
TRANSFORMATION IN COMMON-POOL RESOURCES MANAGEMENT IN CENTRAL ASIA

How Can Intentionality and Path Dependence Explain Change in Water-Management Institutions in Uzbekistan?

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We review historical and contemporary literature on change in water-management institutions in post-socialist Uzbekistan, exploring the dynamics of change of formal institutions in irrigation-water management there by analyzing relationships between the perceptions and beliefs of policymakers, policy interventions they undertake, and the consequences that these seem to have on resource-use practices. We have mainly relied on the reviewed literature, but have also made use of expert interviews conducted by the authors during 2011–2016 in Uzbekistan. Our results indicate that Uzbek policymakers have learned much from the unanticipated and undesired consequences of earlier irrigation reforms, as their perceptions and beliefs have changed and developed over time. Yet, although policymakers' beliefs have been fostered by a newly emergent Integrated Water Resources Management approach – which has become a central, globally promoted paradigm – the beliefs and institutions inherited from the Soviet era, as well as informal practices in irrigation-water use, have also been acting to constrain the choices of politicians and economic entrepreneurs.

Keywords: Institutional change; intentionality; path dependence; water use; water consumers association

I. Introduction

During the past century, expansion of irrigated agricultural areas was a key component of nation-building processes in Soviet Central Asia (Abdullaev and Rakhmatullaev 2015) and, in recent decades, international donor agencies have been heavily investing in supporting the now-independent countries in the region to modernize their large-scale irrigation facilities and make water use and management more efficient (Moss and Hamidov 2016). There is, however, a critical discussion in the contemporary literature on water management in Central Asia about the role of shared visions and path dependence (Van Assche et al. 2014) in shaping the potential outcomes of these reforms. Some authors agree that Soviets patterns of behavior (i.e. old mental models) still dominate Central Asian nations, creating obstacles to successful reform implementation (Sehring 2009a; Abdullaev and Rakhmatullaev 2015), and that new forms of local organization created under decentralization reforms have now become “lost in transition” (Veldwisch and Mollinga 2013). Our study seeks to contribute to this discussion.

To understand the dynamics of ongoing institutional change in irrigation management in post-Soviet Central Asia, we propose that examining Uzbekistan's experience is crucial, as the country's annual

water withdrawal for agriculture is key for establishing sustainable water management in the whole region.¹

Our analysis of the nature of Uzbek policy development and implementation in irrigation-water use is aided by the cognitive interpretation of institutional change set forth by North (2005), who underlines the importance of examining relationships between belief systems, path dependence and institutional development. Further, he holds that institutional change can be conceptualized as an evolutionary process: institutions are designed by policymakers based on their beliefs and, as policymakers face changes in the external environment or unanticipated or undesired consequences, they may adapt and modify institutions to improve their competitive positions. At the same time, however, their choices are constrained by (i) path dependence within certain institutional frameworks, as well as (ii) their own belief structures (North 2005).

The objective of the present study is to explore the dynamics of change of formal institutions in Uzbek irrigation-water management during the post-Soviet period by analyzing relationships between perceptions and beliefs of policymakers, policy interventions they undertake, and consequences that these seem to have on resource-use practices. We seek here to reveal the gap that generally exists between the intentions and outcomes of water-use policies in Uzbekistan, while also highlighting the shared beliefs that dominated the policy making process in water management and how they became institutionalized, the learning process that policymakers have gone through and demonstrating how these beliefs and institutions have been constrained by path dependence.

This article is structured as follows: first, we discuss the concept of institutions, institutional change and the role of cognitive schemata, based primarily on North (2005). Second, we briefly review Uzbek irrigation-water management institutions during the Soviet eras, and outline the reforms of the post-Soviet period, focusing on how Uzbek policymakers have perceived reality, what their beliefs have been, and what formal institutions they have introduced. Policymakers here are considered to be Uzbek politicians, international experts, members of parliament, and representatives of state and international organizations who have been heavily involved in the design and implementation of reforms in Uzbekistan. We note here that strong involvement of international organizations in Uzbekistan was possible because the reform was technically and financially supported by international development agencies, such as the World Bank (WB), Asian Development Bank (ADB), German Agency for International Cooperation (GIZ) and United States Agency for International Development (USAID). Due to the nature of this decentralization reform, in many cases, the international experts and advisers recruited by these organizations were working together with local non-governmental organizations and municipalities regarding awareness building among water users and capacity building of newly created grassroots organizations. By all accounts, such policymakers are not a homogenous group with similar perceptions, experiences and beliefs. Nonetheless, in our view, certain normative/ideological beliefs were shared and dominated the discourse regarding irrigation-water management, which is what this study seeks to investigate. Third, we consider how the perceptions and beliefs of policymakers have changed, how policymakers have modified institutions, and the consequences of these changes on resource-use practices. Finally, our findings are interpreted within the context of seeking to understand ongoing formal institutional change in irrigation-water management in Uzbekistan.

2. Conceptualizing the intentionality and path dependence of institutional change

To begin, we need to clarify what will be meant by institutions here. Two principal conceptualizations from economic theories on institutions can be identified in the literature: “institutions as (external) rules versus institutions as repositories of shared beliefs (about each other’s behavior)” (Brousseau et al. 2011, 10). The first of these concepts can be attributed to North (1990), who defines institutions as the rules of the game, as constraints imposed on human interaction. He differentiates between formal rules (constitutions, statute law, common law and regulations) and informal constraints and rules (conventions, norms and self-enforced codes of conduct) and their enforcement characteristics (North 1990). The alternative perspective here is an understanding of institutions as “the endogenously derived “play of the game” or strategies created when agents repeatedly interact in a particular situation” (Brousseau et al. 2011, 10). While Sugden (1989) emphasizes regularity of behavior, Aoki (2005, 2010) defines institutions as the “self-sustaining, salient patterns of social interactions, as represented by meaningful rules that every agent knows and incorporated as agents’ shared beliefs about the ways how the game is to be played” (Aoki 2005, 7).

¹ Uzbekistan annually uses about 50.4 km³ of water for agriculture, compared to 26.3 km³ in Turkmenistan, 14 km³ in Kazakhstan, 10.4 km³ in Tajikistan, and 7.4 km³ in Kyrgyzstan (FAO 2013).

North was not, however, only concerned with exogenous institutions. In his later work, he developed views about the intentionality of institutional change and development of endogenous institutions, underlining the importance of examining relationships between human beliefs and institutions. In this vein, he proposed that “belief systems embody the internal representation of the human landscape. Institutions are structures that humans impose on that landscape in order to produce the desired outcome. Belief systems therefore are the internal representation and the institutions are the external manifestation of that representation” (2005, 49). In North’s view, co-evolution of beliefs and institutions is a gradual process, constrained by history and differing across time and space (Aoki 2010). This conceptualization of the intentionality of institutional change relies on a series of ideas: (1) humans construct beliefs to model reality – how it works and how it should work; (2) over time, the dominant beliefs of politicians and economic entrepreneurs become embedded in institutions and shape the economic and political performance of societies; (3) existing institutions constrain the choices of policymakers when they seek to redesign and change them; and (4) institutional change occurs relatively continuously, as the perceptions of reality held by politicians and economic entrepreneurs change and they redesign and implement policies to improve their competitive positions (North 2005).

In order to illustrate the intentionality of institutional change and the nature of evolutionary mechanisms in a “trial and error process”, North refers to the experience of the Soviet Union in a way that is relevant for our study:

This story of the Soviet Union is a story of perceived reality → beliefs → institutions → policies → altered perceived reality and so on. The keys to the story are the ways beliefs are altered by feedback from changed perceived reality as a consequence of the policies enacted, the adaptive efficiency of the institutional matrix – how responsive it is to alteration when outcomes deviate from intentions – and the limitations of changes in the formal rules as correctives to perceived failures. (North 2005, 146)

As we will show below, all of these factors are essential for understanding the development of water-management institutions in Uzbekistan. Here we apply North’s concept of intentionality by exploring the following two research questions:

- What perceptions have shaped the beliefs of Uzbek policymakers, and how have these beliefs been institutionalized during the post-Soviet era?
- How have such perceptions, beliefs and institutions been both constrained by the path dependence of old institutional frameworks as well as eventually changed by responses to emergent problems and undesired consequences?

This paper is based on empirical data collected during 2011–2016, when we analyzed formal documents and conducted expert interviews and focus group discussions at the national, provincial/district, and local levels. We interviewed 19 representatives from 15 organizations situated in Uzbekistan’s capital, Tashkent, and Bukhara province, who were involved in the country’s irrigation-management reform process. Moreover, a roundtable discussion among policymakers and Uzbek and international experts took place in May 2015 in Tashkent, the protocol of which was analyzed to understand participants’ perceptions and shared beliefs about the impacts of irrigation-management reforms.

3. Irrigation management institutions during the colonial period and the Soviet era

In the second half of the 19th century, the Central Asian nations, at that time called Turkistan, became part of the Russian empire. Russian rulers introduced colonial administration and attempted to change water-related institutions at the regional level. For instance, in 1877, the Turkestan Governor-General issued Provisional Regulations for the Irrigation of Turkestan and established the post of Regional Irrigator for the management of major irrigation canals in the region. According to Dingelstedt (1893), however, these regulations actually led to confusion, because it was considered a remarkable attempt “at one and the same time to retain the usual order and subordinate it to” colonial administration structures. These new “rules” generated so much discontent among the population that the newly appointed Governor-General Chernyaev canceled the “provisional regulations”, abolished the post of Regional Irrigator and restored the “well-trying and harmless, old regular order”, which operated until 1886, when the new Regulations on the

Administration of Turkestan were issued (Bedrintsev and Korzhavin 1975). This document provided rules for irrigation infrastructure management and stipulated the expected contributions of the population for repaying in kind and/or in cash for canal repairs and adjustments, cleaning of canals and networks from sediment and keeping the system in working condition.

During the colonial period, the organization of water management at the local level remained almost unchanged, carried out according to informal traditional rules. A notable example is the *khashar* rules, which coordinated cooperation in collectively constructing, repairing, and cleaning irrigation canals and related infrastructure. Rural people were obliged to work in the field to organize infrastructure work and divert flows from rivers into canals. Hundreds of farmers would, for example, walk for tens of kilometers from villages to reach the head of a canal, carrying building materials in their hands (twigs, straw, reeds, and rocks). Already at that time, the potential for expansion of irrigated areas to produce more cotton was being actively explored by Russian scientists (Bedrintsev and Korzhavin 1975).

During the Soviet period (1920–1991), the role of irrigated agriculture in Uzbekistan was redefined. In the initial years of the Soviet occupation, large orchards, all the main canals and irrigation facilities were nationalized and transferred to the People's Commissariat of Agriculture under the Department of Agriculture of Turkestan (Bedrintsev and Korzhavin 1975). In the farming system, collectivization of agriculture by means of establishing collective (*kolkhozes*) and state (*sovkhoses*) farms started in 1928 and, by March of that year, there were 510 *kolkhozes* and 137 *sovkhoses* with different production profiles. By the 1940s, all rural households in Uzbekistan had been organized into collective forms of agriculture (Khan and Ghai 1979) and large-scale irrigation schemes were constructed to cultivate agricultural crops (mainly cotton).

Cotton, which had already been introduced during the colonial period, was strongly expanded during the Soviet era. In an effort to achieve cotton independence, agricultural farming was predominantly linked to cotton production, which required an intensive workforce and application of irrigation water (Hamidov et al. 2015). Production plans for the established *kolkhozes* and *sovkhoses* as well as product prices were set by the state (Trevisani 2010).

As a result of the great and long-lasting efforts associated with the Soviet expansion policy, the total irrigated land area in Uzbekistan increased from 1.38 million ha in 1913 to 4.22 million ha in 1990. With the development of irrigation infrastructure, the volume of agricultural products also increased, with cotton production increasing especially rapidly. If, as estimated, the *dehkan* (peasant) farmers in Uzbekistan produced about 0.6 million tonnes of raw cotton in 1913 from 1.3 million ha of total irrigated land, then by 1972 they produced about 5.3 million tonnes of raw cotton on the 2.7 million ha of total irrigated lands – a ten-fold increase (Bedrintsev and Korzhavin 1975).

The governance structure of the late Soviet period of Uzbekistan, especially in the 1980s, was based upon a centrally administered, territorially based management principle, outlined as follows:

- Water management at the national (republican) level was carried out by the Union Republic Ministry of Melioration and Water Management, which was subordinated to the Ministry of Melioration and Water Management of the Soviet Union and Council of Ministers of the Uzbek Soviet Socialist Republic (UzSSR). It carried out the operation of irrigation and drainage systems, construction on newly irrigated lands, reconstruction of existing irrigation systems, construction of reservoirs and waterworks, maintaining facilities in working condition, and the use of underground water for irrigation.
- The Ministry implemented these tasks through their representatives at the provincial (*Oblvodkhoz*) and district (*Rayvodkhoz*) levels. They developed and approved water use plans to distribute water to the borders of water users, i.e. *kolkhozes* and *sovkhoses*. They were also in charge of maintaining irrigation systems and collector-drainage networks at the inter-farm level. Finally, they were responsible for monitoring as well as for land and soil conservation.
- Meanwhile, at the local level, water-resource management and operation and maintenance of irrigation and drainage systems were implemented by *kolkhozes* and *sovkhoses*. On average, *kolkhozes* had 2,000–4,000 ha, whereas *sovkhoses* had 5,000–8,000 ha of irrigated land. The main actual water users were field brigades, who had irrigation areas of about 150 ha within the *kolkhozes* and *sovkhoses*. Until the end of the growing season of 100–150 days – depending on a particular crop's irrigation regime – brigades received water by direct water flow and arranged irrigation to its fields. Each brigade had a brigadier, who received water in accordance with the current water use plan and then directed it to one of the brigade's irrigation fields. After finishing irrigation of the last brigade field, the following day irrigation of the brigade's first irrigation field would begin again.

For the development of cotton production, irrigation scheduling played an important role, as it attempted to ensure distribution of water between districts and water users at appropriate times (Bedrintsev and Korzhavin 1975). It should be noted, however, that intensive use of new lands led to increase of water scarcity, resulting in poor-quality irrigation water in the middle and lower reaches of the Amudarya and Syrdarya rivers. This eventually led to the shrinking of the Aral Sea and the declining environmental situation of the surrounding sea zone (Hamidov et al. 2016). Moreover, development of large-scale irrigation systems without proper drainage infrastructure resulted in environmental changes that later contributed to the rise of groundwater levels (Hamidov et al. 2007). Being in an arid zone, this phenomenon led to increased salinity – eventually affecting about 50% of irrigated lands – and reduced land productivity in Uzbekistan (Qadir et al. 2009).

By the last years of the Soviet Union, the agricultural situation in Uzbekistan had become very difficult and unsatisfactory, as many collective and state farms were unprofitable and went into bankruptcy. Furthermore, there were no funds for irrigation-system maintenance. As a result, the condition of irrigation and drainage infrastructure continued to deteriorate.

4. Analyzing the design of formal institutions and their alteration in the post-Soviet era

In this section, we analyze formal institutions associated with Uzbek irrigation management, with a focus on post-Soviet practice and the rationale behind policymakers changing the previously established institutions described in Section 3. In the process, we operationalize North's concept of intentional institutional change, drawing links between the initial irrigation reforms, their institutional outcomes, and policymakers' shared beliefs and how they were changed and institutionalized as policymakers learned and adapted in the light of gained experience. The design and change of formal institutions applied in Uzbekistan aptly illustrates the process of trial-and-error experimentation and learning. Here, we briefly outline some of the key aspects of that process.

4.1. Introduction and outcomes of cooperative farms as an initial reform measure

Following Uzbekistan's political and administrative independence in 1991, policymakers outlined a set of reforms and new formal rules for the agricultural sector, seeking to achieve food self-sufficiency for the population by increasing production volumes. They believed that, to achieve this goal, it was necessary to realize fundamental changes and implement phased reforms in agriculture. In the first stage of the agricultural reform process, *sovkhoses* were converted into *kolkhozes*. Then, gradually, depending on their financial conditions, *kolkhozes* were reorganized into *shirkats* (family-oriented agricultural cooperatives). The new formal rules on land management were introduced in 1998, including the Land Code that created the *shirkat* as the new organizational form. The Code recognized three main types of agricultural producers in Uzbekistan: traditional household plots were renamed *dehkan* farms, large-scale *kolkhozes* were classified as *shirkats*, and a new category of individual farms (*fermerskie khozyaistva*) was introduced (Lerman 2008). Subsequently, each of these organizational forms received a special law of its own in 1998: the Law on *Dehkan* Farms, the Law on Individual Farms, and the Law on *Shirkats*.

By this point, policymakers were becoming increasingly annoyed even hearing about the concept of *kolkhozes*, because they were associated with the old Soviet agricultural system that was in the process of being left behind (Ilkhamov 1998). Their shared belief was that the creation of *shirkats* would address the vacuum left by *kolkhozes* and *sovkhoses* and that these family-oriented agricultural cooperatives would make agriculture more efficient and profitable. Generally speaking, the *shirkats* had relatively similar tasks as the *kolkhozes* and *sovkhoses* that had preceded them. The key differences were that they were family-oriented and organized on a smaller scale (Ilkhamov 1998). The newly implemented formal rules outlined above were directed towards expanding the area under wheat cultivation in *shirkat* territories, to achieve self-sufficiency in wheat production. As a result, total wheat cultivation area was increased by more than 200% (UNECE 2001), largely at the expense of cotton production.

Nevertheless, the main outcomes of the initial phase of institutional change were very disappointing for policymakers. A key problem here seems to be that, as was the case with *kolkhozes* and *sovkhoses*, the newly formed *shirkats* were still accountable to the state, meaning a lack of investment and financial incentives for *shirkat* members. The establishment of *shirkats* did not improve the environmental situation either; as mentioned above, an estimated 50% of all irrigated lands in Uzbekistan had salinity problems by the early 21st century. Furthermore, no restructuring was undertaken in the irrigation sector to improve its dilapidated condition or functioning (Abdullaev et al. 2009). Policymakers learnt from these institutional

outcomes of the implemented land reforms and responded by changing their shared beliefs and formal institutions. The focus of these new changes was on irrigation management.

4.2. Learning and responding to the initial reforms in the light of experience

Almost a decade after the fall of the Soviet Union, Gatzweiler and Hagedorn (2001, 18) pointed out that, “when the centrally planned economies collapsed, the shared mental models [shared beliefs] which had been developed during the socialist system could no longer fulfill their tasks”. As a result, individuals and groups began seeking new knowledge and cognitive schemata to help them understand the world that had changed so much for them, and collective learning processes, along with the evolution of new shared beliefs, seem to have played an essential role in the emergence of new institutions during this transition (*ibid*). Here, we illustrate how Uzbek policymakers learned from and responded to the outcomes of the initial water-management reforms in the light of experience.

The pressing economic and environmental problems entailed by the collapse of the Soviet Union required the government to come up with immediate solutions. There had been significant deterioration of the secondary and tertiary (also called on-farm) irrigation canals, because the *kolkhozes* and *sovkhozes*, and later even the *shirkats*, could not regularly maintain them due to lack of financing (Kasymov and Hamidov 2017). Additionally, cotton policy, state dominance in decision making on agricultural land and water use, co-existence of production targets, and low procurement prices exacerbated the situation (Djanibekov et al. 2013). Policymakers responded to these and other emerging problems by designing new formal institutions combining a variety of principles and approaches. These included community-based resource management and basin management principles that were developed based on the international discourse on water management. Sehring identifies ecological, economic and political-institutional approaches from this discourse that are worth mentioning here:

The social dimension aims at equitable distribution of water usage between poor and rich people, between different economic sectors, between rural and urban needs. The environmental dimension aims at sustainable use taking into account ecological needs and water quality issues. The economic dimension aims at efficient use, thereby contributing to improved water access and sustainability. Finally, the political dimension aims at democratic empowerment of the water users in order to achieve an equitable and target oriented water management. (Sehring 2009b, 26)

These approaches were conceptualized as elements of Good Water Governance by the declaration of the 2nd World Water Forum, at The Hague in 2000, and as components of Integrated Water Resources Management (IWRM), by the Johannesburg Summit in 2003. Basic principles of IWRM are water management according to basin boundaries (instead of administrative ones), decentralization, subsidiarity, participation of all stakeholders, demand orientation, and gender equality (Black and Hall 2003, cited in Sehring 2009b).

The IWRM approach was endorsed by almost all concerned international organizations worldwide and was discussed in Uzbekistan during a series of policy dialogue workshops and meetings between Uzbek policymakers, experts, and representatives of donor agencies. As a result of these discussions, Uzbek policymakers at the national level designed new formal institutions in irrigation management that incorporated the new principles. For instance, the structure of water governance was changed in November 1996, with the Cabinet of Ministers’ Decree No. 419, which abolished the Ministry of Agriculture and the Ministry of Melioration and Water Management of Uzbekistan at the national level. These ministries had existed in the country since the late 1920s, during the early Soviet period, and were responsible for agriculture and water-related activities as two separate organizations. In 1996, in place of these organizations, a single centralized body – the Ministry of Agriculture and Water Resources (MAWR) – was established. The rationale behind this change was the assumption that a single Ministry would be more effective in management of land and water resources in a more integrated manner (e.g. better coordination and financial management).²

At the provincial and district levels, a further change in the water sector took place in 2003, with a shift from administrative, territorially based management to basin, canal-based water management principles. As a result, in place of *Oblvodkhoz* and *Rayvodkhoz*, Basin Irrigation Systems Authorities (BISA) and Irrigation Systems Authorities (ISA) were created to manage water. According to the new formal institutions, BISA and ISA are no longer responsible for reporting water-related activities to local *khakimiyats* (governor’s offices), which had been the case prior to the change (Veldwisch et al. 2012). Instead, since 2003 they have been

² However, with Decree No. 5330 on 12 February 2018, MAWR was split again into two separate organizations: the Ministry of Agriculture (MoA) and the Ministry of Water Resources (MWR).

directly reporting to the water resources department of MAWR in Tashkent, headed by a deputy minister who is responsible for water-related issues in the country (Hamidov 2015). The main responsibilities of BISAs, funded by the state, are to manage all large-scale water infrastructures, including effective use of water resources at the basin level. The main task of an ISA, for example, is to ensure timely and fair distribution of water resources to local Water Consumers Associations (WCA).³

At the local level, new formal institutions and organizations were created as well. For example, after intense discussions among policymakers, the project On-farm Irrigation Management, financed by the European Technical Assistance to the Commonwealth of Independent States (TACIS), initiated the establishment of the first WCAs in Uzbekistan, intended to replace the poorly functioning *shirkats*. These newly-formed WCAs were positioned to deliver services – water allocation and infrastructure maintenance – through introduction of their own rules and procedures. Moreover, the mission of the World Bank (2–12 June 1999) to assess progress in implementing the project Modernization of Cotton Production in Uzbekistan recommended that the irrigation component of the project needed to develop guidance on organizational and legal procedures for WCA creation. The establishment of WCAs was strongly driven by the donor community, which helped with resource mobilization and provided financial support (Djumaboev et al. 2017). During the initial stages, the Asian Development Bank, Swiss Agency for Development and Cooperation, United States Agency for International Development, and the World Bank were especially active in facilitating the creation of WCAs in Uzbekistan (Zinzani 2016). From 2000 onwards, WCAs began being established by the government of Uzbekistan as part of nationwide policy (Veldwisch and Mollinga 2013).

At the beginning of 2000, five pilot WCAs were created in the Khorezm province, established within the boundaries of liquidated collective farms. The Cabinet of Ministers' Decree No. 8, approved in 2002, is the most relevant legislation specifying WCAs as the entities responsible for irrigation management in Uzbekistan. This decree specifically identifies who water consumers are and how WCAs are to be formed. In accordance with the decree, WCAs can be established on a voluntary basis and are responsible for managing water at the on-farm level. Additionally, the revision of the national Water and Water Use law on 29 December 2009 also put some emphasis on WCAs. By 2018, about 89,700 individual farms, which are members of 1,503 WCAs, had been created (MWR 2018; **Figure 1**).



Figure 1: On-farm irrigation canal in Uzbekistan (Source: IWMI archive).

³ The Water and Water Use law of Uzbekistan was revised in December 2009 and the previously used Water Users Association (WUA) term was changed to Water Consumers Association (WCA). Distinctions between these two terms were clarified as follows: water users do not affect the actual amount of available water (e.g. fisheries and hydropower), whilst water consumers reduce the actual amount of available water (e.g. irrigation and drinking). Thus, we use the term of Water Consumers Association throughout this paper.

With the introduction of the WCAs, a new formal institution called the Irrigation Service Fee (ISF) was also introduced, in order to fund and manage them, with ISFs being paid in cash or in kind by members, rather than simple water-usage fees. The ISF, determined by each WCA through its General Assembly, can be paid on the basis of either per-hectare, per-crop cultivated or on the volume of water provided. Due to a lack of water metering devices for numerous and scattered plots, most WCAs levy ISFs on a per-hectare basis, calculated simply by dividing total expenses by the total hectares to be irrigated for a given plot (Hamidov 2015).

The main intention of the new reforms and the accompanying formal institutional changes has been to achieve more efficient, equitable and sustainable irrigation-water management by (i) organizing water management along hydrographic boundaries and (ii) devolving greater decision power to local communities, meaning here the water users themselves. One of the key assumptions behind these approaches is that management along hydrographic boundaries is essential for the sustainability of vital ecosystems. This understanding was developed over time.

Beginning in the 1960s, with the development of hydrology as a scientific discipline with its own measuring methods, water was conceptualized as a resource the scarcity of which will increase over time, with population growth and economic development. To deal with this rising scarcity, technical systems (e.g. dams, reservoirs) to control natural water resources and increase supply were seen as a key solution in the “hydraulic concept” (Allan 2003, cited in Sehring 2009b). However, during the 1980s this approach was criticized due to social and environmental consequences of large technological projects (e.g. construction of dams), including loss of biodiversity and population displacement. With the development of water-saving technologies, the main assumptions behind the hydraulic concept were further questioned. Further, during the 1990s the conceptualization of water as a scarce economic resource led to approaches looking into the demand side – the assumption was developed that giving water an economic value through pricing mechanism will create incentives for more efficient use of the resource (Allan 2003, cited in Sehring 2009b). Most importantly, during the 2000s the discourse shifted towards considering the role of governance and societal capacities in water management, as it was becoming clear that water scarcity arises not only due to physical scarcity, or lack economic mechanisms to promote more efficient water use, but also due to inadequate supportive institutions, such as policies, laws and civil society organizations (Mehta 2006).

Another key assumption on which the Uzbek reforms have been grounded is that traditional local organizations and their institutions can be successful in management of water and that local communities can take over responsibilities from the state. Policymakers worldwide have come to assume that transfer of authority to local communities may increase the efficiency of resource management by decreasing transaction costs associated with them (Ngaido and Kirk 2000), an argument relying on the efficiency view of the economic theory of institutional change. Here, institutional change is explained as being the result of contracting among economic actors (e.g. farmers, traders, and customers) and predicted to be Pareto improving.

The common-pool resources (CPR) theory has provided considerable backing for this approach, making a strong argument against Hardin’s “Tragedy of the Commons” (1968) idea by showing that local communities can successfully manage natural resources through sets of locally created rules and regulations (i.e. institutions). The theory defines a CPR as “a natural or man-made resource system that is sufficiently large as to make it costly (but not impossible) to exclude potential beneficiaries from obtaining benefits from its use” (Ostrom 1990, 30). When a given CPR (e.g. irrigation water) has a high value, but existing institutions and missing technologies (e.g. water metering) fail to properly regulate its use, this creates an open access situation, where resource users may freeride on the actions and expenditures of others, unless ways are found to reduce freeriding as an attractive strategy. In such cases, the joint users of a CPR are confronted with a classic appropriation problem: they have the incentive to individually appropriate more of the resource for their individual use, or they can choose to limit themselves by coordinating their appropriation activities with others. Contrary to Hardin’s pessimistic view of this situation, with resource users only following their own self-interest until the resource is depleted or degraded, communities that have made the latter choice of acting together have had success in sustainably managing resources for centuries, as Ostrom (1990) and her colleagues have shown.

However, the old institutional framework remaining from the (pre-)Soviet era in Uzbekistan has markedly constrained the choices of policymakers. We propose that *path dependence* can explain why some old institutions have persisted, in spite of reform programs attempting to modify or replace them, as reflected in the following examples.

First of all, at the national level, the assumptions that basin management can facilitate more sustainable use of water and that local communities can successfully take over some responsibilities from the state were promoted by external donor organizations and were only cautiously accepted by Uzbek policymakers. It seems that the drought years of 2000 and 2001 created a window of opportunity to push for the reforms (Yalcin and Mollinga 2007), and the concept of hydrological boundary management was already to some extent familiar to Uzbek policymakers and experts.⁴ Yet, although new approaches were institutionalized, they may not have actually fully reflected the shared beliefs of Uzbek policymakers. The new reforms were considered an attempt to depoliticize water distribution and improve the effectiveness of water-use planning and management, while also maintaining centralized control (Yalcin and Mollinga 2007). As a result, there developed an “ambivalent and uneasy combination of “reform” and the reproduction of centralized state control in ever new forms” (Veldwisch and Mollinga 2013, 759).

Furthermore, at the provincial level, there was resistance of powerful lower-level bureaucrats (*khakimiyat*), seeking to protect their vested interests (Wegerich 2015). Implementation of water-management reforms in Uzbekistan has been largely shaped by power struggles between the center and provinces. For instance, changing from administrative to hydrological boundaries was widely interpreted “a move of the MAWR as a whole to reduce its dependency on *khakimiyats*’ influence” (Yalcin and Mollinga 2007, 7). But some *khakimiyats* were able to resist the change and create BISAs within their provincial boundaries (Andijan, Ferghana, Namangan, Tashkent and Surkhandarya provinces). Their ability to do so was strengthened by the discretionary power given to them in interpreting national policy (Wegerich 2015).

At the local level, we observe that the new formal rules did not seem to change the shared beliefs of local government representatives or resource users at all. For instance, despite WCAs being *de jure* non-governmental farmers’ organizations, most users have believed that they are *de facto* state run (Hamidov 2015). In this vein, an interviewed representative from the Amu-Bukhara BISA reiterated that, given the fact that centralized governance had strongly dominated during and shortly after the collapse of the Soviet Union, Uzbek farmers’ views of the situation can be regarded as a perception of their dependency on the state. He also underlined that, despite WCAs having first been introduced about a decade ago, farmers in 2013 still perceived local government authorities as the body that should provide continuous support and solutions for them, instead of themselves. This is generally consistent with findings from Oberkircher and Hornidge (2011), who propose that farmer behavior is still trapped in the old Soviet command style, where local governments played a significant role in managing irrigation systems.

An interview conducted with a representative of the World Bank in Uzbekistan in 2011 also reaffirmed⁵ that Uzbek policymakers as well as farmers have been bound by a mentality that may require years or decades so as to change their perceptions and understanding of the irrigation system. He provided an example of Western irrigated agriculture systems where, unless farmers pay for water services to the resource provider, they may not have access to water in due time and in the required amounts. Meanwhile, institutions in Uzbekistan are structured in such a way that Uzbek farmers may receive full support from WCAs (e.g. out of respect or with in-kind aid) in spite of their making no contributions to any collective action supporting the WCAs.

During a roundtable with Uzbek policymakers and experts, organized by the research project Institutional Development in Central Asia (InDeCA) in 2015, it was stressed that continued discrepancy between formal rules seeking to institutionalize new approaches and informal practices reflecting actual actor beliefs may lead to high degrees of uncertainty that are likely to limit positive policy impacts (**Figure 2**).

Last but not least, the recent splitting of the Uzbek Ministry of Agriculture and Water Resources into the Ministry of Agriculture and the Ministry of Water Resources can slow down the process of system improvement. Within the new structure, the role of ISAs has been weakened and, instead, the role of district-level irrigation system departments (*Rayvodkhoz*) has been re-strengthened. An international expert⁶ has recently argued that the Ministry of Water Resources is, *de facto*, an irrigation-oriented organization, and the current restructuring is really only for the sake of “cosmetics”. **Table 1** summarizes the dynamics of water management reform in Uzbekistan, changes of shared beliefs of policymakers, and the path-dependence problems we have identified.

⁴ For instance, management of the Zerafshan basin had already been organized irrespective of the administrative boundaries of the constituent Union Republics during the Soviet era (Olsson et al. 2010).

⁵ Personal communication with World Bank expert, Tashkent, 15 December 2011.

⁶ Personal communication with an expert of the United Nations Development Programme (UNDP) in Uzbekistan (7 November 2018, Tashkent).



Figure 2: Policymakers and Uzbek and international experts exchange experiences and ideas on irrigation reforms at a roundtable discussion in Uzbekistan in 2015 (Source: InDeCA project archive).

Table 1: Water management reforms in Uzbekistan, as shaped by new shared beliefs and path dependence.

Reforms	Institutions and organizations in water management at different levels	Change of governance	Shared beliefs of policymakers	Path dependence
Late Soviet period (1970–1990)	<ul style="list-style-type: none"> • Union Republic Ministry of Melioration and Water Management • <i>Oblvodkhoz</i> and <i>Rayvodkhoz</i> • <i>Kolkhoz</i> and <i>sovkhoz</i> 	Administrative, territorially based management principles	Advantages of large-scale collective and state farms (technological advancements; public good provision and equitability in resource distribution)	State domination of land and water use remained
Early post-Soviet reforms (1991–1996)	<ul style="list-style-type: none"> • Ministry of Melioration and Water Management • <i>Oblvodkhoz</i> and <i>Rayvodkhoz</i> • <i>Shirkat</i> 	Administrative, territorially based management principles, dissolving <i>kolkhozes</i> and <i>sovkhozes</i> , and creating <i>shirkats</i>	Small-scale family-oriented <i>shirkats</i> would make agriculture more efficient and profitable	State domination of land and water use remained
Latest reforms (since 1996)	<ul style="list-style-type: none"> • MAWR • BISA, ISA, and <i>Rayvodkhoz</i> • WCA 	Shift to river basin canal-based principles and some responsibilities to local level. Creation of MAWR, BISA, ISA, and WCA	<ul style="list-style-type: none"> • Basin management would assure more sustainable water use • Shifting some responsibilities to grassroots organizations would increase water efficiency 	<ul style="list-style-type: none"> • Resistance from lower-level bureaucrats • WCAs are still not fully independent

5. Discussion and conclusions

This study has sought to present an overview of the dynamics of institutional change in irrigation-water management in modern Uzbekistan during its different periods of transition. To answer questions regarding the shared beliefs that dominated policymaking processes in water management there and how they were institutionalized, as well as how these beliefs and institutions were constrained by path dependence, we have applied North's concept of intentional institutional change to explain the historical emergence of rationales behind changes of formal rules in the irrigation sector.

We suggest here that Uzbek policymakers have learned much from the unanticipated and undesired consequences of the initial irrigation reforms of the 1990s, as we have observed how their perceptions and beliefs have changed and developed over time. As noted in the Introduction section, policymakers in Uzbekistan are a very heterogeneous group. It seems that not all policymakers were convinced of, e.g. river basin management, but the beliefs of certain policymakers dominated others and got more influence on governance decisions. Furthermore, we also propose that although the new institutions were guided by a new water management approach which has become a central paradigm nowadays – promoted globally – the beliefs and institutions inherited from the Soviet era as well as informal practices in irrigation-water use have also been constraining the choices of politicians and economic entrepreneurs.

How can the experience of Uzbekistan help us to understand the possible future of irrigation management in Central Asia? Before addressing that question, let us first remind ourselves that Uzbekistan's experience is quite important for the whole region because the country is one of the main water user. Now we highlight two main lessons that we feel are worth drawing from this experience.

First, coming out of the Soviet era, during reform implementation a discrepancy emerged between the beliefs of policymakers, the new formal rules set down by the government with strong support from international development agencies, and the shared beliefs of lower-level bureaucrats and actual water users. Here, the role of informal rules, practices, power relations and asymmetric access to water resources had been underestimated in terms of their effects on societal perceptions, beliefs and formal institutions, which ended up playing a huge role in resource access and the creating of present informal rules (Hamidov 2015). Working to overcome this discrepancy by bringing policymakers, lower-level bureaucrats and water users together to develop shared beliefs – a mutual understanding of their society and its needs – will be crucial for establishing lasting irrigation-water institutions in Uzbekistan and Central Asia.

Second, the alteration of societal beliefs and formal institutions outlined in this article may shed light on the direction of future institutional change in formal institutions in Central Asia. The problematic increase in water consumption and water-related conflicts that have emerged due to the failure of initial reforms are now better recognized by policymakers and experts as important issues to be considered when designing future institutions to promote sustainable resource use.

Furthermore, modern formal institutions generally rely on the efficiency hypothesis of institutional change, which has dominated discourse among experts and policymakers worldwide and guided the design of the latest irrigation-management reforms in Uzbekistan. However, as North (2005) points out, simple economic efficiency is a static criterion, whereas institutions exist in a changing world, which suggests the importance of adopting a dynamic perspective and evaluating institutions based on their adaptive efficiency, meaning their ability to adapt to changing circumstances and develop new institutions.

Nevertheless, we suggest that our study demonstrates that Uzbek policymakers have learned and gained valuable experiences from designing and implementing post-socialist land and water reforms, although path dependence still constrains their choices. In the years to come, we hope that a new generation of Uzbek policymakers who would be more open towards institutional innovations and new perceptions will shape institutional change and improve resource management in Uzbekistan.

In order to support learning processes and institutional development in irrigation-water management in Central Asia, we further suggest a need for future studies to specifically address the question of what roles informal institutions, power relations among actors at different levels/sectors and the adaptive efficiency of institutions can play in shaping shared beliefs and designing new effective institutions in post-socialist transitions. Finally, challenges related to emerging climate-change problems associated with changing water availability and growing competition over water resources across different sectors of the economy (e.g. water–energy–food nexus) will need to be reflected upon by policymakers in designing new formal institutions in the region.

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Competing Interests

The authors have no competing interests to declare.

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