Journal of
Geography & Natural Disasters

Adhikari and Tarkowski, J Geogr Nat Disast 2013, S5
DOI: 10.4172/2167-0587.S5-001

Research Article Open Access

Examining Water Governance: A New Institutional Approach

Bhim Adhikari[1]* and Jacob Tarkowski[2]*

[1]International Development Research Center, Ottawa, Ontario, Canada
[2]Faculty of Environmental Studies, York University, Ottawa, Ontario, Canada

Abstract

This paper conducts a synthesis of case studies on different aspects of water governance. Although the concept of water governance encompasses a complex mix of institutions at multiple levels and scales, we consider four elements of governance: public participation, equity, accountability, and transparency in our analysis. A new framework for institutional analysis is proposed which incorporates these elements within a decentralized polycentric social-ecological system. This system is adapted from a number of previously proposed frameworks in the literature. Focus is maintained on developing countries in an attempt to uncover different sources of governance success and inefficiencies. The paper provides some gaps in theory and knowledge with the goal of facilitating discussion and providing some policy implications for the future direction of water governance.

Keywords: Governance; Water governance; Institutional analysis; South Asia; Africa

Introduction

The institutional arrangements governing water resources have been under the spotlight in many countries around the world in recent years [1-4]. This interest follows heightened emphasis on water governance as a crucial ingredient to sustainable development [5]. It has now become essential to address water governance in a dynamic fashion, approaching it from a social, economic, political and environmental point of view. As the economic dimension focuses on the efficient use of water resources and the role of water in overall economic growth, the social dimension points to equitable uses of water resources. The political dimension emphasizes equal democratic opportunities for stakeholders and citizens at large to influence and monitor the political process and outcomes at various levels. Finally, the environmental dimension advocates for improved governance of water resources to help enhance their sustainable use and the use of associated ecosystem services. These aspects of water governance as an aggregate are central to sustainable growth, poverty reduction, and in meeting the Millennium Development Goals [6]. However, water decision-makers and managers are currently not prepared to fully realize the development potentials of new forms of water governance (e.g. facilitating inclusive decision-making processes, coordination and negotiated outcomes) [3]. There is also lack of theoretical analysis and debate of the core concepts of water governance [7]. Moreover, problems of water governance have often been neglected by governments, the public, donors, and development agencies as being too intractable to deal with [8].

Governance is a contested concept across discourses. The concept acknowledges increasing complexity of interactions of different elements in policy processes [9]. Langlands [10] defined governance as 'good management', which reinforces the idea of good performance, good stewardship of public resources, good civic engagement and ultimately good outcomes. In their analysis aimed at identifying the reason for the relative ineffectiveness of global water governance, Pahl-Wostl et al. [4] developed a framework and examined how core governance processes are performed and linked with special attention to the role of leadership, representativeness, legitimacy, and comprehensiveness, which they considered to be critical characteristics of the processes that underpin effective trajectories of policy development and implementation. Drawing on a range of social theories and constructs, Franks and Cleaver [7] defined water governance as 'the system of actors, resources, mechanisms and processes which mediate society's access to water'. On the other hand, international donor agencies use a normative approach to describe good governance, focusing on management factors to promote economic issues [11]. According to this strand of literature, governance refers to accountability, participation, predictability and transparency, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, efficiency and effectiveness, responsiveness, and control of corruption [12-14]. As the complexity of governance is difficult to capture in a simple definition, we considered four major elements of water governance in this paper: public participation, equity, accountability, and transparency. We consider these four elements as an amalgamation of the many suggested facets to address governance issues. We however acknowledge that this is not an exhaustive review of water governance. We will explore these four elements in several case studies with pertinence to the water sector.

Public participation is analyzed in terms of whether or not policy, projects and programs are sensitive to local needs. Within this scope, the conditions or considerations that facilitate public-participation at the local water governance level are explored. Although there are many aspects of equity, we explored equity in gender-roles, as it is undeniably an important issue and to keep our analysis in line with Millennium Development Goal #3: to promote gender-equity and empower women [15]. In terms of gender-equity, the ability of community water supply programs (CWSPs) and water user associations (WUAs) to address gendered issues is evaluated. Furthermore, equity is considered with specific relevance to the three elements proposed by Corbera et al. [16]. Accountability essentially reassures the public that an acknowledgement and assumption of responsibility for actions, decisions and policies exists. The institutional or regulatory reform that improves accountability within water governance is thoroughly examined. We further examine the accountability issue through the lens of corruption

***Corresponding authors:** BhimAdhikari, International Development Research Center, Ottawa, Ontario, Canada, Tel: +1-613-236-6163 ext. 2187; Fax: +1-613-238-7230; E-mail: badhikari@idrc.ca

Received September 05, 2013; **Accepted** September 27, 2013; **Published** October 03, 2013

Citation: Adhikari B, Tarkowski J (2013) Examining Water Governance: A New Institutional Approach. J Geogr Nat Disast S5: 001 doi:10.4172/2167-0587.S5-001

because its existence implies failure of other mechanisms of governance and leads to inefficient appropriation of resources. Possible solutions to combating corruption within water governance are also identified. Transparency as a unit of analysis allows for public knowledge, and accessibility thereof to inform of political processes and to serve as a facilitator for accountability and against corruption.

The remainder of the paper is organized as follows. In Section 2, we introduce the theoretical framework of our analysis. Section 3 describes the four elements of water governance using selected case studies. Section 4 discusses and summarizes the critical findings of our analysis. Finally, section 5 presents major conclusion and policy implications of this work.

Theoretical framework of analysis

The scope of governance spans the local-, national-, basin- and global-level, and this requires a mechanism to recognize the vast amount of inputs and allow for their aggregation towards one institutional output. This output should be a sound and all-encompassing mechanism of governance. It must not only identify with the multi-level nature of water governance, but also allow for interaction with other sectors of natural resource management. Furthermore, it must be easy to identify how the four facets of governance create the inner workings of said institutional output.

In recent years, a shift has been observed from command-and-control and prescriptive management of natural resources towards community-based systems of management [17-19]. For example, Andersson and Ostrom [20] have offered a conceptual model of decentralized resource governance from a polycentric perspective. They argue that a polycentric perspective on natural resource governance can provide several additional lessons useful for policy analysts [20]. However, this approach still lacks interaction between different stakeholders, particularly interactions between and within non-governmental organizations (NGOs), local user groups and various levels of government which influence political outputs and in turn have direct implications on the natural resource itself. In order to address this shortcoming Anderies, Janssen and Ostrom [21] have offered a framework of socio-ecological systems from an institutional perspective. This framework offers insight into the social interactions of all actors involved, and also their ecological impacts on the natural resource. Furthermore, the framework also recognizes that both social and ecological systems interact interdependently [21]. In this paper, we combine these two models into an analytical framework suitable for discussion within this paper. We finally incorporate the four elements of governance to demonstrate how resource users, NGOs and public infrastructure providers (the three major actors) influence them. A circular flow diagram is offered to depict how ongoing interrelation of these four elements with all three actors drives the mechanism of governance. Table 1 offers a definition for each of the four elements and the criteria that will be used for their evaluation throughout this paper.

The new conceptual model adopting the two previously offered models in unison with the four elements of governance is presented in Figure 1.

This hybrid model bridges two conceptual models aimed at contributing something new to water governance analysis. The resource and public infrastructure entities remain unchanged from the previous model of a social-ecological system. However, resource users and public infrastructure providers have now been expanded to include all levels of stakeholders within polycentric governance. The resource users entity has been modified to allow for micro-level user and local user group inputs. This aims to account for local considerations, or more specifically, socio-cultural factors (i.e., cultural and religious norms). It may also create a venue to uncover some of the informal institutions that govern resource allocation. Within the public infrastructure providers entity the interactions between and within different levels of government are captured in hopes of addressing polycentric governance. The new entity NGOs accounts for the third party impartial and intermediary role upon which these organizations often base their existence. The circular flow diagram depicts the ongoing interaction of all three entities with the four elements of governance to establish a system of polycentric governance. It should be noted that the system of polycentric governance is not static, as it is constantly changing with input from all stakeholders, and thus is represented in this fashion.

The merging of these two models to form a decentralized polycentric social-ecological system can provide new insights into the water governance process. Polycentricity shows interactions at a micro-level, and thus allows for better representation of how different external forces on actors may filter through. The intermediary role of NGOs is emphasized with their placement between resource users and public infrastructure providers. Their theoretical placement in the middle is not absolute, as there must be recognition that some may be closer tied to resource users, and others with public infrastructure providers. All channels of policy and associated socio-cultural and external influences can now be better tracked within a single consolidated framework. The four facets of governance are incorporated as a circular flow diagram,

Element	Abbreviation	Definition & Criteria
Public Participation	PP	• Addresses to what degree all stakeholders, and specifically those who are targeted to be beneficiaries, are allowed to voice their concerns. • There needs to be some sort of mechanism in place to determine whether or not the concerns are being heard and considered within the design of policy implementation.
Equity	EQ	• Analysis in a gender-disaggregated manner. • Evidence of equitable: access, decision-making and outcomes. • Requires evidence of gender-specific planning, implementation and even feedback mechanisms, as well as equitable access to benefits for stakeholders.
Accountability	AC	• Evidence of an obligation within the governance framework to answer or justify the rationale for execution of action. • Existence of procedures set out to monitor progress, report and evaluate on results, and provide valuable feedback. • Value is placed on degree to which there is oversight in decision-making and implementation. Evidence of a mechanism to penalize wrongdoing.
Transparency	TR	• Assessed in terms of citizens' access to information and the level of effort taken to facilitate understanding of the decision-making process. • May exist in statutory law, or simply within the customary context of a specific framework.

Source: Authors.

Table 1 : Definition, evaluation criteria and abbreviation for each of the elements of governance.

Link	Explanation
(1) Between resource and resource users	The incorporation of users and local user groups will ideally help in more efficient water allocation from a community management perspective.
(2) Between users and public infrastructure providers	This is the most important change, as it does not only encompass an interaction between resource users and public infrastructure providers, but of all levels of actors within. For example, users to local government, users to central government, local user groups to local government, and local user groups to central government. This stresses the role of polycentricity within this conceptual model of institutional analysis.
(3) Between public infrastructure providers and public infrastructure	The incorporation of local government and central government, as well as input from all actors within the resource users entity via link (2) will hopefully create a public infrastructure tailored to all stakeholder needs.
(4) External forces on social actors	With a polycentric model, there is a chance that external forces on social actors may influence all interactions thereafter in a manner different than in a top-down or centric model.
(5) Between NGOs and resource users	This link will ideally help foster new brainstorming for policy at the local level.
(6) Between NGOs and public infrastructure providers	This link will ideally take the new brainstorming from the local or community level and influence public infrastructure providers to consider it in policy planning and implementation.

Source: Authors.

Table 2 : Explanations for new links and new link implications.

thus recognizing their continuous influence on and input from all actors. What this model contributes to the natural resource governance literature is identification of the intricacies and interconnectedness of the interactions, influences, and governing frameworks between all actors, and most importantly, how all this affects the resource itself.

In regard to the links between entities, the majority remain from the previous model of a social-ecological system. However, new clarifications need to be made for links (1), (2), (3) and (8) due to the notion of polycentricity being incorporated into the model. Table 2 will offer insight into both the new links added and clarify existing ones.

Water governance–insights from case studies

We selected seven case studies that provide insight on how each of the four facets of water is crucial in contributing to overall water governance. Each addresses failure(s) in water governance in countries of the developing world (e.g. Sri Lanka, Chile, India, South Africa and Zimbabwe). The intent of each case study is to uncover how a failure in one (or more) facet(s) of governance results in a failure in overall water governance. The proposed framework is consulted for illustrative purposes and an analysis is performed to highlight specific deficiencies and to make recommendations.

The case studies were selected from a large pool of journal articles returned from generic keyword searches of water governance. Geographic selection criteria were first applied to exclude papers that were not set in developing nations. A second set of criteria eliminated all case studies that did not highlight a failure or deficiency in water governance. This left a moderate pool of case studies that were relevant to our geographic focus and facilitated analysis of failures or deficiencies in water governance. The authors feel that deficiencies are effective in validating key linkages in the proposed framework, as they indicate areas of concern and highlight focus areas.

This reaffirms the framework's use as a visual aid to institutional analysis. Factors crucial to successful governance are also captured throughout the discussion to supplement findings of the case studies.

Water rights and multiple uses in Sri Lanka: This case study emphasizes the importance of customary and religious law, as well as local norms and other regulations [22]. The paper highlighted some of the various uses of water in irrigation systems and the various types of water rights associated with these uses in Sri Lanka. A classification scheme is offered for examining the statutory and customary water rights of multiple users of water and is applied to the Kirindi Oya irrigation system in Sri Lanka.

According to statutory law, the Sri Lankan government claims legal ownership of all surface water and does not recognize any system of individual or group water ownership rights. However, over the centuries local notions of rights to water have developed in the study area of Kirindi Oya. These play an important part in water allocation, and even more so because they are not formally recognized. The major types of water-uses within this area include: field crop production, homestead garden cultivation, fisheries, livestock, domestic-uses, micro-enterprises, and wildlife [22]. These water-uses have an array of right allocations, including: informal customary-use rights, limited-use rights, permit rights, unauthorized abstraction, and land-ownership dependent rights. It is important to note that although there exists a lack of coordination among rights across water-uses, domestic-use is given priority over irrigation.

The definition of public participation within the proposed framework outlines two important factors: 1) the degree to which all stakeholders can voice their concerns; and, 2) whether a mechanism exists to ensure that concerns of relevant stakeholders are being met and considered within policy implementation. There exists a fundamental deficiency with respect to the first factor of public participation. As discussed above, Sri Lankan statutory law claims legal ownership of all surface water and does not recognize any other systems of ownership rights. This demonstrates an outright lack of recognition of various resource user-rights. Within the proposed framework this represents a breakage in link (2) between resource users and public infrastructure providers (Figure 1). Without this link, any systems of rights (e.g. customary, religious, etc.) other than statutory are ignored. The authors support this as they state that non-irrigation users of water are not only claimants on the ongoing management of water resource systems, but also must be included in any allocation decisions.

The case study also states that conventional approaches to water rights have tended to focus on rights as defined by statutory law, overlooking customary and religious law, as well as local norms and other regulations. As demonstrated in the previous section, a failure in governance occurs when there is lack of a mechanism to ensure that concerns of stakeholders are met. Furthermore, the framework highlights the many necessary venues of communication required between all stakeholders to develop such a mechanism. The authors support this as they indicate that taking a multi-faceted approach to

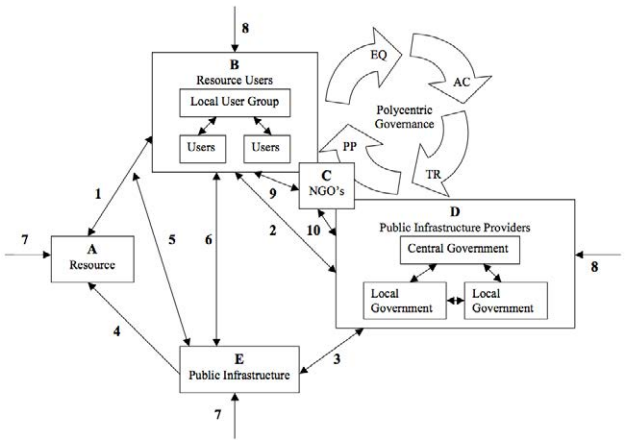

Figure 1: The conceptual model of a decentralized polycentric social-ecological system–modified from [20,21].

recognizing water-uses, users, and types of water rights is likely to be even more important to ensure public participation of all relevant stakeholders in negotiations over water allocation. Without open communication and a mechanism to support it, public participation will not be possible and this will result in a governance failure. Finally, depiction of governance in a circular flow diagram indicates that these channels of communication must never close and are constantly redefining water rights within the region. This constant redefinition is what creates a system of governance that adapts to changing social norms and concerns of various stakeholders.

Public participation and effective water governance in Chile: This case study analyzes whether there is consideration of public participation within a development project that targets groundwater contamination in Chile. The authors Dagg and Garande [23] argue that a rigid classification of participation does not exist due to its diverse application in specific social contexts. They propose two types of participation: people-centered and planner-centered. The first involves empowering a community by enhancing local management. The second occurs when participation is incorporated after decisions have already been made, and this was the method taken by local government officials.

Achieving a high level of participation in the project is reflected by the degree of confidence the community has in it. However, the NGO planning the project failed to conduct group consultations with the community. It was felt that a top-down approach was taken, whereby local government officials and the Universidad de Tarapaca were consulted about the project before the community was approached. An attempt to understand the local communities and their problems should have occurred, rather than proceeding with assumed background information. The villagers felt that the project could have the possibility of re-gaining their support if communication channels were improved upon. The authors concluded that if further insight into the people, area and problem were taken, then the project would have incorporated existing cultural contextual factors by the time it reached the planning phase.

Looking to the definition of public participation within the proposed framework reveals both a lack of consideration of stakeholder concerns and a mechanism to ensure these concerns are incorporated into policy implementation. A re-evaluation of the project objectives and goals is necessary, but cannot proceed without community input. Confidence in the project does not exist until the mechanisms put in place for participation and communications are re-assessed. The authors reiterate this as they state that people are more committed to a project's success when they actively participate in the planning and implementation stages.

In this specific instance there appears to be a breakdown around two of the major actors: 1) public infrastructure providers; and, 2) NGOs. This case study differs slightly from the previous, as it includes an NGO. Looking to the proposed framework a breakage in link (2) can already be identified, indicating that there has been no consultation between resource users and public infrastructure providers. The importance of the intermediary role of NGOs emerges as a crucial element to achieve local participation in this instance. The Asian Development Bank [12] supports this notion in their recognition of NGOs having the ability to provide governments with a useful alley in enhancing participation at the community level and promoting a bottom-up approach to development.

The case study indicates that if time and energy were invested to raise project awareness and capacity building before the participatory process commenced, community involvement would have been facilitated. As this did not occur, there was a failure in governance easily identifiable within the proposed framework. A mechanism put in place for participation and communication between all three actors would have resulted in people-centered participation and public confidence in the project.

Equity

Women and community water supply programs in India: This case is a good example of the efficacy of (CWSPs) in India, with reference to the Accelerated Rural Water Supply Program (ARWSP), which is India's oldest CWSP [24]. The program aims to assist states in implementing schemes for supplying safe drinking water and identifies women as the principal beneficiaries.

Within India, socio-cultural considerations play a very large role in developing approaches to effective water governance. The Indian caste system, which is seen as resting upon the basic principles of hierarchy and difference, hinders any attempts at equitable water allocation. Furthermore, behaviors, attitudes, roles and responsibilities are gendered within caste and ethnic groups residing in local communities. It is important to note that the caste system's specific findings cannot be generalized; however, they do provide an indicator as to how important the socio-cultural context can be to gender-equity.

The ARWSP's identification of women as beneficiaries has been analyzed in three villages, with consistent results. According to the authors, upper castes within each village dominate access to water pumps, excluding all others from accessing the pumps, even if pump placement is in a public location. The placement of a hand pump in a public area is not sufficient; as dominant castes choose the placement and lower caste villagers feel socially obligated to follow the wishes of the dominant group. Furthermore, the authors claim that agencies designing such programs have applied a so-called blanket approach using the same methodology irrespective of local socio-cultural considerations.

The case study reveals several implications within the offered definition of equity. It uncovers that analysis of equity must be gender-disaggregated, as women are often faced with inequitable access to resources. The mere identification of women as beneficiaries in CWSPs is not enough, there must be recognition for a need to incorporate details

concerning aspects that include: which women are identified, how they may be approached, what kind of benefits they need, and how these can effectively be delivered to them. This statement is well in line with the proposed definition of equity within the new framework. Looking to the visual framework reveals a breakdown in governance between agencies (i.e. NGOs) and resource users, or link [9]. Governance mechanisms at the community level must be in tune with the internal social dynamic of the village and should promote suitable behavioral change to induce more equitable allocation of resources. The socio-cultural context needs to be integrated as a dynamic variable that interacts with all other aspects. The framework highlights the importance of this sort of fluidity between and within resource users, NGOs, public infrastructure providers, and the mechanism of polycentric governance.

The study concluded that the ARWSP has failed to recognize the pivotal significance of patterns of social interaction and gender roles within Indian village communities. Kurauchi et al. [25] argued in a similar vein indicating that more direct approaches are necessary, including: formulation of targeted discussion groups, provision of reserved seats in local decision-making bodies, and separate consultative processes. Without these sorts of approaches, social dynamics will likely not surface in top-down management, but the proposed polycentric framework facilitates for easy identification of these sorts of shortfalls. It also provides the necessary visualization for their incorporation when analyzing and restructuring the governance process.

Water resources development in Southern Africa: A large portion of the discourse pertaining to equity is gender-based and lacks recognition of equity within its broader context. Selloane and Pieter [26] highlighted the concept of equity in terms of sharing benefits derived from beneficial uses of water. Within this they identify with equitable access of derived benefits as being key in recognizing the rights of affected people. They focus upon two inter-basin transfer schemes in the South African Orange-Senqu river basin region.

The Orange River Development Project (ORDP) is an inter-basin transfer scheme in the South African region. It consists of two large dams, which have expropriated approximately 30 farms. Farmers were notified of the project during the planning phase and mobilized to establish a committee, but it did not have much of a voice in the major decisions (i.e. determining compensation arrangements). However, the nature and scope of the resource benefits was laid out at the project onset, and thus farmers did attain direct access to water for irrigation, domestic supply and hydroelectricity.

The Lesotho Highlands Water Project (LHWP) is another inter-basin transfer scheme within South Africa and the Kingdom of Lesotho. This project has affected nearly 3,000 households, with about 680 of these being displaced. The distribution of benefits in this project has suffered from a lack of policy framework or a defined mechanism for allocating the direct benefits to the local communities and directly affected people.

The case study highlights equity in its broader context. Applying the definition of equity within the proposed framework, it reveals the importance of equity in terms of overall: access, decision-making, and outcomes. In both the ORDP and LHWP there was strong evidence of failures in governance with respect to all three elements of the proposed definition. Within the ORDP farmers had no decision-making power or input on outcomes (i.e. determining compensation arrangements). Access to direct benefits was not observed in the LHWP. The proposed framework reveals a fundamental break in link (2) between resource users and public infrastructure providers, and also within each entity.

Further analyzing the two projects within the scope of the definition of equity reveals a great deal of room for improvement. The authors indicate arrangements that facilitate equitable sharing of benefits extending to local communities often lack a well-defined framework. There has also been recent increasing consensus that local stakeholders and especially those affected by water projects should have access to the benefits accrued, in addition to compensations for environmental and social costs of developing such projects. These inefficiencies surface when performing an analysis with the proposed framework. There is no clear evidence that all relevant stakeholders have equitable access to the benefits derived from the use of water resources. The redistribution of benefits at a national-level also requires public participation, as it integrates all relevant stakeholders. A process of allocating benefits more equitably is well facilitated in the defined lines of communication between all stakeholders in the proposed framework. Furthermore, Karen et al. [27] identify inequitable access to water supply and sanitation as a critical challenge to development for developing nations.

Two more concerns arise in dealing with the transfer of benefits among stakeholders. The first recognizes that some of the social and cultural implications extend beyond those of an economic or financial nature. The second shows that cost bearers, or those affected by water development projects are not receiving the benefits. Furthermore, proper benefit sharing mechanisms require planning during the initial stages of a water development project and also depend greatly on the capacity and autonomy of the implementing agencies. Consulting the proposed framework of analysis reveals the appropriate venues and lines of communication to allow social and cultural implications to filter into allocation decisions and at the right stages. However, an institutional analysis framework of this sort must be incorporated from project onset and in an ongoing fashion. The perpetual circular flow diagram in the proposed framework depicts this sort of continuous feedback mechanism. It also ensures that the structure of governance adapts with changing stakeholder input.

Accountability

India's water crisis: the challenges of governance: This case study reveals the fragmented nature of organizational setup for water policy formulation in India at both the central-and state-level. Water planning is divided amidst several ministries and among a number of organizations within them. This makes it difficult to place responsibility and accountability on one player. It is imperative to make public officials accountable for their behavior and responsive to the entity from which their authority is derived. However, it has become difficult to pinpoint accountability in India, as many government functions are duplicated within various levels of governance. Narain's [28] recommended solution is to develop a unified set-up at the river-basin level that runs in a hierarchical fashion down to the watershed-level. To support this recommendation and provide for greater accountability, water planning and data at each level should be coordinated, consolidated, and made available to the public.

The ineffectiveness of bureaucracy in India reveals instances where links between irrigation expenditures and revenues cannot be traced due to lack of coordination. Reform needs to focus more closely on moving from the current system of cost recovery to a system of irrigation that finances improvements in water delivery directly with revenues. This will allow for accountable use and allocation of revenues within the water sector. Other factors dampening accountability within India's bureaucracy include: frequent changes in top management of central organizations; poor accountability of state tube-well operators; and exploitation of water-well licenses by large farmers. Although these

specific recommendations and examples may not be universal, their implications to increase lines of accountability are.

Several methods of decentralizing water governance have been considered in hopes of increasing accountability. One approach has been to turn over management to farmers and establish a sense of ownership that may induce incentives to improve the system. Another has been the forming of WUAs, with legal backing and political support acting as sources of accountability. NGO pilot projects have been characterized as a bottom-up alternative; however, their progress is slow and gradual. Both suggestions reaffirm a statement made by the ADB [12] that criteria and oversight mechanisms must be evident to ensure that standards are met. A weak legal-framework for water-use property rights in this case study has not been able to facilitate the level of necessary mutual accountability between resource users and water providers.

This case study addresses both of the drivers of accountability defined within the proposed framework. Looking for evidence of an obligation within a governance framework to answer or justify the rationale for execution of action reveals blatant disorganization and bureaucratic overlap. The author recommended improvements in coordination, building incentives for participation, and most importantly, creating overall accountability in bureaucracy. Moreover, improving environmental governance can be understood as a process of institutional reform and organizational restructuring for more effective management of natural resources. The proposed framework has accounted for lines of communication between all relevant stakeholders. Restructuring of the public infrastructure provider element of the governance framework must occur and it should be cognizant of polycentric governance. This will better define the governance process and allow for the necessary level of coordination and consolidation within government.

Institutional reform is necessary to improve the state of accountability within water governance. The most important aspect is the need for some form of public for a where the bureaucracy is made directly accountable for its actions to water users. Opening all lines of communication between resource users and within the public infrastructure entities of the proposed framework can allow for creation of the necessary procedures to monitor progress, report on, and evaluate the governance process. This would enable users to exercise a legitimate right to the provision of water. However, reform of this sort cannot occur without simultaneously improving coordination at various levels within the bureaucracy and restructuring it in a manner suitable for greater public exposure of its processes.

Experience from South Asia's water and sanitation sector: This case study highlights the prevalence of informal payments in the South Asian, and particularly Indian public service sector [29]. Given the relatively small monetary values of these informal payments, it is difficult to detect collusion between customers and staff. The disincentives for supervisors to punish field officers allow for petty corruption to go unnoticed. This corruption appears in three forms: 1) competitive contracting; 2) the kickback system; and, 3) the market for transfers.

Competitive contracting reveals both contracting cartels and political influence in contractor selection. Contractors essentially compete against each other by partnering with elected officials and senior bureaucrats that can provide insider information and/or carefully manipulate tender documents. The kickback system allows funds to be skimmed by a number of different actors through complex arrangements. This particular form of corruption was evident in virtually every water & sanitation (W&S) institution that was visited in this particular case study. Finally, the market for transfers is a favor-bartering system between lenders and staff where payment is often in the form of a political favor.

Addressing corruption requires institutional reform at all levels; for example, the market for transfers can only be addressed with large-scale civil reform. It is also not surprising that losses in efficiency have been observed, as it is not unreasonable to suspect that these institutions regularly spend 20-35% more than the value of the services rendered. These inefficiencies result from a failure in governance and place developing countries into further financial hardships.

Three strategies are proposed to address corruption within the W&S sector. Information technology (IT) is the first, and it consolidates all applications through a single cell window rather than allowing them to pass through a dozen desks. This may have implications of rent being concentrated in fewer hands, but three strategies have prevented this: 1) activities are carried out with proximity to the Director's office in a public space; 2) the customer leaves with a receipt as the process only requires one visit; and, 3) the use of a computerized application limits scope for manipulation. This solution may not be feasible for all scenarios in the developing world, mainly due to the funding and infrastructure required to support it. The second strategy is to reform the side-payment system. This involves initiatives such as the Slum Networking Project, in which a partnership is formed between municipal corporations and NGOs. The NGOs act as a financial intermediary and hold all funds until the contractor satisfactorily completes construction work. The final strategy is to engage – or bypass – elected officials. This involves establishing credible regulatory boards or project management units that are insulated from staff influence.

The three strategies share two drivers: altering accountability networks in service provision and changing the attitudes of service providers in a way that increases the moral cost of misconduct. It is important to note that each instance of successful traditional public-sector reform is often accompanied by parallel developments such as bringing engineers face-to-face with the hardships of their customers.

Corruption within the proposed framework is defined as the degree to which there is oversight in decision-making and the degree to which implementation is valued. The author reveals that in the South Asian experience, corruption is full blown and is hindering implementation of efficient water governance. Furthermore, there appears to be no mechanism that penalizes wrongdoing.

Corruption has been recognized as an emerging threat to equitable and sustainable development [30]. Curbing it requires understanding and action at both the policy and institutional levels. Anti-corruption policies emphasize macro-level initiatives such as economic- and sector-policy reforms (liberalizing trade or reducing subsidies) and transformation of critical institutions such as the judiciary. It must be recognized that such large-scale reforms take time and considerable political will to implement. They also require an institutional framework that will reflect this change, hence the visual representation of an ongoing circular adaptability of the facets of governance within the proposed framework.

More feasible solutions offered by the author have focused on the need of an intermediary actor. Looking to the proposed framework reveals NGOs as ideal candidates to fill this role. The Slum Networking Project already in effect within this case study falls well in line with

this notion. Creating alternative third parties such as regulatory boards or project management units within government is cited as another solution. The proposed framework of analysis incorporates this recommendation with ease as it is rooted in polycentric governance. This presumption allows for ongoing interactive learning between local user groups, government officials and any third parties. Implications for water governance come in the form of accountability. Heightening accountability networks by involving new actors in water governance is a common prescription for reducing control over information, and thus opportunities for corruption. Looking to the proposed framework allows for visualization of the necessary placement of these intermediary actors, and proves useful in conceptualizing how to adequately implement this.

Transparency

Water governance transformation in Zimbabwe: The Water Act of 1976 has guided developments in the water sector of Zimbabwe since independence. In 1998, the Water Act was modified to transform water management with three objectives in mind: replace the existing Water Act with one more suitable for contemporary Zimbabwe; increase stakeholder participation; and improve access to water. An independent research study conducted by Krasposy and Lewis [31] investigated whether the three objectives were in fact achieved. Despite claims of stakeholder consultations taking place, research discovered that the extent was very limited. Furthermore, interviews with stakeholders revealed that a majority did not have any knowledge pertaining to: the existence of the 1998 Water Act; the establishment of Catchment Councils (CCs) and Sub-catchment Councils (SCCs); names of their SCCs; representatives of both the CCs and SCCs; and the process of electing representatives to both councils.

The interview results are disappointing, as only 20.7% of respondents were aware of a new Water Act, with the remainder claiming that they had never heard anything about it. Furthermore, stakeholders commented that they were never involved in the drafting of the current Act, or aware that a process of developing a new Act had occurred. As for the SCCs, 82% of respondents were not aware of their existence. Of the respondents that were aware of their existence, only 18.5% were able to name their respective council correctly, and 56% could only guess as to what the purpose of the SCCs was. Finally, only 29.6% of those who were aware of the existence of SCCs could name their representatives, and those who could not were not even aware that they had representation.

These figures are alarming, as the intended beneficiaries of the Water Act seem to be the least informed. According to the law, the representatives of CCs and SCCs are to be elected by the stakeholder group; however, interviews revealed that the individuals who could name their representative did not even know how they were chosen. This highlights a fundamental failure: if no transparency mechanisms exist, then stakeholders have no knowledge about government processes, and thus cannot participate in governance.

The definition of governance within the proposed framework contains two important considerations: 1) citizens' access to information; and, 2) the level of effort taken to facilitate understanding of the decision-making process. The authors have demonstrated that neither of these existed when the Water Act was reformed in 1998. The breakdown of water governance in rural Zimbabwe can partly be attributed to the lack of transparency. Lack of knowledge pertaining to policy has made it difficult for all stakeholders to participate meaningfully in water governance in their areas. Without participation of the local community, the mechanism of governance breaks down at its most valuable stage. Local considerations are tailored to the natural resource and offer more insight than decisions or inputs of a top-down nature. This inter-causality of transparency and participation is well represented by the notion of a dynamic circular flow diagram for the inputs of governance within the proposed framework.

A suggested remedy is to conduct awareness workshops to increase both transparency and stakeholder influence, as knowledge concerning something ultimately represents a form of power. These small-scale initiatives targeting local-levels of government can move faster than those at the national-level [32]. The proposed framework accounts for these channels of communication between levels of government and resource users. Its basis on polycentric governance also supports both the planning and subsequent analysis of incorporating such ongoing small-scale initiatives.

Discussion

The case studies are further discussed with implications that can be generalized towards overall water governance. Conclusions from the case studies are consolidated and best practices are identified. The proposed framework is referenced where it can offer either identification of deficiencies, or where it can facilitate visualization of improvements.

Public participation

Bakker and Meinzen-Dick [22] uncover the multidimensional nature of stakeholders and how their participation depends heavily upon water-uses and rights in their Sri Lankan case study. The majority of water allocation in irrigation systems is usually directed to agricultural systems and does not balance the dynamic nature of stakeholders. The proposed framework recommends participation of a polycentric nature from all actors and their subsidiaries within. This is consistent with Gurung's [33] indication that the principle of participation derives from the acceptance that people are at the heart of development. Cooke and Kothari [34] concur, as they state that the ostensible aim of participatory approaches is to make people central to development by encouraging beneficiary involvement. With these recommendations, a more efficient allocation of water can flourish on behalf of a better system of governance. Furthermore, the conventional approach to water right allocation often overlooks customary and religious law, as well as local norms and regulations [32]. The inclusion of informal laws of a customary or religious nature can be facilitated through the proposed framework. The revolving circular flow mechanism of polycentric governance allows for ongoing resource-user input at the micro-level. The appropriate lines of communication also exist between and within all major stakeholders. Krasposy and Lewis [31] further contribute, as they cite transparency as a powerful mechanism in allowing stakeholders to actively participate in water governance. Gurung [33] supports this notion, as development is seen as both for and by people, thus requiring access to the institutions that promote it. Sneddon and Fox [35] conclude that participatory approaches in the Lower Mekong Basin benefited from the legitimization of local knowledge, thus emphasizing the importance of stakeholder participation. Equity also requires consideration, as participation must be equitable to truly represent its relevant demographic.

Participation lacks rigid classification and remains a contested concept [19], however, two generic types are offered: people- and planner-centered. Dagg and Garande [23] concluded in their findings that people-centered community participation plays a key role in effective water governance. In order for it to exist, time and energy must

be invested to raise project awareness and capacity-building before the participatory process commences. The concept of a circular flow diagram facilitates this as it has no beginning or end, thus allowing planning processes to begin at any point, or alternatively, at any actor. Findings within the case studies advocate CWSPs and WUAs as mechanisms that promote participation; however, both gender- and cultural-sensitivity must be incorporated. A lesson to be taken from these case studies is that a multi-faceted approach recognizing water-uses, rights and types of water rights of a formal and informal nature must be taken to allow participation of all users in a water governance system. The proposed framework is positioned to facilitate visual representation of these recommendations, and to demonstrate how their resultant outcomes may affect stakeholders and the overall mechanism of governance.

Equity

Bhattacharya et al. [24] reveal that initiatives such as CWSPs are implemented with the holistic assumption of equal benefits to all stakeholders. A comprehensive assessment of the theoretical framework in connection with the findings of the case studies reveals a fundamental requirement for equity. Although sensitivity to equity cannot be directly addressed in the framework, the pivotal significance of patterns of social interactions and gender roles surfaces when all actors contribute to the polycentric governance regime. The International Fund for Agricultural Development [36] identifies lack of recognition of water-use and rights considerations as a contributing factor to poor equity within WUAs. Singh [37] discussed the differences between men and women with respect to needs, roles and interests. The lack of success in promoting equity includes: lack of gender awareness, lack of literacy, restrictions of women's participation, and limited agricultural credit being offered to women. Although the framework can facilitate recognition of gender roles within a cultural context, it does not have a mechanism to address them. Capacity building must occur in the form of educating women to improve their confidence and thus their likelihood of participating in local governance. Integrating the socio-cultural values of a given community must also facilitate suitable behavioral change. Both CWSPs and WUAs are effective in eliciting participation, but they lack equitable representation, thus a more gender-sensitive approach must be taken in governing water at the community-level.

Equitable governance is multidimensional and has implications beyond that of gender. This is consistent with Kurauchi et al. [25] who claimed that equity includes, but is not limited to, just distribution among stakeholders of profits derived from natural resources; fair disclosure of information; equal provision of resources; and, access to credit, training, etc. Corbera et al. [16] have indicated that equity lies in access, decision-making and outcomes. Furthermore, Selloane and Pieter [26] follow suit and claim that all stakeholders should have access to benefits through a mechanism ensuring equitable distribution. They recommend implementing this by planning during the initial stage of a water development project. This implies an equitable stake in the decision-making process of stakeholders to produce a resulting equitable outcome. An appropriate legal and policy framework must exist to allow for this sort of stakeholder interaction. The proposed framework facilitates this as all stakeholders can interact with each other and can also influence the mechanism of polycentric governance. Only equitable representation in all stages of this process will ensure that all stakeholders are involved. Selloane and Pieter [26] conclude that the social and cultural implications of benefit sharing extend beyond the economic and financial realm and that the individuals directly affected by water development are not receiving benefits. Equitable access of these benefits requires a formal recognition of rights. Performing a comprehensive analysis of said institutions with the proposed framework has helped reveal the multidimensional nature of equity within the case studies.

Accountability

An accountable bureaucracy is one in which channels of communication and government processes are transparent to relevant stakeholders. Narain [28] reveals that fragmentation among levels of governance makes it difficult to place responsibility and accountability in the hands of one actor. This inability to identify with a single accountable actor results in water governance failures. In the Indian experience, a unified set-up at the river basin level, running through a hierarchy down to the watershed level is a proposed solution. This unified set-up requires coordination of all involved actors and their subsidiaries; and the proposed framework allows for visualization of this sort of reorganization. Narain [28] cites several initiatives targeting governance failures that result from inadequate accountability, including: instituting WUAs; involving NGOs; and, forming regulatory bodies. The common theme is to improve users' control over water by making the bureaucracy accountable to them. This is further supported by Zhong and Mol [38], as they found public hearings for water tariff setting in China provided various stakeholders legal access to and participation in the decision-making process.

Increasing bureaucratic accountability requires institutional reform. A simultaneous improvement in coordination within levels of government, and heightened public exposure of bureaucratic processes is crucial. This heightened public exposure can be linked with more transparent governance, and in turn, less corruption. The notion of polycentricity within the proposed framework is consistent with the required institutional reform and allows for visualization of the necessary coordination between all levels of bureaucracy. The proposed framework also identifies NGOs as intermediaries, which can help in redefining bureaucratic channels and exposing them to all interested stakeholders.

Corruption is a prevalent phenomenon in many countries, and thus requires attention as it threatens efficient water governance and by association, water allocation. Davis [29] suggests three methods to combat corruption in his case study: information technology; reforming side-payment systems; and, engaging–or bypassing–elected officials. These three suggestions have two common drivers: increasing accountability; and, changing attitudes of service providers so as to increase the moral cost of misconduct [29]. Wade [39] similarly suggested strengthening the user side of the irrigator-official relation by both the familiar device of user organizations and by monitoring performance of canal systems by independent monitoring organizations whose reports would be made public.

The proposed framework allows for visualization of the three methods, as all channels of communication between actors are intended to be open. Furthermore, intermediaries such as NGOs can mediate the interaction between private and public fora to encourage consideration of all stakeholders. Although the theoretical framework cannot directly facilitate the two identified drivers (i.e. increasing accountability and changing attitudes to increase moral cost of misconduct), parallel developments resulting from it can. These developments can include both lessons learned and a sense of community from increased interactions between stakeholders. The overall remedy lies in large-scale institutional reform, as water governance has implications in overall governance. This large-scale reform can be easily facilitated in a polycentric system of governance because of improved channels

of communication. This openness should deter corruption, and must be paired with the simultaneous attitude change of service providers. However, top-down large-scale reform is difficult to implement, as it is time and resource intensive. Inserting intermediaries (i.e. NGOs, regulatory boards, and project management units) at appropriate checkpoints during the governance process is a more feasible local-level solution. The proposed framework of institutional analysis allows for incorporation and visualization of how such initiatives can reduce failures of water governance attributable to corruption.

Transparency

A transparent water governance process highlights the importance of making information accessible to all relevant stakeholders. Pope [32] states that guaranteed access to information is the most crucial element in building a successful open society. This is because knowledge gives stakeholders the power to actively participate in the management and utilization of water. Krasposy and Lewis [31] reveal that when stakeholders have no knowledge about water management strategies, they cannot participate in governance. Interviews of key stakeholders in their case study revealed no awareness of local policy initiatives. This caused a failure in the system process resulting from improper dissemination of information on government policy and processes. The individuals identified as beneficiaries were the least informed about the policy reform process that intended to improve their access to water. This reflected a fundamental breakdown in basic transparency of the governance process and did not allow stakeholders to participate.

Transparent governance requires awareness workshops, and reorganization of priorities among bureaucrats to facilitate the sharing of knowledge. Van der Zaag [40] considered that a transparent decision-making process is crucial to the implementation of integrated water resources management. Although interaction of all stakeholders is incorporated into the polycentric governance model, a specific mechanism for sharing knowledge must still exist. Initiatives that would induce information sharing would flourish within the theoretical framework, as the multiplicity of communicatory links would allow dissemination to all stakeholders. These initiatives should target local-levels of government, as they will have quicker implementation and uptake than at the national-level [32].

Conclusion

This paper has addressed four facets of governance that if improved upon can offer a more sustainable allocation of water to all stakeholders. Furthermore, it has uncovered the multidimensional nature of both formal and informal institutional conditions required to facilitate this. Ostrom [17] identified that within a polycentric system, the users of each common-pool resource can have the authority to contribute to creation of rules as to the use of that particular resource. Agrawal [18] built upon this and claimed studies of commons are relatively negligent in examining how aspects of the resource system, user group membership and the external social, physical, and institutional environment affect management at the local-level. The proposed framework of analysis tries to capture the polycentric notion of Ostrom's claim, while balancing it with the gaps identified in Agrawal's statement. The idea is to maintain a polycentric model of governance that simultaneously identifies interaction with both the resource and the four elements of governance. However, as Saleth and Dinar [1] have stated, there must be a balance between centralization and decentralization to carefully craft institutional arrangements at different levels to achieve both local flexibility and regional coordination.

This paper has identified several problem areas for water governance. It has also offered a framework that allows for visualization of these shortfalls within an intricate mechanism of institutional analysis. Looking to public participation reveals the multidimensional nature of stakeholders cannot be represented without first considering customary and religious law, and local norms and regulations. Furthermore, people-centered community participation is most effective; however, it requires investments in project awareness and capacity building before the participatory process commences. An analysis of equity through the case studies reveals a 'blanket approach' that inadequately addresses gender awareness, literacy, participation, and credit-access. It also reveals that considerations of equity extend beyond the gender context to include overall equitable access, decision-making and outcomes. With respect to accountability, fragmentation of bureaucratic organization and processes makes it difficult to place responsibility in the hands of one actor. In terms of transparency, the power to actively participate in the management and utilization of water requires knowledge. Thus, stakeholders must have access to information on government policies and processes. Corruption proves to be a good mechanism for identifying failures in other aspects of governance. Combating it requires large-scale institutional reform, such as: increasing accountability; and, changing attitudes of service providers to increase moral cost of misconduct. The interconnectedness of these four elements of governance is rather apparent. With the absence of accountability, transparency or public participation in governance, opportunities arise for corruption. Moreover, accountability cannot exist without transparency, as accountable bureaucracies must expose their processes to the public. Additionally, public participation cannot be fully realized until equity is considered. These interrelations are non-exhaustive and reveal the necessity of each of the four facets in facilitating effective water governance.

The policy implications put in place for the future of water governance must realize the multi-level, -dimensional, -spatial, -disciplinary and -sectoral nature of water to break free of the tunnel-vision approach that has hindered policy-makers thus far. The proposed framework is provided as a tool to help uncover deficiencies in governance and to foster brainstorming of solutions, citing specific case studies to support its theoretical underpinnings. It combines existing and forward-thinking frameworks to provide a venue for comprehensive institutional analysis. We acknowledge that not all the findings can be extrapolated beyond their respective case studies. However, it is important to note that the intent is to offer a new domain for policymakers to collaborate and develop forward-thinking solutions to the complex issues facing present day water governance. As changes in weather conditions resulting from climate change are projected to affect availability and distribution of water resources, adaptation to climate change will be closer linked to better water governance and its role in sustainable development [41]. In other words, responding to the challenges of climate change impacts on water resources will require good governance at different levels, be it local, regional, or national.

References

1. Saleth RM, Dinar A (2000) Institutional changes in global water sector: trends, patterns, and implications. Water Policy 2: 175-199.
2. Perret S, Farolfi S and Hassan R (2006) Water governance for sustainable development.Earthscan, London, UK.
3. Tropp H (2007) Water governance: trends and needs for new capacity development. Water Policy 9: 19-30.
4. Pahl-Wostl C, Conca K, Kramer A, Josefina M, Schmidt F (2013) Missing Links in Global Water Governance: A Processes-oriented Analysis. Ecology and Society 18: 33.

5. GWP (Global Water Partnership) (2003) Effective Water Governance.IWA water wiki, Stockholm, Sweden.
6. World Bank (2004) Water resources sector strategy: strategic direction for World Bank Engagement. Washington DC, USA
7. Franks T, Cleaver F (2007) Water governance and poverty: a framework for analysis. Progress in Development Studies 7: 291-306.
8. Good governance for good water management (2006) Environment matters 2006. The World Bank Group, Washington DC, USA.
9. Hooghe L, Marks G (2001) Multi-level Governance and European Integration. Rowman& Littlefield Publishers, Lanham, Maryland, USA.
10. The Good Governance Standards for Public Services(2004) OPM and CIPFA, London.
11. Waheduzzaman (2007) Good Governance In Democratic Developing Countries: A Paradox. School of Management, Victoria University, Melbourne, Australia.
12. Asian Development Bank (1999) Governance: Sound Development Management. Metro Manila, Philippines.
13. World Bank Institute (2007) A Decade of Measuring the Quality of Governance. The International Bank for Reconstruction and Development Washington DC, USA.
14. Organization for Economic Co-operation and Development (2010) Principal elements of good governance in Organization for Economic Co-operation and Development. Paris cedex, France.
15. United Nations (2008) MDG 3: Promote gender quality and empower women. New York, USA.
16. Corbera E, Kosoy N, Tuna MM (2007) Equity implications of marketing ecosystem services in protected areas and rural communities: Case studies from Meso-America. Global Environ Chang 17: 365-380.
17. Ostrom E (1999) Coping with tragedies of the commons. Annu Rev PoliSci 2: 493-535.
18. Agrawal A (2001) Common Property Institutions and Sustainable Governance of Resources.World Dev 29: 1649-1672.
19. Neef A (2009) Transforming Rural Water Governance: Towards Deliberative and Polycentric Models? Water Alternatives 2: 53-60.
20. Andersson KP, Ostrom E (2008) Analyzing decentralized resource regimes from a polycentric perspective. PolitSci 41: 71-93.
21. Anderies JM, Janssen MA, Ostrom E (2004) A Framework to Analyze the Robustness of Socio-ecological Systems from an Institutional Perspective. Ecology and Society 9: 18.
22. Meinzen-Dick R, Bakker M (2001) Water rights and multiple water uses: framework and application to KirindiOya irrigation system, Sri Lanka. Irrigation and Drainage Systems 15: 129-148.
23. Garande T, Dagg S (2005) Public participation and effective water governance at the local level: A case study from a small under-developed area in Chile. Environment, Development and Sustainability 7: 417-431.
24. Bhattacharya P, Jacks G, Singh N (2005) Women and community water supply programmes: An analysis from a socio-cultural perspective. Nat Resour Forum 29: 213-223.
25. Kurauchi Y, La Vina A, Badenoch N, Fransen L (2006) Decentralization of Natural Resources Management: Lessons from Southeast Asia. World Resources Institute (WRI), Resources Policy Support Initiative (REPSI).
26. Selloane MP, Pieter VZ (2007) Can local people also gain from benefit sharing in water resources development? Experiences from dam development in the Orange-Senqu River Basin. Phys Chem Earth 32: 1322-1329.
27. Karen B, Michelle K, Nurendah S, Nernst-Jan M (2008) Governance Failure: Rethinking the Institutional Dimensions of Urban Water Supply to Poor Households. World Dev 36: 1891-1915.
28. Narain V (2000) India's water crisis: the challenges ofgovernance.Water Policy 2: 433-444.
29. Davis J (2004) Corruption in Public Service Delivery: Experience from South Asia's Water and Sanitation Sector. World Dev 32: 53-71.
30. Banda F (2002) Governance and Corruption in The Future is Now Vol. 3: Emerging Challenges for the Indonesia, ed. Bigg T. London: IIED, 92-98.
31. Krasposy K, Lewis J (2006) An analysis of stakeholder knowledge about water governance transformation in Zimbabwe. Phys Chem Earth 31: 690-698.
32. Pope J (2005) Dimensions of Transparency in Governance. 6th Global Forum on Reinventing Government. Towards Participatory and Transparent Governance. Seoul, Republic of Korea.
33. Gurung, SM (2000) Good Governance, Participation, Gender and Disadvantaged Groups in Dialogue on National Strategies for Sustainable Development in Nepal.
34. Cooke B, Kothari U (2001) The case for participation as tyranny in Participation: the new tyranny? Zed Books, London.
35. Sneddon C, Fox, C (2007) Power, Development, and Institutional Change: Participatory Governance in the Lower Mekong Basin. World Dev 35: 2161-2181.
36. IFAD (2007) Gender and water: Securing water for improved rural livelihoods: The multiple-uses system approach. Rome, ItalSingh N (2006) Women's Participation in Local Water Governance: Understanding Institutional Contradictions.Gender, Technology and Development 10: 61-76.
37. Singh N (2006) Women's Participation in Local Water Governance: Understanding Institutional Contradictions.Gender, Technology and Development 10: 61-76.
38. Zhong LJ, Mol APJ (2008) Participatory environmental governance in China: Public hearings on urban water tariff setting. J Environ Manage 88: 899-913.
39. Wade R (1982) The system of administrative and political corruption: Canal irrigation in south India. J Dev Stud 18: 287-328.
40. Van der Zaag P (2005) Integrated Water Resources Management: Relevant concept or irrelevant buzzword? A capacity building and research agenda for Southern Africa. Phys Chem Earth 30: 867-871.
41. UN Water (2012) Climate Change Adaptation: The Pivotal Role of Water. UN Water Policy Brief.

This article was originally published in a special issue, **Water Resources Research, Development & Management** handled by Editor(s). Dr. Srilert, Chulalongkorn University, Thailand