# CHANGING PRINCIPLES OF INTERNATIONAL WATER LAW IN CENTRAL ASIA: ADDRESSING THE CRISIS, FROM CUSTOMARY PRINCIPLES TO VIRTUAL WATER FOOTPRINT

AIGUL ARYNOVA

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# CHANGING PRINCIPLES OF INTERNATIONAL WATER LAW IN CENTRAL ASIA: ADDRESSING THE CRISIS, FROM CUSTOMARY PRINCIPLES TO VIRTUAL WATER FOOTPRINT

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## ABSTRACT

CHANGING PRINCIPLES OF INTERNATIONAL WATER LAW IN CENTRAL ASIA: ADDRESSING THE CRISIS, FROM CUSTOMARY PRACTICE TO VIRTUAL WATER FOOTPRINTS

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Laws regulating transboundary water allocation in Central Asia discriminate water interests of upperstream states and contribute to the excessive water use by downstream states. The present research studies water conflict in Central Asia emphasizing the changing impacts of international water law and its cardinal principle, the equitable and reasonable utilization (ERU).

A review of the main water regime which had developed in Central Asia including agreements signed following the USSR's collapse is conducted. This allows questions to be asked about the impact and effectiveness of international water law and the ERU principle in the regional water allocation scheme. The results reveal that current water sharing does not recognize the ERU principle and is discriminatory towards upperstream states. In order to offer solutions for developing upperstream states, this paper recognizes that multifactor standard of the ERU, as well as countermeasures and foreclosure of future use principles set ground for just water sharing.

Additionally though, adopting and elaborating concepts crucial to the new sustainability discourse – especially the concepts of *water footprint* and *virtual water* – it will be shown how the current regime by allowing wasteful water use, permissively contributes to the regional water crisis. This is demonstrated through a review of water footprints on agricultural production in the region.

It is recommended that further research is carried out on integration of the ERU principle to the water allocation laws of Central Asia, particularly on the penalization of wasteful water use and adoption of interdisciplinary concepts and regulation across the region.

Keywords: International Water Law, Equitable and Reasonable Utilization, Virtual Water, Water Footprint, Central Asia

# ÖZ


ORTA ASYA'DAKİ ULUSLARARASI SU HUKUKUNUN DEĞİŞEN İLKELERİ: KRİZE YÖNELİK, GELENEKSEL UYGULAMALARDAN SANAL SU İZLERİNE KADAR

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Orta Asya'da sınırlararası su tahsisini düzenleyen yasalar, yukarı akarsu devletlerinin çıkarlarını ayrı tutarken, aşağı havza devletlerinin aşırı su kullanımına katkıda bulunmaktadır. Mevcut araştırmalar, Orta Asya'daki su ihtilafını uluslararası su hukukunun değişen etkilerine ve bunun temel prensibine, adil ve makul kullanımına (ERU) vurgu yaparak incelemektedir.

Bu çalışmada SSCB'nin çöküşünü takiben imzalanan anlaşmalarla birlikte Orta Asya'da geliştirilen başlıca su rejimi gözden geçirilmiştir. Çalışmanın ana konusu olarak söz konusu bölgesel su tahsisi rejimi ele alınırrken uluslararası su hukukunun etkisi ve etkinliği ve ERU ilkesine uygunluğu sorgulanmaktadır. Çalışma sonucunda ortaya çıkan bulgulara bakıldığında ortay açıkan su paylaşımı mekanizması ERU ilkesin uymamakta ve yukarı akarsu devletlere ayrıcalıklar sağlamaktadır. Gelişmekte olan yukarı havzaa devletler için çözümler sunmak amacıyla, bu çalışma ERU'nun çok faktörlü standardının yanı sıra gelecekteki kullanım prensiplerine ilişkin önlemlerin ve haczedilmesinin adil su paylaşımı için zemin oluşturduğunu kabul etmektedir.

Ek olarak, yeni sürdürülebilirlik tezinde – özellikle su ayak izi ve sanal su kavramlarında - kritik öneme sahip olan kavramların benimsenmesi ve detaylandırılmasıyla fazla su tüketimine izin veren mevcut rejimin bölgesel su krizine nasıl katkıda bulunduğu irdelenmektedir. Bu, bölgedeki tarımsal üretim konusundaki su ayak izlerinin gözden geçirilmesiyle gösterilmiştir.

ERU ilkesinin Orta Asya'daki su tahsis yasalarına entegrasyonu, özellikle de fazla su kullanımının cezalandırılması ve bölge genelinde disiplinlerarası kavramların ve düzenlemelerin benimsenmesi konusunda daha fazla araştırma yapılması önerilmektedir.

Anahtar Kelimeler: Uluslararasi Su Hukuku, Adil ve Makul Kullanım, Sanal Su, Su Ayak İzi, Orta Asya

*To My Mom,*

*Because all that I am, or hope to be, I owe to her.*

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| | |
|---|---|
| AQUASTAT | FAO's information system on water and agriculture |
| CA | Central Asia |
| CAPS | Central Asian Power System |
| CASA | Central Asia- South Asia power transmission project |
| CBD | Convention on Biological Diversity |
| CESCR | UN Committee on Economic, Social and Cultural Rights |
| CIS | Commonwealth of Independent States |
| ERU | Equitable and Reasonable Utilization |
| EU | European Union |
| FAO | Food and Agriculture Organization |
| GDP | Gross Domestic Product |
| GOELRO | Transliteration of the Russian abbreviation for "State Commission for Electrification of Russia" |
| GWh | Gigawatt hours |
| HPP | Hydro Power Plant |
| ICJ | International Court of Justice |
| ICWC | Interstate Commission for Water Coordination of Central Asia |
| IEA | International Energy Agency |
| IIL | Institute of International Law |
| ILA | International Law Association |
| IRWR | Internal Renewable Water Resources |
| IWRM | Integrated Water Resources Management |
| MW | Megawatt |
| SADC | South African Development Community |

| | |
|---|---|
| SREB | Silk Road Economic Belt |
| TARWR | Total Actual Renewable Water Resources |
| UN | United Nations |
| UNCED | UN Convention on Environment and Development |
| UNECE | UN Economic Commission for Europe |
| UNEP | UN Environmental Program |
| UNFCCC | UN Framework Convention on Climate Change |
| UNWC | UN Watercourses Convention |
| USAID | United States Agency for International Development |
| USSR | Union of Soviet Socialist Republics |
| WWII | World War II |

# CHAPTER 1. INTRODUCTION

## 1.1 MOTIVATION

The World Bank warns that by 2050 conflict and migration may emerge from water shortages aggravated by growing demand in the whole world and especially in arid regions like Central Asia (Figure 1) (World Bank, 2016). As annual population growth percentage in all Central Asian states exceeds the world average, it is expected that 13 million more people will live here by 2030 (Abdullaev & Rakhmatullaev, 2015, pp. 849-861). Similar to the population boom, the temperature increase in the region might surpass the global average (Unger-Shayesteh, 2013, pp. 1-3). This has a direct affect to the melting of glaciers. The Aral Sea basin has already lost quarter of its glaciers in the second half of the 20$^{th}$ century (Russel M. , 2018). Climate change scholars predict that another quarter may melt by 2025 and the water share per inhabitant may drop as low as 500 $m^3$ by 2120 (Russel M. , 2018).

Along with the growing demand, water management of Central Asia got entangled in the problems related to the topographic differences of riparian states, as well as political, ethnic, economic tensions and environmental degradation. Because of importance of water to the agriculture, every Central Asian state protects its share of water at the level of national security, which exacerbates already tense political relations. While ethnic clashes in the Ferghana valley killed hundreds in 1990 and 2010, hundreds of thousands fled Kyrgyzstan after the bloody ethnic conflict in 2010 (Mirovalev, 2016).

On the other hand, Afghanistan, which has been overlooked in the water sharing agreements, started to lay claims on its water rights. Central Asian states have not figured out how to include this late-developer into the allocation of already scarce water. The situation is exacerbated by the environmental degradation, the best illustration of which is the desiccation of the Aral Sea, which without proper and timely solution may grow into a serious security threat for the whole region in the near future.

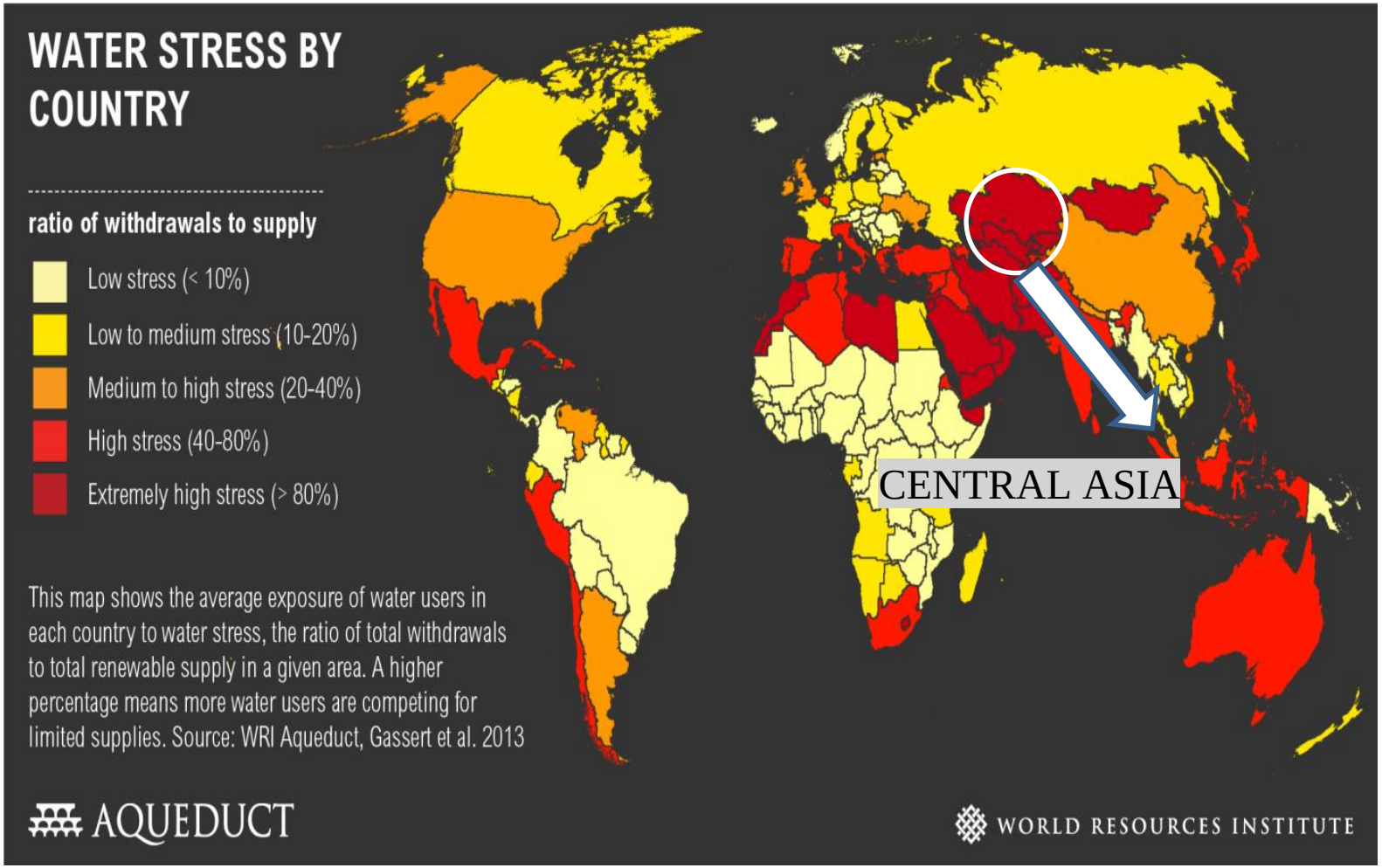


**Figure 1. Water stress by country (World Resources Institute, 2013)**
**https://www.wri.org/resources/charts-graphs/water-stress-country**

While the above-mentioned problems are more prominent, some equally important yet hidden reasons behind water scarcity are rarely discussed and researched. This relates to the consumption of water in the region. It is a well-known fact that, like everywhere else in the world, agriculture is the main consumer of water in Central Asia. With the infrastructure built by the Soviet Union, these lands have been used in irrigation mode, and this system continues up to date.

However, it is rarely emphasized that, despite growing water scarcity, Central Asian states have not paid enough attention to the problem of excessive use and overconsumption. For example, Uzbekistan is the fifth biggest cotton producer after China, USA, India and Pakistan, and its annual revenue from cotton fiber equals to US$ 1 billion (Chapagain & et al., 2006b) (Aldaya & et al., 2010). Cotton industry of the USA, India and China is water efficient because it is rainwater based. On the other hand, high evaporative demand, low effective rainfall and poor soil conditions of downstream Central Asian states bring to excessive withdrawal of water.

While Central Asian states refuse to give up their water consumption habits despite the snowballing water crisis, hydropower projects of upperstream states threaten agriculture with growing rivalry over water. In September of 2018 World Bank together with Islamic Development Bank, USAID, European Bank for Reconstruction and Development and European Investment Bank has agreed to finance $1.7 billion Central Asia and Southern Asia Electricity Transmission and Trade program (CASA-1000) (World Bank, 2018). This is a regional energy trade program that will allow Tajikistan and Kyrgyzstan to sell surplus electricity from HPPs to the neighboring Pakistan, Afghanistan and further to India.

Moreover, in 2013 China's President Xi Jinping, announced the Silk Road Economic Belt (SREB) Initiative with $40 billion Silk Road Fund (Chugh, 2017). Upperstream Kyrgyzstan and Tajikistan have hopes that this "audacious plan" of China might help in supporting their costly hydropower projects.

These two projects may motivate upperstream states to consume more water than before to gain revenues, which may bring to the intensification of tension with downstream neighbors. In the middle of existing problems, finding remedies is essential before a mere competition grows into a destructive war. The water wars discourse in Central Asia began when the ex-president of Uzbekistan claimed that "control over water resources in the republics of Central Asia may lead to a full scale war". Even if war never takes place, poor water and land policies

cause Central Asian states to lose $1.7 billion every year (CA Human Development Report, 2005, p. 6). Moreover, as the World Bank 2016 report suggests, under business-as-usual water management scenario, the Central Asian region can lose up to 11% of its GDP because of water deficit (World Bank, 2016).

## 1.2 OBJECTIVES

Much research has been carried out to tackle the problem of water crisis in Central Asia. Yet, little has been done to eliminate the discriminatory water allocation in the region. The innovation of the present research is in offering to look deeper into the roots of the problem. On the one hand, this research will demonstrate how, when it is in the interest of early developing states, developments in international water law may be disregarded and doctrines of the past be proclaimed when protection of existing and established water interests are at stake.

Central Asian water sharing is set by the allocation quotas of the Soviet Union. Because these quotas prioritized irrigation, upstream Kyrgyzstan and Tajikistan's water interests were immensely discriminated. Their annual water quotas equal to 0.55% and 11.2% respectively compared to 49.35%, 21% and 17.9% allocated to Uzbekistan, Kazakhstan and Turkmenistan, respectively (UN, 2004, pp. 35-36). During Soviet times, to compensate such inequality, downstream Kazakhstan, Uzbekistan and Turkmenistan have compensated upperstream states with fossil fuels needed for electricity production and heating in winter. However, this system of compensation has ceased to exist after the collapse of the Soviet Union.

Upperstream late-developers, Kyrgyzstan and Tajikistan, already exceed their water quotas, as hydropower is their main source of electricity. In order to protect existing uses, downstream neighbors have historically interpreted such water use as harmful and unlawful behavior. Thereby new water development attempts of Kyrgyzstan and Tajikistan have been downgraded and ignored. However, as big hydropower projects get financed, this may open doors for more tension at international level.

Moreover, as McIntyre (2006) claims, conflicts over transboundary waters will more often occur in developing states, because unlike developed states their water infrastructure has yet to develop (p. 201). So, unless timely remedies are offered, a mere competition may grow into a serious security concern.

In order to contribute to the solution of the water problem in Central Asia, the present research studies water conflict in Central Asia emphasizing the changing impacts of international water law and its cardinal principle, the equitable and reasonable utilization (ERU).

Wolf (1999) claims that in arid regions prior uses and downstream needs in general are almost always protected and favored. So this research is based on the assumption that water allocation in Central Asia follows a general practice, and is not based on the ERU principle but on the prior appropriation doctrine instead. In relation to this, a review of the main water regime which had developed in Central Asian including agreements signed following the USSR's collapse is conducted. This allows questions to be asked about the impact and effectiveness of international water law and the ERU principle in the regional water allocation scheme. The special emphasis is made on the later developing upperstream states and on the general misperception that "equity is biased towards the first developer" and that as the result "the late developer can only claim the water resources which have not been utilized already" (Wegerich & Olsson, 2010, pp. 707-717).

The second innovation of present research is in incorporation of interdisciplinary concepts that provide valuable information on wasteful and excessive water use in the region, which traditional hydro-centric studies are often blind to. By introducing the water footprint and virtual water concepts, the goal is to show how current water allocation regime contributes to the regional water crisis by allowing wasteful water use. This is demonstrated through a review of two articles on water footprint of agricultural production in the region.

## 1.3 OVERVIEW OF THE STRUCTURE AND METHODOLOGY

The goal of present research is to study water conflict in Central Asia from the perspective of international water law and its cardinal principle, the ERU. To accomplish this, author uses case study and legal analysis methodologies. While case study provides a platform that allows examining the topic in depth, legal analysis will help to test the hypothesis and point out the main issues. The paper is divided into six chapters, which are described below.

Chapter 2 is divided into two parts. The first part attempts to answer the question of who uses how much water and how in the Aral Sea basin, in which Central Asian states lie. In order to achieve this goal, physical as well as socio-economic characteristics of Central Asian states

are described. This involves information on water resources, climate, as well as the effect of water on population, agriculture and hydropower sectors derived from analytical sources such as the FAO, World Bank, the UN, etc.

The second part of Chapter 2 recognizes the importance of painting the historical picture of water use in Central Asian regions in order to understand the origin and causes of present water management problems. By distinguishing on six main periods in the history of Central Asian region, this chapter will analyze international and local historic records in order to find out what water policies existed during each period.

Water crisis in Central Asia is of interdisciplinary character and it lies in the middle of other important problems. In order to identify origins of conflict and emphasize on possible negative consequences, Chapter 3 will underline political, economic and environmental aspects that directly and indirectly affect water conflict in Central Asia.

Chapter 4 consists of three main parts. First, author questions the impact and effectiveness of international water law and the ERU principle. The goal is to find out whether international water law may provide an appropriate platform for dealing with issues related to water use that suits well to the interdisciplinary character of water conflict of Central Asia. This will include the study of international water law by painting its historical picture, enlisting main sources, describing four patterns of state behavior, and discussing the three customary rules.

Second part of Chapter 4 introduces the equitable and reasonable utilization theory. It discusses the importance of finding a balance between the ERU principle, the no harm rule and prior appropriation doctrine. Further, it is discussed how upperstream late developers may utilize principles of foreclosure of future uses and countermeasures in competition over water with downstream early developers.

In order to utilize findings from the first two parts of Chapter 4, the last third part conducts legal analysis of water regulation in Central Asia from the perspective of legal effectiveness and with reference to the ERU. It recaps the content and language of main regional, multilateral and bilateral treaties signed by Central Asian states between 1991 and 2006. The goal of this legal review is to find out the ERU principle's role in the regional water allocation scheme.

Chapter 5 elaborates on water footprint and virtual water concepts, which are important concepts in the contemporary sustainability discourse. Since agriculture is the main water consumer in Central Asia, a review of two articles on the water footprint of three main crops

in Central Asia is carried out. The goal is to show how the current water allocation regime allows wasteful water use and thereby permissively contributes to the regional water crisis.

As a conclusion, Chapter 6 digests and discusses the main findings from the previous chapters with the purpose of making recommendations for further research.

# CHAPTER 2. PHYSICAL, SOCIO-ECONOMIC ASPECTS AND HISTORY OF WATER USE IN CENTRAL ASIA

Different factors related to the circumstances of the basin should be considered in order to identify the equitable water needs of states sharing transboundary water resources. Moreover, in order to understand contemporary water problems, it is useful to examine the past water policies. Based on these, Chapter 2 is divided into two parts.

First, this Chapter will explore the physical, social and economic aspects of Central Asian states with the goal of finding out the true nature and extent of each state's dependence on the shared water resources. To answer the questions of who uses, how much water and how in the Aral Sea basin, in which Central Asian states lie, first the physical aspects of the Aral Sea basin will be analyzed followed by examination of the socio-economic aspects of water in Central Asian states. The physical aspects of this Chapter will define the drainage area, the topographic characteristics of the basin, contribution of each state's flow to the total runoff as well as the climatic conditions of the region, as well as the effect of water on population and main water consuming industries.

The second part of this Chapter acknowledges that disputes over water in Central Asia are not new; they have a long and painful history. Central Asia had been and still is a strategically important region, which is why it was conquered many times by different empires and dynasties. Every conquest has left a certain legacy behind in many aspects of life in the region, including the water management. While some conquests have been beneficial, bringing in new knowledge and infrastructure, others were destructive and resulted in environmental degradation and water conflict. The goal is to paint the historical picture of water use in the region in order to find out and understand the origin and causes of present water management problems.

Based on the analysis of international historic records, author distinguishes on the main six periods in the history of Central Asian region in order to find out what water policies existed during each period. These six periods include the medieval times, the Arab rule, the Mongol rule, the Tsarist Russia's rule, the Soviet Russia's rule, and the Post-Soviet time.

## 2.1 PHYSICAL ASPECTS

The Aral Sea basin covers an area of 1 550 000 km$^2$. It is a closed basin, which mainly lies on the territory of five former Soviet Central Asian republics[1] plus Northern Afghanistan and a small part of Iran. In the north it borders with Russia, in the east with China, in the south with Pakistan and in the west with Iran, the Caspian Sea and Russia again (Figure 1). Connecting the eastern edge of Europe and the western edge of Asia, the location of the basin is strategically important in linking Europe with Asia (Varis & Kummu, 2012).

Afghanistan and Iran have not been part of the water distribution in the region in the last decades despite their contribution to the annual runoff the basin (9.3%) (Table 1). The reason behind such exclusion is an unstable political situation in Afghanistan and Iran's very small share in the runoff. However, this does not mean that Afghanistan and Iran can not claim for their share of water in the future. Nevertheless, due to the absence of these two states in water allocation agreements and insufficiency of available data, this thesis will limit its scope to the five Central Asian states only. Some information on Afghanistan will be provided in the chapter on physical aspects of the Aral Sea basin.

The Aral Sea basin is extremely varid geographically. On the one hand, there are mountainous water "monopolies" with a deficit of cultivable lands. For example, 90% of the territories of Kyrgyzstan and Tajikistan are covered with mountains, and they serve as "water towers" of the Central Asian region (CAwater-info). These states are home to some of the highest mountains in the world (the Communism Peak in Tajikistan has a height of 7 495 m above the sea level (FAO, 2013) ). They used to be called *Ok Doglar* ('white mountains') in the ancient times before the Chinese warriors renamed them to the Tien Shan ('heavenly mountains') after occupation in the 10$^{th}$ century (Dukhovny & de Schutter, 2011). Moisture trapped in the mountains in the form of glaciers is a great source of abundant water both in Kyrgyzstan and Tajikistan, yet these two states are limited in cultivable lands.

Downstream Kazakhstan, Turkmenistan and Uzbekistan, on the other hand, are covered with flat fields and deserts and only 10% is mountains. Kara Kum (or Black Sand) desert covering 80% of Turkmenistan's territory is one of the largest deserts in the world (FAO, 2013). While

[1] Southern Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

such land distribution creates promising irrigation potential, it requires enormous amounts of water, which these countries do not produce internally (CAwater-info). As the result downstream states rely on water resources flowing from upperstream neighbors.


**Figure 2. Map of Central Asia (University of Texas, 2009)**
http://legacy.lib.utexas.edu/maps/middle_east_and_asia/caucasus_central_asia_pol_2009.jpg


**Figure 3. Main rivers of the Aral Sea basin (CAwater-info) http://www.cawater-info.net/aral/index_e.htm**

### 2.1.1 Water resources

The Aral Sea basin is formed by two main rivers: the Amu Darya and the Syr Darya that are produced by glacier- and snowmelt in the Pamir and Tien Shan ranges of Tajikistan and Kyrgyzstan respectively (Sorg & et al., 2014). Together these rivers supply 116 $km^3$ of total mean annual flow to the basin (Table 1) (CAwater-info).

Tajikistan and Kyrgyzstan are the main contributors to the average annual river runoff of the basin, contributing 51.5% and 25.2% respectively (Table 1). Uzbekistan contributes 10.6%, while Kazakshtan and Turkmenistan contribute the least.

**Table 1. Surface water resources in the Aral Sea Basin**

| **Surface water resources in the Aral Sea basin (mean annual runoff)** | | | | |
|---|---|---|---|---|
| **Country** | **River Basin** | | **Total Aral Sea basin** | |
| | **Syr Darya** | **Amu Darya** | | |
| | **$km^3$/year** | | **$km^3$** | **%** |
| Kazakhstan | 2.516 | - | 2.516 | 2.2 |
| Kyrgyzstan | 27.542 | 1.654 | 29.196 | 25.2 |
| Tajikistan | 1.005 | 58.732 | 59.737 | 51.5 |
| Turkmenistan | - | 1.405 | 1.405 | 1.2 |
| Uzbekistan | 5.562 | 6.791 | 12.353 | 10.6 |
| Afghanistan and Iran | - | 10.814 | 10.814 | 9.3 |
| Total Aral Sea basin | **36.625** | **79.396** | **116.021** | **100** |

**Source: (FAO, 2013) http://www.fao.org/3/i3289e/i3289e.pdf**

The Amu Darya is the largest river of the basin in terms of volume. Its average annual water flow is 80 $km^3$. It originates in the rivers of Panj and Vakhsh in Tajikistan and Afghanistan. Then it crosses Uzbekistan and Turkmenistan before flowing into the southern shore of the Aral Sea (Figure 2). The total length of the Amu Darya is 2 540 km (CAwaterinfo, n.d.). Tajikistan is the biggest contributor to the flow of the Amu Darya (74%), followed by Afghanistan and Iran, while Uzbekistan and Turkmenistan contribute the least (Table 1) (CAwater-info).

The Syr Darya has a smaller volume (36.6 km$^3$), but it is the longest river in the basin (3 019 km). It originates in the river Naryn of Kyrgyzstan and crosses Uzbekistan, Tajikistan and Kazakhstan before flowing into the northern part of the Aral Sea (Figure 2). Kyrgyzstan contributes 75.2% to the flow of the river, followed by Uzbekistan (15.2%), Kazakhstan (6.9%) and Tajikistan (2.7%) (Table 1) (CAwater-info).

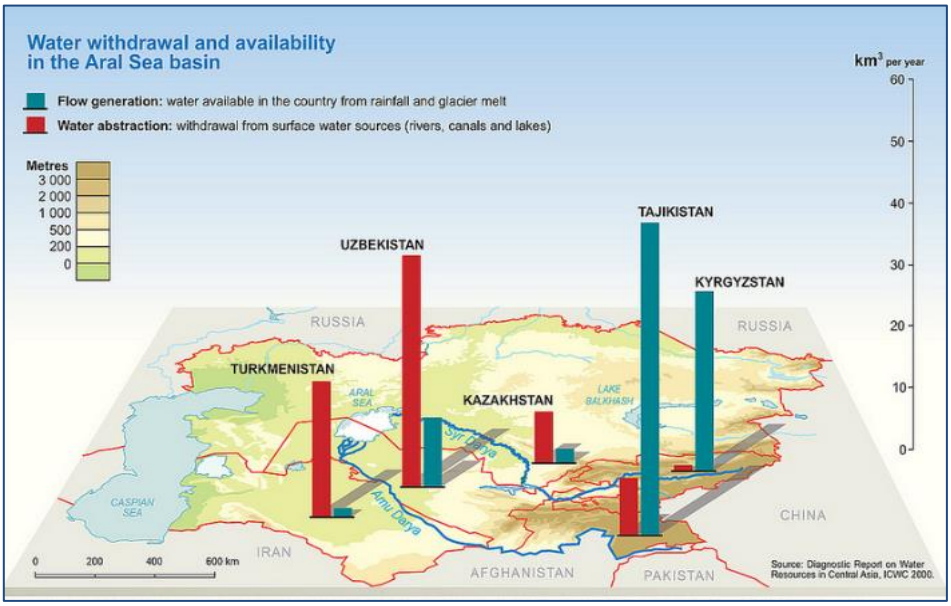


**Figure 4 Water withdrawal v availability in Central Asian states (CAwaterinfo)**
**http://www.cawater-info.net/infographic/index_e.htm**

The pattern of water consumption rate in Central Asian states is opposite to the rate of contribution to the annual discharge of the basin (Figure 4). While more than 60% of the annual discharge in the basin originates in the upperstream Tajikistan and Kyrgyzstan, these countries use only 17% of the total available water. On the other hand, downstream Kazakhstan, Uzbekistan and Turkmenistan in total consume 83% of the available water (Figure 4) (CAwaterinfo, n.d.).

Not only water consumption, but also water distribution according to regional water agreements is contrary to the water contribution of states to the total river flow. The Food and Agricultural Organization (FAO) has distinguished water resources between internal renewable water resources (IRWR)[2] and total actual renewable water resources (TARWR)[3].

[2] IRWR represent water resources produced by rivers that are located inside a state.
[3] TARWR represent water resources that a state is entitled to in accordance with water allocation agreements.

This classification has demonstrated (Table 2) that downstream states in Central Asia have significantly higher TARWR despite very low IRWR. For example, Uzbekistan and Turkmenistan with IRWR 589 $m^3$/inhabitant and 275 $m^3$/inhabitant respectively, have TARWR of 1760 $m^3$/inhabitant and 4 851 $m^3$/inhabitant respectively. This difference in the water distribution reveals that water allocation in Central Asia obviously favors downstream states. The TARWR of the upperstream main water contributors on the other hand is diminished to two times in Kyrgyzstan and three times in Tajikistan (FAO, 2013).

**Table 2. Comparison of IRWR and TARWR among Central Asian states**

| Annual Renewable Water Resources | | | | | |
|---|---|---|---|---|---|
| **Country** | **IRWR** | | **TARWR** | | **Dependency ratio** |
| | **Volume** | **per inhab (2011)** | **volume** | **per inhab (2011)** | |
| | **$km^3$** | **$m^3$/inhab** | **$km^3$** | **$m^3$/inhab** | **%** |
| Afghanistan | 42.7 | 1 457 | 65.3 | 2 019 | 29 |
| Kazakhstan | 64.4 | 3 971 | 107.5 | 6 632 | 40 |
| Kyrgyzstan | 48.9 | 9 073 | 23.6 | 4 379 | 1 |
| Tajikistan | 63.5 | 9 096 | 21.9 | 3 140 | 17 |
| Turkmenistan | 1.4 | 275 | 24.8 | 4 851 | 97 |
| Uzbekistan | 16.3 | 589 | 48.9 | 1 760 | 80 |
| Central Asia | 241.6 | 2 576 | | | |

**Source: (FAO, Irrigation in Central Asia in figures: Aquastat Survey - 2012, 2013, pp. 33-40)** **http://www.fao.org/3/i3289e/i3289e.pdf**

### 2.1.2 Climate

Climate is an important factor that affects water needs of Central Asian states. The Aral Sea basin as it is has one of the most continental and arid climates in the world with very hot summers (with maximum temperature of +52 ºC) and cold winters (with minimum temperature of -38 ºC) (FAO, 2013). There is little rain because the mountains trap most of the moisture from the humid winds. This creates sharp difference in the precipitation rate between states. While the estimated volume of annual precipitation is relatively high- 1 270 $km^3$,

Turkmenistan for example only gets an annual average of 161 mm of rain. On the other hand, it rains a lot more in Tajikistan, with up to 691 mm of rain per year (FAO, 2013).

More importantly, Central Asia a climate change prone region. The temperature increase in the region is expected to surpass the global average (Unger-Shayesteh, 2013). The increasing average temperature in the region causes the glaciers to melt faster. According to some rough estimates, the volume of glaciers in the Syr Darya basin has decreased from 121 $km^3$ in 1960's to 101 $km^3$ in 2000's (Sorg & et al., 2014). According to another study, one-fourth of glaciers of the whole basin disappeared in the second half of the $20^{th}$ century, another quarter will be melted by 2025, and only one-quarter of current average consumption will be available by the next century (Russel, 2018). The water share per inhabitant may drop as low as 500 $m^3$ by 2120 (Russel, 2018). Such reduction of water resources may have dire effect on the increasing population of the region.

## 2.3 ECONOMIC AND SOCIAL IMPACT

### 2.3.1 Population

Article 10(2) of the 1997 UN Watercourses Convention incorporates a presumption that in defining the state's dependence on the shared watercourses, the factor of 'vital human needs' takes precedence over other factors (Wouters & et al., 2005) (McIntyre, Water, Law and Equity, 2017). So including a report on population of Central Asian states is crucial for the present research.

Water resources directly affect Central Asian population as it is a source of human survival and a source of living for the inhabitants of the region. Out of 68 million people living in Central Asia, 60% are from rural areas and over 8 million people are employed in agricultural sector. Because agriculture is also the main water consumer, availability of water resources has a direct effect not only on drinking and sanitation, but also for living conditions of the rural inhabitants. Kyrgyzstan and Tajikistan have the highest ratio of rural population in the region. (Table 3).

Annual population growth percentage in all Central Asian states is above the world average-1.2% (WorldBank, 2018). Population in Uzbekistan along increased from 4.3 mln in 1910 to more than 28 mln in 2010 (Abdullaev & Rakhmatullaev, 2015). With population boom, it is expected that by 2030 there will be 13 million more people living in the region (Abdullaev & Rakhmatullaev, 2015). Uzbekistan and Kazakhstan are the most populous. Kyrgyzstan and Tajikistan have the highest percentage of inhabitants living below the national income poverty line (25.4% in Kyrgyzstan and 31.3% in Tajikistan). It looks like Kazakh population lives under best economic conditions compared to its neighbors; and information on Turkmenistan's poor population is not available.

**Table 3. Population of Central Asian states**

| Population of Central Asian states | | | | |
|---|---|---|---|---|
| | **Population** | **Rural population** | **Annual growth** | **Population living below the national income poverty line** |
| | **2017** | **2017** | | |
| **Country** | **mln people** | **% of total population** | **%** | **%** |
| Kazakhstan | 18 | 43 | 1.36 | 2.7 |
| Kyrgyzstan | 6.2 | 64 | 1.99 | 25.4 |
| Tajikistan | 8.9 | 73 | 2.41 | 31.3 |
| Turkmenistan | 5.7 | 49 | 1.67 | n/a |
| Uzbekistan | 32 | 49 | 1.68 | 14.1 |

**Source: (ClimateWatch, 2016; WorldBank, 2018)**
https://www.climatewatchdata.org/countries/compare?locations=KGZ%2CKAZ%2CUZB
https://data.worldbank.org/indicator/SP.POP.TOTL?locations=KZ-KG-UZ-TM-TJ

### 2.3.2 Agriculture and Hydropower sectors

Water has become paramount for economic development of Central Asian states. Agriculture is the main consumer of water, while hydropower sector requires water for electricity production in the upperstream riparians, which creates a competition over a scarce resource between two sectors.

In terms of yearly GDP Kazakhstan is the richest state in the region, followed by Uzbekistan and Turkmenistan. However, the GDP per capita in Turkmenistan is a lot higher (6 947 US$/inhab) compared to Uzbekistan (2 232 US$/inhab) (Table 4). This is explained by the difference in population between the two (Uzbekistan- 32 mln people, Turkmenistan- 5.7 mln people) (Table 3). The main state revenues of these developed downstream states come from oil, natural gas and coal in Kazakhstan, and natural gas in Uzbekistan and Turkmenistan (Graph 1). Fossil fuel poor upperstream Kyrgyzstan and Tajikistan fell behind their neighbors in economic development, having the lowest GDP's of the region.

**Table 4. Economic and social indicators of Central Asian states**

| Economic and Social indicators of Central Asian states | | | | |
|---|---|---|---|---|
| | **GDP** | **GDP per capita** | **Agriculture value added (% GDP)** | **Number of people undernourished** |
| | **billion US$** | **US$/inhab** | **%** | **1000 inhab** |
| Kazakhstan | 184 | 10440 | 5 | 800 |
| Kyrgyzstan | 6.5 | 1106 | 15 | 300 |
| Tajikistan | 7.8 | 925 | 27 | 2900 |
| Turkmenistan | 37.3 | 6947 | 14.55 | 200 |
| Uzbekistan | 66.7 | 2232 | 18 | 1600 |

**Source: (FAO, 2013-2017)** http://www.fao.org/nr/water/aquastat/data/query/results.html

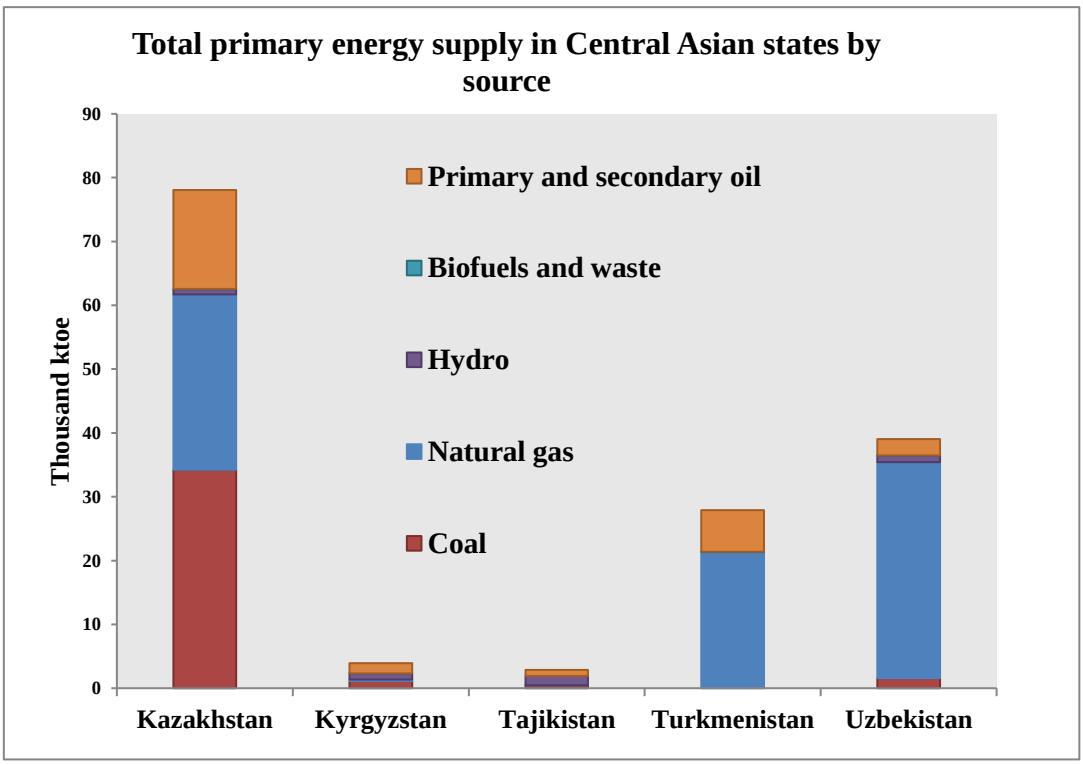


**Figure 5. Total primary supply of Central Asian states by source (IEA, 2015)**

Along with energy, agricultural sector plays an important role both in the economy and national food security policies of Central Asian states. Despite its importance, the value added from agriculture is less than 20% in all Central Asian states except for Tajikistan (27%) (Table 4).

**Table 5. Comparison of total v agricultural water withdrawal in Central Asia**

| | Agricultural water withdrawal | | Total water withdrawal |
|---|---|---|---|
| **Country** | **km³/year** | **% of total withdrawal** | **km³/year** |
| Kazakhstan | 14 | 66.23 | 21.14 |
| Kyrgyzstan | 7.1 | 93.01 | 8 |
| Tajikistan | 10.44 | 90.86 | 11.49 |
| Turkmenistan | 26.36 | 94.31 | 27.95 |
| Uzbekistan | 50.4 | 90 | 56 |
| Central Asia | 108.3 | 86.93 | 124.58 |

**Source: (FAO, 2013-2017)** **http://www.fao.org/nr/water/aquastat/data/query/results.html**

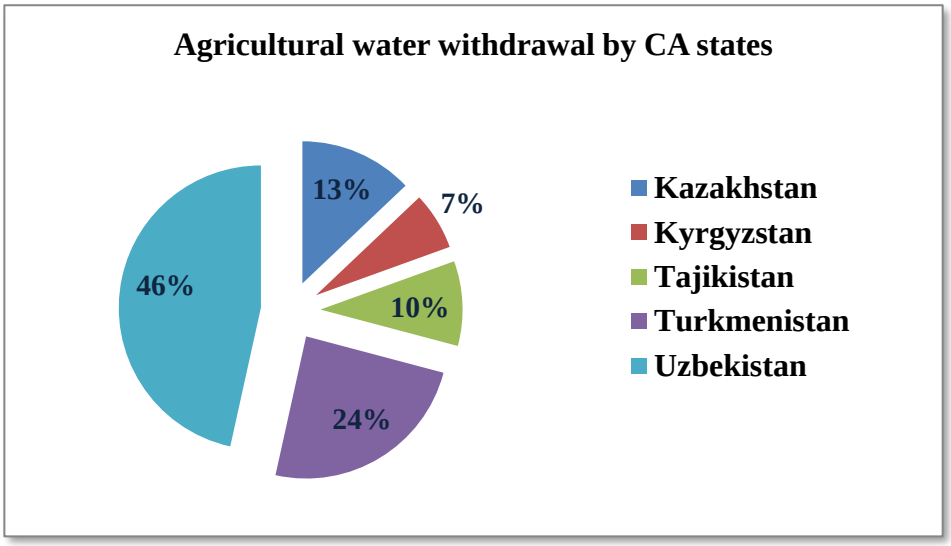


**Figure 6. Agricultural water withdrawal in Central Asia (FAO, 2013-2017)**

The competition between hydropower and agriculture, which remains the main source of tension over water in the Central Asian region, is the result of the infrastructure development carried out by the Soviet Union.

On the one hand, the Soviet Union has built complex hydraulic infrastructure which included reservoirs[4], canals[5] and pumping stations. This equipped 13.2 million ha of Central Asian land for irrigation, which equals to 73% of the total irrigation potential of the whole region. Wheat, cotton and rice are the main crops harvested here (FAO, Irrigation in Central Asia in figures: Aquastat Survey - 2012, 2013), in which Uzbekistan is the main producer, followed by Turkmenistan and Kazakhstan (Table 6). Every year Uzbekistan and Turkmenistan, which are the main water consumers, together withdraw about 76.8 $km^3$ of water (Table 5), which equals to over 60% of the total water withdrawal in Central Asia (Figure 6).

**Table 6. Harvested irrigated crop area in Central Asia**

| **Harvested irrigated crop area** | | | | |
|---|---|---|---|---|
| | **Wheat** | **Cotton** | **Rice** | **% of total grain production** |
| | **1000 ha** | | | |
| Kazakhstan | 208 | 134.2 | 94 | 6.3 |
| Kyrgyzstan | 360 | 45.5 | 5 | 60 |
| Tajikistan | 179.7 | 236.1 | 14.3 | 84.5 |
| Turkmenistan | 917 | 652 | 11 | 100 |
| Uzbekistan | 1295 | 1406 | 52 | 61.5 |

**Source: (FAO, Irrigation in Central Asia in figures: Aquastat Survey - 2012, 2013)**
**http://www.fao.org/3/i3289e/i3289e.pdf**

[4] There are more than 290 water reservoirs in Central Asia with a total volume capacity over 163 $km^3$. The biggest reservoirs are Nurek in Tajikistan and Toktogul in Kyrgyzstan (Rakhmatullaev & et al., 2010).

[5] The Kara Kum (translated as 'black sand') canal located in Turkmenistan was built in 1950 and is 1300 km long, which makes it the longest man made irrigation canal in the world.

On the other hand, aware of the hydropower potential of Central Asia (150 GWh) the Soviet Union has built 45 large scale hydropower stations with a gross capacity of 36.7 GWh/year (Rakhmatullaev & et al., 2010). The biggest among them are located in the upperstream states- in Tajikistan the Nurek HPP has an installed capacity of 2700 MW and in Kyrgyzstan the Toktogul HPP has a capacity of 1200 MW. About 27.3% of average energy consumption in the Central Asia basin already comes from hydropower stations (CAwater-info). With the built infrastructure, upperstream energy and land poor Kyrgyzstan and Tajikistan heavily rely on hydropower for domestic energy consumption. They already produce 98% and 75% of their domestic electricity supply respectively from hydropower plants (CAwater-info). So there is a clash of interests between hydropower and agricultural sectors over water resources.

The new hydropower projects like Kambarata 1 and 2 in Kyrgyzstan, Rogun dam project in Tajikistan, electricity trade project CASA 1000 and the Chinese projects on reviving the Silk Road, which will be discussed in the Chapter 4.3.1.2, may increase the tension over water in the near future.

## 2.4 HISTORY OF WATER USE IN CENTRAL ASIA

Ancient water regulation was built on equity defined by traditions, customs and beliefs of people based on their spiritual and moral values. Because of high importance of water, it was never sold. This attitude continued through the medieval times, the Arab and the Mongol rule. For a long time after the Arab conquest, the law of sharia, or the Muslim law has governed water. Under Muslim law, inhabitants were under a "duty to use water economically, equitably, with consultation of all stakeholders and with respect for the environment" (CAwaterinfo, n.d.). Farming, under Islam was one of the most honorable occupations, and farmers were called *ashraf-ul-ashraf* ("the noblest among the nobles") (Dukhovny & de Schutter, 2011, p. 6)

The historical review of water use in Central Asia has demonstrated that the conquest of the region by the Tsarist Russia and the subsequent overtake by the Soviet Union had left the biggest imprint on the development of water management in Central Asia. Russia was interested in ample land and water resources of Central Asia that could help it reach self-sufficiency in cotton production. So, it took Tsarist Russia over 165 years to annex the region.

The biggest investments into development of water infrastructure in Central Asia took place under the Soviet Union. Devastated by the WWII and the emerging Cold War, the value of this region grew in the role of a “bread and cotton basket” amidst the ambitious Soviet plans. With the help of innovations in heavy industry, two main rivers were diverted, irrigation canal routes, dams and hydropower plants built, and electrification projects brought to a grandiose integrated Central Asian Power System (CAPS). These all were part of the “bread and cotton basket” policies of the Soviet Union. As the result the irrigated land has increased from 1.3 mln ha in 1900 to 8 mln ha in 1990’s.

The advantages of the Soviet rule were manifold including the developments in the industry, agriculture, education system, and etc. However, cotton-oriented water system has ignored social, economic and environmental costs. This had dire consequences for the Soviet Union itself - large investments into inefficient irrigation system, which became “an Achilles heel of the Soviet economy”, have contributed to the dissolution of the Soviet Union.

In terms of consequences for the local inhabitants, after the Soviet withdrawal, the newly formed Central Asian states were left with political, economic, ethnic and civil tensions that exacerbated the water relations and brought to a conflict. Short-term unilateral Soviet aspirations that have disregarded equity as well as economic, social and environmental factors of the local communities have wasted great infrastructure investments and have resulted in a water crisis.

### 2.4.1 The medieval times

During the Bronze Age, around five thousand years ago, the climatic conditions near main Central Asian rivers triggered the first settlement of nomads, which paved the way for development of new civilizations here. The first civilizations developed estuary farming in oases and deltas of the river basins. From the first to fourth centuries A.D. the region was under one of the most powerful rulers of that time- the Kushan khanate. In this period with the help of ancient engineers the farming started to shift from deltas to irrigated fields, which proved itself quite successful even without modern equipment. First irrigation systems were built by digging out canals to the fields. As the result 3.6 million hectares of land were already developed under irrigated farming about two thousand years ago near two main Central Asian rivers (Amu Darya and Syr Darya) (O'Hara, 2000).

### 2.4.2 The Arab rule

From the 7th century A.D. the region was under the Arab control. This period is distinguished as a time of abundance and the era when the Great Silk Road passed the Central Asia. In this time new great cities such as Merv in Turkmenistan and Samarkand in Uzbekistan have emerged.

Such prosperity also had an impact on irrigation projects in the region, which doubled. Arab scientists had advanced knowledge in mathematics and architecture, and they introduced new canal routing methods and built complex irrigation networks. The first dam was built on the territory of Uzbekistan that irrigated 1000-1200 ha of land (Abdullaev & Rakhmatullaev, 2015). The statistical and hydrological calculations produced in this period were used later in history by the Soviet engineers. The writings of Arab historians and geographers are the first sources in history describing water management in Central Asia of that early period. (Valentini & al, 2004) (O'Hara, 2000)

An example of successful water management policies of that time is the city of Merv. This ancient city had to produce enough food for its vast population while it had an access to only one river, which had small annual discharge. In the circumstance of water scarcity, the water management was so productive that the city not only supplied its population with food but also exported crops (O'Hara, 2000).

### 2.4.3 The Mongol rule

In the early 13th century Mongols have invaded the Central Asia. It was a period of endless wars over power. The region was divided among three knanates (Kokand, Bukhara and Khiva) and tribal hordes (composed of Kazakhs, Kyrgyzs and Turkmens). Khanates were mainly sedentary societies whose economy depended on intensive agriculture. Tribal hordes were nomadic societies that lived in steppes and deserts of Central Asia and relied on nomadic pastoralism. Water was equally important for both sedentary and nomadic societies in sustaining agriculture and the livestock (Perez Martin, 2017). Water in this period was

regulated by the laws of Sharia and Adat (customs and traditions that were orally transmitted). According to Sharia, water should be treated as a common good and should be shared equally.

However, in this period water was often used as a strategic tool and as a weapon against an enemy. In 1850's, the Khiva Khan in order to subordinate the rebellious Turkmens, deprived them of water by building two dams on the Lauzan river, on which the Turkmens' depended for livelihood. After several unsuccessful attempts to break the dam, Turkmens had to surrender. (Valentini & al, 2004) (Troitskaya, 1954)

### 2.4.4 The Tsarist Russia's rule

In the 18th century, Tsarist Russia, similar to Mongols, has come to the Central Asia with the annexation plans in order to increase the borders of its empire all the way to China and further into India (Perez Martin, 2017). The first annexation attempts ended up in a failure. But after a hydrographic study of the Aral Sea, Tsarist Russia used water resources in its conquest. Water was used both to penetrate the territory of Central Asia by using the war flotillas. And, similar to the Khiva khan, waterways and channels were diverted and dams were built to deprive the local inhabitants of water. It took Tsarist Russia 165 years to annex the region.

After the conquest, Kokand khanate merged into Turkestan province, while Bukhara and Khiva khanates have lost their sovereignty. As the result, khanates lost control over management of their water resources and old water management hierarchies were completely set aside together with their values, interests and technical knowledge.

Moscow's water policy applied in Central Asia after its conquest was mainly driven by its desire to free itself from reliance on American cotton (O'Hara, 2000) and to make Central Asia a source of other agricultural products. For this, group of agricultural and engineering experts were brought to the region to study the agricultural potential and prospects for cotton growth. The valuable 1912 data on water capacity of the region is used even in today's calculations (Valentini & al, 2004).

With the help of independent investments Tsarist Russia was able to develop 330 000 hectares of irrigated land, build 60 cotton processing plants and a railroad. The biggest contribution from Tsarist Russia was the development of the Golodnaya (Hungry) steppe. But still, because the Russian Treasury had limited funds, the increase in irrigated land was fairly modest.

### 2.4.5 The Soviet rule

With the revolutionary victory of the Bolsheviks in 1917, the Union of Soviet Socialist Republics (the Soviet Union) driven by Marxist and Leninist ideas replaced the Tsarist Russian rule (Perez Martin, 2017). The Soviet Union has brought to a radical change in water management of Central Asia.

In 1918 Lenin signed the first legal act on water management called a "Decree on the Allocation of 50 Million Rubles for Irrigation Works in Turkestan and the Organization of such Works" (Valentini & al, 2004). From that day on huge investments to construction of highly integrated irrigation system were made (O'Hara, 2000).

Farms that belonged to locals were liquidated under the process of collectivization of land. The regional water management system was also centralized and taken away from traditional elders and councils. Water just like land became "a common resource to be used for the benefit of all" (O'Hara, 2000, p. 375). Turkestan has ceased to exist and was replaced by Central Asian republics, which were to function under the control from Moscow.

In order to "divide and rule", Soviet Union promoted competition over water among Central Asian republics. Such competition impeded the possible regional cooperation and put Moscow at the seat of an arbiter in questions over water among Central Asian republics (O'Hara, 2000).

Following the WWII, the development of water infrastructure with the help of heavy industry came in an accelerated pace. Reaching self-sufficiency in food and technical raw materials as soon as possible was vital for the Soviet Union in the light of the Cold War. In the process of reaching the set goals, little attention was paid to the social, economic and environmental costs. At one point a new canal with the length of 800 km was dug out in the desert in only 5 years. "The world has not known such a pace of hydro construction!" (Valentini & al, 2004, p. 30)

The total water intake in the Aral Sea basin increased almost twice between 1960 and 1990 (Valentini & al, 2004). Rivers were diverted over considerable distances in order to irrigate desert lands and as the result to increase cotton production. There was significant increase of irrigated lands in Uzbekistan (close to 1.3 mln ha in 1900s; 2.6 mln ha in 1950's and 4.2 mln in 2000s) turning Uzbekistan into "the cotton basket" of the Soviet Union (Abdullaev & Rakhmatullaev, 2015, p. 849).

Along with expanding irrigated land, Moscow also financed electricity projects under the famous GOELRO plan. With this project numerous dams with installed hydroelectric power plants were built in the region. The biggest among them is the Nurek dam in Tajikistan, which is located at the Vakhsh river and its hydro power plant has installed capacity of 2700 MW. The second biggest is the Toktogul dam located on the Naryn river of Kyrgyzstan whose HPP has installed capacity of 1200 MW. Both of these huge hydropower plants worked in the irrigation mode during the Soviet rule. This means that the main goal of these dams was not to produce electricity but to store water during winter and to release in summer during the harvesting season. Irrigation was prioritized over power generation, and upperstream states were compensated with fossil fuels for electricity deficits (Ziganshina, 2009).

### 2.4.6 Post-Soviet

In 1991 the Soviet Union collapsed and five new independent states were born. This meant that rivers were not managed as a unitary water basin any more. Along with political, economic, ethnic and civil conflicts that newly emerged stated were faced with, tensions over water began between the downstream water consumers (Turkmenistan, Uzbekistan, Kazakhstan) and the upper stream water producers (Kyrgyzstan and Tajikistan) (Perez Martin, 2017).

In 1992 Central Asian states met in Almaty[6] to sign a law ("Agreement on Cooperation in the field of Joint Water Resources Management and Conservation of Interstate Sources) and establish a regulating institution (Interstate Commission for Water Coordination of Central Asia (ICWC)). However, since each state pursued its sovereign interests over regional, the law turned out to be too fragile and fruitless, and the ICWC did not bring to efficient or effective results. Along with administrative problems, Central Asian states were also left with the legacy of the Soviet Union's greedy cotton growing irrigation policies, which brought to serious environmental problems. Such include the desiccation of the Aral Sea and the degradation of land. As an illustration of the seriousness of land degradation, only in Turkmenistan over 50,000 ha of land were abandoned because of soil degradation in 1980's (O'Hara, 2000, p. 377).

[6] Capital city of Kazakhstan.

# CHAPTER 3. WATER CRISIS IN CENTRAL ASIA

The World Bank warns that by 2050 conflict and migration may emerge from water shortages aggravated by growing demand in the whole world and especially in arid regions like Central Asia (World Bank, 2016). Unfortunately, water crisis is not a problem of the future or not even a recent problem for this region. It has begun long time ago with the dissolution of the Soviet Union. With increasing demand and decreasing supply of water it is only snowballing into a bigger crisis, which has negative implications for different areas of life.

It is necessary to study water crisis in Central Asia in order to demonstrate an interdisciplinary character of a problem and to emphasize the scale of danger that water crisis may bring to. Water respects no borders. As the result, water problems trespass political, economic and environmental aspects of Central Asia and affect them by exacerbating existing tension or by creating new sources of danger. These three aspects will be reviewed in this chapter.

The political factors of water crisis in Central Asia will include national self-sufficiency aspirations and policies of neighboring states, ethnic issues and Afghanistan as a new water player in the near future.

The economic factors will include the growing competition between agriculture and hydropower with special emphasis on the over-consumptive and inefficient use of the agriculture, and the "water wars" discourse emerging around water and electricity projects.

At the end, this chapter will explore environmental factors of water crisis. This will include the climate change and the Aral Sea disaster.

In order to understand the political factors of water crisis in Central Asia, this chapter will first review national self-sufficiency aspirations and policies of Central Asian states. The goal will be to demonstrate how such policies hinder regional integration, 'puppetize' Central Asian states and turn the region into a game field of super powers. Next ethnic issues will be explored to reveal the difficulty of coming to a consensus in water management policies in an environment where ethnic issues exacerbate the growing tension and suspicion between Central Asian states. And finally this chapter includes Afghanistan, which has been overlooked historically in the water allocation schemes of the Aral Sea basin because of shaky political

situation in the country. Although Afghanistan is the not the present-day crisis it may become one once Afghanistan claims for its fair share of water.

Next goal of this chapter is to analyze economic factors of water crisis in Central Asia. For this purpose the competition between agriculture and hydropower, which are the main sources of water conflict, will be examined. Obviously, agriculture is the main water consumer of the region. However the emphasis will be made on the fact that agriculture consumes so much water not because it sufficiently contributes to the food security of the Central Asian states or because it makes significant contribution to the GDP of states. Instead the goal will be to demonstrate how overconsumption, inefficient use and artificially formed drainage lakes used as unsustainable water conservation tools bring to large water withdrawals.

Next goal will be to shed light on the "water wars" discourse around hydropower projects of Kyrgyzstan and Tajikistan. The study will emphasize on the $1.7 billion Central-Asia South Asia Electricity Transmission and Trade program (CASA 1000) that was approved by World Bank in fall of 2018 and that will commence in 2019. Although examining the effect of this project on the existing water conflict is not the goal of present research, it is important to acknowledge that the CASA 1000 may have important consequences to the already tense water relations between Central Asian states.

The third aspect of water conflict that this paper will explore is environmental. Topics such as climate change and the Aral Sea disaster will be presented.

## 3.1 POLITICAL ASPECTS OF WATER CRISIS

Lioubimtseva claims that political, economic and social factors have a greater influence on the vulnerability of states to variations in water resources compared to physical factors. She gives an example of Kazakhstan, which is on the last place among Central Asian states in terms of water availability. Lioubimtseva thinks that despite this, Kazakhstan is less vulnerable to climate change compared to Uzbekistan and Kyrgyzstan because it is politically more stable and richer than its neighbors (Lioubimtseva & Henebry, 2009). So it is important to examine political aspects of water crisis in Central Asia.

### 3.1.1 National self-reliance policies

Water often turns both into a tool and a target in the Central Asian states' aspirations for full self-reliance and nation-building policies. Moreover, because of its potential to ignite conflicts between states, water is often perceived as a resource of national security. As suggested by Mosello, "securitization of water resource management increases the prospects of conflict and, as a consequence, diminished the likelihood of regional cooperation" (Mosello, 2008, p. 156).

"Kazakhstan 2050 Strategy", for example puts a goal of becoming one of the 30 most developed states in the world by 2050 by means of reinforcing statehood and patriotism (Zhang, 2015). Neighboring states have very similar aspirations. Put in simple words, every state wants to be better than everybody else in the region, and in order to reach such goals each tries to increase its energy, food and water independence. Instead of attempting to build an integrated system, states are looking for opportunities from 'outside': ways of exporting energy to outside countries like Afghanistan, Pakistan, Turkey, Iran and Russia; as well as finding investors that can finance costly new infrastructure projects that can help to boost economies.

Superpowers like the USA, Russia and China play important role in the nation-building aspirations of Central Asian states. In order to amplify their influence in the region, all three generously offer international grants and loans that help to give life to costly infrastructure projects of these states. Russia for example has pledged to finance the construction of Kambarata-1 (120 MW) and Kambarata-2 (1900 MW) hydropower projects in Kyrgyzstan with an estimated cost of $3.2 billion (Mirovalev, 2016). The condition for such financing was that Kyrgyzstan would kick out American troops based in the country. Kyrgyzstan did as Putin wanted, however Russia terminated the contract only after completing the first phase of Kambarata-1. Kyrgyzstan's ex-president, Almazbek Atambayev later claimed that "Russia may never have planned to actually fund these hydro-electric projects in the first place" (Hashimova, 2016). Russia has also financed the construction of Sangtuda-1 HPP in Tajikistan, on which over $230 million were spent. Russia and Tajikistan hold 75% and 25% of shares in this HPP respectively.

Another important player in the region is China, which has been active in the region for a long time by investing into construction of railway links, roads, bridges, tunnels, oil and gas pipelines (Chugh, 2017). Central Asian states have actively traded with China for decades: a

quarter of total oil production in Kazakhstan is carried out by Chinese companies; and Turkmenistan exports more than half of its gas to China (Chugh, 2017).

In 2013 China's President Xi Jinping announced the Silk Road Economic Belt (SREB) Initiative with $40 billion Silk Road Fund (Chugh, 2017). According to this "audacious plan", through economic and infrastructure investments, China would like to connect with 40 European, Asian and African states, which would "give China unprecedented access to 60 percent of the world's population and a third of global wealth" (Chugh, 2017).

As a transit region, Central Asian states see this as an opportunity to gain extra investment for developing their own infrastructure (Zhang, 2015). However, while Central Asian states welcome Chinese money, they are cautious about political and economic implications from China's increasing influence in the region, because as we all know- one can find free cheese only in a mousetrap.

### 3.1.2 Ethnic issues

Managing water is even more complicated in a region with ethno-territorial issues in the top list of existing problems (Mosello, 2008). Although ethnic conflicts may not have a direct effect on the water issues, they add up to the difficulty of states to build amicable relationship based on mutual trust and benefit sharing.

The centralized planning process during Soviet Union did not see Central Asian republics as independent states, so borders were drawn without consideration of ethnicity of inhabitants. After independence, when borders became international, each Central Asian state had ethnic minorities of its neighboring states, with which tensions became inevitable. As the result of ethnic tensions, Uzbekistan and Kyrgyzstan had difficult relationship for decades. Ethnic clashes in the Ferghana valley killed hundreds in 1990 and 2010. Hundreds of thousands fled Kyrgyzstan after the bloody conflict in 2010 (Mirovalev, 2016).

Between 2012 and 2013, 38 incidents happened at the Kyrgyz-Uzbek border, another 37 took place at the Kyrgyz-Tajik border (Zhang, 2015). Such local incidents often grow into serious armed conflict between border troops that involve closing of borders. This magnifies suspicion and lack of trust between neighboring states (Zhang, 2015).

### 3.1.3 Afghanistan as a new player

Afghanistan is what Tarlock calls “the classic transboundary regime nightmare” (Tarlock, 2005). Despite significantly undeveloped water resources, Afghanistan has ambitious water development plans for its share of the Amu Darya river. Although Afghanistan does not claim for water for the time being, sooner or later Central Asian states will face the reality of fairly including this late-developer into the water sharing agenda. This will disturb the existing and settled expectations over already scarce resource, which may result in a dangerous tension.

Afghanistan is almost never included under the definition of ‘Central Asia’, but in terms of water resources it is another contributor to the Aral Sea basin. Almost 40% of Afghanistan’s territory lies within the basin, and its share in the basin equals to 16.2% (FAO, Aquastat, 2012). Together with Iran, Afghanistan annually contributes over 9% of water to the basin’s total annual river runoff.

The development of Afghanistan fell behind because of the civil war and the recent control by Taliban. As the result only 26.11 $km^3$/year of water are withdrawn from the total renewable freshwater available (Tarlock, 2005). So water use in the country is significantly undeveloped. However, northern Afghanistan has ambitious plans of expanding its industry and agriculture through water projects on the Amu Darya river (Tarlock, 2005). Central Asian states are already wary of Afghanistan because of Taliban’s presence and a recent history of bloody wars, so tensions over water with this riparian state are highly undesirable.

## 3.2 ECONOMIC ASPECTS OF WATER CRISIS

According to the World Bank 2016 report, under business-as-usual water management scenario, the Central Asian region can lose up to 11% of its GDP because of water deficit (World Bank, 2016). Central Asian states are already losing $1.7 billion every year because of unsuccessful water and land policies. (CA Human Development Report, 2005, p. 6) Downstream states do not want to supply the upperstream states with high-priced fossil fuels for free. As the result electricity deficits in upperstream states push them to switch the use of dams from irrigation to hydropower generation mode.

### 3.2.1 Competition between agriculture and hydropower

Water crisis among Central Asian states consists of many factors, but the most important among them is competition between the agricultural and hydropower sectors. Upperstream Kyrgyzstan and Tajikistan accuse Uzbekistan and Turkmenistan for guzzling precious water at thirsty cotton fields. Uzbekistan, Kazakhstan and Turkmenistan at the other hand, oppose the hydropower projects of Kyrgyzstan and Tajikistan, afraid that such would obstruct water from flowing downstream.

#### *3.2.1.1 Agriculture*

Every Central Asian state, except for Kazakhstan, uses more than 90% of its total annual water withdrawal for agriculture. Agriculture is important for food self-sufficiency ambitions of regional states. For downstream Uzbekistan and Turkmenistan, which are among the world's largest cotton producers, agriculture is also a source of exchange currency.

Uzbekistan forces farmers to grow cotton and sell it to government at low prices. It also uses forced labor including government officials and students to pick cotton in autumn every year. Umida Niyazova, Uzbek rights activist that was forced to leave the country and live in Germany, told Al Jazeera that Uzbekistan "controls one of the world's largest systems of forced labor" (Mirovalev, 2016). Moreover, agriculture in Uzbekistan is also a source of

prominent problems related to water use such as overconsumption, inefficient water use and drainage water.

World Bank draws attention to the problem of overconsumption and over-allocation on the example of the Murray-Darling basin, Australia. World Bank claims that despite the far-sighted water reforms, failure to deal with the problem of over-allocation of water in the Murray-Darling basin has brought to the ecological collapse in the form of a drought. (World Bank, 2016)

Water intensive crops themselves consume a lot of water. In addition to this, they are harvested in areas with arid climate that have high evaporation rate, which adds up to the inefficient water use (Karthe & et al., 2014). Almost half of the diverted water is lost between the river and the crop (Karthe & et al., 2014, p. 870). One third of water flowing through Kara Kum Canal is lost before reaching the fields (Russel M. , 2018).

In addition to inefficiency problems, more water than needed is used in Central Asia. Use of water per capita is one of the highest in the world. Turkmenistan for examples consumes up to 5000-6000 $m^3$/capita every year (Karthe, D. & et al., 2017). "While calculated irrigation rates ranged between 3,800 $m^3$/ha to 11,200 $m^3$/ha, actual specific water consumption in 1990-1998 was from 4,500 $m^3$/ha to 20,600 $m^3$/ha" (Karthe, D. & et al., 2017). Not only irrigation is to blame for such over-consumption. For example, the water consumption in the capital city of Turkmenistan, Ashgabat, equals to the water consumed in Chicago. This is the result of grandiose water intensive projects like a monumental fountain that entered the Guinnes Book of Records, the grandiose tree-planting initiative (Russel M. , 2018), and water collecting artificial lakes like Altyn Asyr (translated as Golden era or age) lake[7].

According to the "Strategy on Economic, Political and Cultural development of Turkmenistan", the total volume of such artificially formed lakes of Turkmenistan should reach 11 $km^3$ (Zhyltsov, 2016). While only about 45-50% of water withdrawn for irrigation is actually consumed by crops, the remaining volume of water (about 30%) is drained into artificial lakes and natural depressions (Sarygamysh in Turkmenistan) (CAwater-info). Some of such artificial lakes are located in the middle of a desert, which is dangerous because their evaporation rate is higher than in natural wetlands, natural lakes and rivers (FAO, Irrigation in

[7] This grandiose artificial lake project launched by Turkmenistan with an estimated cost of $8 billion has an area of 2,000 $km^2$ in the Kara Kum desert. The lake is filled by diversion of the Amu Darya river. This resulted in decreased water for drinking and irrigation in the downstream regions, which forced many inhabitants to move out of these regions (Sievers, 2002).

Central Asia in figures: Aquastat Survey - 2012, 2013). This may bring to further depletion of water resources and exaggeration of water deficit.

#### *3.2.1.2 Hydropower*

Downstream states complain that water used for energy production in winter is 'wasted' against water use for irrigation in summer. However, hydropower is the main source of winter electricity for fossil fuel poor Kyrgyzstan and Tajikistan that experience chronic electricity shortages.

Ex-president of Uzbekistan, Islam Karimov threatened with possibility of wars in the region over water. Following Russia's pledge to invest into the Kambarata 1 and 2 HPPs of Kyrgyzstan, Karimov claimed that "control over water resources in the republics of Central Asia may lead to a full-scale war" (Mirovalev, 2016). After Kyrgyzstan passed a law in 2001[8], which stipulated provision of water on a 'paid' basis, Uzbekistan carried out military exercises in the close proximity of the border with Kyrgyzstan near the Toktogul dam.

Except for Russia's empty promises to invest in Kyrgyz hydropower sector, both Kyrgyzstan and Tajikistan have not been able to find reliable investors for their costly hydropower projects. But in September of 2018 World Bank together with Islamic Development Bank, USAID, European Bank for Reconstruction and Development and European Investment bank has agreed to finance $1.7 billion Central Asia and Southern Asia Electricity Transmission and Trade program (CASA-1000). In a press release of World Bank called "The CASA-1000 Project crosses another milestone", it is claimed that construction of the transmission line is expected to begin in 2019 (World Bank, 2018). According to this project, Tajikistan and Kyrgyzstan will be able to sell surplus electricity in summer and that way earn revenues, which can later be used to cover costs of winter energy production (Figure 7). With the goal of developing regional energy trade in South Asia, the CASA-1000 will help to cover the deficit in Pakistan and Afghanistan during the peak summer season when demand is the highest (World Bank, 2018).

[8] 2001 Law of on interstate use of water objects, water resources and water economy constructions of the Kyrgyz Republic.


**Figure 7 Map of the CASA 1000 Project (CASA-1000)**
**http://www.casa-1000.org/MAPR9.jpg**

Once completed, the CASA-1000 might become a catalyst for Kyrgyzstan and Tajikistan in finding investments for their hydropower projects. Regional energy market with reliable consumers would make these HPP projects more attractive for the potential investors.

Both Kyrgyzstan and Tajikistan feel an urgent need to develop their hydropower resources. Tajiks living in rural areas use firewood for heating in the winter, as the result of which 70% of Tajikistan's forests disappeared (Russel M. , 2018). During the coldest winter in 2008 people and livestock died in Tajikistan as the result of lack of electricity (Libert, 2008). Central Asian electricity is demanded both within the region and by the neighboring countries (like Afghanistan and Pakistan). Kyrgyzstan and Tajikistan plan to finish the construction of large hydropower projects commenced under the Soviet Union (Rogun HPP in Tajikistan (3200

MW), and Kambarata 1 and 2 in Kyrgyzstan (2020 MW) ) but not completed because of the Soviet Union's dissolution. The completion of these new dams will expand the electricity generation capacity of both countries.

### 3.2.2 Disintegration of the Central Asian Power System (CAPS)

Another economic aspect of water crisis in Central Asia includes disintegration of the Central Asian Power System (CAPS) that was built during the Soviet Union. The International Crisis Group in its 2014 report on 'Water Pressures in Central Asia' claimed that "the root of the [water] problem is the disintegration of the resource-sharing system of the Soviet Union imposed on the region until its collapse in 1991" (International Crisis Group, 2014).

As part of the Soviet Union, integrated and synchronized system of energy sharing between five Central Asian republics was exercised through the CAPS (Figure 8), which guaranteed annual trade of 25 TWh of power (Vucetic & Krishnaswamy). The CAPS connected coal based thermal power plants in Kazakhstan with natural gas thermal power plants in Turkmenistan and Uzbekistan and with hydro power plants in Tajikistan and Kyrgyzstan (Figure 9). Its installed generation capacity used to be 24 074 MW (World Bank-Mercados , 2010). With the dissolution of the Soviet Union, the exchange of electricity between CAPS countries has considerably reduced. The volume of trade though the CAPS has declined by 68% (Vucetic & Krishnaswamy), from $15 billion per year in 1985 to $1 billion in 2002 (Boisson de Chazournes, 2006, p. 160). There are many reasons behind such power decline, one of which is inefficiency of the CAPS. According to the World Energy Council's 2007 report, because of long distances between the generation plants and the load centers, tremendous amount of power is lost within the CAPS through transmission (World Energy Council, 2007, p. 23).

Following 1991, Central Asian states did not want to be part of the CAPS as they looked for national power independency and they felt like the CAPS was drawing them back in their aspirations. However, Kazakhstan, Kyrgyzstan and Tajikistan are still using the CAPS, not so much because they want to, but because they have to. The integrated design of the CAPS does not let these states to fully disconnect.

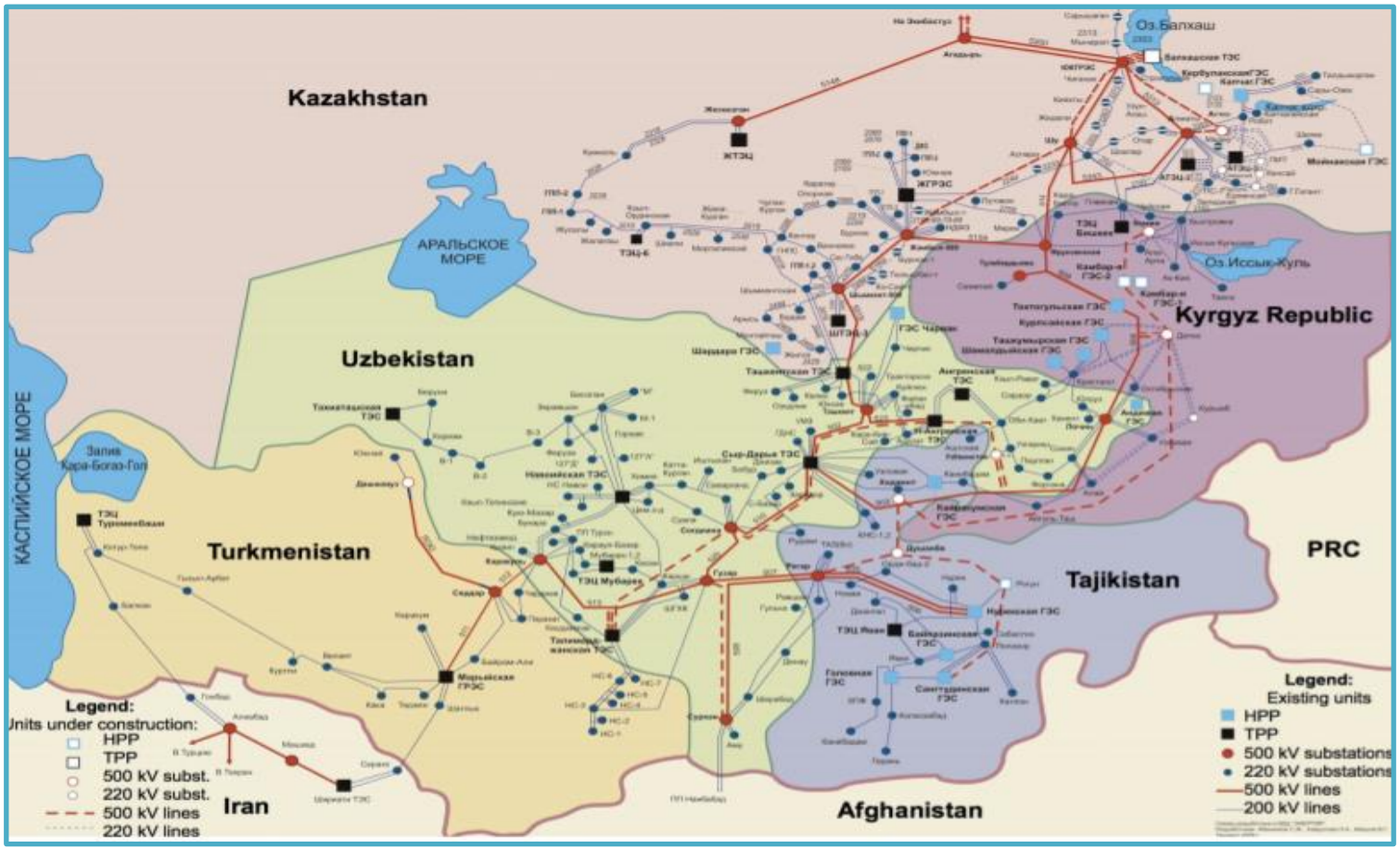


**Figure 8 Integrated grid and installed capacity in the Central Asian Power System (CAPS) (World Bank-Mercados, 2010, p. 21)**
**http://documents.worldbank.org/curated/en/961351468178154865/pdf/98830-WP-P117280-PUBLIC-Box393182B.pdf**

Kazakhstan tried to leave the CAPS in 2009. However, despite surplus electricity generation capacity of thermoelectric plants in its northern regions, Kazakhstan is forced to use the CAPS to supply its southern regions with electricity imported from Kyrgyzstan and Uzbekistan. This is one of the many legacies of the Soviet Union. The 500 kV electricity line that connects northern and southern Kazakhstan simply is insufficient to transfer big amounts of power between the north and the south (World Energy Council, 2007, p. 7). As the result, Kazakhstan's northern grid is connected with Russia and its southern grid is connected with the CAPS. Kyrgyzstan and Tajikistan encounter the same problem. In order to supply northern regions with power, the electricity produced at hydropower plants in the south has to go through the CAPS first. These three states are literally forced to export and import energy within the CAPS.

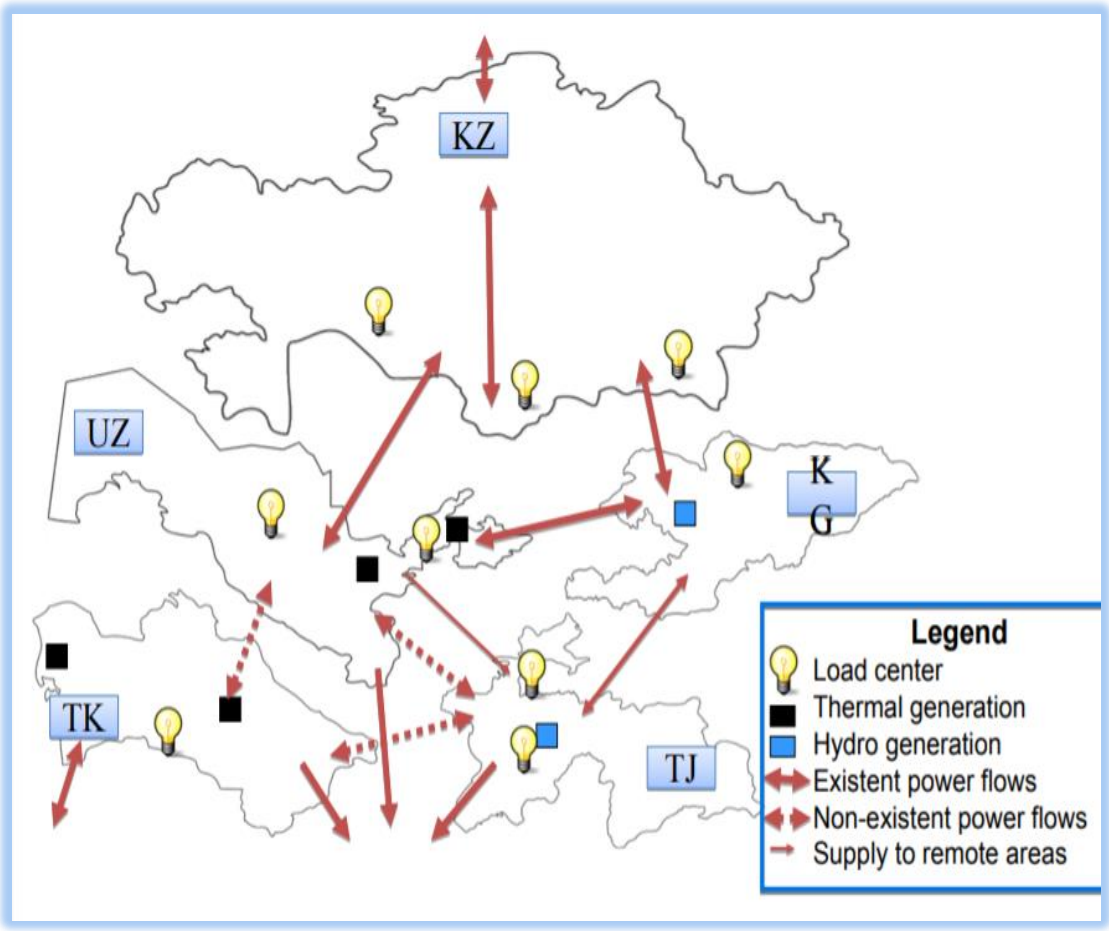


**Figure 9 Present and past power flows within the CAPS (World Bank-Mercados, 2010, p. 6)**
**http://documents.worldbank.org/curated/en/961351468178154865/pdf/98830-WP-P117280-PUBLIC-Box393182B.pdf**

Turkmenistan does not have this problem, so it withdrew from the CAPS as early as in 2003. It exports power to Iran and Turkey instead (World Energy Council, 2007, p. 14). Although Turkmenistan left the CAPS it continued electricity transfers to Tajikistan through Uzbekistan until Uzbekistan blocked such power transfer.

One of the reasons why Uzbekistan withdrew from the CAPS was Tajikistan's overdraft of electricity from the integrated grid following a very cold winter in 2008, as the result of which both states had energy failure. As Uzbekistan left the grid it cut off Tajikistan from its main winter electricity supplier- Turkmenistan (Putz, 2018). Despite requests from both Turkmenistan and Tajikistan to allow the transit of energy between the two, Uzbekistan blocked such power share. Another reason for Uzbekistan's withdrawal was that it found another consumer for its electricity in the face of Afghanistan, which promised higher profits (Chugh, 2017).

According to a study carried out by the Mercados-Energy Markets International, under a condition of integrated operation, the CAPS may save up to $2.1 billion to Central Asian states without any need for additional investments (World Bank-Mercados , 2010). It is an assuring statement. However, integrated operation is questionable considering the huge power loss of the CAPS and the lack of trust and unwillingness to cooperate between Central Asian states.

## 3.3 ENVIRONMENTAL CRISIS

In 2008 EU recognized that "water management is the most sensitive environmental issue in Central Asia, which if not addressed, could develop into a serious security threat for the entire region in the medium term" (Hodgson, 2010).

### 3.3.1 Climate change

Climate change is another threat that Central Asian region may face. The temperature increase in the region is expected to surpass the global average (Unger-Shayesteh, 2013). According to a meteorological data, Central Asia has seen a steady increase in the average temperatures since 19th century (Lioubimtseva & Henebry, 2009). Increasing temperature threatens melting of glaciers, which is the main source of water in the region. The ice mass of the Tien Shan mountains has decreased by 27% between 1961 and 2012 with an annual water loss of up to 5.4 $km^3$ (Mirovalev, 2016). By 2050, the total glaciers' ice mass may cut down by half (Mirovalev, 2016).

### 3.3.2 The Aral Sea disaster

According to a historical record the Aral Sea has already desiccated before by the Mongol invaders who diverted the Amu Darya towards the Caspian Sea between the 13th and 16th century. After the return of the Amu Darya, the Aral Sea recovered by mid 1600s (Micklin, 2016). Before 1960's when extensive irrigation projects of the Soviet Union began it was the fourth largest lake in the world. The Aral Sea shrunk by 90% of its original volume and looks more like the "Aral Kum" ('Aral desert') now (Figure 10) (Russel M. , 2018).

The severe negative impacts from the shrinking of the Aral Sea include the ending of the fishing industry (which produced 30-35 thousand tons or 22 million cans of fish every year and engaged 80% of inhabitants of the Aral Sea coast) and acute health problems of the

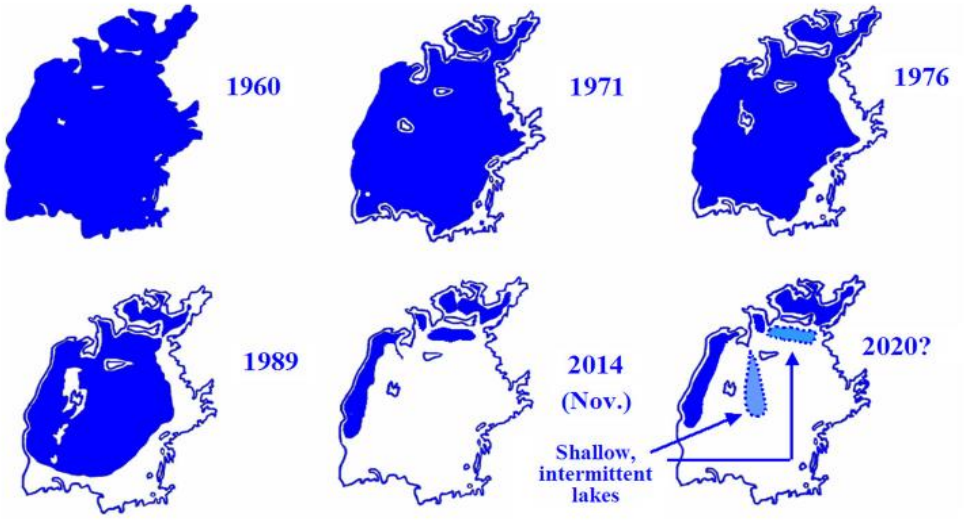


**Figure 10 The changing profile of the Aral Sea (1960-2020) (Micklin, 2016, p. 6)**

population living near the sea (respiratory diseases, cancer from blowing dust, salt and toxic substances). In order to return the Aral Sea to its initial state, it would require an average annual river inflow of 56 $km^3$ and about 103 years.

The climate around the Aral Sea has changed dramatically with colder winters and hotter summers. Evaporated water leaves behind a crust of salt and pesticides that during storms turn into toxic dust clouds that are dangerous to the health of local inhabitants.

# CHAPTER 4. INTERNATIONAL WATER LAW, THE ERU PRINCIPLE AND WATER REGULATION IN CENTRAL ASIA

In order to prevent water conflict from growing into a serious international crisis, a remedy that wields "a set of rules, instruments, and mechanisms capable of transforming conflicts into cooperation" (Vinogradov & et al., 2003) and that is well-suited to the interdisciplinary character of a water conflict is needed. International water law suits well as it can provide an appropriate platform for dealing with issues related to water use. Key principles of international water law that are based on equity, reasonableness, fairness and sustainability properly address water management and water allocation goals and thereby promote global and regional peace and security (Wouters & et al., Water security, hydrosolidarity, and international law: a river runs through it, 2008).

Some scholars doubt the conflict preventing and fair water use ensuring capacity of international water law, perceiving it as "still a relatively primitive legal system" (Dellapenna, 2001, p. 239). Such opinion is based on that international water law lacks centralized institutional law-making and law-enforcing institutions. Moreover, there is little agreement on the normative nature and "legal implications" of the theories and principles, on which international water law is based. (McIntyre, Water, law and equity, 2017, p. 45). However, peaceful and equitable allocation of water "cannot be achieved without certain generally recognized and agreed 'rules of the game' " (Wouters & et al., Water security, hydrosolidarity, and international law: a river runs through it, 2008, p. 107). It is remarkable, that states in a dispute over international watercourses themselves often appeal to the rules of international law in their defense (Vinogradov & et al., 2003).

International water law is "the body of rules concerned with the inter-State allocation of rights in the uses and benefits of transboundary waters" (McIntyre, Water, Law and Equity, 2017, p. 45). "[T]he overarching objective of this body of law is to determine how such rights in shared water resources can be allocated equitably, taking account of a range of relevant factors and considerations" (McIntyre, Water, law and equity, 2017, p. 45). In order to acknowledge the real potential of this body of law, a thorough analysis of it is a prerequisite.

In order to respond to this condition, the goal of this chapter will be to answer the question of what legal instruments and mechanisms of international water law exist and how they have evolved. Present Chapter is divided into three main parts.

First this chapter will attempt to paint the history of international water law with special emphasis on the contribution from international organizations. This will include analysis of different sources of international water law as well as of four patterns of state behavior. This will also include elaboration of the two substantive and one procedural rule, which are customary rules of international water law.

The second part of this Chapter is based on assumption that the ERU concept, although not a panacea, can become the main remedy to water conflicts and as the result can operationalize international water law. Despite the general criticism that this rule is too vague, it will be argued that the real strength of the ERU rule is in its flexibility, adaptability to new circumstances, application of multifactor standard and recognition of water in all its forms, including virtual water. The ERU rule recognizes that new water uses can be justified and should not be perceived as harm.

In order to provide a thorough analysis of the ERU principle, this chapter will begin by defining the concept of 'equity', then the relevant factors on which this rule depends will be discussed, after which the weaknesses and strengths of the concept will be pointed out. Moreover, this Chapter will demonstrate how this rule has been utilized in real life.

The goal is to shed light to a general misperception, according to which "equity is biased towards the first developer" and because of that "late developer can only claim the water resources which have not been utilized already" (Wegerich & Olsson, 2010, pp. 707-717). Based on this idea, downstream early developers have historically claimed for protection of existing uses of water and downgraded new water development attempts.

Prior appropriation and no harm doctrines (used in their 'pure' form) are criticized as discriminatory towards new developers. International water law that has its roots in the US court law at one point did protect exiting uses through prior appropriation doctrine on the ground of their higher benefit. However, following the Nebraska v Wyoming (1945) and more importantly the Colorado v New Mexico (1982) cases, as it will be demonstrated, prior appropriation is a doctrine of the past. These two cases have put the multifactor standard and justified new uses above the existing uses, even if the later was more beneficial in economic terms. The goal is to show that prior appropriation is not any more a leading factor in equitable allocation of water. The no harm rule, similarly, cannot function as an independent norm but only as complementary to the ERU rule.

As the final step, it will be demonstrated that harm can also travel upstream, thereby suggest upperstream late developers to utilize principles of foreclosure of future uses and countermeasures in their claims over water against downstream early developers.

Based on the findings of the first and second part of this Chapter, in the third part will examine the water regulation in Central Asia from the perspective of legal effectiveness and with reference to the cardinal principle of international water law. Questioning the reasons behind failure of water regulation in Central Asia, the goal will be to find out to what extent the ERU theory is included in the fourteen global, regional, multilateral and bilateral treaties signed by Central Asian states between 1991 and 2006. This review will examine the language of water allocation treaties in Central Asia to examine the role of the ERU principle.

## 4.1 HISTORY OF INTERNATIONAL WATER LAW

This chapter will elaborate on the chronology of how international law of non-navigational water uses has evolved.

The roots of international water law date back to the first civilizations that lived near great rivers such as the Nile, Tigris, Euphrates, Indus, Amazon and Mississippi. These early civilizations have used their rivers mainly for irrigation, flood control, travel and transportation. Eventually they had to come up with rules that would regulate such uses. Over time, this triggered the development of complex legal doctrines. (Wouters, An assessment of recent developments in international watercourse law through the prism of the substantive rules governing use allocation, 1996) The first international treaty in history goes back to 2500 BC when two Sumerian city-states called Lagash and Umma agreed to end the bloody war over the Tigris river. (Perez Martin, 2017, p. 17)

By the beginning of the 19$^{th}$ century, with industrial revolution in Europe, rivers were mainly used for navigation purposes because other types of transportation have not yet developed. Moreover, irrigation and hydropower, which are examples of non-navigational use of water, were not yet developed at that time to compete with, so navigational uses of water became superior to non-navigational uses (Teclaff, 1991) (Eckstein, 2002). Rivers then have practically turned into “international highways” (Salman, 2007), which had to be regulated.

As the result, in 1815 major European powers entered into the Act of the Congress of Vienna, which authorized riparian states with the freedom of navigation. (Salman, 2007)

In the following years of rise of industrial revolution, alternative transportation was invented that was faster and more efficient in trade and commerce than ships (Dellapenna, 2001). Rivers began to be more often used for hydropower and industry. Factors such as growing population, more water use for irrigation and reconstruction works following the WWII brought to the steady decline of the supremacy of water use for navigation (Eckstein, 2002). First recognitions of non-navigational uses of rivers were in treaties that regulated navigational uses, which are the Barcelona Convention (1921) and the Geneva Convention (1923) (Salman, 2007).

Unlike navigational uses that were easier to regulate, it turned out that non-navigational uses are more complicated and there was no consensus on a common law. There were no official rules adopted, instead various theories and practices have emerged based on the pattern of use of international waters by states (Salman, 2007). In the first decades of industrial revolution, international water law mainly consisted of bilateral treaties (Eckstein, 2002). Moreover, this branch of law has its roots in the law of the US Supreme Court, which "ironically itself [is] based on international law" (Tarlock, A.D. & Wouters, P., 2007, p. 526)

International non-governmental organizations have played a crucial role in the normative development of main principles of international water law and to the further codification of these principles in the global water treaty (UN Watercourses Convention). How exactly each organization has contributed in this process of law making will be explored in the next chapter.

### 4.1.1 Contribution of International Organizations

It is important to emphasize the work of institutions like the Institute of International Law (IIL), International Law Association (ILA) and International Law Commission (ILC), which have extensively contributed to the development of international water law.

The IIL and ILA are first scholarly non-governmental organizations established at the end of 19$^{th}$ century and working in various branches of international law (Salman, 2007). Rules and resolutions of these organizations are not binding and are not formal documents. However, they carry considerable authority as their work reflects customary international law (Salman, 2007).

The IIL adopted Madrid Declaration (1911) and Salzburg Resolution (1961), both of which emphasize the importance of the no harm rule, which emerged as one of two substantive rules of international water law.

The work of the ILA includes the famous Helsinki Rules (1966) and the Berlin Rules (2004). The Helsinki Rules established the equitable and reasonable utilization (ERU) principle as the basic and cardinal principle of international water law. "[U]ntil the adoption of the UN Watercourses Convention 30 years later, [Helsinki Rules] remained the single most authoritative and widely quoted set of rules for regulating the use and protection of international watercourses." (Salman, 2007, p. 629) Later on, the Helsinki Rules were recognized as customary international law by international community. These set of rules have greatly influenced the UNWC 1997.

The ILC as a group of legal experts nominated by states and functioning under auspices of the UN continued with the work of the ILA. Its main task is to codify and develop international law upon the assignment of the UN General Assembly. The final draft of the UNWC 1997 was adopted following 23 years of work, and entered into force after ratification and accession by 35 states in 2014. The Convention is mainly based on the Helsinki Rules of the ILA and partially on the work of the IIL.

The UNWC 1997 is a global framework convention and the most authoritative statement of customary norms of international water law today. It helps to set the basic standards governing the non-navigational uses of transboundary freshwater resources. It is binding on the states that ratified it or acceded to it. The basic substantive and procedural rules are addressed in the Convention, leaving out the details for states to negotiate upon. (McCaffrey, 2001)

One of the reasons why it took so long for the UNWC 1997 to enter into force after adoption was the concern of states that two substantive rules of international water law (the ERU and no harm) were incorrectly balanced. Doubts persist on whether the concerns of developing upper riparians were adequately met in the Convention (Schawabach, 1998). The substantive principles of ERU and no harm rule contained in the articles 5, 6 and 7 of the UNWC 1997 are tested to find out whether there is "a balance between the rights and obligations of upper and lower riparian states" (Eckstein, 2002, p. 85).

Despite the existing debate and criticism, the International Court of Justice (ICJ) applied the UNWC 1997 in the Gabcikovo-Nagymaros case even before the Convention entered into force. In this case the ICJ emphasized the importance and the supremacy of the ERU principle.

This in a way ended the long-lasting debate by strengthening and affirming the centrality of the ERU as the fundamental principle of the UNWC 1997 (Eckstein, 2002) (Salman, 2007) (McCaffrey, 2001).

## 4.2 SOURCES OF INTERNATIONAL WATER LAW

Sources of international water law are similar to the sources of international law as stated in Article 38(1) of the Statute of the International Court of Justice (International Court of Justice). According to this article, the main sources include international conventions, international custom, general principles of law and judicial decisions. However, international water law is not limited to these four sources. Works of international organizations (as mentioned in the previous chapter), conference documents and papers of highly qualified publicists although not legally binding, have effect of a soft law. For the purposes of this research, this chapter will only elaborate on the main sources, which include international conventions, customary law and judicial decisions.

### 4.2.1 International conventions

International conventions, also called treaties, agreements, protocols, charters, statutes, etc. are relatively straightforward in their application. Norms set in international conventions are different from all the other sources as they are more precise and accessible. These legal documents only bind states that have demonstrated their approval by signature or ratification. In accordance with *pacta sunt servanda* principle, states are bound to comply with agreements they have signed and to act in good faith (Vinogradov & et al., 2003). The most important international treaty in international water law is the 1997 UN Convention on the Non-Navigational Uses of International Watercourses (1997 UN WC).

### 4.2.2 International customary law

Unlike international conventions, customary law is "more complex and uncertain" (Dellapenna, The customary international law of transboundary fresh waters, 2001, p. 239). The state practice is examined in order to define customary norms. A process of claims and counter-claims between states is looked at, and when a state consistently follows a certain pattern of behavior out of sense of legal obligation, then this pattern becomes customary international law. Sense of legal obligation arises when a state acts in certain way because it believes that such practice is required by law, described by a maxim *opinon juris sive necessitatus*, shortly referred to as *opinion juris*. (Dellapenna, The customary international law of transboundary fresh waters, 2001, p. 241) (Schawabach, 1998) Chapter 4.5 on "Four patterns of state behavior" will look at four main patterns of state behavior that have historically developed in state practice.

States' persistent behavior out of sense of legal obligation is similar to people not driving through red lights not only because it is dangerous, but also because they perceive it as an "anti-social behavior", and an illegal act (Dellapenna, The two rivers and the lands between: Mesopotamia and the international law of transboundary waters, 1996). Dellapenna (2001) offers another good example of "a field between two villages, with no road across the field. […] Gradually most people will follow a particular line. […] For whatever reason, a definite path will emerge, and gradually it will become a road. Eventually, everyone will agree that this road is the only right way to travel from village to village even though no one can say precisely when this notion took hold. At that point, they will object to others as trespassers if they choose to use a different path to go from village to village- by which time we have a legal and not merely a factual claim." (Dellapenna, The customary international law of transboundary fresh waters, 2001, p. 267)

Despite the difficulty in its identification, once a rule is accepted as customary international law, it becomes binding on states even in the absence of a treaty (Dellapenna, The customary international law of transboundary fresh waters, 2001). Different sources are analyzed in order to define whether a practice is customary international law or not. Such sources include state votes in international assemblies, decisions of international courts and arbitrations, treaties and international agreements, and writings of "most highly qualified publicists".

### 4.2.3 Judicial decisions

Judicial decisions are important. Although judges do not create law, by analyzing state behavior they help to identify and clarify customary rules of international water law. Moreover, international water law does not prohibit referring to national judicial decisions in resolving international water disputes. Because of such flexibility "US Supreme Court, in particular, has greatly influenced the articulation of some of the fundamental rules of water law" (Vinogradov & et al., 2003, p. 14). The US court cases that influenced international water law the most include *Kansas v Colorado* (1907), *Nebraska v Wyoming* (1945) and *Colorado v New Mexico* (1982). These cases will be elaborated in more detail in Chapter 5.4.2.

The court decisions are binding only on the parties to the case. International courts are not bound to follow previous court decisions (contrary to the common law rule of precedents); however, in practice courts of nearly every case consider previous court decisions that have similar facts. (Vinogradov & et al., 2003) The most important case ruled by International Court of Justice (ICJ) is *Gabčíkovo-Nagymaros* [1997]. This case will also be elaborated in more detail in the Chapter 5.3.3.

## 4.3 FOUR PATTERNS OF STATE BEHAVIOR

It is important to examine how states have behaved historically in relation to their riparian position (upperstream or downstream). Depending on their position and subsequent interests, states have made different claims over shared waters and subsequently affected the main sources of international water law in the form of treaties and more importantly customary law.

Over decades, states have encountered a rather predictable pattern of behavior, and their claims and counterclaims mainly depended on their riparian status. Based on these behaviors, four main theories have emerged. These are absolute territorial sovereignty, absolute territorial integrity, limited territorial sovereignty and community of property.

### 4.3.1 Absolute territorial sovereignty

The theory of absolute territorial sovereignty is typically used by uppermost-riparian states that often wish to be the sole owners of the water that flows through their territory, ignoring

the consequences of such ownership to the other, mainly downstream states (Teclaff, 1991) (Dellapenna, Treaties as instruments for managing internationally-shared water resources restricted sovereignty v community of property, 1994). It is also called the Harmon Doctrine, named after the Attorney General- Judson Harmon- who in 1895 gave an opinion regarding the conflict between the USA and Mexico over the diversion of Rio Grande. According to the Attorney General, "a state is free to dispose, within its territory, of the waters of an international river in any manner it deems fit, without concern for harm or adverse impact that such use may cause to other riparian states" (Salman, The Helsinki Rules, the UN Watercourses Convention and the Berlin Rules: perspectives on international water law, 2007, p. 627). This principle reflects a historic desire of states to "jealously" govern power over water within their territory (Teclaff, 1991).

International water law, however, prohibits states to act in accordance with this principle and calls for more cooperative and peaceful means of resolving disputes.

### 4.3.2 Absolute territorial integrity

Absolute territorial integrity is another extreme of the Harmon Doctrine, which is generally favored by downstream states. According to this principle, riparian states cannot do anything that could affect the quantity or quality of the natural flow of an international river (Dellapenna, Treaties as instruments for managing internationally-shared water resources restricted sovereignty v community of property, 1994) (Salman, The Helsinki Rules, the UN Watercourses Convention and the Berlin Rules: perspectives on international water law, 2007). Downstream states often rely on this principle to protect their existing or prior uses of transboundary waters. Similar to the Harmon Doctrine, absolute territorial integrity has been criticized in international water law as "individualistic and anarchical". (Dellapenna, Treaties as instruments for managing internationally-shared water resources restricted sovereignty v community of property, 1994, p. 269)

### 4.3.3 Limited territorial sovereignty

Limited territorial sovereignty, or restricted sovereignty, is the only theory that has survived and has become the foundation of the modern international water law (Salman, The Helsinki Rules, the UN Watercourses Convention and the Berlin Rules: perspectives on international water law, 2007). It prohibits both absolute territorial sovereignty and absolute territorial integrity and claims that all riparian states are equal in their use of international waters. This theory both establishes a right to use water for all riparian states and a duty to make sure that the use brings no harm to other riparians. (Dellapenna, Treaties as instruments for managing internationally-shared water resources restricted sovereignty v community of property, 1994) (Salman, The Helsinki Rules, the UN Watercourses Convention and the Berlin Rules: perspectives on international water law, 2007)

Restricted sovereignty theory has been recognized as customary international law in the form of equitable and reasonable utilization rule. The rule of equitable and reasonable utilization will be elaborated in more detail in Chapter 6.

### 4.3.4 Community of property

Community of property theory is the extension of the third, limited territorial sovereignty, theory (Salman, The Helsinki Rules, the UN Watercourses Convention and the Berlin Rules: perspectives on international water law, 2007). It claims that the common property nature of the shared water resources creates and binds riparian states into a community. The theory disregards international borders and calls for a communal and joint management of common waters. The real example of community of property can be found in the International Boundary Waters Commission established by the United States and Canada.

While many highly qualified publicists see this theory as an “ideal principle” (Salman, The Helsinki Rules, the UN Watercourses Convention and the Berlin Rules: perspectives on international water law, 2007), states are unwilling to give up their sovereignty over a basic resource to the communal authority (Schawabach, 1998). For these reasons, the theory remains largely unrealized.

## 4.5 SUBSTANTIVE AND PROCEDURAL RULES

on the state practice, two substantive and one procedural rule have been recognized as customary international water law, which are: the rule of equitable and reasonable utilization, no harm rule and an obligation to cooperate on international waters.

### 4.5.1 Equitable and reasonable utilization

Limited territorial sovereignty is the only theory that has survived as customary international law in the form of equitable and reasonable utilization principle (ERU), which will be explored in Chapter 5. The ERU is the cornerstone principle of international water law (McCaffrey, 2001, p. 257) (McIntyre, The role of customary rules and principles of international environmental law in the protection of shared international freshwater resources, 2006, p. 177). This doctrine has its origins in the US court decisions in federal disputes on water (McCaffrey, 2001, p. 253). It offers a balanced approach to watercourse development by "determin[ing] the legitimacy of a use by balancing all factors relevant to a particular case and determining from that whether the use is an equitable and reasonable one" (Wouters, An assessment of recent developments in international watercourse law through the prism of the substantive rules governing use allocation, 1996, p. 419).

ERU is introduced in the Articles 5 and 6 of the 1997 UN Watercourses Convention (UNWC 1997). This principle was also applied in an International Court of Justice case concerning the Gabcikovo-Nagymaros Project (1977) between Hungary and Slovakia. In this case the court emphasized the importance of implementing "the multi-purpose programme… for the use, development and protection of the watercourse [involved in the case]... in an equitable and reasonable manner". (McCaffrey, 2001, p. 254)

ERU does not necessarily call for an equal share of water between riparian states, instead the goal is "an equitable share of the uses and benefits of the watercourse having regard to all relevant factors" and with regard to "the legitimate needs and interests of other co-basin States" (McIntyre, Water, Law and Equity, 2017, p. 51). The Article 6 of the UNWC 1997 gives a non-exhaustive checklist of factors that states need to consider in defining an equitable and reasonable share in a watercourse.

### 4.5.2 No harm rule

The no harm rule prohibits use of international watercourses in a way that could cause significant harm to other riparian states. (Wouters, An assessment of recent developments in international watercourse law through the prism of the substantive rules governing use allocation, 1996)

Although some try to defend the contrary, the general view that highly publicized scholars take is that 'no harm' rule does not prohibit all transboundary harm (McIntyre, The role of customary rules and principles of international environmental law in the protection of shared international freshwater resources, 2006, p. 170). The reason for this is that "most uses of international watercourses will result in some harm" (Wouters, An assessment of recent developments in international watercourse law through the prism of the substantive rules governing use allocation, 1996, p. 438). So, the goal should be not to prohibit harm in total, but to find a compromise between harm and an equitable use. This rule is "well established as an element of the doctrine of limited territorial sovereignty, if applied in isolation leads to a rule of absolute territorial integrity" (Schawabach, 1998, p. 277), so it should play "a complementary role" (Salman, The Helsinki Rules, the UN Watercourses Convention and the Berlin Rules: perspectives on international water law, 2007, p. 639).

### 4.5.3 Duty to cooperate

Duty to cooperate is a procedural customary water law, which was recognized as an "umbrella term, embracing a complex of more specific obligations which by and large, do reflect customary international law" (McIntyre, The role of customary rules and principles of international environmental law in the protection of shared international freshwater resources, 2006, p. 180). This duty includes the obligations to notify, consult and negotiate, exchange information and participate in dispute settlement procedures, which are enlisted in the UNWC 1997. (McIntyre, The role of customary rules and principles of international environmental law in the protection of shared international freshwater resources, 2006)

### 4.5.5 Conflict between the ERU and No-harm rule

> "Suppose, for example (as is often the case), that upstream State A has not significantly developed its water resources because of its mountainous terrain. The topography of the downstream states on the watercourse, B and C, is flatter, and they have used the watercourse for irrigation extensively for centuries, if not millennia. State A now wishes to develop its water resources for hydroelectric and agricultural purposes. States B and C object on the basis that this would significantly harm their established uses. How should the positions of State A, on the one hand, and State B and C, on the other, neither of which seems unreasonable, be reconciled?" (McCaffrey, 2001, p. 254)

The question laid down by McCaffrey is the most debated topic in international water law. Topographic characteristics of the lower basin states make irrigation easier and as the result invite urbanization, this results in an earlier and faster "development of consumptive uses [..] in the lower basin […] than in the upper basin" (Dellapenna, The two rivers and the lands between: Mesopotamia and the international law of transboundary waters, 1996, p. 245) (Schawabach, 1998). Exceptions like US v Mexico exist of course. According to a survey carried out by The Economist, conflicts over transboundary waters will more often occur in developing countries, because unlike developed countries their water infrastructure has yet to develop. (McIntyre, 2006, p. 201)

A new use by a developing upper-stream state can be interpreted as injurious and harmful to the established uses by downstream states. So, if no harm rule is applied in its "pure" form, it may become similar to the absolute integrity rule (McIntyre, The role of customary rules and principles of international environmental law in the protection of shared international freshwater resources, 2006) and prohibit upper-stream states from engaging in new development projects (McCaffrey, 2001), even if such projects prove to be equitable and reasonable.

In balancing between the ERU and no harm rules the test should be on "what the state in question does with the water that is addressed by the equitable-and-reasonable standard" (McCaffrey, The Law of International Watercourses: non-navigational uses, 2017, p. 389). Examples of unreasonable use of water by a state include "sale of withdrawn water outside the basin, excessive withdrawals for use by the withdrawing state outside the basin, serious pollution of the watercourse, as by toxic or hazardous substances, and the like". (McCaffrey, The Law of International Watercourses: non-navigational uses, 2017)

Downstream states often use their legal, economic, political and even military power to block the development projects of the upperstream states. The German Federal Supreme Court stated in the Danauversinkung case that "[o]ne must consider not only the absolute injury caused to the neighboring State, but also the relation of the advantage gained by one to the injury caused to the other" (Dellapenna, Treaties as instruments for managing internationally-shared water resources restricted sovereignty v community of property, 1994, p. 39). So, in order to avoid bias and discrimination the no harm rule should be applied as complementary to the ERU rule and not as a separate principle.

## 4.6 THE EQUITABLE AND REASONABLE UTILISATION RULE

### 4.6.1 EQUITY

**What is 'equity'?**

'Equity' has no universally accepted meaning. It is often used in the context of fairness and justice. Lowe defines it as "general principles of justice as distinguished from any particular system of jurisprudence or the municipal law of any State" (Lowe, 1992). Goldie determines it as "compendium of concepts supporting, promoting and implementing those entitlements, benefits and satisfactions which are validated by society's contemporary sense of justice and fairness" (Goldie, 1987).

In court adjudications on water cases, importance of equity is in the flexibility and a measure of discretion that it grants to the judges in considering each dispute according to its facts. Referring to the *Tunisia-Libya Continental Shelf* case[9], the ICJ asserts that equity allows a court to "choose among several possible interpretations of the law the one that appears, in the light of circumstances of the case, to be closest to the requirements of justice" (McIntyre, Utilization of shared international freshwater resources- the meaning and the role of "equity" in international water law, 2013b, p. 115). Thereby, equity in a way helps to treat the imperfections of international law (McIntyre, Utilization of shared international freshwater resources- the meaning and the role of "equity" in international water law, 2013b).

**Where is 'equity' used?**

The significance of equity has not been confined only to international water law. Equity is equally important for international human rights law, international environmental law and law on sustainable development.

The United Nations Environmental Programme (UNEP) adopted in 1978 defined equity as a key requirement in control, prevention, reduction and elimination of harm that may be

[9] Continental Shelf, Libya v Malta, [1985] ICJ Rep 13.

produced from using shared natural resources (McIntyre, Utilization of shared international freshwater resources- the meaning and the role of "equity" in international water law, 2013b, p. 114). International environmental treaties that significantly emphasize equity are Principle 21 of the 1972 Stockholm Declaration on the Human Environment, the 1992 UN Convention on Environment and Development (UNCED or Rio Declaration), the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and the 1992 Convention on Biological Diversity (CBD). (McCaffrey, The contribution of the UN Convention on the law of the non-navigational uses of international watercourses, 2001)

The Rio Declaration also established the pivotal role of equity in "operationalizing" the principle of sustainable development. "[I]n the absence of detailed rules, equity can provide a conveniently flexible means of leaving the extent of rights and obligations to be decided at a subsequent date" (Sands & Peel, 2012). Charles Bourne claimed that sustainability can realize its goals and objectives only through equity. (Bourne, 1997)

International document on human right to water and sanitation, the 2002 UN Committee on Economic, Social and Cultural Rights (CESCR), refers to equity in regards to the states' responsibility to avoid any kind of discrimination in its policies on water provision (McIntyre, Water, Law and Equity, 2017, p. 48). Similarly, the terms like "equitable access to safe and affordable drinking water for all" and "equitable sanitation and hygiene for all" are used in the methodological guidance on Sustainable Development Goal 6 targets issued by the UN-Water. (McIntyre, Water, Law and Equity, 2017, p. 49)

### 4.6.2 THE ERU PRINCIPLE

The equitable and reasonable utilization (ERU) is the fundamental and cardinal principle of international water law, which is enshrined in both the 1966 Helsinki Rules[10] and in the global framework water treaty- 1997 UN Watercourses Convention (1997 UNWC)[11]. In accordance with this rule, in utilization of transboundary watercourses states are bound to act equitably and reasonably, with consideration of all relevant factors that are determined on a case-by-case basis. Based on state practice, this rule is part of customary international law.

[10] The Helsinki Rules on the Uses of the Waters of International Rivers (1966).
[11] The UN Convention on the Law of Non-Navigational Uses of International Watercourses (1997).

The goal of the ERU rule is to reach optimal utilization of international waters with regards to the needs, benefits, harm and unmet needs of the riparian states. Equitable does not necessarily mean equal share of water or of benefits, it is rather an allocation based on what is just in the given circumstances of each riparian state. (Wouters & et al., Sharing transboundary waters: an integrated assessment of equitable entitlement: the legal assessment model. (IHP-VI Technical Document in Hydrology; No. 74), 2005)

The provisions of the 1997 UNWC are binding even on states that are not signatories of the Convention because these rules reflect customary international water law (Salman, Entry into force of the UN Watercourses Convention: why should it matter?, 2015). Article 6 of the 1997 UNWC requires consideration of all relevant factors and weighing of the benefits with possible injuries to the neighboring basin states (Paisley, 2002). Unique characteristics of every basin should define which factors are more important with special weight given to the protection of vital human needs.

**Relevant factors**

The ERU rule depends on the relevant factors that are to be considered together in order to arrive at a conclusion on the basis of the whole. The Article 6 of the 1997 UNWC provides a list of seven factors, and the Article 5 of the 1966 Helsinki Rules provides a list of eleven factors. It is impossible to give an equal weight to all the factors in every basin. This is why every basin has to decide which factors should be given more weight based on the circumstances and the facts of the case, with special weight given to the protection of vital human needs.

Wouters et al. divide the relevant factors into two broad categories: (1) factors of a natural character, which includes hydrographic, hydrological, climatic, ecological, and etc., and (2) economic and social factors (economic needs, population dependent on watercourse, effects of use on other watercourse states, existing and potential uses, conservation measures, and availability of alternatives). (Wouters & et al., Sharing transboundary waters: an integrated assessment of equitable entitlement: the legal assessment model. (IHP-VI Technical Document in Hydrology; No. 74), 2005, p. 21)

This is a non-exhaustive list of factors, meaning there may be more according to circumstances. Because often other factors such as matters of "national or global security, strategic interests, goals of environmental protection, good governance, poverty eradication, human rights" (Wouters, The relevance and role of water law in the sustainable development of freshwater, 2000, p. 204) or even cultural and religious factors may have an impact on water allocation process in a certain region.

**Weakness is a strength**

The ERU rule is often blamed for being too 'vague'. However, the normative failure is its real strength (Wouters, The relevance and role of water law in the sustainable development of freshwater, 2000, p. 204), because it allows for "the flexibility required to secure the participation of hesitant State actors in the ongoing gradual and progressive elaboration of the kind of sophisticated legal regimes necessary for the cooperative and sustainable management of an increasingly scarce and contested resource". (McIntyre, Water, Law and Equity, 2017, p. 46)

Another strength that originates in the alleged failure is the adaptability to the changing demands of riparian states on water. Also some disapprove the list of relevant factors, which is claimed to provide "occasionally conflicting parameters which are to be considered as a whole" (Wolf & et al., 1999, p. 10). However, equity would not be possible if all the factors were not considered.

More importantly, for this research, the ERU recognizes water in its different forms. In addition to the conventional recognition of surface water, the ERU also recognizes the virtual water.

**Where is the ERU principle used?**

The ERU principle plays an absolutely central role in legal documents regulating transboundary water relations. This principle has also been utilized in the decisions of

International Court of Justice (ICJ), the most prominent of which is *Gabčíkovo-Nagymaros*[12] case (Figure 11).

***Gabčíkovo-Nagymaros [1997]***

Tarlock claims that "the equitable apportionment doctrine has more potential for the successful resolution of interstate disputes" (Tarlock, The law of equitable apportionment revisited, updated and restated, 1985). Even before the 1997 UNWC entered into force, the ICJ applied the ERU rule in the *Gabčíkovo-Nagymaros* case. This important case strengthened the position of the ERU principle and had a general positive effect on the further entering into force of the 1997 UN WC. The ICJ proclaimed the ERU as the governing principle of international watercourses. (McCaffrey, The contribution of the UN Convention on the law of the non-navigational uses of international watercourses, 2001, p. 144)

The dispute concerned a large project on the Danube River agreed between Hungary and Czechoslovakia by the bilateral 1977 treaty. Despite this agreement and substantial work fulfilled, Hungary terminated its duties on environmental grounds. As the result, Czechoslovakia proceeded with fulfillment of the project on its own by implementing a 'provisional solution', which included diversion of 80-90% of the Danube River. Hungary did not agree with such diversion.

The ICJ recognized that both parties were guilty of violating their international obligations. More importantly, the court asserted that "[t]he suspension and withdrawal of that consent constituted a violation of Hungary's legal obligations, demonstrating, as it did, the refusal by Hungary of joint operation; but that cannot mean that Hungary forfeited its basic right to an equitable and reasonable sharing of the resources of an international watercourse". So, the ERU right is so fundamental that even a wrong or unlawful behavior cannot take that 'basic right' away.

The ICJ judged that Czechoslovakia was wrong to unilaterally deprive Hungary of its equitable and reasonable share of transboundary waters.

**Figure 11 Gabčíkovo-Nagymaros [1997] case**

[12] Gabčíkovo-Nagymaros Project, Hungary v Slovakia [1997] ICJ Rep. 7.

In 2000 the Southern African Development Community (SADC) member states decided to revise their Protocol on Shared Watercourse Systems (1995) in order to make it compatible with the ERU principle as set down by the 1997 UNWC (Paisley, 2002, p. 13). Other legal instruments that integrated the substantive rules of the 1997 UNWC include the Protocol for Sustainable Development of Lake Victoria Basin 2003, the Agreement on the Establishment of the Zambezi Watercourse Convention 2004, and the Nile Basin Cooperative Framework Agreement 2010. (Paisley, 2002)

Bilateral and multilateral agreements that utilized ERU principle include the Columbia River Treaty (1964); the Treaty of Peace with Germany (Treaty of Versailles); the Convention and Statute on the Regime of Navigable Waterways of International Concern (1921); the Agreement Regulating the Use of the Waters of the Kunene River for the Purposes of Generating hydraulic power and of inundation and irrigation in the Mandated Territory of South West Africa (1926); the Cunene River Basin Agreement (South Africa and Portugal (1926); The Convention on the Protection of the Rhine against Pollution from chlorides; the Treaty on the Lesotho Highlands Water Project between the Government of the Kingdom of Lesotho and the Government of the Republic of South Africa (1986); the Treaty between the Hungarian People's Republic and the Czechoslovak Socialist Republic concerning the construction and operation of the Gabčíkovo-Nagymaros system of locks (1977). (Paisley, 2002)

### 4.6.3 NO HARM RULE AND PRIOR APPROPRIATION DOCTRINE

Analysis of international water treaties reveals general state practice (Wolf & et al., 1999), according to which existing uses of water are more often protected under prior appropriation doctrine. No harm rule is utilized in states' attempts to stop new water projects and developments. Such state practice is a reflection of absolute territorial integrity pattern of behavior. Although such practice is not supported by international water law, it causes a fallacious thinking that "equity is biased towards the first developer", and hence that "the late developer can only claim the water resources which have not been utilized already" (Wegerich & Olsson, 2010).

This is more often the case in transboundary basins divided between early and late developers. Lower riparians have historically been main users of international rivers because of topographic characteristics that were more favorable for early development. The era of early-developing downstream states was mainly between middle to end of twentieth century (Zeitoun, 2015). During this period the Aswan dam was built, which developed irrigation and hydropower sectors of Egypt. Iraq developed its irrigation at the deltas of Tigris and Euphrates. Water developments in Israel also progressed in this period. There is almost fifty years of difference between the water projects of these downstream states and the water projects of their upperstream neighbors that are only taking place. Zeitoun claims that "'[t]he hydraulic missions' of these downstream governments enabled a degree of control over their societies, and in many cases helped the states flourish economically" (Zeitoun, 2015, p. 950). He also asserts that such developments however created a dependency, which became more visible once upperstream hydraulic missions also began to flourish. Such dependency made downstream states vulnerable to developing upstream water projects. (Zeitoun, 2015)

McIntyre explained the reason why existing uses are more often favored in practice. Calculating human, social, economic and environmental benefits (or harm) is an easier task. It is more difficult to calculate the benefits or harm of future uses, as it happened in *Colorado v New Mexico* (1982) case.

However, it is important to note that the ERU rule is not biased and it does not set grounds for discriminatory behavior by early developers. Even a brilliant tool cannot fulfill anything on its own. It needs a master who knows the tool well and can utilize it skillfully.

#### 4.6.3.1 No-harm rule

For a long time it could not be decided whether the ERU or no harm rule is the fundamental and guiding principle of 1997 UN WC and of international water law. Misunderstanding of the relationship between the ERU rule and the no-harm rule created confusion on the rights and obligations of upstream and downstream states (Salman, Downstream riparians can also harm upstream riparians: the concept of foreclosure of future uses, 2010). Each group of riparians assumed that international water law and its global framework convention (the 1997 UNWC) favor their side.

However, as Professor McCaffrey commented, the relationship of the two principles is as follows: “while the no harm principle does qualify as an independent norm, it neither embodies an absolute standard nor supersedes the principle of equitable utilization where the two appear to conflict with each other. Instead, [the no-harm principle] plays a complementary role, triggering discussions between the states concerned” (McCaffrey, The law of international watercourses: Non-navigational uses. 2nd ed. , 2007, p. 408). This statement defines the ERU principle as the main rule, the no-harm rule is one of the important factors that riparian states should consider in the equitable allocation of their shared resources (Wouters & et al., Sharing transboundary waters: an integrated assessment of equitable entitlement: the legal assessment model. (IHP-VI Technical Document in Hydrology; No. 74), 2005).

Riparian states, both upstream and downstream, will eventually develop their water resources, which will make harm inevitable (McCaffrey, The law of international watercourses: Non-navigational uses. 2nd ed. , 2007). As Professor McCaffrey concluded “if a state’s use is equitable it should be allowed to continue, even if it causes significant harm to another state” (Utton, 1996). So, existence even of a significant harm is not enough to bar a certain action.

#### 4.6.3.2 Prior appropriation doctrine

According to the definition of the prior appropriation doctrine provided by the Cornell Law School’s Legal Dictionary and Encyclopedia, this doctrine stands for water rights determined by priority of beneficial use. It was specified under this definition that “[t]his means that the first person to use water or divert water for a beneficial use or purpose can acquire individual rights to water” (Cornell Law School). The legal maxim of “first in time, first in right” also defines this doctrine well.

According to a study conducted by Wolf (1999), in arid regions prior uses and downstream needs in general are almost always protected and favored in treaties signed between riparian states (Wolf & et al., 1999, p. 11).

Application of prior appropriation doctrine in its pure form similar to no-harm rule disadvantages late developing upperstream states. This is similar to granting downstream riparians a veto power to downgrade the water projects of upperstream states.

Bourne on the other hand claims that "the doctrine of prior appropriation has almost been universally rejected in favor of the doctrine of equitable utilization" (Salman, Downstream riparians can also harm upstream riparians: the concept of foreclosure of future uses, 2010). According to him the past utilizations are considered as one of the many factors in determining the share of riparian states in a river basin. Water allocation based on prior appropriation has been criticized as "wasteful, not conductive to the optimal economic development of the watercourse, and potentially environmentally damaging" (Lipper, 1967). Article 6 of the 1997 UNWC also annulled priority of use by claiming that no category of use can be given any superiority, with the exception of protection of vital human needs.

The evolution of the US case law on water will be briefly presented under this subsection in order to demonstrate the need to change the use of prior appropriation doctrine not only in the discussions, but also in practice. The prior appropriation doctrine, just like international water as a whole has roots in the US case law. It is useful to look at how this doctrine has evolved in the US case law to see what implications such evolution may have for international water law.

***Kansas v Colorado* (1907)**

The case over Arkansas river between two states (Kansas and Colorado) that is considered a straight prior application case is *Kansas v Colorado*[13]. In this case Kansas has been through ten years of droughts, which brought to farm depression. As the result Kansas could not develop as fast as Colorado. The court in this case applied economic interpretation of equity through crude cost-benefit analysis. As the result "Colorado was rewarded for its initiative in organizing irrigation in the arid regions of the state and allowed to authorize appropriations in excess of the dependable flow" (Tarlock, The law of equitable apportionment revisited, updated and restated, 1985, p. 387). Kansas was penalized for inability to develop, although the drought was to blame. Colorado won because its use of Arkansas was more beneficial.

***Nebraska v Wyoming* (1945)**

The second case is *Nebraska v Wyoming*[14]. Although the court in this case did not completely deviate from strict application of priority rule, the importance of this case is in setting the multifactor standard of equitable apportionment, which coincides with the relevant factors found in Article 6 of the 1997 UNWC and Article 5 of the 1966 Helsinki Rules. The court

[13] 206 US 46 (1907).
[14] 325 US 589 (1945).

advised to take into consideration the following factors: “physical and climatic conditions, the consumptive use of water in the several sections of the river, the character and rate of return flows, the extent of established uses, the availability of storage water, the practical effect of wasteful uses on downstream areas, the damage to upstream areas as compared to the benefits to downstream areas if a limitation is imposed on the former” (Tarlock, The law of equitable apportionment revisited, updated and restated, 1985, p. 399).

***Colorado v New Mexico* (1982)**

The third unique case is *Colorado v New Mexico*[15]. This case set the new standard for equitable apportionment. The court stated that “the countervailing equities supporting a diversion for future use in one state may justify the detriment to existing uses in another state” (Tarlock, The law of equitable apportionment revisited, updated and restated, 1985, p. 405). The equity test no longer relied on whose water use is more beneficial. The court gave Colorado a chance to demonstrate clear and convincing evidence that by diverting the river its benefit would outweigh the harm it may bring. The test was between present inefficient uses of New Mexico and benefits that could be gained from future uses of water by Colorado. New Mexico won the case only because Colorado failed to present convincing grounds on that the diversion should be allowed. The burden of proof that the harming late-developing states have to present is always high, so they “need to be shrewd negotiators” (Paisley, 2002). Simply relying on law is not enough.

As seen from the history of case law of the US, the interstate court stopped prioritizing prior appropriation as the main doctrine long time ago. Law has adapted and evolved to fit the new circumstances, and it is time for the regional water sharing to do the same. It would be more useful if prior appropriation and no harm rule have stopped being the main factors defining the water allocation, but were used instead as important relevant factors in the ERU test.

### 4.6.4 FORECLOSURE OF FUTURE USES AND COUNTERMEASURES

[15] 467 US 310 (1984).

The unique quality of the ERU rule is that it does not create limits on what is just and fair. So, upperstream late developers are not as helpless as it might seem. Principles of foreclosure of future uses and countermeasures may strengthen their position in supporting their hydraulic development projects (Zeitoun, 2015). And although these principles are part of international law rather than international water law in particular, they may still be utilized as part of equity test.

**Foreclosure of future uses**

Foreclosure of future uses tries to show that upstream water projects cannot be seen as harm simply because downstream water infrastructure has developed earlier. It also demonstrates how harm can 'travel' upstream as well as downstream.

The ERU rule has "considerable evolutionary potential" (Zeitoun, 2015, p. 384). State's understanding of what is just and fair may change over time, with changing circumstances, like new water projects, population increase, less water because of climate change, and etc. So, water allocation that was totally fair ten or more years ago may not be suitable anymore. Lower riparian's persistent claims for the protection of existing uses or claims of priority of use because they developed earlier and started using water earlier, would be wrong.

By interpreting development projects of upper riparians as harm, and prohibiting such actions, would foreclose upperstream state's future uses of water (Zeitoun, 2015). This happens often when downstream state has developed extensive irrigation infrastructure, which uses most of the available transboundary water. In such a basin, if water allocation is based on priority of use or existing uses doctrines, any attempt by upstream riparian to utilize transboundary river would be interpreted as harm (Zeitoun, 2015, p. 352). By foreclosure of future uses, the upstream state is harmed by downstream state's water use. So, harm can travel both upstream and downstream.

Salman gives an example of a letter that Indian prime minister sent to the president of Pakistan, in which he wrote that if "lower riparian can proceed unilaterally with projects, while upper riparian should not be free to do so […], it would enable the lower riparian to create, unilaterally, historic rights in its favor and go on inflating them at its discretion thereby completely blocking all development and uses of the upper riparian". (Salman, Downstream riparians can also harm upstream riparians: the concept of foreclosure of future uses, 2010, p. 352)

The Senegal River Charter signed in 2002 is one of the few international water documents that recognized foreclosure of future uses[16]. According to this charter the signatories are bound to inform each other of the projects that among others may impede the riparians future projects.

[16] Signed between Mali, Mauritania, Senegal and later joined by Guinea.

(Salman, Downstream riparians can also harm upstream riparians: the concept of foreclosure of future uses, 2010, p. 353)

**Countermeasures**

Countermeasure is a principle in international law, which in short refers to illegal acts that become legal when executed by one state in response to an earlier illegal act by another state towards the former. In other words, it is a legitimate or legalized breach of law. This important rule was for the first time utilized in transboundary water dispute in the case of *Gabčíkovo-Nagymaros*.

In *Gabčíkovo-Nagymaros* case, Czechoslovakia tried to justify its 'provisional solution' (which involved the diversion of 80-90% of the Danube River) as a countermeasure to Hungary's suspension and subsequent termination of bilateral Treaty. However, such justification was dismissed on the grounds that the injury sustained by 'provisional solution' of Czechoslovakia was not commensurate with the harm inflicted by Hungary's initial breach of treaty. The ICJ concluded that unilateral diversion of 80-90% of Danube lacked proportionality (Koe, 1998). And according to the proportionality principle, even a very beneficial use is precluded when it can result in "grossly disproportionate adverse impact on the social, economic, developmental or environmental requirements of other watercourse States". (McIntyre, Water, Law and Equity, 2017, p. 67)

Countermeasure could be used by upperstream states in Central Asia. According to the Almaty Agreement signed in 1992 right after the Soviet dissolution, the Central Asian states have agreed to sustain the Soviet water allocation scheme. Under this agreement, upstream Kyrgyzstan and Tajikistan would continue collecting water in their dams during winter to release in the irrigation season. The downstream states agreed to supply upstream states with oil, gas and coal necessary for heating during winter. However, as downstream states stopped the fossil fuel supplies, which earned higher revenues through sale in the world market, upstream states were forced to breach the agreement and switch the dams to hydropower production mode. So Kyrgyzstan and Tajikistan have breached the regional agreement as a countermeasure to the previous breach by downstream states, so their breach of no harm rule could be justified. And unlike Czechoslovakia, both Kyrgyzstan and Tajikistan did not breach the proportionality rule by depriving the downstream states of substantial amounts of water.

Countermeasures were not claimed by parties in the *River Meuse*[17] (1937) case. However, Judge Anzilotti is often cited and his claims enforce the principle of countermeasures. Judge Anzilotti used a Roman law maxim- *inadimplenti non est adimplendum* ("he who fails to fulfill his part of an agreement cannot enforce that bargain against the other party") (McIntyre, Water, Law and Equity, 2017, p. 54). In this case the court dismissed the Netherlands' claim against Belgium which diverted the River Meuse. The court's decision was based on that Netherlands itself earlier diverted the same river in a similar way. "[H]e who come[s] to equity must come with clean hands", Judge Anzilotti concluded. (McIntyre, Water, Law and Equity, 2017, p. 55)

[17] Diversion of Water from the Meuse, Netherlands v Belgium, (1937) PCIJ Series A/B No 70.

## 4.7 WATER REGULATION BEFORE AND DURING SOVIET UNION

Despite the dry climate early civilizations have been able to develop in Central Asia with the help of clever water management and distribution systems. Water was of high importance and never sold. Before the conquest by the Tsarist Russia, water management was mainly subject to the rules of sharia and adab (customary oral rules of good behavior).

The recent history under the Soviet rule had a strong influence on the development of water regulation in Central Asia. With the establishment of the Soviet Union in the region and subsequent centralization of water allocation systems, a more structured and precise water regulation was introduced, which had both positive and negative results. The Soviet Union wanted to reach self-sufficiency in cotton production and to free itself from dependence on American cotton. As the result of substantial infrastructure investment, the USSR turned Central Asia into its "cotton basket". With hydraulic goals concentrated on agriculture projects, water allocation prioritized irrigation and hydropower generation was of secondary importance.

The main law regulating water in Central Asia at this time was called the "Basics of water legislation of the USSR and Union Republics" signed in 1970. According to the Article 3 of this law the USSR was the sole owner of water, and union republics had the right of use only. Table 7 displays the water allocation quotas that the USSR set for the riparians of Syr Darya and Amu Darya rivers as established by the Protocol No. 413[18] and the Protocol No. 566[19] (UN, 2004, pp. 35-36). Such water quotas favored downstream Uzbekistan, Kazakhstan and Turkmenistan, while upstream Kyrgyzstan and Tajikistan's water interests were immensely discriminated. This discriminated allocation has been compensated during the Soviet rule with fossil fuels needed for electricity production and heating in winter from downstream states.

[18] Protocol No. 413 of the Science and Technology Council of the USSR Ministry of Land Reclamation and Water Management on Syr Darya (1945).

[19] Protocol No. 566 of the Science and Technology Council of the USSR Ministry of Land Reclamation and Water Management on Amu Darya (1987).

**Table 7. Water allocation scheme set by the USSR**

| Water allocation scheme set by USSR | | |
|---|---|---|
| | **Amu Darya** | **Syr Darya** |
| | **%** | **%** |
| Kazakhstan | - | 42 |
| Kyrgyzstan | 0.6 | 0.5 |
| Tajikistan | 15.4 | 7 |
| Turkmenistan | 35.8 | - |
| Uzbekistan | 48.2 | 50.5 |
| | **100** | **100** |

**Source: (UN, 2004, pp. 35-36)**
**https://www.unece.org/fileadmin/DAM/env/water/damsafety/effuse_en.pdf**

Because Afghanistan was not part of the USSR, water relations between Afghanistan and the USSR were regulated through a separate treaty[20]. This treaty among others includes terms on navigation, no harm rule, diversion and water use for agriculture and industry. Articles 18 and 19 stipulate that diversion of river and new water projects are only possible upon agreement of both parties. Article 24 states that agricultural and industrial works near river shall be governed by the regulations of the party on whose territory the operations are located. Since water use for agriculture and industry even near the river includes some diversion, it is not clear under what circumstances the diversion is subject to the agreement of both parties and when not.

## 4.8 WATER REGULATION AFTER USSR DISSOLUTION

With the goal of finding out to what extent the ERU principle is present in the regional, multilateral and bilateral treaties and agreements signed by Central Asian states, the Table 8

[20] Treaty between the USSR and the Royal Government of Afghanistan concerning the regime of the Soviet-Afghan states frontier (1958)

provides with the list of fourteen main treaties signed between 1991 and 2006. Each of these treaties has been analyzed to find out any reference to the ERU concept.

The analysis has revealed that half of these agreements have some reference either to the ERU concept, to international water law or to international law. However such reference differs for every one of them.

**Table 8. Water treaties in Central Asia (1991-2006)**

| Water treaties in Central Asia signed between 1991 and 2006 | | | | |
|---|---|---|---|---|
| | **Treaty** | **Short name** | **Parties** | **ERU principle** |
| **1992** | Agreement between the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan and the Republic of Uzbekistan on Cooperation in the Field of Joint Management on Utilization and Protection of Water Resources from Interstate Sources | 1992 Almaty Agreement | Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan | Preamble: "based on the historical community of people living in the republics, their **equal rights** and responsibilities for ensuring **rational use** and protection of water resources"; recognizing interdependence and interconnection of interests of all the republics in dealing with joint use of water resources according to the principles common for the entire region and **equitable regulation** of their use; Art. 1: While recognizing **community and integrity of water** resources in the region, the Parties shall have **equal rights to water use** and responsibility to ensure **rational use** and protection of water; Article 10: "measures for **rational water use** and conservation" |

**Table 8. Water treaties in Central Asia (1991-2006) (Continued)**

| | | | | |
|---|---|---|---|---|
| **1992** | Agreement on interaction in the field of ecology and environmental protection | | 1992 Commonwealth Agreement on Environmental Interaction | n/a |
| **1993** | Agreement on joint activities in addressing the Aral Sea and the zone around the Sea crisis, improving the environment, and ensuring the social and economic development of the Aral Sea region | 1993 Kzyl- Orda Agreement | Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan | Preamble: Confirming their commitment to **the international water law principles**, respecting the **mutual interests** of each of the sovereign states-participants of this Agreement in the matters of usage and protection of water resources in the basin, proceeding from the necessity of preserving the Sea; |
| **1996** | Agreement between Turkmenistan and the Republic of Uzbekistan on Cooperation over Water Management Issues | 1996 Chardjev Agreement | Uzbekistan, Turkmenistan | n/a |

**Table 8. Water treaties in Central Asia (1991-2006) (Continued)**

| | | | | |
|---|---|---|---|---|
| **1996** | Agreement between Kazakhstan, Kyrgyzstan and Uzbekistan on fostering economic cooperation on the use of fuel and water resources, construction and operation of gas pipelines in the Syr Darya basin | | Kyrgyzstan, Kazakhstan, Uzbekistan | n/a |
| **1998** | Agrement between Kazakhstan, Kyrgyzstan and Uzbekistan on the use of water and energy resources in the Syr Darya basin | 1998 Syr Darya Agreement | Kazakhstan, Kyrgyzstan, Uzbekistan | Preamble: Having a common desire to find the most precise and **fair solution to use the water** and energy resources of the Syr Darya basin in accordance with the precedents of **international law**. |
| **1998** | Agreement on the general principles of interaction in the rational use and protection of transboundary water bodies of the state members of the Commonwealth of Independent States (CIS) | 1998 Moscow/CIS Agreement | | Preamble: recognizes **Helsinki Rules (1966)** and the UNECE Convention |

**Table 8. Water treaties in Central Asia (1991-2006) (Continued)**

| | | | | |
|---|---|---|---|---|
| **1998** | Agreement between Kazakhstan, Kyrgyzstan and Uzbekistan on cooperation in the area of environment and rational nature use | 1998 Environmental Cooperation Agreement | Kazakhstan, Kyrgyzstan, Uzbekistan | Art. 1 The Parties shall develop cooperation in the area of environmental protection and **rational use** of natural resources on the basis of **equality of rights**, **mutual benefit** pursuant to the Laws of the respective Countries. |
| **1998** | CIS Agreement on informational cooperation in the field of ecology and environmental protection | 1998 CIS Agreement on Informational Cooperation | | n/a |
| **1999** | Agreement between Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan on the parallel operation of the energy systems of the Central Asian states | 1999 Agreement on Energy Systems | Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan | Preamble: Proceeding from multiyear commonality of the historical development, traditional economic, scientific and research links, firmly resolving to establish their own international relations on the basis of **mutual understanding, equity and equality.** |

**Table 8. Water treaties in Central Asia (1991-2006) (Continued)**

| | | | | |
|---|---|---|---|---|
| **2000** | Agreement on the use of water management facilities of intergovernmental status on the rivers Chu and Talas | | Kyrgyzstan and Kazakhstan | Preamble: - mutually aspiring to find a more unassailable and **fair solution to the efficient use of water management facilities** in compliance with generally acknowledged norms of **international law on water resources**; - respecting the principles **of good neighborly relations, equality and mutual assistance**, ; Art. 1: The Parties declare that the use of water resources and exploitation of water management facilities of intergovernmental status shall be aimed at the achievement of **mutual benefit on the fair and equitable basis**. |
| **2006** | STATUTE On the Secretariat for the Commission of the Republic of Kazakhstan and the Kyrgyz Republic on the Use of Water Management Facilities of Intergovernmental Status on the Rivers Chu and Talas | | Kyrgyzstan and Kazakhstan | n/a |

**Table 8. Water treaties in Central Asia (1991-2006) (Continued)**

| | | | | |
|---|---|---|---|---|
| **2006** | Framework Convention for the protection of environment for sustainable development in Central Asia | 2006 Framework Convention on sustainable development in CA | Kyrgyzstan, Tajikistan, Turkmenistan (Not yet in force) | Preamble: "**rational use**"; Art. 3: "**rational use** of natural resources"; Art. 4.5 " Natural resources and other environmental components are used **the most rational way** to ensure the needs and aspirations of present and future generations"; Art. 5.4 " **fair and reasonable use** of transboundary natural resources" |

Only four treaties contain provisions on the ERU concept both in the preamble and within the treaty. In 1992 Almaty Agreement for example the preamble and Articles 1 and 10 have reference to equal rights, rational use and equitable regulation of water resources. The Article 1 of the 1998 Environmental Cooperation Agreement states that parties shall develop cooperation based on rational use, equality of rights and mutual benefit. The 2000 Agreement on the use of water management facilities of intergovernmental status on the rivers Chu and Talas contains similar provisions in the preamble and Article 1. The 2006 Framework Convention on sustainable development in Central Asia, which has not entered into force yet, has the most active support of the ERU principle both in the preamble and articles 3, 4.5 and 5.4.

One treaty- the 1999 Agreement on Energy Systems, by committing to establish international relations on the basis of mutual understanding, equity and equality, makes a direct reference to the ERU principle only in its preamble.

Other three treaties- the 1993 Kzyl-Orda Agreement, 1998 Syr Darya Agreement and 1998 CIS Agreement- do not make any mention of the ERU concept but express their commitment to either the general principles of international law (1998 Syr Darya Agreement), international water law (1993 Kzyl-Orda Agreement) or to the 1966 Helsinki Rules (1998 CIS Agreement). The 1966 Helsinki Rules is the first global non-binding water treaty that established the supremacy of the ERU concept and on which the 1997 UN Watercourses Convention is based.

In terms of global treaties, all lower riparians (Kazakhstan, Uzbekistan and Turkmenistan) have become parties to the 1992 UNECE Water Convention. And only Uzbekistan has ratified the 1997 UN Watercourses Convention. While the UN Watercourses Convention is a globally recognized international water law that entered into force in 2014, the UNECE Water Convention should be applied with care.

The UNECE Water Convention was initially designed as a regional EU treaty that "may focus too much on water pollution and not address sufficiently the issue of competition over dwindling water resources, which confronts many developing countries" (Loures & et al. , 2010, p. 22). And despite its transformation into a global treaty in 2013, as well as interest in promoting the Integrated Water Resources Management (IWRM) and water-energy-food nexus models in Central Asia, its application to this region should be done with care. The reasons for this are "differences in political structures, national priorities, cultural traits, socioeconomic frameworks, financial and infrastructure capacities" between Central Asian states and EU members (Abdullaev & Rakhmatullaev, 2015, p. 857).

# CHAPTER 5. WATER FOOTPRINT OF AGRICULTURAL PRODUCTS

The previous chapter has conducted a legal analysis of water treaties signed by Central Asian states between 1991 and 2006 Central Asia. This brought to the conclusion that half of these treaties recognize the ERU principle and international water law. It was also pointed out that the main problem of water regulation in Central Asia is in that it is based on the prior appropriation doctrine.

The existing water allocation system established by the Soviet Union discriminates upper riparians by allocating only 0.55% and 11.2% of the annual available water in the basin to Kyrgyzstan and Tajikistan respectively (Table 7). Uzbekistan, Kazakhstan and Turkmenistan on the other hand are allocated 49.35%, 21% and 17.9% respectively (Table 7). Such water allocation was suitable for the well-functioning water-energy barter system that existed under the Soviet Union, but is not applicable any more.

It was concluded that a new water allocation mechanism based on the ERU principle should be generated because as it is claimed by the critics, the prior appropriation doctrine is "wasteful, not conductive to the optimal economic development of the watercourse, and potentially environmentally damaging" (Lipper, 1967).

In order to test this criticism of the prior appropriation doctrine, this Chapter will ask the question of how each Central Asian state consumes water in the production of cotton, wheat and rice, in order to see whether such use is efficient or not.

In order to accomplish this goal, the water footprint concept will be utilized. The agricultural sector which is the main water consumer in Central Asia will be scrutinized using the water footprint indicator. This concept will be used to define which water uses in Central Asia are effective and which are not. It will also help to shed light on how much water is used for domestic use and how much is exported.

This chapter will be divided into two parts. The first part will introduce the water footprint concept. The second part will analyze the two publications that were prepared by Hoekstra A.Y. (who invented the water footprint concept) and his colleagues, which have analyzed the water consumption in the production of three main agricultural products in Central Asia (wheat, cotton and rice). These two papers include: (1) Chapagain, A.K., Hoekstra, A.Y.,

Savenije, H.H.G. and Gautam, R. published in 2005 and called "The Water Footprint of cotton consumption; (2) Aldaya, M.M., Munoz, G., and Hoekstra, A.Y. published in 2010 and called "Water footprint of cotton, wheat and rice production in Central Asia".

## 5.1 WATER FOOTPRINT

According to the Asian Development Bank, water footprint is "now emerging as one of the most promising tools in water accounting" (ADB, 2013). It is a concept initiated by Hoekstra, A.Y. and presented at an international expert meeting on virtual water trade in December 2002. The water footprint concept was inspired by the "ecological footprint" developed by Wackernagel and Rees in 1990's (Wackernagel & Rees, 1996). While ecological footprint indicates the amount of land required by a nation, water footprint calculates "the water use behind all the goods and services consumed by one individual or the individuals of a country" (Chapagain & al., 2006) (Hoekstra, 2017, p. 3062).

The importance and innovation of water footprint concept is in taking a new perspective and in offering a new indicator to the issue of water scarcity and on water management as a whole. By questioning the traditional hydro-centric studies that are too concentrated on matters of improving water productivity, water footprint raises questions of equity and sustainability of water use. Some of the questions that this concept asks include: how efficient is the food production system as a whole; is water use in certain sectors sustainable; or how consumption behavior may affect water saving, and etc. Raising such questions and researching for answers may help to identify potential mechanisms of water allocation.

### 5.1.1 Virtual water trade

Water footprint is related with the virtual water trade concept presented by Professor Tony Allan in 1993. Allan argues the 'hidden' nature of virtual water that connects water, food and trade. Through this link Allan claims "people in one place can and do make indirect use of freshwater resources elsewhere through virtual water trade" (Allan, 2002). This happens because not all countries can afford enough water and land to reach food sufficiency; so they choose to import water-intensive commodities as the result. Jordan for example is an extremely

water-scarce state that imports 80% of its virtual water. Every year, Jordan saves 7 billion $m^3$ of water through trade, and it is "the volume of water that would have been required had Jordan produced all imported commodities itself" (Schyns, 2015).

### 5.1.2 Main features of water footprint

The water footprint is based on three main features.

First of all, similar to virtual water concept, water footprint is founded on the idea that water is a global resource: through virtual water trade, activities of people in one state can indirectly affect the water use in another state. In other words, by looking at the water footprint, it is possible to link consumption at one place to the impacts at another place (Aldaya & et al., 2010). Based on this idea, water footprint experts have calculated that between 1997 and 2001, "16% of the water use in the world was not for producing products for domestic consumption, but for making products for export" (Hoekstra, Human appropriation of natural capital: a comparison of ecological footprint and water footprint analysis, 2009, p. 27). As the result, it is claimed that exporters of virtual water often suffer from water problems because of their export position (Hoekstra, Human appropriation of natural capital: a comparison of ecological footprint and water footprint analysis, 2009) and "many water problems bear an international trade component" (Hoekstra, Human appropriation of natural capital: a comparison of ecological footprint and water footprint analysis, 2009, p. 28). While trade helps to alleviate water shortage in most states, it amplifies such shortage in the states exporting virtual water (Hoekstra, The water footprint of modern consumer society, 2013).

The second feature of water footprint is that it analyzes trade patterns from consumption point of view and looks at the final purposes for which water is used. This feature grants us with an opportunity to compare. So, for example, water footprint concept demonstrates that 85% of humanity's water footprint is related to the consumption of agricultural products, 10% is related with consumption of industrial products and only 5% to domestic water consumption (Hoekstra, The water footprint: water in the supply chain, 2010). This allows us to realize that most of the world's water is used for growing food. This concept also informs us that animal products are more water intensive: producing a kilogram of meat uses more water than producing a kilogram of cereals; or producing a kilogram of vegetables uses less water than a kilogram of cereals, and etc. (Hoekstra, The water footprint: water in the supply chain, 2010).

Another example is biofuels, which has the highest water footprint compared to the other types of fuel. So, although biofuels production is promoted for being environmentally friendly and clean, on the other hand, its effect on water resources shows opposite results. The water footprint concept does not invent anything new, but simply presents available information in a new format. And this is importance of this concept- it allows us to know the difference, which is essential in generating and designing water policies and water allocation mechanisms.

The third important feature of water footprint is that it separates between the green, blue and grey water footprint. The 'green water use' was first suggested by Falkenmark in 1995 and grey water footprint was proposed by Postel (1996). While blue water use stands for ground or surface water used in the production of goods; green water use stands for rainwater stored in soil and then evaporated during the production process; and grey water use equals to the amount of water required for diluting the polluted water due to leaching of fertilizers and pesticides. Hoekstra claims that the main concern should generally be with the blue water footprint than with the green water footprint. The reason for this is that while green water would have evaporated any way through another crop if not used, blue water is lost to the atmosphere instead of being used as a ground water or river water for other competing purposes. So blue water generally has greater effect on the environment compared to the green water use.

### 5.1.3 Limitations of water footprint concept

Despite the attractiveness of the concept, there are limitations related to uncertainties in calculations due to the data weakness (Fraiture & et al. , 2010) (Hoekstra A.Y. & Hung, P.Q., 2005). The first limitation is related to the complexity of the factors involved (Yang & et al, 2006). For example, in calculation of a crop exported from one state it is assumed that it is grown there ignoring the possibility that it could be imported from another state for further export. So, it is not always possible to "track the sources of all exported products" (Hoekstra A.Y. & Hung, P.Q., 2005, p. 47). Tracing water footprint of meat and other animal products is an especially complex process because of the difficulty in calculating the exact "composition and origin of feed concentrates" (Hoekstra, Water footprint assessment: evolvement of a new research field, 2017, p. 3072). Where specific data is not available, studies take regional averages. Some states, despite their geographical proximity, can have divergent virtual water

footprints (Hoekstra A.Y. & Hung, P.Q., 2005). So weakness in data availability turns into a serious constraint.

Moreover, losses related with transport, application of water and irrigation vary for every state and a crop type. Such losses are significant in some cases with over 50-80% of water lost between the river and the crop. However, water footprint studies often do not take such losses into account because the information on the evaporative demand level for each state is usually not available (Yang & et al, 2006).

Although these limitations are problematic because they feed doubt on the usefulness of water footprint studies, this is not a problem that originates from the concept. It is instead a general problem that should be worked on. Where there is a gap of information on climatic or water characteristics of a certain basin or a country, this creates a problem not only for this particular concept but for any research that works on providing viable and useful information. This concept cannot solve such problem by itself. Special international and national statistics institutions should work better to supply with required data in a transparent way.

### 5.1.4 Criticism of water footprint concept

While water footprint concept, along with virtual water concept, was complimented for creating awareness, some economists heavily criticize both concepts for the following reasons.

First of all, it was argued that "it is not water that is being traded; it is food" (Merrett, 2003) and that water shortage is not a global problem, but a local and regional one (Wichelns, 2015). So water should be protected at a local level. However, as an example, 44% of water used in production of cotton is for further export rather than for domestic use. As the result, almost "half of the water problems in the world related to cotton growth and processing can be attributed to foreign demand for cotton products". Although water transfer in its physical (bulk) form is almost non-existent, virtual water trade connects consumption of water at one state with negative environmental and economic externalities at another state (Chapagain & et al., The water footprint of cotton consumption: an assessment of the impact of worldwide consumption of cotton products on the wider water resources in the cotton producing countries, 2006b). Hoekstra claims that "[i]n an interconnected world, it is short-sighted to say that

problems are caused and are to be solved where they occur" (Hoekstra, Water footprint assessment: evolvement of a new research field, 2017, p. 3072).

Secondly, it was argued that water footprint is based on misleading theoretical grounds (Jia & et al. , 2017). It was claimed that this concept is wrong because it considers only one production factor (water) and omits other factors such as "available land, labor and technology, national food policies and international trade regulations", which according to critics often outweigh in international trade decisions (Wichelns, Virtual water and water footprints compelling notions, but notably flawed, 2011) (Hoekstra A.Y. & Hung, P.Q., 2005, p. 54). Bringing in examples of water rich but land poor Japan, Korea and Singapore, this criticism is based on the idea that water scarcity does not affect trade strategies and decisions of states. Other factors such, most importantly land scarcity, push even water-rich states to import water-intensive products.

However, Hoekstra (2017) argued that by taking water as a central viewpoint, the goal was to incorporate a new indicator into the sustainability discourse analogous to studies that concentrate only on land or labor productivity. So it would be wrong to expect virtual water trade and water footprint concepts "to account for other inputs (like land, labor) as well". Author claims that it is similar to "taking the wrong tool for a purpose and then blaming the tool for it" (Hoekstra, Water footprint assessment: evolvement of a new research field, 2017, p. 3073). He agrees with that study of virtual water trade in water abundant states should also consider factors other than water (Hoekstra, Human appropriation of natural capital: a comparison of ecological footprint and water footprint analysis, 2009).

Thirdly, it is desired that virtual water trade and water footprint concepts explain reasons behind water scarcity problems or advise on how to stop further degradation rates (Wichelns, Virtual water and water footprints compelling notions, but notably flawed, 2011). When such information is not readily provided, it is claimed that the concepts are "not helpful" (Wichelns, Virtual water and water footprints compelling notions, but notably flawed, 2011), have no policy relevance (Jia & et al. , 2017) and are redundant (Merrett, 2003).

Water is present in all sectors of people's life, which requires an interdisciplinary approach. So asking for one-fits all solution is an impossible task. Instead, this concept can be used within other more complex studies on water in order to fill in a certain gap. Water footprint and virtual water trade do not pretend to invent new knowledge either; they simply gather known information and present it in a new format. By attracting attention from water scholars the concepts stimulate scientific debate. As the result they add "a new fruitful perspective on issues

such as water scarcity, water dependency, sustainable water use, and the implications of global trade for water management" (Chapagain & al., Water saving through international trade of agricultural products, 2006).

## 5.2 WATER FOOTPRINT IN AGRICULTURE OF CENTRAL ASIA

This Chapter is based on the criticism of the prior appropriation doctrine, according to which this doctrine is "wasteful, not conductive to the optimal economic development of the watercourse, and potentially environmentally damaging" (Libert, 2008). The goal is to find out how each Central Asian state consumes water in the production of cotton, wheat and rice, in order to see whether such use is efficient or not. Moreover, the goal will be to scrutinize which water uses are for production of domestic goods and which are destined for export. So it is not within the scope of this study to analyze the methodology of water footprint indicator.

In order to accomplish the goals set above, this chapter will review the two publications by (1) Aldaya, M.M., Munoz, G. and Hoekstra, A.Y. (2010) called "Water footprint of cotton, wheat and rice production in Central Asia" and by (2) Chapagain, A.K., Hoekstra, A.Y., Savenije, H.H.G. and Gautam, R. (2006) called "The water footprint of cotton consumption: An assessment of the impact of worldwide consumption of cotton products on the water resources in the cotton producing countries".

According to these studies, agriculture in Central Asia is responsible for 90% of the total consumptive use and about 95% of the total water withdrawals according to AQUASTAT (Aldaya & et al., 2010). Wheat and cotton are identified as the most water-consuming crops (Aldaya & et al., 2010). The first publication reviews the water footprint of cotton, wheat and rice production in Central Asia. The second publication reviews the effect of cotton consumption on the main cotton producing and exporting countries, which includes Uzbekistan and Turkmenistan as well. Both publications differentiate between the green and blue water components, which demonstrate how cotton, wheat and rice industries affect the scarce water resources in Central Asia.

The green water footprint ($m^3$/ton) has been estimated as the ratio of the effective rainfall ($m^3$/ha) to the crop yield (ton/ha), and the blue water footprint (m3/ton) as the ratio of the volume of irrigation water consumed to the crop yield. Analysis of the methodology used in the calculation of the water footprint is not within the scope of this study, but description of the methodology and sources of utilized data may be obtained from the Hoekstra (2009) (Hoekstra, Water footprint manual, 2009).

**Table 9. Water footprint of production and virtual water import in Central Asia in the period of 1997-2001 ($10^3$ $m^3$/year)**

| | Water footprint related to production within Central Asia | | | | | Virtual water import | | |
|---|---|---|---|---|---|---|---|---|
| | Water footprint related to domestic water use | Agricultural water footprint | | Industrial water footprint | | For national consumption | | For re-export of imported products* |
| | | For national consumption | For export | For national consumption | For export | Agricultural goods | Industrial goods | |
| Kazakhstan | 0.59 | 24.9 | 7.92 | 1.15 | 4.58 | 0.29 | 0.06 | 0.33 |
| Kyrgyzstan | 0.31 | 6.1 | 0.42 | 0.18 | 0.12 | - | 0.02 | 0.01 |
| Tajikistan | 0.43 | 5.4 | 1.05 | - | - | - | - | - |
| Turkmenistan | 0.38 | 8.4 | 1.07 | 0.12 | 0.05 | 0.18 | 0.07 | 0.05 |
| Uzbekistan | 2.68 | 18.9 | 6.24 | 1.15 | - | 1.06 | 0.23 | 0.35 |

**Source: (Aldaya & et al., 2010, p. 13)** **https://research.utwente.nl/en/publications/water-footprint-of-cotton-wheat-and-rice-production-in-central-as**

Central Asia is a net virtual water exporting region (Table 9), in which Kazakhstan and Uzbekistan export around 30% of the total water used. The agricultural water footprint shows that most of the water in the region is consumed by this sector, which mainly grows cotton, wheat and rice. So, the next three subchapters will demonstrate water footprint of cotton, wheat and rice production in the region.

### 5.2.1 Water footprint of cotton in Central Asia

Cotton used to be the dominant crop in Central Asia during the Soviet times. But with independence following 1991 Central Asian states have prioritized food self-sufficiency, so the share of cotton in irrigated agriculture has decreased from 45% to 25%. However, cotton still remains the most important cash crop in the region.

About 16% of the total cotton produced in Central Asia is exported outside the region. According to the National Cotton Council of America (2009), Uzbekistan is one of the largest cotton exporters in the world. It is one of the five biggest cotton crop producers in the world after China, USA, India and Pakistan, which together produce 70% of the world's cotton (Chapagain & et al., The water footprint of cotton consumption: an assessment of the impact of worldwide consumption of cotton products on the wider water resources in the cotton producing countries, 2006b). According to Aldaya et al. (2010) Uzbekistan produces about 3.5 million tons of raw cotton and sells some 1 million tons of cotton fibre, generating more than US$ 1 billion. Turkmenistan's export value after natural gas comes from cotton, which equals to 20%.

Figures 13 and 14 illustrate the impact of consumption of cotton products by the EU member states on the global water footprint (Figure 13) and the blue water footprint (Figure 14) in million $m^3$/year between 1997 and 2001. Although Figure 13 shows that the European states, in terms of global water footprint, mainly depend on water resources of India for their cotton supply, Figure 14 shows that cotton consumption of European states, in terms of blue water footprint, has higher impact on the blue water resources of Uzbekistan than of India. What this means is that India uses only 37% of its surface and groundwater available for growing cotton exported to the EU states, the rest 63% grows utilizing rainwater. Uzbekistan, on the other hand, uses 81% of water from already scarce Amu Darya and Syr Darya rivers to produce cotton for export. This is a great illustration of the level of inefficient water use in Uzbekistan.

Not only water is used to produce export-oriented water intensive commodity but also such use impacts the availability of water in the shared rivers of the region.

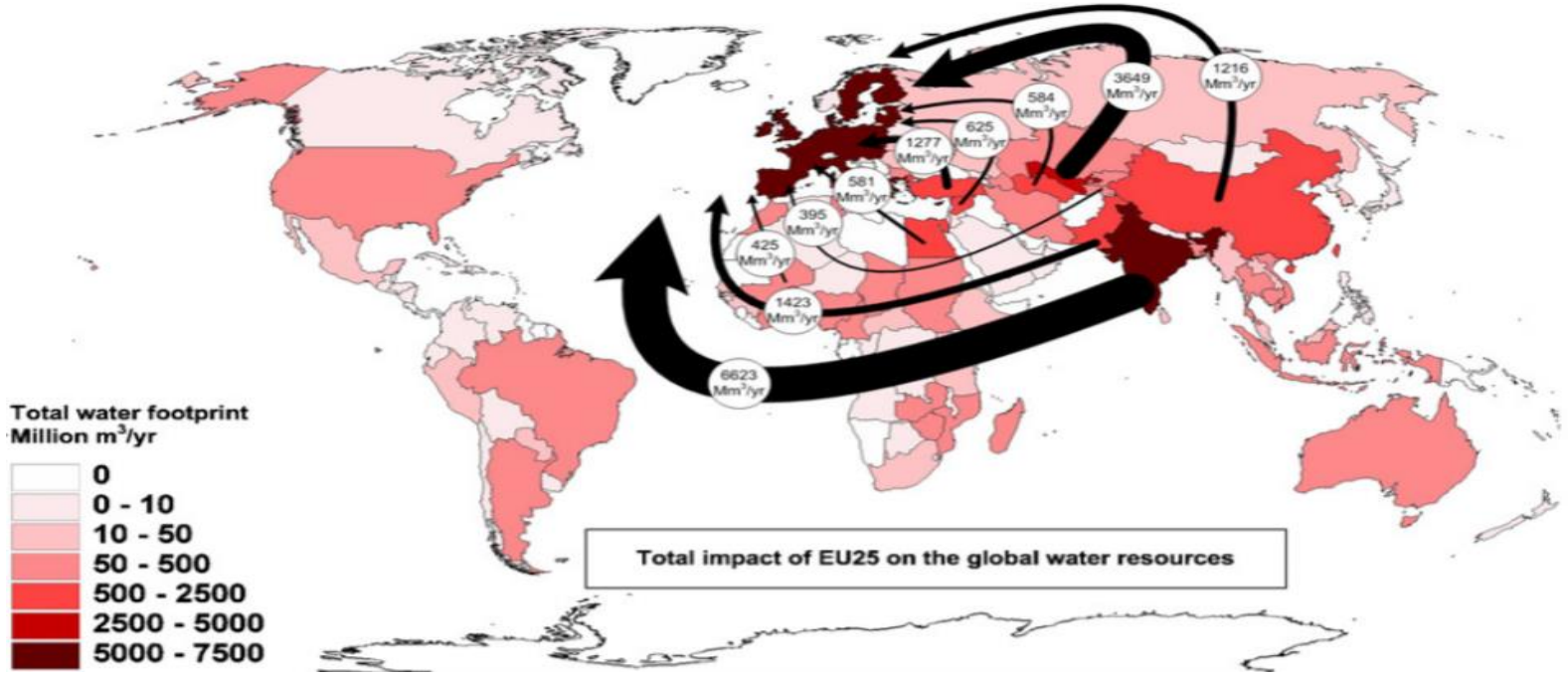


**Figure 12 The impact of consumption of cotton products by the EU member states on the world's global water footprint (Million m3/year). Period: 1997-2001 (Chapagain & et al., The water footprint of cotton consumption: an assessment of the impact of worldwide consumption of cotton products on the wider water resources in the cotton producing countries, 2006b)**

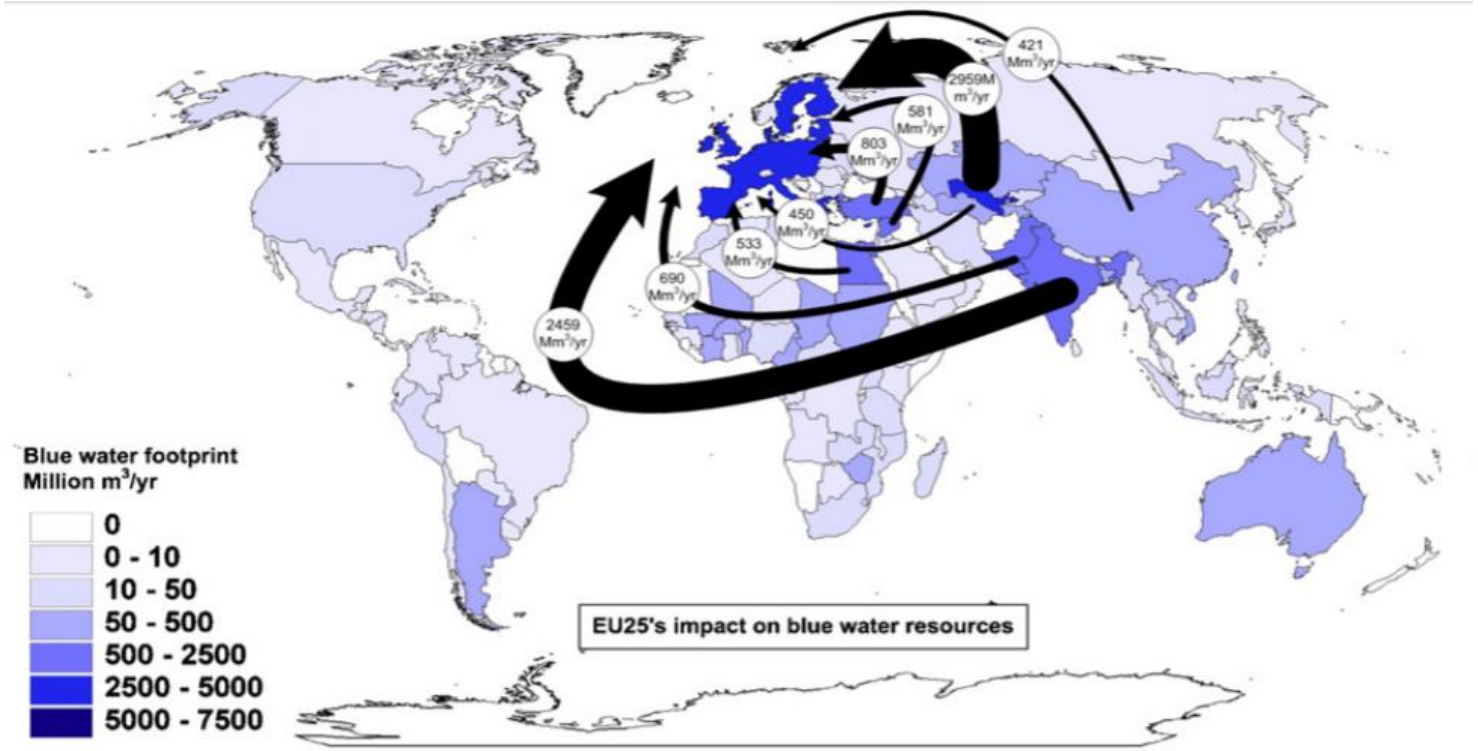


**Figure 13 The impact of consumption of cotton products by the EU member states on the world's blue water footprint (Million m3/year). Period: 1997-2001 (Chapagain & et al., The water footprint of cotton consumption: an assessment of the impact of worldwide consumption of cotton products on the wider water resources in the cotton producing countries, 2006b)**

According to Chapagain, et al. (2006) both Uzbekistan and Turkmenistan have least attractive climatic conditions for producing cotton because of high evaporative demand and low effective rainfall. Because of this both Uzbekistan and Turkmenistan have one of the highest blue water footprints in the world. Chapagain et al. (2006) calculated that Uzbekistan in total consumes 15.7 $km^3$ of water per year for cotton, out of which 14.6 $km^3$/year constitutes blue water footprint. And out of 7.9 $km^3$ of water that Uzbekistan has exported out of the region through virtual water trade between 1997 and 2001, it exported 3.0 $km^3$/year of virtual water to the EU only through sale of cotton products. So, the authors conclude that the EU member states in a way contribute to the shrinking of the Aral Sea by 20%.

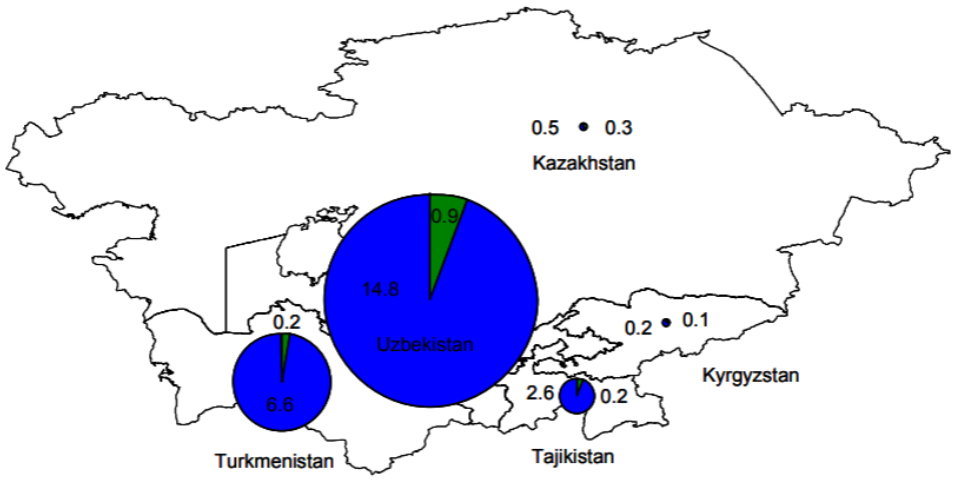


**Figure 14 Total green and blue water footprint ($10^9$ $m^3$/year) for the Central Asian cotton production by nation. 1997-2007 year average (Aldaya & et al., 2010)**

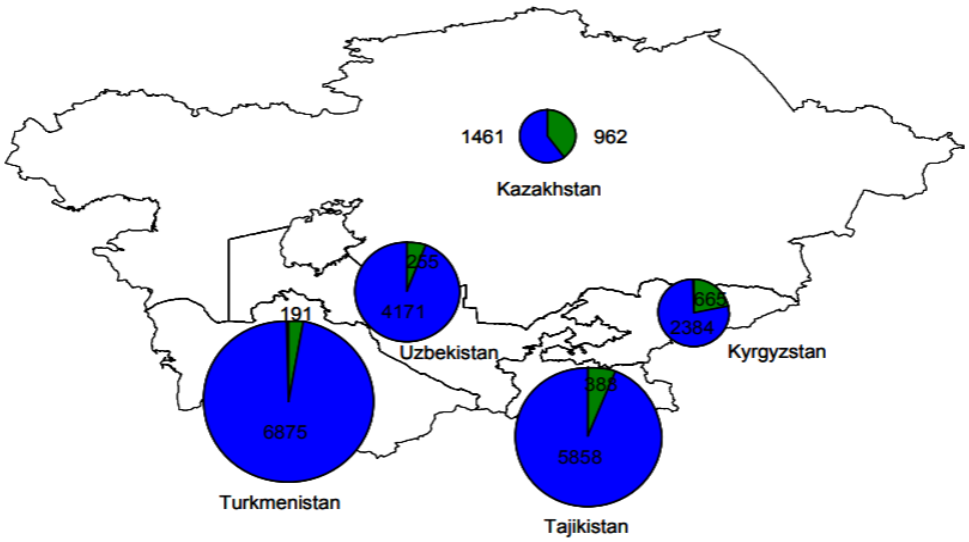


**Figure 15 Green and blue water footprint of cotton production per unit of product by nation. Both the size of each pie and the numbers shown in the pies reflect the water footprint per ton (m3/ton) (Aldaya & et al., 2010)**

According to Figure 15, total water footprint because of cotton production is highest in Uzbekistan. According to Aldaya, et al. (2010), Uzbekistan consumes 15.7 $km^3$/year of water, which equals to the 60% of the total water consumption in cotton sector of the region. More importantly, as already mentioned, more than half of that volume of water (7.9 $km^3$/year) has been exported outside the basin through virtual water trade between 1997-2001 (Aldaya & et al., 2010). According to Figure 16, water footprint per unit of product shows how efficient water use in cotton production is for each Central Asian state. This illustrates that growing cotton has worst impact on water resources in Turkmenistan (7066 $m^3$ of water are required to grow one ton of cotton), because of high evaporation rate, little rain and poor soil characteristics. Tajikistan has the second worst efficiency in water use for cotton production, followed by Uzbekistan. It looks like Kazakhstan has the most attractive climatic conditions for growing cotton because of small water footprint (2423 $m^3$/ton).

### 5.2.3 Water footprint of wheat in Central Asia

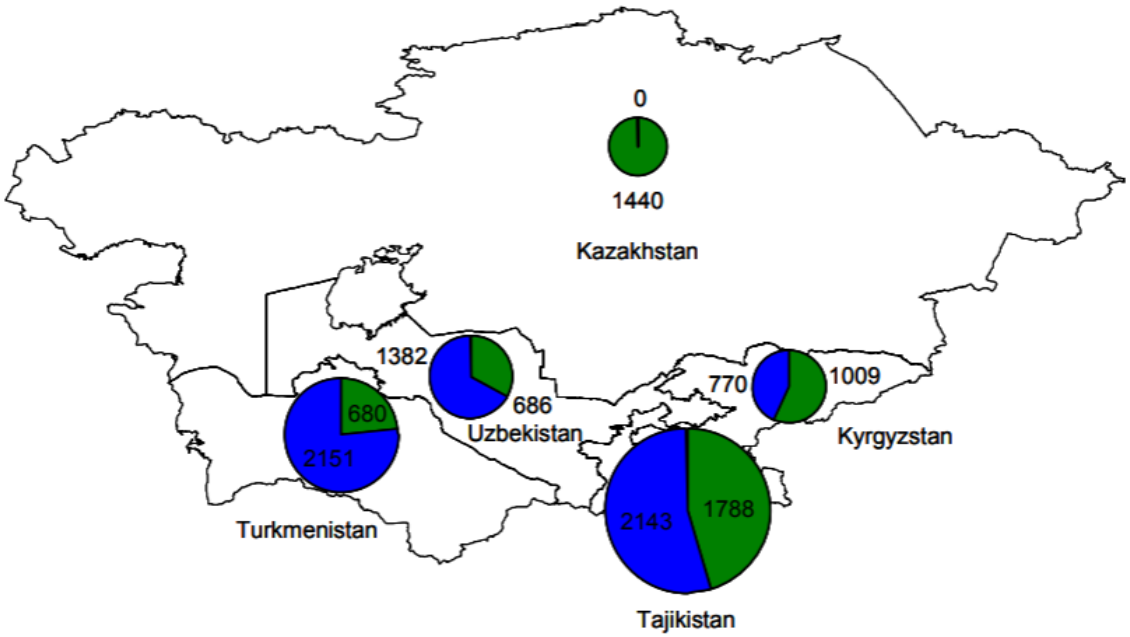


**Figure 16 Green and blue water footprint of wheat production per unit of product by nation. Both the size of each pie and the numbers shown in the pies reflect the water footprint per ton ($m^3$/ton) (Aldaya & et al., 2010)**

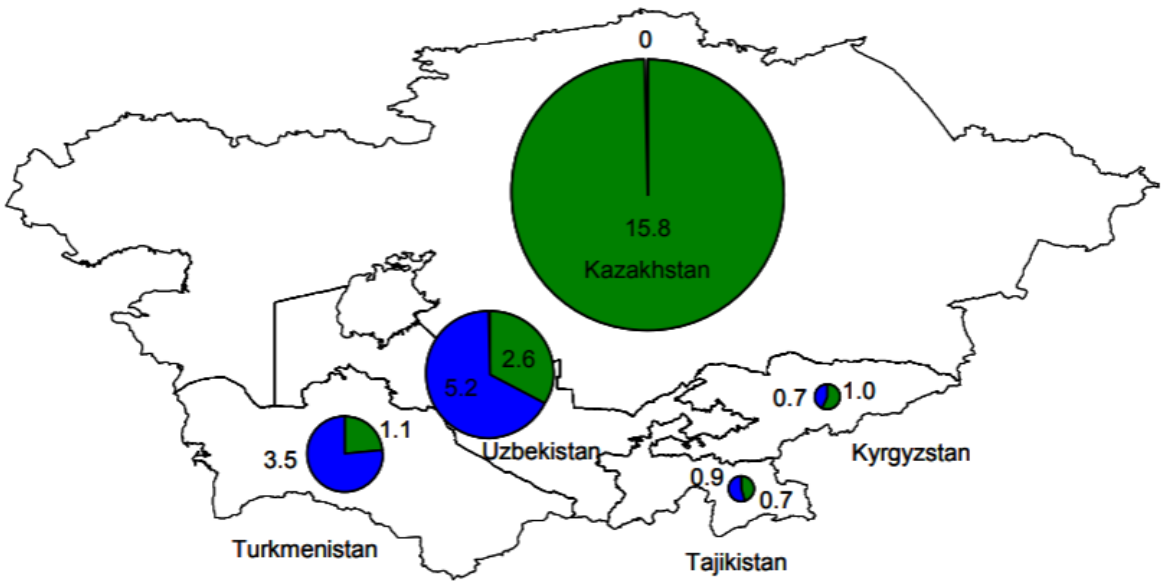


**Figure 17 Total green and blue water footprint ($10^9$ $m^3$/year) for the Central Asian wheat production by nation. 1992-2007 year average (Aldaya & et al., 2010)**

Kazakhstan is the main producer of wheat in the region (57%), followed by Uzbekistan (24%), Turkmenistan (12%), Kyrgyzstan (5%) and Tajikistan (3%) (Aldaya & et al., 2010). As Figure 18 shows, Kazakhstan has the lowest national average water footprint in the region being based completely on green water (1440 $m^3$/ton), which is why Kazakhstan's wheat production is the most efficient among Central Asian states. Kyrgyzstan's wheat production is also efficient in terms of water use. On the other hand, growing wheat in Tajikistan is most inefficient, followed by Turkmenistan and Uzbekistan. The blue water fraction of these countries is as high as 55-76% (Aldaya & et al., 2010).

### 5.2.4 Water footprint of rice in Central Asia

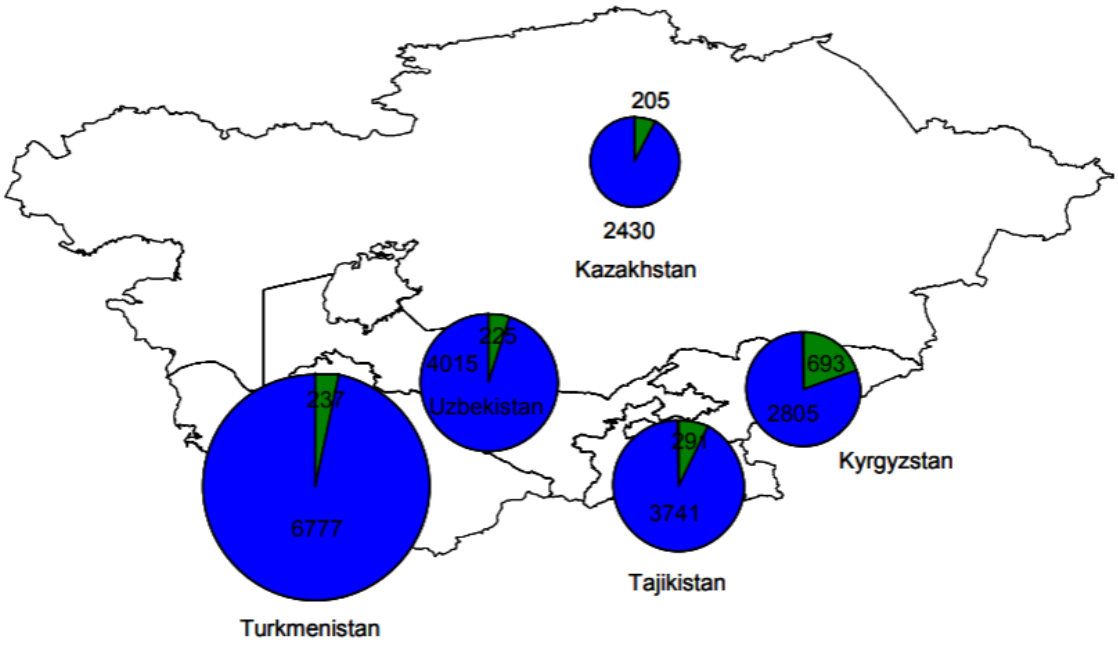


**Figure 18 Green and blue water footprint of rice production per unit of product, by nation. Both the size of each pie and the numbers shown in the pies reflect the water footprint per ton ($m^3$/ton) (Aldaya & et al., 2010)**

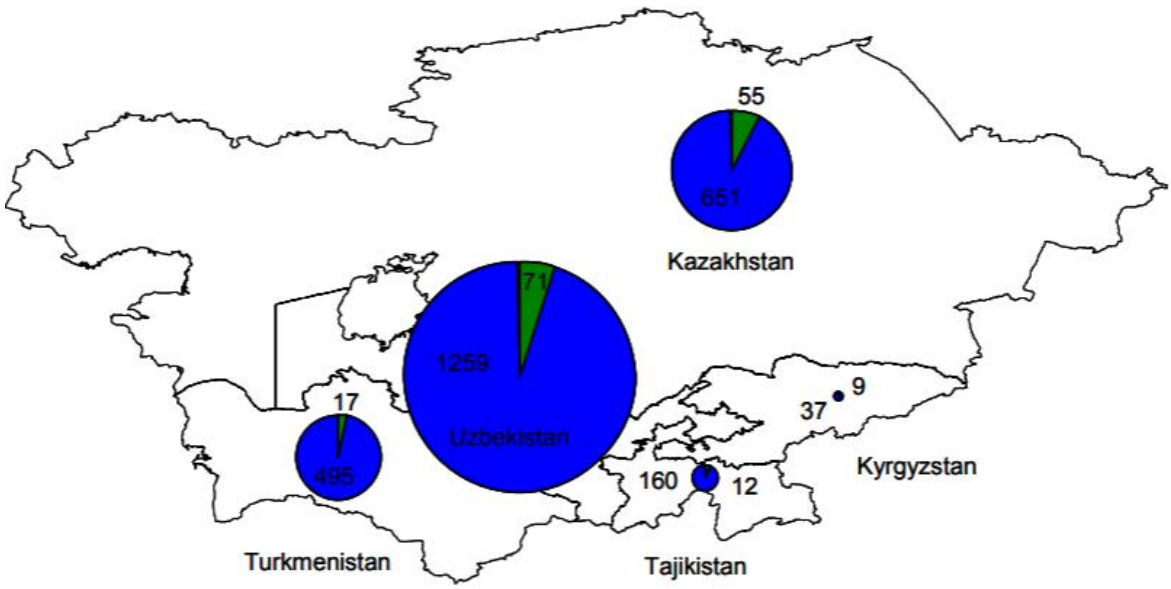


**Figure 19 Total green and blue water footprint ($10^6$ $m^3$year) for the Central Asian rice production by nation. 1992-2007 year average (Aldaya & et al., 2010)**

According to Aldaya, et al. (2010), water footprint of Turkmenistan per unit of product is highest among Central Asian states (7014 $m^3$/ton). The reason why Turkmenistan needs so much water to produce rice is low level of yield related to the poor soil characteristics and arid climate. Uzbekistan, which is the biggest rice producer in the region (Figure 19), has the second largest water footprint per ton. Growing rice both in Turkmenistan and Uzbekistan is inefficient in terms of water use. Aldaya et al. (2010) concludes that the same amount of rice could be grown in Kazakhstan (2600 $m^3$/ton), Kyrgyzstan (3500 $m^3$/ton) or Tajikistan (4000 $m^3$/ton), and would consume less water compared to Turkmenistan and Uzbekistan (Figure 19).

# CHAPTER 6. CONCLUSION

It is encouraging that half of the most important treaties on water use in Central Asia in some way recognize the cardinal rule of international water law. However this recognition is mainly in reference to the general water rights while water allocation is not based on the ERU principle. In fact, except for the 1992 Almaty Agreement, water allocation is not mentioned in any of the given treaties, most of which are rather technical. The 1992 Almaty Agreement affirmed the Soviet-era allocation scheme, which discriminates the rights of upperstream riparians over the downstream water users (as can be seen in Table 7). Such water allocation was justified during the Soviet rule because there was a system of compensation between water and energy sectors, but has not been adapted to the new circumstances.

The goal of Chapter 4 was to demonstrate that the ERU principle can provide an adequate water conflicts resolution platform and thereby operationalize international water law. But simply writing down state's commitment to the ERU principle or to international water law and international law cannot be helpful. The ERU principle cannot function without application of multifactor standard. Relevant factors related to natural, economic, social and political and etc. characteristics of the river basin should be considered in the allocation of shared water in the basin.

In the case of Central Asia, instead of incorporating this multifactor standard, states simply chose to establish the water allocation quotas set by the Soviet Union (Table 7). Upperstream states have agreed thinking that the Soviet water-energy barter system would continue. As the result, it can be concluded that Central Asian water management is based on the prior appropriation doctrine.

**Table 10. Abstraction from the Syr Darya river (1992-1999)**

| | 1992-1993 | | 1993-1994 | | 1994-1995 | | 1995-1996 | | 1996-1997 | | 1997-1998 | | 1998-1999 | | Average | | % of limit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $km^3$ | % | $km^3$ | % | $km^3$ | % | $km^3$ | % | $km^3$ | % | $km^3$ | % | $km^3$ | % | $km^3$ | % | |
| Uzbekistan | 11 | 50.7 | 10.36 | 49.1 | 9.82 | 48.1 | 11.54 | 51.9 | 11.95 | 54.1 | 11.98 | 53.99 | 12.46 | 54.5 | 11.3 | 51.76 | 50.5 |
| Kazakhstan | 8.46 | 39 | 8.42 | 39.9 | 8.42 | 41.2 | 8.48 | 38.1 | 8.1 | 36.7 | 8.2 | 36.95 | 8.32 | 36.4 | 8.34 | 38.32 | 42 |
| Tajikistan | 2.05 | 9.45 | 2.15 | 10.2 | 1.99 | 9.75 | 2.04 | 9.17 | 1.87 | 8.47 | 1.83 | 8.25 | 1.88 | 8.22 | 1.97 | 9.07 | 7 |
| Kyrgyzstan | 0.18 | 0.83 | 0.19 | 0.9 | 0.19 | 0.93 | 0.18 | 0.81 | 0.17 | 0.77 | 0.18 | 0.81 | 0.21 | 0.92 | 0.19 | 0.85 | 0.5 |
| TOTAL | 21.69 | 100 | 21.12 | 100 | 20.42 | 100 | 22.24 | 100 | 22.09 | 100 | 22.19 | 100 | 22.87 | 100 | 21.8 | 100 | 100 |
| The Aral Sea | 7.1 | | 9.25 | | 6.5 | | 3.9 | | 4.9 | | 5.88 | | 7.13 | | 6.38 | | |
| TOTAL | 28.79 | | 30.37 | | 26.92 | | 26.14 | | 26.99 | | 28.07 | | 30 | | 28.18 | | |
| plus diversion to the Arnasay depression | 1.30 | | 9.32 | | 4.92 | | 1.00 | | 1.29 | | 2.19 | | 4.12 | | 3.45 | | |

**Source: (UN, 2004, p. 36)** **https://www.unece.org/fileadmin/DAM/env/water/damsafety/effuse_en.pdf**

This practice once more supports the findings of Wolf (1999), according to whom in arid regions prior uses and downstream needs in general are almost always protected and favored in treaties signed between riparian states (Wolf & et al., 1999). This practice reflects the absolute territorial integrity pattern of state behavior, which is another extreme of the absolute territorial sovereignty theory, and according to which downstream states secure their prior or existing water uses at the expense and to the detriment of the upperstream states.

Based on this general practice, some criticize international water law claiming that "equity is biased towards the first developer" and that as the result "late developer can only claim the water resources which have not been utilized already" (Wegerich & Olsson, 2010). However, the US case law, from which international water law and in particular prior appropriation doctrine have developed, has stopped emphasizing the prior appropriation doctrine as the main factor in allocation of transboundary waters. Similarly the court in Colorado v New Mexico (1982) case ignored the weight of prior uses and concentrated instead on the inefficiencies of existing uses and on the benefits from new uses. So, when it is in the interest of downstream states, they often utilize the doctrine of the past by disregarding the developments in international water law.

Table 10 provides data on the actual abstraction of water from Syr Darya river between 1992 and 1999. According to this information, none of the Central Asian states have complied with the water quota limits. Kyrgyzstan and Tajikistan in particular have exceeded their water limits, which downstream states perceive as harmful behavior. However, it should be pointed out that the Soviet-water allocation quotas have protected prior and existing water uses of downstream states and thereby foreclosed Kyrgyzstan's and Tajikistan's future uses. By foreclosing the future uses of upperstream states, downstream states justify the harmful behavior of upperstream states. So, this supports what was mentioned in the previous chapters- harm can travel upstream as well as downstream.

Kyrgyzstan and Tajikistan have to use water especially in winter, in order to supply electricity to their population, which may simply freeze without it in the cold weather. Downstream states that have first breached the 1992 Almaty Agreement by failing to supply the fossil fuels to upperstream states in winter seasons, have persistently viewed Kyrgyzstan and Tajikistan's acts as a harm. Boute cites Stephen McCaffrey who claims that a state "must not only have failed to prevent the harm by its conduct but must also have been capable of preventing it by different conduct" (Boute, 2016, p. 413). After Kyrgyzstan and Tajikistan have stopped receiving fossil fuels from downstream states, themselves being fossil fuel poor, were left with no available alternatives that would make them capable of preventing harm by not releasing water in winter.

So Anatole Boute underlines the factor of availability of alternatives, which is one of the relevant factors established by the Article 6 of the 1997 UN Watercourses Convention. Boute stresses the role of downstream Central Asian states in stopping upstream Kyrgyzstan and Tajikistan from using water during winter but collecting it for harvesting season instead. He claims that "[b]y guaranteeing adequate supplies of thermal energy at affordable prices, the lower riparian countries contribute to the availability of alternative modes of energy production to winter hydropower generation, *de facto* securing their downstream water interests. *A contrario*, by failing to secure winter energy supplies to the upper riparian countries, the lower riparian countries contribute to justifying the reasonable and equitable nature of winter hydropower generation" (Boute, 2016, p. 413).

Moreover, in such situation the legal maxim *inadimplenti non est adimplendum* applies (i.e. he who fails to fulfill its part of an agreement cannot enforce that bargain against the other party) (McIntyre, 2017, p. 54). This maxim is similar to the countermeasures principle, according to which an illegal act becomes legal when it is executed in a response to an earlier illegal act towards the former (of course within the limits of the proportionality principle). So, Kyrgyzstan and Tajikistan have breached the regional (1992 Almaty Agreement) agreement as a countermeasure to the previous breach by downstream states to supply them with fossil fuels during the winter season, so upperstream states' breach of no harm rule is subject to justification.

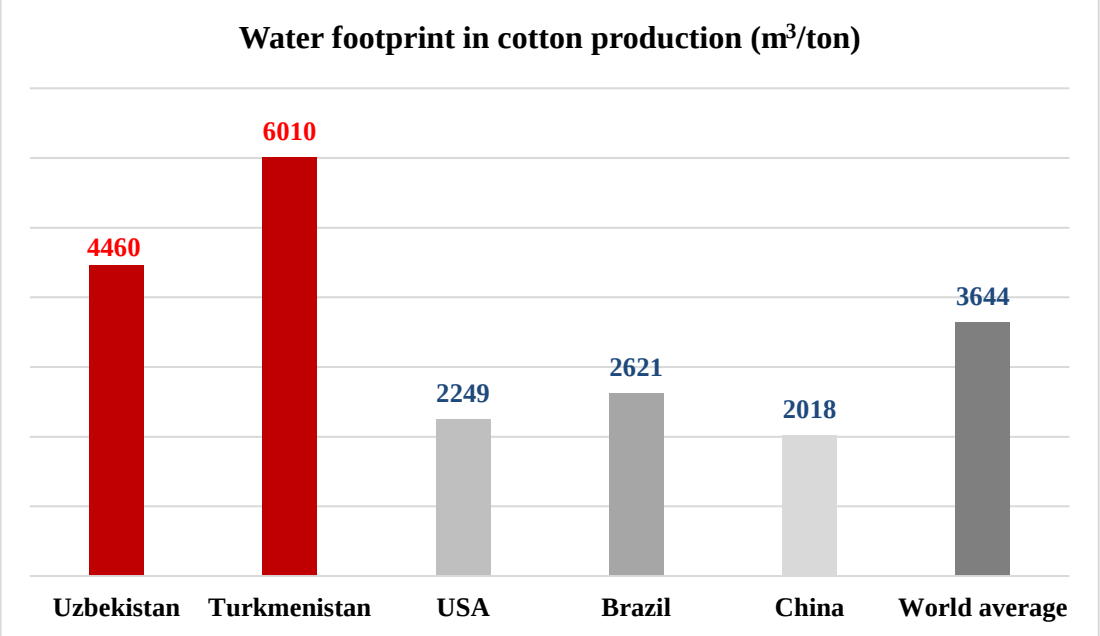


Figure 201. Water footprint in cotton production (Chapagain & et al., 2006b)

Using interdisciplinary concepts like water footprint reveal information that is not visible in traditional hydro-centric studies. Water footprint concept has demonstrated that water use for growing cotton in Central Asia is extremely inefficient. Turkmenistan and Uzbekistan respectively consume 6010 $m^3$ and 4460 $m^3$ of water per ton of cotton produced, which exceeds the world average (Figure 21). Moreover, these two Central Asian states are among the seven biggest cotton producers in the world. This means that they compete with cotton-producing giants like the USA, China and Brazil, whose cotton industry is based on rainwater. So, in order to keep up with them Turkmenistan and Uzbekistan have to make excessive withdrawals from the shared water resources of the Aral Sea basin and thereby contribute to the depletion of already scarce resource.

Water footprint concept helps to understand not only that water is used inefficiently in Central Asia, but it also demonstrates how water is used to grow export-oriented products. Thereby it helps to see that the real problem behind water scarcity in the region may be related to virtual water trade. This has important legal implications, because as Stephen McCaffrey has advised, water use for export-oriented products is an example of unreasonable water use, which would be subject to penalization. So further research is recommended on synchronizing water allocation laws with laws on penalization of unreasonable excessive and wasteful water withdrawals.

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