

# Chapter 8

## Between Multiple Transformations and Systemic Path Dependencies

Timothy Moss and Petra Dobner

**Abstract** This introductory section on water management in the Fergana Valley makes the case for viewing this major water engineering project (MWEP) in terms of two core positions: the interdependency of complex factors at play and the coexistence of forces for change and obduracy. We argue, firstly, that water management in the Fergana Valley is inextricably tied up with agriculture policy and practice, outlining how the region's irrigation system is predicated upon post-Soviet agriculture. We illustrate, secondly, how this relationship is shaped not only by powerful path dependencies – in the shape of physical structures, sunk costs and institutional arrangements – but also by changes, both radical and incremental, in response to system failure, shifting political preferences or the emergence of viable alternatives. We conclude by setting the stage for the subsequent detailed analyses of selected arenas critical to the development of Fergana Valley's irrigation system.

**Keywords** Fergana Valley • Syrdarya River • Uzbekistan • Aral Sea • Irrigation • Post-Soviet agriculture • Cash crop • Path dependency • Transformation • Major water engineering projects

### 8.1 Post-Soviet Transformation as a Multi-dimensional, Long-Term Process

Any study of water management in the Fergana Valley begins with a litany of problems associated with its immense and intricate irrigation system. Which problems are selected, how they are presented and what solutions are proffered varies significantly,

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however, according to the author's perspective. For some, the main problem is how to keep the existing irrigation system operating in order to maintain current modes of intensive agricultural production, focussing on the collapse of effective irrigation management on farms following de-collectivisation and engineering solutions to improve water use efficiency (Dukhovny et al. 2009; Karimov et al. 2012). For others, the main problem is the transnational dispute between the riparian states of the Syrdarya River surrounding the allocation of water from the upstream reservoirs which, after over 20 years of negotiation, has reached an impasse, prompting each nation state to pursue its own, second-best option (Weinthal 2002; Megoran 2004; Wegerich et al. 2012). For others still, the core issue is about strengthening the hand of water users – i.e. farmers – in managing irrigation systems on the ground as a means of improving water-use practices and challenging the authoritarian and bureaucratic procedures of current decision-making (Abdullaev et al. 2009; Gunchinmaa and Yakubov 2010; Abdullaev et al. 2010; Dukhovny et al. 2013). A fourth group of authors targets the dire ecological impacts of the existing irrigation system and its management, notably the Aral Sea catastrophe, deploring the absence of environmental issues in debates on the future of the irrigation system in the region (Spoor 1998; White 2013). This categorisation is by no means mutually exclusive or exhaustive. Further problems confronting the Fergana Valley irrigation system include rapid population growth, negative impacts of climate change, land degradation, infrastructure disrepair, increased crop competition, dependence on donor support, the emigration of specialists and an authoritarian political regime (Dukhovny et al. 2009; Abdullaev et al. 2009; Gunchinmaa and Yakubov 2010; Abdullaev and Atabaeva 2012).

None of these problems exists in isolation. They are each – to a greater or lesser degree – connected with one another. Local decision-making on water allocation is, for instance, powerfully shaped by crop production quotas set by central government. To take another example, the huge scale of the valley's irrigation system has a significant bearing on its hierarchical governance structures. Any attempt to analyse the challenges confronting the management of this major water engineering project (MWEP) must address the interdependency of the complex factors at play. These cannot be limited to the technical or physical aspects of hydrological engineering or plant science but must consider also the social, economic, political and cultural dimensions of the land-water-food nexus, as well as its environmental aspects, notably biodiversity and ecosystem services. This is why the authors of this book propose to conceive of such MWEPs as complex socio-technical, social-ecological and political-economic systems or configurations. Identifying the interdependencies between the components of such systems and how they influence one another is key, we believe, to revealing potential responses to the challenges posed. This is particularly pertinent regarding the connectivity between the water management regime, land reforms and agricultural production in Uzbekistan. Attempting to resolve irrigation problems by focusing solely on water management issues and relegating agricultural policy and practices to background factors misses the point. Appreciating the interconnectivity of the multiple components constituting a MWEP such as the Fergana Valley irrigation system is, therefore, the first core position we take in this chapter.

Our second core position is that a MWEP of this kind is shaped by a combination of forces for both change and obduracy. On the one hand, large technical systems, such as irrigation networks, are renowned for their path dependency (Pierson 2000; Melosi 2005; Sehring 2009). Not only their physical structures, with their high sunk costs and material embeddedness, limit future options for adaptation; also the institutional arrangements developed over time to manage them reveal typically a high degree of persistence. On the other hand, large technical systems can and do change, sometimes quite dramatically, for instance in response to system failure, shifting political preferences or the emergence of viable alternatives (Summerton 1994). What this means for the MWEP in the Fergana Valley is that we need to identify the path dependencies (technical, environmental, organisational, economic, etc.) working to sustain the irrigation system as it is, but also the forces at play which are pushing for change, whether radical or incremental. For, as a historical perspective on the MWEP reveals, Fergana Valley's irrigation system may have been in many ways path dependent, but it was never static, adapting constantly to shifts in political regime, economic strategy, environmental limitations and geopolitical disputes.

These shifts became more sudden and disruptive with the collapse of the Soviet Union and emergence of independent Central Asian states out of the former socialist republics. Here, though, we need to be wary of over-interpreting the significance of this single act of nation-building for subsequent water and agricultural policy. The sudden switch of political regime in 1991 is deceptively suggestive of an abrupt system transformation reaching down into all walks of life. In reality, the radical transformation of some dimensions of society was accompanied by the strong path dependence of others. The prior configuration of technical, economic, organisational and social components of Fergana Valley's irrigation system was certainly destabilised after 1991, but not discarded. What we have been witnessing ever since is the continuous process of reordering this relationship. This process is not happening automatically, following some hidden hand of economic rationality, but in a non-linear, unpredictable and context-dependent way in response to shifting conditions and human agency. The multiple stakeholders involved – from senior water officials in central government agencies to household farmers living off secondary crops – are each trying to cope with this combination of transformation and path dependency in their own ways to advance their own interests. Given the stakes involved, this process is highly contested.

In the remainder of this section, we outline the principal dimensions of transformation and path dependency for first the agriculture sector and then the water sector, highlighting their interdependency. We conclude by setting the stage for the subsequent detailed analyses of selected arenas critical to the development of Fergana Valley's irrigation system.

## 8.2 Transformation and Path Dependencies in Fergana Valley's Post-Soviet Agriculture

The principal transformation of agriculture in Uzbekistan since independence relates to land ownership on the one hand. Land reform was not immediate after 1991, as in the case of the Kyrgyz Republic, but more gradual (Hamidov 2007). Nonetheless, its effects were far-reaching, including on the irrigation system (see below). Land reform in Uzbekistan began during the 1990s with the dissolution of the large-scale collective farms (*kolkhozes*) and state farms (*sovkhozes*) following their bankruptcy as a result of declining state subsidies and investment (Spoor 2004). They were replaced at first by smaller semi-cooperative farms (*shirkats*), still maintaining Soviet-style management. In the early 2000s, a further phase of land reform replaced the *shirkats* with individual farms, a process completed by 2006 (Gunchinmaa and Yakubov 2010). As land was transferred by long-term lease to individuals, a situation was created in which a huge number of people became small landowners and farmers who often had little experience or expertise in agriculture. The resulting problems for agricultural production prompted a fresh round of land reform with the aim of reducing the number of small, inefficient farms. Within the space of just 1 year, between 2006 and 2007, the number of individual farmers in Uzbekistan was reduced from 200,000 to 100,000.

On the other hand, today's agriculture system in Uzbekistan is marked by deep-rooted path dependency relating in particular to state planning of agricultural production and the prioritisation of cash crops. Despite land reforms, state production quotas for cotton and wheat continue to dominate the system (Abdullaev et al. 2009). For these two cash crops, regarded by the government as essential for national (food) security, the state sets quotas for production, just as in Soviet times. The national targets are sub-divided into targets for the individual provinces and districts, with the head of each administrative district being held personally responsible for meeting his/her target. This creates enormous pressure to fulfil the state plan, pressure which is passed on down the line to the individual farmer. For these cash crops, the farmer is further bound by the obligation to buy seed, pesticides and fertiliser from the state at a certain time and to sell cotton and wheat he/she produces to the state at a fixed price below market prices. From these production quotas, water needs are calculated and a plan for water allocation from national to on-farm level devised (see 8.3). Beyond the production of cotton and wheat, farmers are permitted to grow other crops, such as rice, vegetables or fruit, but this is only feasible if it does not endanger meeting the cash crop quotas. In practice, there is generally too little time and too little water left after harvesting the cash crops, rendering a second harvest difficult. Those private farms that specialise in products beyond cotton and wheat are responsible for financing all investments and marketing their goods, yet often receive only poor quality water or none at all (Gunchinmaa and Yakubov 2010).

In effect, there exists a dual agricultural structure characterised by a dominant, yet inefficient state-driven system of cash-crop production on the one hand and a much smaller, but emergent system of household plots and secondary harvests

producing crops like maize, sorghum, rice, sunflower, vegetables and fruit on the other. In recognition of the higher productivity and market value of these products, there has recently been a modest shift in agricultural policy away from cotton not only to wheat but also to rice and vegetables. These products require different cropping patterns and, by consequence, different irrigation practices. This is creating new conflicts over water distribution between the harvests of cotton, winter wheat and secondary crops, revealing also serious limitations to the existing irrigation system (Kenjabaev 2014).

### **8.3 Transformation and Path Dependencies in Fergana Valley's Post-Soviet Irrigation System**

Water management in Uzbekistan has undergone transformation in a number of ways since independence, most of them in the form of organisational restructuring to meet new challenges. The immediate change following the dissolution of the USSR was to set up a trans-boundary central organisation – the Interstate Coordination Water Commission (ICWC) – in 1992 to coordinate water management between the new riparian states. This body replaced the central Soviet government as the head of a hierarchy of water authorities reaching from the national to the local level. These comprise today, for the Fergana Valley, the transnational Basin Water Organisation Syrdarya responsible for implementing ICWC policy, the national government with – above all – the Ministry of Agriculture and Water Resources, sub-basin water management organisations at the regional level and water users associations (WUAs) responsible for on-farm irrigation.

Originally, irrigation was organised around the territorial jurisdictions of provinces, districts and local authorities. In 2003, in accordance with a core principle of Integrated Water Resources Management (IWRM), the organisation structure of irrigation was reordered spatially around hydrographic boundaries, i.e. corresponding to the spatial reach of an irrigation system or sub-system (Dukhovny et al. 2009). In Uzbekistan as a whole, ten basin irrigation systems authorities were established and, under their authority, 63 irrigation system authorities and main canal authorities. In the Fergana Valley basin and sub-basin, authorities were created for the Fergana Canal and its sub-canals. This organisational innovation is judged to have proved remarkably successful in minimising conflicts in the region over water allocation (Abdullaev et al. 2009). In particular, disputes between the upstream province of Andijan and the downstream province of Fergana relating to water use along the South Fergana Canal have been resolved earlier and more effectively since the replacement of provincial with irrigation system-based authorities. The new hydrographic boundaries are, though, only one reason for this improvement in inter-provincial relations. A second reason has been the creation of a new participatory governance structure, comprising nine Unions of Water Users along the South Fergana Canal, which represent the interests of water users associations in the Canal Water Committee (Abdullaev et al. 2009).

The creation of water users associations (WUAs) across the country is the third significant organisational transition after the creation of the ICWC and the reordering of irrigation management around hydrographic boundaries. Given the strong association of WUAs globally with the IWRM paradigm, it is tempting to interpret their creation in Uzbekistan in the early 2000s primarily as an instrument of IWRM. In reality, they were introduced by central government decree in response to an overwhelming crisis in managing on-farm irrigation systems following the collapse of the collective farms. Here we note a dramatic example of connectivity between land reform and irrigation management and, on a broader level, of the embedment of agricultural structures, problems and development potentialities in political power relations, financial needs of the state and modes of political decision making. In the initial phases of land reform, little thought was given to the impacts it might have on irrigation. On-farm irrigation and drainage infrastructure, formerly managed and maintained by staff of the collective farms, had no one responsible for them once these were disbanded (Abdullaev et al. 2010). Water distribution became an issue of contestation and competition amongst the new land-owning units. Many trained and experienced engineers, irrigators and agronomists left for Russia or Kazakhstan. The combined effect of this institutional void and exodus of skilled personnel was a catastrophic drop in the water efficiency of irrigations systems. In the Fergana Valley, losses were reported of up to 55 % of irrigation water supply (Dukhovny et al. 2009). This was the principal reason for the sudden creation of WUAs: to fill an institutional gap left by land reform. Within the space of a few months, on the back of a central government decree, thousands of WUAs emerged. The nature of their emergence is indicative, however, of many of their subsequent shortcomings. Firstly, the government was more interested in creating new organisations than making them viable or fit-for-purpose, with the result that, without adequate funding, most WUAs exist on paper only (Wegerich 2006; Abdullaev et al. 2010). Secondly, being the product of top-down bureaucratic policy, most WUAs do not enjoy the support of their members (see Sehring 2009; Abdullaev et al. 2010). Most water users regard their WUA as the extended arm of state water authorities rather than the self-governing bodies to which they normally ascribe. Many commentators see WUAs in Central Asia as inactive and not financially viable (Wegerich 2000, 2006; Abdullaev et al. 2010).

A fourth important source of innovation in the field of irrigation is undoubtedly the IWRM Fergana Project run by the Scientific and Information Centre of the ICWC and the International Water Management Institute (IWMI) and funded by the Swiss Development Cooperation (SDC). This transnational project, covering the Fergana River Basin in three countries (Kyrgyz Republic, Uzbekistan and Tajikistan), ran from 2001 to 2012 with the aim of improving the efficiency of water resources management by introducing IWRM principles and practice (Dukhovny et al. 2009, 2013). The measures promoted include supporting the reordering of irrigation management around hydrographic boundaries (see above), the increased participation of water users in decision-making bodies (as via the Unions of Canal Users, cited above), training and education for hydro-engineers and farmers (see Sect. 8.4) and research on improved irrigation techniques. Those involved in the project credit it with helping to reduce water used in the region by 12–25 %, increase the equity and

stability of water delivery in South Fergana and improve allocation between upstream and downstream users, thereby dramatically reducing the number of conflicts between canal administrations and WUAs, between WUAs and between WUAs and farmers (Dukhovny et al. 2013). They concede, however, that the IWRM Fergana project did not pay sufficient attention to issues of governance, ecology and climate change (Dukhovny et al. 2014). The IWRM Fergana project can be credited, though, with setting an important example of what can be changed with the necessary political will and financial resources.

Parallel to these transformative factors, the irrigation system of the Fergana Valley is characterised by multiple dimensions of path dependency. First, and visually most obvious, is the path dependency of the physical infrastructures which transport water from massive reservoirs upstream to individual farms in the valley. This complex and hierarchical network of rivers, reservoirs, weirs, major canals, sub-canals, pipes, valves and furrows has been built up over the past 70 years and is deeply embedded – literally and metaphorically – in the landscape of the Fergana Valley. Its physical existence and size alone limits the options for using water in the region because alternative distribution systems of such dimensions are simply not viable. For example, the existing irrigation system is proving ill-equipped to adapt to the increasing diversity of crops beyond cotton, such as rice, wheat and vegetables, which each require different irrigation regimes (Abdullaev et al. 2010). Alterations to the infrastructure system do not challenge its underlying logic of securing adequate water supply for agriculture, but merely equip it to meet new challenges and adapt to technological advances. The automated management system at Ush Qoron is an illustration of how a major weir used for directing water along different canals has been upgraded constantly since the 1970s to address shifting demands and respond to unpredictable water restrictions from the upstream Toktogul reservoir in the Kyrgyz Republic.

The second dimension of path dependency relates to organisational procedures of water allocation. Water for irrigation is distributed, as during Soviet times, according to a central planning system. Data on water needs may be collected at the local level and fed up the system hierarchy, but it is the transnational ICWC which determines overall water quotas for the riparian states. These are then passed down the multi-level structure of the water bureaucracy, from the national Ministry of Agriculture and Water Resources, via the Central Water Management Administration, the 10 basin irrigation authorities, the 63 irrigation system authorities and main canal organisations down to the WUAs and the farmers (Dukhovny et al. 2013). This system allows for continuous intervention by national water authorities in water allocation at subordinate levels, not only under “normal” circumstances but also in emergency situations of water shortage when, for instance, a basin irrigation organisation can set limits to the production of cotton and wheat or prohibit a second harvest (Dukhovny et al. 2013). Such emergency measures are unusual in that they are a rare example of water management taking a priority over agricultural production.

The top-down procedure for allocating water for irrigation is indicative of more deep-rooted, institutional dimensions of path dependency of water management institutions in Uzbekistan and Central Asia generally (Sehring 2009; Abdullaev et al. 2009, 2010). Soviet and even pre-Soviet patterns of behaviour, professional

norms and routinised practices are still highly influential in shaping the responses of water authorities to new challenges (Sehring 2009). Many new regulations and organisations created in the name of IWRM are undermined in practice by the prevalence and persistence of such informal institutions. Representatives of new organisations are often not integrated into decision-making processes and have weak mandates (Schlüter et al. 2010). There is also considerable continuity of leading personnel in water authorities at different levels, from the national ministries via the basin water organisations to provincial departments, whose biographies stretch back to the Soviet era. This “hydrocracy”, or hydraulic bureaucracy, has remained a constant across regime change and organisational restructuring. Water authorities in the Fergana Valley alone can count on 7000 employees – many of them trained in the Soviet era – to implement state water policy (Interview Swiss Agency for Development and Cooperation). The number of water bureaucrats has, however, been substantially reduced since the Soviet period. Indeed, Abdullaev argues that, as a result of severe budget cuts, reduced staff levels and poor on-farm policy implementation, water officials no longer command the respect or play the role they once did in the heyday of Soviet irrigation engineering, when they were the celebrated heroes of the hydraulic mission of modernisation (2012, p. 103). There is, therefore, ambivalence to the modern “hydrocracy”: whilst striving to improve the efficiency of irrigation systems it is reinforcing the path dependency of not only the physical infrastructure but also its own *raison d’être*.

A fourth dimension of path dependency to water management is distinctive by its absence: consideration of environmental impacts. Ecology was never an issue of great concern to irrigation and agricultural production in Soviet times and this has changed little since independence. International shock at the ecological collapse of the Aral Sea is barely reflected in the national debate on the future of agriculture and irrigation. Restoring the Aral Sea has *de facto* been given up by the authorities as a lost cause. In face of overwhelming environmental problems and limited prospects for transnational solutions, resignation has set in (White 2013). Even on a local or regional scale there is little discussion, for instance of the need for minimum environmental flows to sustain ecosystem functions. There is no sign that ecosystem water needs are playing an integral part in water allocation planning in Uzbekistan (Schlüter et al. 2010).

## 8.4 Researching the Fergana Valley: Tasks and Topics

What role can research play in helping to resolve, or – at least – cope with, these complex challenges? Given the legacy of scientific endeavour in this field since Soviet days and the wealth of scholarly attention paid to water management in Central Asia in the years since independence, this is not a trivial question. In the face of what to many observers appears an intractable situation research can first of all raise understanding of the processes outlined above, querying assumptions and revealing inconsistencies of existing knowledge. On this basis, it can devise alternative options, mapping out

potential futures and extending the boundaries of debate. From different disciplinary perspectives, it can support initiatives to shape change, identifying promising points of entry and potential pitfalls as well as accompanying projects through implementation with expertise and critical reflection.

The sections in this chapter all represent attempts to make sense out of the past, present and potential future of the MWEP that is Fergana Valley's irrigation system. They share a common concern to explore the interdependencies of the region's regimes for agricultural production and water management, the first core position of this chapter. Here, the interest lies in revealing not only how each policy field affects the other, but also what institutional misfits between the two – in terms of their differing organisational structures, incentive mechanisms and power relations – make it so difficult to work across them effectively. In line with our second core position, the sections all address the relationship between transformation and path dependency. Transformation is treated as a continuous process of radical and incremental change, rather than a sudden shift. Path dependency is deprived of any deterministic assumptions. Unpacking the emergent hybrids of the old and the new is the task at hand.

The topics of these in-depth analyses have been selected by virtue of what we regard as their critical importance to the future of Fergana Valley's irrigation system and to prospects for making this future more sustainable. In the first piece, Hermann Kreutzmann explores issues of geographical interdependence and rescaling emerging from attempts at inter-state cooperation since 1991 and how the riparian states are responding to the geopolitical impasse. In the following section, Shavkat Kenjabaev and Hans-Georg Frede study the region's irrigation infrastructures in terms of the environmental impacts they are having, the economic conditions they require and the political constraints they are facing. Timothy Moss and Ahmad Hamidov then focus in on the region's WUAs to analyse how far they are fulfilling the multiple expectations vested in them and what the prospects are for giving water users a greater say in the management of Fergana Valley's irrigation system. Finally, Bernd Hansjürgens investigates the potential for economic incentives to encourage more efficient use of irrigation water and crop production and the institutional obstacles to implementing them in the region.

### **Field Trips and Discussions**

1. Central Office of Fergana Irrigation District, Fergana, 4 May 2014
2. Office of South Fergana Canal Management, 5 May 2014
3. WUA Kadyrjon Azamjon, 5 May 2014
4. Swiss Agency for Development and Cooperation, Tashkent, 8 May 2014
5. Friedrich-Ebert-Stiftung, 8 May 2014

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