Red tomatoes along the Silk Road

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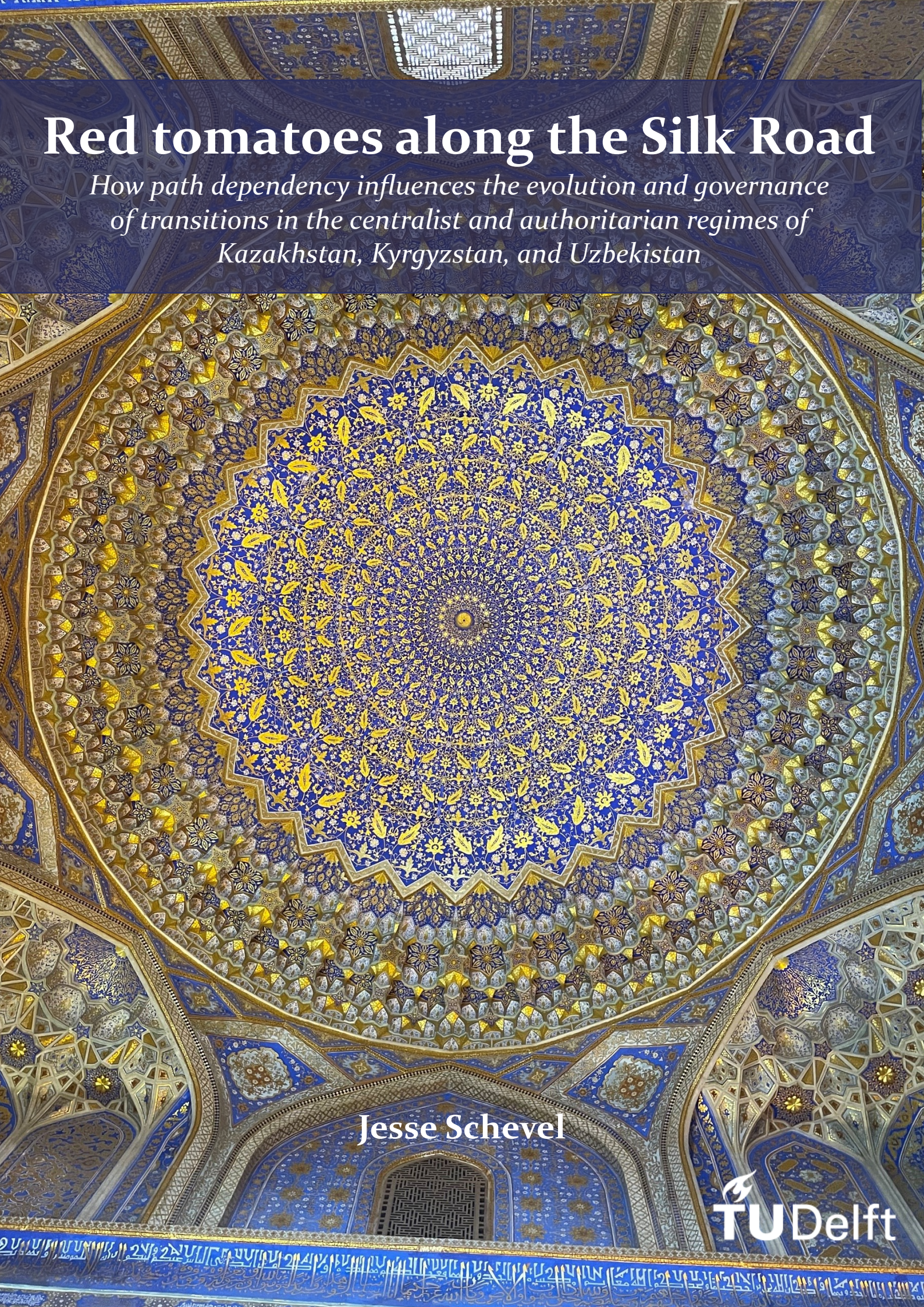

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TU Delft

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by
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The ‘sunken forest’ in Lake Kaindy, near Almaty, was formed after an earthquake that flooded these Asian spruce trees. The cold water helps the dead trunks to preserve.

"Water, like religion and ideology, has the power to move millions of people. Since the very birth of human civilization, people have moved to settle close to water. People move when there is too little of it. People fight over it. And all people, everywhere and every day, need it."

– Mikhail Sergeyevich Gorbachev (2000),
former General Secretary of the Soviet Union

The Uzbeks rose to prominence with the Silk Road. As a connection between East and West, traders and travellers passed through Samarkand for decades to exchange goods and ideology. With three madrassas and a large bazaar, *Registan* would form as trading centre of the city the heart of the Silk Road.

The *Sher-Dor Madrassa* is named after its lions, which hunt Mongolian warriors pictured as the sun and deer. Contrary to Islamic tradition, the madrassa depicts living animals. Completed in 1636, it would be the first madrassa on *Registan*.

Preface

For more than 1,500 years, caravans have traversed the Central Asian steppes. Eastern merchants crossed the dry plains on horses and camels to sell their silk, porcelain, and Arabian spices to the Western world, while Turkic horses, textile, and exotic fruit and vegetables were traded eastward in return. Central Asia has connected Eastern and Western civilizations by the Silk Road for centuries as continents exchanged commodities on a myriad of interconnected routes.

Notwithstanding its name, not only silk was traded along the route, but also knowledge, faith, and culture was commuted from east to west and *vice versa*. Despite its popular legacy as fruitful channel of products, perceptions, and practices, the Silk Road became increasingly disused when China retreated further into its own territory in the Tang Dynasty (618-907). Maritime trade starting in the 16th century between Europe and Asia utterly dried up the Middle Asian trading system, causing major civil abandonment and economic decline in associated regions (Stanojević, 2016).

Due to the dissolution of the Soviet Union (USSR) and China's growing economy in the 20th and 21st centuries, decaying trails were gradually restored and new transport roads between the East and West were established to foster Russian and Chinese exports. Or rather, the Silk Road was reinvented and modernized (Stanojević, 2016). In 2013, Chinese President Xi Jinping formally launched his plan to re-establish the Silk Road through the *One Belt One Road* initiative. Revamped infrastructure connections in Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan – an inevitable part of the traditional route – are foreseen to enhance the endowing country's economies (Stanojević, 2016). But what could Central Asia gain itself from reconstructing this historic and commercial route? Could it perhaps provide some opportunities to scale and rejuvenate the pristine agricultural sector in this desertifying region? That story of transitions is a story of path dependency.

Join me on a journey through Kazakhstan, Kyrgyzstan, and Uzbekistan in this master thesis concluding my academic adventure at the Delft University of Technology to explore how path dependency influences transitions in these centralist and authoritarian regimes on the Turkic steppes by discovering their intriguing history, authentic governance, and fascinating sceneries.

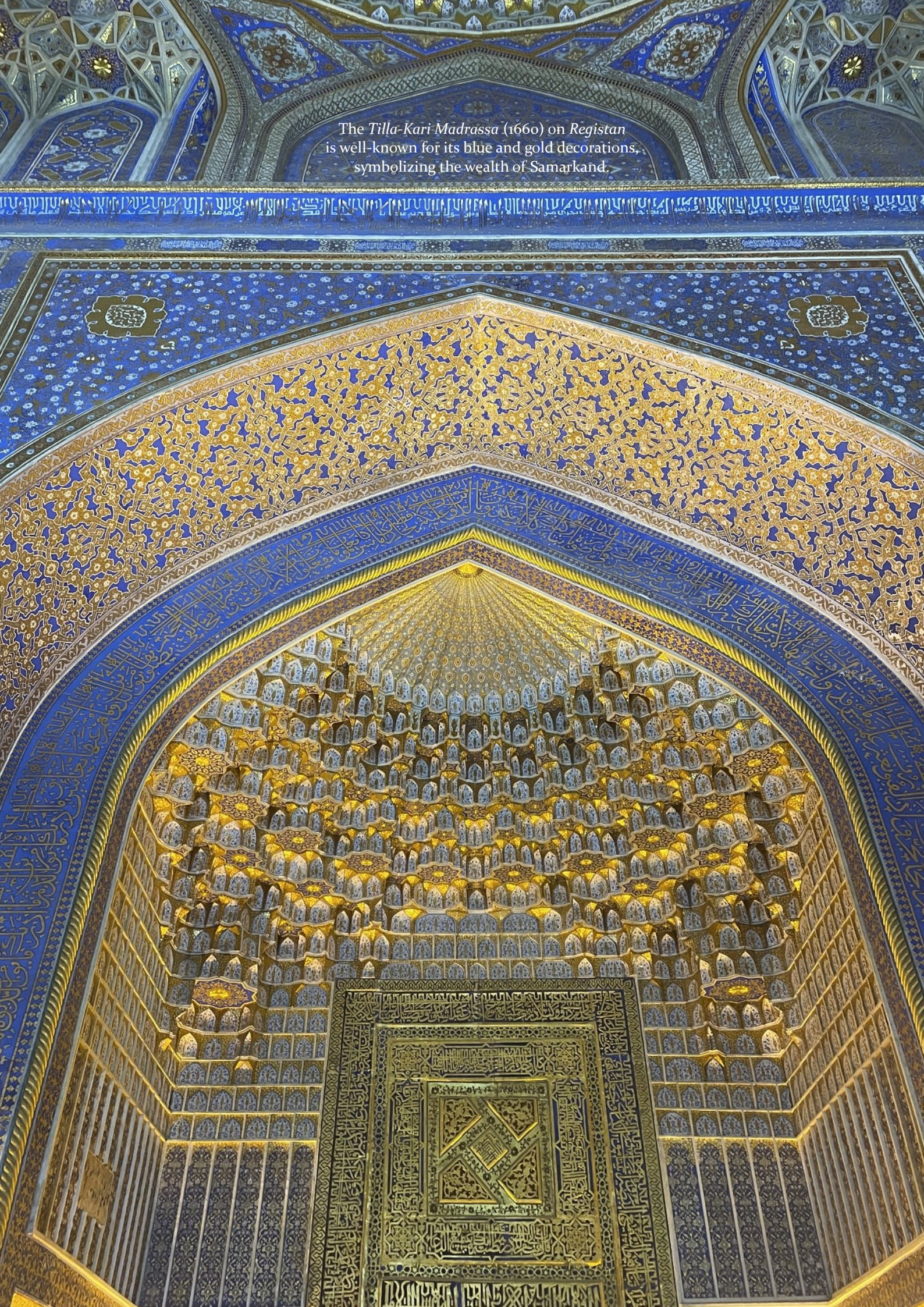
Jesse Schevel
Brussels, April 14, 2024

Issyk-Kul Lake is one of the largest lakes in the world and the major water reservoir in Middle Asia. Fed by more than a hundred rivers from the Tian Shan Mountains and various underground water sources, the lake has been an important footing during the Silk Road era. In the USSR, it would be a popular holiday resort for CPSU party leaders. The lake has no outflow and therefore does not flow into the region's water system. That is for the better good, because slight salinization occurs in the lake, making it unsuitable for drinking water and irrigation.

Abstract

Historically, Central Asia and agriculture have had a tempestuous relationship. The collapse of the USSR in 1999 put agriculture fully in crisis. Greenhouses, a flourishing sector in the latter days of the USSR, almost fully disappeared. In attempt to gain self-sufficiency in fruit and vegetable production, Kazakhstan, Kyrgyzstan, and Uzbekistan reconsider greenhouses to stabilize horticulture in the region's desertifying climate. Current water governance, formed by USSR political and technological path dependencies, has not been able to bolster this transnational infrastructure transition, in which water and energy systems are interrelated and shared across borders. That bears the question: how does path dependency influence infrastructure transitions in centralist and authoritarian regimes? A multiple-case study design gathered data about water governance in Kazakhstan, Kyrgyzstan, and Uzbekistan through a literature review and semi-structured interviews. Planned transitions in those regimes did not evolve as intended due to pushback from actors and USSR induced institutions, not being ready for change. An institutional structure to support transitions in those regimes is lacking due to institutional reproduction of USSR conception, reflecting little pluralism of actors, restricted actor interaction, and top-down governance. High sunk costs make it expensive and physically challenging to change or abandon existing (water) infrastructure, particularly without clear ownership and roles. Accordingly, the USSR conception of governance and past technological decisions lead to path dependencies and impede change in this transnational infrastructure.

Key words: agriculture, authoritarianism, Central Asia, governance, transition



The *Tilla-Kari Madrassa* (1660) on *Registan* is well-known for its blue and gold decorations, symbolizing the wealth of Samarkand.

Executive summary

Central Asia and agriculture have a tempestuous relationship. Remarkable as the region was assigned the role of food producer in both the Russian Empire and the Soviet Union (USSR). The dissimulation of the USSR in 1991, however, put the agricultural sector of Kazakhstan, Kyrgyzstan, and Uzbekistan in crisis. Greenhouses, a flourishing sector in the latter days of the USSR, almost fully disappeared. Regardless of its historical role, the newly independent republics became highly dependent on fruit and vegetables from abroad to nourish their population due to the return of borders in the region. Attempting to gain self-sufficiency in year-round fruit and vegetable production, the countries consider greenhouses again as a promising solution to expand and stabilize horticulture in the region's desertifying climate. A vital source to plants, water is needed to realize this transition. Current water governance – largely originating from the USSR – has not been able to empower this transition due to USSR distribution agreements to serve the cotton and wheat tillage in Kazakhstan and Uzbekistan and outdated infrastructure. That path dependency has impeded horticulture.

A transition is thus needed in the centralist and authoritarian regimes of Central Asia to overcome USSR path dependency and boost the greenhouse area. Besides the technological path dependence of USSR water infrastructure, this transition also has to deal with political path dependency since the Soviet conception is still present in the institutions swaying actors' attitude towards a transition in the newly established republics. Moreover, infrastructures often appear to be interwoven, as the water-energy nexus in Middle Asia shows – an additional factor to regard in drafting transitions. In explaining and managing transitions, popular governance theories like network, adaptive, and transition management yet all assume a certain degree of democracy and subconsciously rely on democratic principles, denying their applicability to autocracies. To understand how transitions in autocratic regimes evolve and are governed, this study posed the question: *how does path dependency influence transitions of infrastructures in centralist and authoritarian regimes?*

This question was answered through five sub-questions that studied the characteristics of centralist and authoritarian regimes, how path dependency influences regime change, how interrelationships of infrastructures do so, what governance theories say about transitions, and how infrastructure transitions have been managed so far in these countries. Through a conceptual framework, the dynamics between path dependencies, interwovenness of infrastructures, and networks have been analysed. Path dependency emerged to determine the conception of actors of transitions, the institutional readiness to foster regime change, and any transition costs. Interrelationships of infrastructures said to increase these costs as it is impossible to change one infrastructure without impacting another, bringing more actors and interests to the table. Observing these dynamics in the governance context, the conceptualization deduced eight criteria – i.e., process structure, formalization, composition, participation,

dependency, durability, selection criterion, and public role – from Linz' (1964) principles to characterize autocracies to analyse their transition governance.

A holistic multiple-case study design of water governance in the Amu Darya and Syr Darya river delta in Kazakhstan, Kyrgyzstan, and Uzbekistan has been the exploratory approach to retrieve data for this analysis. Data have been collected for the case studies through a literature review and semi-structured interviews. This triangulation converges data from multiple perspectives and leads to a more robust understanding of path dependency in autocracies.

The analysis has revealed that pre-planned transitions in centralist and authoritarian regimes occur not as intended due to pushback from actors trying to maintain the *status quo* and institutions not being ready for change. This can partly be traced back to the characteristics of these regimes, which reflect little pluralism of actors, restricted actor interaction, and top-down governance – i.e., not providing for an institutional structure enabling change, as envisaged by the governance theories. Furthermore, path dependencies have a significant influence on infrastructure transitions. Technologically, the high sunk costs of infrastructures make it expensive and physically also challenging to change or abandon this existing infrastructure to serve new goals, prolonging obsolete and inefficient water infrastructure. The USSR water infrastructure hence continues to serve cotton and wheat production downstream despite the USSR disunion. Without clear ownership, common in autocracies, this barrier only seems to increase if nobody feels responsible for initiating change. Politically, conception of governance plays a key role in autocracies as it is likely to live on even if formally abandoned due to institutional reproduction. Central Asian countries reproduced USSR institutions after independence, causing the USSR conception of limited actor interaction and an executive swaying governance to persist. When expecting to disorder this USSR *status quo*, its governance is likely to provoke an antagonist response to protect it, Middle Asia illustrates.

Autocracies thus lack an institutional structure to support transitions. Water transitions in Middle Asia underline that the more power and resources the elite has consolidated, the less they feel the urgency to enable change for fear of losing power. Infrastructure change particularly requires an institutional structure noting its interwovenness and path dependencies; an integrated and strategic vision needs to be developed to support the transition of interrelated infrastructures. On the long-term, that institutional structure will require more embracing of informal decentralization, Central Asia explains. Undeterred by consolidation of power of central governments, informal networks remain key in executing policies and preventing local centralization of governance instead.

In short, both technological and political path dependencies shape the infrastructure transitions in centralist and authoritarian regimes. Previous conceptions of governance and technical decisions designing (transnational) infrastructure make it challenging to adapt this infrastructure. That demands a critical reflection on Western transition governance theories seeing their democratic axioms, their expectation that an institutional structure to enable transitions is present, and their ignorance of cultural-historical factors.

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This waterfall at an altitude of 2,665 meters in Ala-Archa National Park, 40 kilometres from Bishkek, feeds the Ak-Sai glacier. As one of the many glaciers in the Tian Shan Mountains, its meltwater is a key freshwater supply for Kyrgyzstan, Uzbekistan, and Kazakhstan. Normally, at the end of April, the glacier starts to thaw and the water flows towards Bishkek. Still being frozen in May (2023), irrigation will have to be postponed in Central Asia.

List of acronyms

BISA	Basin Irrigation Systems Authority
BWO	basin water organization
CIS	Commonwealth of Independent States
CPSU	Communist Party of the Soviet Union
ICSD	Interstate Commission for Sustainable Development
ICWC	Interstate Commission for Water Cooperation
IFAS	International Fund for Saving the Aral Sea
IMF	International Monetary Fund
ISA	Irrigation Systems Authority
IWRM	integrated water resource management
NGO	non-governmental organization
NPM	new public management
RSFSR	Russian Soviet Federative Socialist Republic
RGP	Republican State Enterprise
SDG	Sustainable Development Goal
SEO	state-owned enterprise
SME	small and medium-sized enterprise
SSR	Soviet Socialist Republic
UN	United Nations
USSR	Union of Soviet Socialist Republics
WTO	World Trade Organization
WUA	water user association

A typical yurt in the Kyrgyz countryside.

Glossary

Aiyl okmotus A form of local self-government in the Kyrgyz Republic, a kind of municipality (Sehring, 2009; Schmitt, 2015).

Elbasy Honorary status of Kazakh President Nursultan Abishuly Nazarbayev (1991-2019) from 2010 to 2022 (Blackmon, 2021).

Glasnost Policy of USSR General Secretary Mikhail Sergeyevich Gorbachev in the 1980s to make institutions more open and transparent about their activities. Its aim was to democratize government authorities and ultimately to develop socialist pluralism (McForan, 1998).

Gosplan USSR State Planning Committee charged with the development of the five-year plans steering and controlling the economy (Zhiltsov et al., 2018).

Hokim Head of a local or regional authority in Uzbekistan, comparable with a governor or a mayor (Ahrens & Hoen, 2013).

Jogorku Kenesh Parliament of the Kyrgyz Republic, since 2007 unicameral. Translated as 'Supreme Council' (Fumagalli, 2016).

Kolkhozes Farms in the USSR that were collectively managed by (formerly free) peasants, which were paid based on the farm's revenues (McForan, 1998).

Mäjilis Lower parliament of the Kazakh parliament (Heim, 2020).

Minvodkhoz The USSR Ministry of Land Reclamation and Water Management that coordinated and determined the allocation of transnational water sources in its single planned economy across the USSR (Stucki et al., 2014).

Oblast An administrative level in many post-Soviet countries, an equivalent of a region or province constituted by the Russian Empire or USSR (Ahrens & Hoen, 2013).

Oblastvodkhoz Provincial water department of Minvodkhoz (Zinzani, 2015c).

Oliy Majlis Parliament of Uzbekistan. Since 2005, bicameral with the Senate and Legislative Chamber (Ruiz-Ramas & Hernández, 2021).

Perestroika Policy of USSR General Secretary Mikhail Sergeyevich Gorbachev in the 1980s to restructure the Soviet political and economic system in attempt to end the *'Era of Stagnation'*. Relying on Lenin's democracy principles, it had the absolute goal of consolidating socialist relations and the socialist system across the USSR while rejuvenating its economy (McForan, 1988).

Sovkhozes Farms in the USSR that were administered by the state, providing a guaranteed income for its employees (McForan, 1998).

Rayon An administrative level in many post-Soviet countries, an equivalent of a district or municipality founded by the Russian Empire or USSR (Zhiltsov et al., 2018).

Rayvodkhoz District water department of Minvodkhoz (Zinzani, 2015c).

The famous Central Asian flat bread, called *lepyoshka*, is commonly sold at bazaars, like at *Osh Bazaar* in Bishkek. Bread is a valuable component of Kyrgyz gastronomy, eaten with almost every dish.

Food security in Central Asia mainly consists of small family businesses that produce and sell food on the streets, like at *Osh Bazaar* in Bishkek,

1 Introduction

Traditionally, Turkestan[1] and agriculture have been at daggers drawn. Quite remarkable, knowing that the Russian Empire banked on an agricultural economy for most of its bicentennial endurance. Even during industrialization in the 18th and 19th century, agriculture remained a major pillar of the Russian economy (Montefiore, 2017). In Imperial Russia, agriculture heavily relied on serfdom as peasants were commonly used to exploit the farms owned by the nobility. After the abolishment of serfdom by Tsar Alexander II in 1861, most peasants took over the land and operated it in communal ownership, so-called *obshchinas*. In practice, not much changed. The former serfs were not yet completely free as Saint Petersburg still substantially centrally dictated what, how, and when crops had to be cultivated or cattle had to be bred. Moreover, the peasantry had to give up most of its agricultural yields, like at the time of the nobility (Voronkova et al., 2018). The Romanov's agricultural system was therefore unstimulating – any market economy incentives were lacking in the regal planned economy – and caused land abandonment across the realm. The *Stolypin agrarian reforms*[2] hoped to bolster the Russian agricultural production through industrialization, privatization of land, and cooperatives. It turned out that this path dependency could not be reversed all of a sudden, leading to food shortages in the 1890s and 1910s (Voronkova et al., 2018) and ultimately laying the grounds for the downfall of the Romanovs (Montefiore, 2017).

When the Bolsheviks took over the imperial territory in 1917 with the newly established Union of Soviet Socialist Republics (USSR), its initial Chairman, Vladimir Ilyich Lenin (1917-1924), promised the people *"peace, land, and bread"* (Montefiore, 2017). Peasants were allowed to divide the confiscated land among themselves in an attempt to revamp the USSR's food production. Instead of paying taxes, these *kulaks* had to waive a fixed amount of yields to the state – *prodnalog* (Voronkova et al., 2018). As the yields were lagging behind over the years, the kulaks were condemned by USSR General Secretary Joseph Vissarionovich Stalin (1922-1953) for concealing harvests. The collectivization of agriculture was triggered (Voronkova et al., 2018). Kulaks were forced to hand back their land properties to collective farms – the *kolkhozes* and *sovkhozes*[3] – and the state would once again determine what should be produced at farm level (McForan, 1988; Bloch, 2002). Land, water, and all tools for cultivation belonged anew to the state. A system of central planning supposed to be utmost productive and fair for all Soviets turned out to be chronically deficient and

[1] Modern Russian Turkestan would mirror the southern part of Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan.
[2] Prime Minister Pyotr Arkadyevich Stolypin (1906-1911) proposed under Tsar Nicholas II reforms to grant private ownership of agricultural land to the peasantry, to develop cooperatives, to lift mechanization, and to equalize taxes among members of society (Voronkova et al., 2018).
[3] *Kolkhozes* were farms collectively managed by (formerly free) peasants which were paid based on the kolkhozes' revenues, while *sovkhozes* were government administered by the Soviet state providing a guaranteed income for its employees (McForan, 1988).

would eventually provoke the *'Soviet famine'* from 1930 to 1933 (Bloch, 2002). Nonetheless, the collectivization would last until the dissolution of the USSR in 1991 because the dominant Marxist-Leninist conception[4] would not approve any market mechanisms in the socialist Union (Voronkova et al., 2018).

1.1 Post-Soviet agricultural contraction

Agricultural systems in Central Asia have developed considerably in the post-Soviet area. After the collapse of the USSR, the newly independent republics were formally put in charge of domestic food production within their freshly established borders (Bloch, 2002; Stucki et al., 2014). Theoretically, this paved the way for de-collectivization and liberalization aimed at enhancing outputs. Adversely, due to the dissimilation of the USSR, all Central Asian republics would suffer from agricultural contraction in the early 1990s (Bloch, 2002; Kim, Sanaev, & Babakholov, 2018). The amount of volumes produced and cultivated land in Uzbekistan – but most notably – in Kazakhstan and Kyrgyzstan fell sharply during the *perestroika*[5] (Lerman, 2009). This decline in production is commonly attributed to the relatively slow reforms towards a market economy after gaining independence (Bloch, 2002; Lerman, 2009). Major differences in governance appeared as each pursued a different strategy to cope with USSR path dependency – largely determined by the country's access to commodities and the inherited infrastructure from the USSR (Ahrens & Hoen, 2013).

On the one hand, Kazakhstan took modest legal and policy reforms to redeem their food system and exploit local commodities. In a despair to sweep land abandonment in the mid-1990s, the nation broke up with kolkhozes and unleashed gradual land reforms. Even if leasing land from the state became common for Kazakh farmers, private land ownership was only recognized in 2003 (Lerman, 2009; Voronkova et al., 2018). This moderate reform was driven by a decade of agricultural decline. Once having formed the *"granary of Central*

[4] Conception refers in this research to someone's conception of the state which *"embodies an inclusive interpretation of human history, incorporates a highly articulated theory of the social order, inculcates these ideas by means of an educational system and an appropriate hagiolatry, possesses mass allegiance, and is identified with the policy and interests of a major power"* (Burks, 1949, p. 184). Brown (2015, p. 4) concurs that conceptions *"comprise multiple elements (power, conflict, agency, etc.)"* and therefore adds that *"proponents of different conceptions of politics tend to emphasize different elements and conceive them in different ways."* This thesis accordingly regards a conception as an understanding of how the state should be organized and governed, which could be based on an ideology (Burks, 1949). Notable examples of different conceptions of the state are those of Max Weber (Dusza, 1989, p. 83), which *"demolished the representative-patrimonial conception of rulership by separating the sovereignty of the state from the sovereignty of the ruler,"* of Vladmir Lenin of a socialist *"labour aristocracy"* to form an aristocracy among the working class to privilege the minority of the workers (White, 2015, p. 135), or that of Karl Marx of *"class consciousness"* establishing a *"dictatorship of the proletariat"* (Lukács, 1972, p. 55). A combination of the latter two would eventually form the ideological basis for the governance of the USSR (Voronkova et al., 2018), referred to as USSR conception in this thesis.

[5] The *perestroika* was an attempt by the Communist Party (CPSU) under General Secretary Mikhail Sergeyevich Gorbachev (1985-1991) during the 1980s to restructure the Soviet political and economic system and end the *'Era of Stagnation'*. Genuinely, Gorbachev envisioned to strengthen the CPSU vision across the USSR with the perestroika while rejuvenating its economy (McForan, 1988).

Asia" (Gencer & Gerni, 2012, p. 72), the drop in demand from its neighbours following the reintroduction of borders caused severe economic downturn; it impaired a post-Soviet investment in agricultural diversification (Bloch, 2002). Despite the contraction in the grain market, the extensive state procurement arrangements of the USSR continued, further lowering prices because of overproduction (Spoor, 1999). Meanwhile, this Soviet inheritance of wheat left the Kazakh with outdated machinery and decaying infrastructure, which were unsuitable to harvest other crops but also too old to keep up with past grain harvests (Bloch, 2002; Kim et al., 2018). Facing lower yields than other republics in the region, the central government of Kazakhstan tried to restructure its agricultural sector – often without supportive governance like adjusting the procurement arrangements (Spoor, 1999). The USSR's path dependency of wheat and mismanagement put the food sector in crisis and made Kazakhstan go through serious rural abandonment, reiteratively having its negative impact on any agricultural output (Spoor, 1999; Bloch, 2002; Kim et al., 2018).

Whereas Kazakhstan reoriented its kolkhozes, Kyrgyzstan was more progressive in recognizing private land ownership and redistributing land to former peasants (Voronkova et al., 2018). Immediately after independence, just like in Kazakhstan, Kyrgyz agriculture shrunk dramatically as the sales markets from the former USSR disappeared and the import of agricultural inputs like fertilizers became more difficult and expensive (Spoor, 1999). The occurrence of peasant farming and forsaking the obligatory central planning system were able to reverse this cynical production trend slightly. The Kyrgyz government started to actively promote small-scale farming among the large group of rural residents. In addition to these promotion policies, state procurement schemes were ditched gently for most commodities to commence market mechanisms. Peasants had to accustom their production to the demands of the local market, begetting moderate economic growth by replacing the state-run kolkhozes and sovkhozes (Spoor, 1999; Kim et al., 2018). In 2000, the smallest country in the region would be the first in exceeding its Soviet era production (Bloch, 2002).

On the other hand, Uzbekistan took a much more controlled transition into market-oriented agriculture, virtually adhering to Soviet collectivization (Spoor, 1999; Ahrens & Hoen, 2013). Diverging from Kazakhstan and the Kyrgyz Republic, the kolkhozes were not abolished,[6] quotas endured, and land was not privatized but would belong to the *mahallah* – the community (Bloch, 2002; Lerman, 2009). Through these collectives and cooperatives, the Uzbek state strictly controlled a slow reform from a cotton monoculture to a more diverse blossoming of grain, fruit, and vegetables (Spoor, 1999; Kim et al., 2018). Driven by the prospect of self-sufficiency, the cotton-oriented agricultural system was marginally amended to cultivate more strategic crops, although cotton remains dominant in the Uzbek countryside (Bloch, 2002). However, this diversification was accompanied by significant production losses owing to agricultural policies

[6] Actually, sovkhozes were in Uzbekistan converted into kolkhozes, after which they have been restructured into *shirkats*, which could be described as cooperatives run by families (Hamidov et al., 2020).

thus far having been strongly fixated at cotton growth (Spoor, 1999; Hamidov et al., 2020). The Uzbek protectionist policies made the country not ready to interact with global wheat, fruit, and vegetable markets. Neither was sufficient skilled labour available to grow these crops, nor was there mechanization to fill that gap (Kim et al., 2018). Aside from that, it was foremost the absence of vital infrastructure that prevented the agriculture in Uzbekistan from flourishing (Bloch, 2002). Ranging from the dearth of basic logistic facilities to insufficient water and energy supplies by a Soviet system still accustomed to cotton tillage, restrained the country from exceeding its USSR output after its independence (Kim et al., 2018) and induced serious land abandonment (Lerman, 2009).

The USSR's agricultural governance and associated infrastructure have created a path dependency, steering all three countries down a certain path of socioeconomic development. The infrastructure built under the Soviets and the role that agriculture was assigned in the USSR led to the independent countries being strongly guided by former USSR policies in their post-Soviet governance of the agricultural sector, limiting them in their transition to a self-sufficient and more diverse agriculture after independence (Spoor, 1999; Bloch, 2002). This story of transition in Central Asia is thus a story of path dependency.

1.2 Greenhouses for food sovereignty

The drop in food production volumes in all three countries strongly applies to greenhouse horticulture. A major trend reversal. Since the 1970s, the USSR had strongly been committed to improving its primary greenhouse production (Temirbekova et al., 2014). Howbeit, most greenhouses would fail to remain operational in the transition from collective to private ownership in the 1990s. The perestroika would spawn a swift shrink in greenhouse horticulture area due to rising costs for and deficits in water and energy supplies, labour shortages, and a slump in mechanization (Devochkina, Nurmetov, & Razin, 2020).

Horticulture in Central Asia remains withal challenging. The region is confronted by saline soils and changing climate conditions. Large parts of the steppes in Kazakhstan, Kyrgyzstan, and Uzbekistan are dry and vulnerable to water and wind erosion (Van Berkum, 2015). The endless deserts – that were once ridden by the audacious Cossacks – make parts of especially Kazakhstan and Uzbekistan unfit for horticulture. Seasonal frosts and droughts alternate rapidly, and the strong winds coming from the deserts erode fertile arable soils inland (Kim et al., 2018). The Russians already experienced in the 19th century under Tsar Nicholas I how a rapid change in temperature could impede your projects in Central Asia (Montefiore, 2017). Protection against such fluctuating climatic conditions is thus necessary to survive on these steppes.

Imaginably, the modern governments of Kazakhstan, Kyrgyzstan, and Uzbekistan reconsider greenhouses because of their potential to shield crops from corrosive wind and extreme temperature changes, providing artificially a stable production climate – and thus, food security (Temirbekova et al., 2014). Being food sovereign had already been a long-lasting aspiration of the USSR. Conventionally, the demand for fruit and vegetables – typical greenhouse crops

– has been high in Central Asia (Abdullaev & Rakhmatullaev, 2016; Kim et al., 2018). To meet consumer demand, most of this fresh produce is currently being imported from its neighbours Russia, China, and Afghanistan. Importing such strategic commodities is rather expensive but, chiefly, increases dependency on complex and unstable states – posing a genuine risk to the food security of these Middle Asian importers (Carruthers, 2015; Umarov et al., 2019; Devochkina et al., 2020). Expansion of horticultural production is therewith in the interest of the sovereignty of these nations (Temirbekova et al., 2014).

The three regard greenhouse horticulture as a resilient and sustainable manner in becoming self-sufficient in all-year fruit and vegetable production to feed their people (Temirbekova et al., 2014; Umarov et al., 2019). Greenhouses might too provide an answer to the ongoing water scarcity and soil degradation in the region. Noting their high water efficiency and controlled environment, fruits and vegetables could be grown with minimal inputs (Carruthers, 2015; Zhiltsov et al., 2018). Furthermore, it offers growers an opportunity to shift their production from water-intensive crops, such as cotton, to more water-efficient greenhouse fruits and vegetables – a nascent trend that already can be observed in cotton-rich Uzbekistan and grain-rich Kazakhstan (Stucki et al., 2014).

In theory, that sounds promising. Nonetheless, greenhouses require a number of basic facilities to function, including efficient water supplies. Water is needed to irrigate plants, to apply fertilizers, and to reuse wastewater. No matter how efficient greenhouses are, plants cannot flourish without sufficient water. Notwithstanding the policy ambitions of these countries, the reality is that Kazakh, Kyrgyz, and Uzbek growers in general do not have proper access to adequate clean water thanks to outdated freshwater infrastructures and the continuation of water distributions as defined in the USSR (Lerman, 2009; Kim et al., 2018; Zhiltsov et al., 2018). That path dependency perceived at farm level, *inter alia,* made greenhouse horticulture post-Soviet so far usually unprofitable. Effective governance of water is thus needed to realize the desired enlargement of the greenhouse area in Central Asia and to overcome the dominant USSR water paradigm (Kim et al., 2018; Zhiltsov et al., 2018).

1.3 Transitions in centralist and authoritarian regimes

Basically, this system failure calls for a structural transition in water governance in Middle Asia. Extensive academic research has been conducted on transitions of socioeconomic systems. Acknowledging the growing complexity of decision-making processes and the interplay between (informal) actors, new governance approaches have been researched based on the assertion that "*the government is not [any longer] the cockpit from which society is governed*" (Klijn & Koppenjan, 2000, p. 2). Network (Klijn, Koppenjan, & Termeer, 1995; Klijn, Steijn, & Edelenbos, 2010; Klijn & Koppenjan, 2000), adaptive (Pahl-Wostl et al., 2007; Poppe, Slingerland, & Termeer, 2009; Voß & Bornemann, 2011), and transition management (Loorbach, 2007; 2008; 2010; Rotmans & Loorbach, 2009) are among the most popular governance theories aiming to replace the

in the West hitherto dominant new public management (NPM) conception.[7] Yet, these governance theories seem to assume a certain degree of democracy and subconsciously rely on democratic principles (Loorbach, 2007; Jhagroe & Loorbach, 2015), conceivably posing restrictions to their materiality.

United in their premise that distribution of power and resources among actors in a socioeconomic regime demands interaction between those actors to achieve socioeconomic goals, they leave the conception of fixed and top-down management by states to the past (Klijn et al., 1999; Voß & Bornemann, 2011). Denying any dominant and hierarchical power at the helm of change, they hypothesize that no actor could independently pursue its goals because of this dependency (Klijn et al., 1995; Klijn & Koppenjan, 2000). In spite of hierarchical leadership, they propose a more open and informal governance system (Loorbach, 2010; Jhagroe & Loorbach, 2015). Quasi-independent networks have to be stimulated in which bottom-up interactions between actors are facilitated – sometimes by the state – to bring about radical regime change (Dewulf et al., 2009; Poppe et al., 2009). Engagement of actors having diverging perspectives and resources is in all theories expected. That delegation of power via including multiple actors resounding varied voices in the governance process pictures the democratic values of the three theories impeccably (Loorbach et al., 2015).

Democratic assumptions that fundamentally question the applicability of these theories to transitions in more centralist and authoritarian regimes, as common in Central Asia (Auty & De Soysa, 2006; Ahrens & Hoen, 2013). The well-embedded definition of Linz (1964, p. 297) of authoritarian regimes – to which this thesis also adheres – clearly depicts this tension by referring to these regimes as "*political systems with limited, not responsible, political pluralism, without elaborate and guiding ideology, but with distinctive mentalities, without extensive nor intensive political mobilization, except at some points in their development, and in which a leader or occasionally a small group exercises power within formally ill-defined limits but actually quite predictable ones.*"

Herewith, Linz establishes four principles that delineate the extent to which a regime classifies as authoritarian. Firstly, according to Linz' typology (1964), authoritarian regimes tolerate limited pluralism of actors in their governance and are not actively mobilizing actors in society to participate and take responsibility in the decision-making process. Only a small group of actors is charged with taking decisions. Secondly, most authoritarian regimes actually restrain – directly through legislation or indirectly – the interaction of actors in networks. Precluding others actors from intervening is supposed to depoliticize and concentrate decision-making, in this way reinforcing power of the ruling minority. Thirdly, it is paramount to note that the distribution of power is often ill-defined in such regimes, making it relatively easy for executive institutions controlled by this governing minority to seize full control in governance. These components construing an authoritarian regime seemingly overlap with the definition of a centralist regime if it would be illustrated as *"a state structure*

[7] *See:* Klijn and Koppenjan (2000), among others, for a more in-depth explanation of NPM and its managerial shortcomings in addressing complex challenges in modern societies.

which defers most of the decision-making to the central government" (Feickert, 2016, p. 252). Centralist and authoritarian regimes therefore often show similar features as they both intend to exert power through a small governing clan.[8]

Supremely, Linz (1964) argues that authoritarian regimes are not customarily guided by an ideology unlike totalitarianism. It may be that some conception has traditionally dominated in institutions, but current policies are not explicitly upholding this ideology, as is the case in totalitarianism. However, it is very likely that past conception has left its mark and still shapes the context within which policies are formed – even if that conception formally has been abandoned. An example of this path dependent context could be distinguished in Central Asia, where institutions are still imbued with the Soviet conception, which most nations have consciously renounced since independence (Ahrens & Hoen, 2013). Ergo, path dependency can sway a regime's positioning without that dogma being actively pursued (Linz, 1964). In other words, not only a technological path dependency but also a political one channels transitions in centralist and authoritarian regimes. But how and to what extent?

1.4 This thesis

Building on the remnants of the Soviet Union, a centralist and authoritarian conception seems to be deeply rooted in the governance in Central Asia (Ahrens & Hoen, 2013) – also in water (Menga, 2018; Zhiltsov et al., 2018). It is a path dependency in governance that cannot be easily ignored if one wants to develop greenhouse horticulture along the Silk Road.

Ensuring food sovereignty in Kazakhstan, Kyrgyzstan, and Uzbekistan is a grand challenge by nature. Food security has been listed among the United Nations' (UN) Sustainable Development Goals (SDGs) (Zhiltsov et al., 2018) and is currently challenged in Central Asia due to regional climate conditions and the lack of water and energy supplies to mitigate this (Stucki et al., 2014). Above shows that greenhouse horticulture production cannot be expanded just through technological solutions. Scaling fruit and vegetable production on the Turkic steppes demands above all governance changes in all three nations (Kim et al., 2018; Zhiltsov et al., 2018). Overhauling the water regime in Central Asia triggers a cross-sectoral and transnational regime change. Water infrastructure is not only transnational but also often strongly linked to energy systems, both administratively and technically (Abdullaev & Rakhmatullaev, 2016). Changing the water governance in some country would directly affect its own energy governance and at the same time the governance of water and energy cross-border. Under Western theories, an integral approach is accordingly needed in infrastructure transitions because of those interdependencies (Rotmans & Van Asselt, 2000). Resolving the issue of transnational water use in Central Asia is

[8] Considering the coinciding definition of centralist and authoritarian regimes based on Feickert (2016) and Linz (1964) respectively, these two terms will be scrutinized together in the remainder of this thesis. Insomuch as Linz (1964) classifying authoritarian regimes as a subdivision of autocracies, the terminology 'centralist and authoritarian regimes' and 'autocracies' might be used interchangeably in this study.

of great geopolitical, socioeconomic, and environmental significance for the livelihood and security in the region (Rahaman & Varis, 2008).

The technological and political path dependencies from the USSR and the various actors involved in water governance – everyone with its unique perceptions, behaviour, resources, and strategies – create a complex issue and thus a grand challenge. Through analysing (transnational) water governance in Kazakhstan, Kyrgyzstan, and Uzbekistan encouraging self-sufficiency in fruit and vegetable production in greenhouses, this research aims at studying the evolution and governance of transitions in centralist and authoritarian regimes to answer the following question:

How does path dependency influence transitions of infrastructures in centralist and authoritarian regimes?

In order to answer the research question in a manageable manner, it will be divided into sub-questions in this thesis. After these sub-questions have been answered, the overarching research question can be solved. The sub-questions that form the basis for this research are:

1. *What are the characteristics of centralist and authoritarian regimes?*
2. *How does path dependency influence transitions?*
3. *How do interrelationships of infrastructure shape transitions?*
4. *What are governance theories saying about transitions?*
5. *How are transitions of infrastructure managed in centralist and authoritarian nations?*

1.4.1 The remainder of this thesis

This question will be unravelled as follows. Firstly, Chapter 2 deals with the concepts of path dependency and interrelationships in infrastructure and what potential effects it could have on transitions. Additionally, this chapter lays the theoretical foundations of this research by studying the characteristics of the network, adaptive, and transition management theories. Chapter 2 serves to answer sub-questions 1 to 3. Thereafter, Chapter 3 explains how the governance of water in the Amu Darya and Syr Darya river basin functions as case study to explore the evolution and governance of transitions in these kind of regimes. A literature review and interviews with local experts form the major methodology in this study. Chapter 4 covers a comparative analysis of the emergence of path dependency in Central Asia by discussing its historical governance structures, unveiling the path dependent context of current regimes in which transitions are taking place. From this analysis, based on the data in Appendix I, the traits of centralist and authoritarian regimes are distilled, answering sub-question 4. This chapter subsequently dives into water governance in Kazakhstan, the Kyrgyz Republic, and Uzbekistan – i.e., the case study – to detect the network features of transitions in centralist and authoritarian regimes, as dictated by the fifth sub-question, following a comprehensive analysis in Appendix II.

Finally, Chapter 5 draws conclusions supplemented by a discussion covering a critical reflection on Western literature and recommendations for future studies in Chapter 6. This research accordingly follows the structure of the conceptual framework as will be presented in Figure 1 in Section 2.4.

The Lower Kolsai Lake near Almaty is ice cold as the water reservoir is fed with meltwater from the Tian Shan Mountains, a mountain range on the border of Kazakhstan and the Kyrgyz Republic. Swimming is strictly forbidden in Almaty's water supply.

2 Transitions in autocracies

Socioeconomic systems are constantly subject to change. Occasionally, when persistent problems cannot be resolved anymore through current policies, a system has to adjust its governance to manage these developments. Contesting these 'system failures' begs a transition (Rotmans & Loorbach, 2009). The web of socioeconomic, institutional, technical, cultural, and ecological dimensions makes modifying a system increasingly complex. Restructuring the system's governance means that all dimensions must be taken into account as the transition will be the coproduct of their synergy (Rotmans & Loorbach, 2009). Modern governance approaches like network management (Klijn et al., 1995; 2010; Klijn & Koppenjan, 2000), adaptive management (Pahl-Wostl et al., 2007; Poppe et al., 2009; Voß & Bornemann, 2011), and transition management (Loorbach, 2007; 2008; 2010; Rotmans & Loorbach, 2009) are nowadays among the most prominent transition theories in addressing this complexity. Unsure is yet whether their democratic assumptions restrict their applicability to those regimes that do not comply with these presumptions or do not subscribe them.

In the meantime, path dependency of past decisions (Goldstein et al., 2023) and interrelationships of infrastructure (Rotmans & Van Asselt, 2000) do not foster these transitions. Chapter 1 clearly demonstrates how the governance of agriculture in Central Asia today is being influenced by past governance and infrastructure decisions taken under the Romanovs or in the USSR, setting its development on a certain path. The exact effects of these system dynamics on transitions in centralist and authoritarian regimes remain to be reviewed. This chapter hence explores a theoretical framework that could research how path dependency influences transitions of cross-border infrastructures in centralist and authoritarian regimes. To this end, the implications of path dependency and interrelationships of infrastructures on transitions in general are studied in the first two sections. The next section pores over how governance theories explain and manage transitions. Referring to their characteristics, this Section 2.3 assesses how these governance transition concepts would fit in autocracies. Finally, Section 2.4 presents a conceptual framework, which builds on the theoretical groundworks laid down in earlier sections. This framework forms the core of this study, helping us to delineate the main governance features of initiating and managing transitions in centralist and authoritarian regimes in the literature review and case study.

2.1 Path dependency

The concept of path dependency finds its origins in industrial economics (Goldstein et al., 2023). Pioneers in the thinking of path dependency David (1985) and Arthur (1989) find that economic systems are highly influenced by antecedent choices. Obsolete technologies continue to be used in industries despite innovations having emerged by cause of previous production decisions. Gradually, this understanding of current system dynamics being influenced by

their precedents spread to other scientific dynamics, counting political science (Goldstein et al., 2023). There too, it turned out to that governance is highly determined by historical choices. Building on these economic avant-gardes, Goldstein et al. (2023, p. 3) generalize this concept to that modern dynamics in processes *"cannot be observed outside of history or as developing 'independently of previous events.'"* Rotmans and Loorbach (2009, p. 3) share that concept by reiterating that *"current and future states depend on the path of previous states."* The latter regard path dependencies as system failures, lock-ins which have been unable to accommodate change. In appraising the effects of technological and political path dependencies on transitions of transnational infrastructures, both will be probed in the next two paragraphs respectively.

2.1.1 Technological path dependency

Economists David (1985) and Arthur (1989) discover that industries often stick to previous production decisions, despite more efficient technologies having surfaced in time. They notice that industrial processes have been standardized in the past to produce an earlier picked technology as efficiently as possible with economies of scale. The costs of adapting industrial processes suitable for this new technology were often estimated to be more expensive than sticking to present technologies (David, 1985; Arthur, 1989): a barrier to transition. This prolonging of a technology due to this transition cost barrier creates a 'lock-in' of technology and can impede the development and adoption of contemporary innovations for the time being (David, 1985). Outdated technologies might carry on longer than desired, in most cases sustaining system inefficiencies.

Many path dependencies can be found in infrastructure (Van der Brugge & Van Raak, 2007; Gross & Hanna, 2019). One could argue that they are almost inherent to infrastructure. The construction of public works is typically marked with high investment, operational, and maintenance costs, and lengthy development cycles (Goldstein et al., 2023). Infrastructure projects have for that reason a low return on investment; it takes a while before a public project has been recouped. These heavy sunk costs deter actors from hastily adjusting infrastructure or offering alternatives: the transaction costs to alter or abandon existing infrastructure are simply just too high (Gross & Hanna, 2019; Künneke, Ménard, & Groenewegen, 2021). Lock-ins routinely occur in infrastructure, preserving old and less efficient infrastructure. An inadequate distribution of the resources to be transported by the infrastructure (Goldstein et al., 2023), like water or energy, could be the result of it, or – even worse – it could prevent a transition from succeeding (Gross & Hanna, 2019; Künneke et al., 2021).

Current water infrastructure in Central Asia, once designed by the USSR for large-scale cotton production, shows how technological choices in the past could hinder a transition to different or more efficient (agricultural) water consumption today because of physical infrastructural lock-ins (Jalilov, Amer, & Ward, 2013). The Central Asian energy infrastructure encounters a similar technological barrier. Kyrgyzstan and Tajikistan are regularly facing electricity shortages because energy has never been produced sufficiently in their country

in the USSR, yet the energy supply from other former USSR republics has stopped after 1991, causing their economies to a standstill (Boute, 2019). Undesirable distributions of natural resources can thus be prolonged purely as a result of technological transition barriers, notwithstanding political will.

Industrial economics learns us that path dependency cannot be ignored in managing infrastructural transitions. Radical change of a system with high sunk costs stays difficult, it is neither cheap nor easy to undo past decisions (Künneke et al., 2021). Gross and Hanna (2019) stage three ways to increase the return of transition investments: adaptive expectations, economies of scale, and network externalities. First of all, actors have to be well informed about the benefits of a transition, for example its improved efficiency. Knowing the future gains of the transition and reducing uncertainty about the return of this new investment might persuade actors to opt for changes in infrastructure. Here, an active role is expected for the government to reduce the ignorance of actors about lock-ins; actors should be stimulated to transition by this information (Gross & Hanna, 2019). Secondly, governments must try to boost the economies of scale of innovations through long-term policies. Not alone could economies of scale reduce the sunk costs of innovations, pushing for improved efficiency, deployment, and technical performance through regulations, strategies, or policies can enforce a transition too. Thirdly, network externalities could steer innovations being better accommodated to present infrastructures (Gross & Hanna, 2019). Whereas the existing infrastructure requires less modification, the transition costs to endorse an innovation are likely to be lower.

Questionable remains how these recommendations for breaking locks-ins pertain in centralist and authoritarian regimes. Künneke et al. (2021) expound that public works in most countries are run by government actors, foremost in autocracies (Merry, 2004; Ahrens & Hoen, 2013). They usually run critical infrastructures themselves for stability reasons. Political stability is, on the one hand, needed to exploit the infrastructure for a long time in order to be able to compensate its heavy sunk costs. Owning the infrastructure yourself, on the other hand, provides some security to the users that it remains operational (Künneke et al., 2021). Moreover, this gives central governments control over the distribution of resources (Stucki et al., 2014). The harmony between the government and the infrastructure makes that its operationalization is firmly embedded in the dominant political context through translating this into law, policies, and actor behaviour – i.e., state authorities – to ensure a successful exploitation (Künneke et al., 2021). That institutionalization of technology management reiteratively increments political path dependency as well.

Like Gross and Hanna's (2019) recommendations signal, governments are thus basically tasked to repair their own technological system failures if they want to change the infrastructure. It is mainly government behaviour that could aid this technological transition, turning this technological path dependency partially into a political one (Goldstein et al., 2023). In the case of transnational infrastructures, escaping from a technological path dependency is even more difficult as all countries contiguous to the infrastructure will have to revise their

position to capacitate a transition. The extent to which technological path dependencies influence transnational infrastructure transitions in centralist and authoritarian regimes will depend heavily on the political will of all nations to adopt infrastructure regimes (Gross & Hanna, 2019) and the resources to pay for the transition cost barrier (Gencer & Gerni, 2012). These conditions could encumber transnational infrastructural transitions in Central Asia. Each state has different interests concerning the physical aspects of these infrastructures, depending on their position along the infrastructure and the purpose it should serve in the country (Kim et al., 2018; Zhiltsov et al., 2018), protracting the technological path dependency.

2.1.2 Political path dependency

In political science, Sewell (1996) and Pierson (2000) were one of the primary to adopt the path dependency concept. In governance too, today's decisions cannot be viewed separately from past developments. Rotmans and Loorbach (2009) consider path dependencies as policy lock-ins which have been unable to nurse transitions. Political failures that thence need to be combatted to make transitions possible.

Pierson (2000) links path dependent governance to the notion of institutional reproduction. Actors, institutions, resources, and processes are oftentimes intertwined around certain societal issues – such as infrastructure – contriving a lock-in (Loorbach, Frantzeskaki, & Thissen, 2010). The specific dynamics of a social issue is associated with a unique governance structure. Irrevocable investments and insights gained in this idiosyncratic architecture make it more attractive for actors to build on existing governance during regime changes *in lieu* of instituting a new structure (Pierson, 2000; Mahoney, 2001). Most of all centralist regimes found it convenient from a 'rational' point of view to repeatedly reproduce governance (Mahoney, 2001). Enduring governance preserves the prior distribution of power in a network, beneficial to the existing ruling class (Mahoney, 2001). Assaying transitions in the military-authoritarian regimes of Central America, Mahoney (2001) exposes that conception could be reproduced just like governance. Previous governance structures or decisions established entrenched in a prevailing ideology could draw out a conception of the state for a long time through reproduction of institutions. A single juncture – at times only discernible afterwards – sparked by a conception could move a state totally towards another conception about governance (Mahoney, 2001). This governance path dependency might explain why the Soviet conception is still alive in Central Asian institutions and that past policies are still perpetuating (Merry, 2004; Ahrens & Hoen, 2013), similar to liberalism up to now being in present Central America behind the scenes (Mahoney, 2001).

Nonetheless, resistance from actors to the *status quo* should culminate in a regime change (Mahoney, 2001). Whereas Pierson (2000) agrees that path dependency does not automatically induce future policy outcomes, Sewell (1996) argues that one has to look at critical junctures in order to understand the path leading to the outcomes of policy processes today. Pierson (2000) and

Mahoney (2001) believe that when the time is right and when maintaining the state of affairs outweighs the transition costs, this historical path can be reversed. Others, however, contend that this barely happens (Sewell, 1996; Geels, 2004; Goldstein et al., 2023). Conceding to Pierson's concept (2000) of path change, they claim that solely momentous occasions might turn into new social constructs, from which it will be difficult to deviate later. Only a few of these events can provoke radical institutional change or substantially adjust paths, setting a new standard – i.e., instituting a new path dependency from which it will become difficult to alter again in the future, Pierson (2004) adds. Until another rare yet radical discourse occurs, path dependency will define the context and processes in which policy decision-making takes place for the time being (Goldstein et al., 2023): a vicious circle of in perpetuity creating path dependencies in governance.

Path dependency plays in governance theories – perhaps implicitly – a fundamental role in laying the foundations for the dominant context (e.g., rules, resources, relationships, etc.) in which transitions are structured (Klijn & Koppenjan, 2000; Pahl-Wostl et al., 2007; Rotmans & Loorbach, 2009). Path dependencies dictate the deep context of a socioeconomic system in which transition are taking place (Goldstein et al., 2023); it forms the core of a system. Geels (2004) construes that it is exactly that deep context that could clog regime change. In order to building up a new regime, you have to deal with its heritage if you want to transition this path dependency. If the context is unfavourable to transform, it could even have an antagonistic effect (Rotmans & Loorbach, 2009). Malcontent actors might activate that deep context (e.g., its institutions, resources, processes, etc.) – i.e., the path dependency – to hamper interference in the system to conserving its current state (Pierson, 2000). That is in line with Mahoney's (2001) commentary that powerful actors in especial, who may lose power or resources, aim to maintain the existing context. Conception might be mobilized to retain the *status quo*. In centralist and authoritarian regimes, one could expect to observe an antagonist path dependency in political decision-making processes out of fear of losing power. Pahl-Wostl et al. (2007) presage that path dependencies in autocracies are most likely to thwart transitions, which already could have been seen multiple times in Kazakhstan, Kyrgyzstan, and Uzbekistan (Ahrens & Hoen, 2013). To prevent conflict with the system's path dependent structure (Geels, 2004) or a lock-in (Goldstein et al., 2023), one has to anticipate its potential antagonist path dependent context in managing transitions (Pierson, 2000). Managing transitions in autocracies therefore goes beyond repairing 'system failures' from path dependency, it is about preventing an antagonistic reaction from the path dependent context.

The impact of path dependency goes beyond just plainly shaping the context. Even the arenas in these governance theories are subject to those path dependencies, whether they are called games (Klijn et al., 1995), institutions (Dewulf et al., 2009; Poppe et al., 2009), or niches (Loorbach, 2007; 2008). Geels (2004) consolidates that transition theories accredit these arenas the competence to challenge the path dependency of regimes bottom-up. Howbeit,

scholars likewise acknowledge that these arenas are extracted from the overall context – i.e., the regime (Klijn & Koppenjan, 2000; Geels, 2004; Pahl-Wostl et al., 2007). To a certain extent, these arenas will wherefore exhibit akin path dependent features as its context, querying their actual ability to challenge the path dependency of its context to empower transitions. To creating a window of opportunity, Geels (2004) requires a mismatch between an arena and the regime context to precipitate a transition. The question is how these windows could be 'opened' in centralist and authoritarian regimes. The aforementioned antagonistic response hints that these regimes might try to keep these windows as closed as possible – admittedly, this will not always be possible. The chances for bottom-up initiatives will be further limited if those arenas indeed are heavily imbued with the same path dependent characteristics as its context, which disadvantages bottom-up regime change. The tipping point has to be found to spark a fruitful transition. Particularly in autocracies like Kyrgyzstan and Uzbekistan, where the regime actively interacts with informal networks to keep them close by aligning them to the dominant context (Ahrens & Hoen, 2013), it remains unclear to what extent niches might resemble path dependent features of the context without vanishing their transition potential. Anyway, it is expected that path dependent governance with lock-ins has repercussions for transnational infrastructural transitions in Middle Asia. A successful transition in autocracies is about preventing an antagonistic response from the dominant (political) context (Pierson, 2000; Pahl-Wostl et al., 2007). But how?

2.2 Interrelationships of infrastructure

Closely related to path dependency is the interwovenness that infrastructure oft reflects. Socioeconomic, environmental, and institutional processes have increasingly become interwoven, Rotmans and Van Asselt (2000) notice. Over time, systems escaped their isolated development and started to interact with other ecosystems due to globalization, knowledge sharing, and technological development, interlinking them by interrelating their progression along with joint issues arising (Rotmans & Van Asselt, 2000; Grafius, Varga, & Jude, 2020). In urban development, for instance, Rotmans and Van Asselt (2000) perceive a metabolism between housing, transport, telecommunication, energy, and water systems. Their physical infrastructures integrated with their stocks and flows getting interrelated. Socially, economically, and ecologically, there are exchanges between these infrastructures taking place, connecting the systems to each other. Technologies are no longer serving one specific goal and societal demand for system functions also have become more intertwined, such as telecommunication as an alternative to transport, or wastewater that is being reused as freshwater source (Rotmans & Van Asselt, 2000). Whether it is in agriculture (Goldstein et al., 2023), energy (Künneke et al., 2021), or transport (Rotmans & Van Asselt, 2000), these trends led to increased interconnectivity and interdependencies of infrastructure (Loorbach et al., 2010).

Grafius et al. (2020, p. 11) compile that infrastructure now functions as *"a system of systems,"* in which "*the physical and economic infrastructure*

strongly interferes with changing social-cultural, ecological, and institutional dynamics," Rotmans and Van Asselt (2000, p. 113) reply. The latter thereby refer to the integration of the physical and socioeconomic infrastructure they found in urban development. Interrelationships of systems do not advance transitions intrinsically since one has to consider its dynamics with other systems and potential transition effects on them as well before acting. Political decision-making has therefore been growing more complex.

Interwovenness looks like a good recipe for path dependency (Loorbach et al., 2010). Sometimes interlinkages might be actively established by actors with the aim to reducing risks and uncertainties – regularly also leading to the contrary (Grafius et al., 2020). But even without creating them, lock-ins could regularly be found around aforestated systems (Loorbach et al., 2010). These interdependencies between infrastructures also result in interdependencies among actors, resources, governance processes, and technologies. At strategic and operational level, this interwovenness makes targeted adjustments in a single system difficult, to the detriment of transitions (Goldstein et al., 2023). The case of destruction of the uniform energy and water system of the USSR in Central Asia – that once produced both irrigation water and hydroenergy for the entire region – after separation stipulates that interdependencies between actors, resources, and technologies around this transnational water and energy infrastructure make it difficult to escape these system failures and trigger an individual transition in those two domains (Zhiltsov et al., 2018; Boute, 2019).

Still, Rotmans and Van Asselt (2000) and Grafius et al. (2020) do not consider interdependencies by definition as a transition barrier. Subservient to democratic principles, they propose an integrated and interactive approach to managing transitions. Well-structured participation of actors should support the design of a long-term vision on interdependent regime changes (Rotmans & Van Asselt, 2000). Exploring actor views, discovering the impact of these interdependencies on transitions, and sharing knowledge across systems helps to roll out a common agenda at strategic and operational level to embark intertwined transitions (Loorbach et al., 2010; Grafius et al., 2020): developing an integral vision for sustainable development conjointly with interested actors to refine transition strategies for interrelated infrastructures (Rotmans & Loorbach, 2000).

Grafius et al. (2020) acknowledge that actors and academics tend to focus on the risks and vulnerabilities related to interdependent infrastructure, leaving beneficial synergies untouched. In case of a physically overlapping infrastructure, like for power stations near point of consumption, there is, for example, an interest in looking for establishing interdependencies to generate beneficial couplings and make them more resilient and robust (Rotmans & Van Asselt, 2000; Grafius et al., 2020). Society's position towards a system could change smoothly when these conveniences surface or the political debate turns due to external developments (Loorbach et al., 2010). Actors and processes will have to adapt adequately to exploit this window of opportunity and manage this regime change. In order to be able to do so, actors will have to abandon the idea

of constant security and stability by the *status quo* and not always to opt for the optimal solution – as one is so much used to – Rotmans and Van Asselt (2000), Loorbach et al. (2010), and Grafius et al. (2020) plead. Actors have to take risks in managing transitions in interrelated systems, they conclude. One has to look at the wider context of system dynamics and encounter long-term benefits and effects of transitions (Grafius et al., 2020).

Interwovenness of infrastructure adds greatly to the complexity of realizing transitions. In general, but especially in centralist and authoritarian regimes. Key in dealing with interrelationships in transitions is to enter into discussions with actors to gain understanding of their interdependencies and perceptions to formulate transition paths cross sectoral (Rotmans & Van Asselt, 200; Grafius et al., 2020). Autocracies are yet used to working unilaterally in narrowly defined (infrastructure) systems. Their governments might therefore be less receptive to a broad participatory process (Rotmans & Van Asselt, 2000) or to seek for beneficial intersectoral linkages (Grafius et al., 2020); it is not in their DNA (Linz, 1964; Ahrens & Hoen, 2013). The questions put by Loorbach et al. (2010) remain particularly relevant for transnational regime changes in centralist and authoritarian regimes: what are the patterns of fundamental change in infrastructure systems and what possible forms of governance could positively influence their regime change? Interrelationships of infrastructure and transnationalism deem to discommode transitions, whether in autocracies or not. These system dynamics will have to be taken into account in exploring the influence of political and technological path dependency in transnational infrastructure transitions in centralist and authoritarian regimes.

2.3 Transition theories

So, concretely, how do we deal with path dependency and interwovenness of systems in infrastructural transitions? The theories of network, adaptive, and transition management try to tackle this complexity of persistent problems. Besides bearing in mind the interplay of a system's socioeconomic, cultural, institutional, technical, and ecological dimensions, today's dominant theories assume that the government is no longer in position to wholly control systems and their evolution (Klijn & Koppenjan, 2000). Their joint criticism of NPM relates to their communal premise that actors are interdependent, in this manner hindering the state to take unilateral action (Klijn & Koppenjan, 2000; Van der Brugge & Van Raak, 2007). These modern governance theories suggest with that to mirror democratic axioms (Loorbach, 2007; Jhagroe & Loorbach, 2015). Would that perhaps slant their application in centralist and authoritarian regimes? This section marks the peculiarities of the three theories respectively and on that ground debunks their use to autocracies if needed.

Next to general components like type of analysis, motive, approach and issue addressed that can be used to describe all academic theories, they will be characterized based on the four principles of Linz (1964) typifying centralist and authoritarian regimes to assess how the theories fit into autocratic nations. In line with his first principle regarding the limited pluralism of actors in

governance, the composition of governance, and degree of participation of actors is examined for all theories. The second principle – mentioning a restrained interaction of actors – intrinsically asks to distinguish the theories in terms of formalization, process structure, and the role that governments play. The distribution of power and resources – Linz' (1964) third principle – addresses in addition to formalization and composition also actor dependency, the selection criteria that are (unconsciously) applied to include an actor into governance, and the duration of the actor's inclusion in the governance. His fourth principle – arguing that autocracies are not governed ideologically – demands to look at the theory's approach as well as the role it attributes to governments. Along those twelve criteria – of which eight emanating from Linz (1964) – the governance theories will be scrutinized.

2.3.1 Network management

Network management, for a starter, is a descriptive type of analysis and relies on the premise of interdependent actors that need to cooperate in networks to realise complex policies or resolve wicked problems (Klijn & Koppenjan, 2000). Concretely, it means that actors depend on each other because of the resources, positions, or power they share. This theory thus assumes that it is impossible for an actor to accomplish satisfactory policies without cooperation (Klijn et al., 1995, Klijn & Koppenjan, 2000). It implies that other actors enjoy resources, positions, or power that prevent an actor from reaching a certain outcome. Such dependencies between various public and (semi-)private actors create a net of relationships, constituting a 'network' of actors (Klijn et al., 2010).

Network management for that reason abandons the doctrine of hierarchical and institutionalized policy decision-making in NPM, indicating a shift *"towards less formalized, interactive forms of governance in which state authority makes way for an appreciation of mutual interdependence with different stakeholders"* (Poppe et al., 2009, p. 36). The main motive for network management said to oppose NPM and be cooperation driven is to do more justice to the complexity of networks. This theory as such reflects a pragmatic bottom-up approach in which policies are the result of complex interactions between multiple, interdependent actors (Klijn & Koppenjan, 2000). A specific interaction in a network of certain actors – for example, on some policy dossier – is called a 'game' (Klijn et al., 1995; Klijn & Koppenjan, 2000).

To some, this might sound rather unstable. Yet, networks turn out to be quite a stable framework in which several synergetic games are taking place simultaneously. Stability is maintained by the rules that prevail in a network. Rules that regulate actors' behaviour and are based on long-term relationships, actors' perceptions, and their dependencies (Klijn et al., 1995; 2010). These rules are somehow established over time and cannot easily be ignored nor changed, structuring processes. Ultimately, the distribution of rules and resources at network level form a blueprint for the games, in which actors interact to achieve mutually agreeable outcomes for specific issues (Klijn & Koppenjan, 2000; Poppe et al., 2009). The process structure, which is moderately determined by

the rules and resources in a network, can therefore be regarded as medium organized in network management.

Based on their perceptions and general objectives, actors might opt to interact in a game. It will be its position and resources in a network that are decisive in the strategies that an actor might employ to achieve its objectives (Klijn et al., 1995; Klijn & Koppenjan, 2000). The composition of a network is relatively fixed with established actors; participation in network management is more closed. Fundamentally, Klijn et al. (1995) hold that the true position of an actor in a game is strongly determined by which resources it can mobilize. That is exactly why governments are unique actors. As no other, government actors retain a unique position in a network controlling exclusive resources. Without them, legitimacy and accountability issues might emerge (Klijn & Koppenjan, 2000). Klijn et al. (2010) therefore add later that interdependencies among actors not necessarily entails equality of actors in a network. Some actors cannot just be excluded and are indispensable because of their position and resources (Klijn et al., 1995). At the same time, network management clearly presumes that monopolies are inexistent; actors always need others to achieve their goals (Klijn et al., 1995). This pragmatism might be tricky for autocratic regimes, in which political, socioeconomic, and natural resources are consolidated (Linz, 1964; Auty & De Soysa, 2006; Ahrens & Hoen, 2013).

Bearing privileged resources as an actor accredits this actor to a certain extent with veto power (Klijn & Koppenjan, 2000). The greater the veto power, the greater the influence of an actor in a game. And the greater the likelihood that an actor might block interaction by not joining in network games and impose policies just unilaterally on others instead (Klijn & Koppenjan, 2000; Dewulf et al., 2009; Poppe et al., 2009). *"Differences in the distribution of resources matter: actors will use them to influence the process and the substance of interaction,"* Klijn and Koppenjan (2000, p. 145) note. So, by not mobilizing their resources, monopolists could simply manipulate the process and obstruct cooperation. Taking advantage of their wealth, power-loss-fearing autocracies, as we have seen in Central Asia (Ahrens & Hoen, 2013), might prefer to veto interactions in which they potentially could lose resources or power (Linz, 1964) – a redistribution for which network management explicitly advocates (Klijn et al., 1995; 2010). The assumption of network management that actors in a network must be prepared to mobilize resources to support interaction (Klijn et al., 1995), does in practice not sound to last in autocracies.

That possibility could equally be at odds with the basic principle of this theory that a dominant decision centre is lacking in a network (Klijn et al., 1995). The idea that system formalization is low since there is no dominant actor which can enforce its goals on others, could be easily disputed in centralist and authoritarian regimes. Practice has shown that Kazakh, Kyrgyz, and Uzbek growers routinely have been excluded from water and energy governance in the region (Kim et al., 2018), perchance because they lack resources paramount to the dominant powers in Astana, Bishkek, or Tashkent to get motivated to join in interactions. Democratic accountability of actors would normally ensure

that a government pursues the public interest (Klijn & Koppenjan, 2000) and preferably acts as a facilitator to improve cooperation (Dewulf et al., 2009; Poppe et al., 2009). Authoritarian regimes by their very nature lack democratic monitoring (Linz, 1964), taking away public pressure and thereupon political commitment to interact (Klijn et al., 1995). This touches upon on one of the main findings of Klijn and Koppenjan (2000) that rules protecting autonomy and position can strongly stymie the extent of cooperation – also negatively, Central Asia demonstrates (Ahrens & Hoen, 2013).

In short, network management has the modus to improve cooperation in games as actors need to cooperate to realize goals (Klijn et al., 1995; 2010; Dewulf et al., 2009; Poppe et al., 2009). Table 1 summarizes the characteristics of network management briefly.

Table 1 – Characteristics of network management

Characteristics	**Network management**
Type of analysis	Descriptive
Motive	Cooperation driven
Issue addressed	Complexity
Process structure	Moderately guided by rules and resources in network
Formalization	Less formalized and more interactive
Composition	Relatively fixed with established actors
Participation	Established actors can participate if they want
Actor dependency	Interdependent due to shared resources and power
Durability actor	Only established actors can participate
Actor selection criterion	Resources it can mobilize
Approach	Pragmatic bottom-up
Public role	Improving cooperation

It can be concluded from the aforementioned that the principles of this theory find its roots – sometimes implicitly – in democratic processes. Discarding the role of a dominant and hierarchical power by hypothesizing that all actors are interdependent (without full veto power) and ergo willing to interact to achieve goals through redistributing resources (Klijn et al., 1995; Klijn & Koppenjan, 2000), network management as a whole seems to be unfit as a democratic-oriented theory to explain and manage transitions in countries that classify as centralized and authoritarian regimes, such as the Central Asian countries. Reading Table 1, the main criticism of network management's principles for autocracies could thus be briefly summarized as follows:

- Governance should be informal and interactive instead of hierarchical and institutionalized;

- Actors should be interdependent based on their common resources and powers, monopolies should be inexistent in a network, and
- Actors should be keen to redistribute resources to achieve their goals, states should support not veto cooperation.

2.3.2 Adaptive management

Our world is changing. Continuously. Sometimes abruptly, sometimes more gradually. That thought calls for a theory that takes uncertainties caused by both steady and turbulent changes more into account. Adaptive management as descriptive theory makes an attempt to do so by very pragmatically adapting management strategies based on perpetually developing knowledge about our ecosystems (Van der Brugge & Van Raak, 2007; Dewulf et al., 2009; Poppe et al., 2009). Pahl-Wostl et al. (2007, p. 34) present adaptive management inasmuch as *"a systematic process for improving management policies and practices by learning from the outcomes of management strategies that have already been implemented."* Which Voß and Bornemann (2011, p. 14) even further abstract to merely *"learning to adapt."* The motive of adaptive management is to improve the quality of the process rather than about achieving certain goals. In theory, goals can be adapted alike based on the process (Pahl-Wostl et al., 2007).

Adaptive management builds on the reasoning that true scientific understanding can only be gained by understanding and adjusting processes (Pahl-Wostl et al., 2007). Learning more is the issue that adaptive management wishes to address. Quality of processes – e.g., which actors are involved and what data are considered – is in the end determining the outcomes of these processes and dominates in this theory. It closely conforms to a scientific experimental design testing hypotheses over and over adjusted to the results of previous experiments (Pahl-Wostl et al., 2007; Voß & Bornemann, 2011). As an alternative to traditional governance theories responding to adversities or irregularities, adaptive governance should theoretically be able to react to change (Van der Brugge & Van Raak, 2007). Hence, Voß and Bornemann (2011) argue that adaptive management first and foremost is driven by complexities and uncertainties demanding a change in management, not by political or managerial hunches. This reflexive approach allows actors to reconsider their perceptions, change their behaviour, and alter the rules beneficial to the quality of the process. Policies should not be regard as something fixed but as hypotheses that will be carefully evaluated through experiments (i.e., actions) and can be modified accordingly (Folke et al., 2005). To monitor developments and outcomes, actors will go through this policy cycle iteratively in a supportive institutional setting (Pahl-Wostl et al., 2007). Going through this policy cycle iteratively formalizes governance somewhat, even if the process structure is low because it can be flexibly determined how and when it will be completed.

Differentiating from classic management theories, adaptive governance does not seem to take place in a physical arena as setting (Voß & Bornemann, 2011). Its management regime reads better as a polycentric institution (Dewulf et al., 2009; Poppe et al., 2009), conceptually depicting the interconnectedness

of non-organizational institutions (such as norms and regulations tailoring actor behaviour), technology, perceptions, and its environmental context for a specific management assignment (Folke et al., 2005; Pahl-Wostl et al., 2007). Actors are mutually dependent and need to cooperate to gather knowledge through social learning (Dewulf et al., 2009; Poppe et al., 2009) to be able to adapt strategies (Pahl-Wostl et al., 2007) through collective action (Folke et al., 2005). However, the actors established in a network can freely determine whether they participate in a game, making its composition flexible. Just like network management, adaptive governance establishes a clear relationship between the context regulating a network and the concrete issues at hand – also known as 'games' (Klijn et al., 1995; Klijn & Koppenjan, 2000) or 'regimes' here (Folke et al., 2005; Pahl-Wostl et al., 2007). Long-term relationships between actors appear in both theories, determining the precise context of a game.

The two theories likewise challenge the traditional hierarchical top-down approach. Although adaptive management distinguishes three different governance levels (i.e., context, networks, and games), they operate quasi-autonomous (Dewulf et al., 2009; Poppe et al., 2009), self-organized (Voß & Bornemann, 2011), and semi-independent (Pahl-Wostl et al., 2007). Politics is no longer at the core of steering management, Voß and Bornemann (2011) put. They argue that adaptive management choosing such an adaptive approach will correct for political fallacies and perspectives. Paradoxically, Pahl-Wostl et al. (2007) raise that, in order of this theory to happen, actors, including politicians, must first be willing to change. Why power-loss-fearing authoritarian regimes (Linz, 1964), like in Central Asia (Ahrens & Hoen, 2013), are likely to curb this has extensively been discussed in paragraph 2.1.2 and might not fulfil their role to improve learning processes. Even so why there might be no public call to change despite maybe widespread dissatisfaction (Pahl-Wostl et al., 2007) due to a lack of democratic standards (Linz, 1964).

This is where the shoe pinches. One could argue that the switch from prediction-and-control to adaptive management (Pahl-Wostl et al., 2007) is challenging in centralist and authoritarian regimes (Linz, 1964). Not only the reasons of political instability or unreliable administrations, as raised by Pahl-Wostl et al. (2017), or the reluctance of power sharing (Voß & Bornemann, 2011) are the sole reasons for this. Institutions in these kind of regimes are often imbued with the conception of controlling (Linz, 1964). Look for instance at Kazakhstan, Kyrgyzstan, or Uzbekistan, where central governments have been entrusted with political decision-making since the USSR (Ahrens & Hoen, 2013). This pathological path dependence (Pahl-Wostl et al., 2007) in autocracies might block their factual adoption of adaptive management (Linz, 1964), categorically when it relates to infrastructural heritage (Van der Brugge & Van Raak, 2007). The solution proposed by Voß and Bornemann (2011) of selective participation has earlier in paragraph 2.3.1 widely been refuted in view of the government's unique position and respective monopolies (Linz, 1964).

The polity aspect of adaptive management would be of special interest *in casu* (Voß & Bornemann, 2011). Shadow networks are mentioned as an

institutional structure that could lay the societal foundations for adaptive management. Middle Asia has a rich history of informal networks – particularly in Kyrgyzstan and Uzbekistan (Ahrens & Hoen, 2013). Although they are mostly encapsulated in the patrimonial network of the nation's autocrat and thus far have never been able to bring about regime change (Ahrens & Hoen, 2013; Fumagalli, 2016; Akchurina, 2021; Ruiz-Ramas & Hernández, 2021), it would be engaging to learn from adaptive management how existing informal networks might be able to contribute to supportive institution building. Unfortunately, this aspect has yet to be elaborated by scholars (Voß & Bornemann, 2011). An overview of the features of adaptive management could be found in Table 2.

Table 2 – Characteristics of adaptive management

Characteristics	**Adaptive management**
Type of analysis	Descriptive
Motive	Process driven
Issue addressed	Learning
Process structure	Reflexes to complexities and uncertainties
Formalization	Slightly formalized with an iterative policy cycle
Composition	Relatively flexible with actors choosing to participate
Participation	Selective participation
Actor dependency	Interdependent due to shared knowledge
Durability actor	Actors established in a network can participate
Actor selection criterion	Willingness to learn
Approach	Pragmatic to adjusting processes
Public role	Improving learning processes

For now, adaptive management, calling on iterative self-organizing regimes in decision-making and central authorities surrendering power (Folke et al., 2005; Pahl-Wostl et al., 2007; Voß & Bornemann, 2011), does not seem to align with the centralized and authoritarian *status quo* in Central Asia to facilitate any transitions. The major objections of autocracies towards the basis of adaptive management can be listed as the following:

- Actors should systematically intend to reiteratively adapt governance strategies by learning from past policy outcomes;
- Actors should be interdependent to build knowledge needed to adjust strategies, rejecting hierarchical governance, and
- Actors should be willing and flexible to participate to redistribute resources, governments should support improving learning processes.

2.3.3 Transition management

Transition management is of the three the most ambitious one. Witnessing the decreasing ability of liberal market-based approaches or top-down steering by governments to coordinate radical regime change for solving problems like sustainable development, an alternative governance approach had to be found (Dewulf et al., 2009; Loorbach, 2010). The focus on stimulating less formalized networks shares this theory with network governance, even though the latter is more targeted at established actors compared to transition management trying to push innovative niches of new actors (Dewulf et al., 2009). The lack of coordination in existing governance theories proved to be unable to facilitate unstructured and complex regime changes like for sustainability. Intrinsically, transition management is problem driven to overcome failures. The theory therefore embodies a reflexive paradigm that *"stimulates transition processes by organizing the build-up of the social structures needed to realize the new regime"* (Van der Brugge & Rotmans, 2007, p. 15). Or, as Loorbach (2008, p. 18) puts it: *"transition arenas with frontrunners structuring societal problems, developing transition visions, and transition experiments."* Its prescriptive philosophy appeals to the convention to empower frontrunners with (often, literal) space in emerging network niches, so-called 'transition arenas', to build informal governance structures that could bring radical regime change, albeit incrementally to overcome an antagonist response from the dominant regime (Loorbach, 2008; 2010; Rotmans & Loorbach, 2009; Jhagroe & Loorbach, 2015).

Four types of governance activities have been unravelled to steer transitions: strategic, tactical, operational, and reflexive actor behaviour. All are embedded in the transition management cycle (Loorbach et al., 2015). Strategic activities focus on the cultural aspect of a system. In this context, the issue is structured and long-term ambitions are debated (Loorbach, 2008, 2010; Jhagroe & Loorbach, 2015). It is also in this context in which the transition arena is established to create a movement of new thinking (Loorbach, 2007; 2008). A clear distinction from network management, which tends to steer at network building and game interventions much more than at general encompassing trends, assigning governments in networks a more specific role (Dewulf et al., 2009). The same holds for adaptive management which assumes a mutual dependency between regimes (Pahl-Wostl et al., 2007) unlike more or less independent arenas in transition management.

Critical to its success, these transition arenas have to be supported by the political regime to acquire any legitimacy and accountability (Rotmans & Loorbach, 2009): an emergent structure should stimulate niches in their further development. Here, a problem might arise with regard to centralist and authoritarian regimes. While transition management pleads for an interaction between top-down governance and bottom-up initiatives (Loorbach et al., 2015) and formal decision-making processes being subordinated to societal governance (Loorbach, 2010), it could be argued that autocrats would not allow room for such informal networks to develop, potentially impeding their own absolute power position (Linz, 1964). The *2005 Tulip* and *2010 Melon*

Revolutions in Kyrgyzstan have illustrated why Central Asian governments, for instance, have been reluctant to take bottom-up initiatives knowing they can have major consequences for positions of power (Ahrens & Hoen, 2013).

In the end, transition management is about *"dismantling"* existing regimes (Rotmans & Loorbach, 2009, p. 189). Notably, as Jhagroe and Loorbach (2015) outline, transition management refers to the perception that governance is a democratic and open procedure, not fixed or exclusive top-down management. Participation is no longer restricted to just governments, but also not open to random anyone. Alternative views should be able to voice in this strategic sphere (Loorbach, 2010). In welcoming antagonist and disruptive views, this value-laden theory goes even beyond the consensus principles of rooted democracy (Jhagroe & Loorbach, 2015). Ahrens and Hoen (2013) *per contra* demonstrate concurrently that Central Asia has been characterized by centralist and authoritarian regimes for centuries – constituting a hierarchical and autocratic path dependency in Kazakh, Kyrgyz, and Uzbek governance. Does that autocratic conception not clash with the peculiar assumptions of democracy in transition management (Linz, 1964)? Concerns that have been supported by Loorbach et al. (2015) also revealing that such underlying cultural, economic, political, and infrastructural regime structures might obstruct marginal regime changes. Yes, regimes might ultimately collapse if they are not living up to expectations – similar in adaptive management (Van der Brugge & Van Raak, 2007) – but then regimes must first open up for alternatives concepts and innovations according to this theory (Van der Brugge & Rotmans, 2007).

A potential conflict with the latent democratic principles of transition management refers to tactical sphere too. Actors on a tactical level are actually steering the transition agenda on a daily basis through network building (Loorbach, 2008; 2010). This agenda maps the necessary paths to achieve the strategic ambitions. Among these transition paths, one could list institutional change, (de)regulation, financial revision, and infrastructural development. A transition agenda should be appealing and imaginable to get support from a broad range of actors (Rotmans & Loorbach, 2009). History has learned that even the tempting *glasnost* reforms[9] of Gorbachev were not attractive enough for the former USSR institutions to be embraced (McForan, 1988). Still strongly prejudiced by Soviet conception, these regimes were not ready for the transition agenda of democratization, liberalization, and privatization yet. Maybe it was because an integrative strategic governance level was lacking, which might have enabled actors to contribute to regime change (Loorbach, 2007; 2008). More likely, however, it seems to be path dependency causing the regime change to fall short. Path dependency typically leads to regime lock-ins accommodating persistent societal problems, Loorbach et al. (2015) note. Recent examples of

[9] Besides perestroika, USSR General Secretary Gorbachev introduced in the 1980s the concept of *glasnost* to make Soviet institutions more open and transparent about their activities. The aim of Gorbachev was to democratize state organizations and ultimately to develop socialist pluralism. Glasnost would yet remain subordinate to perestroika, which, relying on Lenin's democracy principles, had the absolute goal of consolidating socialist relations and the socialist system (McForan, 1988).

such lock-ins can be found in the to this day unsuccessful *2012 Strategy 2050*, *2014 Nurly Zhol*, and *2050 One Hundred Concrete Steps* concepts in Kazakhstan (Heim, 2020) or the recent reforms announced in Uzbekistan (Blackmon, 2021).

Notwithstanding that, Van der Brugge and Rotmans (2007) unfold actions to disrupt regime equilibria. Innovations in the operational sphere that bring about internal and environmental changes to destabilize the regime (Loorbach, 2010; Loorbach et al., 2015). Most of these innovations are bottom-up initiatives exploring alternative regimes (Jhagroe & Loorbach, 2015). Although an individual innovation exceptionally might lead to a regime change (Loorbach, 2010), the question arises how this applies to autocracies. The weakness of transition management is emphasized by Van der Brugge and Rotmans (2007) by pointing out to the need for resources in innovations. Many centralist and authoritarian regimes are ruled by a patrimonial network, which basically enjoys all power and resources (Ahrens & Hoen, 2013; Fumagalli, 2016; Akchurina, 2021; Ruiz-Ramas & Hernández, 2021). This does not just limit frontrunners in initiating bottom-up initiatives, but the fear of losing power as central government also often results in a negative attitude of the governing patrimonial network towards those innovations (Rotmans & Loorbach, 2009). Participation and interaction of various actors, which is at the very core of transition management (Loorbach, 2008; 2010), could be lacking in centralist and authoritarian regimes considering Linz' (1964) principles.

The same goes for the final sphere of transition management: reflexive activities. Resonating with adaptive management (Pahl-Wostl et al., 2007; Van der Brugge & Van Raak, 2007; Voß & Bornemann, 2011), Loorbach (2007; 2008; 2010) and Loorbach et al. (2015) repeatedly underline the actual added value of this theory in evaluating regime change continuously – another common ground with adaptive management by both shielding arenas from political struggles (Voß & Bornemann, 2011) and accepting uncertainties to arise (Dewulf et al., 2009). *"Reflexivity needs to an integrated part of governance processes,"* Loorbach (2008, p. 170) elaborates. He believes that media and science play a central role in this. Neglecting the state-run media and education institutes in centralist and authoritarian countries – as is the case in Central Asia (Ahrens & Hoen, 2013) – one cannot expect a fair public opinion or honest judgement on any regime change. Reflexive activities are in those regimes by definition detached from the *status quo*, which opposes the theory's neutrality assumption (Loorbach, 2008; Loorbach et al., 2015). So, also in the fourth sphere, the transition management cycle does seem to lose power in more autocratic states. In Table 3, the characteristics of transition management have been depicted.

Table 3 – Characteristics of transition management

Characteristics	**Transition management**
Type of analysis	Prescriptive
Motive	Problem driven
Issue addressed	Failure to facilitate regime change
Process structure	Behaviour embedded in transition management cycle
Formalization	Interaction between all governance levels
Composition	Variable groups of actors participate in niches
Participation	Frontrunners are empowered
Actor dependency	Interdependent because of innovations of others
Durability actor	New actors are driving innovative and new niches
Actor selection criterion	Having innovations to embody regime change
Approach	Value-laden by creating a new movement of thinking
Public role	Stimulating niches

Table 3 shows that transition management in all its spheres inherently relies on democratic assumptions of society (Loorbach et al., 2015). The theory therefore does not comprise the potential existence of a central authority in networks. On the contrary, it advocates for *"a new balance between state, market, and society and new ways to facilitate and make as effective as possible the informal network process"* (Loorbach, 2010, p. 162). Equating all actors in a network and empowering a regime change from outside (Loorbach, 2007; 2008: 'niches') does not seem to be consistent with the more autocratic principles in Kazakh, Kyrgyz, and Uzbek societies – and autocracies in general. It is precisely the path dependency that Rotmans and Loorbach (2009) and Loorbach et al. (2015) describe, which hinders a prompt application of the prescriptive transition management cycle in Central Asia. The critique of the application of transition management in autocratic regimes can be captured as follows:

- Governments should stimulate innovative niches, in which new actors could push bottom-up for radical changes to overcome system failures;
- Governments should facilitate a movement of new thinking, and
- Governance should be a democratic, open, and reflexive process, not strict top-down management.

2.3.4 Transitions in autocracies

Network, adaptative, and transition management theories, principally relying on democratic premises, so far do not appear to be able to explain and manage transitions in a network being dominated by a central and authoritarian actor fully. The question of how path dependency in Central Asian water governance could be overcome to expand the greenhouse horticulture area in the region therefore remains unanswered based on these theories. That does not mean

that these theories have been written off completely for autocracies. It could be argued that aspects like informality and niches could also be found to a certain extent in autocratic regimes. Most characteristics of these democratically based theories, however, do not align with the autocratic and path-dependent context in such regimes, previous sections depict. The characterization of each theory in Tables 1 to 3 based on Linz' (1964) principles provides a first understanding of that disparity. Structurally comparing these theories based on Linz' features does not only illustrate how they are interrelated, but also solidifies criticism thereof from centralist and authoritarian regimes. The preceding governance theories are compared with each other accordingly in Table 4.

Table 4 – Comparison of transition theories

	Network management	**Adaptive management**	**Transition management**
Type of analysis	Descriptive	Descriptive	Prescriptive
Motive	Cooperation driven	Process driven	Problem driven
Issue addressed	Complexity	Learning	Failures
Process structure	Medium	Low	High
Formalization	Low	Medium	Low
Composition	Fixed	Variable	Variable
Participation	Closed	Relatively open	Relatively open
Dependency	Interdependent	Interdependent	Interdependent
Durability actor	Established	Established	New
Selection criterion	Resources	Willingness	Innovations
Approach	Pragmatic	Pragmatic	Value laden
Public role	Improving cooperation	Improving learning	Stimulating niches

The classification of governance theories in Table 4 provides a quick overview of the strain on centralist and authoritarian regimes. This table is not merely a merger of Tables 1 and 3 but also compares the theories with each other – in particular for the measurable criteria such as process structure, formalization, composition, participation, dependency, and durability of actor derived from Linz' (1964) principles. Broadly, three encompassing theses could be deduced from Table 4 criticizing the applicability of Western-based governance theories such as network, adaptive, and transition management in centralist and authoritarian regimes, theses that will be scrutinized in the remainder of this research to learn how transitions of infrastructure are managed in centralist and authoritarian regimes and how path dependency influences those regime changes:

1. Governance should be informal and interactive, allowing actors to empower regime change in (independent) niches

In particular, the informality of governance and relatively open participation of actors that all theories acquire (Loorbach et al., 2015) appear to be problematic in centralist and authoritarian regimes. While adaptive management has some kind of formalization in its decision-making through an interactive policy cycle (Pahl-Wostl et al., 2007), network and transition management assume a lose interaction between informal networks (Klijn et al., 1995; Loorbach et al., 2015). Meanwhile, autocratic regimes commonly adhere to a more hierarchical and centralized governance; top-down management by the government prevails (Linz, 1964). Resources and power are highly consolidated by the state in those regimes, formalizing and structuring decision-making (Linz, 1964; Ahrens & Hoen, 2013). Although governance processes in transition management are well structured by the transition management cycle (Loorbach et al., 2015), this does not mean that the central government is not attracted to stimulate bottom-up initiatives to let actors participate and informalize governance. Albeit to a lesser extent, but also network management is moderately structured by rules and resources in a network (Poppe et al., 2009), whilst unstructured reflexes to complexities and uncertainties typify adaptive management (Folke et al., 2005; Pahl-Wostl et al., 2007). The thesis *(thesis 1)* of informality and interaction pivotal in all three theories seems to be incongruous with centralist and authoritarian regimes, which rather aim at formalizing and creating exclusivity of decision-making to protect their power and resources (Linz, 1964).

2. Actors should be interdependent because of common resources and power, participation of various actors is required to achieve societal goals

This goes back to the common assumption of interdependent actors in these theories because of shared resources and power (Klijn et al., 1995; Pahl-Wostl et al., 2007; Van der Brugge & Rotmans, 2007). Governance is therefore more open in adaptive and transition management – both pleading for some form of selective participation (Loorbach, 2010; Voß & Bornemann, 2011) – to realize societal goals. Although participation is more closed in network management, a selected group of actors is allowed to contribute to decision-making (Klijn et al., 1995; Klijn & Koppenjan, 2000). This also makes the composition of the governance in the first two much more variable (Folke et al., 2005; Dewulf et al., 2009) compared to network management (Klijn & Koppenjan, 2010). The main difference in participation between adaptive and transition management is that the earlier mainly allows variably coalitions of established actors to participate (Folke et al., 2005), while the second one tries to empower new actors (Loorbach, 2008). In practice, resources are consolidated in centralist and authoritarian regimes, formalizing and structuring decision-making with limited participation of other actors (Linz, 1964; Ahrens & Hoen, 2013). In accordance with Klijn and Koppenjan (2000), one could argue that the central governments in those regimes have a certain extent of veto power because of solidification, making them more likely to block transitions. The joint thesis of

actor interdependency in the governance theories materializes to be incoherent with the governance *status quo* in autocracies *(thesis 2)*.

3. Central governments should actively support interaction among actors and provide for an institutional structure to regime change
Centralist and authoritarian regimes do not seem to be able to fulfil the public role that the three governance theories have assigned to them. In those regimes, the elite has consolidated both power and resources and accordingly is feeling less urgency to enable regime change for fear of losing power (Pahl-Wostl et al., 2007). Rotmans and Loorbach (2009) note that the ruling class for that reason is more likely to examine innovations or regime changes negatively, which often leads to them limiting bottom-up initiatives. Consequently, governments have been loath to create an institutional structure which fosters participation and actor interaction to facilitate a transition and redistribute power and resources (Klijn & Koppenjan, 2000; Loorbach, 2007; 2008). Without the support from the political regime in autocracies, niches capacitating transitions will not be granted any legitimacy and accountability, hindering regime change (Dewulf et al., 2009; Rotmans & Loorbach, 2009). The thesis of an auxiliary institutional structure in network, adaptive, and transition management to support regime change does not seem to hold in centralist and authoritarian regimes *(thesis 3)*.

Relying on Linz' (1964) principles, it can be concluded with these three theses that network, adaptive, and transition management in general do not align with the characteristics of autocracies and their path dependent governance. To explore how path dependency influences transitions in this kind of regimes, the eight characteristics retrieved from Linz (1964) – i.e., the process structure, formalization, composition, participation, dependency, durability, selection criterion, and public role of governments – will be included in the conceptual framework in Section 2.4 for this analytical purpose.

2.4 Conceptual framework

Incorporating the abovementioned tension between the governance theories and centralist and authoritarian regimes – as the theses embody – with the concepts of path dependency and interrelationships of infrastructures gives a first impression how transitions take place in these regimes. By schematically outlining the dynamics between interwoven infrastructures, path dependency, and networks in one conceptual framework, this conceptualization guides us to systematically analyse how path dependency does influence transitions in transnational infrastructures in centralist and authoritarian regimes in the remainder of this thesis. Inspired by Geels (2004), the conceptual framework in Figure 1 forms this theoretical footing.

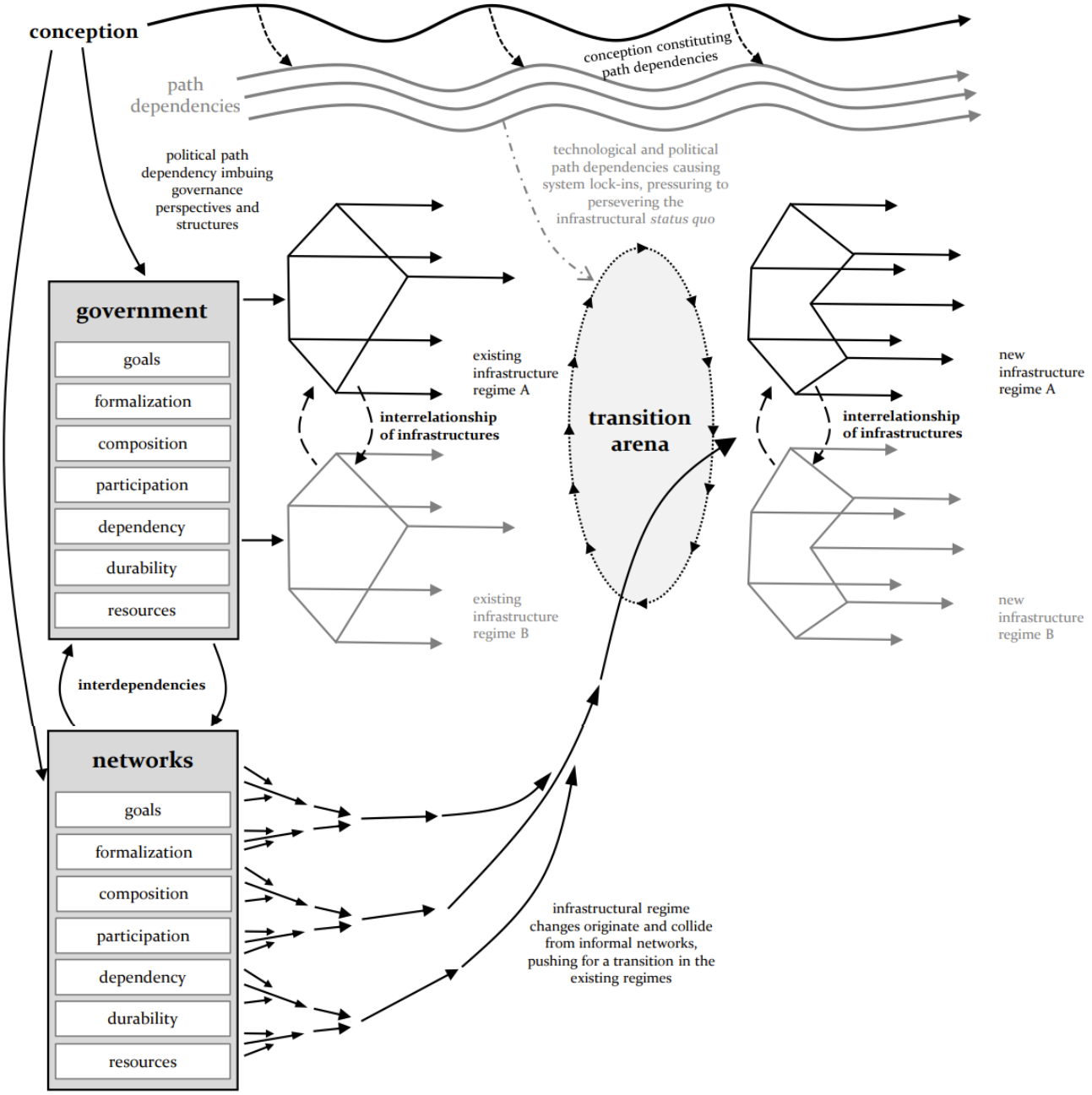

Figure 1 – Conceptualization of transitions of interrelated infrastructures in a path dependent socioeconomic system (author, 2024)

The conceptual framework in Figure 1 portrays the interaction of governance, interrelationships of infrastructures, and path dependencies on infrastructure transitions. This schematic representation visualizes that these concepts come together in the transition arena,[10] in which an infrastructure transition emerges

[10] The name 'transition arena' has been applied to comprehensively define this 'black box' without any prejudice to other academic connotations of this term. Subsequent to Folke et al. (2009) and Pahl-Wostl et al. (2007), this thesis contemplates transition arenas as the interconnectedness of non-organizational institutions (such as norms and any regulations tailoring actor behaviour),

as a result of an interaction between the three. In centralist and authoritarian regimes, this transition arena is still a black box, as the previous sections show. Exploring how that transition arena works, requires one to first understand the separate concepts and their dynamics. Understanding how this transition arena functions, tells us in the end how path dependency influences transitions in these regimes. That would answer the research question of this thesis.

To find that answer, we first need to know how conception might result in path dependencies. Path dependency is the transcendent concept in this framework; regime change is very much influenced by path dependencies. Political path dependency mostly affects governance, while technological path dependency creates lock-ins in infrastructure. Political path dependency arises when previous institutions are reproduced – as frequently happens – and therewith prolong past governance. Preceding conceptions of governance ergo could still affect the perspectives of actors towards a transition or leave contemporary regimes without an institutional structure supporting these regime changes, because they historically never have been present. This might potentially evoke an antagonistic response from the *status quo* (Sewell, 1996; Pierson, 2000; Mahoney, 2001). Historic infrastructure decisions – influenced by that conception – could create a technological path dependency. Heavy transition costs thanks to previous choices can significantly hinder transitions or reject promising innovations (David, 1985; Arthur, 1989; Gross & Hanna, 2019), directing the regime's infrastructure development along a certain path. Path dependency defines the context in which regime change is occurring, also in autocracies. Political and technology path dependencies therefore have to be the starting position of our analyses in Chapter 4 to grasp the institutional and technological governance *status quo*.

Secondly, these infrastructures are linked to each other. Interwovenness of infrastructures leads to interconnectivity of infrastructures (Loorbach et al., 2010). A regime change in one system – e.g., water infrastructure – could thus have effects on other systems – e.g., energy, which means that one must view transitions across infrastructures integrally and interactively (Rotmans & Van Asselt, 2000; Grafius et al., 2020). Because of this interrelationship, it is impossible to change one infrastructure without impacting another. That could increase the transition barrier significantly, reinforcing the technological path dependency in governance. Interwovenness of infrastructures is hence a recipe for discommoding transitions (Grafius et al., 2020), which is why Chapter 4 focuses subsequently on the interrelationships of infrastructures to get a more detailed picture about the infrastructure governance *status quo* as well. That data complete the picture of the context in which these regime changes happen, allowing us to finally dive into the governance that should empower transitions.

Thirdly, the interactions between the central government and networks in governance need to be looked at to assess how they seek to change these

technology, perceptions, and the environmental context related to a specific transition. *See e.g.,* Loorbach (2007), Van der Brugge and Van Raak (2007), Rotmans and Loorbach (2009), and Loorbach et al. (2015) for specific definitions of 'transition arenas' in various governance theories.

political and technological path dependencies of interwoven infrastructures in the transition arena. Governance that may be influenced by past conceptions (Pierson, 2000; Mahoney, 2001). The interplay of government and networks is displayed. Even in centralist and authoritarian regimes, the government and networks are to some extent interdependent. Arising from Table 4, no actor should be able to embody regime change independently due to shared powers and resources (Klijn et al., 1995; Klijn & Koppenjan, 2000; Poppe et al., 2009). They will have to collaborate to enable regime changes *(thesis 2)*. But how does that relate to centralist and authoritarian regimes considering their power and resources consolidation (Linz, 1964; Pahl-Wostl et al., 2007)? That demands an analysis of the features of governance in those regimes. Deduced from Linz (1964), each governance regime could be characterized by its formalization, composition, dependency, and resources. Participation and actor durability are additional elements in the networks. Which actors are participating in a network based on what selection criteria? How do they interact? And how long will they be participating *(thesis 1)*? In Table 4, the public role of the central government was distinguished as one of the key concerns for centralist and authoritarian regimes to empower transitions *(thesis 3)*. What goal does the central government pursue with this infrastructure? Does it align with other actors' objectives? Insights in those interactions between actors will lead to an understanding of how these networks interact in the transition arena to overcome path dependencies in order to realize infrastructure transitions. Learning how the governance is composed in the transition arena enables us to answers the question to what extent path dependence influences infrastructure transitions in centralist and authoritarian regimes. Analysing the transition arena is done in Chapter 4, after which Chapter 5 draws conclusions about the influence of this concept on transitions.

Absorbing all three theoretical aspects of transitions in centralist and authoritarian regimes and their internal dynamics, this conceptual framework in Figure 1 will thus be used to orderly probe how path dependency influences infrastructural transitions in such regimes during this research.

It seems like a sarcastic reference to capitalism, but also in Kyrgyzstan the president lives in the 'White House'. Characteristic of the palace is its Soviet architectural style and the green square on which it is located. The dry fountains in front show that even the president is not excepted from reduced water allocations in times of drought.

While the president appears to be inaccessible in reality, it seems as if you could just knock on his door. After the *Tulip* and *Melon Revolution* had deposed Presidents Akayev and Bakiyev, police gave up trying to rebuild the twice-demolished security walls. *"In Kyrgyzstan, we do not vote with a pencil but with stones,"* a guide jokes while grabbing a stone from the street.

The *Baiterek Tower* with its mythical egg would become Nazarbayev's symbol of modernizing Kazakhstan. The president would declare the newly established city of Astana the country's capital in the same year.

3 Methodology

The research methodology is a cardinal part of any thesis. It could be seen as a scientific recipe that explains how data have been collected and analysed. This chapter justifies the selected research methods as most fruitful approach to answering the research problem and questions posed in Section 1.4. As a first step, Section 3.1 elaborates on the research design of this thesis. It will become clear why the explorative character of this methodological approach perfectly suits this research's qualitative purpose to scrutinize new concepts. Even though qualitative studies are assumed to be more subjective, their flexible data collection methods are ideal for discovering uncharted phenomena. Instead of generalizing findings to the population, the aim of exploratory research is rather to gain a deep understanding of a phenomenon. A holistic multiple-case design of the Amu Darya and Syr Darya river delta has been the exploratory approach to retrieve these data, Section 3.2 details. Section 3.3 discusses how the data have been collected for the case studies through a literature review and interviews. A protocol that has been guiding the interviews has been included in Appendix III. The final segment of this chapter, Section 3.4, proceeds with the analytical methods used to examine the data. A data management plan, as approved by the Human Research Ethics Committee (HREC) of TU Delft, could be found in Appendix IV.

3.1 Research design

A research design composes a plan of action that is used to answer the research questions effectively. It forms the blueprint of a study to collect, measure, and analyse data so that they match the objectives and approach of that study. The exploratory nature of this research, as is weighed in paragraph 3.1.1, called for a qualitative study. Qualitative research was used to retrieve an initial grasp of this unique subject of transitions in autocracies, paragraph 3.1.2 explains.

3.1.1 Exploratory research

The nature of this thesis is explorative. Its objective is to explore how path dependency influences infrastructural change in centralist and authoritarian regimes. In order to be able to answer this question, one first requires a better understanding of the exact nature of transitions in these regimes. Therewith, this thesis takes a first step into a relatively unplumbed domain of transitions in autocracies. A curious nature that fits well with exploratory research. That research methodology intends, so to say, to clarify scientific knowledge gaps by examining qualitative data (Stebbins, 2001). Its modus is to discover potential generalizations or new theories based on data that have been extracted. Exploratory research is for that reason popular to delve into little-known fields or themes (Johannesson & Perjons, 2014).

Abiding by its inductive reasoning, exploratory research investigates whether observations or findings reveal patterns that could be generalized into

hypotheses or theories (Stebbins, 2001). These hypotheses or theories can later be investigated and substantiated in subsequent studies. This research method is thus primarily designed to maximize one's comprehension of a phenomenon as foundation for future research, not to draw any rigid conclusions about a special issue (Johannesson & Perjons, 2014). For example, the transition in water governance in Central Asia is operated *in casu* to consult how transitions in centralist and authoritarian regimes are influenced by path dependency in general. An exploratory study was deemed most suitable to fulfil that research purpose (Stebbins, 2001).

The disadvantage of exploratory research, however, is that it might produce tentative and inclusive results. How and where data are collected and how they are interpret is strongly biased by actors' perceptions (Stebbins, 2011). *Per contra*, Johannesson & Perjons (2014, p. 43) object that exploratory sources are not truly required to be representative and are merely *"used as a means for gathering information in order to explore a new arena."* Correspondingly, they conclude that a bias in the retrieved data and associated analysis does not have to be problematic as long as the results are not translated instantaneously into solid conclusions. They should rather be seen as insights that help to establish a common understanding of an issue and to formulate follow-up research questions or hypothesises that need further to be verified (Johannesson & Perjons, 2014). Those limitations of exploratory research were not identified to be an issue given the explorative purpose of this study arising from the research question, making exploratory research the favoured method for this thesis.

3.1.2 Qualitative research

Most exploratory research has a qualitative character (Johannesson & Perjons, 2014). Although often concurring, they are not mere synonyms, Stebbins (2001) defends. Qualitative research specifies the methodology and method of data collection in a study, while exploratory research addresses how a theory may be derived from data. Qualitative research forms the counterpart of quantitative research. An interpretivist approach, qualitative research retrieves its data from observations, perceptions surrounding a phenomenon, and other non-numeric sources (Johannesson & Perjons, 2014). Contradictory to comparing numeric data in quantitative studies, the paradigm of qualitative research is based on a naturalistic data collection approach (Stebbins, 2001). The common goal of qualitative research is to understand a concept holistically through interpreting behaviour and perceptions of actors. This interpretivism gives some flexibility to this qualitative research by collecting extensive qualitative data to deduce generalizations from them (Stebbins, 2001). Due to this interpretivist approach, qualitative research is often regarded as an extension of exploratory studies.

It could have been expected that the biases of both are largely similar as well. Stebbins (2001) warns that it is difficult to generalize primary qualitative data in interpretivist studies. Like with exploratory research, the interpretation of data is strongly prejudiced by actors' perceptions. Critics therefore point out to the weaknesses in sampling, validity, and generalizability of this qualitative

paradigm (Johannesson & Perjons, 2014). Nonetheless, noting that the actual aim of this thesis is to explore a new phenomenon, these concerns were not considered to pose a problem during such a first inquiry to bring new insights and orientations on this phenomenon to light (Johannesson & Perjons, 2014).

3.2 Research method

This thesis has made use of a combination of methods. Paragraph 3.2.1 presents how a literature review has been employed to learn how academic theories have explained or managed transitions and how this transition governance has been affected by path dependency and interrelations of infrastructures. But there are various approaches to collecting qualitative data for exploratory studies, of which a case study design is probably the most used (Johannesson & Perjons, 2014). Paragraph 3.2.2 discusses the preference of case study over inductive theory as research approach. The actual case study of the Amu Darya and Syr Darya delta that has been administered in this thesis has been polished in paragraph 3.2.3 as well as the underlying structure of a fit embedded multiple-case study. This section concludes with paragraph 3.2.4 in which the validity and rigor of this case study design has been established.

3.2.1 Literature review

In a literature review, contemporary knowledge about a subject is thoroughly and critically analysed, synthesized, and evaluated. The intention of a literature review is to map the scientific landscape to review the current state of research and outline scientific developments around a topic (Harrell & Bradley, 2009). A literature review has been the primary methodology to answer the first three research questions in Chapter 2.

Path dependencies (Künneke et al., 2021; Goldstein et al., 2023) and interrelationships of infrastructures (Rotmans & Van Asselt, 200; Grafius et al., 2020) appeared to frequently occur in infrastructural transitions. Additional literature was sought on what technological (Gross & Hanna, 2019) and political path dependency (Pierson, 2000; 2004; Mahoney, 2001) imply for transnational infrastructural transitions. While some (Geels, 2004) assert that niches are able to challenge path dependency, others (Pierson, 2000; Pahl-Wostl et al., 2007) fear an antagonistic response from the (political) path dependent context – reasonably to be expected in autocratic countries (Mahoney, 2001). Unravelling literature expounding technological and economic transition barriers (Grafius et al., 2020) and political lock-ins (Loorbach et al., 2010; Goldstein et al., 2023) permitted to study how transitions could be managed to overcome these system failures in socioeconomic systems (Rotmans & Loorbach, 2009), laying the foundations of this thesis' conceptual framework in Figure 1.

Additionally, infrastructures – transnational or not – often appeared to be interconnected both physically and governance-wise (Grafius et al., 2020). The concept of interwovenness of societal and physical processes (Rotmans & Van Asselt, 2000) was further dissected by examining the features and effects

of intertwining of infrastructures in agriculture (Goldstein et al., 2023), energy (Künneke et al., 2021), or urban development (Rotmans & Van Asselt, 2000) and how this has caused increased interconnectivity and interdependencies among infrastructures (Loorbach et al., 2010). Assessing the current state of knowledge on interrelationships of systems in transitions (Grafius et al., 2020) equipped the researcher in Chapter 2 with wisdom on what the features of intersectoral linkages (Grafius et al., 2020) precisely entail and what their consequences can be on the transitions in water governance, as reflected in Figure 1.

The third question intrinsically asks for a theoretical literature review of transition in dominant governance theories. How do scientific theories view transitions to cope with these system failures? Network management (Klijn et al., 1995; Klijn et al., 2010; Klijn & Koppenjan, 2000), adaptive management (Pahl-Wostl et al., 2007; Poppe et al., 2009; Voß & Bornemann, 2011), and transition management (Loorbach, 2007; 2008; 2010; Rotmans & Loorbach, 2009) are currently among the most popular governance theories aiming to replace NPM, but on what principles and conditions do these theories rely to describe or manage transitions? In other words, what are their limitations in doing so? This necessitated an extensive analysis from different perspectives on the descriptive or explanatory power of these transition theories in Chapter 2. Table 4 exhibits that each theory systematically has been reviewed for twelve criteria, partially deduced from Linz' (1964) principles to classify autocracies: type of analysis, motive, issue addressed, process structure, formalization, composition, participation, dependency, durability of actor, selection criteria, approach, and public role. This systematic approach made it also possible to compare the theories, *inter alia*, on the extent of democratic underlying values, like participation and informality, that could potentially conflict with centralist and authoritarian regimes (Linz, 1964). The elements of network, adaptive, and transition management have as such been identified in the literature. Following that understanding of these governance theories, three theses debunked their applicability to autocracies, still being valuable input for the conceptual framework in Figure 1 after having learned where the shoe pinches.

3.2.2 Case study

Inductive theory developing is regularly exercised to collect qualitative data for exploratory studies (Johannesson & Perjons, 2014). An inductive approach changes the prevalent top-down discourse of analysis. It does not develop first a hypothesis and consequently tests its validity against data, yet, this approach turns the procedure by looking for patterns among a variety of data collected to abstract generalizations from it (Johannesson & Perjons, 2014). The approach assumes that a theory is grounded in empirical data and could emerge from those data. Inductive approaches are for that reason a popular methodology to dive in scientifically underdeveloped areas.

There are plenty of methods for inductive theory developing, one of them is a case study. Yin (2014, p. 2) defines a case study as *"an empirical inquiry that investigates a contemporary phenomenon within its real-life context,*

especially when the boundaries between phenomenon and context are not clearly evident." In plain language: a case study entails a peculiar phenomenon (e.g., institution, issue, person, etc.) that is being analysed in-depth and independently regarding its characteristics and interaction with its context to get a better understanding of the phenomenon itself. A case study helps one to identify relationships between the phenomenon and context and accordingly to learn how complex (societal) issues are embedded in real-life settings (Johannesson & Perjons, 2014). For Yin (2014), a case study is the preferred research methodology when one would like to learn about social developments, unravel behavioural events that cannot be controlled, or study a contemporary phenomenon. Whatever the field of study might be, a case study is a relatively easy method to gain an integral and real-world perspective on a phenomenon under contextual conditions (Johannesson & Perjons, 2014; Yin, 2014). The major difference with other inductive methods is that a case study focuses on a said phenomenon, whereas others try to find patterns and generalizations more randomly in a wealth of information (Johannesson & Perjons, 2014). A case study was therefore considered most suitable in this research to specifically investigate how path dependency influences transitions in water governance in Central Asia.

3.2.3 The case: Amu Darya and Syr Darya delta

3.2.3.1 Introduction

Regardless of its aridity, Middle Asia is characterized by two extensive rivers crossing almost the entire region. With a length of more than 2,500 kilometres, the Amu Darya is the longest river and rises in the Tajik Pamir Mountains at an altitude of six kilometres, flowing via Turkmenistan and Uzbekistan into the shrinking Aral Sea. Melting glaciers and snow and rainwater are the prime freshwater sources of the Amu Darya, which provides for basic facilities as electricity in Tajikistan and irrigation and drinking water in Turkmenistan and Uzbekistan (Stucki et al., 2014; Menga, 2018).

The Syr Darya might be slightly shorter and rising in another country, its water is not less vital to the region. Originating from the Kyrgyz Tianshan Mountains, water flows more than 2,200 kilometres via a small detour in Tajikistan via the Uzbek Valley of Fergana to Kazakhstan to feed the Aral Sea. Since the Russian Empire – notably during the USSR – the Syr Darya has served as main supply of irrigation water for extensive cotton production in the valley (Stucki et al., 2014; Menga, 2018). Until today, path dependency has meant that Fergana Valley remained the agricultural backbone of Central Asia (Kim et al., 2018). Approximately 75 per cent of all irrigation water in Central Asia comes from the Amu Darya and Syr Darya, in total 90 per cent of the regional water flows are being used for agriculture (Rahaman & Varis, 2008; Stucki et al., 2014; Menga, 2018). Nowadays, much of the population around the Amu Darya, Syr Darya, and Aral Sea basins lives in water scarcity basically thanks to their overexploitation in the past, ramping up to 80 per cent of the total populace in

Middle Asia (Stucki et al., 2014). Figure 2 illustrates the main Central Asian water flows and reservoirs.

Figure 2 – Water flows and reservoirs in Central Asia (Rahaman & Varis, 2008)

Traversing Kazakhstan, Kyrgyzstan, and Uzbekistan, this research focused primarily on the basin of the principal Amu Darya and Syr Darya delta. Along its abundance of water, this river basin is marked with a wealth of fossil energy sources (Auty & De Soysa, 2006). In the plains of the Amu Darya and Syr Darya basins, some smaller natural gas and oil power plants stemming from the USSR can be found – admittedly, the majority of the petroleum resources are located in the West of Kazakhstan, Turkmenistan, and Uzbekistan (Auty & De Soysa, 2006). The Amu Darya and Syr Darya delta provides a fruitful case study to examine how path dependency influences water governance in Central Asia, while also taking into account its interrelationship with the energy system. The two raw materials are mutually dependent in operating their transnational infrastructure – water is needed in energy generation and energy to transport water (Menga, 2018; Boute, 2019) – interlacing them physically and administratively in the basin. Given the limited course of the Syr Darya river in

Tajikistan, this case study had restricted itself to the water governance of the Amu Darya and Syr Darya basin in Kazakhstan, Kyrgyzstan, and Uzbekistan.

3.2.3.2 A holistic multiple-case design

A case study could be designed in different forms. There are basically four types of case studies to choose from: holistic and embedded, which each could have either one single unit or multiple units of analysis (Yin, 2014). Their disparity could best be explained based on the Amu Darya and Syr Darya case that has been employed in this thesis. The quadruple has been visualized in Figure 3.

In a holistic case study, one focuses on a single unit of analysis to get a comprehensive picture of a phenomenon and its relationships with the context (Yin, 2014). Taking the Amu Darya and Syr Darya delta, if one would study how the Kazakh govern water in this area, one would apply a single case. The context is specified by the Kazakh centralist and authoritarian regime, within which the case would look more concretely into the water governance in this delta. That is called a holistic single-case design. Holistic multiple-case designs also exist. In such a case design, one would research the water governance of that Amu Darya and Syr Darya delta (i.e., the same case each time) in all three states: Kazakhstan, Kyrgyzstan, and Uzbekistan (i.e., three distinctive contexts).

Embedded cases, on the other hand, analyse multiple units of a case, providing the researcher with a more detailed grasp of the various aspects of a phenomenon (Yin, 2014). An embedded single-case design would be suitable to, for instance, scrutinize the governance of the irrigation infrastructures and the river basins in the Amu Darya and Syr Darya delta, e.g., under the Kazakh regime in more detail. In embedded multiple-case design, one would be able to study both units in the Amu Darya and Syr Darya valley in all three nations. This means that the governance of irrigation infrastructures and river basins are assessed three times across the centralist and authoritarian regimes of Kazakhstan, Kyrgyzstan, and Uzbekistan. In every case, the irrigation works and river basins form therewith the two embedded units of analysis (Yin, 2014).

Considering the encompassing analysis of water governance in the Amu Darya and Syr Darya delta in Kazakhstan, Kyrgyzstan, and Uzbekistan, this thesis opted for a holistic multiple-case design, as shown in Figure 3. A holistic case study was sufficient to get an encompassing picture of water governance in Central Asia. Multiple-case designs have yet a great advantage over single ones. While making the research a bit more complex, multiple-case designs lead to richer data and make a study more robust (Yin, 2014). This repetition of analyses across multiple countries generates more data through three comparable and parallel cases anxious to find similar results. Comparing the data obtained from water governance in the Kazakh, Kyrgyz, and Uzbek context resulted in a more thorough understanding of how path dependency influences the transition of water infrastructures in centralist and authoritarian regimes. Reducing the bias affiliated with exploratory research (Stebbins, 2011), a holistic multiple-case study design was preferred as research strategy.

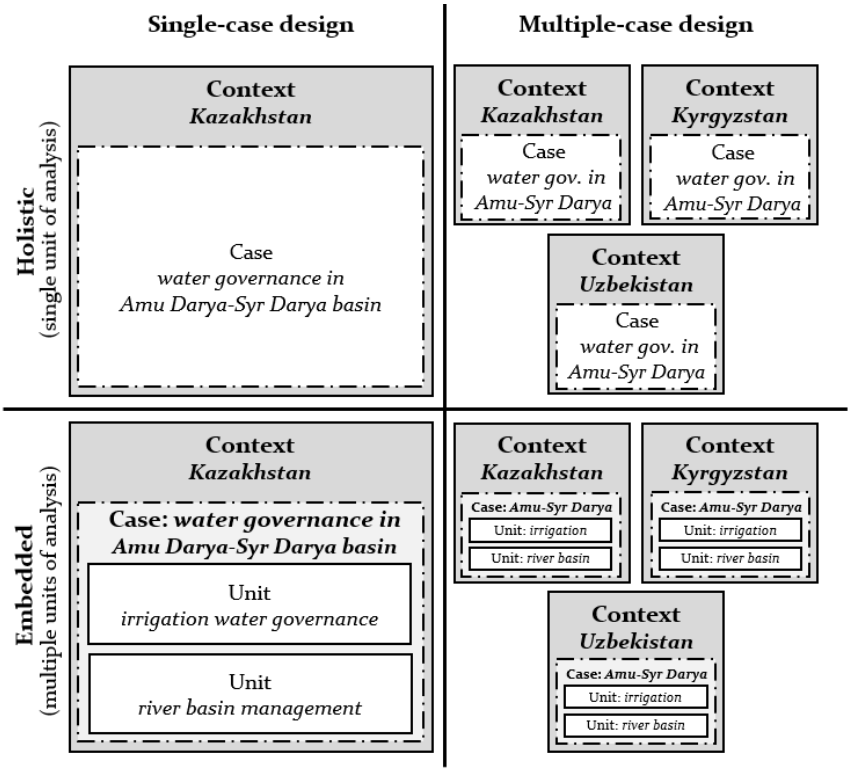

Figure 3 – Basic types for design of case studies adjusted for this thesis (materialization of Yin (2014)) (author, 2024)

3.2.4 Quality and rigor

Sound data collection requires sound cases. The quality and rigor of a multiple-case design has to be judged on its construct, internal, and external validity, and reliability (Yin, 2014). The Amu Darya and Syr Darya delta multiple-case study design has been revised along those four design tests.

Firstly, construct validity evaluates whether the case actually studies the phenomenon it is supposed to explore. To avoid biases, it stresses that concrete and measurable criteria have to be established to collect and investigate data (Yin, 2014). In this thesis, criteria for the case studies have arisen systematically from the conceptual framework in Figure 1. What goals are pursued by actors, how the network has been composed, to what extent the governance has been formalized, which resources actors (could) bring to the table, and how actors in the network are interdependent have been deduced as qualitative measures from this framework to study the cases. Two additional operational criteria have been deducted from this framework to be evaluated in this case study design: the degree of path dependency and interrelationship of infrastructures. Since the same criteria have been employed in Kazakh, Kyrgyz, and Uzbek context based on scientific literature as set out in Chapter 2, it was ensured that three cases were coherently investigating the phenomenon of transitions in water governance in the centralist and authoritarian regimes of Central Asia. This has

created an operational set of measures and prevents the collection of purely subjective data (Yin, 2014).

Secondly, internal validity tests whether causal relationships could be established. Even though internal validity was not an immediate concern for exploratory studies because no claims are made about causal relationships (Yin, 2014), it remains important to check whether just inferences are made. Is it actually true that a certain occurrence has led to an event? Is there no any other factor influencing this event? So, are the cases researched in such a way that the conclusions for the cases are logically valid? This is a vital concern in studying an unexplored topic, simply because we do not know what relationships there are between factors. To improve the internal validity, this case study design had operated the conceptual framework across three different contexts to allow for pattern matching between cases. Pattern matching across cases assured an in-depth understanding of potential causalities in the impact of path dependency on transitions of water infrastructure in centralist and authoritarian regimes, enhancing the internal validity of the case studies and accordingly the validity of this thesis (Yin, 2014).

Thirdly, external validity is about whether findings can be generalized to the population (Yin, 2014). In a single-case design in an exploratory research, there would be a poor basis in generalizing findings by definition. Exploratory and qualitative studies in itself have already a major barrier in generalizing results beyond the case study design because of its subjectivity (Stebbins, 2001; Johannesson & Perjons, 2014). Replication of case studies could withal advance the external validity this research (Yin, 2014). For that reason, the case of the Amu Darya and Syr Darya delta has been conducted three times in three different contexts – i.e., Kazakhstan, Kyrgyzstan, and Uzbekistan – providing as multiple-case design more support to produce generalizations (Yin, 2014).

Finally, reliability guarantees reproducibility of the same results (Yin, 2014). It means that if the same procedures are followed, future studies should obtain similar results and conclusions. A prerequisite for this is to document the procedures extensively to allow reproduction (Yin, 2014). In an attempt to minimize errors and biases in this study, this chapter can be read as a protocol in which all stages of the research have been fully archived, standardized, and scientifically substantiated. In addition, an interview protocol has been shared in Appendix III, which could be used for follow-up research to conduct the semi-structured interviews, to be discussed in paragraph 3.3.2, in a comparable manner. Documenting these guidelines performs as a reliability check to enable reproduction of similar results (Yin, 2014).

3.3 Data collection

The core part of any research is gathering data, evidence which is examined to answer the research questions. These data can originate from various sources. Sources can be broadly classified into two categories. Primary sources are raw, first-hand data, like observations of a researcher or responses in an interview, collected for specific research (Harrell & Bradley, 2009). Secondary data sources

contain second-handed data of other researchers compiled for earlier research purposes (Harrell & Bradley, 2009). Paragraph 3.3.1 in like manner argues how secondary data have been applied to draw an initial picture of path dependency in water governance in the Kazakh, Kyrgyz, and Uzbek context. Afterwards, paragraph 3.3.2 presents semi-structured interviews as primary data resource in this thesis to evaluate path dependency in transitions of water infrastructure in autocracies, the most fitting methodology to search a relatively undiscovered domain. This thesis has thus made use of a mix of data collection methods, specifically in formulating an answer to sub-questions 4 and 5. Yin (2014) emphasizes the benefit to bandage case studies from multiple sources of evidence: this 'triangulation' converges data from multiple perspectives and leads to more robust results.

3.3.1 Literature review

Data for the fourth and fifth sub-question – the case study – have also largely been built through an academic and governmental literature review. Section 1.3 refers to the compact definitions of Linz (1964) of authoritarian regimes and of Feickert (2016) of centralist regimes. To properly define the context of the case studies – i.e., the Kazakh, Kyrgyz, and Uzbek context – it was necessary to determine how these definitions relate to these countries. The developments in governance of these nations (Ahrens & Hoen, 2013) have been reviewed chronologically since the USSR (McForan, 1988) to evaluate the political path dependencies of these centralist and authoritarian regimes in practice. Academic literature (Ahrens & Hoen, 2013) has been exploited to experience how countries are governed today and what path has brought them here. Elaborating on the global definitions of Linz (1964) and Feickert (2016), the nation specific Kazakh, Kyrgyz, and Uzbek situation has been established in Appendix I. This data formed the basis for the interviews (*see:* paragraph 3.3.2) that were conducted as an extra methodology to verify these theoretical insights in practice in order to further sharpen the context of the case study.

Similarly, an academic and government literature review surveyed the water governance (Stucki et al., 2014; Menga, 2018) in the region from a theoretical point of view. The review in Appendix II concentrated on two issues: the formal and informal governance of the natural endowments and their cross-border management. Firstly, the governance during the USSR, when it was still a joint region, had been looked at. The technological and political developments of water governance following the dissolution of the USSR were analysed afterward by considering the Central Asian region as a whole because of lasting transnational infrastructures (Menga, 2018; Zhiltsov et al., 2018; Boute, 2019). This theoretical understanding has been verified using semi-structured interviews, necessary given the uncharted nature of this subject.

3.3.2 Semi-structured interviews

3.3.2.1 Why semi-structured

Much is still unknown about how transitions in centralist and authoritarian regimes, just as in Central Asia, evolve. Moreover, much is still unknown about the countries of Kazakhstan, Kyrgyzstan, and Uzbekistan themselves, let alone their energy and water governance. This is partly because Middle Asia has a rich history of informal governance (Ahrens & Hoen, 2013). Just a literature review would be insufficient to conduct sound case studies, not all data about the governance of the countries nor their energy and water systems are expected to have been listed. Semi-structured interviews have been a key addition to verify theoretical knowledge and supplement it with practical examples to get a better picture of the real world (Harrell & Bradley, 2009).

This classic empirical data gathering method introduced primary data to this thesis. Interviews were a useful method to collect data from individuals about their perceptions and experiences on a particular topic to verify theories and fill knowledge gaps (Harrell & Bradley, 2009). Semi-structured interviews are commonly employed in researching new domains (Yin, 2014). That fits well with the aim of this study to discover how path dependency influences changes in water infrastructures in centralist and authoritarian regimes. The advantage of this type of interviews was that it gave the interviewees the opportunity to disclose as much as possible and therefore uncover as much of a specific subject as possible – as in unstructured interviews – but that some standardization of the conversation and results was maintained – as with a structured interview (Harrell & Bradley, 2009). Semi-structured interviews are often used to discover and thoroughly understand a new topic through the open response of the interviewees. At the same time, by posing some guiding and generic questions, it was prevented that the discussion and the answers are fully unstructured, which might cause the researcher to lose control over the course of the conversation (Harrell & Bradley, 2009). Weighing the time constraints of this thesis and the added value of an in-depth conversation to explore this little-known field, semi-structured interviews were favoured.

3.3.2.2 Interview protocol

Keeping any grip on semi-structured interviews requires an interview protocol (Harrell & Bradley, 2009; Yin, 2014). The interview protocol included in Appendix III served two purposes in this study. On the one hand, it provided a guide for the researcher to ensure that certain questions raised in the previous theory were verified or knowledge gaps were filled. However, this does not mean that all questions listed were asked directly and in the prescribed manner to the interviewee. The interview protocol served more as a checklist to ensure that all topics are somewhat addressed in the conversation. On the other hand, this protocol contributed to the standardization and the validity of the research. It standardized the various interviews by following the same protocol each time, but also strengthened the validity of the study by guaranteeing that all aspects of the conceptual framework in Figure 1 were appropriately covered during the

conservations (Harrell & Bradley, 2009). As such, it fostered the reproducibility of this research, the fourth test of solid case studies (Yin, 2014).

The interview protocol had a deliberate structure. After having been introduced to the research briefly, participants were asked to talk about their personal experiences with water governance through explaining their job or by using a self-provided case. In advance, participants had been asked to present a case during the interview in order to unfold its governance from their own experience. In accordance with the protocol, the governance surrounding the water structure was discussed first. The goals pursued by actors, formalization of governance processes, composition of the network, participation of actors, and resources possessed by actors related to their degree of interdependency have been debated by posing open questions to the participants – whether or not directly derived from the protocol. Due to the potential sensitivity, the interview was concluded with a number of open questions to probe the extent to which there was technological and political path dependence according to the interviewee. Interim conclusions during the interview prevented noise and contributed to the validity of the responses (Harrell & Bradley, 2009). Not all interviews could be conducted physically or digitally due to time differences, reduced (virtual) accessibility, or overlapping agendas. In that case, questions were selected from the interview protocol to be shared with the participant.

3.3.2.3 Sampling

Key to the validity of the research is to interview a representative range of actors on their perceptions on the Amu Darya and Syr Darya river basin (Harrell & Bradley, 2009). In qualitative research, the number of participants is less key as no findings were immediately generalized to the population, but it rather supplements and verifies the theory found (Harrell & Bradley, 2009; Yin, 2014). This study used cluster sampling (Harrell & Bradley, 2009) where samples were taken from the Kazakh, Kyrgyz, and Uzbek populations in the Amu Darya and Syr Darya delta. From the local population in all three contexts, government, academic, non-governmental (NGOs), agricultural, and economic actors have been selected to give their perspective on the topic. An initial sample of these populations has been drawn on the advice of the experts of His Majesty's Embassy of the Kingdom of the Netherlands to the Republic of Kazakhstan, the Kyrgyz Republic, and the Republic of Uzbekistan and His Majesty's Honorary Consuls in Almaty, Bishkek, and Tashkent. Prompted by the informal character of these countries, snowball and – albeit to a lesser extent – opportunity sampling were applied to recruit additional participants (Harrell & Bradley, 2009). These sampling methods had the advantage of ultimately identifying experts in unknown and informal networks and accordingly obtaining an accurate perspective of a distinct group about the water governance in the Amu Darya and Syr Darya river basin.

To prevent overrepresentation of a group in this qualitative research, all actors were allocated to a group in Table 5 to ensure an equal representation of participants between the different groups and countries. The randomness of

the sampling was, however, further limited as the interviews were done in English, unless an interpreter had been present, which excluded actors that had not mastered the English language or could not be translated (Harrell & Bradley, 2009). If an actor deliberated on multiple countries, the participant was included multiple in the table. The total number of participants was 13.

Table 5 – Classification of interviewees (N = 13)

	Kazakhstan	**Kyrgyzstan**	**Uzbekistan**
Government		1	3
Academia	2	2	
Agriculture	4		3
NGO	1	1	1
Company	1		

3.4 Data analysis

In the data analysis, all data come together, planting the seeds for the results. This section clarifies how the data had been analysed in Appendices I and II in accordance with the conceptual framework in Figure 1. From an ethical and security perspective for the participants in these centralistic and authoritarian regimes, a strict data management plan has been drawn up in Appendix IV. It was crucial that their safety was guaranteed during this research, paragraph 3.4.1 details, since there have been conflicts surrounding these transnational energy and water infrastructures, or border conflicts have been taking place in the neighbourhood of those infrastructures, mainly between Kyrgyzstan and Uzbekistan and Kyrgyzstan and Tajikistan (Ahrens & Hoen, 2013; Menga, 2018). Paragraph 3.4.2 explains how the data had been sifted through textual analysis.

3.4.1 Data management

The plurality and influence of informal networks in centralist and authoritarian regimes (Ahrens & Hoen, 2013) demanded a detailed data management plan to secure the safety and anonymity of participants. Appendix IV demonstrates how the data had been managed in this study. This was based on two key principles: consent for participation and anonymity.

The possible sensitivity of this research required explicit consent from actors to engage in the interviews. Participants were presented the informed consent statement in Appendix III orally or in writing *ex ante* to underline the intentions of the research, that participation is entirely voluntary – they could withdraw any moment, that they are free to omit any questions, and that no political positions were expected. All study participants were asked for their verbal consent for taking part in the study and for data processing before the start of the interview. All informed consent forms, if not agreed to verbally, were

stored temporarily at a secured TU Delft server account, separately from other data of the interviewees. For security purposes, all forms have been deleted automatically after graduation.

To serve anonymity of the participants, all data were made irreducible in this thesis report. This meant that all responses were fully and irreversibly anonymized directly after the conversation. This prevented that a contribution of an actor would be traceable in this study whether directly through citation or indirectly via any other referral that could expose the identity of participants. For administrative purposes of this research only, names and e-mail addresses of participants had been collected and stored *pro temp*. To minimize personally identifiable information in this research, the anonymized responses were stored separately from this personal data at a secured TU Delft server. Due to anonymization, removal of data of a participant *ex post* was impossible because the data could not be traced back. Regardless of national legislation or local customs, none of the data were allowed to be accessible to others than the researcher and supervisors of this study and have only been stored for the time being of this research process.

3.4.2 Textual analysis

Both the literature review and the interviews have been subjected to a textual analysis (Bernard & Ryan, 1998; Harrell & Bradley, 2009). This textual analysis consisted of transcribing the interviews and in due course of coding the data collected, respectively.

3.4.2.1 Transcription

After conducting, the interviews were transcribed verbatim to record the data as accurately as viable (Bernard & Ryan, 1998). This transcription strategy bears the advantage that the respondent's answers were noted as literally as possible. Yet, this research in Middle Asian countries faced sometimes a language barrier when participants had not mastered the English language (sufficiently). In case the responses had to be translated by a translator, it was more proper to adopt a summary transcription. The translation was often not literally performed but in a summarizing manner, hindering verbatim transcription. This was of course detrimental to the quality of the responses as parts of the participant's response must have been lost (Bernard & Ryan, 1998). Summary transcription was also chosen out of necessity when the interviews could not be taped, reducing the opportunity to take minutes extensively and to listen back (Harrell & Bradley, 2009). Historically and culturally, recording interviews had proven to be less common and touted in Central Asia. So, when objecting to recording, summary transcription was used to ease the participants accepting a minor loss in the quality of data as researcher (Bernard & Ryan, 1998). Non-verbal behaviour has not been reflected in the transcriptions (Harrell & Bradley, 2009).

3.4.2.2 Coding

The transcribed interviews were then coded. This process actually consisted of three phases, which took place iteratively (Harrell & Bradley, 2009). The process started with so-called open coding in which the fragments of the interviews were thematically scanned and labelled – i.e., coded – at a global level (Harrell & Bradley, 2009). Flowing from the conceptual framework in Figure 1 and the interview protocol in Appendix III, the typification of networks were operated as open codes. 'Conception' and 'infrastructure' were added as open codes at this stage to reflect the political and technological path dependency concepts. These open codes would resemble the sub-headings of the analyses in Chapter 4 and Appendices I and II to structure the maintain the same research strategy. Considering that the formalization and the composition of a regime are often interlinked – as Linz' (1964) second principle of restrained actor interaction in Section 2.3 already reveals – are these open codes jointly unravelled in the analyses in Chapter 4 and Appendices I and II. The same applies for the codes participation, durability, and dependency which in practice overlap in line with Linz' (1964) third principle addressing the ill-defined distribution of power and resources.

The next step is axial coding. The assigned codes were again compared with each other and the text fragments and combined into overarching codes (Harrell & Bradley, 2009). Formalization, composition, participation, and actor durability were combined into the axial code 'network features' because they all addressed the design of the network. Goals, participation, dependency, and resources were grouped into 'actor features', as they all related to the characteristics of the actors. The code 'participation' belonged to both 'network features' and 'actor features' because the terminology could cover each of the two. The open codes 'conception' and 'infrastructure' could be considered as an axial code already considering its importance in this study.

Finally, selective coding merges axial codes to deduce generalizations from the data (Harrell & Bradley, 2009). As an intermediate step, this research has made a distinction between 'path dependency' and 'governance' so that separate insights could be abstracted from the data. These selective codes form accordingly the headings in the analyses in Chapter 4 and Appendices I and II. Table 6 summarizes the full coding process.

Table 6 – Coding process

Open coding	**Axial coding**	**Selective coding**
Conception	Conception	Path dependency
Infrastructure	Infrastructure	
Formalization	Network features	Governance
Composition		
Participation		
Durability		
Goals	Actor features	
Participation		
Dependency		
Resources		

The literature review was carried out in a similar manner, albeit in reverse order. Literature was first coded with more general themes addressed in Chapter 2, as Bernard and Ryan (1998) suggest. Regime changes in water infrastructures in Kazakhstan, Kyrgyzstan, and Uzbekistan were condensed as a refinement of the overall theme of transitions in centralist and authoritarian regimes. Related codes like 'infrastructure', 'conception', and 'path dependency' were applied in the literature review to select literature on Kazakhstan, Kyrgyzstan, and Uzbekistan and to structure this interpretive analysis (Bernard & Ryan, 1998).

The profession of the Orthodox faith by a part of the Kazakh population illustrates the kinship between Central Asia and its former herder, Russia. The Ascension Cathedral (1907) in the centre of Almaty perfectly reflects that lineage.

Not only ideologically but also architecturally, the USSR is still present in the region, as *Hotel Uzbekistan* shows. Built in 1975 and towering over the centre of Tashkent, this brutalist building gives one the impression of being back in Soviet times.

4 Analysis

Transitions also occur in centralist and authoritarian regimes. Admitting that the democratization, liberalization, and privatization reforms in Kazakhstan (Blackmon, 2021), the Kyrgyz Republic (Ahrens & Hoen, 2013), and Uzbekistan (Blackmon, 2021) may not have gone as smoothly as their leadership intended following the USSR's dissolution, the (water) governance in the countries did change. The elaboration of the multiple-case study design of the Amu Darya and Syr Darya delta in Appendices I and II clearly demonstrates that, where the first focuses on how the governance context of the three republics has changed and the second explicitly studies transitions in their respective water domain. This chapter thoroughly analyses and compares how changes in the governance context and water governance have evolved in the three Central Asian republics. Section 4.1 discusses the evolution of the governance context in Middle Asia, after which Section 4.2 is dedicated to examining change in water governance conforming to the coding as delineated in paragraph 3.4.2.2.

4.1 Path dependent Soviet context

Regardless of the USSR's disintegration in Central Asia, its conception did not suddenly fade in the institutions (Merry, 2004). Appendix I manifests that Kazakhstan, Kyrgyzstan, and Uzbekistan can still be considered as a centralist and authoritarian regime as democratization has been limited since gaining independence (Auty & De Soysa, 2006; Ahrens & Hoen, 2013). Moreover, it appears that informal, patrimonial networks continue to be of great relevance to legitimize the central authority of the state capitals (Auty & De Soysa, 2006; Akchurina, 2021; Blackmon, 2021). Especially in Kyrgyzstan and Uzbekistan, regional and economic elites have obtained a relatively large weight in shaping national policies. Thirdly, it finds that most natural resources and key sectors regularly are consolidated by a patrimonial network, which often has strong ties to the central authority (Fumagalli, 2016; Heim, 2020; Blackmon, 2021). Even in Kyrgyzstan, being the most progressive country in this regard, liberalization and privatization is still considered to be below Western standards (Anceschi, 2019). The evolution of governance in the three republics is analysed into more detail in this section and is summarized in Table 7 to define the contexts in which water transitions happen. Table 7 builds on the data in Appendix I.

4.1.1 Path dependency

4.1.1.1 Conception

In all three post-Soviet countries, the USSR conception still plays an important role in their governance (Merry, 2004; Heim, 2020; Akchurina, 2021; Blackmon, 2021). Differences can however be noted in to what extent this conception is hitherto influencing the governance of the country. The easiest is Uzbekistan, where its first president, President Karimov, almost explicitly adhered to USSR conception both institutionally and economically (Blackmon, 2021). Seeing the

economic prospects of his state because of its petroleum wealth (Merry, 2004), he saw little urgency to either liberalize or privatize his SOEs nor to democratize institutions (Auty & De Soysa, 2006; Ahrens & Hoen, 2013). The central planning economy as developed under the USSR was reproduced (Blackmon, 2021) with the country running on energy and cotton (Auty & De Soysa, 2006). The Soviet era leader also stuck to patrimonial leadership – in line with USSR conception – as a result of which the centralist and authoritarian regime of the USSR widely persisted (Ahrens & Hoen, 2013). Current President Mirziyoyev seems willing to implement some reforms to this USSR conception, but, paradoxically, gets stuck in those Soviet structures while trying, Blackmon (2021) and interviewees notice. Despite attempts to reform, Uzbek governance remains strongly aligned with USSR conception (Merry, 2004; Blackmon, 2021).

Things were very different in Kyrgyzstan. As its first President Akayev had never been part of the Soviet elite and openly had supported Gorbachev's perestroika and glasnost (Merry, 2004; Akchurina, 2021), he and his successors focused on ambitious reforms to revamp the pristine economy and abandon the USSR conception (Strayer, 1998; Fumagalli, 2016). Its conception did withal not completely disappear in Kyrgyzstan. Reproduction of USSR governance in the 1994 constitution of the independent republic (Fumagalli, 2016) and the re-appointment of former party elites in office (Akchurina, 2021) ensures that the Kyrgyz Republic still mirrors some USSR conception of governance. Economic and institutional reforms were deemed necessary in the advent of the resource-poor country to reinvigorate development; the patrimonial regime preferred to keep the *status quo* originating from the USSR, causing reforms to flounder (Ahrens & Hoen, 2013).

Kazakhstan seems to have chosen exactly the middle path. The USSR conception still lives on in the desert country, although – just like in Kyrgyzstan – moderate reforms were initially implemented to restore the economy (Merry, 2004; Heim, 2020). Liberalization and privatization was prompted, which often appeared to result in transferring SOEs to President Nazarbayev's patronage, the initial president of Kazakhstan serving from 1991 to 2019 (Auty & De Soysa, 2006; Ahrens & Hoen, 2013). Kazakhstan did have natural endowments, but the difference with Uzbekistan was that their exploitation had not yet been developed in the USSR (Gencer & Genri, 2012). After the oil economy started to flourish, Kazakhstan seemed to return to the autocratic dogma of the USSR due to former Soviet elite fearing of losing power (Auty & De Soysa, 2006; Blackmon, 2021). The country would make a turnaround and follow more and more the same path as Uzbekistan under Presidents Nazarbayev and Tokayev in pragmatically perpetuating the governance conception of the USSR (Heim, 2020). As long as the petroleum revenues poor in, Tokayev is not assumed to adapt this ingrained conception (Blackmon, 2021).

The fact that this Soviet conception continues to prevail in Kazakhstan and Kyrgyzstan despite reforms can be attributed to the concept of institutional reproduction (Pierson, 2000; Mahoney, 2001). Both countries have – implicitly – adopted the USSR *status quo* in their governance as an independent country.

That makes sense, it is easier to build on existing governance than to develop something new. That persistence of USSR conception in Central Asia also raises the theorem that the extent to which transitions are strived for in an autocracy is partly driven by the elite's availability of resources. The rebuff of Kazakh and Kyrgyz elite shows that they might be able to mobilize the dominant conception to evoke an antagonistic effect protecting its *status quo* if the transition moves into a for them undesired direction (Rotmans & Loorbach, 2009).

4.1.1.2 Infrastructure

There appears to be some correlation between the extent to which countries have invoked reforms and the ubiquity of infrastructure. They jointly inherited an extensive infrastructure mainly designed to irrigate cotton and wheat fields downstream in Kazakhstan, Turkmenistan, and Uzbekistan (Jalilov et al., 2013; Menga, 2018). After the collapse of the USSR, the water system also formally disintegrated (Zhiltsov et al., 2018). Notwithstanding that, snow and glaciers continued to melt in the Kyrgyz and Tajik mountains at time of independence, allowing grain in Kazakhstan and cotton in Uzbekistan to continue to grow. The cotton cultivation remained a vital economic pillar for Uzbekistan and could be continued without adjusting infrastructure (Bloch, 2002; Hamidov et al., 2020). Moreover, the USSR had already established a basic petroleum infrastructure in Uzbekistan that Karimov could elaborate on to expand his energy production (Boute, 2019). Not much had to change from the USSR as the infrastructure thus far supported Karimov's economic goals, despite its aging and inefficiency (Stucki et al., 2014).

While the cotton-oriented water infrastructure supported the Uzbeks, the Kyrgyz Republic felt disadvantaged by this design. It would result in water-rich Kyrgyzstan facing water shortages in winter as it was still transporting and storing water to serve downstream cultivation interests (Jalilov et al., 2013). The remote country had besides the water works little infrastructure to build on for its economy after independence (Spoor, 1999; Ahrens & Hoen, 2013). The only infrastructure the country basically possessed did not serve the Kyrgyz interests (Herrfahrdt-Pähle et al., 2006). That might be a reason why Akayev focused on liberalizing and privatizing agriculture in the hope of some economic growth in the outlying country without infrastructure available (Gencer & Gerni, 2012).

Again, Kazakhstan finds itself in the middle. Like Uzbekistan, it gained an extensive irrigation infrastructure from the USSR to water its vast grain fields (Bloch, 2002). Nazarbayev was able to employ this infrastructure immediately after independence to maintain the country's function as the breadbasket of the region. Liberalization reforms in agriculture did therefore not occur, it was not necessary (Ahrens & Hoen, 2013). Although Kazakhstan, as Uzbekistan, has large oil and gas reserves, the Soviets had never deployed the Kazakh natural endowments (Boute, 2019). Infrastructure to develop this mineral-rich soil was lacking (Gencer & Gerni, 2012). Nazarbayev was forced to make minor reforms in the energy sector to attract energy investments for its construction and boost the industry (Auty & De Soysa, 2006).

From this it can be deduced that the infrastructure that the republics inherited from the USSR steered its development in a certain direction, hinting at a technological path dependency (Van der Brugge & Van Raak, 2007; Gross & Hanna, 2019). That path dependency coerced Kazakhstan and Uzbekistan to build on the agricultural and (primitive) energy infrastructure constructed by the Soviets (Auty & De Soysa, 2006; Boute, 2019; Hamidov et al., 2020) instead of establishing new economic activities. Contrariwise, economic development in Kyrgyzstan proved to be challenging due to the lack of infrastructure around (Herrfahrdt-Pähle et al., 2006), concluding that exact same technological path dependency formed a major limiting factor on the other side of the border. The influence of technological path dependency in infrastructure development can thus not be underestimated, post-Soviet Central Asia illustrates.

4.1.2 Governance

4.1.2.1 Goals

Not only Kyrgyzstan (Auty & De Soysa, 2006), but also Kazakhstan (Merry, 2004) initially had the ambition to liberalize the economy. While Kazakhstan aimed at scaling the petroleum industry with minor reforms (Boute, 2019), a fragile economy forced the resource-poor Kyrgyzstani to resort to substantial liberalization and privatization (Akchurina, 2019). In both, their goals seem to be partly shaped by the extent to which they had access to (natural) resources. Indeed, after the oil industry in Kazakhstan grew, Nazarbayev's goal seemed to switch to consolidating power and resources (Merry, 2004; Auty & De Soysa, 2006). In Uzbekistan, Karimov would use the protection of critical sectors and national security as an argument for his centralization (Auty & De Soysa, 2006; Ruiz-Ramas & Hernández, 2021). Clinging to their consolidated power, Tokayev in Kazakhstan (Heim, 2020; Blackmon, 2021) and Mirziyoyev in Uzbekistan (Anceschi, 2019; Blackmon, 2021; Ruiz-Ramas & Hernández, 2021) both appear to aim today to diversify their economy, with the latter mostly wanting to escape its isolationism (Anceschi, 2019). How fortunate they will be remains to be seen considering that they are lingering on the centralist and authoritarian regime. Previously pre-planned transitions such as liberalization in Kyrgyzstan (Ahrens & Hoen, 2013) and privatization and democratization in Kazakhstan (Merry, 2004; Blackmon, 2021) have for that same reason been erratic.

On a governance level, the Kyrgyz Republic strives for intercommunal stability. The country has had a turbulent history since independence as ethnic and economic elite competed for power (Fumagalli, 2016). That turbulence has made Kyrgyzstan aim to redistribute power for its stability (Akchurina, 2021). That internal strife does also not contribute to its evolution in a liberal economy (Bizikova et al., 2014; Akchurina, 2021). Why Kazakhstan and Uzbekistan do not have these goals could be explained by the fact that power and resources have been more consolidated in Kazakhstan (Heim, 2020), which means there is less ground for a power struggle between clans. In Uzbekistan, on the other hand, informal agreements were concluded for the sake of stability (Anceschi, 2019;

Blackmon, 2021), so this was not an explicitly goal but the result of strategies focusing on consolidating power.

4.1.2.2 Formalization and composition

Originating from the USSR, all countries were accustomed to a centralist and authoritarian regime (Auty & De Soysa, 2006; Ahrens & Hoen, 2013). President Karimov followed this USSR demise most strictly. He would centralize power around his presidency and restrain any opposition (Ruiz-Ramas & Hernández, 2021). Under Karimov, power over economic and security affairs was put directly under the president in 1992, making the president virtually omnipotent (Ruiz-Ramas & Hernández, 2021). As in any centralist and authoritarian regime (Linz, 1964), power is not always well distributed in practice. Regional elites had some influence in governance due to the vastness of the country. By making informal agreements with them, Karimov was able to secure his power (Ahrens & Hoen, 2013; Ruiz-Ramas & Hernández, 2021). When the elite seemed to become too powerful in the *Oliy Majlis* in 1999, Karimov expanded the parliament to two chambers to water their influence down (Blackmon, 2021). By binding elites and legally reducing their authority, power consolidation in a country with informal networks was possible (Blackmon, 2021; Ruiz-Ramas & Hernández, 2021). Even under Mirziyoyev, this modernization of authoritarianism seems to endure.

In Kazakhstan, Nazarbayev basically consolidated his power in 1995 by sidelining parliament (Auty & De Soysa, 2006). He would use the 1998 Russian oil crisis to centralize economic resources as well (Merry, 2004). A concentrated oligarchy emerged in Kazakhstan, in which a small clique around Nazarbayev controlled both economic and political power (Ahrens & Hoen, 2013). Despite the cabinet and *Mäjilis* – Kazakhstan's lower house – in 2017 having regained some of their political authority (Heim, 2020) and Nazarbayev's resignation in 2019, his concentrated oligarchy would not fade since the country's natural endowments and power had already been transferred safely into the hands of his clan (Blackmon, 2021). Similar to Karimov in Uzbekistan, Nazarbayev was also able to attract the local elite with his wealth of resources and therewith strengthen his presidency (Heim, 2020; Blackmon, 2021).

Right after independence, Kyrgyzstan started as a presidential republic after parliament was sidelined (Fumagalli, 2016). That *Jogorku Kenesh* regained its power in 2010, but informal agreements between the central and regional governments would in practice define national governance (Ahrens & Hoen, 2023; Fumagalli, 2016; Akchurina, 2021). President Akayev's position turned out to be weak and needed continuous support from regional elites for his decisions (Ahrens & Hoen, 2013; Akchurina, 2021). To consolidate power, Akayev, like his Kazakh and Uzbek colleagues, tried to position his patronage network in the Jogorku Kenesh (Fumagalli, 2016). The *Tulip Revolution* and *Melon Revolution* have however illustrated that the Kyrgyz president is not intangible. Whenever President Akayev or Bakiyev tried to consolidate his power at the expense of regional elites, regional powers would rise successfully to depose the president (Ahrens & Hoen, 2013; Fumagalli, 2016; Akchurina, 2021). The constitutional

reform of 2010 could not completely reverse the power imbalance of Akayev and Bakiyev, the president would stay the central figure in Kyrgyzstan (Fumagalli, 2016). Without enjoying economic resources like in Kazakhstan or Uzbekistan, the president would always rely on the backing of variable groups of elite for his decisions – resulting *de facto* in a semi-presidential system (Fumagalli, 2016).

Those observations lead to the inference that the more economic and political resources the ruling class obtains, the more power can be consolidated – also through binding influential actors to you to further consolidate authority. This consolidation does not seem to provide a fruitful institutional structure in which (bottom-up) transitions could take place, but it aligns with Linz' (1964) typology of centralist and authoritarian regimes and thesis 1. Notably, in all three regimes regional or informal networks influence decision-making. In Kazakhstan and Uzbekistan, however, they became part of the presidential patronage network (Ahrens & Hoen, 2013; Blackmon, 2021; Ruiz-Ramas & Hernández, 2021), as such effectively limiting decentralization. Kyrgyzstan's institutional structure seems to be more supportive of transitions by involving variable configurations of economic and regional networks in decision-making (Fumagalli, 2016). The president and his patronage network do not have sufficient authority to make decisions unilaterally (Ahrens & Hoen, 2013; Akchurina, 2021), so a variety of coalitions is needed (Fumagalli, 2016), which appears to offer fertile ground for bottom-up transitions as can be deduced from the extent to which the country has been liberalized and privatized (Gencer & Gerni, 2012; Bizikova et al., 2014).

4.1.2.3 Participation, durability, and dependency

Participation and dependence are closely linked to governance formalization and composition. It is therefore no surprise that participation in Kazakhstan is limited because of consolidation of resources and power by Nazarbayev's clique (Ahrens & Hoen, 2013). A small group essentially decides upon the country's governance. However, compared to the USSR with its influential regional elite, this clan has been supplemented with post-Soviet oligarchs who had benefited from Nazarbayev's liberalization policy (Heim, 2020; Blackmon, 2021). As still the case in Kyrgyzstan and Uzbekistan, regional actors in the oblast had in the past quite some influence in Kazakh governance as they were responsible for the implementation of central policies (Ahrens & Hoen, 2013). Often opposing liberalization policies due to concerns about loss of power (Auty & De Soysa, 2006), Nazarbayev has weakened their position by further centralizing regional power and resources (Blackmon, 2021). The central government dependency on other actors outside Nazarbayev's clan is hence low (Blackmon, 2021), limiting participation in Kazakh governance – in line with thesis 2 in Chapter 2.

Surprisingly, the modern authoritarian regime in Uzbekistan – despite its name – has a significantly higher participation of actors. Karimov has mainly consolidated his power by entering into alliances with (former Soviet) regional and economic elites in fixed coalitions (Ahrens & Hoen, 2013; Ruiz-Ramas & Hernández, 2021). By cleverly moving between these informal networks and

neutralizing opposition, Karimov managed to centralize his power (Blackmon, 2021; Ruiz-Ramas & Hernández, 2021). In Uzbekistan, it has never been possible to fully consolidate power considering that power and resources are shared with this regional and economic elite (Blackmon, 2021; Ruiz-Ramas & Hernández, 2021). Consequently, Karimov remained to a certain extent dependent on these informal networks and had to let them participate to realize central policies (Anceschi, 2019), unlike Nazarbayev and Tokayev who in Kazakhstan have been able to exclude participation more easily due to their increased centralization of power and resources (Blackmon, 2021).

The Kyrgyz central government dependency on regional and economic elites because of shared power and resources is also a reason for participation (Fumagalli, 2016; Akchurina, 2021). The difference with Uzbekistan is that this participation not just concerns informal agreements, but is also formalized as these groups are represented in the parliament (Fumagalli, 2016). Furthermore, the position of these informal networks appears to be markedly stronger than in Uzbekistan. In Uzbekistan, none of the clans has yet been able to overthrow the system (Ruiz-Ramas & Hernández, 2021), while ethnic groups have ensured the termination of Akayev and Bakiyev respectively during the *Tulip* and *Melon Revolutions* (Fumagalli, 2016). Although the participation of these actors in the 2010 constitutional reforms was limited for that reason, formal steps have also been taken to ensure that participation remains possible in Kyrgyz governance. For example, a party can never seize an absolute majority in the Jogorku Kenesh and there is a fixed tenure for the president (Fumagalli, 2016; Akchurina, 2021). This legal division of power and resources actively facilitates participation in Kyrgyzstan, something Kazakhstan and Uzbekistan do not do. This reiterates our interpretation that the less power and resources the ruling class – i.e., the president – in autocratic regimes has, the more participation he must allow to get his policies through. Therewith, Kyrgyzstan seems to substantiate thesis 2 in Chapter 2 that the government must stimulate this participation of actors to foster regime change (Klijn et al., 1995; Pahl-Wostl et al., 2007; Van der Brugge & Rotmans, 2007).

4.1.2.4 Resources

A lot has already been said about the distribution of water and energy resources and power across the network. The dependency of the central governments in Tashkent (Blackmon, 2021; Ruiz-Ramas & Hernández, 2021) and Bishkek (Fumagalli, 2016; Blackmon, 2021) on regional and economic networks is high considering that they share resources. The difference between Uzbekistan and the Kyrgyzstan is that Kyrgyzstan has relatively few (natural) endowments. Its most important commodity – i.e., water – mainly serves lower-lying countries (Menga, 2018), making it largely dependent on its neighbouring countries for its commodities and economic development (Ahrens & Hoen, 2013). As paragraph 4.1.1.1 explains, this resource poverty was one of the main drivers behind Akayev's post-independence liberalization and privatization campaign.

There is hardly a greater contradiction with its neighbours Kazakhstan and Uzbekistan. In the latter case, its wealth was even accredited the depiction of *Uzbek paradox* (Ahrens & Hoen, 2013). Since the country enjoyed so many cotton, energy, and mineral commodities, it bore economic growth without any reforms being implemented (Auty & De Soysa, 2006; Blackmon, 2021). Most of the Uzbek resources would belong to Karimov's oligarchic network (Blackmon, 2021). Possibly one could also speak of the same situation in Kazakhstan today. In the beginning, in the nation rich in grain and cotton, some liberal reforms were needed to stimulate industrial development (Voronkova et al., 2018; Heim, 2020). After the former Soviet elite in Nazarbayev's clique had taken over these natural resource monopolies, reforms were halted but economic development continued (Blackmon, 2021). A *'Kazakh paradox'*? Now that both countries are re-examining how to diversifying their economies, Kazakhstan seems to retract under Tokayev to the early days of President Nazarbayev: implementing some economic reforms to trigger the advancement of a said sector, after which the concentrated oligarchy of the former president just prolongs (Blackmon, 2021). President Mirziyoyev seems to consider copying this *'Kazakh approach'* in his Uzbekistan with reforms to empower alternative – i.e., non-cotton and non-petroleum – industries (Anceschi, 2019; Blackmon, 2021). Given that previous liberalization and privatization mainly led to the consolidation of resources by the elite (Blackmon, 2021), the question is to what extent society will benefit from additional reforms under Tokayev and Mirziyoyev. Even though the two states have many endowments, most are possessed by a select group clustered around the president. And the more power and resources are centralized, the less urge for transitions is felt among this upper class, as the centralist and authoritarian regimes in Central Asia exhibit (Auty & De Soysa, 2006; Ahrens & Hoen, 2013), fearing to lose power (Pahl-Wostl et al., 2007), referring to thesis 3 in Chapter 2.

Table 7 – Comparison of governance context in Central Asia

	Kazakhstan	**Kyrgyzstan**	**Uzbekistan**
Conception	Medium USSR influenced	Medium USSR influenced	High USSR influenced
Infrastructure	Medium availability	Limited availability	High availability
Goals	Diversification and consolidation	Liberalization and ethnic stability	Abandoning isolation and protecting citizens
Formalization	Concentrated oligarchy	Semi-presidentialism	Modern authoritarianism
Composition	Fixed economic elite	Less fixed elite formations	Fixed regional elites
Dependency	Limited due to power and resources consolidation	Medium as power and resources are hared	Medium as power and resources are hared
Participation	Minimal interaction with regional actors	Full interaction with regional actors	Medium interaction with informal networks
Durability	Former Soviet elite and new oligarchs	Soviet regional elites and new businessmen	Former Soviet elite and new businessmen
Resources	Rich of endowments	Few endowments	Rich of endowments

The comparison of the evolution of governance in Central Asia in Table 7 gives a clear overview of how Kazakhstan, Kyrgyzstan, and Uzbekistan have evolved differently after their common history in the USSR. This analysis of governance development in the centralist and authoritarian regimes along the Silk Road could be summed up with:

- Previously pre-planned transitions have not develop as intended
  The scheduled reforms of Nazarbayev in Kazakhstan and Mirziyoyev in Uzbekistan have been erratic and did not achieve the intention to escape path dependency (Blackmon, 2021). Liberalization efforts in Kazakhstan and Kyrgyzstan in the past also occurred erratic due to pushback from the elite trying to protect the status quo and institutions not being ready for a market economy (Auty & De Soysa, 2006; Ahrens & Hoen, 2013). That finding seems to align with thesis 3, criticizing that an auxiliary institutional structure in which governments are supporting transitions is not by definition present in centralist and authoritarian regimes as is assumed in the three governance theories.
- The USSR conception continues to prevail in the institutions despite reforms due to institutional reproduction
  The USSR conception still strongly determines governance in post-Soviet countries through institutional reproduction. Uzbekistan actively builds on the USSR conception by not having made any efforts to adjusting it (Merry, 2004; Blackmon, 2021). Regardless of some reforms, Kazakhstan sticked to the centralist and authoritarian conception of the USSR too as the Soviet-influenced institutions were not yet ready to convert into a market economy (Blackmon, 2021) and institutional reforms were slowed down as the petroleum revenues increased, conserving the USSR political

and economic structure (Ahrens & Hoen, 2013) – endorsing thesis 3. Even in Kyrgyzstan, the USSR conception remained dominant as it was copied in its constitution of 1994 and as former USSR elite continued to work in government (Fumagalli, 2016; Akchurina, 2021). Although the USSR conception formally was abandoned by Kazakhstan and Kyrgyzstan, it pragmatically persisted as institutions such as rules, authorities, and processes from the USSR were actively reproduced after independence by their Soviet era bureaucrats. Despite any transitions, the regimes would very much rely on existing governance structures after the dissolution of the USSR.

- Antagonist responses might be evoked to protect its *status quo*
  Kazakh and Kyrgyz patrimonial networks pushing back liberalization and democratization reforms for fear of losing power strongly resembles an antagonistic response mobilized by the USSR status quo to protect it (Auty & De Soysa, 2006; Blackmon, 2021). Hokims in Kazakhstan, for example, have actively upheld the USSR status quo by resisting to carry out economic reforms (Auty & De Soysa, 2006), while in Kyrgyzstan the regional elite ousted Presidents Akayev and Bakiyev after threatening to tip the traditional power balance in the country (Fumagalli, 2016).
- Inherited infrastructure steer a country's development into a certain direction citing a technological path dependency
  The large-scale water infrastructure that the Soviets left behind enticed the Uzbeks to elaborate on the extensive cotton plantations to keep their economy running after proclaiming independency; Kazakhstan would do this for wheat (Jalilov et al., 2013). To this day, agriculture is therefore a key economic pillar in these states (Ahrens & Hoen, 2013; Heim, 2020). The lack of infrastructure in Kyrgyzstan has caused that the economy had difficulty to develop (Ahrens & Hoen, 2013). The from the Soviets inherited water infrastructure would principally serve the interests of the downstream countries as the infrastructure continued to operate as it had done in the USSR (Jalilov et al., 2013). Water would continue to flow down from the mountains in Kyrgyzstan and Tajikistan to irrigate cotton and grain plantations in Kazakhstan and Uzbekistan due to the physical water infrastructure obtained, supported by the prolongation of water distribution agreements once designed by Moscow (Jalilov et al., 2013; Menga, 2018), limiting its development of a water-rich economy despite liberalizations (Gencer & Gerni, 2012). On the other hand, Kazakhstan was left with a primitive petroleum extraction industry, forcing the state to liberalize this monopoly somewhat to push the initial development of its oil industry (Auty & De Soysa, 2006; Heim, 2020).
- The more power and resources the elite has, the easier it seems to be to exclude other actors from participating and to consolidate power
  President Nazarbayev of Kazakhstan consolidated power and resources to establish a concentrated oligarchy, enabling his patrimonial network to lead the country without really needing other actors outside his clique

to achieve objectives (Ahrens & Hoen, 2013; Blackmon, 2021). President Karimov in Uzbekistan consolidated power via binding agreements with informal networks. In exchange for their political and economic support, this elite was granted some autonomy, requiring medium interaction with informal actors in governance (Blackmon, 2021). President Akayev failed to centralize power because competences were strongly divided in the country and he had no resources to bind elites to him (Fumagalli, 2016; Akchurina, 2021). Full participation of regional actors would be the consequence. Even if power and resources are distributed, they still could be consolidated through agreements with informal actors if you have bargaining power as actor, Uzbekistan shows (Blackmon, 2021; Ruiz-Ramas & Hernández, 2021). Governance is thus not per se informal and interactive in centralist and authoritarian regimes because of limited actor interdependency, underlining theses 1 and 2.

4.2 Water governance

Although the three Central Asian republics have followed their own path after their independence in developing water governance, their governance seems to be quite similar in the end. Their shared history in the USSR (Zhiltsov et al., 2018) and their mutual dependence through transboundary waterways (Jalilov et al., 2013; Menga, 2018), but certainly also the influence of international actors on the development of water governance (Herrfahrdt-Pähle et al., 2006; Wegerich, 2008; Herrfahrdt-Pähle & Pahl-Wostl, 2012; Veldwisch & Mollinga, 2013) could be identified as key contributing factors to its evolution. Still, there are differences in water governance in Kazakhstan, the Kyrgyz Republic, and Uzbekistan. Following the analysis of the governance context of these states in Section 4.1, this section discusses their water governance. Water governance of all countries has been compared in Table 8 based on the data in Appendix II.

4.2.1 Path dependency

4.2.1.1 Conception

It is not surprising that water governance differs little in conception from its context. In Kazakhstan, for instance, as in the rest of the economy, Nazarbayev introduced a number of reforms in water governance as a result of agricultural liberalization (Wegerich, 2008; Lerman, 2009; Voronkova et al., 2018). These reforms mainly aimed to further exploit the path dependence of wheat growth, facilitated by the USSR's large-scale irrigation infrastructure (Rahaman & Varis, 2008; Wegerich, 2008; Menga, 2018). Kazakh water governance was obliquely liberalized because agriculture was facing liberalization policies. However, this new republic continued to clasp to the USSR conception that water distribution and infrastructure development were organized at a national level (Voronkova et al., 2018). The centralist and authoritarian system largely survived because of that conception, interviewees emphasize. They see that it very much depends

on the president how water is managed, just like in the USSR when Minvodkhoz was in charge (Voronkova et al., 2018).

Uzbekistan in water governance as well remained to strongly adhere to the USSR conception (Veldwisch & Mollinga, 2013; Zinzani, 2015c). In contrast to Kazakhstan, it did not implement agricultural liberalizations at all (Spoor, 1999; Hamidov et al., 2020), which means that no subsequent reforms in water governance followed (Rahaman & Varis, 2008; Zinzani, 2015c). These reforms were also not deemed necessary as the USSR water governance would still serve the same goals, that of cotton (Spoor, 1999; Hamidov et al., 2020), interviewees also note. Even more strongly than in Kazakhstan, the central and authoritarian character of water governance persisted, with decisions being taken at central level in Tashkent concerning water allocations and infrastructure (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Menga, 2018; Hamidov et al., 2020). Hitherto, the USSR conception resonates in Uzbek waters via its governance, purposes, and use of infrastructure.

Maybe the strongest is the influence of the USSR on Kyrgyz governance. This may sound a bit paradoxical because the entire water infrastructure in the country was aimed at watering cotton and grain in Kazakhstan, Turkmenistan, and Uzbekistan (Jalilov et al., 2013; Menga, 2018). As in the overall context, this gave President Akayev an incentive to implement reforms to make the economy bloom (Fumagalli, 2016; Voronkova et al., 2018). However, the USSR conception continued to dominate in the Kyrgyz Republic (Stucki et al., 2014). Suddenly, people were looking to Bishkek and no longer to Moscow for the centralistic control of the water, to which they were used. Initially, the Kyrgyz institutions pragmatically continued the USSR legacy to manage the water grid (Jalilov et al., 2013; Zhiltsov et al., 2018), until Akayev also indirectly liberalized the water infrastructure through dissolving the kolkhozes and sovkhozes – even more so than in Kazakhstan, which just privatized these SOEs (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015). Nevertheless, Sehring (2009) notes that the Kyrgyzstani institutions appear not to be ready for this and bureaucrats are resisting the reforms to protect the Soviet *status quo*. The USSR conception hence persists to pragmatically control water governance, as it does in Kazakhstan.

Anew, the examples of Kazakhstan and Kyrgyzstan demonstrate the potential effects of institutional reproduction (Pierson, 2000; Mahoney, 2001). After independence, both countries largely derived their water governance – howbeit maybe not on purpose – from that of the USSR. Notwithstanding any reforms, the USSR conception still dominates water governance. The difference with Uzbekistan – which explicitly persisted the conception – is small in reality. Multiple Kazakh and Uzbek growers look to confirm that this centralist and authoritarian regime in water governance is holding back their transition to a more efficient production. They seem to refer to the antagonistic response, as defined by Rotmans and Loorbach (2009). The governance formed by the USSR restricts them to maintain the former Soviet *status quo* as much as possible.

4.2.1.2 Infrastructure

Also in water governance there is a strong relationship between political and technological path dependence, i.e. conception and infrastructure. In terms of water infrastructure, it could be argued that Kazakhstan and Uzbekistan had a strong advantage over Kyrgyzstan after the downfall of the USSR. Infrastructure in Central Asia mainly involved infrastructure to enable downstream irrigation (Bloch, 2002; Kim et al., 2018). The inefficient and outdated network of canals, water reservoirs, and irrigation pipes continued to decorate the landscape throughout Central Asia (Zhiltsov et al., 2018), including in Kyrgyzstan despite serving little its own objectives (Herrfahrdt-Pähle et al., 2006). The transition costs occur to be too high to switch to a more efficient infrastructure or to an infrastructure that serves other objectives. This is not only evident from the example that Kyrgyzstan has only introduced a few hydroenergy works into the water infrastructure since experiencing energy shortages (Boute, 2019). Above all, the case shows that the transition to more efficient water use in Kazakhstan and Uzbekistan – such as greenhouse horticulture – has not been made yet as appropriate infrastructure is lacking to support that transition (Temirbekova et al., 2014; Umarov et al., 2019).

The USSR's water infrastructure has set up path dependency in Middle Asia, making it difficult for Kazakhstan and Uzbekistan to abandon these large-scale cultivations and for Kyrgyzstan to scale hydroenergy production. In line with Gencer and Gerni (2012) and Gross and Hanna (2019) proposals how to nullify technological path dependency, there has been no political will from Kazakhstan and Uzbekistan yet to overturn this water infrastructure (Zhiltsov et al., 2018; Kulenbekov & Asanov, 2021) and the Kyrgyz Republic cannot bear the costs itself (Stucki et al., 2014; Menga, 2018), which maintains this obsolete infrastructure because of technological path dependency. Due to this inherited water infrastructure, water use in Central Asia after the USSR remains to focus on cotton and wheat production, not empowering the transition to other – more efficient kinds of – water uses, both upstream and downstream, the cases of minor growth in greenhouse horticulture area in Kazakhstan and Uzbekistan (Temirbekova et al., 2014; Umarov et al., 2019) and the stagnant development of hydroenergy in Kyrgyzstan (Jalilov et al., 2013; Boute, 2019) portray.

This technological path dependency seems to be reinforced by disputes about ownership of the infrastructure. After the loss of the USSR, ownership of the Amu Darya and Syr Darya transnational infrastructures was divided among riparian states (Zhiltsov et al., 2018). The example of the foreign official based in Uzbekistan shows that this leads to ambiguities over responsibilities, causing further deterioration of the works due to inadequate maintenance and the lack of accountability (Schmitt, 2015; Zhiltsov et al., 2018; Hamidov et al., 2020). The same discussions exist domestically, interviewees indicate. In Kazakhstan and Kyrgyzstan, part of this water infrastructure has also ended up in private hands through the WUAs following the liberalization of kolkhozes and sovkhozes (Herrfahrdt-Pähle et al., 2006; Wegerich, 2008). Nevertheless, farmers do not feel responsible to maintain an infrastructure that does not serve their interests

and adheres to old USSR standards (Schmitt, 2015; Zinzani, 2015b), interviewed farmers clearly express. Without clear ownership nor responsibilities, the technological path dependency of infrastructures only seems to increase.

4.2.2 Governance

4.2.2.1 Goals

While Kazakhstan initially aligned more with Kyrgyzstan when it comes to economic liberalization (Merry, 2004; Auty & De Soysa, 2006), the country has found a partner in Uzbekistan in its water goals (Zhiltsov et al. , 2018; Blackmon, 2021). Agricultural production had to be maintained in both countries (Kim et al., 2018; Ruiz-Ramas & Hernández, 2021), which implied that water had to be redirected to agriculture to serve that from the USSR retrieved objective. Water resources were also used to expand the primitive energy sector from the USSR in both countries (Kim et al., 2018; Ruiz-Ramas & Hernández, 2021). For some it might be unexpected that Kazakhstan has also set itself the goal of saving the northern part of the Aral Sea basin in recent decades (Menga, 2018; Zhiltsov et al., 2018). Admittedly, Mirziyoyev in Uzbekistan now also pays more attention to environmental conservation than his predecessor (Hamidov et al., 2020), Kazakhstan had put this goal on its agenda much earlier. The Kazakhs may have had an easier time prioritizing this environmental goal because their economy has been less dependent on agriculture than in Uzbekistan (Jalilov et al., 2013; Kim et al., 2018) and therefore less dependent on the water flows coming from the Kyrgyz and Tajik mountains. Since Mirziyoyev is looking at how to diversify his economy (Anceschi, 2019; Blackmon, 2021), there appears to be more room for other policy goals such as the environment, international donors convey in the interviews. In practice, the socioeconomic interests still prevail as stated by a donor. Nonetheless, this suggests that the more important an objective is in an actor's perception, the less space there appears to be for other goals.

The Kyrgyz Republic seems to somewhat confirm this statement. Water should mainly contribute to the revamp of the country's primordial agriculture and energy sector according to Akayev (Auty & De Soysa, 2006; Gencer & Gerni, 2012; Boute, 2019). Privatization and democratization of water governance was a priority for him and international donors, in the hope of growing the economy (Menga, 2018; Zhiltsov, 2018). Not putting all eggs in one basket, he anticipated to achieve economic growth by pursuing multiple goals. That this transition has not been successful in Kyrgyzstan seems to validate the finding that transitions in centralist and authoritarian regimes occur erratic, as paragraph 4.1.2.1 earlier concluded. The flaky transition path to environmental goals in Kazakhstan and Uzbekistan (Hamidov et al., 2020) backs this argument. We should not forget that Kazakhstan *"still has an enormous problem,"* to paraphrase a donor.

4.2.2.2 Formalization and composition

The formalization and the composition of water governance strongly correlates with conception. It was therefore expected that Kazakhstan and Uzbekistan would most strongly adhere to the hierarchical governance of the USSR

(Herrfahrdt-Pähle & Pahl-Wostl, 2012; Zinzani, 2015c). In Uzbekistan, the USSR *status quo* was simply prolonged in the beginning. It would Karimov take until 2003 to initiate minor reforms under pressure from international donors, which paradoxically led to more centralization (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Hamidov et al., 2020). Nazarbayev carried out a similar move by consolidating all levels of government into the State Committee for Water Resources (Zinzani, 2015b; 2015c). In both regimes, the aim was to ensure that central policies were carried out in a more integrated manner, preventing regional deviations.

The power of regional actors would never be completely marginalized in any of the countries following the rise of WUAs (Wegerich, 2008; Veldwisch & Mollinga, 2013). In reality, hokims would often keep controlling these WUAs (in Kazakhstan) or the local water infrastructure (in Uzbekistan) and could as such informally further adjust water allocation at regional level (Wegerich, 2008; Herrfahrdt-Pähle & Pahl-Wostl, 2012; Zinzani, 2015b; 2015c). This was also a consequence of a poor defining of the governance of WUAs, which allowed its governance to be informalized by regional actors in Kazakhstan (Rahaman & Varis, 2008; Zinzani, 2015b) and Uzbekistan (Herrfahrdt-Pähle & Pahl-Wostl, 2012). Hokims harked back to the USSR tradition that regional actors drive local water governance, not its users like farmers as formally anticipated (Zinzani, 2015b; Hamidov et al., 2020). Reproducing the USSR governance infrastructure, water governance would be characterized by central allocation with informal decentralization. The main decisions would be taken centrally, but the hokims would retain sufficient capacity to introduce local minutiae (Wegerich, 2008; Veldwisch & Mollinga, 2013). The composition of water governance therefore changed little in Kazakhstan and Uzbekistan, although the idea was to give farmers more influence with the (in Uzbekistan voluntary) WUAs (Rahaman & Varis, 2008; Herrfahrdt-Pähle & Pahl-Wostl, 2012; Zinzani , 2015b). It remained a combination of national authorities and regional actors, with Nazarbayev and Karimov again entering into (informal) agreements with hokims to consolidate their power (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Zinzani, 2015b).

Kyrgyzstan tried to find a similar balance between central direction and local implementation (Herrfahrdt-Pähle et al., 2006). With the installation of WUAs and Councils in the BWOs, the Kyrgyz Republic, like Kazakhstan, hoped to promote farmers' participation in water governance and decentralize water governance (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015). Unlike Kazakhstan and Uzbekistan, the Kyrgyz central government never managed to strengthen its central oversight as a result of continued discussions about the role of central organizations and central policies (Schmitt, 2015). Multiple local governments are said to have influence on water governance, which extended the patrimonial network after the USSR because existing power structures often remain present in these existing or new bodies such as the WUAs (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015). For farmers, the centralist and authoritarian nature of water governance remains intact, even though the weight governance lies more in the region which dictates decisions (Schmit, 2015). In Kazakhstan and Uzbekistan,

the central authorities happen to have more leverage (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Zinzani, 2015c).

In theory, this fragmentation of governance could provide more room for customization and participation in the region. Nonetheless, in Kazakhstan and the Kyrgyz Republic, this fragmentation mainly led to discussion about the responsibilities of the different governance institutions, which in turn caused tensions (Zinzani, 2015c). The lack of clarity slows down transitions and ensures that patrimonial networks can continue to exist, as Kyrgyzstan shows (Schmitt, 2015). Responding to this ambiguity, Kazakhstan moved to more centralization after informal networks took over formal WUAs (Wegerich, 2008). In centralist and authoritarian regimes, it appears that informality can lead to centralization as a result of unclear division of responsibilities. That seems to suggest that a clear division of responsibility – including ownership of infrastructure – might lead to more honest and stable decentralization of governance and accordingly could support (bottom-up) transitions. It might become more difficult to work with varying coalitions because responsibilities are more strictly defined, as Kyrgyz governance currently exhibits (Fumagalli, 2016), yet this institutional structure might be able to counterbalance power consolidation by the central government and consequently create more possibilities for bottom-up regime changes.

4.2.2.3 Participation, durability, and dependency

With the WUAs and the Councils in the BWOs, Kazakhstan (Rahaman & Varis, 2008; Zinzani, 2015b; 2015c) and Kyrgyzstan (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015) attempted to improve participation in decision-making locally. A formal effort by the central government to eradicate the patrimonial network in local water governance (Herrfahrdt-Pähle et al., 2006; Ahrens & Hoen, 2013). Most of these institutions are yet said to be run by regional (former USSR) elite, limiting participation of farmers as end users. This could be traced back to that they never have fundamentally incorporated participation of relevant actors or accountability mechanisms to them in their governance (Rahaman & Varis, 2008; Wegerich, 2008; Zinzani, 2015b). National legislation failed to define the governance of WUAs and local water infrastructure, hokims were given a free pass to take control (Herrfahrdt-Pähle et al., 2006; Wegerich, 2008; Sehring, 2009; Zinzani, 2015b). Moreover, the creation of WUAs was strongly pushed by international donors, the central governments in Almaty or Bishkek felt hence little responsibility for implementing these policies and fostering participation (Sehring, 2009; Zinzani, 2015b; 2015c). The consequences of this democratic deficit could be major, as appears in Kyrgyzstan. There, not only do farmers not see the WUAs as their representative (Herrfahrdt-Pähle et al., 2006; Wegerich, 2008), but the national government also does not regard it as an independent organization that implements central policy (Sehring, 2009; Schmitt, 2015). These institutions thus end up in a power vacuum, enabling regional actors to take the lead based on USSR tradition. This seems to align with the discussion

in paragraph 4.2.2.2, which also argues for formalization of governance at local level for the purpose of participation.

In Uzbekistan, the WUAs would likewise be led by hokims and linger the hierarchical governance of the Soviet Union (Veldwisch & Mollinga, 2013). The fundamental difference in Uzbekistan is that WUAs were never formally enforced – as in Kazakhstan and Kyrgyzstan – but could be set up locally on a voluntary basis (Hamidov et al., 2020) – something that was actively pushed by donors (Veldwisch & Mollinga, 2013; Zinzani, 2015a). Little would change in the centralist water governance because the hokims of the oblast were put in charge (Herrfahrdt-Pähle & Pahl-Wostl, 2012). Here too, donors failed to implement the international discourse of participation and decentralization in a centralist and authoritarian regime due to the prevailing USSR conception (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Veldwisch & Mollinga, 2013). While offering space as central government – just as in Kazakhstan and Kyrgyzstan – the absence of participation would never allow for a fair inclusion of the interests of farmers in water governance (Hamidov et al., 2020). In all three countries, the reforms were mere reproduction of USSR water governance (Hamidov et al., 2020). The efforts of international donors – perhaps precisely because of their efforts, as in Kyrgyzstan (Herrfahrdt-Pähle et al., 2006; Wegerich, 2008) – have not resulted in the institutional structure improving the participation of actors. The lack of an active incentive for participation by the three central governments and the hokims in these centralist and authoritarian regimes could be explained by the notion that they possess most power and resources already (Fumagalli, 2016; Heim, 2020; Blackmon, 2021), so they have little urgency to boost participation to conduct their policies.

4.2.2.4 Resources

The multiple-case study does not directly indicate that the elite in Central Asia has actively consolidated water resources. Irrigation water remained virtually free (Herrfahrdt-Pähle & Pahl-Wostl, 2012), as farmers stress. Farmers in none of the countries can withal freely determine their water consumption. National but especially regional governments would determine the timing and volume of their water supply, which would frequently lead to scarcity at farm level (Herrfahrdt-Pähle et al., 2006; Herrfahrdt-Pähle & Pahl-Wostl, 2012; Zinzani, 2015b). By determining when and how much water a farmer could receive, the hokims and other regional actors effectively controlled the water resources. The liberalization and privatization reforms in Kazakhstan and Kyrgyzstan had genuinely not resulted in more resources for farmers (Wegerich, 2008; Schmitt, 2015). In Uzbekistan, sticking to the USSR conception of water as *res communis*, the commodity be always owned by the state (Stucki et al., 2014; Menga, 2018).

With the WUAs, Kazakhstan and Kyrgyzstan wanted to transfer the irrigation infrastructure of the former kolkhozes and sovkhozes to the farmers, so that they became responsible for its maintenance (Wegerich, 2008; Sehring, 2009; Zinzani, 2015b). The national government yenned farmers to pay for the infrastructure (Schmitt, 2015; Zinzani, 2015c). On the contrary, farmers did not

see the infrastructure as their property because they had no say in its water allocations as well (Schmitt, 2015; Zinzani, 2015b; 2015c). They held the regional elite responsible for maintenance. The result of this debate about ownership would be that the infrastructure would further deteriorate, leading to a more inefficient water system and more water shortages in the tillage (Sehring, 2009; Schmitt, 2015; Zinzani, 2015b; Hamidov et al., 2020). Neither in Kazakhstan nor in the Kyrgyz Republic nor in Uzbekistan have the WUAs been able to arrange a redistribution of water resources and infrastructure to users (Zinzani, 2015c). Fundamental reforms will be needed to strengthen the position of users in local water governance – e.g., improving the governance of the WUAs.

Questionable is whether and to what extent central and regional elite is eager to facilitate this. Over time, they have been able to consolidating these endowments after the partition of the USSR and evolved into leading actors in water governance. Past transitions in Central Asia, however, have also exposed that these actors in centralist and authoritarian regimes in general are feeling less urgency to enable transition as they have already centralized power and resources (Auty & De Soysa, 2006; Ahrens & Hoen, 2013) and might fear losing power over such a transition (Pahl-Wostl et al., 2007).

Table 8 - Comparison of water governance in Central Asia

	Kazakhstan	**Kyrgyzstan**	**Uzbekistan**
Conception	Medium USSR influenced	Medium USSR influenced	High USSR influenced
Infrastructure	Outdated and focusing on wheat production	Outdated and focusing on supply downstream	Outdated and focusing on cotton production
Goals	Maintaining yields and conserving environment	Liberalizing agriculture and scaling hydroenergy	Cotton growth remains dominant
Formalization	Central allotment	Central oversight	Central allotment
Composition	Fixed with central and regional governments	Rather fixed with governments and donors	Fixed with central and regional governments
Dependency	Medium as regional actors execute central decisions	High as regional actors and donors execute decisions	High as regional actors partly formulate decisions
Participation	Limited user participation	Limited user participation	Limited user participation
Durability	Established local elite	Established network	Established state actors
Resources	Rich of endowments	Few endowments	Rich of endowments

The comparison of the water governance in Middle Asia in Table 8 gives a clear overview of how Kazakhstan, Kyrgyzstan, and Uzbekistan have distinguished themselves after 1991. Complementing the analysis in Section 4.1, the analysis of the development of water governance in Central Asia across countries in Table 8 could be summarized with the following results:

- The USSR centralist and authoritarian conception endures – even after formal abandonment – due to institutional reproduction

All three countries still rely heavily on the USSR conception of water governance with which they were left: centralized and authoritarian. Uzbekistan would adhere most strongly to this Soviet conception by reproducing USSR governance after independence since the institutions were already designed to fulfil Karimov's cotton objectives (Veldwisch & Mollinga, 2013; Zinzani, 2015c). Minvodkhoz was in Uzbekistan therefore initially retained while oblastvodkhozes and rayvodkhozes still enacted local water governance (Zinzani, 2015c). Kazakhstan likewise largely maintained the USSR conception of national water distribution and infrastructure development (Voronkova et al., 2018). The Kazakh State Committee for Water Resources would be basically a continuation of Minvodkhoz and regional actors remained somewhat in charge of local water governance, whereas the central government persisted to direct the overarching policy (Rahaman & Varis, 2008). Akayev in the Kyrgyz Republic was not able to change the USSR discourse as institutions did not agree on how modern water governance should look like, prolonging the USSR institutions as bureaucrats resisted reforms after 1990 (Sehring, 2009).

- The governance *status quo* might mobilize the dominant conception to evoke an antagonist response, trying to prevent a transition
  Contemporary water governance in Central Asia is outlined to growing cotton in Uzbekistan and wheat in Kazakhstan (Jalilov et al., 2013; Menga, 2018). Multiple Kazakh and Uzbek growers indicated that they experience an antagonistic response from the regime when attempting to transition to a more diverse plantation like moving to other crops or wanting to expand their greenhouse horticulture area. Most notably, liberalization policies in Kyrgyzstan would never turn out to materialize due to lack of consensus on these policies. A delay fuelled by the USSR conception that hoped to prolong the water status quo fixated at cotton (Sehring, 2009) – an institutional structure was lacking in accordance with thesis 3.
- Disputes about ownership of an infrastructure reinforce a technological path dependency
  The collapse of the USSR divided the transnational infrastructures of the Amu Darya and Syr Darya suddenly into five different owners, leading to disputes about ownership. Not only did upstream countries feel limited responsibility for maintaining these infrastructures because they did not serve their interests (Menga, 2018; Zhiltsov et al., 2018), but interviewees also point out that sometimes the infrastructure owned by one country is located within the territory of another. This lack of responsibility for a functioning water infrastructure challenges transitions and reinforces technological path dependence. Domestic accountability issues further enlarge technological path dependency. In Kazakhstan and Kyrgyzstan, neither government nor farmers feel any responsibility for maintaining the infrastructure, resulting in the obsolete USSR infrastructure targeted

at cotton and wheat to be sustained and as such creating an additional transition barrier (Herrfahrdt-Pähle et al., 2006; Wegerich, 2008) .

- Unclear roles and responsibilities in governance slows down transitions and ensures that the *status quo* continues to exists
  The WUAs in Kazakhstan and Kyrgyzstan display that without defined roles and responsibilities of actors, political path dependence will persist (Schmitt, 2015; Zinzani, 2015b). As no one seems to feel responsible for the water infrastructure, there is less urgency for initiating a transition to a more water-efficient system as they are not responsible (Rahaman & Varis, 2008; Wegerich, 2008; Zinzani, 2015b; 2015c). That lack of clarity allows the elite in Kyrgyzstan to maintain the status quo (Schmitt, 2015), whereas the central government of Kazakhstan uses this ambiguity as a main reason to centralize water governance again (Wegerich, 2008).
- The more power and resources possessed by the elite, the easier it is for them to consolidate power and exclude actors from participating and the less they feel the urgency to enable transitions for fear of losing power
  Notwithstanding the push of international donors to foster participation of local actors – partially through WUAs – the central governments have lacked incentives to genuinely include them in governance because they are able to realize their goals with the current governance composition (Herrfahrdt-Pähle et al., 2006; Wegerich, 2008). Hokims, from their side, would rather not give up their power and resources in the local network, having thus little incentive too to boost participation in Kazakh, Kyrgyz, or Uzbek water governance (Fumagalli, 2016; Heim, 2020; Blackmon, 2021), a finding that is in line with thesis 2. In addition to the previous, Pahl-Wostl et al. (2007) argue that actors, like the central government and hokims, that have consolidated power, might fear losing power as result of a transition because they essentially already possess most of it (Auty & De Soysa, 2006; Ahrens & Hoen, 2013). If the WUAs in Kazakhstan and the Kyrgyz Republic would really mirror the democratic principles as they were accredited, their farmers would gain power and resources mainly to the detriment of the hokims (Herrfahrdt-Pähle et al., 2006; Wegerich, 2008; Hamidov et al., 2020) because both power and resources then would have to be redistributed to other actors (Zinzani, 2015c). Centralist and authoritarian regimes hence do not look to feel the urgency to enable transitions, they only could lose.

Water is plentiful in the Kyrgyz Republic, but not drinkable everywhere until you boil it. The mineral water from the mountains is. When visiting Ala-Archa National Park during weekends or holidays, most Kyrgyz people return home with filled water bottles, often with a week's worth of water. In the warm sun, people queue up patiently in long lines with their depreciated cars.

The first greenhouse strawberries along the Silk Road can be found near Almaty

5 Conclusion

Transitions happen everywhere, regardless of context. However, that context does sway how these transitions arise and develop (Klijn & Koppenjan, 2000; Pahl-Wostl et al., 2007; Rotmans & Loorbach). This context is formed by path dependencies (Goldstein et al., 2023). Whether political or technological, past choices determine the context in which transitions evolve. This is particularly true for infrastructures due to high costs of adapting or abandoning it (Gross & Hanna, 2019; Künneke et al., 2021). To understand how transitions develop and are governed in a centralist and authoritarian regime, this study questioned the influence of path dependency on infrastructure transitions in this context.

Through the conceptual framework in Figure 1, the dynamics between path dependencies, interwovenness of infrastructures, and networks have been analysed in this thesis. Path dependency emerged to determine the conception of actors of transitions, the institutional readiness to foster regime change, and any transition costs (David, 1985; Arthur, 1989; Sewell, 1996, Gross & Hanna, 2019). Interrelationships of infrastructures showed to increase these costs as it is impossible to change one infrastructure without impacting another – raising the technological transition barrier, likewise bringing more actors and interests to the table – increasing the political barrier (Grafius et al., 2020). Recognizing these dynamics in the context, the conceptual framework presented criteria to study the governance of the transition arena (Linz, 1964). Understanding how actors interact to overcome path dependencies depicts how this affects infrastructure transitions in centralist and authoritarian regimes. Based on the data gathered through this conceptualization, this conclusion answers to this knowledge gap by solving the various sub-questions posed in Section 1.4 first.

5.1 Path dependency bears erratic transitions

History shows that planned transitions in centralist and authoritarian regimes occur erratic. There is of course always change, but pre-planned transitions do not go smoothly in centralist and authoritarian regimes, as the countries in Central Asia and their water governance depict. Near the end of his dominion, Kazakh President Nazarbayev aimed at economic reforms and infrastructure expansion to diversify the national economy away from fossil fuels (Heim, 2020; Blackmon, 2021). Just like with his Uzbek colleague, President Mirziyoyev, this institutional and economic transition has not been running swimmingly due to pushback from actors and institutions not being ready for a market-based economy (Heim, 2020; Blackmon, 2021). Previously, the liberalization and privatization reforms enforced by Kyrgyz President Akayev after the fall of the USSR had not been successful in generating growth since his government was not institutionally equipped to embody these regime changes (Auty & De Soysa, 2006; Ahrens & Hoen, 2013). Path dependency cannot easily be escaped.

This can partly be traced back to the characteristics of these centralist and authoritarian regimes. In accordance with Linz' (1964) typology, there is

little pluralism of actors in governance of centralist and authoritarian regimes, interaction with actors is restricted, and the executive often mostly controls the governance. Unlike totalitarianism, these regimes are withal not steered by an ideology. This centralist and authoritarian context has proven unable in Central Asia to accommodate transitions as it does not fully bear in mind the interplay of a system's socioeconomic, cultural, institutional, technical, and ecological dimensions (Klijn & Koppenjan, 2000), causing planned transitions to occur erratic. That likewise gives an answer to the first sub-question in this research, asking about the characteristics of these regimes.

5.2 The past sets the pace

Path dependency influences transitions in two ways. On the one hand, one can distinguish a technological path dependency when an inefficient technology is carried on longer than desired due to the high costs of changing (David, 1985; Arthur, 1989). On the other hand, there are political path dependencies when past decisions have put governance on a track that has been unable to support the craved transition (Pierson, 2000; Rotmans & Loorbach, 2009). Both types of path dependencies seem to be inherent to infrastructure transitions in the autocracies of Central Asia, as the following shows in response to the second sub-question searching to learn how path dependencies influence transitions.

5.2.1 Infrastructure causes lock-ins

Technological path dependency has a significant influence on infrastructure transitions (Van der Brugge & Van Raak, 2007; Gross & Hanna, 2019). The high sunk costs associated with infrastructures make it expensive and physically also challenging to change or abandon this existing infrastructure to serve new goals (Gross & Hanna, 2019; Künneke et al., 2021). Only when the benefits of regime change outweigh these costs (Gross & Hanna, 2019) and the owner – i.e., often a government – of the infrastructure has the will and can bear the costs (Gencer & Gerni, 2012), this technological path dependency could be reversed. In case of transnational infrastructures, such as waterways, this means that all riparian countries must be open to transition (Gross & Hanna, 2019).

The prolonging of the extensive irrigation infrastructure in Central Asia as designed by the USSR for large-scale cotton production in Kazakhstan, Turkmenistan, and Uzbekistan endorses this theory (Jalilov et al., 2013; Menga, 2018). Since Kazakhstan (Auty & De Soysa, 2006) and Uzbekistan (Hamidov et al., 2020) do not want to adjust this cross-border water infrastructure to secure their production and Kyrgyzstan does not have the power to change it (Stucki et al., 2014), an obsolete and inefficient water infrastructure remains in Middle Asia, serving cotton and impeding a transition to more efficient and diverse water use (Zhiltsov et al., 2018). Meanwhile, that USSR water infrastructure limits the Kyrgyz Republic in developing a hydropower economy since the water continues to flow to downstream countries, as was constructed by the Soviets (Menga, 2018; Boute, 2019). Technological path dependency thus negatively

affects transnational infrastructure transitions by creating a major political and financial barrier for transitions to more efficient systems, causing lock-ins of obsolete and inefficient infrastructures.

This technological path dependency is reinforced by disputes about the ownership of the infrastructure. After the loss of the USSR, the ownership of the transnational water works was divided among riparian countries (Zhiltsov et al., 2018). Foreign officials notice that ambiguities over responsibilities led to further deterioration of the infrastructure due to inadequate maintenance and the lack of accountability (Schmitt, 2015; Zhiltsov et al., 2018; Hamidov et al., 2020). Domestically and internationally, an ownership deficit was perceived by both governments and users (Herrfahrdt-Pähle & Pahl-Wostl, 2012), sustaining the USSR *status quo* (Schmitt, 2015; Zinzani, 2015b). Without clear ownership nor responsibilities, the technology path dependency of infrastructures only seems to increase because it establishes an additional transition barrier.

5.2.2 Conception sets the scene

Interesting is as well the influence of political path dependence. Conception plays a unique role in centralist and authoritarian regimes. If a conception has dominated governance, it is likely that this philosophy will live on – even if it has been formally abandoned – through institutional reproduction. Pierson (2000) and Mahoney (2001) find that it is easier to build on existing institutions instead of reinventing the wheel. New regimes reproduce institutions in their newly created governance, ensuring that this conception persists.

Institutional reproduction turned out to be common in Central Asia after the dissolution of the USSR. Although Kazakhstan tried to implement some reforms after independence, the Soviet-influenced institutions showed not ready for this transition to a market economy with contracts, accountability, and tax schemes (Ahrens & Hoen, 2013; Heim, 2020). Even the Kyrgyz Republic as most liberal country in Middle Asia largely replicated the USSR governance in its initial constitution (Fumagalli, 2016; Akchurina, 2021), while Uzbekistan explicitly adhered to the USSR conception not only in terms of governance but also economically (Merry, 2004; Blackmon, 2021). Albeit that the USSR formally ceased to exist in Kazakhstan and Kyrgyzstan, its conception of centralism and authoritarian governance has pragmatically endured as in Uzbekistan.

This conception does not seem to encourage transitions. If a transition is expected to disorder the *status quo* of autocratic regimes, its governance is likely to provoke an antagonist response to protect it (Rotmans & Loorbach, 2009). The reproduction of USSR institutions after its disjuncture in Central Asia has frequently discouraged transitions if they were not deemed to match the former Soviet *status quo*. For example, in Kazakhstan, it would take until 1996 for the economy to return to its Soviet levels after initial institutional and economic reforms had failed (Auty & De Soysa, 2006). Also in Uzbekistan, a grower sees that President "*Mirziyoyev gets stuck in the Soviet structures*" in pursuing his reforms as the *status quo* pushes back his reform agenda. Not even a Soviet era leader and full of reforms (Akchurina, 2021), President Akayev of

Kyrgyzstan was not able to liberalize water governance and change the USSR discourse as institutions did not agree *"to what good water governance should look like"* (Sehring, 2009, p. 67). The ongoing dominance of the conception of the USSR in Central Asia illustrates how conception – even after renunciation – creates a political path dependency (Pahl-Wostl et al., 2007) and accordingly thwarts transitions potentially altering the centralist and authoritarian *status quo* with an antagonist response (Mahoney, 2001). In autocratic regimes, path dependency tries to maintain the existing conception as much as possible.

5.3 Resolving path dependency needs institutional structure

Transitions thus need an institutional structure, whose development will have to be supported by the regime. If that support is not there, the transition costs will be higher. Governance theories like network (Klijn et al., 1995), adaptive (Pahl-Wostl et al., 2007), and transition management (Loorbach et al., 2015) all rely – maybe subconsciously – on democratic principles for that support. Those democratic latent values resulted in three theses criticizing the applicability of these Western-influenced governance theories in centralist and authoritarian regimes. Although transition (Loorbach et al., 2015) and network management (Poppet et al., 2009) opt for a more structured governance through settled processes or rules than adaptive management (Folke et al., 2005), they all agree that governance should be less formal and open to non-governmental actors for a successful transition (Klijn et al., 1995; Pahl-Wostl et al., 2007; Loorbach et al., 2015) *(thesis 1)*. The second thesis assumes that actors are interdependent due to shared resources and power (Klijn et al., 1995; Pahl-Wostl et al., 2007; Van der Brugge & Rotmans, 2007). Participation of actors and their willingness to redistribute resources and power is in all theories they key to gaining support for change (Klijn & Koppenjan, 2010; Loorbach, 2010; Voß & Bornemann, 2011). Depending on the theory's motive, all plead for an active role of the central government to foster interaction and exchange among actors – i.e., providing for an institutional structure to regime change (Klijn et al., 1995; Pahl-Wostl et al., 2007; Van der Brugge & Rotmans, 2007) *(thesis 3)*.

7.3.1 Autocracies lack institutional structure empowering transitions

Elaborating on this answer to sub-question 4, these three theses based on Linz' (1964) aforesaid principles exhibit why centralist and authoritarian regimes perceiving their governance characteristics could not give the right support for this institutional structure according to this theories. The wandering course of transitions in water governance in this study underlines that the more power and resources the elite has consolidated, the less they feel the urgency to enable regime change for fear of losing power (Pahl-Wostl et al., 2007). In resource-rich Uzbekistan, President Karimov saw little need to pursue any liberalization and democratization reforms (Auty & De Soysa, 2006; Ahrens & Hoen, 2013). In Kazakhstan, Nazarbayev would initially pursue some reforms to ultimately gain more resources as government, allowing to further consolidate and curb

new transitions (Blackmon, 2021), displaying the incongruence of autocracies with thesis 2. Also in water, Kazakhstan and Uzbekistan felt little urgency to reform because its governance served their goals and the USSR central system allowed them to maintain control over water to achieve that goal (Rahaman & Varis, 2008; Herrfahrdt-Pähle & Pahl-Wostl, 2012; Menga, 2018). Institutional reproduction of regimes in which resources and power have been consolidated can thus lead to reduce participation because interdependencies are limited – explaining why a vital part of an institutional structure to empowering regime change is not being present in autocracies *(thesis 2)*.

The situation of the WUAs in Central Asia may reflect the broader impact on infrastructures if an institutional structure is lacking in centralist and authoritarian regimes. The WUAs in Kazakhstan and Kyrgyzstan display that without defined roles and responsibilities of actors, the *status quo* will persist (Schmitt, 2015; Zinzani, 2015b). As no actor seems to feels responsible for the water infrastructure in Central Asia, there is no urgency to transition to a more efficient water system as they are not responsible (Rahaman & Varis, 2008; Wegerich, 2008; Zinzani, 2015c). That lack of clarity allows hokims in Kyrgyzstan to maintain the *status quo* and keep the position they enjoyed in the USSR via institutional reproduction (Schmitt, 2015), whereas the central government of Kazakhstan uses this ambiguity as a main reason to centralize its water governance (Wegerich, 2008) and basically revert back to Minvodkhoz (Zinzani, 2015c). That formalization due to institutional reproduction reduces chances for bottom-up transitions again *(thesis 1)*, forcing us to reconsider what kind of institutional structure transitions in autocratic regimes require.

5.3.2 Infrastructure transitions demand structure

Infrastructure transitions particularly desire an institutional structure given their unique nature. In the aforementioned, it was already indicated that political will of all actors related (Gross & Hanna, 2019) and access to the right resources (Gencer & Gerni, 2012) could hurdle the technological and political barrier that path dependency poses. The high transition costs of infrastructures require an extra stimulating institutional structure (Gross & Hanna, 2019). In addition, infrastructures are often interwoven with each other (Rotmans & Van Asselt, 2000; Grafius et al., 2020), as the water-energy nexus in Central Asia also exemplifies (Zhiltsov et al., 2018). A transition in one system will thus also lead to a change in the other system, which could increase the transition barrier (Loorbach et al., 2010; Grafius et al., 2020). Kyrgyzstan is a clear example of this: it is impossible for the state to scale hydroenergy production without the USSR water infrastructure targeted at cotton being adapted too (Menga, 2018; Boute, 2019). Answering the third sub-question: noting that their flows and functions are interconnected, targeted adjustments in one infrastructure are difficult, to the detriment of transitions since the costs of change are higher (Goldstein et al., 2023). Rotmans and Loorbach (2000) argue, withal, that an integrated and strategic vision could embark intertwined transitions as it is able to resolve technological and political path dependencies. Mainly in autocracies, where an

institutional structure for transitions is missing, this integration suggest high transaction costs to develop such a shared and integrated strategy to support transitions of interwoven infrastructures.

5.4 Embracing informal decentralization

Not as paradoxical as it may sound, but that institutional structure in centralist and authoritarian regimes will require embracing informal decentralization, as (water) governance in Central Asia illustrates. Undeterred by the consolidation of power of the central governments in Kazakhstan and Uzbekistan, informal networks would remain a key actor in governance (Heim, 2020; Blackmon, 2021; Ruiz-Ramas & Hernández, 2021). Presidents in both countries found their own ways to deal with this informality. Nazarbayev in Kazakhstan, on the one hand, centralized not only power but also resources, creating a concentrated oligarchy around him (Ahrens & Hoen, 2013). Karimov, on the other hand, made binding agreements with local elites in Uzbekistan to support his authority and ergo to consolidate his power (Blackmon, 2021; Ruiz-Ramas & Hernández, 2021). In the resource-poor Kyrgyz Republic, Akayev was unable to consolidate power with his patronage network because of the great ethnic diversity in the country and as he did not have any resources to knot the regional elite to him (Fumagalli, 2016; Akchurina, 2021).

Whether successful or not, all leaders in Central Asian centralist and authoritarian regimes have been forced to deal with some kind of informality and decentralization in positioning themselves. Nazarbayev's failure to push liberalization further in Kazakhstan (Auty & De Soysa, 2006), the unsuccessful economic reforms of Mirziyoyev in Uzbekistan (Anceschi, 2019), or the fatal power consolidation efforts by Akayev and Bakiyev in Kyrgyzstan (Fumagalli, 2016; Akchurina, 2021) have made clear what the repercussions could be if the balance between the central government and regional actors is disrupted – i.e., hokims are block transitions in these autocratic regimes if they view the change negatively. Assuming that these regimes would like to retain their nature after this transition – Linz' (1964) principles alike – national governments will have to reconsider the current balance between central and regional actors in order to make a transition successful. Regional actors and informal networks will need to be able to participate in governance to a certain extent and formulate initiatives to smoothen transitions *(thesis 1)*, although this implies that the authority of the central government is likely to erode. A dilemma for the central government if it wants to succeed in their transitions: it would mean that it would have to redistribute power and resources – e.g., water – to other actors (Zinzani, 2015c) *(thesis 2)*, which could be experienced as losing influence in governance but might provide for an institutional structure supporting regime change *(thesis 3)*.

Transitions in water governance in Central Asia have deciphered that these informal networks are not only important for formulating transitions, but also for implementation. Top-down transitions in Kazakhstan and Kyrgyzstan, forcing that water governance should be decentralized via WUAs and that users

should become responsible for its infrastructure (Wegerich, 2008; Herrfahrdt-Pähle & Pahl-Wostl, 2012; Zinzani, 2015b; 2015c), caused that farmers did not feel responsible for sustaining this transition (Sehring, 2009; Zinzani, 2015c), the infrastructure further deteriorated due to this carelessness (Sehring, 2009; Schmitt, 2015; Zinzani, 2015c; Hamidov et al., 2020), but, above all, that hokims continued to dominate water governance through institutional reproduction as they were controlling the execution of centrally orchestrated water governance policies (Wegerich, 2008; Veldwisch & Mollinga, 2013). That mismatch gave hokims the chance to intervene in the governance of WUAs – just like their superiors in an attempt to prevent to lose influence compared to their position in the USSR (Zinzani, 2015a; 2015c).

The centralist and authoritarian governance remains intact in existing transitions because it has been managed hierarchically *(thesis 1)* and actors were not properly included *(thesis 2)*, providing an answer to sub-question 5. Displaying that hokims in the execution still have the opportunity to impede centrally dictated transitions in centralist and authoritarian regimes and that in practice power is often unclearly spelled out in autocracies (Linz, 1964) – as Central Asia seems to confirm in this thesis – this could be read as another argument why informal decentralization should be embraced by the central government to a certain extent to create an institutional structure to cherish transitions in centralist and authoritarian regimes *(thesis 3)*. That dilemma of allowing participation (Loorbach et al., 2015) and redistributing power and resources to other actors *(thesis 2)* – thus losing its privileged position in governance (Klijn et al., 1995; Klijn & Koppenjan, 2000) *(thesis 1)* will centralist and authoritarian regimes have to face on the short-term if they want to accomplish their pre-planned transitions on the long-term *(thesis 3)*.

5.5 Path dependency and transitions in autocracies

With those answers to the sub-questions, this brings us to the main question. Both technological and political path dependencies influence the transitions of infrastructures in centralist and authoritarian regimes. Past decisions to design (transnational) infrastructure in a certain way and for a certain function make it difficult to adapt this infrastructure. It requires political will from all actors involved – with their conflicting objectives – and sufficient (financial) resources to overcome this transition barrier. This is difficult in autocracies because they aim to enforce these transitions unilaterally but often have insufficient power (locally) and resources to do so, generating lock-ins of outdated and inefficient infrastructures. The transition barrier will be even higher when infrastructures are interwoven – like water and energy – because related infrastructures have to be considered in this transition as well. This technological path dependency is reinforced by disputes about the ownership of the infrastructure – seeming to be common in centralist and authoritarian regimes – as there is a lack of responsibility perceived to sustain this transition.

Politically, a conception – even if formally abandoned – could continue to influence the governance in which the transition is taking place due to

institutional reproduction. If this transition is unfavourable to the governance *status quo*, conception could be mobilized to provoke an antagonistic response trying to actively circumvent this transition. The likelihood of an antagonistic response seems significantly larger in centralist and authoritarian regimes as they often have an ideological basis. This governance designed by conceptions could therefore counter transitions because this conception still is awake in institutions, despite the fact that this conception is no longer formally leading. Moreover, this political path dependency in centralist and authoritarian regimes might result in a lack of institutional structures to facilitate transitions *(thesis 3)*, considering that these regimes never envisaged true participation, flexibility, *(thesis 2)* and informality in governance *(thesis 1)*. The previously dominant conception has ensured that an institutional structure is missing in governance, which explains why transitions in those regimes in general are occurring erratically or are demotivated because they do not get the needed support to flourish.

6 Discussion

This final chapter in this study is devoted to the discussion. Discussion about the societal implications of this research, the limitations of this thesis, and it provides recommendations for further research. The added value of this study will be elaborated in Section 6.1 with a critical reflection on Western literature on the governance of transitions. Section 6.2 delves into the limitations of this research and deduces directions for future research.

6.1 Critical reflection on Western literature

Popular governance theories such as network (Klijn et al., 1995), adaptive (Pahl-Wostl et al., 2007), and transition management (Loorbach et al., 2015) are all relying on networks in explaining and managing transitions. This arises from their common assumption that actors are interdependent due to shared power and resources and thus should exchange to realize objectives (Klijn et al., 1995; Pahl-Wostl et al., 2007; Van der Brugge & Rotmans) *(thesis 2)*. Networks have been found in the centralist and authoritarian regimes on the Silk Road as well. However, power and resources happen to be much more consolidated in these regimes by the central government (Fumagalli, 2016; Heim, 2020; Blackmon, 2021; Ruiz-Ramas & Hernández, 2021). The central government is therefore considerably less dependent on other actors than these theories assume. This allows them to take decisions more unilaterally, resulting in fewer checks and balances among the different actors in the network. That reduces the incentive for central actors in these regimes to interact. That also fits with their centralist and authoritarian nature, in which top-down management in general prevails (Linz, 1964) *(thesis 1)*. The democratic axioms of participation and informality restrict the application of these theories to centralist and authoritarian regimes as the premise that actors are interdependent cannot be fulfilled (Klijn et al., 1995; Pahl-Wostl et al., 2007; Van der Brugge & Rotmans). These Western governance theories can accordingly not well explain or manage transitions if governance is more hierarchical organized and centralized as a result of consolidation of power and resources. This asks us to critically reconsider the democratic assumptions of these transitions in order to formulate thorough theories that could describe or manage transitions in regimes that do not subscribe or comply with these presumptions too.

Supplementary to this interdependency assumption, these theories are assuming an institutional structure that does not seem to exist in centralist and authoritarian regimes on the Silk Road *(thesis 3)*. First, the informality and participation of actors in governance that all theories acquire (Loorbach et al., 2015) appear to be inexistent in these regimes *(theses 1-2)*. Instead, governance along the Silk Road has rather been formalized and hierarchically structured with limited participation of actors (Wegerich, 2008; Herrfahrdt-Pähle & Pahl-Wostl, 2012; Zinzani, 2015b; 2015c) *(thesis 1)*. Secondly, the water governance in Kazakhstan, the Kyrgyz Republic, and Uzbekistan was found to consist of a

fairly fixed group of actors, part of a patrimonial network (Rahaman & Varis, 2008; Herrfahrdt-Pähle & Pahl-Wostl, 2012; Zinzani, 2015b), contrary to the perception in these theories that actors should be relatively flexibly included in governance if they want to participate (Pahl-Wostl et al., 2007) *(thesis 2)*. The institutional structure in these regimes has not been set up to involve actors outside this patrimonial network or any informal networks, as the democratic deficits in the WUAs mirror (Herrfahrdt-Pähle et al., 2006; Wegerich, 2008; Hamidov e al., 2020). Thirdly, these centralist and authoritarian regimes do not look to be able to effectuate the public role of accommodating transitions that the three governance theories have accredited to them (Pahl-Wostl et al., 2007; Dewulf et al., 2009; Loorbach et al., 2015) *(thesis 3)*. In the past, there was a lack of participation, flexibility, and informality in Central Asian water governance because policies were centrally dictated from Moscow (Voronkova et al., 2018). Since then, reforms have mainly been a reproduction of the USSR water governance *status quo* (Hamidov et al., 2020), implying that these regimes still do not exhibit this institutional structure.

Relying on the USSR institutional structure, post-Soviet governments lacked incentives to transition these regimes because current governance was able to achieve their goals as in water (Herrfahrdt-Pähle et al., 2006; Wegerich, 2008). This raises the fundamental question of how to deal with regime change if this institutional structure is missing in the governance context – something that these Western governance theories implicitly seem to assume with their networks (Klijn et al., 1995; Pahl-Wostl et al., 2007; Loorbach et al., 2015) *(thesis 3)*. Without a resolution of how this institutional structure could be established in accordance with these theories, if lacking, it confines the extent to which these theories could explain or manage transitions significantly. Its institutional assumptions exclude these theories for now from being applied to centralist and authoritarian regimes. Maybe the *'institutional layering'* concept might provide a solution to escape these governance lock-ins (Streeck & Thelen, 2005). Old institutions are not directly replaced in this theory but moderately transformed as *"new elements [are] attached to existing institutions [to] gradually change their status and structure"* (Streeck & Thelen, 2005, p. 31). Incremental change through adding layers to the *status quo* might be fertile in centralist and authoritarian regimes as this transition could appear to be less threatening to central actors because the old governance does not disappear.

That touches on the third shortcoming of these theories identified in such regimes. These Western governance theories do not take sufficiently into account cultural-historical factors. In all three post-Soviet countries, the USSR conception still plays a vital role in shaping their governance (Merry, 2004; Heim, 2020; Akchurina, 2021; Blackmon, 2021). Despite the conception formally having been abandoned, it still influencing the institutions and economy of the newly established republics – and thus the governance in which transitions are evolving. This is caused by institutional reproduction (Pierson, 2000), through which USSR conception has survived in Central Asia (Ahrens & Hoen, 2013; Heim, 2020). This has induced a political path dependency over time (Pahl-

Wostl et al., 2007), a historical factor that influences transitions because it has and continues to produce the governance context. One could discern a similar cultural-historical factor in the recurring influence of hokims in governance. Not only interviewees, but also the literature indicates that local citizens are regularly looking to hokims to organize regional governance as they have always done: a cultural custom (Heim, 2020; Blackmon, 2021; Ruiz-Ramas & Hernández, 2020). Water governance in Central Asia is an excellent example of the fact that this position does not need to be officially defined – most of the times not – but that hokims nevertheless supervise this governance relying on cultural-historical perceptions, such as in the WUAs when there was a paucity of governance (Zinzani, 2015a; 2015c). Water governance in Uzbekistan shows that even with decentralization, a top-down governance structure emerges at the local level (Veldwisch & Mollinga, 2013); regardless of decentralization, the centralist culture continues to exist anyway in these regimes either at a different government level (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Hamidov et al., 2020). The question would be how to deal with such cultural-historical factors in governance theories that mainly focus on network characteristics concerning the interaction between actors, not encompassing cultural-historical traditions and values.

This would also lead to an update of the conceptual framework in Figure 1. This model incorporated these three theses derived from network, adaptive, and transition management with the concepts of interrelated infrastructures and path dependency and predominantly functioned as a theoretical footing in this research. Having established the lack of awareness of cultural-historical factors in transitions, means that this element should be added. In the existing model this is only reflected to a limited extent through including conception of governance as a factor in creating political and technological path dependence, but cultural-historical factors go beyond that interpretation. More attention should also be paid to the concept of institutional reproduction in that model, given the impact that USSR conception turns out to continue to have on Central Asian countries even after their dependence and its formal renunciation: the institutional structure empowering regime change, as envisaged by the three governance theories, can as a consequence still not be detected. Adding those two components might result in an understanding what institutional structure – perhaps institutional layering as proposed by Streeck and Thelen (2005) – is needed to support the evolution of transitions in centralist and authoritarian regimes.

6.2 Limitations and future research

This research aimed at studying the evolution and governance of transitions in centralist and authoritarian regimes. To explore how path dependency shapes infrastructural change in autocracies, the case of water governance in Central Asia has been employed to gain a better understanding how transitions in such regimes have developed (Johannesson & Perjons, 2014). That results in two key limitations of this research. Firstly, although this study has opted for a holistic

multiple-case study by studying water governance in the Kazakh, Kyrgyz, and Uzbek context to get a more detailed understanding of this phenomenon – i.e., richer data – and make the study more robust (Yin, 2014), this does not mean that its findings could be generalized instantaneously to regime change in other fields in centralist and authoritarian regimes. To get a stronger basis in generalizing findings to the population, one could better opt for an embedded multiple-case study design that could analyse multiple water governance units into detail in these regimes to improve its external validity (Stebbins, 2001; Johannesson & Perjons, 2014), as suggested already in paragraph 3.2.3.1.

Secondly, the reader should bear in mind that this study encompasses a qualitative and exploratory research. Semi-structured interviews were a pivotal extension of this thesis to verify theoretical knowledge and supplement it with practical examples to get a better understanding of (water) governance in this Middle Asian neighbourhood (Harrell & Bradley, 2009). The validity of semi-structured interviews is relatively low as answers are difficult to compare and might result in biases (Harrell & Bradley, 2009). Interviews were mainly used in this qualitative study to supplement and verify scientific theories, not to validate them (Harrell & Bradley, 2009; Yin, 2014). To validate results, a larger sampling will have to be carried out with greater randomness. Clustering actors in Table 5 has attempted to prevent overrepresentation of countries and actors in the sampling. It should withal be noted that Kazakhstan and Uzbekistan are overrepresented in this thesis due to the initial sample via Dutch experts in the region and was reinforced by the snowball effect. It turned out that European relations with resource-rich Kazakhstan and Uzbekistan (Auty & De Soysa, 2006) were stronger than with resource-poor Kyrgyzstan (Akchurina, 2019). Remoteness of the country (Bloch, 2002) also made it challenging to interview Kyrgyzstani. To increase validity of this study on water governance in these three regimes would require a much larger and more random sampling across countries and categories. Any results of such an extension of this study would allow the generalization of findings to the population (Harrell & Bradley, 2009), enabling future research to make valid statements about the influence of path dependency in general in centralist and authoritarian regimes.

Furthermore, it should be noted that this study is unable to encompass the entire water governance in Kazakhstan, Kyrgyzstan, and Uzbekistan. The three republics were selected as cases to allow for pattern matching between cases to get an in-depth understanding of potential causalities in transitions of the water governance in centralist and authoritarian regimes (Yin, 2014). Plenty of research has already been done on the development of water governance in these three countries (*inter alia:* Herrfahrdt-Pähle et al., 2006; Wegerich, 2008; Herrfahrdt-Pähle & Pahl-Wostl, 2012; Veldwisch & Mollinga, 2013; Hamidov et al., 2020), some of which even have attempted to consider the region as a whole (*e.g.* Rahaman & Varis, 2008; Jalilov et al., 2013; Stucki et al., 2014; Abdullaev & Rakhmatullaev, 2016; Menga, 2018). Notwithstanding that, future research will remain necessary in this relatively unexplored region, especially with the arrival of Tokayev in Kazakhstan and Mirziyoyev in Uzbekistan, who with their

announced reforms could have the potential as major water user to radically change the water agenda that has been dominating the post-Soviet Silk Road (Blackmon, 2021). The grand challenge of food sovereignty in this desertifying region as discussed in Section 1.4 will thence remain interesting to be studied.

Normally, as said, a structured interview would have contributed to the validity of the research. In a research entirely devoted to the effects of the USSR conception in Central Asia, the author also encountered this while conducting his research. Interviews – despite a semi-structured method – occurred less structured than one is used to in the West. There have been times when additional participants unexpectedly joined an ongoing interview to answer specific questions asked to another actor or that questions were answered by actors under a watchful eye of their manager, something that is not unusual in those kinds of regimes. In addition, it was not appreciated pursuant local customs to record interviews, given the USSR history in the region. This required the author to document the answers as much as was feasible on the spot. These interviews were therefore conducted under conditions other than those that are standard in Western academics. Considering the qualitative and exploratory nature of this study, this only affects the validity of this study to a limited extent. It goes beyond the scope of this thesis to examine the impact of doing research – and interviews in particular – under non-Western standards on research validity in general.

Finally, time constraints have prevented the author to engage with the transitions of energy governance. The Silk Road embodies an unmistakable water-energy nexus, with the Kyrgyz Republic and Tajikistan possessing water upstream and Kazakhstan, Turkmenistan, and Uzbekistan having petroleum downstream (Cruz-del Rosario, 2009; Zhiltsov et al., 2018; Sehring, 2020). In the USSR, these countries were connected in a uniform water-energy system to exchange these commodities with each other. Even after independence, these states remain dependent on each other for these natural endowments. Taking energy governance into account enables the interdependencies of countries to be further studied at a transnational level. Water and energy are not just only technically but also institutionally interwoven in Central Asia (Abdullaev & Rakhmatullaev, 2016), allowing for further exploration of the influence of path dependency on transitions of transnational infrastructures in centralist and authoritarian regimes. These insights could provide input as well on how to address the concerns raised in the reflection on Western theories in Section 6.1.

Anyone thinking that the Netherlands is a flower country will be surprised in Central Asia. Flowers have a unique meaning in Russian and Turkic culture, it is an experience. Although water is scarce in steppe country Kazakhstan, many flowers flourish in the city centre on Women's and Victory Day. Especially around *Republic Square*, Almaty, the water flows through the many fountains and the green parks to bloom flowers.

Epilogue

Having reached the end of our journey in this study through marvellous and intriguing Central Asia marks likewise the closure of my academic adventure at Delft University of Technology. It was my privilege to travel this region with you in search of the influence of path dependency on infrastructure transitions in centralist and authoritarian regimes. Like the people that have travelled the Silk Road together in caravans, I could never make this journey alone. First of all, I therefore would like to express my deepest gratitude to Dr Haiko van der Voort and Dr ir. Leon Hermans, my two supervisors. Without Haiko's patience in this unique process and Leon's critical reflections, this thesis would never have been completed. Words cannot express how grateful I am for sharing their expertise and knowledge with me. Thank you for being my companion along this road.

I am also thankful to all the interviewees that were eager to exchange with me on this unplumbed topic. Their perceptions have been of great added value to get a better understanding of (water) governance in Middle Asia. The various grand challenges in this region deserve to more attention in the future. In that regard, I will have to thank my employer, Glastuinbouw Nederland, for allowing me to write this thesis and conduct local research. The photos in this thesis are a vivid example of their flexibility.

Lastly, I would like to mention my family and friends. I would especially like to recognize my father, mother, sister, grandmother, and aunt Janny – the latter of whom rightfully continued to push me to finish my education. Their belief in me has kept my spirits and motivation high during this long process. I would be remiss in not highlighting one woman in particular: my better half Marloes, who had to give in so much during the evenings and weekends so that I would finish my research but continuously had so much confidence in me. Finally, we have time to explore the world again.

Jesse Schevel
Strasbourg, April 22, 2024

The *Tilla-Kari Madrassa* (1660)
on *Registan*

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Appendix I – Context case study

Historically, 1991 will always be recalled as the year of the collapse of the USSR. The Soviet's *annus horribilis* was preceded by years of accumulating crises in Eastern Europe, the Baltics, the Caucasus, and Central Asia. Over the years, Moscow fell into crisis as the CPSU slowly lost its monopoly on power in USSR constituent republics (Strayer, 1998). After the independence of Estonia and Latvia in 1990 and Georgia and Lithuania in 1991, General Secretary Gorbachev made a final attempt to convert the USSR into a new federation of independent republics (SSRs) (Brzezinski & Sullivan, 1997; Strayer, 1998). Nevertheless, this constitutional reform was offered too late. Following the *August Coup*, basically hard-line CPSU members putting Gorbachev aside as *de facto* Supreme Leader of the USSR, he finally resigned from his position in late August 1991 (Strayer, 1998). Ceremoniously still continuing serving as USSR President, Gorbachev principally paved the way for President Boris Nikolayevich Yeltsin (1991-1999) of the largest constituent republic – the Russian Soviet Federative Socialist Republic (RSFSR) – to take over the Kremlin and the remnants of the Soviet regime (Brzezinski & Sullivan, 1997).

Causing more mayhem in the USSR, the leaders of the leading Soviet republics of Russia, Ukraine, and Belarus gathered to discuss the future of the USSR, or at least what was left of it. In early December, the republics agreed on the *Belovezh Accords,*[11] proclaiming the definite partition of the USSR and the establishment of the Commonwealth of Independent States (CIS). The CIS[12] would institute a framework aimed at looser cooperation among former Soviet republics after obtaining independence (Brzezinski & Sullivan, 1997; Ahrens & Hoen, 2013; Šćepanović, 2022). The consecutive *Alma-Ata Protocols*[13] would ultimately ratify the formal dissolution of the USSR by the remaining eight of twelve former Soviet republics. The Republics of Estonia, Georgia, Latvia, and Lithuania did neither sign nor participate in the Protocols due to their prior withdrawal from the USSR in the early 1990s (Strayer, 1998; Šćepanović, 2022). Moreover, it was agreed under the Protocols that these eight newly independent states would join the CIS by the end of the year (Brzezinski & Sullivan, 1997; Šćepanović, 2022). On Christmas Day 1995, the USSR officially ceased to exist.

The transition from a Soviet Socialist Republic (SSR) to an independent state also entailed the necessary institutional reforms. Moscow was no longer in charge, detaching republics from the Kremlin's ruling. For the first time since their incorporation in the Russian Empire in the 19th or 20th century. Clearly shaped by decades of Russian and later Soviet domination, each republic chose

[11] The 1991 Agreements Establishing the Commonwealth of Independent States.
[12] Following the dissolution of the USSR, the CIS was established in 1991. At present, the CIS unites Azerbaijan, Armenia, Belarus, Kazakhstan, Kyrgyzstan, Moldova, the Russian Federation, Tajikistan, Turkmenistan, and Uzbekistan. Originally, Georgia and Ukraine participated in the CIS as well, but withdrew their memberships in 2008 and 2018 respectively following military conflicts with Russia (Šćepanović, 2022).
[13] The 1991 Protocol to the Agreement establishing the Commonwealth of Independent States.

a different path for institutional reform, largely depending on social capital, access to natural resources, and USSR heritage (Auty & De Soysa, 2006).
Composing the context for the Amu Darya and Syr Darya river delta multiple-case study design, this appendix contemplates the evolution of governance in Kazakhstan, Kyrgyzstan, and Uzbekistan respectively since the 1990s. The structure of the governance of each country will be explored, guided by the conceptual framework in Figure 1. This annex therefore pays attention to the formal nature of governance, as appears in the literature, as well as to the informal side based on the interviews. It will appear in this appendix that the extent to which a state was resource-rich or resource-poor strongly determined the degree and pace to which liberalization measures were introduced (Auty & De Soysa, 2006). Likewise, the force of social capital, intensity of transboundary cooperation in this landlocked region, and dependence on other Central Asian republics prove to be decisive factors for institutional change (Gencer & Gerni, 2012; Ahrens & Hoen, 2013). Even after independence, most republics seemingly continue to be a product of Russian imperialism and basically persisted as *"neo-Soviet regimes"* (Merry, 2004, p. 287). Governance in Kazakhstan, Kyrgyzstan, and Uzbekistan will be discussed successively by looking at path dependency and the organization of networks. A timeline of the historical governance developments in Central Asia is sketched in Figure 4 for ease of overview in the subsequent sections.

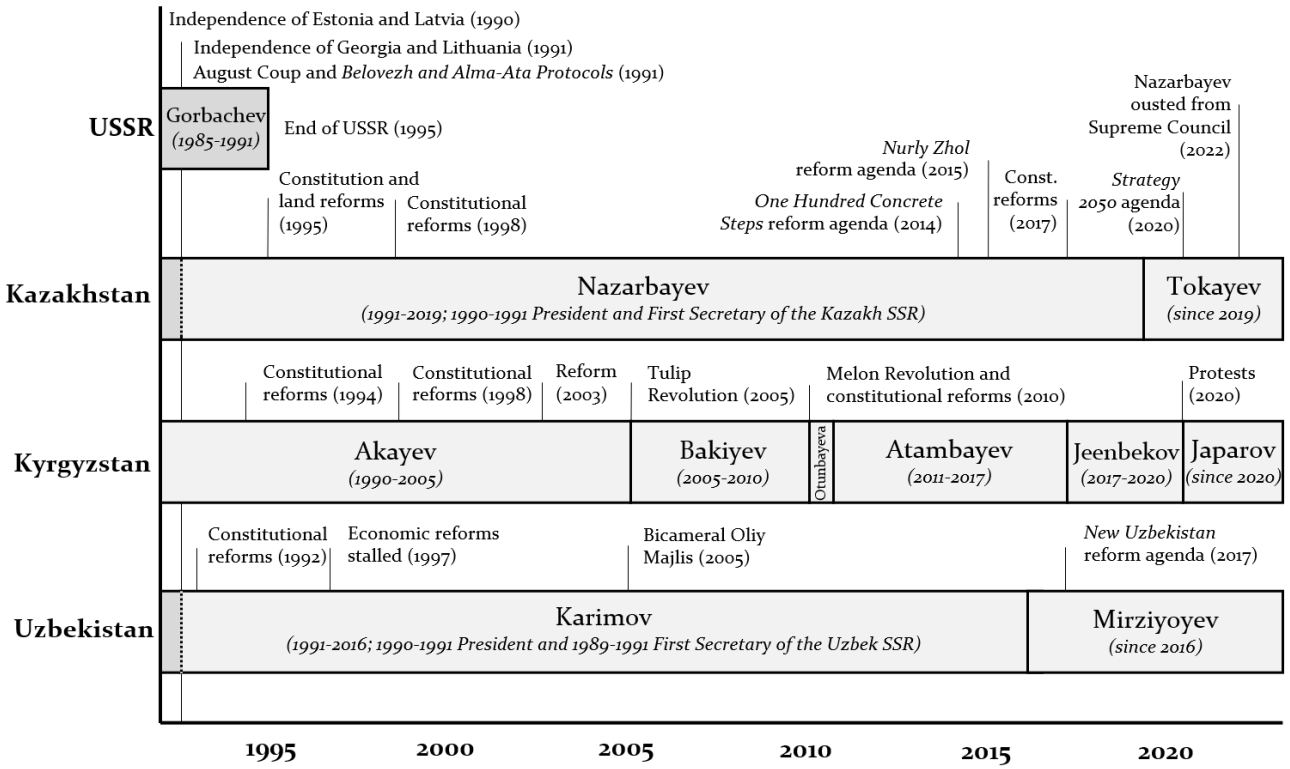

Figure 4 – Timeline of governance development in Central Asia (author, 2024)

I.1 Kazakhstan

Once encapsulated by Tsar Nicholas I in the 19th century (Montefiore, 2017), Kazakhstan has had a long-standing tradition of being at the centre of the Russian Empire and its successors. Comprising half of Europe's size, it entered the USSR in 1936 (Ahrens & Hoen, 2013). Kazakhstan would further expand its agricultural pillar under this new Russian regime, developing into the *"granary of Central Asia"* (Gencer & Gerni, 2012, p. 72). The country would quickly aim to deviate from this agricultural path after independence to attain economic growth from its soil in other ways, becoming under its longstanding leader Nursultan Abishuly Nazarbayev (1991-2019) the economically leading country in Central Asia after its previous warden, Russia (Gencer & Gerni, 2012). Table 9 summarizes the governance characteristics of the Kazakh context in line with the conceptual framework.

I.1.1 Path dependency

I.1.1.1 Conception

Nazarbayev deemed liberalization necessary to restore the national economy (Auty & De Soysa, 2006). The Soviet-influenced institutions in Kazakhstan proved not to be ready yet for such a transition (Heim, 2020). They were not set up for these steps into a market economy – e.g., having financial contracts, legal accountability, or tax schemes – as a result of which socioeconomic reforms occurred erratically and stagnantly (Ahrens & Hoen, 2013). Interestingly, the country's traditionally most precious sectors agriculture and energy mostly escaped liberalization and privatization policies (Ahrens & Hoen, 2013). Superseding the largely during the USSR established agricultural industry as the state's prime economic pillar, Nazarbayev envisioned to exploit the Kazakh mineral-richness. Legislation to attract foreign investment – mainly for the extractive industry – was adopted to build a highly export economy around oil and natural gas, moving it to the dominant pillar of the national economy (Merry, 2004; Boute, 2019; Heim, 2020). Moderate yet inconsistent reforms were carried out predominantly so that these former state monopolies could be transferred to the Kazakh elite, often part of Nazarbayev's patronage system (Auty & De Soysa, 2006; Ahrens & Hoen, 2013).

Forecasting the economic and power consequences of liberalization, the transition towards a market economy proceeded slower than Nazarbayev initially intended. Its pace of liberalization was curbed by the former Soviet but still powerful elite, fearing loss of power (Blackmon, 2021). Further expanding competition would make them lose their privileged monopolist position over resources and therewith their exclusive revenues (Auty & De Soysa, 2006). Due to technological but foremost political path dependency it would take until 1996 for the Kazakh economy to return to its Soviet levels (Gencer & Gerni, 2012). After several years of institutional and economic reforms, the country eventually reverted to a concentrated oligarchy with an authoritarian drift, just like in the old days (Auty & De Soysa, 2006). The substantial revenues that

Kazakh soils contain reduced the need for rigid institutional reform, leaving the USSR power structure and economic outlook in modern Kazakhstan under Soviet era leader Nazarbayev covertly relatively unaffected (Ahrens & Hoen, 2013; Blackmon, 2021). Pragmatically, the USSR conception was endured by Nazarbayev even after having gained independence (Heim, 2020).

Once part of the clan of Nazarbayev himself, it is not expected that the in 2019 newly elected President Kassym-Jomart Kemeluly Tokayev will radically challenge this strongly ingrained conception (Blackmon, 2021). It is expected that, as long as the elite of Nazarbayev dominates the institutions and the petroleum revenues poor in, this from USSR conception derived concentrated oligarchy is likely to persist in Kazakhstan (Merry, 2004).

I.1.1.2 Infrastructure

Despite the country enjoying rich oil and natural gas deposits, Kazakhstan had been assigned the role of food producer for centuries under the Russian regime (Bloch, 2002). Unlike in Uzbekistan, neither the Romanovs nor the USSR had ever really deployed Kazakhstan's natural resources (Gencer & Gerni, 2012). On the contrary. During the Soviet regime, Kazakhstan was in fact a major importer of energy (Ahrens & Hoen, 2013), leaving its second largest SSR with a relatively primitive extractive industry and mineral-rich soils (Gencer & Gerni, 2012). The nation was therefore expected soon to surge (Auty & De Soysa, 2012). Instead, the Kazakhs inherited outdated infrastructures mostly adapted to agricultural production (Bloch, 2002). That dogmatic focus on extensive wheat production for the former USSR led with the return of borders in Central Asia due to USSR dissolution to massive contraction of the economy because sales markets could no longer be reached (Auty & De Soysa, 2006). Furthermore, obsolete machines and the lack of adequate infrastructure made it insurmountable to sustain grain production in Kazakhstan nor to switch to other crops (Bloch, 2002; Kim et al., 2018). The inherited USSR infrastructure adjusted to wheat cultivation caused a severe contraction in agricultural output and rural desertion (Spoor 1999; Bloch, 2002; Kim et al., 2018).

I.1.2 Governance

I.1.2.1 Goals

At the beginning of its dependence, Kazakhstan conveyed under Nazarbayev the ambition to develop a more liberalized economy (Merry, 2004), raising faith in democratization (Ahrens & Hoen, 2013). Still being closely tied to its former herder both economically and politically, Kazakhstan generally followed the path of Russian liberalization policies to embody economic growth. Subsidies and price caps for pre-eminent consumer goods were gradually abolished. In pursuit of a market economy to foster economic growth and to overcome the failure of socialism (Heim, 2020), the Kazakh central government proceeded with privatization (Auty & De Soysa, 2006). Anticipating budget replenishment and an improved integration into the global economy, the Kazakh authorities allowed private activities by transferring property rights from the state to the

private sector in order to boost the country's economic development (Auty & De Soysa, 2006; Ahrens & Hoen, 2013).

Considering that most power and resources in Kazakhstan have been consolidated in Nazarbayev's clan, it has been argued that it informally pursued the goal to further expand its authority across the country and profit personally from the exploitation of Kazakhstan's natural endowments (Auty & De Soysa, 2006; Blackmon, 2021). The president used the economic downturn of 1998 to opportunistically centralize powers (Merry, 2004; Auty & De Soysa, 2006) and most state-owned enterprises (SOEs) liberalized under his leadership would ultimately end up in the hands of his associates (Auty & De Soysa, 2006).

Until the 2008 financial crisis, their natural endowments had helped authorities to maintain power and provide for political stability in the post-Soviet country. The oil and gas-dependent state was, however, hit ruthlessly by the fall in oil prices and energy exports, stressing the urgency for diversification of its economy (Gencer & Gerni, 2012; Heim, 2020). In overcoming its economic challenges in the short and long term, Kazakhstan had to modernize its economy – also institutionally (Heim, 2020). President Nazarbayev demanded an economic revolution with reforms through sweeping industrialization and innovation (the *2012 Strategy 2050*) and bettering and financing infrastructural development (both the *2014 Nurly Zhol* and the *2015 One Hundred Concrete Steps* concepts) (Heim, 2020). As part of these reforms, Kazakhstan*, inter alia,* reconsidered greenhouse horticulture to diversify its economy and strengthen its agricultural sector (Temirbekova et al., 2014). Nevertheless, the government was dissolved in 2019 for failing to raise the Kazakh's living standards and diversify the economy away from fossil fuels, a frantic impulse to effectuate the ambitions (Blackmon, 2021). Previously belonging to Nazarbayev's inner circle and being his heir apparent in his political party – Nur Otan,[14] Tokayev has advanced these ambitions while maintaining his power position (Heim, 2020; Blackmon, 2021). Whether he will be successful remains withal to be seen. *"It is mainly the paperwork that must provide certainty in this country,"* a grower and businessman notice. *"On paper it is all correct, but in practice it is different – paper is patient but the reality is not,"* the second one elaborates.

I.1.2.2 Formalization and composition

Ultimately, in the 1990s, the underdeveloped economy started to show some improvements. Bafflingly, this growing wealth contributed to the legitimization of Nazarbayev's – entitled *Elbasy*[15] – central and growing authoritarian regime. In 1995, the parliament had already been side-lined and power was relegated to the president (Auty & De Soysa, 2006). The 1998 Russian oil crisis exacerbated the situation – hitting the pristine Kazakh economy, heavily depending on the freshly started energy production, sternly. Consolidation of presidential powers intensified as Nazarbayev intervened trying to save the economy. Meanwhile, he exploited that opportunity to ban opposition and once again extend his

[14] Since 2022 formally known as 'Amanat'.

[15] *Translated:* Leader of the Nation, Nazarbayev was stripped of his title in 2022.

presidential mandate (Merry, 2004; Auty & De Soysa, 2006). Any manifestation of rising opposition would be crushed harshly by Nazarbayev's clique (Merry, 2004). With a weakened civil society, a concentrated oligarchy resurged in Kazakhstan, limiting participation as a small clique who would determine the course of the country in the coming decades (Ahrens & Hoen, 2013). Explaining his future plans, a researcher from Almaty implicitly displays the formalization in governance: *"We want to, but the government decides what happens."*

Although Nazarbayev still retained key policymaking functions during his last reforms in 2017, some socioeconomic competencies were reverted back to the cabinet and the *Mäjilis* – the lower house of the parliament (Heim, 2020). The unexpected resignation of Elbasy in 2019 did not change the status of Kazakhstan as a concentrated oligarchy, with natural endowments hitherto primarily owned by the elite and having limited market forces (Auty & De Soysa, 2006; Heim, 2020). Nazarbayev, despite his resignation, continued to be a determining factor in Kazakh politics behind the scenes as Chairman of the Supreme Council until his ousting in 2022. A move that has regularly been described as from a 'hard' to a 'soft' authoritarian ruler (Blackmon, 2021, p. 183). Moreover, Nur Otan – his political party – remained by far the most dominant party in the Mäjilis, controlling its absolute majority through patrimonialism, headed by Nazarbayev's oldest daughter as Senate President (Blackmon, 2021).

The power and legitimacy of Nazarbayev as *de facto* ruler of Kazakhstan and the institutionalization of his Nur Otan as ruling party, questions whether his successor Tokayev will have sufficient charisma to draw back authority to achieve his goals – and if needed to bypass his predecessor (Blackmon, 2021). Tokayev might face difficulties in changing the Nazarbayev era economic and institutional policies, knowing that the elite still supports his predecessor as economic liberator of the country and that multiple opposition parties are also indirectly linked to Elbasy through (regional) elite (Blackmon, 2021). Maybe stripped of his title, but Nazarbayev's leadership in Kazakhstan is far from over due to the consolidation of power and resources in the past through his clan.

Circumstantially, Kazakhstan's concentrated oligarchy has also showed informality in its decision-making. Due to the sudden switch from socialist to more liberal policies and institutions not geared to this new conception, the government surprisingly has somewhat of an informal character internally (Heim, 2020). Allowing its institutions to be defined *"as informal business rules and laws regulating economic and business behaviour"* (Heim, 2020, p. 4) grants some flexibility to Nazarbayev's centralized and formalized policies in practice.

I.1.2.3 Participation, durability, and dependency

The evolution of a concentrated oligarchy in the 1990s has left Kazakhstan with a weak civil society. A small group of loyal politicians and businessmen around the president run in practice the country from Astana. They largely determine the direction of the nation (Ahrens & Hoen, 2013). This ruling class consists of a combination of politicians from the USSR and newer ones, oligarchs who saw their wealth increase at the beginning of Kazakhstan's independence following

Nazarbayev's liberalization policy (Heim, 2020). In the early years of sovereign Kazakhstan, the number of actors involved in political decision-making grew, after which it stabilized as new reforms were curbed by this (former USSR) elite (Blackmon, 2021). An NGO established in the region personifies the interaction between economic and political actors in this clique through a close friend:

> *"I was celebrating the birthday of a good friend of mine in Kazakhstan. He is the chairman of an advisory body to the minister. It was a jubilee birthday and, really, 400 people were invited to his party. A few pigs and sheep were slaughtered and hundreds bottles of vodka were ordered, just for his birthday party. It cost him a fortune, but it is his way to maintain his network. Deputy ministers, ministers, and representatives – they were all there."*

However, policy is not solely decided by this small group in the capital. Regional actors too have a strong influence on the implementation of economic policies. Even if Nazarbayev wanted to exert his centralized power and policies, he would still find himself dependent on regional influence (Ahrens & Hoen, 2013). To some extent, these lower government levels are responsible for the execution of national economic policies. When reforms are not supported by the regional elite, they might not want to carry them out. Regional leaders of the *oblasts*[16] have often been against economic reforms like the privatization of local SOEs, afraid of losing power over them, and have therefore tried to deter these policies. Regional actors proved to be more loyal to their oblast than to their national leadership, meaning that Nazarbayev's economic policies might not be implemented because these decentral actors were able block them (Auty & De Soysa, 2006).

This constituted a vicious circle that continuously solidified the power of the central government. In order to ensure coherent economic policies across the country and not to lose any revenues, steps were taken to further centralize the execution of economic policies to counteract regional disparities (Auty & De Soysa, 2006). The participation of local actors was confined by Nazarbayev as he legally tasked his central government with facilitating economic growth and liberalization to subdue regional troubles (Blackmon, 2021). Tokayev is not predicted to revert competencies back to the regional level. Not just since Tokayev originally belongs to the clan of Nazarbayev and is a Nur Otan loyalist, but also because he is likely to opt for stability and continuity by consolidating power as his predecessor did (Blackmon, 2021).

I.1.2.4 Resources

Since Kazakhstan did not have any direct access to natural gas, as the case in Uzbekistan, Nazarbayev was forced to progressively implement liberal reforms to attract foreign investment and privatize SOEs (Auty & De Soysa, 2006; Gencer & Gerni, 2012; Boute, 2019). Based on a *'first come, first served'* principle

[16] Administrative level in many post-Soviet countries, an equivalent of region or province constituted by the Russian Empire or USSR (Ahrens & Hoen, 2013).

in issuing property vouchers, several SOEs – among which its kolkhozes (Voronkova et al., 2018) and extractive industry (Heim, 2020) – were privatized and sometimes even ended up with foreign shareholders in order to boost the economic development in Kazakhstan (Auty & De Soysa, 2006; Heim, 2020). Nonetheless, most economic sectors remained to be dominated by SOEs and Kazakh oligarchs due to the weak protection of (intellectual) property rights, which deterred foreign investors (Heim, 2020). The former Soviet elite turned into an economic elite by obtaining a monopolist position over these resources (Auty & De Soysa, 2006). Actively tempering the liberalization aspirations of Nazarbayev reinforced their revenues (Blackmon, 2021). Consequently, Elbasy's clan largely retained power over these rewarding primary products rather than fully privatizing them for public welfare (Auty & De Soysa, 2006). The reliance of the Kazakh on energy revenues increased significantly as this patrimonial network started to exploit the country's commodities to the fullest (Égert & Leonard, 2006). How vulnerable this made the state's economy became evident during the 1998 oil price crisis, displaying some first *'Dutch disease'* effects[17] (Auty & De Soysa, 2006; Égert & Leonard, 2006).

That 1998 oil crisis marked a political and economic turn. On the one hand, the increasing energy yields allowed for some elementary investments in new infrastructure and social welfare, finally countering the aftermath of the perestroika, while on the other hand inflation arose. Astana's intervention was urged to both re-allocate the petroleum revenues through economies of scale and stabilize the national economy (Ahrens & Hoen, 2013; Boute, 2019; Heim, 2020). Excessive oil prices funded the Kazakh treasury well (Égert & Leonard, 2006), clearing the government from seeking additional sources of income and further privatization (Ahrens & Hoen, 2013). Incentives to reform the state fundamentally evaporated as the energy revenues increased and Nazarbayev's aristocracy strengthened its autocracy (Auty & De Soysa, 2006; Blackmon, 2021). Urgency to tackle the Dutch disease effects of the Kazakh economy was echoed during the 2008 financial crisis. Economic reforms were introduced to liberalize and privatize industries to enhance and diversify the Kazakh economy from fossils (Boute, 2019; Blackmon, 2021). Following the footsteps of his predecessor, President Tokayev is expected to follow his path to moderately privatize SOEs over the coming years to foster that transition (Blackmon, 2021).

[17] Dutch disease effects could be defined as *"countries with abundant natural resources and especially with economic structures relying heavily on oil production [...], resulting in boom-bust cycles and sluggish long-term economic growth"* (Égert & Leonard, 2006, p. 86).

Table 9 – Characteristics of the Kazakh context

Characteristics	**Kazakh context**
Conception	USSR conception pragmatically endures
Infrastructure	Outdated infrastructure for extensive wheat production
Goals	Diversifying the economy and consolidating power
Formalization	Concentrated oligarchy
Composition	Fixed with Nazarbayev's clan determining decision-making
Dependency	Limited as power and resources are consolidated
Participation	Minimal participation of regional actors for policy execution
Durability	Former Soviet elite and new oligarchs are participating
Resources	Plenty of natural endowments, getting water from upstream

Reading Table 9, the Kazakh governance in which water transitions are evolving can be summarized to the following characteristics:

- Nazarbayev and his clan have greatly consolidated power and resources;
- USSR conception remained covertly under Soviet era leader Nazarbayev relatively unaffected, and
- Decision-making remained centralized by Astana, yet informality exists due to regional policy implementation and incongruous institutions.

I.2 Kyrgyzstan

As one of the smallest former SSRs in Central Asia, the Kyrgyz Republic has experienced a turbulent development since 1991. Historically, capriciousness seems to characterize the Kyrgyz political *status quo*. Already in the 18th century, Empress Catherine the Great tried to expand the imperial Russian influence across the mountainous country. Under the regime of Tsar Alexander II, the territory was formally occupied and annexed by the Russian Empire in 1876 (Montefiore, 2017). Ever since the USSR's disintegration, regional tensions between the North – symbolized by the republic's capital Bishkek – and the South – having the second largest city in the country, Osh, as its centre – have neutralized institutional stabilization, democratization, and economic growth, making it with Tajikistan one of the least developed former Soviet countries despite its liberalization drive (Gencer & Gerni, 2012; Ahrens & Hoen, 2013). How governance has developed in Kyrgyzstan has been compiled in Table 10.

I.2.1 Path dependency

I.2.1.1 Conception

While in other Central Asian republics conflicts would thwart market economic and institutional reforms, its geographic isolation and the strong focus on trade with other USSR republics, which was stifled in the 1990s by the resurrection of national borders, caused economic decline in Kyrgyzstan (Strayer, 1998; Auty

& De Soysa, 2006). Reinforced by a patrimonial regime, institutional reforms likewise failed to materialize (Ahrens & Hoen, 2013). Notwithstanding that, Kyrgyzstan developed as the most advanced and liberal country in Central Asia when it comes to institutional and economic reforms (Auty & De Soysa, 2006; Gencer & Gerni, 2012; Menga, 2018) regardless of slow glasnost and perestroika reforms in the Kirghiz SSR (Fumagalli, 2016).

Three major revolutions have defined the governance of the Kyrgyz Republic. Firstly, the dissolution of the USSR seemed to pave the way for liberal democracy in this resource-poor country. The year before, Askar Akayevich Akayev (1990-2005) had won Moscow's blessing as President of the Kirghiz SSR in the USSR by supporting Gorbachev in his reforms, unlike other SSR leaders (Merry, 2004; Akchurina, 2021). Having obtained the Kremlin's loyalty earlier, although never being part of Soviet communism, Akayev was uncontestedly named president of an independent Kyrgyzstan in 1991. Akayev was not the only one; after leaving the USSR many party elite received new government positions in the independent nation (Akchurina, 2021). Prolonging the Soviet conception was further encouraged by the continuation of the 1994 constitution of the former Kyrgyz SSR, with which the independent republic would formally rely on the same governance as its predecessor. Some amendments were introduced between 1994 and 2010 to consolidate the president's power. A new constitution would only follow after President Kurmanbek Saliyevich Bakiyev's (2005-2010) removal in 2010, returning some power to the parliament and cabinet, led by the prime minister, conform USSR customs (Fumagalli, 2016).

I.2.1.2 Infrastructure

Economically, the hilly country was hit hard by the collapse of the USSR (Gencer & Gerni, 2012). Resource-poor Kyrgyzstan had a small manufacturing, agricultural and mining industry, which found its markets in Russia or other Central Asian countries (Auty & De Soysa, 2006). Infrastructures designed for these transnational trade flows fell into disrepair after the collapse of the USSR, resulting in significant economic contraction. Most importantly, the financial support that the Kyrgyz Republic received from the USSR disappeared, causing the insular and isolated country to fall into economic decline (Gencer & Gerni, 2012). In response to this shrinking economy, Akayev rapidly liberalized society by privatizing SOEs, and joining international organizations such as the World Trade Organization (WTO) and the International Monetary Fund (IMF) (Gencer & Gerni, 2012; Ahrens & Hoen, 2013). The small agricultural sector seemed to be the only economic pillar that was still standing after 1991. But this sector also shrank following the reintroduction of borders in the region, ergo causing markets to disappear and prices to rise (Spoor, 1999). President Akayev abandoned the Soviet kolkhozes and sovkhozes and started promoting peasant farming. Farmers were increasingly allowed to determine their own production and sales in the hope of reviving Kyrgyz agriculture – and the economy (Spoor, 1999; Kim et al., 2018). Even though agricultural production returned to Soviet

levels in 2000, the country's remoteness would never allow for intensive food production (Bloch, 2002).

Large-scale industrialization was difficult not only because of the lack of USSR infrastructures on which could be build, as in mineral-rich countries, and the lack of a large workforce (Ahrens & Hoen, 2013), but also since Akayev's government in Bishkek was not was equipped with the power and resources to stimulate local economies (Auty & De Soysa, 2006). The great dependence on its neighbouring countries became even more visible when Kyrgyzstan suffered from serious power shortages for a long time due to the downfall of the uniform USSR energy system, until it switched to hydropower (Menga, 2018; Boute, 2019). The most important infrastructure that it inherited from the USSR was a water system to enable cotton and grain production in downstream countries Kazakhstan and Uzbekistan, not constructed for Kyrgyz economic production (Herrfahrdt-Pähle et al., 2006). Again, the limited infrastructure available hampered the economic development of the liberalized but remote country.

I.2.2 Governance

I.2.2.1 Goals

The Kyrgyz Republic was a weak and resource-poor country under the former Soviet yoke and is still considered as one of the least developed former USSR republics (Gencer & Gerni, 2012; Ahrens & Hoen, 2013). The loss of ties with its neighbours after the USSR disunion led to a strong economic downturn in the southeastern country (Gencer & Gerni, 2012; Ahrens & Hoen, 2013). Akayev as first president wanted to restore and stabilize the economy – among which its vital, yet fragile agricultural sector – through liberalization and privatization of SOEs (Auty & De Soysa, 2006) and participation in international organizations (Gencer & Gerni, 2012; Ahrens & Hoen, 2013). The initiative he took to revive the Kyrgyz agriculture and economy would be consistently continued by his successors (Kim et al., 2018), regardless of the nation's political turbulence since 1991 (Akchurina, 2021). Kyrgyzstan aspires to evolve into a modern economy (Gencer & Gern, 2012; Bizikova et al., 2014), but its remoteness has until today primarily held back this transition (Bloch, 2002).

At the same time, Kyrgyzstan is defined and steered by various ethnic minorities. The initially weak position of Akayev provoked democratization and decentralization to favour local elite (Auty & De Soysa, 2006). The state's six presidents since its founding in 1991 have all tried to stabilize the country by mitigating clashes between ethnic minorities or the economic elite. Through redistribution of power, Kyrgyzstan tries to establish intercommunal stability – although these never seem far away (Fumagalli, 2016).

I.2.2.2 Formalization and composition

His election would form the start of Akayev's patrimonial dynasty. Until 1994, the country was basically run as a presidential government as the *Jogorku*

Kenesh[18] – the Kyrgyz national parliament – *de facto* was dodged (Fumagalli, 2016). Although the parliament regained its formal power, it was informally superseded by informal agreements between central and regional authorities (Ahrens & Hoen, 2013; Fumagalli, 2016; Akchurina, 2021). Akayev frequently sought the necessary support from the regional elite governing the Kyrgyzstani oblasts in order to guarantee political stability in the country, considering his own weak central government (Ahrens & Hoen, 2013; Akchurina, 2021). By 1996, Kyrgyzstan undeniably lost track of its path towards liberal democracy. With his patronage network settled in the Jogorku Kenesh, presidential power was increasingly consolidated through constitutional reforms in 1998 and 2003 and political repression (Auty & De Soysa, 2006; Fumagalli, 2016).

After the 2000 elections, Akayev indicated that he would not seek re-election for another term. Nevertheless, the president tried to arrange his succession dynastically by letting his daughter, Bermet Askarevna Akayeva, lead his newly established 'Alga, Kyrgyzstan' party. To the dissatisfaction of the regional elite, fearing to lose significance in the party to the patrimonial clique. After the fraudulent parliamentary elections of 2005, regional leaders showed their actual power. The western district of Aksy arose and mobilized against Akayev's regime, exposing the weakness of the central patronal government. Supported by the opposition, the protests in Aksy evolved into oblast protests that eventually also would reach Bishkek. Losing support of the elite, the *Tulip Revolution* would force Akayev to flee Kyrgyzstan, breaking ground for Prime Minister Bakiyev to serve as the country's second president following a pact between northern and southern leaders (Ahrens & Hoen, 2013; Fumagalli, 2016; Akchurina, 2021).

The *Tulip Revolution* features the second cornerstone in Kyrgyzstan's development. Contradictorily, one that did not foster democratization. Despite his promises of reform towards a liberal democracy, President Bakiyev heavily relied on Akayev's patronage network, neutralizing the call for institutional change. Progressively, the clout of the Jogorku Kenesh eroded by consolidating power as president, eliminating more regime opponents, and strengthening nepotism across the country (Ahrens & Hoen, 2013; Fumagalli, 2016; Menga, 2018; Akchurina, 2021). Between 2008 and 2009, an authoritarian presidency rose due to Bakiyev's crackdown on dissidents and opponents and his tendency towards grounding a dynasty in politics. With a potential dynastic succession by his son, Bakiyev made the same mistake as Akayev and directly threatened the influence of regional and economic elites. The distribution of power between regional and economic elites had yet become unbalanced as informal networks were slowly disintegrated by the Bakiyevs, but another dynasty would permanently sideline them (Ahrens & Hoen, 2013; Fumagalli, 2016; Akchurina, 2021). In January 2010, President Bakiyev tried to enhance his autocracy by narrowing ministerial competences and bypassing the constitution. Again, regional protests occurred in the northwestern city Talas, gradually spreading

[18] *Translated:* Supreme Council.

through the oblast and moving to Bishkek despite harsh repression. Facing Russian sanctions and economic decline, Kyrgyzstani elite abandoned quickly the Bakiyev regime, showing their true power in national decision-making. The Bakiyevs were ousted by April (Ahrens & Hoen, 2013).

An interim government was installed under Roza Isakovna Otunbayeva (2010-2011) after the *Melon Revolution*. Former opposition leader Otunbayeva introduced major reforms as acting president to move the Kyrgyz Republic towards premier-presidentialism. The position of the regions was side-lined to neutralize the patronal system and to enable a power transformation from the president to the prime minister (Ahrens & Hoen, 2013). Although the president was stripped of most of its powers, *inter alia,* the legislative initiative, it did not mean that the power unbalance of Akayev and Bakiyev has been fully reversed. Quite the contrary, the president kept his veto and the right to fill nearly all relevant government positions (Fumagalli, 2016). Regardless of constitutionally diminished powers, President Almazbek Sharshen uluu Atambayev (2011-2017) was still *de facto* the central figure in the country – towering over the prime minister – considering that he retained competence in foreign policy and the Jogorku Kenesh was led by his party (Fumagalli, 2016).

Formally, the 2010 constitutional revision resulted in a more centralized Kyrgyzstan, as local governments were subjected to the prime minister. In reality, because the influence of informal networks was neglected in these reforms, a 'shadow state' emerged in which Akayev's and Bakiyev's allies and informal (regional and economic) networks tried to seize power and allocate economic resources (Ahrens & Hoen, 2013; Fumagalli, 2016; Akchurina, 2021). An NGO in the region backs that claim on the factual influence of the regions:

> *"If you want to get something, you have to go to the oblast. Mainly because of the economic relations that are established at this government level. [...] Those people are often also elected to parliament or have friends there, so a good relationship with them is important. Networking is very important here, informal agreements are shaping policies here."*

Post-2010 governments headed by Presidents Sooronbay Sharip uulu Jeenbekov (2017-2020)[19] and Sadyr Nurgojo uulu Japarov (*since* 2020), largely consisting of prominent politicians from the Akayev and Bakiyev era, were disunited and therefore unable to live up to democratic expectations (Ahrens & Hoen, 2013; Akchurina, 2021). Effectively, a semi-presidential regionalist system maintained in which regional networks and a fragile Kyrgyzstani presidency determine government policies rather than the parliament (Fumagalli, 2016). However, *"they are trying now to get a more grip on the situation, for example, for energy they are well on their way to establishing a one-shop-stop,"* as an NGO describes the attempt by the government in Bishkek to gain more presidential control over the country. Which clans the president involves in his governance partially

[19] Ousted as president after the 2020 election fraud allegations (Akchurina, 2021).

depends on his background and connection with certain networks – e.g., roots and economic associations (Fumagalli, 2016; Akchurina, 2021).

I.2.2.3 Participation, durability, and dependency

The mammoth influence of the regional authorities in Kyrgyz governance was sustained by the 1994 constitutional reform. The new bicameral parliamentary system of the Supreme Council would consist largely of regional officials. In addition, the new elite – i.e., the businessmen who had benefited from Akayev's liberalization and privatization reforms – also would secured a seat in the new parliament (Fumagalli, 2016; Akchurina, 2021). Major power in governance has to be attributed to this regional and economic elite in decision-making under Akayev and Bakiyev noting their regional weight and resources – they turned out to be able to make and break the power of Bishkek (Akchurina, 2021).

To this day, the statehood of Kyrgyzstan remains therefore fragile, as the institutional crises in 1990, 2005, and 2010 clearly reveal. Even after their power has been significantly curbed in the 2010 constitutional reform of Otunbayeva (Fumagalli, 2016). In both the 1990 uproar for independence and the *Tulip* and *Melons Revolutions*, ethnic minorities and the economic elite clashed, causing intercommunal instability and profound regime change nationally. The power of these informal groups has been reduced in the 2010 reforms, which provides fertile ground for further clashes between regional groups to reclaim their past power position (Fumagalli, 2016). Meanwhile, in Bishkek, Japarov still enjoys significant ascendancy over the Jogorku Kenesh and his cabinet. However, he faces a maximum presidential term of six years and his party will never be able to receive an absolute majority in parliament. A maximum number of seats per party in the Jogorku Kenesh discourages the patronage network to seize full power and offers sincere opportunities for further democratization by restoring the regional and electoral balance (Fumagalli, 2016; Akchurina, 2021).

I.2.2.4 Resources

Kyrgyzstan has traditionally been a republic with few natural endowments. The most valuable commodity the Kyrgyzstani have, is water. Yet, it is often of little use to local inhabitants because the water has historically served the interests of lower-lying Kazakhstan and Uzbekistan by continuing USSR agreements and using the by the Soviet for this purpose designed infrastructure (Menga, 2018). The water-rich economy therefore remained small (Auty & De Soysa, 2006), despite liberalization and privatization policies under Akayev (Gencer & Gerni, 2012; Ahrens & Hoen, 2013). *"Oligarchs are disturbing factor here. There are many oligarchs, especially in the districts, but also in the oblasts – regional rich people, not per se in oil as in Russia, but in agriculture and energy which have a strong leading role there,"* an NGO explains.

Genuinely, the only things that could be liberalized were the kolkhozes and sovkhozes. That is what Kyrgyzstan did. It would be the first Central Asian country to recognize private land ownership (Voronkova et al., 2018). Land was returned to former peasants – the start-up of small farms on previous USSR

properties was even zealously encouraged by the Kyrgyz government to meet local food demand (Spoor, 1999; Voronkova et al., 2018). Everyone got a piece of land, even the scientist interviewed, who would never use it:

> *"When the Soviet Union collapsed, land was distributed between the population based on the amount of land and the number of people around. I also have my own piece of arable and irrigated land after the Soviet Union collapse. I do not use it, but I have it."*

The agricultural sector would grow back to its Soviet magnitude in 2000 (Bloch, 2002); the rest of the economy would continue to lag behind due to the country's poor endowments notwithstanding efforts of the government to enhance economic development through levelling resources (Gencer & Gerni, 2012; Ahrens & Hoen, 2013).

Table 10 – Characteristics of the Kyrgyz context

Characteristics	**Kyrgyz context**
Conception	Trying to abandon the USSR conception for a liberal dogma
Infrastructure	Limited infrastructure and designed for downstream interests
Goals	Developing a liberal economy and stabilizing the country
Formalization	Semi-presidential regionalism
Composition	Partially depending on the preferences of the president
Dependency	Medium as power and resources are considerably shared
Participation	Decisive influence of regional actors in governance
Durability	Settled regional elites and new businessmen are interacting
Resources	Few natural endowments, water mostly flowing downstream

For Kyrgyzstan, its governance context since the USSR demise in Table 10 can be recapped with the consecutive features:

- Ethnic minorities and economic elite largely influence national policy-making because of their regional authority and resources;
- Power is less consolidated by the president, although he still dominates national governance *de facto* after centralization in 2010, and
- Despite liberalization, remoteness and absence of good infrastructure continue to confine any economic development.

I.3 Uzbekistan

Uzbekistan is one of the few double landlocked countries across the globe, meaning that not only does the country itself not have any connections to an ocean or sea, but its surrounding countries do neither. Like most parts of

Middle Asia, the territory was conquered by the Russian Empire in the 19th century under Tsar Alexander II (Montefiore, 2017). In 1924, it joined the USSR as an SSR and would become the Soviet centre of Central Asia, administratively, military, and industrially (Auty & De Soysa, 2006). The country would adhere to the USSR conception for a long time after independence (Merry, 2004) by continuing the centralized economy to exploit its endowments in a balanced manner (Blackmon, 2021). The Uzbek context has been briefly characterized in Table 11 along the criteria deduced from Linz (1964).

I.3.1 Path dependency

I.3.1.1 Conception

After the collapse of the USSR, autonomous Uzbekistan would cling under its first President Islam Abduganiyevich Karimov (1990-2016) to the former Soviet conception for a long time (Merry, 2004). As a former Soviet era leader, he chose to maintain its structure of a centralized economy to mine its natural resources. Under Karimov, liberalization was restricted, as he retained a patrimonial vision – in line with Soviet conception – in which the state has the obligation to protect its citizens (Blackmon, 2021). After 1991, with this fortunate source of income, there was little economic incentive for the government of Uzbekistan to neither liberalize and privatize its SOEs nor democratize its institutions to generate new economic activities. The centralist and authoritarian regime of the USSR widely persisted, while reforms were implemented in most other CIS countries (Auty & De Soysa, 2006; Ahrens & Hoen, 2013).

President Karimov's ongoing claims that Uzbekistan was not ready for liberalization were reinforced in 1995. Between 1995 and 1997, gold and cotton prices fell sharply, causing a firm economic downturn. In irrational response, Tashkent postponed fundamental institutional change aimed at liberalization and privatization to stabilize the economy through a drastic return toward neo-Soviet market regulation (Merry, 2004; Auty & De Soysa, 2006; Ahrens & Hoen, 2013). Years after stagnation, liberalization and privatization reforms were formally stalled in 1997 with the implementation of multiple exchange rates, further controlling exports, imports, and domestic production (Blackmon, 2021). Herewith, the Uzbek economy resembled more a traditionally planned than a modern market economy. Uzbek farmers, for example, were still relying on consolidation programmes and regulated production and sales instead of being determined in a market-driven process (Gencer & Gerni, 2012).

Gradual reforms under Karimov have meant that the Uzbek economy has continued to run on energy, cotton, and gold since 1990 (Auty & De Soysa, 2006). Massive liberalization and privatization did not occur as a consequence of the country's commodities, the USSR's planned and centralized economy largely remained (Merry, 2004; Blackmon, 2021). Current President Shavkat Miromonovich Mirziyoyev (*since* 2016) still bumps into this USSR conception in chasing his *New Uzbekistan* reforms, an Uzbek grower notices: *"Mirziyoyev gets stuck in the Soviet structures. That president tries everything but just gets stuck – that is such a shame because then nothing will or can change."* And NGO

elaborates why the reforms do not materialize yet: *"People in this country are looking very protectionist and isolated at things."*

I.3.1.2 Infrastructure

In the USSR, together with Turkmenistan, the country formed the Union's energy backbone. The massive natural gas and oil reserves in the south of the Uzbek SRR and – to a larger extent – Turkmen SSR provided much of the energy and electricity supply within the USSR (Strayer, 1998; Auty & De Soysa, 2006). Facilitated by the remaining Soviet infrastructure after gaining independence, the state has grown into one of the largest gas producers in the world (Auty & De Soysa, 2006; Gencer & Gerni, 2012). Most of the necessary infrastructure for this exploitation had been left behind by the Soviets, making it easy for Karimov to extend energy production in a sovereign republic (Ahrens & Hoen, 2013). In the USSR, Uzbekistan was a net importer of petroleum, which would slowly move to exporting to Kazakhstan, Kyrgyzstan, Russia, and Tajikistan (Auty & De Soysa, 2006; Boute, 2019) – craving a conversion of the domestic-oriented USSR energy infrastructure into an export-fit one. When it thus comes to energy infrastructure, the Uzbeks have reversed the *status quo* by expanding rooted energy works gained from the USSR (Boute, 2019).

Not only did the USSR leave behind energy infrastructure, much of Central Asia's water infrastructure has historically been serving Uzbekistan. Water infrastructure in the region has been designed in the Soviet era to foster extensive cotton production at kolkhozes and sovkhozes (Jalilov et al., 2013; Menga, 2018; Hamidov et al., 2020). All infrastructure had been adjusted to in the USSR to facilitate this monoculture, making it difficult to switch to new economies (Bloch, 2002; Kim et al., 2018). Encouraged by the Soviet irrigation infrastructure, the government sticked to cotton by lingering the kolkhozes, commodity quotas, and moving land to mahallahs (Bloch, 2002; Lerman, 2009; Hamidov et al., 2020). Economic development would be fuelled by scaling up energy, cotton, and mining production via USSR infrastructure rather than by introducing economic reforms (Auty & De Soysa, 2006; Ahrens & Hoen, 2013).

I.3.2 Governance

I.3.2.1 Goals

President Karimov strictly adhered to a patrimonial vision as in the USSR and believed that the state had the duty to take care of its citizens (Merry, 2004; Blackmon, 2021). Liberalization of property and democratization of governance did not fit in that picture – vital industries had to be protected from foreign influences in order to best serve the Uzbeks and centralized power would help to protect these critical sectors and national security (Auty & De Soysa, 2006; Ruiz-Ramas & Hernández, 2021). Karimov prolonged the Soviet's authoritarian regime (Ahrens & Hoen, 2013).

The sudden death of Karimov in 2016 left Uzbekistan with a succession issue. The late president had not appointed his heir and would ultimately find Prime Minister Mirziyoyev as his replacement. It is still too early to draw any

conclusions on Mirziyoyev's legacy, but the new president proposed his *New Uzbekistan* reform agenda in 2017. The premise of the agenda is forming a stronger administration and rule of law to support democratic reforms, in which the parliament is retrieving more power. NGOs see the administration of the country changing after the death of its former president:

> *"Uzbekistan is modernizing considerably by streamlining the entire administration. Where about three to four years ago, I was setting up a carbon sequestration project, I had to deal with four to five ministries [...] That is now changing here as well. [...] Because now, you have to deal with the Ministry of Agriculture, the Ministry of Water, oblasts, districts, and economic actors – it is never really clear who you need."*

Mirziyoyev also suggested to modernizing key economic sectors like agriculture and infrastructure through liberalization. Targeting economic growth, the central government has implemented various liberalization measures through removing capital restrictions, tax reforms, trade-free zones, and moderately allowing imports and exports by privatizing SOEs (Ruiz-Ramas & Hernández, 2021). Abandoning isolationism, economic reforms are aimed at globalization and strengthening of the Uzbek economy in the Central Asian region (Anceschi, 2019). Reviving the greenhouse horticulture sector is only a part of this (Umarov et al., 2019). Despite economic reforms, the authoritarian regime has in reality not much altered under Mirziyoyev (Anceschi, 2019; Blackmon, 2021; Ruiz-Ramas & Hernández, 2021).

I.3.2.2 Formalization and composition

Meanwhile, the Uzbek regime classifies as the second-highest authoritarian and corrupt post-Soviet republic in Central Asia, after Turkmenistan (Ahrens & Hoen, 2013; Blackmon, 2021; Ruiz-Ramas & Hernández, 2021). A country of paradoxes, Uzbekistan, on the one hand, is ruled by a strong central authority in Tashkent, while on the other hand, due to the state's marginal infrastructure, regional elites have gained more power, locally challenging Karimov's regime. Yet, none of them proved capable of overthrowing the system (Ruiz-Ramas & Hernández, 2021).

Following the USSR demise, Karimov consolidated all decision-making power around his presidency. Pivotal economic sectors and security affairs were directly placed under his leadership. While brutally supressing all (Islamist-oriented) opposition, the position of the president started to tend towards all mighty (Ruiz-Ramas & Hernández, 2021). *"The president is very influential. The president can, for example, determine by decree how much and what should be exported,"* a foreign official underlines. In fact, the CPSU retained its power under Karimov, albeit under a new name and formally abandoning the socialist conception (Ruiz-Ramas & Hernández, 2021). The 1992 constitution reform made the president *de jure* 'supreme leader' of Uzbekistan. Nevertheless, the *Oliy Majlis*, the parliament, still had some exclusive powers, both regionally

and centrally. When the unicameral parliament in 1999 became dominated by the *hokims*, the regional or local governors, Karimov established a bicameral parliament to curb regional influence and stabilize his own power. Since 2008, the Legislative Chamber – parliament's lower house – would consist of elected deputies, of which pro-Karimov parties would carry basically all seats because opposition was excluded from participation. The Senate consisted of regional representatives and presidential nominees, ensuring Karimov regional loyalty (Ahrens & Hoen, 2013; Blackmon, 2021; Ruiz-Ramas & Hernández, 2021). The true political and economic influence of the Oliy Majlis was limited, most informal networks would be concentrated directly around President Karimov himself (Ruiz-Ramas & Hernández, 2021).

The reformist agenda Mirziyoyev has, *inter alia,* by Ruiz-Ramas and Hernández (2021) been called to be more a modernization of the authoritarian regime rather than actual liberalization. Originally not being part of Karimov's clan and moving against other elites, he tried to consolidate power through economic reforms.

I.3.2.3 Participation, dependency, and durability

The role of the regions was certainly not diminished in the Karimov era. Conversely, due to the inability of the weak government structures to carry out central decisions regionally, Karimov allowed informal decentralization.[20] Through informal agreements with regional elites, he created and expanded his own patronage network. In exchange for loyalty to his economic and political leadership, regional elites and clans were granted some autonomy (Ahrens & Hoen, 2013; Ruiz-Ramas & Hernández, 2021). Despite frantic efforts to counter regionalization and the power of regional elites, clans increasingly seized influence in the political sphere. Where in the past traditional tribal clans were decisive, this shifted to economic and political clans shaped by personal and professional connections. Different clans coexist, all fighting for limited resources and power, while collaborating in varying coalitions (Ahrens & Hoen, 2013; Ruiz-Ramas & Hernández, 2021). Uzbekistan is mostly governed by informal networks. The Karimov family developed into the most important informal network in the country. Developing into an oligarch, Karimov's clan accumulated several domestic monopolies, such as telecommunications and mining, and held through relationships also close ties with other economic sectors (Blackmon, 2021; Ruiz-Ramas & Hernández, 2021). Until his death in 2016, President Karimov manoeuvred between central authority and informal networks to enhance his power and wealth by neutralizing opposition, slowly taking over regional competences, and expanding his patronage network across institutions and industries (Blackmon, 2021).

[20] Within Uzbekistan, only the Autonomous Republic of Karakalpakstan possesses formally decentralized powers. As a sovereign republic within Uzbek territory, it can veto decisions of the central government and has the right to secession, decided by an internal referendum. In practice, Tashkent bears great influence on the autonomy republic due to the limited financial resources and small population (Ruiz-Ramas & Hernandéz, 2021).

The influence of regional elite was not purely economic, their resources also resulted in political power in Tashkent. Karimov initially consolidated his power through informal agreements with tribal clans – like the hokims elected to the Oliy Majlis – expanding this cooperation later to economic clans (Ahrens & Hoen, 2013; Blackmon, 2021; Ruiz-Ramas & Hernández, 2021). Uzbekistan is a tangle of informal networks, all striving for power and resources and working together to achieve this in multiple coalitions. By neutralizing opposition and manoeuvring between different informal networks, Karimov centralized power that Mirziyoyev now builds on. The latter has chosen to continue this path by personalizing his leadership and associating various clans to him (Anceschi, 2019; Ruiz-Ramas & Hernández, 2021).

Mirziyoyev also acknowledged the power of these networks. Hence, he has travelled across the country to promote his apparent reformist agenda and to associate regional clans with him (Anceschi, 2019; Ruiz-Ramas & Hernández, 2021). The president tried to popularize his policies and personalize his regime, something his predecessor had never done because of his reliance on informal agreements with clans to secure his power in Tashkent (Anceschi, 2019). Even with a new president, Karimov's paternalistic institutions persist to highly steer political decision-making (Blackmon, 2021) with some new elite groups of (foreign) oligarchs being added as informal networks to the governance (Anceschi, 2019). Karimov's paternalistic authoritarian regime thus survived its founder by Mirziyoyev modernizing it through minor economic reforms, marginalizing the ruling (local) elite and other opposition, and personalizing Uzbek leadership (Ruiz-Ramas & Hernández, 2021).

I.3.2.4 Resources

The economic development of Uzbekistan appears like a paradox. It is therefore often described as the *Uzbek paradox* or *Uzbek puzzle* (Auty & De Soysa, 2006; Ahrens & Hoen, 2013). However, this paradox is easy to explain. The country retains important commodities such as petroleum, cotton, and gold. Using these natural endowments in the mid-1990s led to economic growth, deemed to evolve into the most prosperous republic in Middle Asia after independence (Auty & De Soysa, 2006; Blackmon, 2021). Experiencing this sprouting wealth, Karimov was never forced to pursue fair liberalization and privatization policies to redistribute resources and power, strictly controlling the national economy (Gencer & Gerni, 2012; Blackmon, 2021).

Not only Karimov's vision advanced gradualism. The yields from energy, cotton, and gold production increased substantially during its first years of independence and ensured balanced state revenues. Cotton production is in the modern Uzbek economy mostly helping regional elites to maintain their privileged socioeconomic and political position locally, its added value itself decreased over time (Menga, 2018). As a resource-rich country, Uzbekistan was accordingly not forced to jump to the liberal global market to generate income. In contrast, to control main industries and prevent privatization, the Uzbek government introduced fierce protection measures such as tariff barriers and

import substitution measures in 1996. Domestic producers were protected at the expense of international trade (Auty & De Soysa, 2006; Ahrens & Hoen, 2013). In the 1990s, considering its petroleum wealth, Uzbekistan had the best regional outlook on economic growth. However, the centralized economy and ongoing state monopolies would disincentivize entrepreneurship and (foreign) investment (Merry, 2004). After a couple of years, neighbour Kazakhstan would overtake the country in liberalization, having followed initially much the same pace of reform (Gencer & Gerni, 2012; Blackmon, 2021).

A shadow economy emerged, just like in Kyrgyzstan (*see:* Section I.2). Companies were unwilling to trade their products through official channels due to the strict state control and high exchange rates. The black market grew strongly and export revenues fell significantly. Detrimentally, this stimulated the government to enforce additional (non-)tariff barriers and limitations on the privatization of SOEs (Ahrens & Hoen, 2013). Acknowledging the economic downturn, the government started to show some policy flexibility since 2000. Karimov loosened foreign exchange controls and signalled the bureaucratic space essential for small and medium-sized enterprises (SMEs) to develop. It would last until 2005 before the president really started economic liberalization and support for SMEs (Auty & De Soysa, 2006; Ahrens & Hoen, 2013). However, the country's isolation also had an advantage. The financial crisis of 2008 and 2012 did not affect Uzbekistan that severely because of persistent economic isolation. Its limited integration in the global financial market had Uzbekistan relatively poorly affected by the global economic downturn as its (petroleum) exports continued to grow during the crises (Gencer & Gerni, 2012).

Table 11 – Characteristics of the Uzbek context

Characteristics	**Kyrgyz context**
Conception	Authoritarian and planned economy USSR conception lasted
Infrastructure	Plenty of USSR infrastructure allowing for energy production and regional water works adjusted to Uzbek cotton demands
Goals	Abandoning isolation while protecting its citizens
Formalization	Modern authoritarianism
Composition	Rather fixed with a ruling web composed by the president
Dependency	Medium as power and resources are somewhat shared
Participation	Decisive influence of informal networks in governance
Durability	Former Soviet elite and new businessmen are participating
Resources	Rich of natural endowments and foreign water supplies

Based on the aforementioned, Uzbekistan's governance could be summarized by referring to the following elements:

- Gradual reforms under Karimov has prolonged the Soviet's planned and centralized economy to a large extent;
- Power has been consolidated through informal agreements with tribal, regional, and economic informal networks, and
- Karimov's paternalistic institutions endure to highly determine Uzbek governance.

Appendix II – Cases

Hand in hand with energy, water will determine the future of Central Asia. Its geographical location and natural and climatic conditions make water a critical resource for livelihood in the region (Kim et al., 2018; Zhiltsov et al., 2018) – both in quantity and quality (Stucki et al., 2014). Nonetheless, this study defines water scarcity mainly in terms of quantity. Food production nor other economic activities are possible without sufficient water supplies. In terms of quantities, Central Asia has abundant water resources, stress over it should not be needed (Stucki et al., 2014). While Kyrgyzstan and Tajikistan form a water hydrocracy as water supplier, Uzbekistan holds the regional hydro-hegemony as major water consumer because of its water-intensive cotton plantation (Menga, 2018), resembling the water imbalance in the region.

Remarkably, it have been water-rich Kyrgyzstan and Tajikistan that were confronted with severe deficiencies in winter – not sparse Kazakhstan, Turkmenistan, or Uzbekistan downstream (Jalilov et al., 2013). Continuation of agreements once commissioned by Moscow in the Soviet era – designed for large-scale cotton production downstream, not considering any hydroenergy generation upstream (Boute, 2019) – results today into fierce discussions about the allocation of the water resources among up and downstream countries (Jalilov et al., 2013; Menga, 2018). Furthermore, these water commodities are exploited inefficiently due to old agreements and outdated infrastructure, not tailored to sustainable water management in the area (Rahaman & Varis, 2008; Menga, 2018). This chapter examines how water has been governed in this watery region and how the current governance structure has been shaped by previous political and technological decisions – path dependency.
Section II.1 will first deliberate on the transnational governance of the Amu Darya and Syr Darya river delta. The local water governance of these rivers in Kazakhstan, Kyrgyzstan, and Uzbekistan is then discussed in Sections II.2 to II.4. Data has been collected through literature review and interviews for this analysis. How the governance of water has evolved in Central Asia across countries has been visualized in a timeline in Figure 5.

II.1 Transnational governance

Landlocked Central Asia is distinguished by immense inland deserts, mountain ranges, and no connection to any sea or ocean. Water is scarce in parts of the region. Not everywhere. Most water in the region originates from glaciers in the mountains of Kyrgyzstan and Tajikistan (Jalilov et al., 2013; Zhiltsov et al., 2018). The water flows from this mountain range via the Amu Darya and Syr Darya through Tajikistan, Turkmenistan, and Uzbekistan and Kyrgyzstan, Tajikistan, Uzbekistan, and Kazakhstan respectively to the Aral Sea, Figure 2 illustrates (Abdullaev & Rakhmatullaev, 2016; Zhiltsov et al., 2018; Kulenbekov & Asanov, 2021). Together, these waterways are the main source of water for Central Asia.

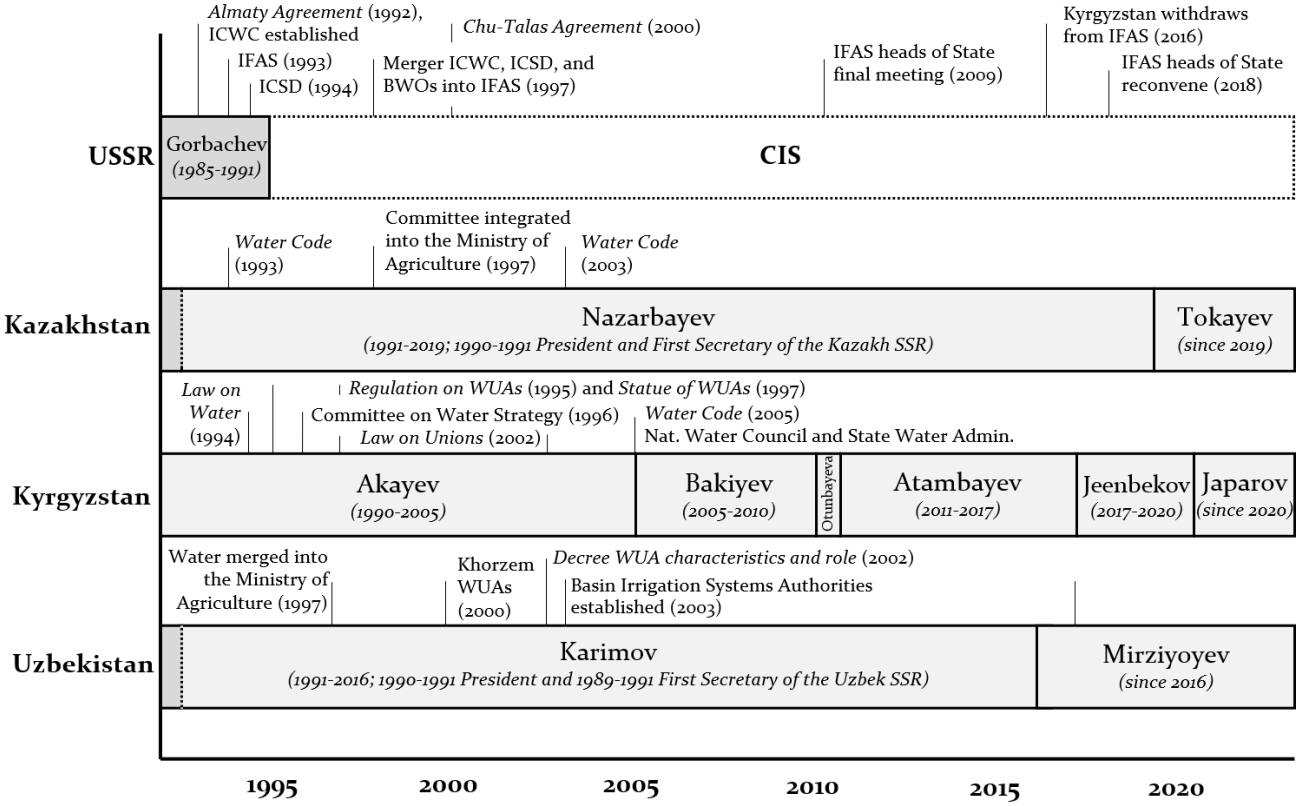

Figure 5 – Timeline of water governance development in Central Asia (author, 2024)

Downstream countries heavily count on these transboundary rivers for their water supply, as the prime river basins are located upstream beyond their national borders.[21] In fact, more than 80 per cent of their freshwater supply is controlled by Kyrgyzstan and Tajikistan (Stucki et al., 2014; Zhiltsov et al., 2018). For Uzbekistan, this is even 90 per cent, foreign officials stress. The rest of their water flows stems from Russia (*inter alia,* the Tobol and Ural rivers), China (among others, the Irtysh, Ili, and Toshkan), or Afghanistan (the Amu Darya river) (Rahaman & Varis, 2008), which are beyond the scope of this research. Apart from rivers, the Aral Sea, Caspian Sea, and Lake Balkhash play a prominent role in supplying Kazakhstan, Turkmenistan, and Uzbekistan with water. Since the Aral Sea is fed by the Amu Darya and Syr Darya, the Caspian Sea predominantly by the Russian Volga, and Lake Balkhash by a desertifying Ili, the low-lying countries in Central Asia are even more dependent on their neighbours for their water supply than might be thought (Zhiltsov et al., 2018; Kulenbekov & Asanov, 2021). Kyrgyzstan and Tajikistan have often criticized the distribution of water resources in Central Asia, pointing out that these mainly serve downstream countries to their own detriment (Jalilov et al., 2013). For a better understanding of this dispute, the path dependency of water governance

[21] Kyrgyzstan and Tajikistan are virtually self-sufficient in their water use, while Kazakhstan for 31 per cent of its water supplies is relying on transboundary water flows and Turkmenistan and Uzbekistan even for 97 and 77 per cent respectively (Stucki et al., 2014).

in this region is reviewed in paragraph II.1.1. Next, paragraph II.1.2 dives into the current governance of this commodity. In Table 12, the transboundary water governance in Middle Asia has been condensed.

II.1.1 Path dependency

II.1.1.1 Conception

Early on in Tsarist Russia, it was decided that Central Asia – more accurately, Uzbekistan – would form the heart of the Empire's cotton and grain production (Rahaman & Varis, 2008). The Amu Darya and Syr Darya were tapped to sustain agricultural development through canalization and irrigation of river valleys and oases downstream. Water use was first centralized by Saint Petersburg in the 19th century to expand the amount of irrigated land in Kazakhstan and Uzbekistan. The Romanovs turned Turkestan into the main cotton and grain producing area of the Russian Empire (Menga, 2018; Zhiltsov et al., 2018).

This policy was continued and magnified by the USSR. In the 1920s, the Soviet's Politburo demanded[22] to increase cotton production in Turkestan by further expanding the amount of irrigated land through enlarging the number of drainage facilities. The USSR Ministry of Land Reclamation and Water Management *(Minvodkhoz)* coordinated and determined the allocations of transboundary waters in its single planned economy, not the SSRs themselves. True to their conception, under USSR law, all water was owned by the state (*'res communis'*) and distributed through a restricted demand principle – the end of water as *'res nullius'* in Imperial Russia (Stucki et al., 2014; Menga, 2018). Private ownership of water was not allowed. Fixed quotas were therefore assigned by Moscow's State Planning Committee *(Gosplan)* to the SSRs, which they had to designate to oblasts, rayons (districts), and even kolkhozes and sovkhozes to realize the central economy's objectives of the USSR (Zhiltsov et al., 2018).

At local level, the competences of water governance bodies overlapped without clear responsibilities, giving Minvodkhoz *de facto* a monopoly on water governance (Zinzani, 2015c; Menga, 2018; Zhiltsov et al., 2018). Located far away in Moscow, Minvodkhoz was at the helm of resolving water distribution in Central Asia. Notwithstanding the top-down governance of this commodity formally, that distance made monitoring the implementation of water policies difficult. Meaning, in practice, there would still be some room for informal arrangements at grass-root level on the exact water allocation in the region. Powerful actors in oblasts and rayons or at kolkhozes and sovkhozes identified an opportunity to make a couple of minimal informal adjustments to secure their own water interests – constituting a patrimonial network around local water governance, mostly targeted at increasing cotton cultivation in Uzbekistan or wheat in Kazakhstan (Sehring, 2020). Since no one was actually responsible for water security – its control was poorly organized and water consumption was not charged – the system operated very inefficiently, leading to more water intake downstream than projected by Gosplan (Cruz-del Rosario,

[22] The 1918 Decree on Organization of Irrigation Works in Turkestan.

2009; Kulenbekov & Asanov, 2021). This enduring mismanagement led to stern environmental degradation of rivers, basins, and other natural endowments in Central Asia (Stucki et al., 2014).

As the Aral Sea was shrinking and a socioeconomic and environmental disaster was emerging, the Soviet regime instituted in 1986 two basin water organizations (BWOs) to mitigate the competing water claims on the Amu Darya and Syr Darya between up and downstream countries. A uniform water-energy system was established. In exchange for storing water during winter on Kyrgyz and Tajikistani territory to be gradually released in spring and summer, Kazakhstan, Turkmenistan, and Uzbekistan would provide these countries in return with coal and gas for electricity generation through the unified Soviet energy system: a benefit sharing scheme was established (Menga, 2018; Zhiltsov et al., 2018). The BWOs, based in Uzbekistan, in reality, adhered to existing diversion of Central Asian waters for cotton production, while the downstream countries procrastinated to compensate for the energy deficiencies upstream (Zhiltsov et al., 2018; Kulenbekov & Asanov, 2021). In other words, Kyrgyzstan and Tajikistan found themselves storing water in winter to water agriculture downstream in summer, as agreed, but received no or minimal energy in return, leading to energy shortages in the cold winters in those countries. A conflict-prone situation, contained by the USSR for the time of its existence, which now escalated without (Stucki et al., 2014; Menga, 2018). How the collapse of the USSR still resonates in water governance and why this precisely might lead to conflicts, is perfectly described by a representative of an NGO in the region:

> *"The question is: who is in charge of these water reservoirs – and thus determines who is getting the water? There have been fights in the border area, cameras were hung, until things calmed down a bit on both sides of the border. You have to stay away from those enclaves because of political uncertainty. Most of those enclaves in Kyrgyzstan are in practice Uzbek and thus basically governed by the Uzbek government. Therewith, the Uzbek government also largely controls the water that flows through these enclaves, albeit beyond their official borders. If they start extracting too much water, you will immediately get complaints from the Kyrgyz people that are formally there and then in response the Kyrgyz might be attacked by the Uzbeks, who are formally based in Uzbekistan."*

Dissolution certainly did not mean disconnection in Central Asia. The newly independent republics stayed connected through the uniform water-energy system commenced by the USSR (Zhiltsov et al., 2018). For downstream countries, it was indispensable to revive the extant system to safeguard their fragile agricultural backbone. Contrariwise, upstream countries saw a unique opportunity to finally ameliorate the unfair USSR water allocation quotas and to boost their hydropower generation, tearing the Soviet *status quo*. According to Kyrgyzstan and Tajikistan, water is a commodity whose use should be paid for by downstream countries (Stucki et al., 2014). Legally speaking, upstream

Middle Asia pleaded for water distribution based on the principle of *'equitable and reasonable utilization'* justifying a higher consumption themselves, while downstream countries advocated to protect existing water allocations because of environmental conservation, referring to the *'no harm'* principle[23] (Stucki et al., 2014). Even after gaining independence, Kyrgyzstan and Tajikistan would continue to find themselves on the losing end of changing the water allocations and remain experiencing energy shortages. Moscow's arrangements serving the extensive cotton tillage downstream survived its dissolution, barely facilitating hydroenergy production upstream (Jalilov et al., 2013; Menga, 2018; Boute, 2019).

II.1.1.2 Infrastructure

The water infrastructure in Central Asia has historically largely been revolved around irrigation of agricultural lands in the Amu Darya and Syr Darya basins. The development of artificial irrigation via canals has a long history and dates way back to before the Tsar Empire (Zhiltsov et al., 2018). In the second half of the 19th century, under the reign of Tsar Nicholas I, canalization took refuge in the region. In 1872, the first *Kaufmansky Canal* would be dug, tapping its water 80 kilometres back from the Syr Darya for cotton production (Zhiltsov et al., 2018). In the following century, more canals originating from the Amu Darya or Syr Darya would be steadily dug to stimulate cotton and wheat production in Kazakhstan and Uzbekistan, until the USSR would take over the country and rapidly scaled up irrigation and drainage facilities (Zhiltsov et al., 2018).

In the 1990-1930s, multiple irrigation systems, dams, and canals were built in Uzbekistan to better tailor water management to the needs of cotton cultivation. Canals were also dug in Kazakhstan and more irrigation works were constructed, this time suited for wheat production (Menga, 2018; Zhiltsov et al., 2018). Meanwhile, canals, reservoirs and irrigation systems emerged as well in Turkmenistan and Tajikistan to further scale up USSR food production in Central Asia. Various policies were adopted at CPSU congresses in the 1960s and 1970s to further develop irrigation and drainage in the Amu Darya and Syr Darya river basins to improve soil fertility and surge crop yields (Menga, 2018; Zhiltsov et al., 2018). Approximately 75 per cent of all irrigation water would come from the Amy Darya and Syr Darya rivers, in total, 90 per cent of the regional water flows were being used for agriculture (Stucki et al., 2014), as also stressed by interviewees. A vast infrastructure was created that led water from the Amu Darya and Syr Darya via first larger, then smaller canals, followed by even smaller canals to the kolkhozes and sovkhozes (Zhiltsov et al., 2018).

At the same time, the USSR's extensive water infrastructure in Central Asia was associated with great inefficiency. Their earth beds caused a lot of water to leak from these systems, interviewees add. Additionally, saltwater and

[23] The environmental pressure downstream was predicted to be higher than upstream by cause of intensive cultivation associated with fertilizer and plant protection product use, increasing salinization caused by water drainage, and other industrial emissions to water and air, which would potentially harm the local environment (Stucki et al., 2014).

groundwater could enter the infrastructure, deteriorating water quality. Due to a lack of financial resources, many water infrastructures connected to the Amu Darya and Syr Darya would be constructed with a low efficiency and quality (Zhiltsov et al., 2018). Well into the 1980s, this ineffective water infrastructure would expand around the Amu Darya and Syr Darya to eventually cover a total of 7.4 million hectare of irrigated agricultural area (Zhiltsov et al., 2018). When the Soviets experienced that water levels were dropping rapidly in the 1960s – most notably, in the Aral Sea – and that they could serve less acreage with water, the USSR opted for technological innovations. However, this could not prevent the major water losses in the inefficient irrigation infrastructure that had been constructed decades earlier (Stucki et al., 2014; Zhiltsov et al., 2018).

The increasing water intakes from the Amu Darya and Syr Darya for irrigated farming, peaking during the 1950-1980s, led to large water shortages, and, famously, the falling Areal Sea basin (Rahaman & Varis, 2008). The water demand did not only culminate in the 1980s due to the growth of agricultural production. The construction of hydropower facilities had its effect too on the water flows of the Amu Darya and Syr Darya. In its final period, the USSR started to construct hydropower infrastructures in Kyrgyzstan and Tajikistan to generate electricity for the citizens of those SSRs (Boute, 2019). Simultaneously, the water reservoirs of these hydropower installations contributed to a better control of the water flow in the irrigation works downstream (Stucki et al., 2014; Zhiltsov et al., 2018). Six of these dual waterworks would be introduced along the Syr Darya; the Amu Darya river would even be granted more than 35 of such inefficient water reservoirs to enable irrigation and hydropower (Stucki et al., 2014). The water level in the Syr Darya would become regulated on the basis of the Naryn-Syrdarya cascade of water reservoirs. By gradually releasing water from the various reservoirs, the land in Kazakhstan and Uzbekistan could be irrigated in the summer smoothly. The *Toktogul Dam*, located in Kyrgyzstan, used to be the largest reservoir in the Naryn-Syrdarya cascade and was ordered to release 75 per cent of all its water in summer (Siegfried & Bernauer, 2007; Zhiltsov et al., 2018). Figure 6 shows the cascade of infrastructures in the Syr Darya that is still being present and widely operated in upstream Kyrgyzstan.

Figure 6 – Infrastructure of the Naryn-Syrdarya cascade (Siegfried & Bernauer, 2007)

Basically, all freshwater supplies in Central Asia have been redirected by its infrastructures to foster cotton growing, instead of generating electricity for energy-poor upstream Kyrgyzstan and Tajikistan (Stucki et al., 2014; Menga, 2018; Zhiltsov et al., 2018; Kulenbekov & Asanov, 2021). Regardless of a few hydropower installations being installed upstream in the Amu Darya and Syr Darya (Boute, 2019), the water allocations of the USSR remain to favour today the irrigation of Kazakh, Turkmen, and Uzbek agricultural land over the Kyrgyz and Tajiki generating some hydroelectricity (Menga, 2018; Zhiltsov et al., 2018).

The inefficient system has lost efficiency over time following its aging. Because of unclear ownership of the transboundary infrastructures and the high operational and maintenance costs of this extensive network, the water infrastructure in Central Asia, adapted to the region's agricultural needs, has fallen further into disrepair (Stucki et al., 2014). The collapse of the USSR has had negative effects on the maintenance of the infrastructure (Rahaman & Varis, 2008; Zhiltsov et al., 2018). There are even stunning examples where the infrastructure owned by Uzbekistan is nowadays located in Kyrgyz territory due to the introduction of borders in Central Asia, hindering maintenance (Stucki et al., 2014) according to foreign officials as well. Today, much of the population around the Amu Darya, Syr Darya, Ili, and Aral Sea basins lives in water scarcity thanks to their overexploitation in the USSR, ramping up to 80 per cent of the total populace in Central Asia lacking access to water because of this historic redistribution of water in the area (Stucki et al., 2014).

II.1.2 Governance

II.1.2.1 Goals

Regulating water resources has been high on the political agenda in post-Soviet Central Asia. The *Almaty Agreement,*[24] concluded by all five republics, explicitly recognized the need of joint governance of transboundary water resources with the reintroduction of borders, particularly of the Amu Darya and Syr Darya. Under the Almaty Agreement, the countries would established the Interstate Commission for Water Cooperation (ICWC) to enforce supervision and control on transboundary water management of the Amu Darya and Syr Darya. Above all, the pact turned out to persevere the Soviet era water allocation in the region, benefiting downstream countries over Kyrgyzstan and Tajikistan (Rahaman & Varis, 2008; Cruz-del Rosario, 2009; Bizikova et al., 2014; Zhiltsov et al., 2018). Although the formal goal of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan with the ICWC was to distribute water allocation more fairly and to better control the water flows, in practice it turned out that Kazakhstan, Turkmenistan, and Uzbekistan mainly tried to maintain the water allocation *status quo* after the collapse of the USSR to ensure water supply for their cotton and grain cultivation (Jalilov et al., 2013; Bizikova et al., 2014; Menga, 2018). *"We are understanding that saving [the Aral Sea] was just a sentence,"* an academic concludes. In the meantime, Kyrgyzstan and Tajikistan tried to change water distribution via the ICWC so they could apply more hydroenergy production in their countries, but that would mean less spring and summer irrigation water for downstream (Jalilov et al., 2013; Menga, 2018). The joint goals of the ICWC would therefore be overshadowed by the prevailing individual goals of the countries. A foreign official summarizes it as follows: *"Everything in this region is about cotton and wheat, in the whole region, still you could say, but especially in Uzbekistan and Turkmenistan."* An NGO elaborates:

Meanwhile, international donors like the World Bank, United Nations (UN), and Asian Development Bank also tried to achieve certain goals through financing integrated water resources management (IWRM) practices in the region (Herrfahrdt-Pähle et al., 2006; Sehring, 2009; Zinzani, 2015c; Menga, 2018). A representative explains that their activities in Central Asia as they want to *"improving employment, climate adaptation, and efficient water use"* in the regio and support national governments in realizing those ambitions.

II.1.2.2 Formalization and composition

The ICWC was formally tasked to assure that upstream countries would store water in the two rivers and release it adequately to allow agricultural land laying downstream to be irrigated. Factually, the two existing BWOs of the USSR would become executive bodies of the ICWC (Stucki et al., 2014; Menga, 2018). The ICWC proved to be a weak institution. In spite of its statues, Stucki et al. (2014) argue that it was a powerless organization knowing that the water quotas

[24] The 1992 Agreement between the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Uzbekistan, the Republic of Tajikistan, and Turkmenistan on Cooperation in Joint Management of Use and Protection of Water Resources of Interstate Sources.

applied in practice in the Amu Darya and Syr Darya never had been approved by the organization. The weakness of the ICWC was further exposed by Stucki et al. (2014), who demonstrate that the BWOs practically had no control over the Amu Darya and Syr Darya at all, inconsistent with its governance mandate under the Almaty Agreement and ICWC Statute. The past USSR institutions remained ill-organized and would in reality not constitute an Interstate control mechanism on water intake, despite its treaty. Rather than a new executive and operational body governing the Amu Darya and Syr Darya cross-border, the BWOs would stick to its former Soviet planning function (Stucki et al., 2014; Menga, 2018). This merger of various USSR and post-Soviet organizations ensured that the ICWC became very bureaucratic. It was primarily concerned with delegating decision-making powers to the appropriate underlying bodies nationally or regionally instead of deciding on water allocation itself through involving all affiliated nations and relevant actors (Stucki et al., 2014). Not only did the lack of involvement of actors in the decision-making prove to be a problem – with the most glaring actor missing being Afghanistan, controlling 10 per cent of the Amu Darya (Rahaman & Varis, 2008; Stucki et al., 2014) – but the principal issue was the lack of an effective dispute resolution mechanism (Menga, 2018). If actors disagreed about the water distribution, there appeared to be no mechanism to resolve this conflict. The ICWC lost is effectiveness as it was not entitled to take decisions and would reflect the unequal USSR water balance after gaining autonomy (Menga, 2018; Zhiltsov et al., 2018).

A similar fate befell the subsequent International Fund for Saving the Aral Sea (IFAS).[25] Initially, the institute was established by all five Central Asian republics in 1993 to attract international funds to restoring the environment in the basin and to managing these financial resources retrieved. The mandate of IFAS was extended over time to the coordination and management of water and other environmental issues in the transboundary Aral Sea basin (Menga, 2018; Zhiltsov et al., 2018). In conduct, built on the remnants of the USSR's water governance, IFAS would conserve the regional water imbalance favouring the irrigation of land over energy generation and environmental conservation in the Aral Sea basin. Budget and authority lacked (Zhiltsov et al., 2018). The 1994 Interstate Commission for Sustainable Development (ICSD)[26] would neither be able to shift the attention in the Aral Sea basin to environmental conservation. Notwithstanding its ambitions to restore the regional habitat and contribute to settling water allocation disputes in the Amu Darya and Syr Darya, it would mature as a consultative body without any power and finances (Zhiltsov et al., 2018; Sehring, 2020). The post-Soviet international bodies ICWC, IFAS, ICSD, and the BWOs would function inadequately as they still adhered to the USSR conception on water governance and did not collide with the national interests of riparian countries (Cruz-del Rosario, 2009).

[25] The 1993 Decision on Founding the International Fund for Saving the Aral Sea.
[26] The 1993 Agreement on Joint Action to Address the Problem of the Aral Sea and Surrounding Areas, Environmental Improvement, and Ensuring Socio-Economic Development of the Aral Sea Region.

The merger[27] of the ICWC, ICSD, and BWOs into the IFAS in 1997 did not improve the situation either. In light of the situation in the Aral Sea basin, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan decided to make IFAS the umbrella organisation of the ICWC, ICSD, and two BWOs to prepare a common strategy to administer water distribution across Middle Asia and to design multilateral treaties to protect its water resources (Stucki et al., 2014; Menga, 2018; Zhiltsov et al., 2018). The fact that IFAS has not been able to change the water distribution is accredited to its governance. Its hierarchical governance puts IFAS directly under the authority of the presidents of the five rival states. No executive decision can be taken without unanimous approval of either their president or (deputy) prime minister (Stucki et al., 2014; Menga, 2018). Without an effective dispute resolution mechanism, this consensus structure is unfit to realize the organization's ambition of 1997. The internal rivalry over water, the narrow and weak mandate in practice, and lack of financial resources prevented the integration of IFAS, ICWC, ICSD, and BWOs into an effective water governance body (Menga, 2018; Zhiltsov et al., 2018). The organizations would continue to operate strongly independently of each other (Stucki et al., 2014) and ensure that countries are more likely to take unilateral decisions than discussing them in IFAS or its bodies (Menga, 2018).

None of the newly founded international organizations proved capable of sustainably governing transboundary water allocations by cause of rivalry between states and exclusion of other actors in the decision-making (Menga, 2018; Zhiltsov et al., 2018). Neither were any of the bilateral or multilateral legal frameworks[28] able to improve the neo-Soviet *status quo* and tear down the neopatrimonial network in the newly independent countries (Zhiltsov et al., 2018), persevering locally a higher water consumption for cotton production than earlier agreed upon (Sehring, 2020). Just a couple of *ad hoc* bilateral and multilateral agreements were concluded to balance water interests in the short-term (Zhiltsov et al., 2018). However, most of these agreements were concluded

[27] The 1997 Decision on Restructuring the International Fund for Saving the Aral Sea.

[28] *Bilateral agreements include:* The 1992 Agreement between the Government of the Russian Federation and the Government of the Republic of Kazakhstan Concerning the Joint Use and Protection of Transboundary Waters; 1992 Agreement between the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Uzbekistan, the Republic of Tajikistan, and Turkmenistan on Cooperation in Joint Management of Use and Protection of Water Resources of Interstate Sources; 1993 Agreement on Joint Action to Address the Problem of the Aral Sea and Surrounding Areas, Environmental Improvement, and Ensuring Socio-Economic Development of the Aral Sea Region; 1996 Agreement between the Government of the Republic of Uzbekistan and the Government of Turkmenistan Concerning Cooperation on Water Management Issues; 1998 Agreement between the Government of the Republic of Uzbekistan and the Government of Republic of Kyrgyzstan on the Questions of the Use of Water Energy Resources of Naryn-Syr Darya's Hydropower Stations Cascade; 1998 Agreement between the Government of the Republic of Kazakhstan, the Government of Kyrgyz Republic, the Government of the Republic of Tajikistan, and the Government of the Republic of Uzbekistan Concerning Use of Water and Energy Resources in Syr Darya River Basin; 1999 Agreement on the Status of the International Fund for Saving the Aral Sea (IFAS) and its Organizations; and 2000 Agreement between the Government of the Republic of Kazakhstan and the Government of Kyrgyz Republic on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas.

between local authorities near the border with their counterparts on the other side, in which they pragmatically bartered water for energy (Menga, 2018).

None of the initiatives for international cooperation – whether through treaties, funds, or organizations – has resulted in an IWRM strategy in Middle Asia, coordinating water governance cross-border and surmounting the political deadlock between upstream and downstream states – despite IWRM development being explicitly included in the mandate of the ICWC (Stucki et al., 2014). Kazakhstan, Turkmenistan, and Uzbekistan – considering their overreliance on water-intensive economies – have not been ready to install enforceable compensation mechanisms to reimburse the energy losses of Kyrgyzstan and Tajikistan during seasonal water storage (Bizikova et al., 2014; Stucki et al., 2014; Zhiltsov et al., 2018). The relations between riparian countries remains therefore fragile (Menga, 2018). As long as a mechanism misses to remunerate for the energy deficiencies upstream during winter, the Central Asian republics will not be able to filling the gap of the USSR as normative institution evaluating fair water shares among countries, Stucki et al. (2014) and Zhiltsov et al. (2018) argue.

II.1.2.3 Participation, durability, and dependency

In the case of transnational water flows, the riparian countries are by definition dependent on each other. Not only does downstream depend on upstream for the amount of water that flows downward and timing of that release, but also on other adjacent countries for how much of this flow they tap – and therefore for what is left for them. Hence, it is logical that all republics participate in IFAS. This does not mean that all countries participated equally in this international governance, Stucki et al. (2014) note. The energy urgency of Kyrgyzstan and Tajikistan had not been included evenly in the ICWC's mandate as the cotton and wheat interests of Kazakhstan, Turkmenistan, and Uzbekistan. Its focus was mostly on irrigation downstream without paying attention to the need for hydropower generation upstream, an imbalance that would never enable the organization to govern water allocations fairly and efficiently (Menga, 2018; Zhiltsov et al., 2018; Sehring, 2020). These tensions would lead to the five heads of state not speaking to each other between 2009 and 2018 until a first meeting again in 2018 in Türkmenbaşy, Turkmenistan. Without Kyrgyzstan. The Kyrgyz Republic perceived the ICWC decisions repeatedly to its detriment, forcing it to withdraw from IFAS in 2016 – further limiting the organization's mandate (Zhiltsov et al., 2018).

It could be argued that Kyrgyzstan has more bargaining power than Tajikistan when it comes to its relations with Uzbekistan. The Syr Darya is considerably more regulated by dams than the Amu Darya, which means that Kyrgyzstan could exert more influence on Uzbek crop yields than Tajikistan since it has much more opportunities to store water within their territory (Menga, 2018). Favourable relations with Kyrgyzstan are thus key for the Uzbek agricultural development in the long-term. Nonetheless, principally, IFAS kept on relying on the debris of the USSR transboundary water management system,

sustaining the region's imbalanced water-energy nexus from the Soviet era (Cruz-del Rosario, 2009; Zhiltsov et al., 2018; Sehring, 2020).

Participation is limited in this transnational governance. In addition to a number of international donors trying to influence governance by financing IWRM projects (Menga, 2018), in reality it is mainly the five member states that are at the forefront of transnational water governance. This does not directly imply active participation by all countries. Kyrgyzstan and Tajikistan demand, for instance, more attention to all interests – calling for a balance between the cultivation interests downstream and their energy concerns – as a condition for more active participation (Stucki et al., 2014). Moreover, this transnational governance mainly focuses on facilitating agreements between its member states. Users or other actors that have an interest in the governance of these water flows are not included (Zhiltsov et al., 2018). The consequence of failing to accommodate participation is that the annual operation agreements on water allocation – often established in the USSR – remain intact and that the implementation of IWRM in Central Asia is lacking (Menga, 2018).

Fruitful international cooperation or not, the countries know that they are dependent on each other. Short-term instruments are employed regionally on an *ad hoc* bilateral basis to pragmatically exchange water for energy (Menga, 2018). This is also due to the fact that the countries are highly dependent on each other's domestic water policy, because most of the water for those policies is tapped from the Amu Darya and Syr Darya. After 1991, each republic chose to regulate its water system differently by opting for a distinctive combination of the state-centric system and trends in international law (*see:* Sections II.2 tot II.4). Each country adopted different laws and codes to arrange distribution, consumption, and compensation within its own territory (Menga, 2018). With all waterways in Central Asia (artificially) being connected by rivers, canals, or other water infrastructure erected by the Soviets, domestic decisions on water influence directly the water governance in the entire region and thus the cross-border water balance (Stucki et al., 2014).

II.1.2.4 Resources

Water resources are unevenly distributed across the region. And so is its water consumption. When looking at the origin of the Central Asian water flows, Kyrgyzstan and Tajikistan form a hydrocracy as major water supplier in the area. Uzbekistan, on the other hand, is the major consumer of this water because of its water-intensive cotton cultivation, making it the region's hydro-hegemony (Menga, 2018). This water imbalance developed gradually over the course of the Russian Empire and the USSR. The water governance would stay imbalanced after the dissolution of the USSR due to obsolete agreements and infrastructure – thus, political and technological path dependencies (Jalilov et al., 2013). In addition, de-collectivization and privatization of kolkhozes and sovkhozes in Kazakhstan and Uzbekistan increased competition for water among farmers to cultivate crops (Kulenbekov & Asanov, 2021). The unequal water intake would grow substantially since 1991, causing the balance to become further lost.

Ultimately, this path dependency would lead to energy deficiencies in Kyrgyzstan and Tajikistan (Stucki et al., 2014; Menga, 2018). To overcome cold winters, the two upstream countries started to exploit their most valuable asset. The energy shortages in conjunction with the high energy prices imposed by downstream countries necessitated Kyrgyzstan and Tajikistan to unilaterally set up an energy system and scale their primitive USSR hydropower production for electricity generation in winter (Stucki et al., 2014; Menga, 2018; Kulenbekov & Asanov, 2021). Consequently, they began to store meltwater in the summer in reservoirs along the Amu Darya and Syr Darya to enable national electricity production in winter. This had severe impact on downstream communities, like the Kazakh and Uzbek. Twice. Firstly, water storage in summer causes a major shortage in irrigation water downstream, lowering crop yields. Secondly, fields were flooded in winter because of the massive water releases upstream because of the hydropower generation (Zhiltsov et al., 2018). This escalated the tensions with Kazakhstan and – predominantly – Uzbekistan and froze international relations (Stucki et al., 2014; Menga, 2018; Kulenbekov & Asanov, 2021).

Repeatedly, Uzbekistan has halted the Tajiki from taking in more water from the Amu Darya for hydropower by cutting off energy supplies (Stucki et al., 2014; Menga, 2018). In general, Uzbekistan has been very vocal in opposing hydropower generation in Central Asian watercourses. The country considers dams in both the Amu Darya and Syr Darya as a great threat to its and regional security and welfare, as the Ferghana Valley may dry up (Menga, 2018). For the same reasons, Uzbekistan has had a fallout with Kyrgyzstan, which threatened to affect their crop yields with those water works (Menga, 2018). The arrival of water engineer Mirziyoyev as president in Kyrgyzstan has thawed the frozen relationship with Uzbekistan and sustainable transboundary water governance is starting to be explored (Kulenbekov & Asanov, 2021). Another example of improved relationships between member states is the *Chu-Talas Agreement*,[29] concluded by Kazakhstan and Kyrgyzstan. *In casu*, signatories agreed to share the cost for operation and maintenance of transboundary water infrastructure, which are mostly located upstream in Kyrgyzstan (Rahaman & Varis, 2008). Although, as a framework document, Moscow's water allocations among both states largely remained untouched by this agreement, limiting its effectiveness. It clearly indicates that honest regional cooperation with regard to water is being scrutinized by both up and downstream countries (Zhiltsov et al., 2018).

Resources have to be interpret more broadly in this transboundary governance. Financial resources form another key part of the resources linked to the governance of water in Central Asia. Previously in the USSR, the unified water system was run and financed by Minvodkhoz (Menga, 2018; Zhiltsov et al., 2018). Now the countries themselves are responsible for its maintenance and operationalization. A costly task, for which these developing countries are actively seeking international donors such as the World Bank, UN, or Asian

[29] The 2000 Agreement between the Government of the Republic of Kazakhstan and the Government of Kyrgyz Republic on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas.

Development Bank (Menga, 2018). Their contribution was needed to prevent that the USSR irrigation infrastructure would further deteriorate and might not be operational any longer in the future, a representative indicated.

Table 12 – Characteristics of Central Asian water governance

Characteristics	**Central Asian context**
Conception	USSR agreements on water allocations largely continued
Infrastructure	All water infrastructure redirected to serve cotton cultivation
Goals	Joint water goals overshadowed by national goals
Formalization	Hierarchical and unanimous decision-making
Composition	Institutions consist of their five member states, composition of countries in bilateral and multilateral agreements varies
Dependency	High as power and water resources are shared
Participation	Member states dominate governance, donors try to influence
Durability	After having joined, states can participate until withdrawal
Resources	A wealth of water upstream and petroleum downstream

The transnational water governance context in Central Asia can be captured with the following notions:

- Institutions kept on relying on the debris of USSR water governance, sustaining the region's imbalanced water allocation post-Soviet;
- Relationships between riparian countries are fragile and institutions are weak due to neglecting energy interests in water governance, and
- Unclear ownership of the transboundary infrastructures and their high operational and maintenance costs has fallen them into disrepair.

II.2 Kazakhstan

II.2.1 Path dependency

II.2.1.1 Conception

The USSR conception had a profound impact on Kazakh water governance, as it did in other former Soviet republics. After the dissolution of the USSR, grain and cotton production remained a key economic sector for Nazarbayev (Auty & De Soysa, 2006). Large-scale irrigation projects of the USSR had supported the country on its route to serving as *"granary of Central Asia"* (Gencer & Gerni, 2012, p. 72). While Nazarbayev carried out moderate liberalization reforms in the agricultural sector to boost its yields and overcome the economic downturn, which the reintroduction of borders in Middle Asia had caused (Bloch, 2002; Ahrens & Hoen, 2013), aspects of the USSR conception would persist in water governance during his tenure. The country was abandoned with a centralist and authoritarian approach to water governance. The fledgling republic was given

the perception that water distribution and infrastructure development were settled at the national level. The Kazakh government would retain control over the water resources besides the accommodating infrastructure according to the Soviets (Voronkova et al., 2018).

However, the liberalization strategy of kolkhozes and sovkhozes forced Nazarbayev to follow a similar path in water governance (Lerman, 2009; Voronkova et al., 2018). Not without consequences, the agricultural water intake would increase sharply during the 1990s (Zhiltsov et al., 2018). This increase could easily be explained by the fact that with liberalization of these Soviet farms, their affiliated water infrastructure became privatized as well. In the USSR, kolkhozes and sovkhozes were responsible for water governance at farm level. Liberalization of these farms by the government automatically put parts of the associated water infrastructure on these farm in private hands. The *Water Code* of 1993 even formally advocated for the ongoing liberalization of irrigated agriculture (Wegerich, 2008). This liberalization intensified water demand in Kazakhstan, reflecting a continuation of the Soviet era priority of establishing large-scale infrastructure projects for agriculture (Rahaman & Varis, 2008; Wegerich, 2008; Menga, 2018).

The government institutions in Kazakhstan were not yet ready for such drastic reforms, Appendix I.1.1.1 concluded. The government was still steeped in the Soviet conception and had difficulty to adapt to a more market economy (Heim, 2020). A flaw inherited from the USSR, according to scientists and growers interviewed. They confirm that there is still little strategic thinking in the country. There is no fundamental discussion about how the future should look like in Kazakhstan, it rather depends on the whims of the president as in the USSR, interviewees emphasize. Nonetheless, policies were introduced to attract foreign investment to stimulate an export economy (Merry, 2004; Heim, 2024). However, if governance systems in practice are not equipped for a market economy, then such an attraction policy makes little sense and can demotivate foreign investors from future investing. A grower illustrates why:

> *"Kazakhstan has a very complicated system dating from the Soviet era – SMETA and Gosexpertisa. You do not know what you see. They have Soviet standards for everything: so many holes, so many screws, meaning so much drilling time. But working with that outdated Gosexpertisa for greenhouses results in high costs. [...] This system is really directly coming from the Soviet era and does not fit with innovations. We had to do all the construction calculations again , because Gosexpertisa demanded different things than the modern constructers. Sometimes the system required a tube to be very small, while in reality it had to be three times as large. [...] The business environment still has to take a few steps in Kazakhstan to keep on attracting investments."*

Moreover, both the Kazakh government and growers seem to a certain extent to still be used to the conception that centrally is dictated what, when, and how

to grow – just like under the Romanovs and the USSR (Voronkova et al., 2018) – the experiences of some researchers from Almaty exhibit:

> *"Last year, the government told us to only produce tomatoes. We had to grow vine tomatoes and free tomatoes. Our yields are going to Dubai and Russia, those exports markets are most nearby. We are only using biological plant protection products, we are not allowed to use any chemicals. [...] Sometimes, the greenhouse is even empty, because there are no instructions what to do."*

In short, water governance does not much deviate from governance in general in Kazakhstan (Heim, 2020) and appears to have pragmatically prolonged the USSR conception after independence, not making it attractive for foreigners to invest. Whether Tokayev will deviated from this centralist and authoritarian conception in water cannot yet be determined at this time (Blackmon, 2021). A businessman questions whether his plans will materialize referring to the Kazakh conception of governance: *"What the Kazakhs themselves also say: we love making plans, but when the plans are finished, we throw them away, we have no interest in executing them."*

II.2.1.2 Infrastructure

As discussed elaborately in paragraph II.1.1.2, Kazakhstan acquired an extensive water infrastructure network from the USSR tailored to the needs of wheat and cotton cultivation (Spoor, 1999; Bloch, 2002; Kim et al., 2018). This voluminous infrastructure tapping water from the Amu Darya or Syr Darya allowed Kazakh farmers to grow their grain or cotton after the dissolution of the USSR. This was accompanied by major water losses because of the outdated and inefficient water infrastructure originating from the USSR, which became too large for the Kazakh themselves to be upheld (Menga, 2018; Zhiltsov et al., 2018). As a result, the infrastructure deteriorated further and dried up water flows (Zhiltsov et al., 2018). Apart from these existing canals and rivers aimed at grain and cotton, there are few other water sources in the country. Groundwater is an alternative but is only used to a limited extent in Kazakhstan until now (Stucki et al., 2014; Zhiltsov et al., 2018). If you have to switch to groundwater to appease your needs due to a lack of freshwater supplies, you will have to build this infrastructure yourself, a grower from Aktobe indicates:

> *"Our neighbours simply use water from the river, but went looking and the river level was already very low. We also did not like that river water, because of all kinds of risks from bacteria – then you bring surface water into the greenhouse with considerable risks. So, then you start drilling. Ultimately, five wells were drilled at a depth of eighty to hundred meters – but you have to do it all yourself. It is basically just drilling haphazardly and then seeing what kind of flow you get out of it, after which you test the quality. That is quite difficult in Aktobe, because the sources are quite salty and the water quality*

is poor. Only after you have found relatively okay-ish water, you start building your own installations. You have to do it all yourself."

The water infrastructure from the USSR still dominates the Kazakh landscape, although the quality of the public works is decaying and less arable land can be irrigated than before (Stucki et al., 2014; Zhiltsov et al., 2018). If your objective does not fit within the existing infrastructures, you will have to install them yourself - with the approval of the oblast. The grower above hints that this increases transition costs and as such hinders a regime change to more efficient horticulture. He is supported in this message by a number of researchers in Almaty who also point to infrastructure as a main bottleneck: *"We would be eager to plan another eight hectares, but the infrastructure is still lacking."*

II.2.2 Governance

II.2.2.1 Goals

The goals of the Kazakh government are twofold. On the one hand, Nazarbayev aimed at economic development and industrial growth, affecting the allocation of water too. Along his policy ambitions, he prioritized water for agriculture, energy, and mining – the USSR agenda alike. Regarding agriculture, he wanted to increase its output as much as possible with just the right water supply (Kim et al., 2018; Zhiltsov et al., 2018). To increase the water efficiency of agriculture and diversify the oil-driven economy, both presidents were also committed to expanding and modernizing the greenhouse horticulture area in the country as part of this strategy (Temirbekova et al., 2014).

On the other hand, signalling a change of USSR policies, water policy in modern Kazakhstan focuses strongly on the shrinking Aral Sea basin, in an attempt to prevent an environmental disaster from happening. Measures to improve water efficiency and the preservation of water resources have been introduced jointly with international donors to ensure a more effective water use (Menga, 2018; Zhiltsov et al., 2018). A representative of one of these donors confirms the good cooperation with the Kazakh government to achieve joint environmental goals:

"We work a lot with that country on integrated water resource management. It was actually on our initiative that a dam was built to restore the northern part of the Aral Sea. If you look at the Kazakh flows, forty per cent of the water actually ends up in the sea. The Kazakhs are doing well, they want to, but they still have an enormous problem."

The government of Kazakhstan and influential donors appear to stand united in their intention to scale crop yields while conserving the environment via a more efficient water governance. These goals trickle down to local governments which also make it their goals to get in the president's good graces, a grower in Aktobe adds that *"[...] each oblast wants to show off and that is why they push*

their fossil industries to invest in greenhouse horticulture to flatter the new president, in line with his goals."

II.2.2.2 Formalization and composition

In the USSR, the SSRs had no authority over water governance. From Moscow, Minvodkhoz would establish the Kazakh water policy to serve the wheat growth in its vast countryside (Zinzani, 2015c; Zhiltsov et al., 2018). Kazakhstan would maintain a central water governance structure after USSR disunion. Under the *Kazakhstan Water Code* of 2003, it was formally established that the national government is in charge of water governance in the country (Rahaman & Varis, 2008). However, the first reforms oriented to implementing IWRM took already place in the early 1990s. The competences of Minvodkhoz would be transferred to the newly grounded State Committee for Water Resources following the dissolution of the USSR. This Committee would first become part of the Kazakh Ministry of Natural Resources and Environmental Protection, after which it was transferred to the Ministry of Agriculture in 1997. Kazakhstan would be the only republic in Central Asia after 1991 without having a Ministry of Water Management, yet this Committee would be charged with the allocation of water resources and the roll out of IWRM across the nation (Zinzani, 2015c).

The first major law governing water in Kazakhstan would be the *1993 Water Code*.[30] It was decided that the BWOs for the Amu Darya and Syr Darya along with six others would continue to exist as division of this Committee to manage the water in their respective basins (Rahaman & Varis, 2008; Zinzani, 2015b; 2015c; Menga, 2018; Zhiltsov et al., 2018). At the same time, to implement and control national water policies and programmes, Almaty also empowered local representatives – *maslikhats* – and executive agencies – *akimats* – with water governance. Together with the Regional State Water Management organizations, they had the authority to arrange the nationally allocated water distributions in their territory and provide maintenance to local infrastructure (Rahaman & Varis, 2008). With this central governance structure, Kazakhstan attempted to gain more control over water governance after its independence by consolidating the experts from a national, oblast, rayon, and basin level into this Committee, structuring and controlling the adoption and implementation of national policies and programmes across government levels in Kazakhstan (Zinzani, 2015b; 2015c).

This *Water Code* wanted to advance water governance at local level. The law called for institutionalization of governance through the establishment of water user associations (WUAs) at past kolkhozes and sovkhozes level, a change in governance heavily pushed by international donors (Rahaman & Varis, 2008; Zinzani, 2015b; 2015c). Liberalization had broken up these large SOEs into smaller agricultural units. Preventing conflicts between farms, the government founded WUAs to organize water distribution fairly and efficiently between farmers and to maintain the irrigation infrastructure on their farms (Wegerich,

[30] 1993 Water Code of the Republic of Kazakhstan.

2008). *De facto*, little changed compared to the USSR since the organizations' would be sternly steered by local governments, not the farmers or any other users (Rahaman & Varis, 2008; Zinzani, 2015b). The *Water Code* had neglected to define the legal status of WUAs as well as clearing their governance structure, creating some flexibility for the local elite in establishing WUAs (Rahaman & Varis, 2008; Wegerich, 2008; Zinzani, 2015b).

The national government also experienced this inefficiency and started planning reforms in 1996. The new *Water Code*[31] was intended to empower the eight BWOs within the Committee. River Basin Councils were established so that the scope of the BWOs would be supplemented with implementing IWRM in their basin (Rahaman & Varis, 2008; Zinzani, 2015b; 2015c). The BWOs would yet remain the key water governance institution. On behalf of the Committee, they stayed responsible for the allocation of water, overseeing water quality, and monitoring environmental protection (Zinzani, 2015c). Under the *2003 Water Code*, they would be supported by their Councils in carrying out this mandate (Zinzani, 2015b; 2015c). Considering their focus on IWRM and governance, the Councils should form the bridge between the WUAs and regional authorities in governing regional waterways. Not having the support of local actors, a lack of finances, and a shortcoming in understanding of IWRM resulted in weak Councils, usually characterized by having a low efficiency and high bureaucracy (Zinzani, 2015c). Involvement of akimats and other influential local actors did not contribute to the legitimacy of the Councils, partly because the Committee and BWOs also did not recognized the added value of this body (Wegerich, 2008; Zinzani, 2015b; 2015c). Many policies have been designed by the national government to reinforce the Councils, the limited participation of users – i.e., no election possibilities – and the influence of local governments in water governance would withal never improve its legitimacy (Zinzani, 2015c).

There were not only tensions between the BWOs and the Council, there were also disputes between the BWOs and the Republican State Enterprises (RGP). According to the *1993 Water Code*, the BWOs are governing the basins and the RGPs are responsible for water policies in the underlying oblasts. Due to financial and institutional problems at the BWOs because of the dependency on the Committee, the RGPs – funded by the oblasts – began to take over some tasks from the BWOs, which caused tensions among the institutions. As a result, the RGPs became more influential and took in more and more basins the lead in water governance, overstepping their formal competences under Kazakh legislation.[32] That imbalance further weakened local water governance, particularly the position of BWOs. Until today, water governance in Kazakhstan therefore has an informal character, where farmers sometimes even have found ways to consciously work around the cumbersome institutions to adequately resolve specific irrigation issues (Zinzani, 2015c). Those formal WUAs have been replaced by a dynamic and financially driven informal network to achieve

[31] 2003 Water Code of the Republic of Kazakhstan.
[32] 1996 Decree on the Differentiation of Functions between the River Basin Agencies and the Provincial Water Departments.

certain goals (Wegerich, 2008). In response, the central government is trying to get more control over water consumption by tackling illegal extraction and formally reporting consumption again, a grower signals:

> *"For now, you could drill a hole quite easily without any registration, that will become different now. So, we quickly had all sources registered at the oblast so that they are fully licensed before the legislation comes into effect."*

This centralization was also recently institutionalized, a businessman adds:

> *"In the past, the different regions were responsible for water governance, but now there is a new ministry. Due to this split, every region was responsible for its own part to manage water resources and the infrastructure. So, a while ago, they established a new ministry to bring everything together and get things running more smoothly again."*

To sum up, water governance can be classified best in Kazakhstan as central allotment with informal decentralization. Involved in the Committee, national and local authorities play a dominant role in water governance. Involvement of users or other interested actors is limited. Regional actors happen to have quite some opportunities to specify the allocations as decided by the Committee at local level to serve their own objectives. Some growers from Almaty underline this influence of local authorities: *"Only the hokim knows what we will be doing, that is not up to us. We want to, but the government decides what happens."* Together, the national and regional actors in the Committee decide on the execution of the water allocations across the country (Zinzani, 2015b; 2015c).

II.2.2.3 Participation, durability, and dependency

Already in the *1993 Water Code*, Nazarbayev wanted to foster water governance at local level through the establishment of WUAs, a development which was also actively pushed for by international organizations (Rahaman & Varis, 2008; Zinzani, 2015b; 2015c). Despite the intention to get farmers more involved, the WUAs turned out to be predominantly steered by regional (former Soviet) elite, not the farmers (Rahaman & Varis, 2008; Zinzani, 2015b). Moreover, there appeared to be governance gaps in Kazakhstan. Individual farmers were not allowed to set up any WUAs themselves under the *Water Code*, these could only be created from previous SOEs. In that case, these farmers had to informally organize water distribution and maintain the infrastructure themselves. It would take until the next reform in 2003 before these 'independent' farmers could join a regional WUA (Wegerich, 2008). According to the *2003 Water Code*, a WUA would no longer be judicially forced to stick its administrative boundaries to former USSR farms, but was allowed to broaden its mandate to a hydrographic area. This allowed new farmers to join. Still, the *Water Code* neglected to define the legal status of WUAs as well as clearing their governance

structure, creating some flexibility for the oblast elite in establishing WUAs (Rahaman & Varis, 2008; Wegerich, 2008; Zinzani, 2015b).

It was noted by Rahaman and Varis (2008), Wegerich (2008), and Zinzani (2015b; 2015c) that most WUAs did not fairly represent the farmers' interest in managing water. Its governance was often dominated by hokims or a couple of influential actors that rather pursued their individual interest in allocating water. Most of the WUAs would never fundamentally incorporate the participation of relevant actors or accountability mechanisms to them in their governance (Rahaman & Varis, 2008; Wegerich, 2008; Zinzani, 2015b). It is not always clear to users what happens with their fees. The delegation of infrastructure to the oblastvodkhoz and rayvodkhoz caused budget deficits at oblast level. Money from the WUAs was needed for the maintenance of the main infrastructure. While farmers pay for better infrastructure in the WUAs, the money disappears to the oblasts and rayons. While facing a collapsing infrastructure at home in their WUA, the fees were used elsewhere untraceably (Wegerich, 2008; Zinzani, 2015b). Instead of a supportive governance institution, farmers mainly regard WUAs as a way *"to extort money from the populace"* (Wegerich, 2008, p. 48). Its effectiveness is expected to be further marginalized with the reduction of funding from the government in Astana to the RGPs, which requires WUAs to send more money to RGPs to keep up the main infrastructure (Zinzani, 2015c). As a consequence, WUAs' support base among users is low (Zinzani, 2015c) as it appeared to mostly serve the interests of the local elite (Wegerich, 2008). This resulted in farmers not really feeling responsible for the WUAs nor the governance of local waterways, causing the infrastructure to further to decay (Zinzani, 2015c).

The creation of WUAs in the 1990s in Kazakhstan, however, has been decidedly pushed by international organizations, agencies, and donors in the region, like the World Bank, UN, and Asian Development Bank. Several of those international organizations have tried to foster the governance of irrigation infrastructure to local communities through WUAs. By financing large parts of this process, they tried to formalize local governance, decentralize decision-making, restructure the irrigation infrastructure, and execute policies and programmes to foster sustainable development (Rahaman & Varis, 2008; Wegerich, 2008; Zinzani, 2015b). Yet, the WUAs persist to adhere to the USSR's dogma of decision-making led by (local) governments with limited user participation accompanied by a financial deficit and collapsing infrastructure (Zinzani, 2015b). Governments and large companies would participate in water governance, but not small entrepreneurs or farmers, an engineer describes:

> *"It is mainly the large consumers who have a position at the table there. It is a very difficult story if you, as a smallholder farmer, want more water. Because, where do you go?"*

In some rayons, for these reasons, participatory processes of users were even stopped fully by dismantling the WUAs. Top-down governance by local elite

returned and put an end to bottom-up policy, as advocated for by international donors actively since the 1990s (Zinzani, 2015c). The ambition of the WUAs to represent local communities and *"minimize inter-personal conflicts,"* failed (Wegerich, 2008, p. 48). As the participation issues in the Councils also show, the end users of water – i.e., farmers – have limited involvement in governance and national authorities, together with the regional (former Soviet) elite, dominate water governance (Zinzani, 2015c).

II.2.2.4 Resources

Notwithstanding the WUA's informal status and the lack of coordination in local governance, the government decided to transfer a small part of the water infrastructure to the oblast – i.e., *oblastvodkhoz* – and rayon governments – the *rayvodkhoz*. The majority of the water infrastructure remained under state ownership. The initial idea in 1996 was and remains that the farmers would have to purchase the water infrastructure associated with their farm (Wegerich, 2008). The national government wanted basically to get rid of this inefficient infrastructure and make users – via the WUAs – responsible for its operation. Perceiving the weakness of the WUAs, the government would run programmes for farmers in the subsequent years to support them in governing those water bodies and taking over the irrigation infrastructure. Without significant success, farmers would never embrace the responsibility for its maintenance as they believed it did not honestly serve their water interests (Rahaman & Varis, 2008; Wegerich, 2008; Zinzani, 2015b). An engineer explains the consequences:

> *"Recently many utilities have been privatized. Do you know what happened? The infrastructure has been exploited to the fullest, people have earned quite some money from it, budgets were emptied, and a deteriorated infrastructure was returned to the state. The quality of the infrastructure was poor and budgets were exhausted when it came back."*

It also did not help that despite their payment for water use, farmers were not able to determine neither the quantity nor the timing of their water supply, the ruling class would decide upon that – a tax would not give them any ownership over the infrastructure (Wegerich, 2008; Zinzani, 2015b). It could thence be argued that the water resources were possessed – maybe not officially – by the national government and the regional elite and difficult to access for farmers.

The physical irrigation infrastructure would thus remain via the RGPs in the hands of the oblastvodkhoz and rayvodkhoz, whereas the WUAs became responsible for its operation and maintenance – i.e., the local elite (Zinzani, 2015b; 2015c). Howbeit, the Kazakh government wanted farmers to contribute financially to the exploitation of the infrastructure. Tariffs for agricultural water use were introduced from 1997 onwards. However, the water system is still set to supply water for kolkhozes and sovkhozes, not allowing it to calculate how much water individual farmers consumed. Use was estimated inaccurately instead, which did not encourage farmers much in the past to use water more

sparingly. *"Kazakhstan is also now charging for water use per litre, so we have to consider it in our production costs and thus in our prices,"* a grower in Aktobe reveals, suggesting that an incentive to use water more efficiently is arising. In general, *"commodities are not valued – it is very normal to sit in a house at 30 degrees in winter as one does not feel what the actual costs of these utilities are,"* an engineer emphasizes in his call for utilities in Kazakhstan to be priced fairly to empower transitions.

Table 13 – Characteristics of Kazakh water governance

Characteristics	**Kazakh water governance**
Conception	USSR conception pragmatically endures
Infrastructure	Outdated infrastructure for extensive wheat production
Goals	Maintaining yields while conserving the environment
Formalization	Central allotment with informal decentralization
Composition	National and regional actors in the Committee decide
Dependency	Medium as the government depends on regional actors for the execution of water allocations and efficient management
Participation	No active participation of farmers in WUAs or Councils
Durability	Emerging farmers can join WUAs run by local (Soviet) elite
Resources	Regularly shortages as quantity and timing of supply are determined by ruling class, ownership issues of infrastructure

Reflected in Table 13, Kazakh water governance can be quickly summarized to the following characteristics:

- Weak local and regional institutions allow for informal arrangements in water allocation and meanwhile create governance deficits;
- User participation in local water governance is low, WUAs and water allocations are mostly managed by local governments, and
- Farmers do not feel responsible for the governance of the WUAs and the maintenance of the decaying local irrigation infrastructure.

II.3 Kyrgyzstan

II.3.1 Path dependency

II.3.1.1 Conception

A Kyrgyz academic is clear: *"Water in Kyrgyzstan is organized from the Soviet times."* Unlike Kazakhstan, Kyrgyzstan was assigned the role of water supplier in the USSR, not that of consumer (Menga, 2018). The country has traditionally been used to serving the cotton plantations in Uzbekistan and grain fields in Kazakhstan and Turkmenistan. From Moscow, Gosplan determined how water from the Kyrgyz and Tajik mountains was distributed throughout the region

(Jalilov et al., 2013; Zhiltsov et al., 2018). Following the disunion of the USSR, downstream countries looked directly at Kyrgyzstan and Tajikistan to secure the usual water supply to their land, which had to be endured to continue their cultivations (Menga, 2018). Perpetuation of agreements from the USSR through the water infrastructure once constructed for this purpose by the Soviets would continue to serve lower-lying Kazakhstan and Uzbekistan in their water needs despite partition (Jalilov et al., 2013; Menga, 2018). Notwithstanding efforts of President Akayev to implement water liberalization reforms by introducing key market principles, the Soviet conception continues to have a notable influence on water governance in Kyrgyzstan. An attempt to get its neighbours to pay for this commodity through the ICWC failed, effectively leaving Kyrgyzstan empty-handed through the remnants of the USSR (Stucki et al., 2014). Or, as Sehring (2009, p. 67) explains that Kyrgyzstan – like Tajikistan – was unable to change this USSR discourse as a result of not being *"confronted with the same norms in the international discourse as to what good water governance should look like."* The first legislation in liberated Kyrgyzstan would therefore be a continuation of USSR conception (Sehring, 2009).

Not only regionally but also domestically, Akayev had to deal with USSR conception while trying to execute reforms. While the Kremlin used to be in control with Gosplan and Minvodkhoz, people now looked directly to Bishkek when it came to structuring water governance. Like in many other former Soviet republics, Kyrgyzstan would face a legacy of centralist and authoritarian water management due to the USSR. Water would be allocated centrally and the infrastructure would be maintained by the national government, as the Kyrgyz people were used to (Jalilov et al., 2013; Zhiltsov et al., 2018). This conception was not in line with Akayev's philosophy. To help the primitive economy and agricultural sector of Kyrgyzstan get back on track, he turned to liberalization (Kim et al., 2018; Voronkova et al., 2018), as discussed in detail in Section 1.1. Opposite to the centralist planning conception of the USSR, decentralization and liberalization efforts were made in water governance to stimulate peasant farming (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015). Kyrgyz institutions had to adapt to the introduction of liberalization in water governance, including the partial privatization of the wide-ranging water grid. Sehring (2009) saw that the institutions were not yet fully ready for this. Some of the water liberalization policies in the early days of Kyrgyzstan would never be materialized due to the lack of consensus on these policies. Some bureaucrats and politicians preferred to maintain the *status quo* rather than redistribute the water more fairly among farms. This resistance – fuelled by USSR conception - would greatly delay water reforms in Kyrgyzstan (Sehring, 2009). The USSR conception would persist to play a key role in the reform efforts under its six presidents, an NGO illustrates:

> *"But still, the Ministry of Agriculture is conservative and sticks to past agreements, while water has now a separate ministry tries to work on more long-term plans. Yet, it is all about paper reality, also in the Ministry of Water, not focusing on daily priorities."*

II.3.1.2 Infrastructure

When Akayev declared the country independent in 1990, he found the country with extensive infrastructure that delivered water from the Kyrgyz mountains through an extensive network of canals, reservoirs, and irrigation pipes to the Uzbek cotton fields and Kazakh grain (Zhiltsov et al., 2018). The emphasis in the USSR had been on large-scale water infrastructure development in modern Kyrgyzstan to redirect water for its central planning economy. The country itself also had an irrigation network for its small-scale agricultural sector of former kolkhozes and sovkhozes, yet the vast majority of infrastructure transported water to the Kazakh and Uzbek plains and valleys for cotton and wheat (Menga, 2018; Zhiltsov et al., 2018). The Russians had constructed several dams and reservoirs in Kyrgyzstan to ensure that water reached these tillage at the right time. The infrastructure in the country therefore mainly served its neighbours and did not suite Kyrgyz needs (Herrfahrdt-Pähle et al., 2006).

With the collapse of the USSR's unified energy system, Kyrgyzstan faced major electricity and gas shortages after its independence (Zhiltsov et al., 2018; Kulenbekov & Asanov, 2021). Kyrgyzstan – like Tajikistan – still storing water in winter in accordance with USSR custom but no longer receiving energy from downstream countries as compensation, was forced to switch to hydropower (Menga, 2018; Boute, 2019). In the USSR, several hydropower stations had been built already in the 1980s in the Syr Darya river basin to supply the region with hydroelectricity (Auty & De Soysa, 2006; Stucki et al., 2014; Zhiltsov et al., 2018; Boute, 2019), but these systems were too outdated and small-scale to cover the energy gaps and the expected growth in electricity consumption (Boute, 2019). Kyrgyzstan had thus to maximize its use of hydroenergy generation (Boute, 2019). Where in the past most water would flow downward via the extensive infrastructure as by the USSR designed for this purpose, upstream is now eager to adapt this outdated infrastructure by adding more hydropower plants (Menga, 2018; Boute, 2019; Kulenbekov & Asanov, 2021). A foreign official in Uzbekistan also sees this development and the consequences of changing this infrastructure for downstream countries:

> *"Huge investments are made in hydropower and big dams. Last year, we had a hard winter in Central Asia. There was an energy shortage and then the dams were emptied by Kyrgyzstan and Tajikistan to generate electricity. That led to floodings downstream and water shortages in summer. Mainly Kyrgyzstan and Tajikistan have dams because of energy scarcity, and they are building more and more, there are a few in Uzbekistan."*

Another international representative in Uzbekistan backs that insight as well as its risks concisely: *"Water is also more and more kept by the Tajiki and Kyrgyz to generate energy, that is really bad for us."* Nevertheless, the bulk of the water infrastructure in Kyrgyzstan would remain dedicated to supplying farmland in Kazakhstan and Uzbekistan (Stucki et al., 2014; Zhiltsov et al., 2018). After all, the USSR water conventions largely continued (Sehring, 2009).

However, Kyrgyzstan struggled to properly maintain this infrastructure after Russian support disappeared. The infrastructure was outdated, there was a lack of investment, and inefficient water governance remained (Menga, 2018; Zhiltsov et al., 2018). The infrastructure would correspondingly deteriorate, causing water shortages across riparian nations and inadequate access to clean water and sanitation in some areas (Menga, 2018). How the access to clean and healthy water is affected by outdating infrastructure, describes an NGO:

> *"Especially, in the Chu-Talas and Issyk-Kul Lake near Bishkek you have high water levels in spring and summer due to melting glaciers. That is not an advantage. If you use municipal water sources, for example, these are often not closed sources. In that case, the water from the mountains flows into the drinking water supply when there is a lot of rain. We helped many people to make investment plans to prevent this, as this is deteriorating the water quality considerably. And also, because the water pipes are not all beneath soil, there is a high risk of freezing. In the heavy winters, even the rivers can freeze, which means that the people are losing their vital water sources."*

This was exacerbated by the fact that ownership of transnational infrastructure was sometimes unclear and maintenance was therefore lagging behind (Schmitt, 2015). A foreign official gives a striking example of how the return of borders in the area has led to poorer infrastructure because maintenance is difficult:

> *"[...] during the Soviet Union those systems – the Amu Darya river basin and the Syr Darya river basin – were all united in one. That leads to strange situations now. After the breakup of the Soviet Union, you now have water pumping stations in Kyrgyzstan, which belong to Uzbekistan."*

The USSR's waterworks still criss-cross the Kyrgyz landscape to feed agriculture downstream with water, either with a slowly increasing number of hydropower stations in the Syr Darya.

II.3.2 Governance

II.3.2.1 Goals

Akayev's goals to grow the primeval agricultural sector and Kyrgyz economy in general through liberalization and privatization has been widely discussed in paragraph I.2.2.1 (Auty & De Soysa, 2006; Gencer & Gerni, 2012). Pursuant to his reforms, the government aimed to privatize certain parts of the Kyrgyz water infrastructure by placing the ownership and governance of water distribution in the hands of private parties and the WUAs – i.e., the farmers. This should be accompanied by decentralization of decision-making to the WUAs, in which farmers and communities should be included in the decision-making of water management (Menga, 2018; Zhiltsov et al., 2018). In achieving these goals he found a partner in international donors having an extraordinary liberalization

and democratization drive (Herrfahrdt-Pähle et al., 2006; Sehring, 2009). A scientist tells that these goals have been reached according to the government: *"I have information that these WUAs will be closed. The government thinks that they have finished their goals and resolved their main issues that the association had to carry out for the future."* That does not mean that the development of infrastructure is fully done in the country according to the authorities, he says: *"The Kyrgyz government is trying to build water resources. For 2024-2025, the government has the plan to build 31 new water reservoirs."*

Along the goal of liberalizing agriculture and consequently water governance, the Kyrgyz Republic has been committed to expand hydroenergy production to fill the gap between energy supply and demand during winter. Hydropower generation is expected to become the dominant energy source in the country (Boute, 2019).

II.3.2.2 Formalization and composition

Water is an important policy element in Kyrgyzstan. It provides irrigation for its agriculture, but above all it can also generate energy (Boute, 2019). Like in Kazakhstan, the key water infrastructures in the Kirghiz SSR were operated by Minvodkhoz, kolkhozes and sovkhozes were in charge of the irrigation systems at farm level (Herrfahrdt-Pähle et al., 2006). The dissolution of the USSR put suddenly independent Kyrgyzstan in charge of governing the infrastructures, forming the origin of one of Central Asia's most vital water sources – notably, the Syr Darya. Now, it was Kyrgyzstan's task to maintain, govern, and finance this paramount yet extensive infrastructure (Herrfahrdt-Pähle et al., 2006). The responsibilities of Minvodkhoz were subordinated to the Department of Water Management within the Kyrgyz Ministry of Agriculture because of the close interconnection of agriculture and water in the country (Sehring, 2009). Supply of drinking water would, however, be integrated in another part of the ministry, the Department for Rural Water Supply, while flood and risk management was transferred to the Ministry of Emergency Situations – increasing fragmentation in water governance (Herrfahrdt-Pähle et al., 2006; Sehring, 2009). Relying on the privileged position of Minvodkhoz in the USSR, the Kyrgyz Department of Water Management would be accredited institutional and financial autonomy within the ministry to allocate water (Herrfahrdt-Pähle et al., 2006).

Compared to Kazakhstan and regardless of Akayev's eagerness, it would take the Kyrgyz more than a decade to formulate a new water strategy for the independent country. In attempt to formulating sustainable water policies, President Akayev enacted the National Committee on Water Strategy in 1996 to formulate water governance principles for future policies (Sehring, 2009). New water policy was desperately needed, existing legislation[33] still created a lot of uncertainty about the mandate of the various new organization, agencies, and bodies and was also lacking an enforcement mechanism (Herrfahrdt-Pähle et al., 2006). Due to conflicting interests of its members, the Committee would

[33] 1994 Law on Water of the Kyrgyz Republic.

never succeed in presenting solid conclusions to replace this weak 1994 law with IWRM (Sehring, 2009). Meanwhile, the government privatized kolkhozes and sovkhozes, which also brought parts of former USSR irrigation infrastructures into private use (Auty & De Soysa, 2006; Herrfahrdt-Pähle et al., 2006; Schmitt, 2015). Just as in Kazakhstan, these large USSR state-owned farms were divided into smaller peasant farms. Also here, WUAs were founded to govern water distribution among these farmers. Again with the help of international donors similar to those in Kazakhstan, Akayev would order their creation in the late 1990s by presidential decrees.[34] In 2002, WUAs would be granted the formal mandate[35] to maintain the irrigation infrastructure of former kolkhozes and sovkhozes (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015). By 2004, around 60 per cent of all irrigated land in Kyrgyzstan would be covered by WUAs (Sehring, 2009), in 2013 this would have grown to 73 per cent (Schmitt, 2015). The *2005 Water Code*[36] would ultimately fully ratify their authority in Kyrgyz governance (Herrfahrdt-Pähle et al., 2006).

The design of the *Water Code* started already in 2000 but took longer than anticipated because of overlapping competences of institutions and the absence of customs or policies to elaborate on (Sehring, 2009). The land reform of Akayev aimed at distributing land to peasant farming (Spoor, 1999; Schmitt, 2015; Kim et al., 2018) necessitated a reform in water governance: the irrigation infrastructure was in disrepair by cause of its ambiguous ownership whereas its exploitation grew after liberalization (Schmitt, 2015). The *2005 Water Code* had therefore the goal to restructure the Kyrgyz water governance and define IWRM practices. Adding to the institutional complexity in Kyrgyzstan, two brand new institutes were announced. A National Water Council would be charged with the governance and planning of cross-sectoral water use and was put under the direct auspices of the prime minister (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015). The State Water Administration, on the other hand, was commissioned by Bishkek to execute the *Water Code*.

Schmitt (2015), *inter alia,* criticizes the governance reforms withal as top-down. He stipulates that institutional arrangements have remained vague, there is no enforcement mechanism, and users are not fairly included in the governance. Although the long-term allocation of water to WUAs in the *Code* does give farmers certainty on how much water they will receive, its distribution has been dictated to them without consultation (Herrfahrdt-Pähle et al., 2006). Improvements are still pending as long as the National Water Council cannot agree on how it wants to implement this *Water Code*. The announced *National Water Strategy*, which should further indicate the governance of the BWOs and its Councils, is still a long way off (Herrfahrdt-Pähle et al., 2006; Sehring, 2009).

WUAs have replaced the national government in most parts of the state as key decision-maker in water governance (Schmitt, 2015). *"It was a decision to work with local people, to organize them through an organization so that we can*

[34] 1995 Regulations on WUAs in Rural Areas and 1997 Statute of WUAs in Rural Areas.
[35] 2002 Law on Unions (associations) of Water Users.
[36] Water Code No. 8 of 2005 of the Kyrgyz Republic.

manage water management issues better. WUAs came up – at the national level it was decided that these kinds of associations were established," a researcher presents. But the WUAs are not solely responsible for local water management. The Ministry of Agriculture established in 1997 a branch in each of the six oblasts – oblastvodkhoz – across the country. Oblasts have each the task to supervise the water governance in their territory and therewith mainly to control their rayons. Each rayon has an own organization too – the rayvodkhoz – which since 1995 has been responsible for the maintenance of the local infrastructure between the WUAs. The rayons in addition determine the water allocations to the WUAs in their territory and collect taxes for the sustenance of the system. Rayons determine conjointly with the WUAs the exact irrigation volumes for farmers in the region (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015).

Typical to Kyrgyzstan, this leads to a mixture of centralized governance with local accents (Sehring, 2009). The implementation of WUAs in Kyrgyzstan would thus highly depend on its region. National policies have outlined the desired characteristics of WUAs, yet its final features are heavily influenced by local customs. The formation of WUAs has often been conducted by the *aiyl okmotus* – a formal local self-government (Sehring, 2009; Schmitt, 2015), a kind of municipalities. An academic: *"They take their responsibilities to take care of the water and infrastructure in the various water districts in a region"* even though they do not have *"an agronomist who can give proper consultation to farmers."* This not only results in most WUAs being governed along to the territorial borders of this administrative tier rather than its hydrographic range, but also that the WUAs are strongly tied to local government institutes. The WUAs are accordingly no longer an independent organization but form an extension of the ruling local elite (Herrfahrdt-Pähle et al., 2006; Sehring, 2009). Existing power structures in the region are often mirrored in the WUAs. WUAs mainly execute the (economic) interests of influential actors *in lieu* of serving the local farmers' objectives (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015):

> *"The irrigators and controllers who work in the river basin management are also employed by the state enterprise, RGP. This means that the oblast has a lot of influence in the organization of the river basins. If a hokim would call the experts on a Friday afternoon to arrange a water connection for some friend, which has been taking way to long, you could bet that they will fix it before the weekend even starts,"* demonstrates an NGO.

Water governance of Kyrgyzstan has reinforced a patrimonial network, limiting participation of farmers in governance and undermining the implementation of IWRM in the Kyrgyz Republic (Schmitt, 2015). An academic reiterates that informality: *"The district department should work with the rule, they should not change the rules formally. But they are doing it with money, so there is small corruption."* Farmers find themselves stuck between centrally defined goals – influenced by views of international donors – and patrimonial execution of water allocations as its governance remains to be steered by the national

government and donors, whereas regional (former Soviet) elite specify water distributions (Schmitt, 2015). *"Kyrgyzstan is really in a transition situation. They are moving to more level-based management, but at the moment part of it is still with the government in Bishkek,"* an NGO summarizes. Two academics get flashbacks to the past: *"Now the government want to make one organization out of it – like it was in Soviet times."*

II.3.2.3 Participation, durability, and dependency

Water governance almost seems to be a shared competence of the national government and local authorities. National policy has not been fully developed, as illustrated by the delayed *National Water Strategy* (Herrfahrdt-Pähle et al., 2006; Sehring, 2009), allowing local elites to exert great influence on the WUAs and thus local water governance (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015). The Kyrgyz government made some attempts to improve participation of users in local governance. Copying Kazakhstan, the BWOs would be empowered and would be assigned Councils to govern them more inclusively (Herrfahrdt-Pähle et al., 2006) to foster participation of farmers in the political decision-making (Schmitt, 2015). Centrally, it was dictated that more participation was required in water governance, an academic explains:

> *"Local water governance was separated from the government as there was a need to manage it better because of the collapsing infrastructure et cetera. It was a decision to work with local people, to organize them through an organization so that we can manage water management issues better. WUAs came up – at the national level it was decided that these kinds of associations were established."*

The leading role of the local elite in water governance – like the WUAs – led to the reproduction of the patrimonial network of the oblasts in water governance (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015), undermining participation of farmers. As they do not consider the WUAs to be independent organizations, they are not eager to participate in its governance nor do they want to be responsible for infrastructure maintenance, Schmitt (2015) adds. In some mountainous areas, this has led to the establishment of informal WUAs, in which farmers engage in water distributions outside the formal WUAs (Herrfahrdt-Pähle et al., 2006).

On a national level too, water governance appears to have an ownership issue. The development of the *2005 Water Code* has been highly guided by non-Kyrgyz NGOs and international organization wanting to improve the country's water governance. Parliament grudgingly adopted the policy and regarded the organizations that had written the law as its implementers; they did not feel accountable for it (Sehring, 2009). These donors have supported the Kyrgyz government in equipping the WUAs, so that they could promptly carry out the new policies ideas (Herrfahrdt-Pähle et al., 2006). A scholar comments:

"Every region and village has their own branch. In 2011, 2012, the World Bank suggested to make a kind of reform on upstream countries like Kyrgyzstan, some reform on the water resources. There was some budget – some grant from the Swiss government too – and the World Bank got this grand and used it to resolve Kyrgyz water management issues. This were the WUAs. These association, however, they got a lot of funding to exist."

Sehring (2009) observes that donors often ran their own projects to achieve certain goals, without any legal basis for this. Reforms were mostly formalized after projects have been running to *ex post* legitimize their efforts. These international actors would gain great power over the Kyrgyz water governance by imposing WUAs and advocating for the abolition of the oblastvodkhozes within the Ministry of Agriculture to grant the WUAs with more authority (Herrfahrdt-Pähle et al., 2006).

The result would be that both the farmers and the national government in Bishkek did not consider WUAs to be an independent organization carrying out the national irrigation strategy (Sehring, 2009; Schmitt, 2015). According to the USSR doctrine, WUAs are the lowest level of governance and are charged to realize national policies. Maintaining some degree of top-down governance in water can be seen as a legacy of USSR conception as well as a response to the influence of donors (Sehring, 2009). The national government regards WUAs mainly as its subordinate agencies with limited self-autonomy (Sehring 2009; Schmitt, 2015). Even though this is at odds with the *2005 Water Code*, which promotes participation and decentralization of tasks to WUAs (Sehring, 2009), it could explain why the national government in Bishkek has been reluctant in strengthening the BWOs and especially their Councils (Herrfahrdt-Pähle et al., 2006), which would have fostered participation of and delegation of powers to users, such as farmers (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015). For now, water governance can best be described as depending on the local patrimonial network for its execution, excluding users from participating, and upholding inefficient infrastructures because of the lack of ownership and accountability among institutes (Schmitt, 2015).

II.3.2.4 Resources

Paradoxically, the water reforms of 2000 and 2005 have mainly provided the ruling class with more resources, whereas the underclass – i.e., the farmers – have been further marginalised and have become increasingly more dependent on local governments (Sehring, 2009). The consequence is that most farmers do not know how their water allocation is precisely governed – let alone how they could contribute to its governance, Sehring (2009) notes. Due to the close relations with the aiyl okmotus, the majority of farmers does not see themselves as owner of the WUA, although formally they are under the *2005 Water Code* (Schmitt, 2015). Herrfahrdt-Pähle et al. (2006) argue that in the same way this *Water Code* did indeed give them clarity about what water was allocated to them in the upcoming years. However, they were not consulted in formalizing

this distribution: it would be the product of a top-down decision of the central government and donors. Water shortages for that reason regularly occur at farm level in Kyrgyzstan (Herrfahrdt-Pähle et al., 2006). Still, an NGO believes that the water distribution is much fairer in Kyrgyzstan than in Uzbekistan:

> *"In Kyrgyzstan, there is more control over water. The government checks better who takes what water and tries to redistribute it, while here [in Uzbekistan] it is all about the first one in line and the one which has the best network getting most water."*

In many WUAs, the local infrastructure is deteriorating, causing more water to leak. Particularly if the infrastructure is shared with other WUAs or the leak is occurring outside its administrative territory, there is a serious risk that none of the WUAs views it as its responsibility to fix it (Schmitt, 2015). In fact, it commonly happens that WUAs are formed along the boundaries of the aiyl okmotus by the elite and not along the hydrographic borders of the water basin, leaving some areas unmanaged (Sehring, 2009; Schmitt, 2015). The water infrastructure is accordingly inherently inefficient – infrastructure is collapsing and illegal water intake is not sanctioned (Schmitt, 2015). The donor-driven WUAs are facing an ownership issue under Kyrgyz citizens and authorities (Herrfahrdt-Pähle et al., 2006; Schmitt, 2015).

Table 14 – Characteristics of Kyrgyz water governance

Characteristics	**Kyrgyz water governance**
Conception	Liberalization reforms shaped by USSR conception
Infrastructure	Outdated infrastructure tailored to downstream water usage, limited hydropower production
Goals	Liberalizing agriculture and scaling hydroenergy generation
Formalization	Central goal setting with patrimonial execution
Composition	National actors and donors steer and regional actors specify
Dependency	High as the government depends largely on regional actors and donors for the execution of water governance
Participation	No active participation of farmers in WUAs or Councils
Durability	Actors in the former USSR patrimonial network govern
Resources	Continuously water shortages and a discussion about the ownership of infrastructure

Water governance in Kyrgyzstan can be defined by the following features:

- Decision-making has been centralized because of weak local bodies, slight allocation adjustments are made by patrimonial networks;

- Neither the national government nor farmers consider WUAs to be an independent organization carrying out a fair irrigation strategy, and
- Both consider donors to be responsible for the governance of the WUAs and the maintenance of the decaying local irrigation infrastructure.

II.4 Uzbekistan

II.4.1 Path dependency

II.4.1.1 Conception

Uzbekistan is considered the country that follows most closely in the footsteps of the USSR (Merry, 2004). Economically and institutionally, the state would stick to the USSR conception under President Karimov after its shepherd had disappeared. Its planned economy, for instance, did not change considerably in an independent Uzbekistan. A foreign official provides an example:

> *"The older generation [of hokims] was already a leader during the communist period. They automatically have a communist top-down thinking. I often visit farms and there is always a hokim present too. And it always ends with him telling the farmer how to improve his business operations, to which they listen, which was also the case in communist times."*

This means that the drawn-out plains and valley are still cultivated with cotton and wheat, which was likewise encouraged by an USSR water infrastructure precisely built for this objective (Jalilov et al., 2013; Menga, 2018; Hamidov et al., 2020). Historically, water governance in Soviet Central Asia had been almost entirely been about scaling the cotton and wheat production of kolkhozes and sovkhozes in Kazakhstan and Uzbekistan (Spoor, 1999; Hamidov et al., 2020). Autonomous Uzbekistan continues to fixate on this cotton growth (Spoor, 1999; Zhiltsov et al., 2018) and accordingly would change its water governance little from USSR practices – as it supported its goals – during the initial period of its independence[37] (Rahaman & Varis, 2008; Zinzani, 2015c), including inheriting its inefficiencies and water overuse (Herrfahrdt-Pähle & Pahl-Wostl, 2012). Put differently, USSR water governance was mostly endured in Uzbekistan (Veldwisch & Mollinga, 2013; Zinzani, 2015c). A foreign official confirms this cotton path dependency, even though he observes an early change appearing of the cotton dominance in the Uzbek centrally planned economy:

> *"Most of the irrigated land is still used for cotton and wheat, but cotton seems to be gradually being replaced in several oblasts by wheat or other arable crops or even vegetables."*

President Karimov saw no need to reform his country, as paragraph I.3.1.1 has described earlier. The centralist and authoritarian style therefore also remained

[37] The 1993 Law on Water and Water Use would mostly endure USSR water governance (Zinzani, 2015c).

to exist in water governance through central planning and control over water resources (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Menga, 2018). Most decisions were taken at a central level, dictating water allocations and the development of infrastructure (Hamidov et al., 2020). Water resources were considered as a state property in Uzbekistan – as it was in the USSR (Stucki et al., 2014; Menga, 2018) – so the central government should exercise ownership and control over them (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Veldwisch & Mollinga, 2013). This control over water allowed Karimov to prioritize its distribution for key sectors, including agriculture. This indirectly gave the central government another method to regulate agricultural production. In a planned economy relying on consolidation programmes and regulated production, modern Uzbekistan was able to prioritize cotton growth in the economy through centrally set water allocations (Hamidov et al., 2020). In fact, almost the entire (water) governance in Uzbekistan has been based on cotton production, derived from the USSR (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Menga, 2018; Hamidov et al., 2020). This 'cotton conception' in governance makes transitions difficult to shift its goals, a grower notes: *"[...] in Uzbekistan, they are still thinking about monoculture – as in the USSR."*

It is not easy for institutions to abandon this conception, a conception that has been rooted in water governance since Russian rule. Under Karimov, the Uzbek economy would exist to run on agriculture, energy, and minerals as it always had been (Merry, 2004; Auty & De Soysa, 2006). Greenhouse growers have pinned their hopes on current President Mirziyoyev to move away from this cotton doctrine with his *New Uzbekistan* reforms to empower alternative industries (Blackmon, 2021). A breeder experiences an antagonistic response within the central government from officials who were already working there in the USSR and who are hindering transitions due to their affiliation with this conception. Due to the dominance of the USSR conception, he expects little from these reforms for the time being:

> *"Mirziyoyev gets stuck in the Soviet structures. The president tries everything but just gets stuck – that is such a shame because then nothing will or can change."*

Until today, the Soviet conception of massive cotton cultivation and dedicating water resources to fulfil that purpose are still vibrant in present-day Uzbekistan. A conscious choice by its first President Karimov to grow its economy along the path taken by the Soviets (Merry, 2004; Auty & De Soysa, 2006; Ahrens & Hoen, 2013).

II.4.1.2 Infrastructure

In terms of infrastructure, one could argue that Uzbekistan was at its beck and call. While Uzbekistan had to build the necessary infrastructure to expand its small petroleum industry (Auty & De Soysa, 2006; Boute, 2019), the Soviets had built an extensive water network in the country to feed the cotton plantations

with this vital liquid (Bloch, 2002; Kim et al., 2018). Their infrastructure was designed to redirect water to kolkhozes and sovkhozes, where the tillage took place (Jalilov et al., 2013; Menga, 2018; Hamidov et al., 2020). However, de-collectivization of kolkhozes and sovkhozes led – albeit to a lesser extent than in Kazakhstan and Kyrgyzstan – by the end of the 1990s to the arrival of smaller (family) farms (Zinzani, 2015a; 2015c). Irrigation infrastructure adapted to the scale of former agricultural SOEs made it impossible for the rayvodkhozes to comply with the diverse needs of smaller farmers on that plot (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Zinzani, 2015c). Water demand could not be met and the irrigation infrastructure deteriorated (Hamidov et al., 2020). Even with the protection of the sector by the state, yield losses could not be prevented (Bloch, 2002; Lerman, 2009). A foreign official illustrates the scale of the problem:

> *"We noticed in 2019 that only about 60 per cent of the total agricultural area equipped for irrigation was actually irrigated. We learned that at the other forty per cent of land, the Soviet's irrigation infrastructure had so much deteriorated that it was not operational anymore."*

The land reforms and the collapsing infrastructure forced Tashkent to adjust its water governance to the new needs of farmers (Herrfahrdt-Pähle & Pahl-Wostl, 2012). The USSR extensive water infrastructure in Uzbekistan remained withal inefficient. Canals connected to the Amu Darya and Syr Darya, constructed by the Soviets, often have an earth bed as a bottom, causing water to leak from the infrastructure and saltwater to creep into them (Zhiltsov et al., 2018). A foreign official concretizes this problem using the example of Karakalpakstan, in which the main *Bustan Canal* formed a major leak. Of the 100,000 hectares it used to irrigate, only 35,000 hectares could now be served. A large part of the water supplied by the Amu Darya leaked through the bottom of this 70 kilometre long canal. To improve the efficiency of this canal, the earth bed was replaced with concrete. Height differences were also introduced so that the water would flow faster and more adequately, generating higher yields. With the support of international donors, a small part of the USSR's irrigation network spanning 7.4 million hectares in Central Asia could be improved. Until today, a major part of the infrastructure remains inefficient due to construction choices made in the past (Stucki et al., 2014; Zhiltsov et al., 2018). These past choices do not always provide fertile ground for water efficiency innovations because they do not fit with extant USSR infrastructure, an Uzbek government official tells:

> *"Uzbekistan has been using modern technologies to save water, but they have not been that effective. Government programmes subsidized drip technology, again, the quality of the drip technology was not well and were not good managed too. After one year, many farmers returned to traditional watering, causing an increase in water intake."*

Foreign officials notice as well that *"irrigation water consumption has decreased the last five years and its water productivity has increased"* in Uzbekistan as a result of such innovations. Nonetheless, most of the water infrastructure would be continued in Uzbekistan as started by the Soviets, not much would change about its goals and operations for decades (Stucki et al., 2014; Zhiltsov et al., 2018; Hamidov et al., 2020). Herrfahrdt-Pähle and Pahl-Wostl (2012, p. 7) call it a *"small-scale approach [that] does not seem appropriate for solving large-scale problems". "[S]till lots has to be done to modernize its infrastructure,"* a foreign official concludes simultaneously.

What also did not change due to the prolonging of the USSR conception is that the ownership of the infrastructure by the state. While in Kazakhstan (Stucki et al., 2014) and Kyrgyzstan (Wegerich, 2008; Zinzani, 2015c) there was a dispute over who was responsible for the operationalization and maintenance of the infrastructure with liberalization and the emergence of WUAs, the central government in Uzbekistan remained the owner as under the doctrine of the USSR (Herrfahrdt-Pähle & Pahl-Wostl, 2012). Debates about responsibility may thus be avoided in attempts to rejuvenate the outdated and inefficient USSR water infrastructure that is still aimed at large-scale cotton production.

II.4.2 Governance

II.4.2.1 Goals

In the advent of an independent Uzbekistan, President Karimov believed it was his duty to protect vital industries – like agriculture – to take care of its citizens (Merry, 2004; Blackmon, 2021). Just as he introduced little liberalization and privatization in agriculture, that reason might explain why water governance also stayed centralist and authoritarian. Karimov's principal goal was to uphold cotton production and enlarge the petroleum industry (Ahrens & Hoen, 2013; Ruiz-Ramas & Hernández, 2021). Since the USSR had already invested heavily in this, water governance would not change much (Jalilov et al., 2013; Menga, 2018; Hamidov et al., 2020).

However, his successor, current President Mirziyoyev, announced major economic reforms with his *New Uzbekistan* agenda. The country should escape from its isolation and evolve into an important player in Central Asia through privatization and liberalization (Anceschi, 2019; Blackmon, 2021; Ruiz-Ramas & Hernández, 2021). Umarov et al. (2019) see an expansion of the greenhouse horticulture area in Uzbekistan appearing on the agenda to bolster efficiency in water governance and back food sovereignty. An international donor clarifies how this reform agenda affects water governance:

> *"President Mirziyoyev understood that the current Uzbek water governance was no longer sustainable. He developed a government strategy, followed by a resolution, to recognize key economic and social sectors. The strategy focuses on six areas to improve water governance – water use, saving technologies, improvement of the conditions of irrigated land, digitization, introducing some market mechanisms, and including human resources. With*

those six targets and some underlying indicators, he hopes to improve irrigation and drainage in Uzbekistan. The strategy should cost around three billion and runs for about seven years."

At the same time, he is critical of how these reforms will be implemented in practice. Compared to Kazakhstan, he perceives that Uzbekistan, together with Turkmenistan, still focuses primarily on the socioeconomic interests of water rather than the environment, giving the example of the Aral Sea policies under Mirziyoyev:

"The governments are not concerned with the state of the sea, they do not want to send that much water there because it would decrease agricultural production. Their priorities are to create jobs and increase agricultural production. You need water for that."

From this it be concluded that the goals of the government are ambivalent when it comes to water governance. Although these new goals were institutionalized at the insistence of international donors, these goals do not always seem to be pursued (Hamidov et al., 2020). Regional actors prefer to maintain the former USSR water governance to allow their cotton to flourish, a prevailing economic goal (Veldwisch & Mollinga, 2013; Hamidov et al., 2020).

II.4.2.2 Formalization and composition

Following the same path as the USSR, Minvodkhoz initially lasted in the newly independent republic along with the emigration of the Ministry of Agriculture to Uzbekistan. Oblastvodkhozes and rayvodkhozes would continue to allocate water among kolkhozes and maintain the infrastructure on behalf of Minvodkhoz (Zinzani, 2015c; Hamidov et al., 2020). Except for the merger of Minvodkhoz with the Ministry of Agriculture in 1997 into the creatively named Ministry of Agriculture and Water Resources, the Uzbek water governance did not change radically from the USSR (Zinzani, 2015c). The rationale behind this union was that one government institution should be able to view the water and agriculture issues more comprehensively and could enforce adjustments more easily (Hamidov et al., 2020). Outside this institutional alteration, Karimov would keep Uzbekistan after its independence close to Soviet era governance (Herrfahrdt-Pähle & Pahl-Wostl, 2012). *"On forty per cent of the land, the state still decides what should be grown. So, that is cotton or wheat, with certain output requirements for you as farmer,"* an international representative reiterates. Hence, Karimov would never enact a new *Water Code* or any other strategy since the USSR – the current governance was perceived to sufficiently support cotton cultivation in the developing country (Zinzani, 2015c).

Land reforms put pressure on Tashkent to change its water governance (Herrfahrdt-Pähle & Pahl-Wostl, 2012) by transferring the management of irrigation infrastructure to its users – among which, farmers (Zinzani, 2015a). The Uzbek central government conceded, also following pressure from donors

(Herrfahrdt-Pähle & Pahl-Wostl, 2012; Veldwisch & Mollinga, 2013; Zinzani, 2015c). Oblastvodkhozes and rayvodkhozes were dismantled and replaced by Basin Irrigation Systems Authorities (BISA) and Irrigation Systems Authorities (ISA) respectively (Zinzani, 2015a; Hamidov et al., 2020). Tantamount to the oblastvodkhozes, the BISAs would be financed by the state to manage the key water infrastructures in the country. These bodies would likewise inherit the responsibility of allocating water resources to its users in the basins (Hamidov et al., 2020). In total, ten BISAs would be established[38] in 2003 to enforce IWRM within a hydrographic area – a transition driven by the Uzbek Minister of Agriculture and Water Resources wanting to limit the power of hokims in water governance (Zinzani, 2015c). With the approval of ICWC, this reform allowed President Karimov to centralize water governance in Uzbekistan through its agricultural minister (Zinzani, 2015c; Hamidov et al., 2020). For that reason, Herrfahrdt-Pähle and Pahl-Wostl (2012) argue that water governance became more centralized after the reforms. ISAs were tasked to distribute water in a timely and fair manner to WUAs (Hamidov et al., 2020). They decide on the quota and control the irrigation infrastructures across WUAs (Zinzani, 2015c). It could in due course be said that the competences of these new water agencies do not significantly differ from their Soviet era predecessors (Zinzani, 2015c).

Following the examples of the Kazakh and Kyrgyz, Uzbekistan started to explore the added value of WUAs in avoiding water losses. Forasmuch as international donors pushing for the introduction of WUAs, it would be the hokim of the Khorezm oblast that took the initiative in 2000 to establish a few WUAs in his province (Veldwisch & Mollinga, 2013; Zinzani, 2015a), although he first needed to obtain the blessing of Tashkent to conduct this experiment (Hamidov et al., 2020). The experiments would cause the establishment of WUAs in 2000 to manage the water infrastructure at former kolkhozes across the country (Veldwisch & Mollinga, 2013). A decree[39] would strictly define their characteristics and responsibilities: WUAs would be hierarchically organized and rely on the relevant BISA and ISA for their resources and powers to arrange water distribution among farmers, maintain the infrastructure, and collect tax (Rahaman & Varis, 2008; Herrfahrdt-Pähle & Pahl-Wostl, 2012). If in an area no WUA would be present, it could be grounded voluntarily by its users (Hamidov et al., 2020). Donors assisted in the proliferation of WUAs in Uzbekistan to help users to switch from USSR governance practices (Veldwisch & Mollinga, 2013; Zinzani, 2015a) by succeeding former collective farms in the governance and distribution of water resources (Rahaman & Varis, 2008).

In practice, hokims remained influential in water governance. Most of the WUAs would be established by hokims while referring to national policies (Veldwisch & Mollinga, 2013). The control of oblasts over WUAs is high due its hierarchical governance structure. Many oblasts try to expand local agricultural production through WUAs instead of instituting IWRM (Zinzani, 2015a). The Uzbek Ministry of Water Resources has ergo been accused by Veldwisch and

[38] Cabinet of Ministers' Decree No. 320, 2003.
[39] Cabinet of Ministers' Decree No. 8, 2002.

Mollinga (2013, p. 24) to be an *"irrigation-oriented organization,"* which uses WUAs to mask its actual intentions. A concern that has been raised by foreign officials in interviews too. The formally independent WUAs do not seem to be autonomous but strongly determined by informal institutions (Herrfahrdt-Pähle & Pahl-Wostl, 2012). On the one hand, the central government appears to be pursuing specific agricultural goals (Veldwisch & Mollinga, 2013; Zinzani, 2015a). On the other hand, hokims possess great influence over the governance of the WUAs, redirecting water resources locally to serving their objectives (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Veldwisch & Mollinga, 2013). The extent to which its governance has been centralized and formalized by Tashkent, while offering space for informal arrangements to adjust allocations and the lack of participation of users in decision-making, seems to resemble USSR conception of governance in WUAs and Uzbek water governance at large (Hamidov et al., 2020). Reforms in water governance can be described as a reproduction of USSR governance infrastructure (Hamidov et al., 2020).

II.4.2.3 Participation, durability, and dependency

Water governance in Uzbekistan can be said to be hierarchical, the state strictly formulates water consumption at farm level (Herrfahrdt-Pähle & Pahl-Wostl, 2012). Formally, WUAs should actively involve users in decision-making, but in practice many farmers do not know how their water governance is organized (Rahaman & Varis, 2008). User participation is lacking in governance, decisions are commonly made by regional elite without informing users *ex ante* (Zinzani, 2015a; 2015c). Many farmers consider the WUAs as yet another administrative level imposing policies on them, not as an opportunity to organize their water governance more collectively, Rahaman and Varis (2008) and Hamidov et al. (2020) distil. This system of self-government of farmers would never bear the democratic principles as anticipated: within the margins of the centrally opted polices, regional elite could *de facto* take unilateral decisions on its execution (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Zinzani, 2015c; Hamidov et al., 2020). A grower experiences that *"hokims, local governors, have great influence in the system. They basically determine the full governance in their municipalities."* It would become a top-down organization at local level (Veldwisch & Mollinga, 2013), whose creation and form has been dictated by Tashkent (Zinzani, 2015c).

Marginalization of participation is reinforced by the Uzbek central agricultural planning system, in which the hokims are personally accountable for local cotton production and logically seek for opportunities to achieve their quotas (Herrfahrdt-Pähle & Pahl-Wostl, 2012). This central agricultural system and the concept of water as state property (Herrfahrdt-Pähle & Pahl-Wostl, 2012) make water governance directly a segment of the central governance in Uzbekistan (Herrfahrdt-Pähle & Pahl-Wostl, 2012), granting the state more control over their liberalized farmers (Veldwisch & Mollinga, 2013). Or, as Zinzani (2015c, p. 121) summarizes the evolution of water governance in Uzbekistan: *"Reform does not necessarily mean reduction of state control."*

The introduction of WUAs in the Uzbek countryside would be mostly the result of the efforts of international donors. An Uzbek grower explains that collaboration among farmers has not been a tradition in the country: *"Still, the region lacks cooperation unless there is international support for it, as attracted by the national government."* Similar to in Kazakhstan and Kyrgyzstan, donors have advocated for the creation of WUAs as a vehicle for decentralization, economic development, and liberalization (Zinzani, 2015a). The development of WUAs has as a consequence been highly influenced by the international trends in water governance, not considering regional customs or circumstances (Veldwisch & Mollinga, 2014; Zinzani, 2015a). That mismatch gave hokims the chance to intervene in the governance of WUAs, trying not to lose influence over local water management (Zinzani, 2015a; 2015c). Under the guise of self-governance, co-financing (Veldwisch & Mollinga, 2014), and a representative of local communities (Zinzani, 2015c) – as continuously promoted by the donors – regional elite would be able to take control of the WUAs, sometimes even explicitly by trying to bring the WUAs back within the administrative borders of their rayons instead of governing hydrographic areas (Zinzani, 2015c). Since the governance of WUAs has only been institutionalized to a limited extent in Uzbek law, this gave regional elite some freedom to organize them (Herrfahrdt-Pähle & Pahl-Wostl, 2012).

II.4.2.4 Resources

What did change immediately after the dissolution was that the Uzbek now had to pay for the maintenance of their extensive irrigation infrastructure, which the pristine economy could not bore (Zinzani, 2015a). Locally, the reforms did not much improve the independency of farmers, which are still captured in a USSR alike governance system centrally commanding what to do (Veldwisch & Mollinga, 2014; Hamidov et al., 2020). As in the USSR, irrigation water remains basically free, but since the water remained owned the state (Herrfahrdt-Pähle & Pahl-Wostl, 2012) and the WUAs would be hierarchically governed by hokims and their clan serving their own interests (Veldwisch & Mollinga, 2014; Zinzani, 2015a), innovation in water governance by its users is restricted and inefficient cultivation systems are generally prolonged because of this ownership deficit perceived by farmers (Herrfahrdt-Pähle & Pahl-Wostl, 2012). Both growers and officials are concerned about the consequences of this free access to water: *"In Uzbekistan, you can use a vast amount per year regardless of what you need or do."* Because *"[...] why would you invest in efficiency as farmer,"* they respond. Farmers not only do not feel responsible for the maintenance of the water infrastructure but also refuse to pay for unfair distributions (Zinzani, 2015c): a vicious circle that erodes the potential of WUAs in decentralized governance (Hamidov et al., 2020).

Consequently, the water intake has been increasing and the irrigation infrastructures are deteriorating quickly because of this same ownership issue (Hamidov et al., 2020), stipulated by financial shortages at local level to carry out the necessary maintenance and control (Veldwisch & Mollinga, 2014). The

latest trend in Uzbekistan has been to introduce public-private partnerships to overcome financial deficits in water governance. Questionable is how these infrastructural resources and commodities will then be redistributed, a foreign official expresses:

> *"There are, for example, pumping stations that do not have a permission but are tolerated by local politics because of personal interests. Nowadays, many of those pumping stations are becoming public-private partnerships. That is a new hype here and seen as a solution to a lack of government finances. Most pumping stations have been converted into a public-private partnership, but that process was not transparent. Because, which company now owns these pumping station? It is very vague, but we know that many pumping stations have been bought by cotton clubs, to provide water to small cotton farmers. So, the control of the government is gone. Who controls who pumps what?"*

To summarize, the water resources are principally still possessed by the central government of Uzbekistan, in line with the USSR conception (Herrfahrdt-Pähle & Pahl-Wostl, 2012; Hamidov et al., 2020). The *New Uzbekistan* agenda seems to imply a redistribution of resources to users (Anceschi, 2019; Blackmon, 2021; Ruiz-Ramas & Hernández, 2021), WUAs failed to do (Zinzani, 2015c). A foreign official rehashes: *"The real fundamental reforms are yet to come. There was a decree from the president that should give tenant farmers more rights, but that still leaves the problem of crop placement unresolved."*

Table 15 – Characteristics of Uzbek water governance

Characteristics	**Uzbek water governance**
Conception	USSR conception of large-scale cotton cultivation lasted
Infrastructure	Inefficient and outdated infrastructure tailored to cotton
Goals	Cotton production remains dominant, bit ambivalent
Formalization	Centralized with informal arrangements
Composition	National and regional actors decide on water allocations
Dependency	High as the government depends much on hokims for the execution of centrally formulated water governance
Participation	No active participation of farmers, authorities dominate
Durability	Established government actors govern
Resources	Water resources principally owned by the central government, redistribution indicated in policy reforms

Looking at Table 15, the water governance in Uzbekistan can be recapped with the latter aspects:

- Regional and local institutions have been established to centralize and formalize water governance in Uzbekistan;
- Hokims possess great influence over local governance bodies, allocating water through WUAs to serve their own objectives, and
- Farmers are not included and therefore do not feel responsible for the governance of the WUAs nor its irrigation infrastructure maintenance.

Appendix III – Interview protocol

Interview protocols serve as a guide for the researcher for interviews conducted as part of a research to collect all data required for further analysis (Harrell & Bradley, 2009; Yin, 2014). The protocol developed in Table 16 ensures that all elements of the conceptual framework of Figure 1 are appropriately covered during the conservations. Not all questions were raised in all interviews explicitly, this protocol rather served as a guideline for the semi-structured interviews, conditional to the conversation and expertise of the interviewee. The protocol had been developed for an interview of an hour.

Table 16 – Interview protocol

Part	Focus	Information / questions
Start *(2 minutes)*		Dear _____ , My name is Jesse Schevel from Delft University of Technology, the Netherlands. Thank you for being interested to contribute to my thesis: "*Red tomatoes along the Silk Road: An institutional analysis of the evolvement of transitions in centralist and authoritarian regimes of Central Asia,"* a research carried out for the Master of Science programme Engineering and Policy Analysis. I am eager to learn more about your job to get an understanding of how water is governed in Kazakhstan, Kyrgyzstan, and Uzbekistan. Based on the case you brought, I hope we will get a better picture of this in this conversation. Feel free to take the lead and tell me as much as possible about your case, I will tune in for additional questions to clarify the case. As said, I will treat your responses confidentially. The notes will be destroyed after I have completed this research and published the results. Do you have any questions before we proceed? *[If still desired, the participant introduces himself briefly]*
Case / job *(3 minutes)*		*[Participant gives a an initial introduction to the case or their job]*

Governance (25 minutes)	Formalization	1. What role does the national government of Kazakhstan/ Kyrgyzstan/Uzbekistan play in water governance? 2. Relying on your experiences, to what extent has the decision-making, management, or supervision of water been centralized and formalized by the national governments? 3. Has this water governance anywhere been formally recorded or has this structure evolved over time? 4. Is the current water governance easily adaptable? 5. To what extent has the local level room to make adjustments in the water governance? 6. If so, how does the national government perceive this?
	Goals	1. According to you, what are the main objectives the national government of Kazakhstan/Kyrgyzstan/Uzbekistan pursues when it comes to water? 2. How do these objectives align with the water interests of other actors (locally or abroad)? 3. What happens if these objectives do not align?
	Participation and durability	1. To what extent are actors other than the government included in the decision-making, management, or supervision of water? 2. On what criteria are actors selected to participate? 3. How is it possible for (new) actors to join? 4. In your view, how does the government perceive the participation of (new) actors in water governance?
	Composition	1. What actors are or have been included in the decision-making, management, or supervision of water? 2. How have foreign actors been included in this network? 3. Does the composition of participants adjust to specific issues or is the configuration of the network more stable? 4. What role does the government take in such networks?
	Resources	1. According to you, to what extent have actors other than the government been influential in shaping the decision-making, management, or supervision of water? 2. What reasons can be identified for their influence? 3. Are there any resources that these actors possess that the government needs to realize its objectives *(e.g., commodities, properties, power, etc.)*? 4. Are there any monopolies in the water governance?
	Dependency	1. How does the government respond to this interdependency to achieve its goals *(e.g., supporting or vetoing cooperation)*? 2. How is that in case of interdependencies with foreign actors? 3. Are actors (incl. the government) open to redistribute resources in order to achieve their goals?

Path dependency (25 minutes)	Political (conception)	1. Does the government of Kazakhstan/Kyrgyzstan/Uzbekistan base policy making on distinctive societal ideas and ideals? 2. Is this line of thought historically inspired *(e.g., has it been obtained from the USSR)*? 3. Has the government's conception developed post-Soviet? 4. To what extent have these societal ideas and ideals an effect on the governance of water?
	Technological (infrastructure)	1. Does the physical infrastructure of water serve the objectives of the government? 2. How does the government deal with their interwovenness when it comes to changing its structure?
Conclusion (5 minutes)		Well, _____ . Thank you for introducing you to the complexity of your job and this insightful case. From my side, those were all the questions that I wanted to ask. Do you have any final thoughts on the case/your job that you would like to share? Thank you for your time.

Appendix IV – Data management plan

[Shortened version of the approved plan by the TU Delft Human Research Ethics Committee (HREC) on January 5, 2024]

IV.1 Data description and collection

A general description of the type of data that have been used in this thesis, including any re-used data, are provided in Table 17.

Table 17 – General description of the type of data used

Type of data	File	How will data be collected	Process of processing	Storage location	Access
Name and e-mail address of the actor	.xcl file	Interviewees are recruited confidentially by H.M. Embassy of the Kingdom of the Netherlands in Astana, Republic of Kazakhstan, and H.M. Honorary Consuls in Tashkent, Republic of Uzbekistan, and Bishkek, the Kyrgyz Republic. Extant participants can equally nominate new candidates for voluntary participation. Any participant may only be approached by the corresponding researcher with informed consent.	To contacting the interviewees if necessary (if given consent for that) for follow-up questions or to validate the aggregated and anonymized insights gained in the interviews.	At the personal Microsoft 365 account of the author at the protected TU Delft server, separately from the anonymized data of the interviews. This data storage will automatically be deleted after graduation and will never be able to be accessed by national authorities like customs.	Author
Fully and irreversibly anonymized data on the actor's perception of the aspects of transitions in energy and water governance in centralist and authoritarian regimes.	.docx file	Interviews with informed consent	To gain a holistic understanding of the phenomena of transitions in energy and water governance in centralist and authoritarian regimes.	At the personal Microsoft 365 account of the author at the protected TU Delft server, separately from the personal data. This data storage will automatically be deleted after graduation and will never be able to be accessed by national authorities like customs.	Author and responsible researcher

IV.2 Documentation and data quality

The research methodology is a key part of a thesis. It could be seen as a scientific recipe that explains how data has been collected and analysed. Chapter 3 of this thesis will justify the selected research method as most fruitful approach to answering the research problem and questions posed in Chapter 1. As first step, its Section 3.1 will elaborate on the research design of this thesis. It will become clear why the explorative character of this methodological approach perfectly suits the thesis' qualitative purpose to scrutinize new concepts. Although qualitative studies are more subjective, their flexible data collection methods are ideal for discovering uncharted phenomena. Instead of generalizing findings to the population, the aim of exploratory research is to gain a deep understanding of a phenomenon. A case study coloured by interviews and literature will be the main sources to retrieve these data, Section 3.2 explains. Section 3.3 will discuss how the data has been collected for the case study. The protocol that has been guiding the interviews will be included in Appendix III. A data management plan, approved by the TU Delft Human Research Ethics Committee (HREC), can be found in Appendix IV. Appendix V will cover the informed consent statement. The final segment of this chapter, Section 3.4, will proceed with the analytical methods used to examine the data.

IV.3 Storage and backup

Data will be saved *pro temp* at the personal Microsoft 365 account of the author at the protected TU Delft server, separately from the anonymized data of the interviews. Data will only be accessible to project members. This data storage will automatically be deleted after graduation and will never be able to be accessed by national authorities of the Republic of Kazakhstan, the Kyrgyz Republic, or the Republic of Uzbekistan, like customs.

IV.4 Legal and ethical code of conduct

IV.4.1 Personal data

For administrative purposes of this research, the names and e-mail addresses of participants will be collected and stored pro temp. To minimize PII, only their name and e-mail address of participants will be stored during this research pro temp, separately from the anonymized results. Full and irreversible anonymization of results, irreducibility of responses (by saving them pro temp at the personal Microsoft 365 account of the author at the protected TU Delft server, separately from the personal data of the interviewees), and preventing insights from being traceable through citation or any other referral that might expose the interviewee indirectly should limit re-identifiable PII. An interview will solely be conducted with informed consent. Participation is entirely voluntary: participants can withdraw at any time and are free to omit any questions. Removal of data of a specific participant ex post

is not possible due to full anonymization of data, implying the data cannot be traced back.

Research in Middle Asian countries may also present a language barrier when participants have not (sufficiently) mastered the English (or Russian) *lingua franca*, which makes a good interpretation of the participants' contributions difficult. This could potentially lead to misunderstanding or incorrect interpretation of the actor's perspective, possibly with adverse consequences for the actor if his responses are misunderstood and the data are re-identifiable. Dependence on (local) interpreters might entail another risk for a participant in those informal networks. The presence of a (well-known) (local) translator could lead to a participant giving desirable answers instead of his actual view on the matters out of security reasons, or, in extremis, there may be an interest for translators to adjust the perspective of an actor in translating his response by giving another (presumably more positive) impression of the situation as expressed by the actor.

In utmost respect of local customs, habits, and traditions while maintaining EU legal and academic standards, His Majesty's Embassy in Astana, Kazakhstan, and His Majesty's Honorary Consuls in Tashkent, Uzbekistan, and Bishkek, Kyrgyzstan will be actively consulted on how to best interact with local actors and authorities. They know best what customs and regional sensitivities prevail in a neighbourhood and how (informal) networks function locally. That is why, as a neutral actor possessing local knowledge, they will also initiate the first contact with candidate participants if the corresponding researcher may approach them for an interview. For that same neutrality rationale, civil servants employed by the Dutch Ministry of Foreign Affairs or interpreters recommended by them will be utilized to ensure a proper and confidential translation of actors' contributions to counter any miscommunication *ex ante*. They are independent (i.e., not part of any informal network and have sufficient distance from national politics or local sensitivities) and have no *animus nocendi*, ergo guaranteeing participants that they can confidentially and safely share their perspective on this subject without having to fear for any repercussions. This will actively be communicated to the participants *ab initio*.

IV.4.2 Confidentiality and sensitivity of data

The *locus in quo* of this research is the Republic of Kazakhstan, the Kyrgyz Republic, and the Republic of Uzbekistan. In addition to their unique energy and water governance, these states have been selected mainly because of their centralist and authoritarian governance characteristics. Common in such regimes is that actors *de jure* are or *de facto* feel less free to express their honest opinions and views on matters, especially when it concerns government affairs because of the *posse comitatus*. Contributing to this research might pose a risk to participants, especially when openly questioning the *modus operandi* of authorities. Likewise, the hierarchical governance culture in Central Asia may make it challenging to get in touch with the experts *nec precario* of their

supervisors and make participants hesitant to be interviewed to thwart an increased risk of investigation by *inter alia* (local) authorities or their supervisor *nisi prius* gaining their *intra vires* permission. It could even be that supervisors prohibit their experts *ex ante* from participating. When allowed to participate, this might result in desirable answers instead of resonating their actual views on matters because they feel pressure from their supervisors, who had to grant them consent. Therefore, in all energy and water governance cases that are researched, the Kazakh, Kyrgyz, and Uzbek authorities and supervisors will be approached first and informed about the purpose and M.O. of this study so that they are not surprised or taken by surprise by this research, limiting the risks of participants on future investigation. N.B., the explicit aim of this study is to include their perspective as an actor in the research as well and to involve them. If they do not oppose the research, participants (or their supervisors) may be less hesitant to participate. The embassies of the respective countries to the Kingdom of the Netherlands will also be informed first.

In the past, there have been some conflicts among the governments of the Kyrgyz Republic, the Republic of Tajikistan, and the Republic of Uzbekistan and respective local authorities and communities about the distribution of water and energy resources. These tensions can still be perceived locally in the border area of the latter two. Due to the existing security risk in the Kyrgyz-Tajik border area, as identified by the Dutch Ministry of Foreign Affairs, no research will be conducted in that region to maintain the safety of the researcher. This thesis does explicitly not aim to address the root causes of any of those (past) conflicts between Kyrgyzstan, Tajikistan, and Uzbekistan and will accordingly not be discussed in the interviews nor the political perspective of actors will be asked on the distribution of water and energy resources among countries. This research will purely focus on technological and institutional aspects of the transitions of transnational infrastructures; eliciting political views on past conflicts between countries as well as on the bilateral relations of the countries is not of added value and will therefore be omitted both in the interview questions and in the analysis. This has *pro forma* again been included in the informed consent too. By also actively communicating to the authorities and the participants that this research does not delve into the energy and water conflicts between the countries, this should reduce the risk of investigation for participants significantly.

IV.4.3 Intellectual property

Ipso jure, EU legislation regarding informed consent and the protection of personal privacy (e.g., GDPR) will also apply in processing data of non-EU stakeholders. This implies *de minimis* that the interviews only will be conducted with informed consent and that the data will be processed anonymously and confidentially. Participants may not even be approached without gaining their informed consent to contacting them to participate. Regardless of national legislation or local customs, none of the data will be accessible to others than the corresponding and responsible researcher and will

only be stored pro temp – for the time being of this research. Local authorities will never be accredited access to any data.

IV.4.4 Categories of data subjects

Governments, NGOs, academic scholars, and users of energy and water like local farmers.

IV.4.5 Risk identification

Prima facie, only *propria personae* will be involved in this study. All participants are all *sui juris*. However, one could argue that citizens in centralist and authoritarian regimes might classify as vulnerable. *In arguendo*, the actors will be involved in this research and provided with the informed consent statement as well as additional information about the scope, goal, and data management plan of this study. The informed consent form includes clear information about the research goals, what to expect from participants, what risks could arise during the research, and what steps will be taken to limit those risks. This in order to allow participants to make an informed decision on whether to participate in the research, which will always voluntarily and without any justification and their own choice.

IV.4.6 Storage after finishing research

All data will be stored at the personal Microsoft 365 account of the corresponding author, which will automatically be deleted after graduation.

IV.5 Data sharing and long-term preservation

Protecting the PII of individual participants is key for their safety and security, in particular given the plurality and influence of informal networks in centralist and authoritarian regimes, reducing the chances of anonymity. Full and irreversible anonymization of results, irreducibility of responses (by saving them pro temp at the personal Microsoft 365 account of the author at the protected TU Delft server, separately from the personal data of the interviewees), and preventing insights from being traceable through citation or any other referral that might expose the interviewee indirectly should limit re-identifiable PII. Data can never become accessible to anyone other than the corresponding and responsible researchers and will automatically be deleted after graduation.

IV.6 Data management responsibilities and resources

The responsible researcher, Dr H. G. van der Voort, can be contacted after finishing this research: H.G.vanderVoort@tudelft.nl.

Appendix V – Informed consent statement

[To be read aloud or shared in writing]

You are cordially invited to participate in a research study titled:

Red tomatoes along the Silk Road:
An institutional analysis of the evolvement of transitions in centralist and authoritarian regimes of Central Asia

This study is carried out by Jesse Schevel, LL.M. as part of his master thesis for the Master of Science programme Engineering and Policy Analysis at the Faculty of Technology, Policy and Management of Delft University of Technology under the supervision of Dr H.G. van der Voort.

The purpose of this research study is to learn to what extent transition theories are capable of explaining and managing the evolution of cross-border infrastructural transitions in centralist and authoritarian regimes. The data retrieved will be used as input to gain a holistic understanding of transitions in energy and water governance in the Republic of Kazakhstan, the Kyrgyz Republic, and the Republic of Uzbekistan. Data is solely applied anonymously to get a better picture of transitions in these countries. We will be asking you to present your individual perspective on the evolution and management of transitions in your respective energy or water domain in one or multiple of the aforementioned nations. No political statements are expected from you but rather technical and institutional insights.

As with any online activity, the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. This interview will be conducted fully anonymously. No personal data will be collected, apart from your name and e-mail address. All data obtained in this interview will be fully anonymised and only temporarily – for the time of this research – be stored at the personal Microsoft 365 account of the author at the TU Delft server, separately from your personal data to limit traceability. During the research, only the author and responsible researcher will have access to this data. Afterwards, all data will be deleted.

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any questions. In case of questions and/or comments, you can directly contact the author or responsible researcher of this study through:

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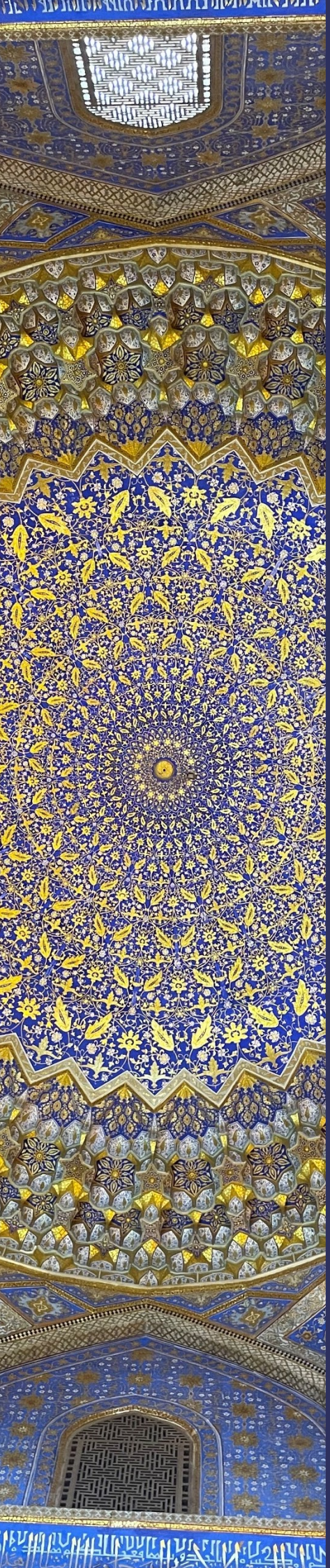

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