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Water Governance in Central Asia: A Luhmannian Perspective

Nodir Djanibekov[a], Kristof Van Assche[b,c,d], and Vladislav Valentinov[a]

[a]Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Halle (Saale), Germany; [b]Faculty of Extension, University of Alberta, Edmonton, Canada; [c]Center for Development Research (ZEF), University of Bonn, Bonn, Germany; [d]Strategic Communication Group, Wageningen University, Wageningen, The Netherlands

ABSTRACT

We develop a social systems theory perspective on Central Asian post-Socialist transition, placing particular emphasis on the coordination problems in transboundary water governance. The extensive Soviet water-energy infrastructure around the Amudarya and Syrdarya rivers required coordination, but this could no longer be politically secured after the 1991 Soviet disintegration. According to the social systems theory of Niklas Luhmann, coordination problems are generally endemic to any modern regime of functional differentiation. We show that each Central Asia state had to tackle substantial internal adaptation problems, which were rendered even more formidable by the need for transboundary coordination. We further demonstrate how the new riparian states offer a complex picture of several forms of differentiation, where functional differentiation is in some ways reinforced by the new national boundaries and the collapse of Soviet planning. We identify possible sources of flexibility, opening up avenues toward adaptation and enhanced coordination across boundaries.

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Introduction

The contemporary governance of water resources in the post-Soviet Central Asian countries presents a striking example of the ambivalence of the political decentralization and economic liberalization that ensued after the break-up of the Soviet Union. Water governance in Central Asia is rife with conflicts over intraregional water allocation, water control infrastructure, and acute local environmental issues related to extensive irrigation (Smith 1995). As Weinthal (2001) notes, most of these conflicts stem from the substantial interdependence among the riparian states in the allocation of regional water. While regional water resources occupy critical importance, they have diametrically opposed meanings for upstream and downstream economies (Abbink, Moller, and O'Hara 2010). Hardwired in the Soviet-designed water-energy infrastructure, this interdependence posed a challenge to the newly independent Central Asian governments, a challenge with which they were ill-prepared to deal. Their discordant national strategies of dam construction and extended irrigation presented substantial risks to the regional water, energy, and food distribution, as well as heightening political tensions (Wegerich 2008).

Geographic location, resource endowment, and how these two factors were utilized by the Soviet government to engrave the interdependence among Central Asian republics

CONTACT Nodir Djanibekov djanibekov@iamo.de Theodor-Lieser-Str. 2, 06120 Halle (Saale), Germany.
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predispose them for complementarity in a larger whole (Weinthal 2001). The upstream countries are poor in energy resources but rich in water, while downstream countries are rich in natural resources but depend on water flows from upstream countries. The Soviet plans for cotton specialization of Central Asia cemented the irrigation system as a centerpiece of integrated decision making among the five republics (Spoor and Krutov 2003). Having previously been part of a centrally administered area, the water infrastructure was introduced to even out the intra- and interannual variations in transboundary river flows (Abbink, Moller, and O'Hara 2010). The complex irrigation system thus strengthened the upstream–downstream interdependence, leading to a situation whereby it would not be functional without central hierarchical governance. In this manner, the Soviet centralized water governance, as "integrate and rule," ensured that upstream and downstream riparian states benefited from participation and compliance with the centrally set plans and orders (Wegerich 2008). Having said this, it still needs to be acknowledged that—at least in technological terms—the Soviet water–energy infrastructure, comprising 967 irrigation systems, 915 hydraulic structures, and 260 dam water-intake systems, functioned fairly well and allowed complete seasonal regulation of the river runoff (Weinthal 2002, 90). The water infrastructure brought large areas of previously uncultivated land into cultivation, albeit at the (calculated) cost of the Aral Sea. However, with the breakup of the Soviet Union, the central coordinating body (the Soviet ministry of water resources) and the regional branches (Minvodkhozi) also disappeared, leading to conflicts over transboundary and interregional water resources (Smith 1995).

Several studies have addressed the question of the economic benefits of Central Asian transboundary river basin cooperation. For instance, Teasley and McKinney (2011) found that all countries in the basin would enjoy increased benefits if they followed cooperative arrangements with additional compensation to an upstream country. However, they argue that there is noncompliance with existing treaties and the disruption of flows. In their study, Abbink, Moller, and O'Hara (2010) argue that cooperation can be difficult in current settings of water coordination, while new schemes such as payments for water releases may help to reduce the risk of cooperative agreements. In a similar vein, Bekchanov, Bhaduri, and Ringler (2015) argue that market-based water allocation can represent an alternative option to the traditional administrative allocation. Focusing on the upstream increase of water use for hydropower, Jalilov, Amer, and Ward (2013) conclude that even this evolution could benefit all parties, if the political will is there. While all such studies agree that the riparians can increase their collective benefits by working together, they fail to explain the current failure of transboundary cooperation. Accordingly, a theoretical foundation is missing.

In this article, we argue that the discourses and practices regarding water allocation in Central Asia are eminently analyzable in systems theoretical terms. In particular, the interdependence between previously regionally integrated economies and the issue of coherent decisions over water allocation can be related by systems theory in a way that sheds a light on both current conflicts and the question of sustainability. The aim of this article is to understand the Central Asian conflicts over water from the perspective of Niklas Luhmann's social systems theory. A first important insight into the issue derived from Luhmann is that these conflicts—unanticipated by policymakers and other concerned stakeholders—are inherently rooted in the regime of functional differentiation (Beckmann 2009), which has been given major impetus by the disintegration of the Soviet Union.

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Luhmann has explicitly acknowledged the role of functional differentiation in accommodating and causing the growing societal complexity, bursting the narrow bounds of the preceding differentiation regimes (segmentary, hierarchical, organizational). Functional differentiation involves the slow formation of specialized systems of communication (and associated organization), such as law, economy, politics, and science. Functional differentiation allows for society as a whole to deal with external complexity, at the expense of higher internal complexity. While we deepen the analysis in later paragraphs, here we can already indicate that functional differentiation allowed for new modes and higher complexity levels of governance, congruent with the formation of nation-states, their bureaucracies, separation of powers, and expert roles. Nonetheless, Luhmann's assessment of functional differentiation is also marked by an attitude that Brans and Rossbach (1997) aptly characterize as "governance pessimism." Functional differentiation creates new modes of observing and coordination, as well as new forms of blindness.

The problem with this differentiation regime is that the individual functional systems fail to "control interdependencies in their environment," since their specialized modes of communication do not allow them to grasp their environment from more than one angle. "The more we rely on systems for improbable performances, the more we shall produce new and surprising problems, which will stimulate the growth of new systems, which will again interrupt interdependencies, create new problems, and require new systems" (Luhmann 1990, 182). In his book *Ecological Communication*, Luhmann (1989, 138) explains this problem in terms of "system rationality increasingly los[ing] its claim to be world rationality. Guidance from internal system environments, for example, markets or public opinion, begins to dominate. To the extent that system rationality appears more realizable it becomes less world-rational and even less socially rational, but once this becomes clear one can also see that this is not a matter of an 'iron law' but rather of the costs of increasingly improbable complexity" (cf. Luhmann 2002, 89). In his theory of ecological communication, Luhmann highlighted the ecological degradation of society as a necessary consequence of the proliferation of overly narrowly focused social systems in a functionally differentiated society. The present article tests the application of this argument to the water governance problems in Central Asia.

In Luhmannian terms, the disintegration of the Soviet Union resulted in the possibility of new differentiations, whereby old hierarchies at larger scales were replaced by new hierarchies at the national and regional scale and segmentary differentiation reasserted itself. This process included a revival and reinvention of networks. Simultaneously, there was a possibility for the new states to link up with a world society in which functional differentiation had become the dominant mode of differentiation (Stichweh 2000; Hornidge, Van Assche, and Shtaltovna 2015). The Soviet Union was not much marked by it, in the sense that law, politics, and economy did not follow their own internal logic. All were supposed to be steered by politics. In each of the newly independent states, a unique mix of functional, segmentary, hierarchical, and organizational differentiation emerged. Using Luhmann's concepts, we investigate how the new variation in regimes—in mixes of differentiation—creates new risks in an environment full of traces of former unity, especially when dealing with an entangled natural–technical system such as water management. The next section provides background information and discusses why efforts to establish cross-border cooperation in Central Asia failed. The third section explains the way in which the critical dependence principle makes itself felt through the

interdependence of the water–energy infrastructure. This is followed by the exposition of how the post-Soviet Central Asian states ignore the complexity of this interdependence and associated risks, before the article concludes with reflections on how water policy in the region can be improved.

Water Coordination Barriers in Central Asia

After independence in 1991, the new Central Asian governments introduced a variety of national policies to make better use of their resources under pressure of a growing population. Formerly specialized economies tried to diversify, formerly integrated economies tried to become more self-sufficient, and former parts of a closed economy tried to benefit from a (selective) opening to world markets. In other words, each new country opted for the individual introduction of a more complex economic system. Discussing the topic of water diversion to agriculture, Weinthal (2001) argues that the nonrepresentation of this sector—the largest water consumer, yet seen as passé—at the interstate water–energy cooperation discussions hindered their success. Despite acute water allocation problems in the region, rather than taking actions to facilitate regional agricultural trade, the newly independent states opted for food self-sufficiency and import substitution programs (Spoor and Krutov 2003). In a similar fashion, the upstream countries sought new opportunities to exploit water resources to expand hydropower production for energy self-sufficiency. Consequently, downstream-irrigated areas and ecosystems suffered (Abbink, Moller, and O'Hara 2010). The new and competitive political constellation, the drive toward self-sufficiency, and internal complexity also prompted increasing control over water resources by upstream countries, the so-called "hydrological pressure" mechanism (Dukhovny and de Schutter 2011, 281).

The Interstate Commission for Water Coordination (ICWC) was established in 1992 to replace the Soviet central governance by collective decision-making and ensure water allocations for agricultural production (Weinthal 2001). Its function was primarily to advise the Central Asian governments by developing annual plans for water allocations and use for each riparian state (Wegerich 2004). Subsequently, another regional organization, the Interstate Council on the Aral Sea (ICAS), was established in 1993 to formulate policies and prepare and implement programs addressing the Aral Sea crisis. At the river-basin levels, water management was continued by two water-basin associations (BVO) within the boundaries of their former Soviet versions (Spoor and Krutov 2003). However, despite these agreements to jointly manage the transboundary water resources on an equitable, reasonable, and mutually advantageous basis, their implementation never became reality (Wegerich 2004).

One possible explanation for the failure to cooperate is the inherent coordination problem stemming from the water–energy interdependence as a Soviet legacy the riparians have been trying to dissolve (Abbink, Moller, and O'Hara 2010). An early attempt to manage this situation was through the introduction of water–energy swaps or barter agreements between the upstream and downstream countries (Spoor and Krutov 2003). While these agreements allowed balancing the energy-oriented use of water in the upstream countries against the agricultural use in the downstream countries, they lacked enforcement and dispute resolution mechanisms (Wegerich 2008; Zakhirova 2013). For instance, Horsman (2001) points out that the agreements made within the BVO system lack authority over

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the national use of resources, as they are recognized neither as international law nor by national legislatures. Moreover, the practical measures to be taken, including national laws and policies, remain abstract (Ziganshina 2012).

At the national level, the reconfigurations of rules and roles of water-related organizations according to new national priorities aggravated coordination problems. Overlapping competencies and responsibility gaps abounded (Sehring 2009). At the larger scale, these organizational reforms led to conflicting roles of previously harmonized organizations of transboundary water management. For instance, since the upstream hydropower reservoirs are under a national ministry of energy, the interstate organizations on water management had no real control over the upstream water flow anymore (Weinthal 2001). Similarly, the dissolution of the Soviet Union erased the ties between Soviet research institutes that previously linked Central Asian republics and the central government in discussions over water use, agriculture, infrastructure design, and exploitation (Pak, Wegerich, and Kazbekov 2014).

Thus, the new nation-states shifted priorities, changed organizational structures, and made the coordinated management of an essential shared resource virtually impossible. The divergence of interests between upstream and downstream countries was also apparent in different interpretations of the role of a (potentially new) water coordination consortium, whereby the upstream countries wanted more funding made available for hydropower sector development, while the downstream interests lie in the irrigation mode of the reservoirs (Dukhovny and de Schutter 2011, 296). The interstate negotiations were solely focused on water-sharing issues at an abstract level, without reference to the demands and needs of various economic sectors and actors. Consequently, the discussions remain rooted in ideological and identity discourses, hardening the differences (Weinthal 2001). By contrast, some bilateral and multilateral agreements that occurred solely within one economic sector seem to be more effective (Zakhirova 2013).

Current transboundary water coordination still requires compliance with the 1992 interstate agreement, which relies upon water use limits estimated during the Soviet times and ignores the changes in water requirements associated with changing economies and demographies (Dukhovny and de Schutter 2011, 270). Nonetheless, renegotiating this agreement proved even more difficult (Wegerich 2008). Lack of trust between the parties has undermined the regional agreements, particularly during years of water scarcity. Furthermore, climate change-induced shifts in the Central Asian river flows can introduce additional uncertainty (Bernauer and Siegfried 2012).

Luhmanns's Complexity–Sustainability Trade-Off

Law, politics, economy, and science are the main functional systems that hold relevance for water policy and water governance. According to Luhmann, each follows its own logic, based upon a unique manner of observing and interpreting the world: law sees the world as a battlefield between light and dark, legal and illegal; politics interprets it through a calculus of gaining and losing power; the economy understands it as a place of profits and loss; and science reduces reality to the distinction true/untrue. Over the course of several centuries, the functional systems have become more independent from each other and thus increasingly able to follow their own logic (Luhmann speaks of operational closure). Simplification at the level of the functional system—the internal construction of simpler

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model worlds—went hand-in-hand with an overall increase of complexity in society as a whole. The specialization of the functional systems allowed for an unburdening of each system, releasing it from the need to reconstruct the world in each aspect. Accordingly, this made it possible to produce a new internal complexity based upon prior complexity reduction (Luhmann 1995).

For society as a whole, the environment is everything that is not society, including its material and ecological environment. For each functional system, the others are also part of the environment. They might be more used to their presence than to certain materialities, although ultimately they cannot fully grasp the others' complexity and the motivations inspired by the logic of the others. Moreover, they are unable to discern the effects on the other systems and the physical environment of their own communications, policies, and actions inspired by them (Luhmann 1989).

Valentinov (2014, 18) thus conceptualized the sustainability problems of the functional and other social systems in terms of the "complexity–sustainability trade-off," derived from the two principles structuring the Luhmannian understanding of system–environment relations. The complexity reduction principle "posits that systems increase their complexity by becoming increasingly insensitive to the complexity of the environment," while the critical dependence principle postulates that "the increasing complexity of systems is associated with their growing dependence on environmental complexity" (Valentinov 2014, 18). Put together, these principles boil down to a precarious relationship between systemic complexity and systemic sustainability, which Luhmann himself expressed as follows: "Through operational closure, systems develop their own degrees of freedom, which they can exhaust as long as it is possible, that is, as long as the environment can tolerate it … The overall effect [of operational closure] however is … not adaptation, but amplification of deviations" (Luhmann 1997, 133; cf. also Valentinov 2015a, b, c; Valentinov and Chatalova 2014).

The Interdependence and Complexity Reduction Aspects

The overarching goal of the Soviet water–energy system in Central Asia was to support cotton cultivation, whereby the system was certainly not balanced in this sense. It is common knowledge today that the Soviet leaders largely disregarded the regional importance of other crucial agricultural outputs such as grains, vegetables, and fruits; indeed, they suppressed the production of these outputs during the collectivization in the 1930s (cf. Spoor 1993). Furthermore, they were entirely unconcerned with the major environmental costs related to soil and water degradation, as well as the desertification of the Aral Sea (O'Hara 2000; Weinthal 2001).

The Soviet water coordination landscape comprised a myriad of ministry branches and research institutes. The Ministry of Land Reclamation and Water Resources of the Soviet Union (Minvodkhoz) assumed the coordination task via the ministerial branches in each Central Asian Soviet republic (Spoor and Krutov 2003). Water management was supposed to be linked to (cotton) production targets (Wegerich, Olsson, and Froebrich 2007; Wegerich 2008). The ministry operated multiple water-related scientific and design institutes, such as the Central Asian Scientific and Research Institute of Irrigation (SANIIRI), being responsible for the scientific development and practical application of scheduled water distribution, as well as Sredazgiprovodkhlopok, which specialized as a design engineering bureau for irrigation projects and worked with associated firms to introduce new

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irrigation techniques (Dukhovny and de Schutter 2011, 155). In addition, the ministry operated various implementation companies, such as Sredazgidrostroy and Glavsredazirsovkhozstroy. More than 70 specialist design institutes were active in the water sector, although coordination problems were common and attempts to solve them included crackdowns, financial carrot methods, and the definition of design and operational standards. In the 1980s, the Soviet government introduced BVO—basin management—allowing the riparian states more bottom-up decision-making freedom in water allocation for irrigated agriculture (Wegerich 2008), as well as reminding all players of the unity of the water system as relevant for their policy coordination. Nonetheless, the Moscow-based ministries and institutes retained (formally) the authority to decide upon agricultural production, determining water plans, priorities, and allocations within the main river basins, which were delegated to their regional branches after coordination and consultation (Weinthal 2002). While this was the system on paper, in practice actors enjoyed varying degrees of autonomy, and many higher level "decisions" simply involved rubber stamping lower level decisions or existing practices. Informality was accepted, as was de facto multilevel governance, as long as essential interests were not harmed (Gleason 1986). These included keeping cotton and energy production at an acceptable level.

As Abdullaev and Atabaeva (2012) point out, the irrigation network enabled the use of water for energy generation through introducing a central interrepublican transmission grid, whereby the Soviet Union became one of the largest hydropower producers. The coordination provided by the irrigation network was clearly in the mutual interest of both the upstream and downstream countries, whereby the former benefited by receiving energy supplies during winter, while the latter enjoyed the opportunity to release water in summer rather than winter. The hierarchical governance of the irrigation network by the Soviet government forestalled costly bargaining processes that would have been inevitable otherwise (cf. O'Hara 2000; Lange 2001; Wegerich 2008). It can be reasonably conjectured that the success of this governance strongly relates to it taking place within one political entity, to its hierarchical character circumventing the Luhmannian problem of coordinating horizontal functional systems.

Luhmann persistently reiterated that an effective coordination among functional systems is rendered difficult by their interrelated properties of complexity reduction and operational closure, as well as a lack of sensitivity to what happens in the environment. Unless they are observed and interpreted in terms of the system, events/processes in the environment are supposedly irrelevant and can remain unheeded. After independence, with increased functional differentiation, attempts at the coordination of water management broke down, treaties were not implemented, and barter schemes did not work. On the technological side, the desiccation of the Aral Sea with a host of concomitant ecological problems could not be stopped or slowed down by any agreements, organizations, or institutional reforms (Spoor and Krutov 2003; Micklin 2010). Obsolete Soviet norms were still recognized, despite the fact that their practice relied upon a nonexistent central coordinating agency (Moscow). As the water allocation norms could neither recapture their old coordinative power nor fit the new demands, the Central Asian water system disintegrated. Within each new state, the pursuit of export revenues, the promotion of economic diversity, and the integration into the world markets posed considerable governance challenges of their own, which were further intensified by the divergence of economic strategies of the upstream and downstream territories. Among other things, this divergence resulted in the

poor predictability of water allocation over both time and space. Furthermore, political rivalries also began to play a major role, having been unthinkable in the Soviet Union.

In Search of Improved Coordination

Sensitivity and Flexibility in Evolving Systems

For Luhmann, the operational closure of the functional systems per se does not render them entirely insensitive to their environment. The sensitivity of systems to the environment can be improved without interfering with their operationally closed character. The compatibility between sensitivity and operational closure is captured by Luhmann's distinction between the coding and programming of functional systems:

> On the level of coding a system is differentiated by means of a binary scheme [such as legal/illegal for the legal system and possession/non-possession for the economic system]. At the same time it establishes itself on this level as a[n operationally] closed system … Programs, however, are given conditions for the suitability of the selection of operations … On the program level a system can change structures without losing its code-determined identity. On this level, therefore, learning capacity can be organized to a certain extent, so through the differentiation of coding and programming a system acquires the possibility of operating as closed and open simultaneously. (Luhmann 1989, 45)

Coding brings in what Luhmann calls the semantics of a social system, namely, the conceptual frames that enable it to discern and interpret environments, that is, other social systems and the physical environment. It is possible to work on the semantics of a given system to render it more sensitive for new and forgotten topics. Indeed, this occurred in the history of social movements, the environmental movement, and so forth, which altered the conceptual schemes of the functional systems without undermining their self-reference. Semantics always highlight and veil aspects of reality, with Luhmann suggesting that the combination of several systems observing reality and the opportunities for self-transformation and learning of the system can manage their selective blindness (Luhmann 1995).

There are other aspects of flexibility, learning, and adaptation. Very succinctly, we have to mention structural couplings between functional systems (e.g., Luhmann 1989; Krause 2005), namely, relations between systems that render them more sensitive to each other, to the extent that changes in one trigger changes in the other. In democratic polities, law and politics are structurally coupled, and what Luhmann calls the functional systems of law and politics—as systems of communication transcending spatial boundaries—are always structurally coupled. This is not a matter of an original design or intention, but rather the result of a particular path of coevolution. Through structural couplings, systems become more sensitive to a particular set of environments, a certain set of other social systems (Luhmann 1997).

There are organizations. For Luhmann, these are self-reproducing social systems that can span boundaries and make unique links between functional systems. While a business is an economic organization, with decisions taken based upon the profit principle and the basic distinction between making/losing money, the organization can have a design department, a legal department, an informal political lobby network, and it might have aspirations to make the most artistic shoes ever, thus creating bridges between political, economic, legal, and artistic functional systems and making those systems more responsive to each other (Seidl 2005).

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There are people, psychic systems in systems terms. People can be involved in different organizations and switch perspective, participating in legal reasoning at one moment, thereby reproducing the legal system, and political reasoning at the next, having an effect on the functional system of politics. People, organizations, and structural couplings all contribute to the flexibility of functional systems by inserting new perspectives and increasing their capacity for learning and adaptation.

Finally, there are catastrophes resulting from the remaining partial blindness of society as a whole, the encompassing social system, including all functional systems and organizations. Society and communities, at a smaller scale, every now and then hit the wall of a reality they always selectively understand. Shocks can destroy communities, and they can induce learning in the web of social systems involved. One way to conceptualize this "hitting the wall" is through the concept of empirical boundaries (Jacobs 2014), as a boundary, a wall, that is not entirely a product of social systems, but either an unobserved natural boundary or a combination of natural factors and forgotten effects of human action (e.g., degrees of pollution, water scarcity, salinization). Empirical boundaries assert themselves because we understand reality through social systems, while living in socioecological systems. Indeed, modified Central Asian river systems and their economies and polities reflect such a socioecological system.

Central Asian Water Governance Reconsidered

In order to understand the options for the improved coordination of water governance in Central Asia, we need to grasp the combination of flexibility and rigidity in the governance paths of the new republics. A closer look at the transitional pathways of these republics in systems theoretical terms produces new insights about remaining coordination options in the case of water policy (Van Assche et al. 2011).

First of all, we need to say that "the" transition away from socialism does not exist. Given that there are many fragments of the former USSR, as well as many models of markets and democracies, the pathways will vary (cf. Humphrey 1999; Verdery 2003). One effect observed in many cases is the partial linkage of regional economies and political systems with the functional systems of economy and politics, for Luhmann world systems that gradually extend their reach at the expense of other forms of differentiation. However, for Luhmann, the West remained marked by lingering forms of hierarchy and segmentary differentiation, including the political segmentation in nation-states and other levels of government. In post-Socialist Central Asia, the legacies of the USSR were not only legacies of socialism but also of formal hierarchy and a rich world of informality, sometimes undermining and sometimes reinforcing it (Gleason 1991; Giordano and Hayoz 2013). Already in the Soviet years, shadow network structures captured some of the benefits of this world of informality and formed coping environments in times of scarcity and instability. The breakup of the Soviet Union not only reinforced functional differentiation, but—even more so—segmentary differentiation and hierarchy: the former owing to the networks and coping mechanisms mentioned, and the latter because the same networks were often able to gain power and to copy Soviet attempts at central and hierarchical steering (Collins 2006).

The new republics in most cases dismantled part of the Soviet organizational infrastructure of government, including expert institutes and administrative and implementation

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organizations, because of the cost. Dismantling can take the form of official elimination, but also of neglect, of reduction to a facade, of abuse for goals alien to the organization's tasks. This de facto means that all the different sorts of organizations lost their autonomy as social systems, being unable to follow their own logic (Shtaltovna, Van Assche, and Hornidge 2012). In systems terms, they ceased to be organizations. Organizational autonomy is now often weaker than in Soviet days. Indeed, even with borders more open in some respects, this makes it difficult for functional differentiation to truly take hold. While organizations can span boundaries of functional systems, in turn functional systems cannot function without relying upon specialized organizations. Historically, the formation of organizations and functional systems was tightly coupled (Luhmann 1995). An operationally closed economic system—namely, the existence of a perspective on reality and a mode of coordination based upon profit/loss distinctions—became possible with the rise of the modern firm, banks, insurance companies, and so on. Conversely, these organizations contributed to the formation of the functional system economy as different from earlier "economies" mixing in morality and politics in value transactions. If organizations lose their autonomy, functional differentiation will be undermined. The blindness associated with functional differentiation, including its effects in terms of the complexity–sustainability trade-off, will be replaced by a blindness specific to other forms of differentiation, increased by uncertainty over which forms of differentiation—and hence which allegiances and rules—should apply to which situation (Van Assche and Djanibekov 2012).

While we cannot proceed in much detail here, we can now see that each of the Central Asian republics came to represent different mixes of forms of differentiation, depending on their Soviet legacies, endowments, their power networks, their respect for science and expertise, their national cohesion, their market opportunities, and their contingent histories of conflict. The appearance of a new political boundary—the new state border—had different implications in each country. Each of the new states has a past and present marked by informality, with a gap between the professed steering and coordination models and what happens. Each of the new states has taken a different path in managing this difference, although it inspired a deep distrust vis-à-vis new formal institutions in all cases, especially concerning new plans and bureaucratic structures. In some cases, suspicion of Soviet-type structures inspired suspicion of transboundary coordination mechanisms. It is difficult to determine what is rational and not under these circumstances, while coordination instruments easily falter under high degrees of uncertainty and the abandoning of long-term perspectives in favor of short-term calculations (Djanibekov et al. 2013).

Water systems, and particularly the construct of the Soviet water–energy infrastructure in Central Asia, bring their own requirements for coordination, as discussed earlier, while the post-Soviet splintering of pathways presented new obstacles for internal and external coordination. The obstacles are different for each new state, with each harboring a different mix of differentiation modes. The dismantling of both coordinative and expertise organizations, the lack of remaining resources, and in many cases the lack of coordination within the state make transboundary coordination very difficult. In systems terms, we can say that the empirical boundaries posed by the modified water system (the "walls") are no longer easily observed in the fragmented political system, while the tools to coordinate action after observation are systematically undermined within each state and between states. It is not so much the blindness of functional differentiation that is to blame. After all, it offers—as

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mentioned—a series of learning and adaptation mechanisms. Rather, what increases the risk of catastrophe, hitting an empirical boundary with catastrophic consequences, is the erosion of all tools of coordination in an environment of radical fragmentation, radical difference between formal and informal institutions, and an impossibility to envision a longer term (Hornidge, Van Assche, and Shtaltovna 2015). What can be observed is not a situation similar to the early Middle Ages, with small political entities resting on segmentary differentiation, nor is it pure hierarchy, with a center commanding and controlling and envisioning a long term, nor functional differentiation, with its varied adaptation mechanisms. Without taking into account the particularity of governance paths, their dependencies, and mixes of differentiation forms (Van Assche, Beunen, and Duineveld 2013), the Central Asian states are unlikely to be susceptible to coordination attempts.

Concluding Remarks

The "complexity–sustainability trade-off" approach to water governance in Central Asia prompted the important insight that the newly independent Central Asian states have to devise new mechanisms to grasp and enhance their environmental sustainability. After independence, their interdependent use of the common water–energy infrastructure became difficult for the new states to observe and coordinate. Functional differentiation creates new risks and new modes to manage risk. However, the blindness emanating from functional differentiation is not the only aspect of transition rendering cooperation for water governance difficult. Rather, the different mixes of forms of differentiation that evolved in each new state greatly contribute to this by adding new blind spots and coordination obstacles, as well as undermining the learning opportunities of the functional systems. Organizations and individuals cannot play their role in adaptation when they can be randomly subjected to coercive or predatory tactics by governmental and nongovernmental actors alike. Trust in formal coordination as such will disappear when one player follows the rules, the other does not, and the third suddenly changes the rules. Structural couplings erode when the legal responses to events in politics or economy are entirely unpredictable in their nature and relevance. The Central Asian states entering an agreement on the "rational" use of Amudarya and Syrdarya waters are unlikely to coordinate their actions according to such rationality since they do not share that rationality. Some do not espouse a long-term perspective, while others are internally highly fragmented and volatile. Some of them have a form of rule of law, while others do not. Some do not have the level of administrative organization necessary to conclude or implement an agreement, while others do not have the watchdogs or even businesses that could play a role in its implementation. While water-basin associations and river-basin agreements are already in operation, their capacity is undermined by these features of governance. Agreements and coordination become largely fictitious.

This intractable problem cannot be resolved, and certainly not by one new organization or one new formal institution, a plan, policy, or law. It can only be managed. Political cooperation between states always has to understand itself as a balancing act between interests, knowing that the calculations and reasoning of the others are not transparent, that the codification of treaties will have unanticipated consequences in the legal realm and the neighboring polity, and that unforeseen economic effects can weaken the grip of the law on everyday action. All this is true for any transboundary agreement. In the case of Central

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Asian water cooperation, the list of specific issues already discussed puts even more pressure on coordination efforts.

What offers hope is the diversity in differentiation modes itself, reducing coordinative power but at least offering a variety of adaptation mechanisms. There are international pressures, there are remaining sources of flexibility internally (persons, organizations, couplings) and there is still a lot of expertise present. Rather than relying on new agreements or organizations, it seems more appropriate then to start reasoning from the actual configurations of actors and institutions, from Soviet legacies and new fragmented realities. Modest agreements, informal agreements, short-term agreements, sectoral agreements, and even failed agreements can engender new contacts, new insights, partial solutions, and minor risk reductions. What brings parties to the table, and what makes them show their cards (as opposed to cooked numbers) under those conditions, cannot easily be predicted. For Western observers and advisers, we deem it essential to relinquish Western assumptions on the rule of law, on communication and negotiation, on the nation-state, on democracy and socialism, on a single transitional path, and on formal institutions and the nature and function of international agreements. Otherwise, the opportunities to get the right actors together will not be observed.

The resilience of the system can be enhanced when more actors learn to perceive and capitalize upon windows of opportunity, where a more sustainable solution could be implemented (Van Assche, Beunen, and Duineveld 2013). Such windows can include a political rapprochement between states, a reinstated international hierarchy, an economic necessity, an increased presence and autonomy of science in politics, and it can take other, more unexpected forms.

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