

Critical Review of IWRM in Achieving Water Security

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Abstract: Integrated Water Resources Management (IWRM) has emerged as a major guiding framework and started gaining momentum after the Dublin Conference in 1992. Countries worldwide have started adopting IWRM this holistic approach in their regulatory and institutional framework to achieve water security and solve water conflicts. The research community has critically analyzed the conceptual framework of IWRM and regarded it as sustainable system. That being said, research also indicates that there is a huge disconnect between IWRM in theory and in practice. This essay theorizes that institutional arrangements, capacity development and participatory action are three factors that are significant in bridging the gap between theory and practice. Further, this paper critically reviews the worldwide IWRM principle and tries to understand and conceptualize how and what interventions are needed for effective water management. Through our review it was evident that micro level intervention is critical in achieving sustainable water management goals, and it is crucial that effective management should be done in macro, meso and micro level regardless of the problems in hand. Our paper tries to highlight three key areas through which these interventions for an effective IWRM can be achieved. We feel that addressing such initiatives can help IWRM move forward from the “is” and to the “ought”. This paper attempts to critique the IWRM interventions in the Zayandeh Rud river in Iran, using institutional arrangements, capacity development and participatory action and in the process tries to highlight the current IWRM stance. It is evident from our investigation, IWRM can be an sustainable tool of cooperation in resolving conflicts and achieving water security if the above mentioned points are effective.

Introduction:

The global population has quadrupled over the course of twentieth century and consecutive water consumption has risen by sevenfold (Michel, 2016). Growing population, increase in demand, limited supply and unsustainable consumption practices have created monumental pressure on the earth’s freshwater resources (Michel, 2016), which has resulted in water insecurity (Fröhlich et al, 2018). Many regions around the world face severe water scarcity due to inadequate groundwater recharge in aquifers, droughts and poor water management. Integrated Water Resource Management is one of the most sought after strategies to resolve conflicts and achieve water security.

IWRM is defined as a system that “promotes co-ordinated development and management of water, land and related resources, in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital systems” (GWP, 2000). Among many strengths, IWRM is a holistic, integrative and all-encompassing system that aims to strike a balance between economic efficiency and environmental sustainability while keeping equity and ecological resilience in mind. That being said, several researchers claim that there is a huge disconnect between IWRM as a theory and as practice (domestic implementation). This is mainly due to institutional roles and tangible and intangible capacity of the country IWRM is being implemented into. The gap between theory and practice poses a serious problem for decision makers, planners and stakeholders who are committed to implementing IWRM as an operational tool and hence often focuses macro level (government/community) interventions over micro level (individuals, culture/social) interventions.

This essay theorizes that institutional arrangements, capacity development and participatory action are three factors that are significant in bridging the gap between theory and practice. Additionally, this essay proposes that institutional arrangements, capacity development and participatory actors need to all work together in order to identify existing problems from planning, implementing and monitoring to effectively operationalize IWRM and achieve water security.

The first section of the paper will describe properties of IWRM: it will elaborate on what is IWRM, how was it conceptualized, and what are its strengths and weaknesses. The second section of the essay elaborates on the significance of institutional arrangement, institutional capacity development and participatory practices in operationalizing IWRM mandates. Further, it highlights that the interconnected nature of these three factors allows them to complement each other. Lastly, the essay presents a recent intervention of IWRM in Iran’s Zayandeh Rud basin. It reflects on the implementation of institutional arrangement, institutional capacity development and participatory practices systems and their effectiveness in reducing conflicts and promoting water security.

PART I: IWRM AND ITS PROPERTIES

Historical conceptualization of IWRM:

Integrated Water Resource Management (IWRM) has become a widely accepted approach for the development and management of water resources (Gallego-Ayala, 2013). Dukhovny et. al. (2009) define IWRM as a “management system, based on taking into account all kinds of water resources (surface water, groundwater, and return water) within hydrological units, and coordinating the interests of different economic sectors and hierarchical levels of water use, involving all stakeholders in decision-making, and promoting the effective use of water, land and other natural resources to meet the requirements of ecosystems and human society through a sustainable water supply”. In simpler terms, IWRM is an approach to water management that maintains balance among economic efficiency, social equity and environmental sustainability (Dukhovny et. al., 2009). While it has been regarded as a fairly new concept, research shows that early

applications of IWRM date as far back as 1900s (Gallego-Ayala, 2013). Origins of IWRM have been found in USA in early 20th century; it was implemented under the USA Floods Controls Act in 1917 in preparation for floods in Tennessee Valley (Gallego-Ayala, 2013). IWRM gained international recognition after the Dublin Conference in 1992. This conference laid out important foundations of the IWRM concept. These principles are:

Principle 1: Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment.

Principle 2: Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.

Principle 3: Women play a central role in the provision, management, and safeguarding of water.

Principle 4: Water has an economic value in all its competing uses, and should be recognized as an economic good.

As mentioned previously, IWRM has become a popular water management strategy worldwide since the last decade (Biswas, 2008;McDonnell, 2008) and continues to be because it is a holistic approach that aims to strike a balance between economic efficiency and environmental sustainability while keeping equity and ecological resilience in mind. However, there has not been a lot of successful implementations of IWRM in real practice due to lack of evidence; IWRM still remains an effective strategy in theory (Varis et al., 2008). Many researchers have yet to bridge the gap between theory and practice, which poses a serious problem for decision makers and planners who are committed to implementing IWRM as an operational tool.

There are several barriers of IWRM, which prevent successful practical implementation of IWRM; these barriers are insufficient human resources (Swatuk, 2005), non-contextual at the country or the river basin level and lastly, dominated by the scientific community (Cashman, 2017). New opportunities for research studies with regards to IWRM aim to investigate better stakeholder participation and more democratic decision-making process (Cashman, 2017).

A Conceptual Reflection of IWRM (Weaknesses):

By late 1990s, IWRM became the main framework and strategy for solving water insecurity and water governance because it ultimately seeks the formation of institutions, relationships, tools and skills to manage water resources while taking equity and ecological resilience into consideration. However, many scholars criticized IWRM by explaining that over-all context of planning and implementing the concepts can be both challenging and broad concept. It has been often criticized that actions in the sub-sector and multi-stakeholder participation, are not often the focus of an “integrated management.” One important factor the author points out is that to avoid inefficiencies in dealing with conflicts in the sub-sector level, the approach to include cooperation in the ground level is usually avoided.

Some of the key well-documented problems that have been highlighted over the ages by different experts are usually around how the framework fits to the context, priorities of the framework, problems with what is being said and done and negligence of IWRM in the political context.

Author	Criticism
Molle, 2008	Molle, 2008 describes the IWRM framework concept as vague and compares it to the “Nirvana concept” The Nirvana Concept gives a picture of an idealized scenario or image of how the world should look like, and the author points out how IWRM tends to picture the image of water management without taking into account root level problems such as mismanaged groundwater exploitations or development of upper catchment area without considering water quality of water downstream to name some few.
Biswas 2004	Biswas, 2004 points out how a concept of ideal integrated water management scenario tends to invest on stakeholders “hopes and fears”- because it is adaptable and amorphous
Watson, 2007	Watson, 2007 criticizes how well the framework can be implemented is unclear
Biswas 2004	“What should be integrated, how and by whom, is it possible”- Biswas 2004 states that “impacts to improve water management has at best been marginal
Van Koppen, 2007	Criticized IWRM implementation and interpretation as a standard reform “package” for integrated water management regardless of the scenario or context
Warner et al., 2009	Kazakh IWRM was formulated in the form of European standards through consultancy without taking into account ground level or local problems, and was largely ignored

Butterworth et al., 2010	Day-today decision making on water development and management issues remains on the interventions of local communities because organization struggle with development capacity to effectively intervene in the local level (e.g. in large parts of sub-Saharan Africa and the Andes).
Gleick, 1993	States IWRM interventions took off in developing countries where there was a problem of water crisis, but he argues that the general problem of water crisis is not the shortages of water but the problem of mismanaged demand and supply; which should have been the case for primary interventions.
Lenton and Muller 2009	IWRM reforms tends to focus on the higher levels of scale, on policy and legislation reforms at national level and the establishment of river basin organizations
Wester and Warner 2002 Blomquist and Schlager, 2005	IWRM framework usually focused on large catchment or river basins as the only or best management
Butterworth et al., 2010	IWRM is not people-centered or doesn't concentrate on the ground level
Merrey et al, 2005	“Lack of concern for people, poor and marginalized”- Authors described the framework as biased again who are really affected compared to their overall goals
Cleaver, 1999; Currie-Alder, 2007	Rather than power-sharing and more empowering forms of participation, most are limited to activities about informing or consulting people, while there is always a risk of co-optation and power play
Arnstein, 1969; Bruns, 2003	People's participation is poorly assessed by IWRM

Allan, 2003; Gyawali et al., 2006; Wester et al., 2003; Blomquist and Schlager, 2005; Mollinga, 2006	IWRM ignored local level politics when it comes to integrated management
Daniell, K.A (2009).	Insufficient human resources
Cashman, A. (2017)	Lack of institutions - there is a need for strong political institutions for good governance, which translates, to good management. There is a need for stable legal institutions as well as administrative capacity
Butterworth et. al., (2010)	IWRM is not context specific, as it didn't consider realities of local context.
Daniell, K.A (2009).	IWRM fundamentally supports water as a human right but pragmatically; it supports the rhetoric "water is an economic good".

To summarize the problems as stated by Butterworth et al., 2010

- Vagueness of IWRM concepts
- No arrangement on who, how, whom
- IWRM is not people centered
- IWRM does not adequately incorporate adaptive management principles
- Concept is cumbersome
- Packages of IWRM does not include local water management practices
- There is a problem with legitimacy issues between River Basin Organization or catchment agencies.
- Local agencies sometimes lack capacity to fulfill basic functions
- IWRM activities ignore politics
- Level of participation in IWRM are low

A Conceptual Reflection of IWRM (Strengths):

The exhaustive critiques of IWRM by scholars results in several other scholars such as Ostrom, Hileman and Hepworth and Cartin to research positive aspects of IWRM. IWRM became a popular water management strategy for several reasons. Hileman mentions that IWRM is a holistic process that links human institutions with natural systems. Ostrom (2009) elaborates on this link by explaining that IWRM encompasses biophysical properties of water, water infrastructure, water user groups as well as water governance systems. In this way, IWRM acknowledges all major interconnected components of water systems, which is crucial for delivering efficient, equitable, and sustainable results. Secondly, one of the advantages of IWRM is the fact that it promotes horizontal cohesion. Hileman elaborates, “IWRM emphasizes the importance of the human dimensions- water-users, stakeholder groups, and institutions - of water development”. Traditionally, water management was engineered focused and scientifically driven. This approach ignored the inclusivity of important institutions and relevant stakeholders. With IWRM being an integrative approach, all actors in all sectors on any given level and relevance to water management is identified in order to create opportunities for collective action and resolve conflicts. Another strength of IWRM is the fact that it encourages vertical cooperation by all stakeholders. IWRM is a “participatory, inclusive, and multi-stakeholder process, and must necessarily address conflicts as they arise between parties with diverging goals for water resources management”. In this way, it discourages top-down approach and encourages all relevant actors to participate (Hileman). Ait Kadi (2014) further mentioned that IWRM is a robust framework because it enables countries to increase capital and infrastructural investments as countries go through major political and cultural changes. Lastly, Lankford and Hepworth (2010) encourage groups to express different interests, negotiate ideas and address different interests of community members. Smith and Cartin (2011) add to this by iterating that IWRM’s framework encourages contested groups to share problems and solve problems.

Hileman	Iterates that IWRM is a holistic process that “encompasses both human institutions and natural systems – as well as place our discussion of peacebuilding and IWRM within the wider context”.
Ostrom, E. (2009).	“Diverse stakeholders come together to craft a shared vision of their water resources future, the presence of underlying social or political conflict only becomes apparent when you begin to deal with water”.
Ostrom, E. (2009).	Elinor Ostrom emphasizes the importance of not just biophysical properties of water, but also water-user groups and water governance systems. Ostrom helps illustrate why a limited focus on physical water resources, or water infrastructure, as well as resolving immediate conflicts is often unable to bring about the efficient, equitable, and sustainable results.

Hileman	<p>A general strength of IWRM is that it emphasizes the importance of the human dimension – water-users, stakeholder groups, and institutions – of water development. IWRM is a participatory, inclusive, and multi-stakeholder process, and addresses conflicts as they arise between parties with diverging goals for water resources management.</p> <p>IWRM promotes transparency as IWRM calls for institutions to work openly and responsively. Decision-making processes should operate as inclusively and transparently as possible. The quality of governance depends on ensuring broad participation and transparency.</p> <p>IWRM promotes the formation of connections among the actors on any one given level – to foster greater cohesion among similar actors. These horizontal connections among similar actor types help strengthen relations, build social capital, and create opportunities for collective action.</p> <p>Social cohesion within and among user groups is critical as it leads to understanding social dynamics, identifying key actors and results in resolving or managing conflict situations.</p>
Hileman	<p>IWRM is an Integrative system because water resources cannot be managed as independent sectors (human consumption, irrigation, hydro-power, etc.). Water use for any one sector influences the quantity, quality, and timing of delivery of water available for all others.</p>
Hileman	<p>“Water resources are shared by many different users. There is a direct relationship between water users upstream and downstream. The actions of one user directly affect all others, so managing water resources requires cooperation among users.”</p>
Morocco (Ait Kadi, 2014)	<p>“The pace and scope of these reforms have run in step with the wider political and cultural changes occurring within the country related to the progress of democracy and distributed governance. Reform processes take considerable time as a result, but in Morocco they have succeeded in enabling the country to make significant capital investment in infrastructure needed to maximise development of surface water resources and their use for irrigated agriculture, potable water supplies, industrialization and energy generation”</p>

Smith and Cartin, 2011 Nigeria	Used multi-stakeholder negotiation to find problems and solution; implemented pilot projects and through trial and error methods found best practice in the Kmadugu Yobe river basin. Water conflicts in that region fell by 90% by 2006.
La Poza microbasin, El Salvador (Hernández, 2012)	Micro-basin Management Committee was created with the support Foundation of Municipalities of El Salvador; The Committee with stakeholders adapted IWRM framework and participatory action to overcome indifferences ad by 2008 water sharing problems were solved in the community.
Jordan Valley, Jordan (Abu-Elseoud et al., 2007)	The village in Damya after being relocated after the Arab Israel war had shortages of irrigation water. A local CBO intervened and facilitated villagers on how to carry out water data analysis, training and generated new ideas about how to save and distribute water in that village. - Top-down inertia was overcome through community participation
Volta basin (Smith and Cartin, 2011)	Communities on either side of the White Volta, in Burkina Faso and Ghana, share a river, but up until the mid-2000s they could not easily cooperate in managing local water resources. To address these problem committees helped link communities across the two borders. The project helped build trust, capacity and helped solve indifferences across the two borders.
Lankford and Hepworth ,2010	“IWRM should function like a bazaar not a cathedral” – water sharing should have multi-functioning, interactive bodies who can exchange and negotiate ideas among the sectors and scale to solve problems

PART II: SYSTEMS FOR PRACTICAL IMPLEMENTATION OF IWRM

Institutional Arrangements:

For IWRM to deliver strong and sustainable results, institutional arrangements should be strong yet tangible. (Serageldin ,1995) defines institutions as systems that define “rules, decision making procedures, programs, policies, legislations, and regulations” in the IWRM framework. Hence, institutions set dimensional and functional scope of all the vertical and horizontal interactions that take place within the water system (Serageldin, 1995). Institutions further define roles of all the sectorial and individual participants while being cognizant of context specific value systems and culture (Serageldin, 1995).

Serageldin (1995) explained that water management is too fragmented among sectors and institutions due to the fact that stakeholders have various vested interests. Subramanian (2017) elaborates on Serageldin’s comment by saying that it is an

overwhelming assumption that stakeholders can be easily identified and integrated in an institutional structure. With regards to water usage and water security, multiple sectors such as irrigation, municipal water supply, power and transportation or different agencies such as government, agriculture, forestry, fisheries, water mining are all at play but corresponding conflicts are dealt with independently when it should be dealt with interdependently. Often, local governments that supply domestic, industrial and commercial water supplies do not consult with provincial, state or national water agencies. This results in various organizations making decisions for different users (Serageldin, 1995). Subramanian (2017) adds that negotiations are not simple given overlapping roles that create competition. Stakeholders have varied interests and often are unwilling to consider conflicts and mandates of other organizations, which leads to unsustainable water management (Subramanian, 2017). One of the main reasons why water management mandates are inefficient is because the national governments take the easy path when it comes to identifying relevant stakeholders. Identifying relevant stakeholders, establishing trust and enforcing horizontal, as well as vertical cohesion is complex; governments usually have selective involvement and only include stakeholders that are easily identifiable (Saravan, 2002).

For IWRM to be sustainable and efficient, institutional arrangements need to be strong. Institutions need to have the ability to build clear communication lines and induce democratic decision-making. Further, they need to be willing to consider mandates of other organizations and enhance inter-institutional coordination by bringing all relevant stakeholders together (Daniell, 2009). Institutions must be able to correct fragmented roles, achieve integration through coordination and collaboration, have the capacity to weigh up social, economic and environmental factors and enforce social cohesion between all the sectors and actors (vertical and horizontal) in order to achieve sustainable IWRM results (Mitchell, 2004).

Institutional arrangements also need to be tangible in the sense that they need to be sensitive to socio-political context of the region and the country. Moose (1998) explains that roles and power of various stakeholders is determined by the socio-political context, which influences each stakeholder's value systems. Evidence shows that institutional arrangements are crucial for catalyzing capacity development.

Institutional Capacity development:

Capacity development in an institution depends on the ability to identify, understand and address problems and to collect knowledge for future use. Capacity Development is recognized in most policy initiative, but it has often seen, when implementing IWRM that capacity development is only done in the community level. It is often expected that, intervention in the macro and meso level agencies have sufficient capacity to play a responsible role in integrating water resource management. This is often done so through stakeholder training and awareness programmes.

However the outcome of this approach is not always produces fruitful results. According to Fowler et al., 2010, this portion of capacity development only comprises of

tangible capacity which is comparatively small to intangible capacity. Intangible capacity comprises of attitudes, values and culture or characteristic (Leidel, Niemann & Hagemann, 2011) of both citizens and government which are often not taken into account when dealing with integrated water management. This scenario often leads to multiple problems between actors who are in charge of managing the resources and the beneficiaries. Some prominent examples would be the how in India, the Government defined who the actors are and who and how much funding should be allocated and in Australia's Herbert River Catchment there is a lack of trust and equity between actors which have led to conflicts regardless of the extensive rhetoric for effective intervention.

Therefore, to effectively implement good capacity development between multiple actors it is not only important to stress on effective capacity development in all levels but also to ensure governance practices to achieve such scenario. A good governance practice or good water governance includes several areas of concentration. These include transparency, democracy and participation decentralization, modern public administration management, effective rule of law, coordination of state and civil society (leidel et al., 2011).

It should be stated that capacity development is recognized in the IWRM framework. However, to ensure good governance practices from the beginning to the end, capacity development should be established in all levels of IWRM processes and it should be ensured that all institution have the appropriate capacity to implement such initiatives in the macro, meso and micro scale.

In the current status quo, capacity development is usually done in the problem identifying phase (Leidel et al., 2011) with the macro and meso level. This usually involves RBOs, experts and government leader with little and no representation from the people who are actually being affected by a problem. Moving forward it should be ensured that capacity development is done so in a transparent and effective manner in the first phase.

To further ensure effectiveness capacity development should be integrated in all level of the any IWRM project. After the first phase, the second phase which is usually *conceptualizing of the IWRM plan* (for any country) is done to identify gaps and best practices for a IWRM operation. It should be stressed that to achieve best solution in this particular capacity assessment, capacity development should be thoroughly assessed to procure the best outcome. The last or the third phase which is *implementation, monitoring and evaluation* is equally important for the project to be sustainable. To ensure a positive outcome from the last stage, institutions have to play a vital role through and this can be done so with effective people's participation.

Participation:

Daniell (2009) mentions that in recent years, participation of stakeholders has become a prime requirement for successful water management practices. Scientific, technocratic and engineering focused approaches have slowly been phased out (Daniell, 2009). In

turn, participatory practices have been regarded as crucial to sustainable development paradigms, as it considers various beliefs, relations, values, frameworks and practices of all actors (Daniell, 2009). Participation enhances IWRM because inclusive participation ensures democratic decision-making (Butterworth et. al, 2010). Further, it promises that all actors will be able to reap the benefits of water management equally. According to Butterworth et. al., (2010) most participatory practices are organized through direct involvement and consultation. In this way, conflicts and challenges are managed via establishing clear communication dialogues between all the stakeholders and results in optimal allocation of resources between all major sectors (Butterworth et. al., 2010). He further iterates that for IWRM to be successful, participation practices cannot be tokenism; meaningful participation implies confronting and deconstructing power imbalances and implementing democratic decision-making (Butterworth et. al., 2010).

Butterworth et. al., (2010) explains that there is a huge disconnect between theory and practice with regards to participatory action and stakeholder involvement. So far within IWRM research, participatory action has been accused of following tokenism and organizing in a spontaneous matter with no genuine input towards the decision making process. Developing comprehensive approaches to participation will require a more aggressive stakeholder mobilization strategy. In this way, lower-level participation is also involved instead of just affected stakeholders. Adding onto inclusive participation, Cashman (2017) also stresses that the “public” or citizens are often forgotten in water management. He distinguishes the difference between “public” and people at the grassroots level. He explains that people need to be educated about water matters because they are also affected by the demand and supply of water. The public or citizens need to be mindful consumers because they also play a huge part in water management (Cashman, 2017). He concludes, “the importance of stakeholder involvement and participatory approach to water management includes users at all levels including customers and citizens” (Cashman, 2017).

Butterworth et. al., (2017) draws a reverse causal relationship between participation and institutional arrangements. He mentioned that strong institutional arrangements and institutional inclusion is integral to effective participatory cooperation and development. Institutional arrangements account for the fact that value systems vary for various participants. To implement a strong IWRM mandate, a cross-sectorial and inter-institutional agents need to collaborate. He mentions “this does not mean that all actions (and actors) have to be fully integrated and handled by a super-agency that replaces the many actors in water, rather it is about finding ways to coordinate and address coordination problems” (Butterworth et. al., 2010).

PART III: PRACTICAL REFLECTIONS OF INSTITUTIONAL ARRANGEMENTS, CAPACITY DEVELOPMENT AND PARTICIPATORY ACTIONS IN IRAN WITHIN IWRM (CASE STUDY)

There is huge different in what is happening in Iran versus what is written in papers within the urban water use and waste water companies which is caused by a lack of regional decision-making power, independent supervision, insecurity and vague

responsibilities. Moreover, there is a need for practice-oriented training to elaborate the sufficient number of skilled staffs with appropriate qualifications for operating the plants.

Recently, drinking water demand has been rising in a way that the water use has grown more than population growth in Iran. In central Iran, Isfahan's population has increased almost three times over the last fifty years, which has promoted different socio-economic changes. Zayandeh-Rud River with the total catchment area of 26,917 km² is the main supplier for drinking water in this region and the two neighboring cities. Due to the increase in the water demand, a dam was built in 1972 to supply water to Isfahan. During the last years, the dam also helped prevent the seasonal flooding of the river but the actual water demands and water withdrawal could not have been answered through.

Isfahan is located in a hot and arid area in the center of Iran with the average precipitation of 265 mm/a. While the total water supply in the Zayandeh Rud Catchment is 1402 million m³/a, the total water demand in Isfahan is 2038 million m³/a, including the main sectors as following: 339 million m³/a for drinking water, 152 million m³/a for industry, and 1074 million m³/a for agriculture use.

Human population growth, high agricultural water use and industry, together with droughts in the Zayandeh-Rud river basin have made water resource management a critical issue in the region. Meanwhile, the increase in water demand along with the climate change effects as the temperatures have been rising up and precipitation have been decreasing annually is leading to increasing water management obstacles.

There is a conflict between farmers downstream and upstream about water sharing and there is a potential for future conflicts between government and the farmers about the control of water and water permits. Based on the water crisis in Iran, there was a lack of integrated management of water resources at river basin level that would constitute the most appropriate scale for water resource management.

In the beginning of twentieth century, the water sector had no place in national organization and planning and there was only a feudal system addressing the local water management issues. At the beginning of the 1960s, the feudal system was abolished due to the social and economic evolution. By the end of the 1960s, stage of improvement and integration has started, when the issue of integrated management of water resources at the river basin level was raised. At present, the two specialized holding companies are in charge of decisions for the main governance tasks related to water, which are the Iranian Water Resources Management Company (IWRMCo.) and the National Water and Wastewater Engineering Company (NWWEC) as well as their subsidiaries.

Due to the intensification of problems and conflicts in Zayandeh Rud river basin, the water sector in Iran decided to create river basin organization (RBO) (Mohajer, Sh. & Horlemann 2017) through which and with the collaboration of all the basins' beneficiaries and stakeholders it could decide about the management of water resources in the basin.

RBO was established in the Ministry of Energy with the objective of IWRM in the Zayandeh Rud river basin and reducing the conflicts on the water resources of this basin (Mohajer, Sh et al., 2017). Although as the first step and the first experience in field, the RBO has partially succeeded in improving the water resource management at basin level, it is still far from ideal.

Water management in Iran is a complicated case that includes a great number of structural and non-structural roles. In Iran, Isfahan Regional Water company has been in the power to control all relevant stakeholders on national, regional, and sectoral level involved (Macro level). As there was a need for a sustainable and integrated water management plan for Zayandeh Rud basin they have started a partnership with Germany (Mohajer et al., 2017) in 2010 to develop and implement an accepted water management concept in Iran using the example of Zayandeh Rud catchment. In order to understand the situation of water sources, the IWRM project involves the main national, regional and local stakeholders to identify existing problems in the catchment, but there was not enough data available about the water consumption in different sectors. That is why the project took six years to implement. Certainly, however it should be noted that IWRM concept can only be successful with the decision-makers' power to give-and-take.

Evidence shows that one of the main problems of an integrated water management plan in Iran is that there is no efficient collaboration between different sectors in the micro level because of the centralized political structure. Therefore, it is leading to a lack of common understanding about the problem issues capacities and also conflicts between decision makers and macro-level stakeholders. Although the authors (Mohajer, Sh. & Horlemann, L. 2017) talks about participatory action being mandatory the evidence shows otherwise. Due to promote perfect IWRM institutional arrangement, capacity buildings, and participatory actions should all work together for the new IWRM framework to be effective. (Mohajeri et al. 2016).

From our study we found out that cooperation between the main governmental organizations including the Ministry of Energy, its subordinated organizations, and other ministries of water using sectors, is very slow and their decisions are biased. Therefore, the decisions that are made are not in harmony with the policies and decisions taken in other sectors. In order to have a better water user systems and increase economic efficiency of water, public participation should be supported in all stages of the plan (Tahbaz Salehi et al. 2010).

Media	Conflict	Author/ Date
Middle East Institute	unknown individuals" blew up the Zayandehroud river pipeline from Isfahan to Yazd Province	Feb 2013

The National World	Protests and disputes break out as rivers and lakes run dry, and some farmers have no choice but to move elsewhere.	Yeganeh Salahi May 2014
Middle East Institute	one was killed, 108 were injured in clashes over water between angry peasants from two neighboring villages in Chahar-Mahal va Bakhtiari province	Aug 2016
Aljazeera	Rivers and lakes are going dry one after another, Iran is losing wetlands, seeing land subsidence, and desertification	Gelareh Darabi Nov 2016
Middle East Institute	one was killed and 12 were injured in fight over illegal water drilling between local peasants and the Law Enforcement Forces in Joghatai county in Razavi Khorasan province	Jul 2017
Iran Daily	Abbas Abdi, openly discussed ten problems that are not being addressed by the Iranian government. These include shortage of water, social issues, corruption, unemployment and environmental problems are fuelling tension in the region. He writes, if the government does not step in, the situation will worsen in time	January 14, 2017
The New York Times	“Iran is the latest example of a country where a water crisis, long in the making, has fed popular discontent. That is particularly true in small towns and cities in what is already one of the most parched regions of the world.	Somini Sengupta January 2018

	Farms turned barren, lakes became dust bowls. Millions moved to provincial towns and cities, and joblessness led to mounting discontent among the young. Then came a crippling drought, lasting roughly 14 years.”	
Cypruss Mail	“Look no further than the Tigris River, where the unchecked development of dams in upstream Turkey and Iran is drying up southern Iraq. As in Palestine, Bangladesh, or Cambodia, farming families always feel the injustice the hardest, and well before the elites in the capitals do.”	March,2017
Middle East Institute	Regional water wars in Iran started happening	Ali Alfoneh Feb 2018
Middle East Institute	Iranian protesters clash with police over water dispute in Isfahan	Ahmad Majidiyar March 2018
Middle East Institute	Water scarcity and the government’s inability and unwillingness to address the problem have triggered angry protests in different parts of Iran in recent months. The water shortage in Isfahan has particularly reached crisis point.	Ahmad Majidiyar March 2018
The Guardian	Kaveh Madani, the deputy chief of Iran’s Department of Environment, was arrested.	Apr 2018

Based on the Zayande Rud River’s initial IWRM plan with Germany it was evident that micro level intervention was not done in the first phase of planning and designing. Though the author of the book *Reviving the Dying* and recent IWRM reform states participatory

action does play a crucial part for an effective operation of IWRM it was not done so in an effective manner.

The 2017 report fails to indicate involvement of farmers in the steering committee meetings or address social problems related to water shortages in the basin. The evidence can be further backed up from **table 3**, which shows the recent conflicts after the IWRM plan was initially conceptualized between farmers and the Iranian Government. It is clear from the current events and conflicts that, water management principles would still need to integrate different concerns and interests from all affected sectors and social groups to identify a common understanding about the problems and challenges to create a sustainable IWRM plan in Iran.

Conclusion:

This paper critically reviews the world-wide IWRM principle and tries to understand and conceptualize how and what interventions are needed for effective water management. Through our review it was evident that micro level intervention is critical in achieving sustainable water management goals, and it is crucial that effective management should be done in macro, meso and micro level regardless of the problems in hand.

Our paper tries to highlight three key areas through which these interventions for an effective IWRM can be achieved. This can be done through modernizing institutional roles, developing capacity assessments in all implementing and conceptualizing phase and most importantly involving participatory action into all of these stages to ensure equity and transparency. We feel that addressing such initiatives can help IWRM move forward from the “is” and to the “ought”.

Iran is one such complicated case where such problems stand out most when IWRM has move forward in solving their framework problems. As discussed in the “positives” of IWRM, recent participatory action from the micro level has effectively helped IWRM reach its goal. But, in retrospect, their intervention in Iran in 2017 might come out short in the long run if proper intervention through good water governance and participatory action is not done successfully. Though Iran’s government has stepped forward in the right direction, their institutional capacity lacks the two highlighted criteria towards a more positive IWRM intervention. Recent conflicts showed that the reluctance of the government to include micro level stakeholders might just prove that theory. For the time being, we can only hope it turns our otherwise.

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