

Article

IWRM and the Politics of Scale: Rescaling Water Governance in Uzbekistan

Andrea Zinzani ^{1,2,*} and Christine Bichsel ³

¹ Global Development Institute, University of Manchester, Manchester M13 9PL, UK

² Geography Unit, Department of History, Culture and Civilization, University of Bologna, Bologna 40100, Italy

³ Geography Unit, Department of Geosciences, University of Fribourg, Fribourg 1700, Switzerland; christine.bichsel@unifr.ch

* Correspondence: andrea.zinzani@gmail.com; Tel.: +39-333-907-1380

Received: 20 December 2017; Accepted: 2 March 2018; Published: 7 March 2018

Abstract: Over the last two decades, politics of scale and rescaling processes in relation to water have been debated by several scholars, especially by geographers and political ecologists, who emphasized their socio-political nature and their interactions with the environment. By contributing to this debate, this paper analyses rescaling processes in water governance in relation to the implementation politics of Integrated Water Resources Management (IWRM) in Uzbekistan. IWRM and related initiatives were promoted worldwide, especially in the “Global South”. These initiatives proposed the shift in water governance from administrative to hydrographic, or river basin, units. Empirically, the analysis focuses on the Middle Zeravshan valley in Uzbekistan, where IWRM was promoted as a part of post-Soviet water reforms. The analysis demonstrates that rescaling water governance towards IWRM and hydrographic units is inherently political. The evidence shows that the process is deeply interlinked with interests and power of Uzbek hydraulic bureaucracies at multiple scales. Firstly, the IWRM sponsored establishment of hydrographic units coincided with a recentralization of water management, supported by national hydraulic bureaucracies. Secondly, the design of the hydrographic unit and related boundaries in the Middle Zeravshan valley was driven by controversial multi-scalar power dynamics and relations between national and province levels, which emphasized the complexity and the multi-scalar nature of rescaling processes rooted in Post-Soviet political transformations.

Keywords: Integrated Water Resources Management (IWRM); politics of scale; development policies; hydrographic units; waterscape; Uzbekistan

1. Introduction

Over the last two decades, Integrated Water Resource Management (IWRM) has achieved the status of the global water paradigm. Advocated by the Global Water Partnership and other international organizations since the end of the 1990s, IWRM has become a widely accepted framework to globally orient water governance towards institutional integration, social, and environmental sustainability [1]. Since the 2000s, scholars and practitioners have critically engaged with the ideas, rationale, logics and outcomes of IWRM in terms of the subjectivities of its experts, governance or the socio-political nature of its central underlying assumptions [2,3]. Despite these contributions, IWRM has only been partially explored for its underlying principles, in particular, its politics of scale and multi-scalar rescaling processes [4,5]. Rescaling processes in relation to water resources have been analyzed and debated in diverse contexts, mainly by geographers and political ecologists. However, the institutional, spatial, and boundary reconfiguration that IWRM implementation processes and politics at diverse scales imply requires further analysis. This paper reflects on one of the central conceptual pillars of IWRM: the proposition that water should be managed according to

hydrographic rather than administrative boundaries. By focusing on the shift in water governance from administrative to hydrographic units, this paper analyses the politics of scale, rescaling processes, and boundaries changes in relation to the implementation of IWRM at diverse scales in Uzbekistan.

The IWRM approach was designed according to the principles of decentralization and devolution of water allocation and distribution directly to private organizations or water users associations, especially in highly centralized states [5,6]. IWRM rests on the overarching rationale of promoting the integration of social, economic, and environmental concerns. It is inspired by the Dublin principles that were discussed during the International Conference on Water and the Environment (Dublin, 1992) (Appendix A). Over the last decades, the framework has been promoted by international and development organizations in both the “Global North” and the “Global South” and adopted in many regions of the world. At the same time, it has also given rise to much criticism. Both academics and water professionals have debated and criticized IWRM for many diverse issues, ranging from the underlying assumptions of the approach, the content and aims of its pillars, to guidelines and politics for implementation [2,4,7–9].

The aim of this paper is twofold. First, it aims to discuss the social and spatial assumptions that guide the formulation of IWRM pillars, and in particular the shift from administrative to hydrographic water governance. Second, it aims to contribute and further debates on politics of scale and rescaling processes in water governance through the focus on IWRM implementation processes and the adoption of a multi-scalar qualitative approach in a specific case study. We explore these processes in the context of the Central Asian region, and specifically in Uzbekistan. Whereas water resources in Central Asia have always played a key role for socio-political and agricultural development, since the collapse of the Soviet Union water politics have become even more strategic with regard to bureaucratic changes, processes of state legitimation and consolidation, and international relations. Furthermore, hydraulic bureaucracies, and their divergent interests and complex power relations, have played a key role in both national and transboundary water governance transformations. Therefore, the socio-political and historical context of water politics in Uzbekistan, inherited by the Soviet Union and today influenced by international development policies, offers a particularly relevant setting to discuss politics of scale and rescaling processes in relation to the IWRM implementation. Uzbekistan represents a region where water management played an important role in the succession of different forms of political regimes ranging from the pre-Russian, Tsarist, Soviet and post-Soviet forms of political rule [10,11]. In Uzbekistan, the IWRM implementation has been promoted and supported since the end of the 1990s by international development organizations (the Global Water Partnership -GWP-, the World Bank -WB-, the Asian Development Bank -ADB-, among others) to shape and orient national water reforms.

With regard to the methodology, a qualitative approach was adopted. Empirical data stem from on-site in-depth field research in Uzbekistan. The field site for this research is located in the Middle Zeravshan valley, an area that is administratively included in the Samarkand province. The Middle Zeravshan valley was selected since it is one of the most important river basin of the country. Historically, it is characterized by extensive hydraulic infrastructural development and irrigated agriculture. This region is also relevant in terms of political power since Samarkand, the second biggest city of Uzbekistan, lies in the centre of the Middle Zeravshan valley. Field research was conducted during three distinct fieldwork stays in Tashkent and in the Samarkand province between March 2011 and December 2012. Data were collected through semi-structured interviews and informal talks with key informants, experts, and members of the Zeravshan Irrigation System Basin Agency (BISA), the Dargom Irrigation System Authority (ISA), the Urgut Water Users Association, the Institute of History and the Institute of Water Problems of the Uzbek Academy of Sciences. Interviews and talks were also held with representatives of international organizations such as the German Corporation for International Cooperation (GIZ) and the Tashkent branch of the International Water Management Institute (IWMI) (Appendix B). Interviews and meetings with selected actors focused on the IWRM implementation, the design of recent national water governance initiatives, and linked institutional

changes, units, and boundaries reconfigurations. Data were analysed by adopting an open-coding approach and then linked to collected literature.

This paper continues with Section 2, which presents and analyses the reconfiguration in water governance from administrative to hydrographic units in relation to the IWRM implementation. In Section 3, we advance the concept of scale in order to analyze this reconfiguration, and discuss rescaling processes in the context of water governance. The focus of the next two sections is on the case study of Uzbekistan. Section 4 examines and discusses the IWRM promotion and the implementation of related initiatives aimed at rescaling water governance Uzbekistan, while Section 5 presents these processes and related multi-scalar power and political implications at basin level in the Middle Zeravshan valley. Our analysis of the Uzbek context is followed by a discussion and conclusions on IWRM and water governance rescaling processes.

2. IWRM: Towards River Basin Governance

Our analysis on water governance units and IWRM begins with the discussion of the changes in units and boundaries sponsored by the IWRM approach. The principle which states that water should be regulated and managed according to hydrographic boundaries and river basin units is central to the IWRM approach. The Global Water Partnership states that IWRM involves the “[. . .] transition from water management within administrative units towards water management according to catchments, river basins or irrigation systems (hydrographic boundaries)” [1,12]. The IWRM approach purports that the shift of water governance to the hydrographic unit will enable the integration of environmental as well as social concerns. The environmental concern supports the vision that resources protection and use would be best assured if management decisions are taken by considering and respecting its ecological integrity and environmental characteristics. The social concern, in turn, presumes that the collective action of those who use the resource rises from a joint interest in managing resources, their use, and protection. According to international organizations promoting IWRM, both the environmental and the social concerns in IWRM find their spatial expression in a hydrographic unit for water governance.

The principle of the hydrographic unit closely relates to the others IWRM principles which aim at an integrative water resources management—integrating all of the stakeholders from water users to political decision makers and different water uses—and a multi-perspectives sustainability (2). By means of this principle, IWRM opposes and tries to overcome the presumed ignorance of hydrosocial characteristics of a watershed and its people attributed by modernist schemes for water management. In particular, IWRM seeks to alter a mind-set of controlling nature through science and engineering by integrating socio-environmental concerns.

Whereas IWRM supports hydrographic units based on water governance as a novel rationale of water resources control, it tends to ignore that this practice existed for a long time, and has been applied since the end of the 19th century [5,13,14]. Ertsen [15] states that even though the Dutch, the French and the English irrigation schools were distinct in their design of infrastructures, since the end of the 1800s they all agreed that water management should be based on hydrographic, or hydraulic, units rather than administrative ones. Hydraulic units refer to areas and boundaries of irrigation systems. Molle [3] points out that hydrographic and hydraulic units were the norm for water management in France, Spain and Great Britain at the end of the 19th century, despite the importance that hydraulic engineering gained during the high-modernist period. In their analyses of contemporary water governance, Graefe [16] and Bourblanc and Blanchon [17] demonstrate that the high complexity of the present practices and the infrastructural connectivity of river basins through water transfers shows that hydrographic units are not the scale of actual water management in diverse parts of the world. Nevertheless, the administrative principle has dominated water management throughout most of the 20th century. This approach enabled the state, its branches (provinces and districts), and their hydraulic bureaucracies to control water and consolidate their power. However, this approach has changed towards the end of the 20th century when the majority of countries, in particular in the “Global North”

and in part of the “Global South”, shifted towards hydrographic units in water governance, also due to the support and the promotion of the IWRM rationale by international organizations [3,8,14]. Few countries, especially those characterized by centralized political regimes, where the state plays a dominant role, still follow administrative rather than hydrographic principles.

A review of literature on water governance reveals that many scholars welcome the reconfiguration from administrative to hydrographic units. For instance, Uphoff, Ramamurthy and Steiner [18] state that it is important to align the boundaries of management structures with those of the hydrographic units in order to integrate environmental with governmental concerns. However, other scholars question whether managing water according to the hydrographic unit, as is promoted by IWRM, would be the best practice throughout the world [5,7]. Some scholars are critical of the idea that this water governance rationale proves to be the solution for every context irrespective of different management histories, institutional frameworks, and political systems. Merrey et al. [7], for example, underline that creating new water institutions based on hydrographic boundaries requires a challenging and expensive political institutional change, which does not ensure an improvement in water management practices. Moss [19] argues that the replacement of existing institutional units with new hydrographic ones could lead to boundary problems (“problem of fit”) with regard to spheres of political influence as well as new forms of competition among water agencies.

As presented at the beginning of this section, a key issue for the implementation of the IWRM approach is the conceptual and practical delimitation of hydrographic boundaries for water management. Therefore, it is important to reflect more in depth on this process, especially on its social dimension. The approach is based on the idea that hydrographic boundaries are to some extent organic and natural, thus being characterized by environmental processes that have gradually developed over time [3]. Indeed, besides environmental processes, human interventions, social dynamics, and power constellations are recognized by the promoters of IWRM for their relevance in the reconfiguration of hydrographic units. However, in contradiction, they are conceptually integrated into the idea of a natural water system. Therefore, IWRM proposes that there is an essentially “natural” domain of hydrographic units. In the case of interpreting hydraulic development and irrigation infrastructures as natural, such simplifications seem to be problematic [4,20]. Infrastructures are the product of a long and often complex socio-political and socio-economic history of human’s engagement with water [21,22]. Therefore, this unit is hydraulic, and is hence characterized by social and engineering interventions, and not hydrological. Yet, the proponents of IWRM are often oblivious to this distinction when re-drawing the boundaries for hydrographic management. The rationale that hydrological unit corresponds to the hydraulic one in IWRM is not only conceptually problematic, but may also lead to simplistic policy choices and misinterpretation of implementation outcomes [4].

Scholars in the field of Political Ecology strongly contest the idea that hydrographic units could be natural [23–25]. Rather, they suggest that nature is a socio-political construction, and water is a socio-natural entity. For their analyses, they propose the concept of waterscape. The waterscape is the product of complex interactions between water, power, technology, and formal and informal practices [26–28] (Appendix C). Furthering this argument, other scholars highlight that the physical delimitation of the waterscape implies contested politics, ideas, and interests. Warner, Wester, and Bolding [20] argue that the purported naturalness of hydrographic boundaries and units, as well as the processes of their delimitation, is in fact strongly politically influenced. Hence, they could not be simply defined as natural.

In this section, we showed that the idea of hydrographic boundaries in IWRM lacks conceptual clarity. While water management supposedly follows hydrological systems, in most cases, it is confronted with a hydraulic history. It is important to argue that the idea of natural boundaries in IWRM to be established for hydrographic water management is quite questionable and opens up debates. Shifting water management units and boundaries not only reassigns territories, but also reshuffles institutional and political processes. We suggest that these changes may best be analyzed with the concept of scale and related rescaling processes.

3. Scale, Politics of Scale and Rescaling Processes in Water Governance

The understanding of scale as socially constructed, historically contingent, and politically contested, in contrast to the previous notion of scale as fixed containers, is rooted in Marxist radical thought. Scholars applied Marxist and neo-Marxist approaches to advance research on the evolution of capitalism, on production processes, power reconfigurations, collective actions, and related social struggles [26,29,30]. Even though we are aware of the huge and heterogeneous debate on the concept of scale and its diverse contributions, which will be discussed below, for the purpose of this paper we define scale as the relationship between spatial dynamics and political processes [31]. Therefore, we adopt the concept of scale to investigate the relationship between water governance processes and their spatial dynamics of hierarchization, differentiation and delimitation. We conceive the shift from administrative to hydrographic boundaries in water governance not only as a territorial change, but also as a transformation of networks of hierarchy and power, associated with changes in actors, institutions and decision-making processes [32]. Scale provides the conceptual lenses for our analysis of this shift. In parallel, over the last two decades diverse scholars increasingly adopted in their research the concept of scale to research the environment and environmental changes [23,33,34]. Smith [35] brought forward the notion of “politics of scale”, which is defined as complex socio-spatial practices, state and non-state regulations and politics, power interactions, and social struggles, which characterize and aim the configurations of scales.

Further research contributed to provide new concepts and analytical perspective to think of spatial units and related hierarchies politically, by reflecting on socio-political interactions. Neumann [29] contends that any analysis of the politics of scale has to question the scalar practices of social actors, their knowledge and visions, inquiring power asymmetries, to analyse and understand relations between them and within different scales. Brown and Purcell [34] add that scales are essentially fluid. They argue that no scale has any inherent or eternal qualities that make it properly suited to a specific socio-political or, as it were, socio-ecologic process. Instead, scalar configurations and related shifts are strategies that are used by actors to pursue specific political projects, which entail socio-political and spatial transformations. Such projects, pursued by both the state and other national and international actors, are defined as rescaling processes [29,30]. In order to analyze these processes, it is crucial to understand the different strategies which actors adopt with regard to rescaling processes, and their socio-political and environmental outcomes.

Scholars argue that since the 2000s, several processes of rescaling in resources governance have occurred in the context of globalization and the promotion of global environmental politics. In addition, a considerable part of analysis on rescaling processes is carried out in the fields of water governance and politics [26,28,36–38]. Although traditionally water resources management has been considered a technical matter for hydrologists and engineers, social scientists have increasingly begun to analyze the political nature of water and processes of its governance, transformations and contestation [6,13,23,24]. Over the last decades, debates have focused on the suitable spatial scale and the boundaries for water management [3,39,40], the consequences of decentralization and deregulations [25,26], the commodification of water resources [27,41], and socio-political transformations in relation to international development initiatives [8,42]. Recent research by Harrys and Alatout [38] and Bourblanc and Blanchon [17] contributed to the debate by exploring the connections between power geometries and rescaling processes by focusing on the Middle East and South Africa, respectively. Their findings suggest that rescaling processes in water management are state strategies of nation-building and power consolidation by elites.

With regard to rescaling processes and international development policies, over the last two decades, international development organizations and donors (the GWP, the WB, the ADB, among others), who promoted the IWRM approach, have encouraged and supported a number of states in Africa, the Middle East, South-east and Central Asia (e.g., South Africa, Nigeria, Israel, Jordan, Vietnam, Laos, Kazakhstan, and Uzbekistan, among others) to change their water governance principles by shifting from administrative units to hydrographic boundaries [1,4]. These reforms in

water management were mostly portrayed to be of technical and administrative, rather than political nature. Thereby, proponents of IWRM not only blinded out the socio-political history of any hydraulic system, but also excluded the political nature of relegating competences for water management and control over water resources to different socio-spatial levels. With this section, we argue that it is relevant to link IWRM implementation, and specifically the shift from administrative to hydrographic unit, with debates on politics of scale and water governance rescaling process. Therefore, we adopted this approach to the analysis of these processes in Uzbekistan and in the Middle Zeravshan waterscape.

4. Post-Soviet Water Reforms towards the IWRM Approach in Uzbekistan: A Contested Multi-Scalar Process

Uzbekistan lies at the heart of the Central Asian region, which is characterized by an arid and semi-arid environment. The waterscapes of Uzbekistan are part of the Aral Sea basin and are characterized by the water flow of Amu-Darja, Syr-Darja and Zeravshan rivers. Since ancient times, the area of Uzbekistan has been significantly shaped, developed and transformed by hydraulic development projects. In particular from the 1950s to the 1980s, during the Soviet “hydraulic mission” [6], this entailed the development and reconfiguration of waterscapes through the construction of large irrigation systems, reservoirs and dams carried out by the centralized state. Thus, Uzbekistan is characterized by a patchwork of diverse waterscapes (4.2 million hectares of irrigated land totally), separated from each other and surrounded by steppes, deserts, and mountains [8,42]. Since Soviet times, Uzbekistan has been the most water consuming country of Central Asia due to intensive cotton agriculture. High-level water abstractions during the last decades have contributed to severe socio-environmental consequences such as the Aral Sea shrinking. Only the 13% of the total amount that was abstracted by Uzbekistan for irrigated agriculture originates from the country’s mountains and glaciers. The remaining 87% is brought to the country by river flow from upstream republics (Kyrgyzstan and Tajikistan). The distribution of this water is regulated by the Interstate Commission for Water Coordination (ICWC), which is an interstate agreement and body on Aral Sea basin transboundary water resources that was formalized in 1992 [12,43].

After the collapse of the Soviet Union, Uzbekistan began to reform its water sector. This happened in parallel with land tenure changes and the dismantlement of state and collective farms. These processes were challenged both by socio-environmental issues such as the contested formalization of peasant farm units and population growth on the one hand, and land degradation and soil salinization on the other [43–45]. In the context of the global promotion of sustainable development, water security and related international development projects, development organizations such as the WB, the United States Agency for International Development (USAID), the United Nations (UN), and the Swiss Agency for Development and Cooperation among others (SDC) have sought to assist and guide Uzbek water sector reforms along the lines of the IWRM approach since the end of the 1990s [8,43]. This donors-promoted reconfiguration of water policies had two aims. Firstly, it sought to support transitional reform processes towards sustainable development. Secondly, it boosted decentralization and liberalization of water resources management towards market economy and participation of stakeholders [4,5]. This donors-driven process was supported by a development discourse characterized by diverse buzzwords such as empowerment, good governance and capacity development among others. It is argued that these concepts were used on the one hand to naturalize and depoliticize the IWRM approach, while on the other hand, to hide the political and economic reconfiguration related to its implementation [5,8].

In Uzbekistan, IWRM oriented reforms have mostly focused on river basin and sub-basin levels. Indeed, at the national level the IWRM framework—in contrast with neighboring countries such as Kazakhstan—was not institutionalized. Despite recent debates on the design of a new water code based on IWRM, the national sector is still regulated by the post-independence Law on Water and Water Use (1993), which was partly amended in 2009, as argued by experts of the IWMI and of the Academy of Sciences [46]. With regard to the river basin and sub-basin levels, the government, supported

by international organizations, promoted an institutional change based on a shift of responsibilities from province water departments (*Oblastvodkhoz*) to river basin organizations, and from district water departments and former collective farms (*Rayonvodkhoz and Shirkat*) to water users associations (WUAs) [44,47,48]. The IWRM oriented water reforms aimed to establish river basin organizations, in order to replace former administrative units and to promote a sustainable socio-environmental approach (Appendix D).

In 2001, a special commission formed by the Cabinet of Ministers of the Republic of Uzbekistan prepared the “Program of Measures on Improvement of Irrigated Lands for 2001–2010”. The program was based on two levels of intervention [47,49]. The first level focused on provinces. It proposed the transition from fourteen province water departments (*Oblastvodkhoz*) to seven river basin organizations. While the province water departments were a part of the administrative organization of water management, the river basin organizations should represent hydrographic units. Differently, the second level scheme of the reforms program focused on the shift of water responsibilities from district water departments and former collective farms to newly established WUAs, which is the milestone initiative of the Irrigation Management Transfer (IMT) policy and is supported by the IWRM narrative at the sub-basin level. This institutional water reconfiguration has been analyzed by several authors, such as Yalcin and Mollinga [49], Veldvisch [50], Wegerich [47] NBT [51], Veldvisch and Mollinga [52], Zinzani [53], among others (Appendix E).

By reflecting on the first level of intervention of the reform process, Yalcin and Mollinga [49] argue that, although the government of Uzbekistan seemed to be willing to introduce river basin governance and establish hydrographic units, there were also other relevant interests that were related to politics of scale, which require a deeper reflection. They claim that basin level water reforms towards IWRM was an agenda that was driven by the Ministry of Agriculture and Water Resources (MAWR) to the aim of consolidating its power within the bureaucratic apparatus. These reforms should decrease the Ministry’s dependency on the influences of provincial authorities and hydraulic bureaucrats who exerted a powerful role in controlling water resources. The reform process was driven and promoted by A. Djalalov, the director of MAWR from 1999 to 2004. As stated by Uzbek key informants and experts, consulted and interviewed during field research in Tashkent, the former Minister worked in very close collaboration with the international development organizations that were operating in Uzbekistan [54]. Following Yalcin and Mollinga [49], Djalalov was critical of the fact that Uzbekistan and other Central Asian countries were by the end of the 1990s some of the few countries since the global promotion of IWRM principles still managing water on administrative principles despite recommendations of the international water community. Therefore, in order to legitimize the MAWR reforms process and to support agricultural and water sectors structural transformations, Djalalov stressed that it was necessary to reconfigure the existing national water governance structure. It emerges that reform plans led to tensions and disputes between province governments (*Hokimyat*) and province water departments on the one hand, and the MAWR on the other hand [49]. As argued by a key informant, these tensions centered on the redefinition of water governance units and boundaries, on political influence and on power changes. As a consequence, strategic negotiations and institutional disputes between the MAWR, province governments and their hydraulic bureaucracies led to a reconfiguration of state-province politics and interactions over the period 2001–2003. The process was confirmed by experts consulted and interviewed in IWMI and at the Academy of Sciences.

Province governments and their hydraulic bureaucracies were able to shape the agenda and readapt the reform process, thereby limiting the institutional and scalar reconfiguration of new river basin organizations [8,49,51,55]. In 2003, instead of the seven authorities proposed by the MAWR in 2001, ten Irrigation Systems Basin Authorities (BISAs) were established by decree n. 320 (21 July 2003). Only five of them adopt hydrographic principles, while the other provinces maintain the administrative boundaries of the former province water departments [43,53,55]. The outcome of this complex and contested process might be understood as an attempt of the MAWR to reduce the power of province hydraulic bureaucracies and maintain and strengthen the centralized state control of water resources. However, key informants that were interviewed in Tashkent and in the Samarkand

province stated that in some provinces heads of province governments, members of province water departments and hydraulic bureaucracies were able to successfully negotiate with the MAWR and adapt the reform process to preserve their power and interests [56]. In spite of this resistance to reforms, the MAWR, with the political and financial support of development agencies, significantly shaped the rescaling process by supporting a recentralization process for the governance of water resources. Such a recentralization contradicts the idea of decentralization that was promoted by the IWRM. In parallel, this discussion showed that the originally planned water reforms in Uzbekistan met resistance at the level of the province administration. Therefore, their implementation differed from the original project.

In sum, this section has shown that water governance reforms in Uzbekistan in relation to the implementation of IWRM principles were politically contested at diverse scales. The proposed reconfiguration from administrative to hydrographic units for water governance offered a platform for political contestation between central and provincial governments. We argue that these changes in water governance units and boundaries were contested as they involve a significant rescaling of political control and a reconfiguration of power relations within Uzbekistan. Therefore, water remains a key resource and its control is essential to political elites.

5. Rescaling Water Governance in the Middle Zeravshan Waterscape

This section explores the rescaling process related to the IWRM inspired shift from administrative to hydrographic water governance in the Middle Zeravshan waterscape. It is relevant to point out that the Zeravshan River, which originates in Tajikistan between Northern Hissar mountains and the Western Pamir and it spans over 741 km, is a transboundary watercourse and its waterscape is shared by Tajikistan and Uzbekistan. While formerly reaching the Bukhara province and the Amu-Darja, the river flow ends in the eastern part of the Navoi province, due to massive water abstraction in its middle section [57].

This transboundary waterscape has not been managed as a unique hydrographic unit since the collapse of the Soviet Union. Neither was this the case during the Soviet regime. Indeed, interstate water relations between Uzbekistan and Tajikistan have been quite problematic since the 1990s due to conflicting water demands. The distinction between the upstream and the other sections of the waterscape is also due to its socio-physical characteristics: the upstream part lacks extensive hydraulic infrastructural development, and the agriculture is mainly conducted along river banks and on terraces. These challenges distinguish the Middle Zeravshan valley as a highly relevant case for analysis. The Middle Zeravshan waterscape extends from the 1st May Dam, located in Uzbekistan less than one kilometer downstream of the border with Tajikistan; in this area, the river flows out from the narrow upstream section. Its irrigation system, connected to the 1st May dam, is one of the largest in Uzbekistan, stretching approximately 50–60 km North to South and 200 km East to West. It is surrounded in its eastern and northern part by the Zeravshan and Turkestan ranges, while in its western and southern parts by steppes [58]. The majority of the irrigation system is administratively included in the Samarkand province (central Uzbekistan), and the administrative boundaries were inherited from the Soviet Union.

The Middle Zeravshan waterscape, similar to other Uzbek waterscapes, has been developed since ancient times. A succession of political regimes transformed steppes and deserts through hydraulic interventions into agricultural lands [11,12]. Several irrigation canals, pumping stations, small reservoirs, and dams were constructed to divert water from the Zeravshan River for irrigation, in particular, since the 1950s. This period can be understood as the Soviet “hydraulic mission”, which was inspired by the idea and rationale of the socialist conquest and transformation of nature [11,53,59]. During this period, intensive monoculture cotton cropping has been developed in the Middle Zeravshan waterscape. Today, the extensive canal network expands on both sides of the Zeravshan River. Its southern part is larger and made up by the most important canals serving irrigated agriculture, as for instance, the Dargom, Eski-Anghor, and Yangiarik (Figure 1).

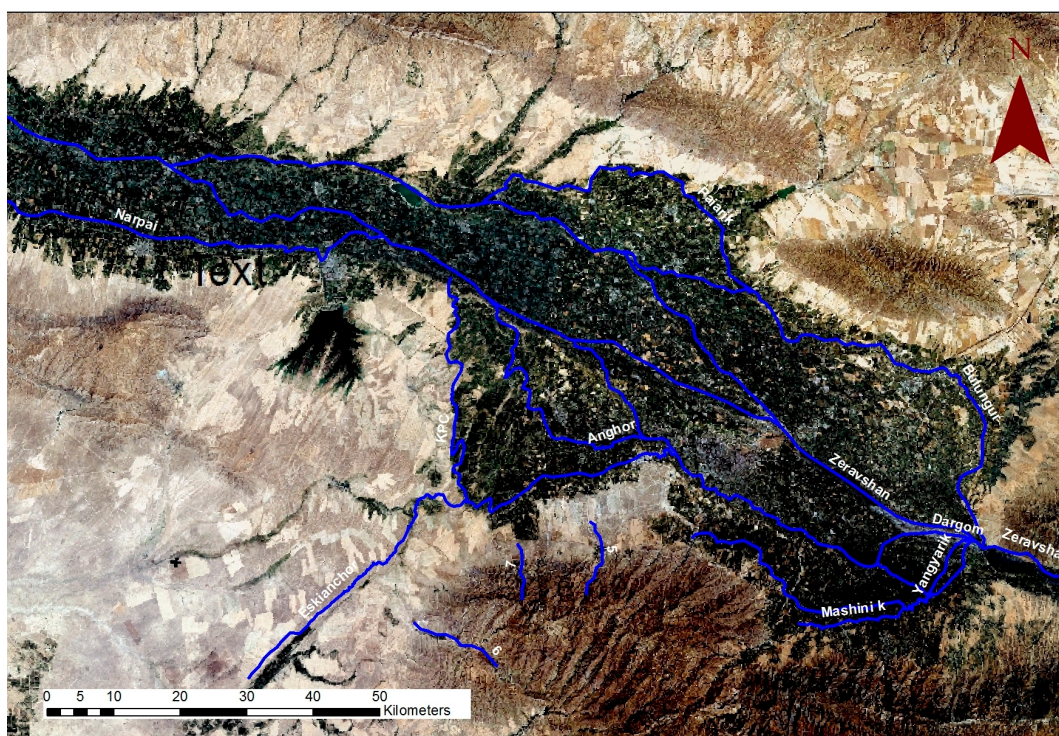


Figure 1. GIS Elaboration of a satellite image (Landsat 5) of the Middle Zeravshan waterscape representing the canals network (source: authors).

Following the national decree of 2001 on water governance transformations, which led to the contested, controversial, and heterogeneous rescaling process, Samarkand Province Water Department was reorganized into the Zeravshan Irrigation Basin Authority (BISA) in 2003. However, the territory of the Zeravshan BISA does not match the initial criteria that was defined by the “Program of measures on improvement of irrigated lands for 2001–2010”, which the MAWR supported, as stated by interviewed members of the Academy of Sciences [60]. Indeed, the original water reforms project foresaw to develop river basin governance and the establishment of one BISA for the entire central and downstream part of the Zeravshan waterscape in Uzbekistan (including Samarkand, Bukhara and part of Navoi provinces). Instead, besides Zeravshan BISA, the Amu-Bukhara BISA was also established. During the months that followed the issue of the “Program of measures” (2001), the river basin governance plan for the Zeravshan BISA was object of conflicting negotiations between Samarkand and Bukhara provinces hydraulic bureaucracies, and it was significantly altered in terms of its territory and related boundaries. Since its official establishment in 2003, the Zeravshan BISA, as explained by their interviewed members, includes the entire territory of the Samarkand province (which represents the 72% of the total BISA’s territory), four districts of Navoi (11%, including Hatirci, Navoi-Konimekh, and Navbackor districts), three of Jizzakh (7%, including Bakhmal, Gallaorol, and Jizzakh districts), and one of Kashkadarja (9%, represented by Chirokchi district) [54]. The total area of the BISA reaches 590,000 hectares [12,53,55].

A closer look at the newly established water management unit reveals that the Zeravshan BISA follows the hydrographic boundaries of the Middle Zeravshan waterscape. Hence, it emerges that the newly established authority belongs to the group of the five BISAs (considering the whole state), which reconfigured their territory in accordance with the decree of 2003. However, as discussed in Section 4, the IWRM inspired water governance reconfiguration from administrative to hydrographic units does not represent a “coming back to nature”. Indeed, the new Zeravshan BISA, based on the hydrographic unit, refers to a hydraulic system which results from a complex history of relations between water, power and technology, as explained by a key informant in Samarkand [56]. For example, Kadirov [61] and Abdullaev and Rakhmatullaev [62] point out that

the canals Tuyatartar and Eski-Anghor, which connect to the Zeravshan River but flow towards neighboring waterscapes (and provinces), have been continuously developed and reconstructed since the 14th century. Thereby, they highlight the challenge and complexity of determining basins boundaries of the Zeravshan waterscape.

It seems that the original idea of the MAWR to promote the establishment of a single BISA for the whole Uzbek part of the Zeravshan waterscape was significantly altered by the influence and the power of the Samarkand province hydraulic bureaucracy that oriented this process towards its objectives. Key informants in Samarkand and interviewed members of the Zeravshan BISA argued that the actual design of the authority was discussed and was finally decided in 2003 by the former director and the staff of the Samarkand Province Water Department (*Oblastvodkhoz*) [54,58]. In a similar line, Abdullaev and Rakhmatullaev [62] provide relevant insights to develop a deeper understanding of the rescaling process and boundaries reconfigurations, and to historicize power relations in the Zeravshan waterscape. It seems that contemporary conflicting relations and power asymmetries between province institutions and hydraulic bureaucracies are rooted and date back to past decades. During the first half of the 1900s, the Zeravshan Irrigation Basin Management Authority (*Zerdolvodkhoz*) administered the Zeravshan valley irrigation system. Already during this time tensions, disputes and controversies with regard to water control, use, and allocation emerged between the water administration personnel of Samarkand and Bukhara provinces. These disputes have continued and developed over the following decades until the 1970s. In 1972, a centralized Soviet hydraulic development intervention, the Amu-Bukhara pumping system, should mitigate disputes and power asymmetries between the two provinces bureaucracies and their ambitions. The construction of the Amu-Bukhara pumping system provided water supply to Bukhara province through the connection of its irrigation system to the Amu-Darja River [55]. However, disputes between the two hydraulic bureaucracies seemingly resurfaced in 2001, when the MAWR, in the pathway to IWRM inspired water governance reconfiguration, sought to establish a new authority which would merge the two administrations. Finally, as explained above, this process did not happen as in 2003, when Zeravshan and Amu-Bukhara BISAs were established as separate authorities based on hydrographic units.

By reflecting on this controversial rescaling process, Wegerich [55] provides an important contribution and argues that the territory of the Zeravshan BISA and its boundaries were internally discussed and drawn up under the leadership of the head of the Samarkand Province Water Department. The process wholly excluded the involvement and the participation of members of Navoi, Jizzakh and Kashkadarja province water departments. As stated by interviewed members of the Zeravshan BISA, the above mentioned districts of these administrative units, supplied by Eski-Anghor and Tuyatartar canals, were added by Samarkand hydraulic bureaucrats to the territory of the former Samarkand water department in order to match the river basin principles and establish a river basin authority based on the hydrographic principle [54]. Wegerich [55] suggests that the Samarkand Province Water Department submitted the BISA draft of the new territory and boundaries to the MAWR in Tashkent. As it was confirmed by an interviewed key informant in Samarkand, despite the Zeravshan BISA did not meet the criteria of the original national plan designed by MAWR for IWRM oriented water reforms in 2001, it was accepted by national hydraulic bureaucrats without resistance [56]. The influential power of members of the Samarkand Province Water Department in shaping the reforms agenda towards its interests in terms of boundaries reconfiguration of the Zeravshan BISA, also comes into view by considering the design of its sub-departments, the Irrigation System Authorities (ISAs). Despite the fact that the Decree of the MAWR issued in 2003 did not provide specific guidelines to design ISAs boundaries, in the majority of BISAs boundaries of sub-departments coincide with those of former district water departments (*Rayonvodkhoz*). On the contrary, by referring to the Zeravshan BISA, members of Urgut WUA stated that ISAs were designed and configured ex-novo by the BISA's head and the governing board in 2003. Eight ISAs were established: Dargom, Eski, Tuyatartar-Kli, Mirzapai, Miankal-Toss, Narpai, Karmona-Kanimex, and Ak-Karadarja [63].

With regard to their territories, interviewed members of BISA stated that ISAs were designed through the adoption of hydrographic principles following the main, secondary canals, and their irrigated areas. However, a closer look to the sub-departments' spatial scale shows that the hydrographic principle was interpreted and readapted in different ways. Some ISAs are based on this principle, while others incorporate and merge diverse small irrigated areas. Wegerich [55] suggests that this heterogeneous approach in the creation of ISAs enabled the head and the governing board of Zeravshan BISA to balance power and interests of small bureaucracies within the districts of the Samarkand province and the neighbouring ones. Furthermore, their interests were also preserved with the reconfiguration of district water departments into WUAs, occurred in 2003. Indeed, in the Samarkand province, WUAs were established keeping the district boundaries with the exception of the Pstdargom district, where a project that was supported by the WB and the SDC was formalized in 2009. As claimed by members of IWMI and by interviewed members of the Zeravshan BISA, the creation of WUAs based on district spatial scale is a unique case if compared to other BISAs in Uzbekistan [53].

Therefore, despite this spatial reconfiguration of sub-departments, driven by province bureaucracies and in contrast with national criteria, the Zeravshan BISA draft was accepted by the MAWR. Several explanations are possible to explain this complex and controversial process. First, personal relations could have played a relevant role. In 2003, as also highlighted by Wegerich [55], the brother of the head of the Samarkand Province Water Department was the state advisor to agricultural issues of the president. This personal relationship could have prepared the ground for the MAWR's acceptance of the draft that was prepared by the Samarkand Water Province Department, as hypothesized by an interviewed key informant in Samarkand. Second, this privileged position seems to be rooted in the Soviet institutional socio-political and economic power relations. Jones Luong [64] argues that the governors of the Uzbek provinces where the largest quantities of cotton are produced have held a prominent and powerful role in negotiating water policies and reforms implementation with national authorities since Soviet times. Due to its agricultural characteristics, this was the case in the Samarkand province. Therefore, this province could be in a privileged position to negotiate power dynamics, strategies, and practices regarding water governance rescaling process in the Middle Zeravshan waterscape.

In this section, we showed that the IWRM inspired water governance rescaling process and related shift from administrative to hydrographic units in the Middle Zeravshan waterscape entailed marginal technical and administrative changes, while it was significantly driven by political interests and asymmetric power constellations. Moreover, the evidence from both field-research and the literature analyzed enables us to demonstrate that these rescaling processes are embedded in the waterscape through a complex history of water governance and contentious relations that dates back at least to the Soviet period.

6. Discussion and Conclusions

In this paper, we discussed politics of scale and water governance rescaling processes oriented towards IWRM in Uzbekistan. Our analysis on water governance spatial units began with and centered on the shift from administrative to hydrographic units, the spatial scales supported by IWRM. We argue, in conflict with the IWRM depoliticized rationale, that redrawing unit and boundaries for water governance is not a merely technical and administrative process, but results in complex and conflicting multi-scalar rescaling processes. Following Swyngedouw [26], Budds and Hinojosa [28] and other scholars, we applied the notion of waterscape to the Middle Zeravshan valley in order to highlight the complex socio-political and power transformations which have shaped this territory, as well as recent rescaling processes.

To the aim of analyzing these processes, we explored the implementation politics of IWRM in Uzbekistan by focusing on the national level rescaling process towards hydrographic units. With the support of bilateral and international development organizations, Uzbekistan has introduced water reforms towards IWRM since the 2000s. However, at the national level IWRM has so far not been

formalized through the issue of a new water code, despite discussions of a new regulatory framework by national authorities have been carried out for many years. With regard to the basin level water governance reconfigurations that are inspired by IWRM, we suggest that the initiative of redrawing all administrative water governance units in the country was of strong interest of the MAWR. This agency sought to consolidate its position and powerful role as a political actor of the central government by decreasing its dependency on province governments, their hydraulic bureaucracies, and their potential conflicting visions. It is hypothesized that the reconfiguration of administrative water units would have been a strategy of the MAWR to weaken provincial government actors since the new BISAs, based on hydrographic units, no longer matched the areas, thus, the provinces of their political influence. However, the attempt to recentralize water governance was met with resistance by actors at province levels. Moreover, the strategy enabled the understanding of uneven power relations between provincial governments, but also between provinces and the central government. These power relations have their own history in Soviet and post-Soviet water governance authorities, institutions, and irrigation schemes. Therefore, it emerges that only five of the originally planned water basin organizations inspired by the hydrographic principle were implemented. As the case study of the Middle Zeravshan waterscape demonstrated, local power dynamics, a historically strong position of the Samarkand province to negotiate its interests, and, possibly, personal relations to the top government officials at national level, enabled a water governance rescaling process towards the hydrographic unit. At the same time, these dynamics also enabled hydraulic bureaucracies to retain power control based on administrative boundaries, since members of the Samarkand Province Water Department drove the rescaling process.

By contributing to debates on politics of scale and rescaling processes, the evidence from the Middle Zeravshan waterscape enables the understanding of how these controversial and conflicting processes are rooted in the heterogeneous multi-scalar power relations that have developed through water governance since the Soviet period. Power relations in Uzbekistan emerge as heterogeneous and multi-scalar since they are deeply interlinked between the national, province and district levels. Moreover, the evidence demonstrates how the shift from administrative to hydrographic units had on the one hand served national authorities to consolidate their role and to recentralize water governance, which is in contradiction with the rationale of IWRM and international organizations. On the other hand it helped province hydraulic bureaucracies to renegotiate their power and try to preserve their interests. We therefore argue that the water governance rescaling process oriented towards IWRM principles has to be understood in the framework of the still ongoing post-Soviet bureaucratic reconfiguration processes and conflicting and asymmetric power relations which emerge from state decentralization. The evidence from Uzbekistan and the Middle Zeravshan waterscape furthers the work of Neumann [29], who emphasizes the need to analyze scalar practices of actors and inquire uneven power relations, since it highlights the relevancy of multi-scalar interlinked relations in rescaling processes. In parallel, the evidence strengthens also the argument of Brown and Purcell [33], who state that rescaling processes are strategies used by powerful actors to pursue specific political projects that entail socio-political and spatial transformations. Indeed, the case of Uzbekistan and the Middle Zeravshan waterscape enable the understanding that IWRM was used by both national authorities and province hydraulic bureaucracies to pursue specific political projects through rescaling processes. While contributions from critical geographers and political ecologists highlighted the political nature of rescaling processes, in contrast, these processes and their political implications, have not been considered by practitioners who analyzed IWRM and its implementation [1,13].

In the beginning of this paper we initiated our reflection on the IWRM rationale and hydrographic units in water governance by arguing that the neglect of political dynamics and power relations results in the misleading understanding of hydrographic spatial scales as natural units of a water system. We also highlighted that the IWRM rationale depoliticized and hid the strategic role of politics and power in water governance. By adopting the analytical framework of the politics of scale and the notion of waterscape, our analysis contributed to the understanding that waterscapes and hydrographic units

are socially constructed and politically contested, and they have their own histories shaped by complex and conflicting social and power relations. Moreover, by exploring the case of Uzbekistan and the Middle Zeravshan waterscape together with IWRM, our analysis contributed to the understanding of the multi-scalar dimension, and the related conflicting relations, in rescaling processes and of their adoption as strategies to pursue specific political objectives. Therefore, both the implementation and the analysis of water reforms towards IWRM, which has to be considered as a process at the interface of water, power, and technology, must take this perspective into account and give due attention to rescaling processes in water governance.

Acknowledgments: Field-research was funded by the University of Fribourg and the University of Verona. The University of Fribourg also funded the costs to publish in open access.

Author Contributions: Andrea Zinzani designed Sections 3–5, while Christine Bichsel wrote Section 2. Sections 1 and 6 were designed by both authors.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A.

Dublin principles have been designed during the ICWE to guide the conceptual development of IWRM (ICWE, 1992; 1):

- 1—Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
- 2—Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.
- 3—Women play a central part in the provision, management and safeguarding of water.
- 4—Water has an economic value in all its competing uses and should be recognized as an economic good.

Appendix B.

Actors interviewed were selected depending on their role and functions in their institutions. However, due to the relevant and contested political nature of the topic, only some of the actors were available for interviews and discussions. With regard to BISA and Dargom ISA, a former member, a hydro-technician and a policy-maker were interviewed, while concerning the Urgut Water Users Association, the head, the accountant and a water master. With regard to institutes of the Academy of Sciences, the GIZ and the IWMI, key informants and experts were interviewed. In total, 15 actors were interviewed.

Appendix C.

The concept of waterscape has increasingly emerged over the last decade in research that discusses the interactions between water, power, technology and socio-political dynamics [24,28,29]. Waterscapes are not merely territories within water flows; they comprise the assemblage of a wide range of water infrastructure, institutions and authorities, everyday formal and informal practices, political discourses, and narratives which produce, and are produced by, power dynamics. Hereinafter we will use this concept to refer to Middle Zeravshan valley and its water system.

Appendix D.

Despite the IWRM promoted shift to hydrographic principles in water governance, examples of river basin organizations have been established already during the Soviet Union. In the Uzbek SSR, the Zeravshan Basin Authority (which was based on the Middle and the Low Zeravshan waterscape) existed from the 1930s until the 1970s, when the Amu-Bukhara irrigation system was constructed [63]. However, it seemed to be a special case. In other basins water was managed on administrative

principles by *Oblastvodkhoz*. At the Soviet inter-republican level, Basin Water Organizations for Amu-Darja and Syr-Darja were created in 1984, and then reformed in 1992 under the ICWC international framework.

Appendix E.

This paper focuses only on the first level of intervention of the “Program of Measures on Improvement of Irrigated Lands for 2001–2010”. Therefore, for the analysis of the second level we suggest to read literature cited in the text.

References

1. Global Water Partnership. *A Handbook for Integrated Water Resources Management in Basins*; Elanders: Mölnlycke, Sweden, 2009.
2. Allouche, J. The birth and spread of IWRM—A case study of global policy diffusion and translation. *Water Altern.* **2016**, *9*, 412–433.
3. Molle, F. River-basin planning and management: The social life of a concept. *Geoforum* **2009**, *40*, 484–494. [[CrossRef](#)]
4. Biswas, A.K. Integrated Water resources management: Is it working? *Water Resour. Dev.* **2008**, *24*, 5–22. [[CrossRef](#)]
5. Mehta, L.; Movik, S.; Bolding, A.; Derman, B.; Manzungu, E. Introduction to the Special Issue: Flows and practices—The politics of Integrated Water Resources Management (IWRM) in southern Africa. *Water Altern.* **2016**, *9*, 389–411.
6. Allan, T. *IWRM/IWRAM: A New Sanctioned Discourse?* SOAS/King’s College University: London, UK, 2003; pp. 1–27.
7. Merrey, D.J.; Drechsel, F.P.; Penning de Vries, W.T.; Sally, H. Integrating “livelihoods” into integrated water resources management: Taking the integration paradigm to its logical next step for developing countries. *Reg. Environ. Chang.* **2005**, *5*, 197–204. [[CrossRef](#)]
8. Zinzani, A. *The Logics of Water Policies in Central Asia: The IWRM Implementation in Uzbekistan and Kazakhstan*; LIT Verlag—Series Geographie: Zurich, Switzerland; Berlin, Germany, 2015.
9. Molle, F.; Mollinga, P.; Wester, P. Hydraulic bureaucracies and the hydraulic mission: Flows of water, flows of power. *Water Altern.* **2009**, *2*, 328–349.
10. Bolding, A.; Alba, R. Viewpoint—IWRM and I: A reflexive travelogue of the Flows and Practices research team. *Water Altern.* **2016**, *9*, 662–678.
11. Bichsel, C. *Conflicts Transformation in Central Asia: Irrigation Disputes in the Fergana Valley*; Routledge: London, UK; New York, NY, USA, 2009.
12. Dukhovny, V.; De Schutter, J. *Water in Central Asia: Past, Present and Future*; CRC Press: Boca Raton, FL, USA, 2011.
13. Solanes, M.; Gonzalez Villareal, F. The Dublin Principles for water as reflected in a comparative assessment of institutional and legal arrangements for integrated water resources management. *GWP TAC Backgr. Pap.* **1999**, *3*, 1–48.
14. Mollinga, P. Water, Politics and development: Framing a political sociology of water resources management. *Water Altern.* **2008**, *1*, 7–23.
15. Ersten, M. The development of irrigation design schools or how history structures human action. *Irrig. Drain.* **2007**, *56*, 1–19. [[CrossRef](#)]
16. Graefe, O. River basins as new environmental regions? The depolitization of water management. *Procedia Soc. Behav. Sci.* **2011**, *14*, 24–27. [[CrossRef](#)]
17. Bourblanc, M.; Blanchon, D. The challenges of rescaling South African water resources management: Catchment management agencies and interbasin transfer. *J. Hydrol.* **2014**, *519*, 2381–2391. [[CrossRef](#)]
18. Uphoff, N.; Ramamurthy, P.; Steiner, R. *Managing Irrigation: Analyzing and Improving the Performance of Bureaucracies*; Sage Publications: New Dehli, India, 1991.
19. Moss, T. Solving problems of ‘Fit’ at the expense of problems of ‘Interplay’? The spatial reorganisation of water management following the EU water framework directive. In *How Institutions Change. Perspectives on Social Learning in Global and Local Environmental Contexts*; Breit, H., Engels, A., Moss, T., Troja, M., Eds.; Leske + Budrich: Opladen, Leverkusen, 2003; pp. 85–97.
20. Warner, J.; Wester, P.; Bolding, P. Going with the flow: River basins as the natural units for water management? *Water Policy* **2008**, *10*, 121–138. [[CrossRef](#)]

21. Obertreis, J.; Moss, T.; Mollinga, P.; Bichsel, C. Water, Infrastructure and political rule: Introduction to the special issue. *Water Altern.* **2016**, *9*, 168–181.
22. Bichsel, C. Water and the (infra-)structure of political rule. A synthesis. *Water Altern.* **2016**, *9*, 356–372.
23. Swyngedouw, E. Exploring human geography—A reader. *Trans. Inst. Br. Geogr.* **1997**, *22*, 237–254.
24. Swyngedouw, E. *Social Power and the Urbanization of Water*; Oxford University Press: Oxford, UK, 2004.
25. Bakker, K. A political ecology of water privatization. *Stud. Pol. Econ.* **2003**, *70*, 35–58. [[CrossRef](#)]
26. Swyngedouw, E. *Place, Nature and the Question of Scale: Interrogating the Production of Nature*; BBAW: Berlin, Germany, 2010; Volume 5, pp. 1–28.
27. Loftus, A. Rethinking political ecology of water. *Third World Q.* **2009**, *30*, 953–968. [[CrossRef](#)]
28. Budds, J.; Hinojosa, L. Restructuring and rescaling water governance in mining contexts: The coproduction of waterscapes in Peru. *Water Altern.* **2012**, *5*, 119–137.
29. Neumann, R. Political ecology: Theorizing scale. *Progr. Hum. Geogr.* **2009**, *33*, 398–406. [[CrossRef](#)]
30. Brenner, N. The limits to scale? Methodological reflections on scalar construction. *Progr. Hum. Geogr.* **2001**, *25*, 591–616. [[CrossRef](#)]
31. Agnew, J.A.; Mamadouh, V.; Secor, A.; Sharp, J. *The Wiley Blackwell Companion to Political Geography*; Wiley & Sons: Oxford, UK, 2015; pp. 26–34.
32. Cohen, A.; Bakker, K. The eco-scalar fix: Rescaling environmental governance and the politics of ecological boundaries in Alberta, Canada. *Environ. Plan. D Soc. Space* **2014**, *32*, 128–146. [[CrossRef](#)]
33. Brown, J.C.; Purcell, M. There's nothing inherent about scale: Political ecology, the local trap, and the politics of development in the Brazilian Amazon. *Geoforum* **2009**, *36*, 607–624. [[CrossRef](#)]
34. Marston, S. The social construction of scale. *Progr. Hum. Geogr.* **2000**, *24*, 219–242. [[CrossRef](#)]
35. Smith, N. Geography, difference and the politics of scale. In *Postmodernism and the Social Sciences*; Doherty, J., Graham, E., Eds.; Macmillan: London, UK, 1992; pp. 57–79.
36. Zinzani, A.; Menga, F. The circle of hydro-hegemony between riparian states, development policies and borderlands: Evidence from the Talas Waterscape (Kyrgyzstan, Kazakhstan). *Geoforum* **2017**, *85*, 112–121. [[CrossRef](#)]
37. Norman, E.; Bakker, K. Transgressing scale: Water governance across the Canada-U.S. Borderland. *Ann. Assoc. Am. Geogr.* **2009**, *99*, 99–117. [[CrossRef](#)]
38. Harris, L.M.; Alatout, M. Negotiating hydro-scales, forging states: Comparison of the Upper Tigris/Euphrates and Jordan River Basins. *Polit. Geogr.* **2010**, *29*, 148–156. [[CrossRef](#)]
39. Molle, F.; Mamanpoush, A. Scale, governance and the management of river basins: A case study from Central Iran. *Geoforum* **2012**, *43*, 285–294. [[CrossRef](#)]
40. Cohen, A.; Davidson, S. The watershed approach: Challenges, antecedents, and the transition from technical tool to governance unit. *Water Altern.* **2011**, *4*, 1–14.
41. Budds, J.; Sultana, F. Editorial: Exploring political ecologies of water & development. *Environ. Plan. D Soc. Space* **2013**, *31*, 275–279.
42. Aminova, M.; Abdullaev, I. Water management in a state-centered environment: Water governance analysis of Uzbekistan. *Sustainability* **2009**, *1*, 1240–1265. [[CrossRef](#)]
43. Wegerich, K. "Handing over the Sunset"—External Factors Influencing the Establishment of Water Users Associations in Uzbekistan: Evidences from Khorezm Province. Ph.D. Thesis, Humboldt University, Berlin, Germany, 2006. Unpublished.
44. Trevisani, T. After the kolchoz: Rural elites in competition. *Cent. Asian Surv.* **2007**, *26*, 85–104. [[CrossRef](#)]
45. Sehring, J. Irrigation reforms in Kirghizstan and Tajikistan. *Irrig. Drain. Syst.* **2007**, *21*, 277–299. [[CrossRef](#)]
46. Academy of Sciences and IWMI; Tashkent, Uzbekistan. Personal Communication, 2011.
47. Wegerich, K. Shifting to hydrological boundaries—The politics of implementation in the lower Amu-Darja basin. *Phys. Chem. Earth* **2009**, *34*, 279–288. [[CrossRef](#)]
48. Abdullaev, I.; Mollinga, P. The socio-technical aspects of water management: Emerging trends at grass roots level in Uzbekistan. *Water* **2010**, *2*, 85–100. [[CrossRef](#)]
49. Yalcin, R.; Mollinga, P. *Water Users Associations in Uzbekistan. The Introduction of a New Institutional Arrangement in Local Water Management; Amu-Darja Case Study, Uzbekistan*; NeWater Project; University of Bonn: Bonn, Germany, 2007.
50. Veldwisch, G.J. Changing patterns of water distribution under the influence of land reforms and simultaneous WUA establishment. *Irrig. Drain. Syst.* **2007**, *21*, 265–276. [[CrossRef](#)]

51. International Water Management Institute (IWMI). *Review of WCA Development in Uzbekistan*; Unpublished NBT report; IWMI: Battaramulla, Sri Lanka, 2012.
52. Veldvisch, G.J.; Mollinga, P. Lost in transition? The introduction of water users associations in Uzbekistan. *Water Intern.* **2013**, *38*, 758–773. [[CrossRef](#)]
53. Zinzani, A. Hydraulic bureaucracies and irrigation management transfer in Uzbekistan: The case of the Samarkand Province. *Water Res. Dev.* **2016**, *32*, 232–246. [[CrossRef](#)]
54. Zeravshan BISA; Samarkand, Uzbekistan. Personal Communication, 2011 and 2012.
55. Wegerich, K. Shifting to hydrological/hydrographic boundaries: A comparative assessment of national policy implementation in the Zeravshan and Fergana valleys. *Water Res. Dev.* **2015**, *31*, 88–105. [[CrossRef](#)]
56. Key Informants; Tashkent and Samarkand. Personal Communication, 2011.
57. Bensidoun, S. *Samarcande et la Vallée du Zeravchan*; Anthropos: Paris, France, 1979.
58. Benjaminovic, R.; Terzinskiy, P. *Irrigatzia Uzbekistana (Irrigation in Uzbekistan)*; Nedatelstvo Fan: Tashkent, Uzbekistan, 1975.
59. Bichsel, C. The drought does not cause fear'. Irrigation history in Central Asia through James C. Scott's lenses. *Revue D'études Comparatives Est-Ouest (RECEO)* **2012**, *44*, 73–108. [[CrossRef](#)]
60. Academy of Sciences; Tashkent, Uzbekistan. Personal Communication, 2011.
61. Kadirov, A.A. *From Historical Water Dividing Bridges in Zeravshan River up to IWRM*; Global Water Partnership Central Asia and Caucasus: Tashkent, Uzbekistan, 2007.
62. Abdullaev, I.; Rakhmatullaev, S. Transformation of water management in Central Asia: From state-centric, hydraulic mission to socio-political control. *Environ. Earth Sci.* **2015**, *73*, 849–861. [[CrossRef](#)]
63. Urgut WUA; Urgut, Samarkand Province and Uzbekistan. Personal Communication, 2012.
64. Jones Luong, P. *Institutional Change and Political Continuity in Post-Soviet Central Asia*; Cambridge University Press: Cambridge, UK, 2002.



© 2018 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).