Sharpening the Focus of the Blue Peace Index: Comparison of the Amudarya and Syrdarya and the Tigris-Euphrates Basins

The Benefits of Cooperation and Price of Non-cooperation

Research paper introduced at the webinar "Strategic aspects of water resource management in Central Asia"

by

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I. The Blue Peace Index

"The main goal of the Blue Peace Index developed by the Economist Intelligence Unit is to give an overview on and comparison of water resource management in different countries and river basins. "The Blue Peace Index assesses management of shared water resources across five pillars: Policy & legal frameworks, Institutional arrangements & participation, Water management instruments, Infrastructure & financing, and Cooperation.".[1]

The BPI methodology describes the five pillars that are assessed in order to compare water resources management in different basins the following way:

"1. **National and basin-level policies, laws and regulations** are essential for establishing an enabling environment that is conducive for sustainable and equitable management of water resources. This is particularly important for management of resources in an integrated and coordinated way. Integrated water resource management (IWRM) takes into account the different water sources, as well as their various users, with the aim of maximising positive social, economic and environmental benefits. IWRM requires a shared common platform that, in turn, usually requires supporting a legal or regulatory framework. Coordinated management

[1] Bluepeaceindex.eiu.com. 2021. *Blue Peace Index | Economist Intelligence Unit*. [online] Available at: <https://bluepeaceindex.eiu.com/#/> [Accessed 23 April 2021].

of shared water resources, in particular, requires not only a robust transboundary framework, but also an alignment with national and sub-national policies and regulations. This domain assesses the extent to which countries have been able to develop robust, yet flexible, legislative and regulatory frameworks at national as well as basin level. It examines water laws and developed, integrated approaches for the development, management and use of shared water resources.

2. **Institutional arrangements and participation** In order to manage water effectively and sustainably at the national and basin level, there is a need to establish underlying political, social, economic and administrative institutions to deliver this cooperation. This requires all stakeholders of the common water resource to cooperate jointly in managing, protecting, and developing the shared resources. To coordinate the various actors and interests, stakeholder engagement and public participation are key at the local and river basin levels. Activities such as information and data sharing and capacity building play an important role in connecting pivotal actors. They also help to reinforce and complement existing frameworks, initiatives, and expertise to coordinate and execute political action. This domain analyses the level to which countries have been able to develop appropriate institutional arrangements for cross-sector coordination, capacity building, information sharing, and stakeholder engagement.

3. **Water management instruments** Water management instruments are national or basin-level tools that coordinate and integrate the management of shared water resources. They can cover aspects such as water allocation and water pollution, as well as management of extreme events such as floods and droughts. These mechanisms are essential for harmonised and responsive decision-making, but also contribute to the development of broader shared vision and trust among riparian actors. This domain assesses the extent to which countries and basins have been able to develop and implement these management mechanisms and methods to put water policies and laws into practice.

4. Infrastructure and financing The effective development and management of shared water resources requires appropriate and sustainable financing. This needs to be sourced both from government spending and with contributions from the private sector. Where finance availability is constrained at the macroeconomic level, basins need to be able to meet the necessary requirements to attract donor or international institutional support. This domain assesses how comprehensively and sustainably investment in water management is conducted at a national and international level, incorporating consideration of: dedicated government spending on

water, the general environment for financing infrastructure projects, and how far innovative measures for finance are being made available.

5. **Cooperation context** In addition to all of the policy, regulatory and institutional tools outlined above, sustainable management of shared water resources is inherently related to a country's or basin's broader socioeconomic, physical, geographic and political realities. To account for this context, this domain considers the major drivers and risk factors relating to peace within the chosen environments, such as water stress, exposure to natural disasters, political instability, and economic cooperation and vulnerabilities. However, the indicators are selected to capture some degree of "agency" that countries can exercise, excluding purely hydrological and geographical indicators that countries cannot influence. The indicators are split across five domains. In this way the index aims to provide a comprehensive view on the status of peace as an essential part of sustainable management of shared resources in the featured countries and basins."[2]

The methodology used by EIU builds on recent path-breaking research by institutional economists[3] that endeavors to examine institutions-performance interaction within the water sector, taking it as a whole, under different conditions (different property right regimes, information conditions, water supply levels, etc.). This methodology has been developed to provide a flexible and pragmatic framework to assess and compare the specific conditions of various river basins in regions that differ hugely in their geography, climate and political and economic conditions. The methodology yields sufficient data that then can be compared in an objective and realistic way. This unique methodology was necessary because different regions and political and economic systems develop different ways of dealing with similar problems. Equally, the same solutions do not necessarily work with equal efficiency in different geographic, climatic, economic, social, and political conditions. A mechanical comparison of data and empirical evidence may not be effective, as it may give a false image of the real situation.

[2] Bluepeaceindex.eiu.com. 2021. [online] Available at: <https://bluepeaceindex.eiu.com/pdf/Blue%20Peace%20Index%202019_methodology%20note.pdf> [Accessed 3 May 2021].

[3] Saleth, R., 2018. Editorial: The Institutional Economics of Water. *Water Economics and Policy*, 04(03), p.1802003.

The BPI was presented to a Central Asian audience on 25 February 2021 during the webinar “Identifying essential structural and institutional reforms to achieve economic sustainability of the water sector of Central Asia". Many participants were intrigued by the fact that the level of cooperation on water resources management in the two main river basins of the region - the Syrdarya and the Amudarya" - was inferior to most other river basins - with the exception of the Tigris-Euphrates, which received the lowest score. The linkage between the low score of the Tigris-Euphrates and the fact that the river basin is situated in one the most unstable, war-stricken regions of the world is obvious.

This study compares in more detail the three rivers that received the lowest score in the BPI: the Syrdarya, Amudarya and the Tigris-Euphrates basins. These regions have many geographical, climatic and historical similarities. These similarities make it possible to convincingly demonstrate how cooperation on the management of shared water resources, or the lack of it, can shape the economic, social, political and security situation of a region in its entirety.

In the Blue Peace Index, the Syrdarya and Amudarya rivers are evaluated independently: the overall score of the Syrdarya river basin is 48,1, while the Amudarya river’s score is 37,3. All scores are counted on a scale of 100 points. These scores are not very high but still much better than the score of the Tigris-Euphrates, which is only 25. We can see that neither the Middle East nor Central Asia is doing too well compared to other river basins.

In this study we will focus on the cooperation context score, as we want to demonstrate the advantages of cooperation and disadvantages of non-cooperation and want to analyse the underlying reasons why some countries choose cooperation and others do not. It is obvious, if we look at the BPI, that both regions have problems with cooperation, but Central Asia is doing better, while in the Middle East the level of cooperation is particularly low. In this study we will summarize the reasons why Central Asia was able to maintain a sufficiently high level of cooperation to support its economic development and stability, while riparians of the Tigris-Euphratest were not capable of doing the same.

We want to investigate the past of the two regions, analyse their geography and climate as well as their current political and economic situation. At the end we will try to draw some conclusions.

II. Similarities between the river basins

Arid climate

Geography determines certain traits of civilizations which will undeniably cause similar behaviours in different groups of people, which in turn will result in similar historical development. In desert environments, civilizations have been formed around river systems and were highly dependent on the water of the river for irrigation.

Average temperatures in the middle and lower reaches of the Amudarya and Syrdarya and the Tigris-Euphrates basin are different due to the latitudinal difference between the two regions. This means the annual mean temperature in cold desert climates, like in Central Asia is roughly around 8 – 12 °C, while in hot desert climates it is around 16 - 21 °C. At the same time, average summer temperatures are comparable: in the lower reaches of the Amudarya it is around 32 °C, with peak temperature reaching 50 °C, while in the delta of the Tigris-Euphrates the average summer temperature is 43 °C, with peak temperature reaching 48 °C.

Though in temperatures the two regions differ somewhat, precipitation is more or less the same. If we are looking at the regions, as a whole, the average annual precipitation ranges from 0-724 millimetres. However, the exact figure depends on the actual location. If we combine the annual precipitation of countries in Central Asia, we get 361,3 millimetres of rainfall and if we do the same for the Middle East, we get around 336,3 millimetres annually.[4]
If we apply the same method for water availability per capita, we get roughly around 2201,5 m^3 per person per year in Central Asia, while in the Middle East it is roughly around 1356,3 m^3.[5] So here we can also see some differences, but as we are talking about large areas, the exact numbers can vary a lot depending on the exact location.

Thousands of years of history of irrigated agriculture

[4] Our World in Data. 2021. *Average annual precipitation*. [online] Available at: <https://ourworldindata.org/grapher/average-precipitation-per-year> [Accessed 2 May 2021].

[5] Our World in Data. 2021. *Water withdrawals per capita*. [online] Available at: <https://ourworldindata.org/grapher/water-withdrawals-per-capita> [Accessed 2 May 2021].

Irrigation plays a crucial role in arid environments. Most desert societies have a long history of irrigation: both in Mesopotamia, the Cradle of civilization, and in Central Asia irrigated agriculture has been present since the Iron Age.[6] Without irrigation agriculture would have a very low efficiency. Thousand years of extensive reliance on irrigation resulted in the development of some of the most advanced water management systems in the world.

Colonial past: Ottoman Empire - Tsarist Empire

Big swaths of the Middle East - including the areas of the Tigris-Euphrates basin - were for four centuries controlled by the Ottoman Empire. In the 19th century Central Asia was gradually integrated into the Tsarist Russian Empire. At the end of the first World War the Ottoman Empire collapsed and Iraq and Syria became French and English mandates (colonies), and the Russian Empire was transformed into the Soviet Union. While both regions were administered by people at far-away places (from London, Paris, and Moscow), there was a major difference between the two regions when it came to cooperation on water. Neither the Ottoman empire, nor the colonial rulers of Iraq and Syria cared about putting in place a functioning water resources management system in the Tigris-Euphrates basin. In contrast, the Soviet Union developed a highly integrated, well-functioning, technically sophisticated and well-financed regional system of water resources management in Central Asia. The downside of the rapid development of one of the most extensive networks of irrigation canals and the expansion of irrigated agriculture (mostly cotton monoculture) was the near disappearance of the Aral Sea, one of the greatest man-made environmental disasters in history.

Ecological damage due to over-irrigation

Short-sighted economic and social policies can cause irreversible ecological damage as demonstrated by the death of the Aral Sea, the decline of the Mesopotamian Marshes and the progressive desertification of many countries of the Middle East. The Aral Sea almost completely dried out because in the time of the Soviet Union priority was given to growing cotton in the basins of the Amudarya and the Syrdarya. This was an economically successful

[6] Pueppke, S., Zhang, Q. and Nurtazin, S., 2018. Irrigation in the Ili River Basin of Central Asia: From Ditches to Dams and Diversion. *Water*, 10(11), p.1650.

venture, but with a terrible environmental - and later socio-economic - cost. It required the redirection of the Syr and Amudarya rivers' water to irrigate an ever-expanding agricultural area: the two big rivers could no longer sustain water levels of the Aral Sea. A similar environmental tragedy happened in Iraq. The Mesopotamian Marshes were drained for agricultural purposes. (However, there was another, political reason behind this policy: the government wanted to force the Marsh Arabs to leave the area).[7] The draining of the Mesopotamian Marshes caused the surrounding area to desertify and increased soil salinity. The result was the exact opposite of the stated objective.

Economic and social difficulties and conflicts of the recent past

Both regions experienced economic difficulties in the last three decades: the economy of Iraq and Syria was negatively influenced by instability, sanctions, and later war. In recent decades mismanagement, underfunding and armed conflict lead to the deterioration of the condition of water infrastructure in the Tigris-Euphrates basin.

Central Asian countries went through a difficult period of economic and political transition after they had become independent in 1991. The sharp drop of the GDP of these countries in the first years of transition negatively influenced their ability to properly maintain and modernize the extensive water infrastructure inherited from the Soviet Union. While the economies of Central Asian countries mostly recovered by the end of the decade, the water sector continued to suffer from chronic under-investment.

Equilibrium of different resources: (upstream - water, downstream - hydrocarbons)

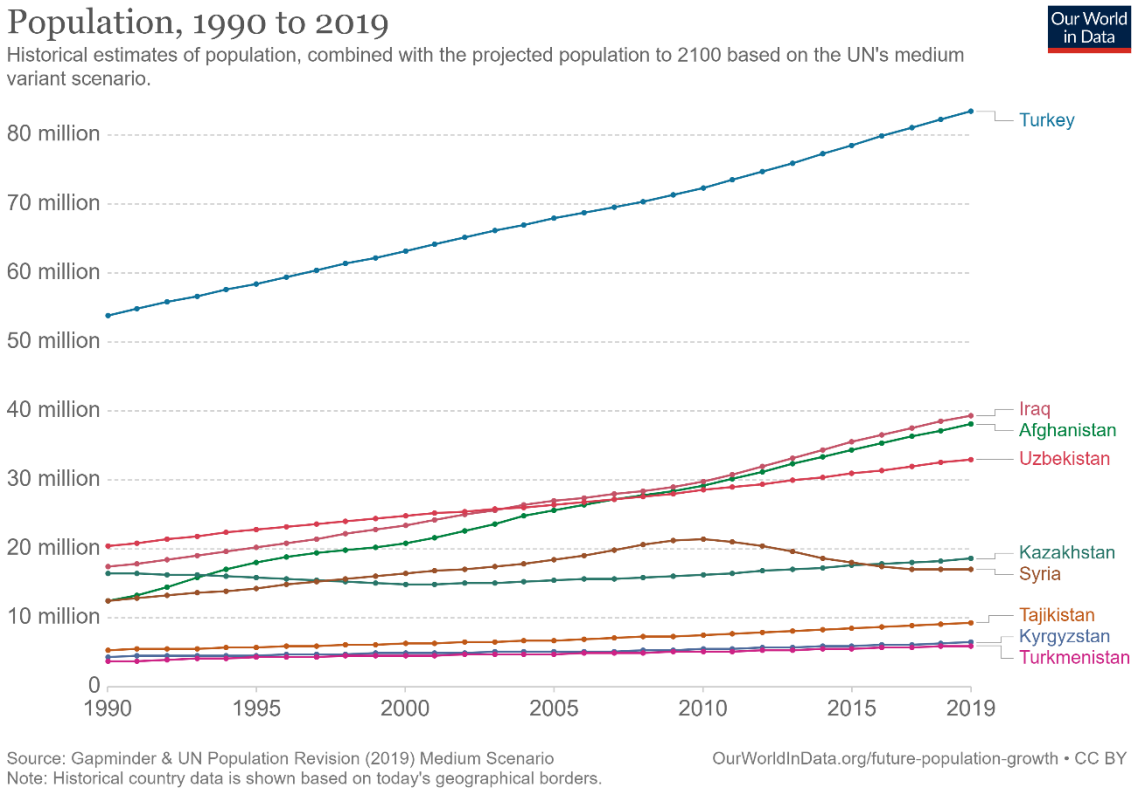
In both regions there is a factor that could promote cooperation, and this is the distribution of resources. In both cases the upstream countries have, to a certain degree, control over water resources (thanks to big reservoirs). The upstream countries have the potential to regulate water flows in the interest of downstream agriculture and communal and industrial water use (by storing water in winter and spring, and releasing it in the growing season) and export summer electricity to downstream neighbors. Downstream nations have other valuable resources,

[7] 2003. *The Iraqi government assault on the Marsh Arabs*. Washington, D.C.: Human Rights Watch.

namely hydrocarbons and electricity generated in thermal power plants, that can be exported to upstream countries in winter time. This balanced distribution of different resources provides an opportunity for exchange and cooperation, but even though this is the case in both regions, it has been realized only in Central Asia.

Rapid demographic growth

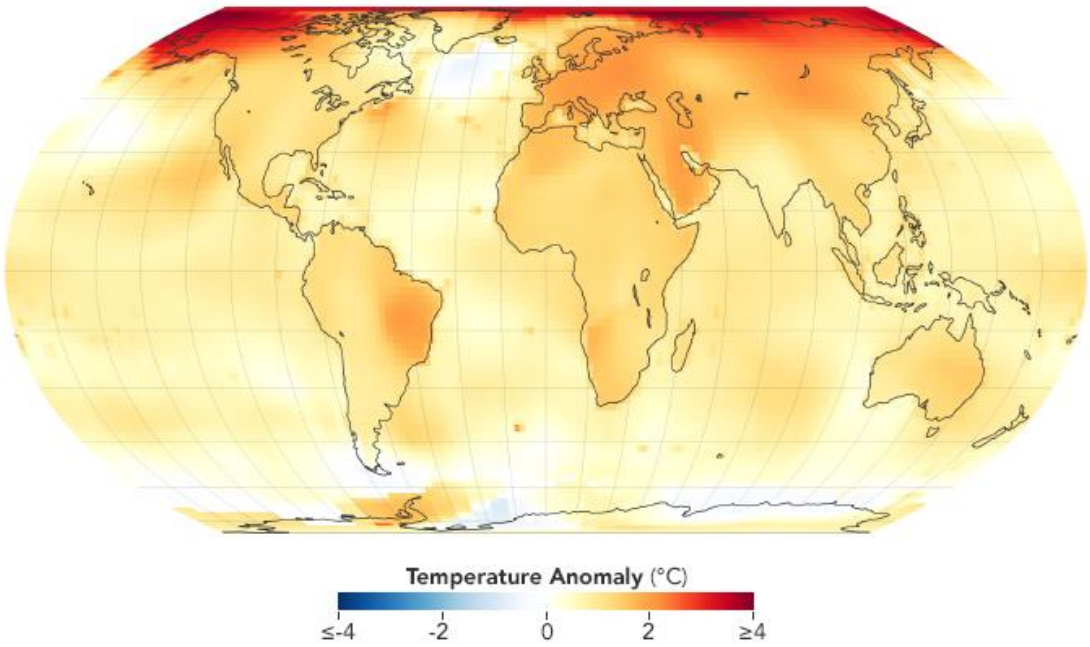
Every country in the examined regions has experienced and is experiencing a rapid population growth, even Syria's population grew 2.54% from 2019 to 2020.[8] This population growth puts even more pressure on the already struggling water sector as water stress becomes higher and higher every year. More people need more clean drinking water, food, and sanitation. Larger industries also require immense amounts of water, since growing populations require job-creation through industrial development.



[8] Worldpopulationreview.com. 2021. *Syria Population 2021 (Demographics, Maps, Graphs)*. [online] Available at: <https://worldpopulationreview.com/countries/syria-population> [Accessed 28 April 2021].

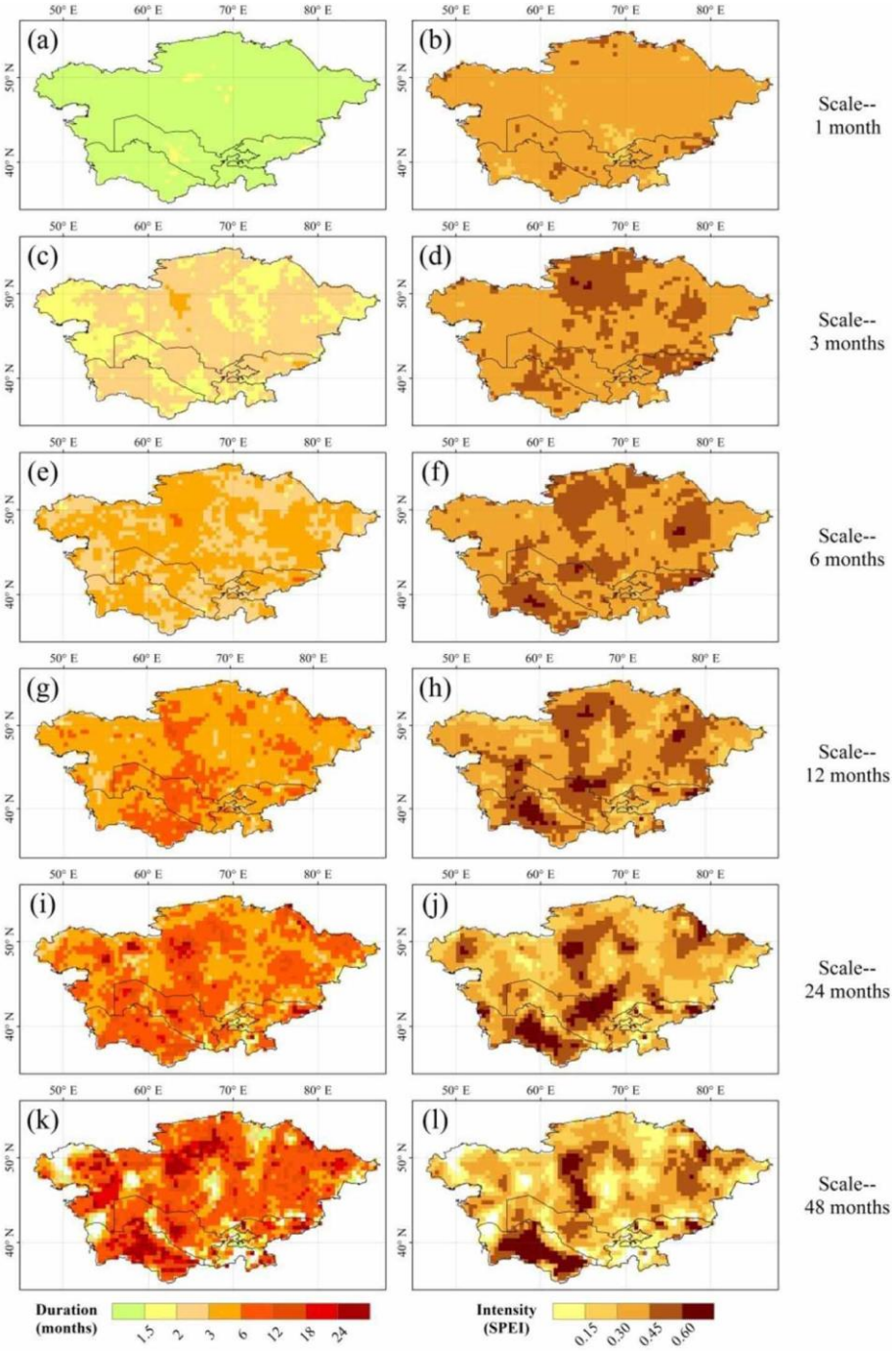
Climate change is hitting the basins of the Amudarya, Syrdarya and Tigris-Euphrates equally strongly

All three river basins belong to the regions of the globe that are most heavily affected by climate change.



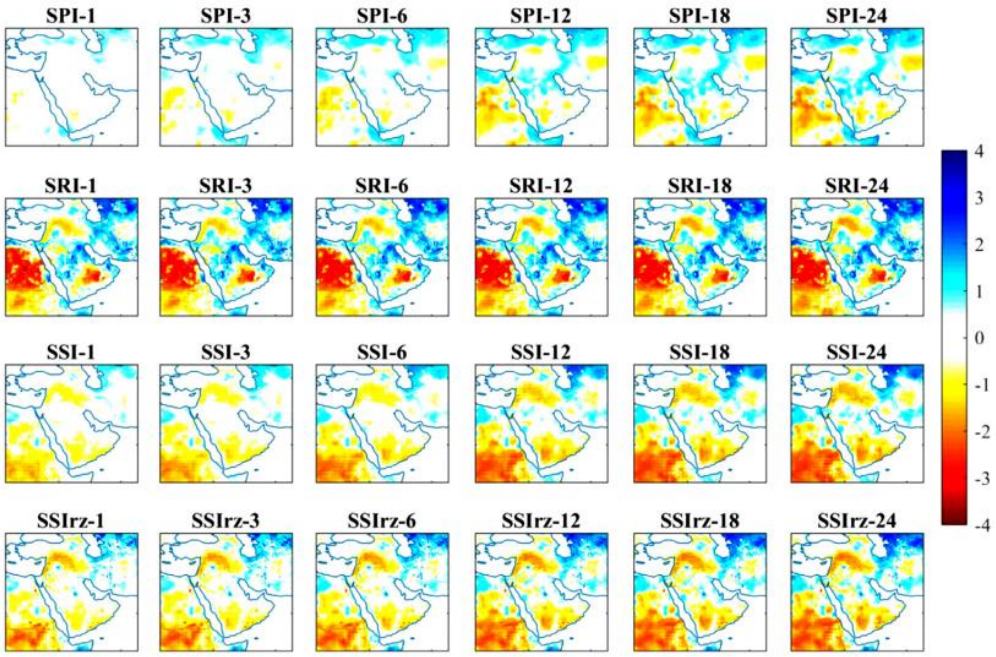
Depiction how much various regions of the world have warmed or cooled when compared with a base period of 1951-1980.[9]

[9] Earthobservatory.nasa.gov. 2021. *World of Change: Global Temperatures*. [online] Available at: <https://earthobservatory.nasa.gov/world-of-change/global-temperatures> [Accessed 3 May 2021].



Spatial distribution of the drought duration (left) and drought intensity (right) at different time scales in Central Asia from 1982–2015.[10]

[10] Deng, H., Yin, Y. and Han, X., 2020. Vulnerability of vegetation activities to drought in Central Asia. *Environmental Research Letters*, 15(8), p.084005.

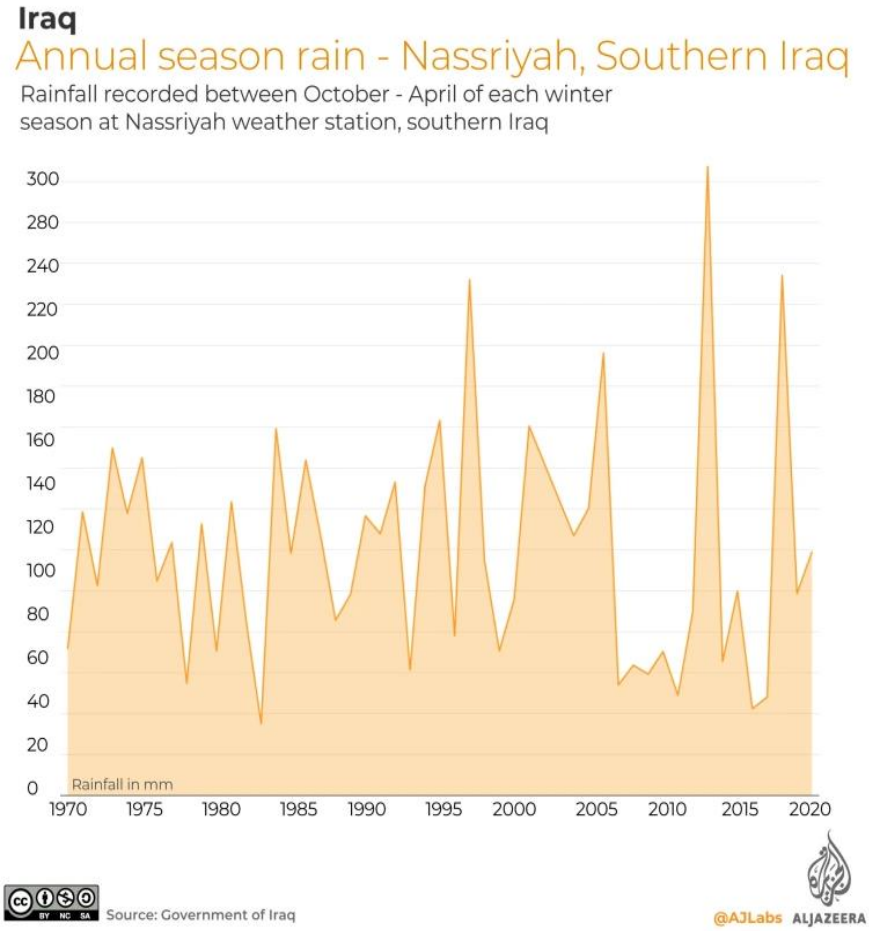


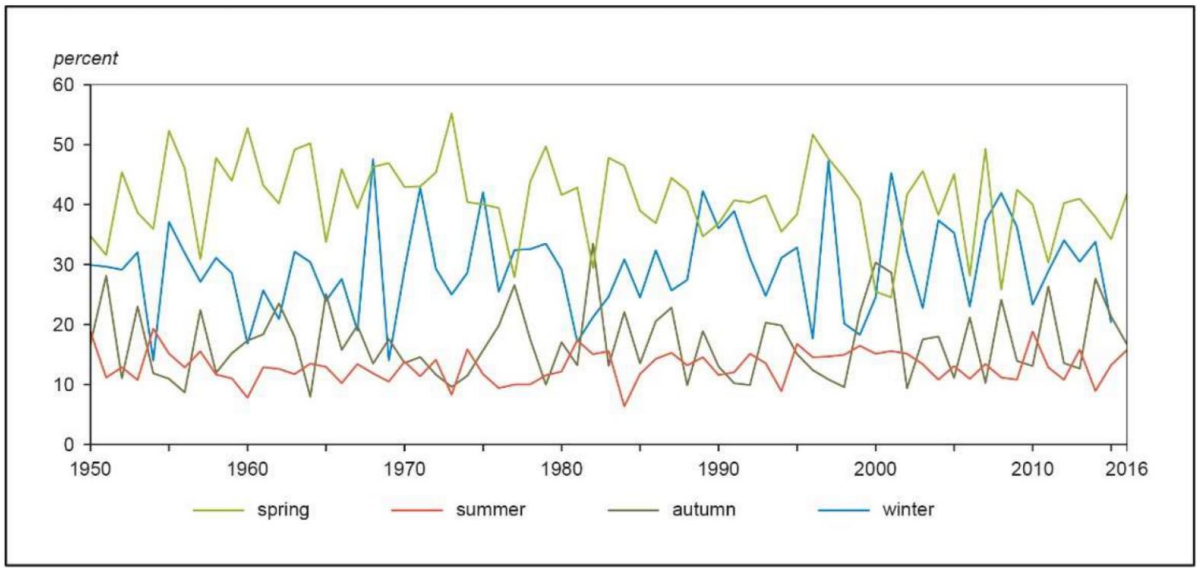
Drought trends for the period of 1948–2017 according to the SI-1, -3, -6, -12, -18, and -24 months over the Middle East. Please note that the colour bar indicates the mean change of SI in seven decades.[11]

Average temperatures rise annually, which increases the required amount of irrigation water/ha. Irregular weather patterns include more frequent multi-year droughts and greater fluctuations in water flows. A recent striking example is the news about the Bedouins of Iraq who cannot continue living in the desert, as due to scarce rainfall pastures are not able to support their herds any more.[12]

[11] Hameed, M., Ahmadalipour, A. and Moradkhani, H., 2020. Drought and food security in the middle east: An analytical framework. *Agricultural and Forest Meteorology*, 281, p.107816.

[12] Foltyn, S., 2021. *'There's no rain': Climate change threatens Iraq's Bedouins*. [online] Aljazeera.com. Available at: <https://www.aljazeera.com/news/2021/4/28/no-rain-iraqs-bedouin-tribes-affected-by-climate-change> [Accessed 29 April 2021].





Seasonal proportions of annual precipitation sums in Central Asia from 1950 to 2016.[13]

[13] Haag, I., Jones, P. and Samimi, C., 2019. Central Asia's Changing Climate: How Temperature and Precipitation Have Changed across Time, Space, and Altitude. *Climate*, 7(10), p.123.

On the above graphs we can see how the rainfall has decreased in recent decades in both regions. Before, rainfalls were more frequent and more evenly spread. In recent years there are longer intervals between heavy rainfalls, which is not ideal for agriculture.

III. Differences

Central Asia enjoys a distinct "cooperation advantage": it can rely on and modernize inherited cooperation frameworks, there is a complementarity and balance between upstream and downstream economies, and effects of climate change are cushioned by glacier melting. This "cooperation advantage" has allowed Central Asia to preserve stability and economic growth. Today it provides a window of opportunity for strengthening resilience and adaptation to climate change.

There are many similarities between the two regions but there are also important differences that led to different solutions to similar problems. While both regions had to cope with economic difficulties after 1991, there was a major difference between the management of water resources in the Syrdarya and Amudarya basins on the one hand and the Tigris-Euphrates on the other. The most important difference was the level of cooperation on water. While it would be an exaggeration to say that efficiency of water resources management and the level of regional water cooperation had a decisive influence on the economic, political, and social development and security of these regions, cooperation on water or the lack of it was one of the factors that influenced recent, very different development paths of Central Asia and the countries around the Tigris-Euphrates basin.

Central Asian countries chose to continue cooperation on water in order to solve problems that emerged after they gained their independence. They signed a number of legally binding and declarative documents on water cooperation and established the International Fund for Saving the Aral Sea - a broad regional framework for water and environmental cooperation. Central Asia has a longer tradition of cooperation since this region was part of the integrated economy of the Soviet Union. The Soviet system provided a strong framework for water cooperation (central planning, central budget, unified electricity grid, unified legislation, etc.). Since 1991, when they became independent, Central Asian nations have continued cooperation, even if it was not as close and efficient as before. It is true that the new legal and institutional frameworks

set up by the newly independent states have not always been able to effectively resolve disputes and ensure efficient and rational management of shared water resources in an optimal way. An imperfect regional market was not an ideal framework either for effective, market-based solutions. Still, the existing cooperation frameworks helped avoid open conflict over water and today they offer a solid basis for building stronger cooperation in the future.

In the Middle East, as it has been mentioned earlier, effective cooperation on the management of shared water resources has never been achieved. Turkey, as the upstream country of the Tigris and Euphrates, played the role of the water hegemon, building a great number of reservoirs on both rivers and their tributaries, without consulting downstream countries or without establishing a legal and institutional framework for cooperation with them. As downstream nations slid into anarchy in the 21st century, any cooperation on water resources management became practically impossible.

Due to a number of intertwined conflicts in the countries of the Tigris-Euphrates basin and because of persistent efforts of governments to solve their problems on their own, there never emerged a functioning regional cooperation framework (legal and institutional) on water after the collapse of the Ottoman Empire and the colonial system. Upstream infrastructure was built and operated after the second World War without cooperative or consultative arrangements. Lack of water cooperation has been a complicating factor, hindering the development of good neighbourly relations. In fact, the lack of cooperation on water was an important reason for instability in the region. Water scarcity and droughts have increased in intensity and the Fertile Crescent has seen the most severe drought in recorded history in the years before the Arab Spring. The combined effects of lack of cooperation on water and climate change proved disastrous for the region.

An important factor facilitating stable cooperation in Central Asia is the complementarity and balance between the economies of upstream and downstream countries. The upstream riparians of the Syrdarya and Amudarya rivers have much lower per capita GDP and much smaller economies than the downstream riparians.

Country	GDP per capita, PPP (2019)	GDP, PPP (Millions, 2019)
Kazakhstan	$27,517.9	$509,458.11
Kyrgyzstan	$5,486.2	$35,419.71
Tajikistan	$3,529.3	$32,896.77
Turkmenistan	$15,207.0 (2018)	$88,974.54 (2018)
Uzbekistan	$7,308.5	$245,421.34

Source: World Bank[14]

This provides mutual leverage for both the upstream and downstream nations and a strong incentive for cooperation. Downstream countries need the cooperation of the upper riparians that operate the big reservoirs to receive sufficient amounts of water in the growing season. "Upstream countries, at the same time, have much smaller economies than their downstream neighbours. ...They may risk debt distress if they shoulder alone the burden of investment in jointly used infrastructure such as large multi-purpose water reservoirs. The much larger economies of downstream countries...can provide a substantive contribution to the development of regionally important water infrastructure. " [15]

This equilibrium of economic leverages and the complementarity of upstream and downstream economies prevents the emergence of a regional water hegemon - as we see in the Tigris-Euphrates basin. Another important factor is a long history of cooperation in the Soviet period, which created strong ties between these nations. The complementarity and balance between upstream and downstream economies result in a "symbiotic" relationship, whereas both upstream and downstream countries benefit more from cooperation than from seeking self-sufficiency and unilateral solutions.

[14] World Bank. 2021. *World Bank Group - International Development, Poverty, & Sustainability*. [online] Available at: <https://www.worldbank.org/> [Accessed 9 May 2021].
[15] Carececo.org. 2021. *The second webinar of the research program "Water as a driver of sustainable recovery" covered essential structural and institutional reforms*. [online] Available at: <https://carececo.org/en/main/news/news/vtoroy-vebinar-issledovatelskoy-programmy-voda-kak-dvizhushchaya-sila-ustoychivogo-vosstanovleniya-o/> [Accessed 3 May 2021].

In the Tigris-Euphrates basin the situation is fundamentally different. Turkey, the upstream country, holds all the cards - it is the dominant military, political and economic power. Due to this unbalanced relationship between upstream and downstream countries, non-cooperation is the prevailing strategy. Most cooperation attempts have failed in the past and it is unlikely that cooperation on water will emerge in the short or medium run. The three countries in the river basin are Turkey, Syria, and Iraq. Turkey, the most populous and economically and militarily most powerful country has for centuries been the dominant nation of the region. While Iraq, thanks to its wealth of fossil fuels could have easily surpassed Turkey in economic development, it has been weakened by bad governance, internal strife, military adventures, and conflict. The permanent instability of downstream countries is the result of poor socio-economic policies, ethnic conflict (thanks to borders drawn arbitrarily by their colonial masters), aggravated by wars and outside aggression. But even before the recent series of conflicts, Iraq and Syria even combined, could not match the military power of Turkey, and compensate for its geographical advantages. The lack of cooperation and damage caused by past and current conflicts left downstream countries in ruins.

Unlike Central Asia, the region of the Tigris-Euphrates basin was divided among different powers, so riparians have no common past experience of close cooperation, the way Central Asia has. After the First World War the Ottoman Empire fell and the once unified region became divided amongst Turkey, France, and Britain. These different entities had either different colonial masters (looking after their own interest only) or different national policies: cooperation on water was unlikely to emerge. After downstream countries regained their independence at the end of the second World War, tensions flared up from time to time: while it was clear that agreement on water cooperation could become a key ingredient of a stable political environment, every time riparian countries attempted to establish a functioning system of regional water cooperation, they failed. Ankara has a very strong geopolitical leverage and is in the position to use water as a tool of foreign and security policy.[16]

Thanks to unhindered control of water resources by the upstream country, non-cooperation seems to be its winning strategy:

[16] (www.dw.com), D., 2021. *Syria: Are water supplies being weaponized by Turkey? | DW | 24.01.2021*. [online] DW.COM. Available at: <https://www.dw.com/en/syria-are-water-supplies-being-weaponized-by-turkey/a-56314995> [Accessed 4 May 2021].

In reality, and especially in the long run, every riparian emerges as a loser from a situation where non-cooperation prevails. The permanent instability of downstream countries cannot but negatively affect the stability and economic development of every neighbour. Unresolved problems create a negative spiral: the more problems arise, the more unsolvable the situation gets.

Different neighbourhoods influence regional cooperation

Outside influence has also to be taken into account when we explain the differences in cooperation on water between the Syrdarya and Amudarya basins on the one hand, and the Tigris-Euphrates basin on the other.

Central Asia has a long history of relations with its two big neighbours, China, and Russia. The Silk Road connected China and Europe through Central Asia. Tsarist Russia colonized the region, then for seven decades Russia and the five Central Asian countries were integrated in the Soviet Union. After becoming independent, the Russian Federation remained a close economic, political, and military partner. In recent years, its influence has been gradually overshadowed by an economically much more powerful China. The Belt and Road Initiative includes Central Asia as a key transport hub of Eurasian Transport corridors.[17]

The two big neighbours are equally interested in the peace, stability, and economic development of Central Asia. While they seem to prefer dealing with Central Asian countries on a bilateral basis, or in the framework of the Eurasian Economic Union, the Shanghai Cooperation Organization or the BRI framework, this cooperation continues in parallel with the development of mutually advantageous cooperation on water among the five countries of the region.

In contrast to Central Asia, the Tigris-Euphrates basin is situated in one of the most unstable regions in the world: the Middle East. The region is the playground of great power competition (mostly for oil and gas), intertwined with the fight of regional powers for dominance. Many countries compete for influence and dominance in the Middle East, but no clear winner has emerged yet, because the aspiring regional hegemons are either not strong enough, or they are

[17] Belt and Road Initiative. 2021. *Belt and Road Initiative*. [online] Available at: <https://www.beltroad-initiative.com/belt-and-road/> [Accessed 24 April 2021].

too far away to control the region effectively. The example of the three river basins clearly demonstrates that non-cooperation on water has less advantages and more disadvantages, and the positive aspects benefit only one actor, while cooperation offers benefits to all actors. To summarize, non-cooperation in the Middle East is the "default" situation, as there is no mutual trust and no historic and economic foundation upon which it could be built. For the time being it seems unlikely that the spiral of misery makes these countries realize that cooperation on water resource management could be an important step towards stability and shared prosperity.

IV. Reprieve of the Melting Glaciers

If we are talking about water scarcity and water cooperation, we cannot ignore climate change, which affects every single region on Earth. Climate change does not hit every region with the same intensity and does not have the same effects everywhere. Some regions - like Central Asia - have a built-in buffer against the effects of climate change - their glaciers. Melting glaciers increase water flows for a few decades, compensating for decreasing water flows caused by irregular weather patterns, earlier snowmelt, and higher average temperatures. Central Asia belongs to the regions where the rapid melting of glaciers provides a few decades of reprieve, delaying the most severe effects of climate change. [18] But this is just temporary, as soon as the majority of glaciers will have melted, problems will return with vengeance. These few decades give some time for Central Asia to prepare for high water stress. "The point of peak water for the Aral Sea basin might come somewhere in the middle of the 21st century (Huss & Hock 2018)."[19] Most current estimates put the time of peak water approximately 30 years from now. This is a tight time frame, but it is enough to strengthen resilience and climate change adaptation, among others through strengthened regional cooperation. There is a window of

[18] UNESCO. 2021. *Experts discussed a project on glacier melting in Central Asia in the context of climate change*. [online] Available at: <https://en.unesco.org/news/experts-discussed-project-glacier-melting-central-asia-context-climate-change> [Accessed 20 April 2021].

[19] Shareweb.ch. 2021. [online] Available at: <https://www.shareweb.ch/site/Climate-Change-and-Environment/Documents/NexusBrief-Cryosphere-ENG-22Oct2019.pdf> [Accessed 30 April 2021].

opportunity to prevent a serious blow by climate change to the economy and stability of the region.

Unlike in the two big river basins of Central Asia, there are less glaciers in the catchment area of the Tigris-Euphrates to cushion the effects of climate change. Most of the glaciers are smaller and even those have already shrunk significantly. This means that water flows in the basin are not "topped up" sufficiently by melting ice and thus there is no natural "cushioning" to mitigate the effects of climate change. The effects of water shortage caused by climate change became dramatic in the 21st century.

One of the predictions of the numerous studies on the consequences of global warming is the rise of mass migration from drier regions. Droughts without a doubt are crises on their own, but understanding how grave they can be, we have to take a look at Syria, where climate change may have contributed to the outbreak of the Syrian Civil War. There are many studies, articles detailing the effects of climate change, but they mostly picture it as a future problem. However, in reality the effects of climate change have been with us for quite a while. A study published in 2015 under the title "*Climate change in the Fertile Crescent and implications of the recent Syrian drought"*,[20] presents compiled statistics about water shortages in the Fertile Crescent.

Syria has experienced the worst 3-year drought in written history, starting in 2006/2007, right before the outbreak of the Civil War. The Fertile Crescent has seen the worst multi-year drought of recent decades (some analyses even speak about the longest and most severe drought of the last 900 years!) caused by climate change. Without water reserves to rely on, downstream countries of the river basin had no possibility to counter the effects of climate change.

As a consequence, Syria faced a socio-economic crisis caused by the mass displacement of people. Peasants in the Fertile Crescent were forced to abandon their land because of the lack of water. The drought hit Iraq equally heavily. By 2010, 20% of Syria's population was made up of Iraqi refugees and internally displaced people, that is roughly 4,28 million people. As

[20] Kelley, C., Mohtadi, S., Cane, M., Seager, R. and Kushnir, Y., 2015. Climate change in the Fertile Crescent and implications of the recent Syrian drought. *Proceedings of the National Academy of Sciences*, 112(11), pp.3241-3246.

Andrew Freedman point out in his article[21] "It cannot be explicitly said that the Syrian conflicts were caused by the water scarcity as investigation due to the undergoing conflict is not possible, but it is more than possible that without the mass domestic migration to urban regions, the unrest would not have been so severe." It is highly likely that 1.5 million internally displaced people, and famine have contributed to the outbreak of the Syrian Civil War.

In this spiral of instability, the lack of transboundary water cooperation clearly played a role. Without multi-year regulating capacity controlled and managed jointly by all riparians, downstream countries had not the slightest chance of withstanding the effects of the most dramatic, three-year drought in their history.

Extreme water stress caused by climate change and lack of cooperation had a series of consequences: it killed livestock, drove up food prices, caused sickness and forced a mass migration from the dry rural areas. The authors of the study conclude that while the drought may not have been the main cause of the civil war, it certainly made the situation worse. "The authors acknowledge that many factors led to Syria's uprising, including corrupt leadership, inequality, massive population growth, and the government's inability to curb human suffering." The main question is: "would the civil war have happened anyhow without the droughts?" What is certain is that the peasants left the rural areas due to the droughts. The country has already faced a grave refugee crisis, because of the Iraq war. An additional one and a half million internally displaced persons in urban areas may easily have been the last straw that broke the camel's back. A socio-economic-humanitarian crisis combined with the unpopularity of the government provided a fertile ground for internal protest and made the country vulnerable to foreign interventions in different forms. The conclusions of the study (and many similar studies)[22], warrant further research as they are a serious warning about future conflicts in the making in areas affected by climate change.

[21] Freedman, A., 2021. *Global warming helped trigger Syria's civil war*. [online] Mashable. Available at: <https://mashable.com/2015/03/02/global-warming-syria-civil-war/?europe=true> [Accessed 30 April 2021].

[22] Burke, M., Hsiang, S. and Miguel, E., 2015. Climate and Conflict. *Annual Review of Economics*, 7(1), pp.577-617.

Iraq officially ended its civil war in 2018, but since then water scarcity has devastated the country. Large part of the flows of the rivers is used upstream or lost due to poorly maintained and damaged infrastructure. Iraq therefore lacks sufficient water supply and due to the conflicts and its current financial difficulties it cannot repair its damaged water treatment facilities, canals, pipelines and HPS. The irrigated area is also shrinking: low river flows allow saltwater from the Persian Gulf to flow upwards causing even more damage to agriculture and communal water supply. Iraq's survival therefore depends on its ability to overcome the present problems of water resources management.

V. Summary

We have examined the consequences of cooperative and non-cooperative strategies in three river basins. In the Tigris-Euphrates basin non-cooperation was the chosen strategy because this made it possible to create stability at least in one country. The lack of cooperation undermined social and economic stability in the downstream nations. Economic difficulties resulted in the decay of water infrastructure, leading to increasing water losses. A vicious circle had formed. With an urgent need for cooperation, but without any past experience of working together as partners, the countries chose to rely on themselves. Without cooperation downstream countries of the basin will continue to experience instability and slow economic growth. The price of non-cooperation is high for the upstream country too. It suffers from the fallout of violent conflicts in its neighbourhood and has to shoulder the huge burden of millions of refugees, terrorism and overall insecurity, negatively affecting such important sectors of its economy as tourism.

In the case of Central Asia cooperation was the chosen option. By cooperating, these countries achieved a high degree of stability and economic growth. Cooperation on water contributed to the relatively efficient use of this limited resource. Cooperation offered overwhelming advantages to all riparians: it helped preserve stability in the difficult period of transition and today provides a solid basis for joint efforts to achieve resilience to climate change and green, sustainable development.

Water is the most important resource for humans. Without it, life is not possible. Cooperation is the only way to ensure that people will have continued, guaranteed access to this precious resource in the future.