing constraining conditions to increase the effectiveness of IWRM in Bangladesh. Specified institutional responsibility can be supportive in this regard. Improve management instruments will be the key to strengthen both enabling environment and balanced institutional arrangement.

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