Sharing transboundary waters

Partager les eaux transfrontalières

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Abstract. Sharing the water of transboundary watercourses sometimes become a source of dispute between riparian states. A general method to share the water of transboundary watercourses has not yet been applied. This article examines existing practices, disputes, and criteria of some of the international financial institutions to propose a simple water-sharing method to allocate the water of the transboundary watercourses between riparian states. This method will help each riparian country to know how much water it will get from the transboundary water flow. So, states can plan on how to divide water between different uses and on building infrastructures on the watercourse or not. The proposed method is expected to decrease water disputes between riparian states as it clarifies the amount of water every riparian state gets from the transboundary watercourse. This article proposes a simple water-sharing method based on sharing the transboundary water quantity by 1/3 ratio for the downstream state and 2/3 for the upstream state. The method envisages compensation payments to other riparian states in different forms in case of excess water usage. As the environment needs a regular water flow, the proposed method also inquiries about some water to be released for the environment.

Résumé. Le partage de l'eau des cours d'eau transfrontaliers devient parfois une source de différends entre les États riverains. Une méthode générale de partage de l'eau des cours d'eau transfrontières n'a pas encore été appliquée. Cet article examine les pratiques existantes, les différends et les critères de certaines institutions financières internationales pour proposer une méthode simple de partage de l'eau pour répartir l'eau des cours d'eau transfrontaliers entre les États riverains. Cette méthode aidera chaque pays riverain à savoir combien d'eau il tirera du débit d'eau transfrontalier. Ainsi, les États peuvent prévoir comment répartir l'eau entre différents usages et construire ou non des infrastructures sur le cours d'eau. La méthode proposée devrait aider à réduire les différends relatifs à l'eau entre les États riverains, car elle clarifie la quantité d'eau que chaque État riverain obtient du cours d'eau transfrontalier. Cet article propose un calcul simple de partage de l'eau basée sur le partage de la quantité d'eau transfrontière par 1/3 pour l'état aval et 2/3

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pour l'état amont. La méthode prévoit des paiements de compensation aux autres États riverains sous différentes formes en cas de consommation excessive d'eau. Des versements, à titre de compensation aux autres États riverains sous différentes formes en cas de consommation excessive sont également prévus. Finalement, nous proposons dans ce calcul de réserver une certaine quantité d'eau qui sera rejetée pour l`environnement afin de tenir compte du besoin de l'environnement à un débit régulier d'eau.

1 Introduction

Water is vital for the continuity of life on earth. However, it is not evenly distributed on the earth surface. States would like to obtain more water from the shared water resources. Therefore, the allocation of shared waters might cause disputes. Some states have regulated and clarified through agreements the amount of water allocated to each state. However, most states do not choose this method as some states are not willing to share water or they have difficulties in allocating water as they cannot agree on how allocation should be made. When a river passes through water-scarce states, it becomes harder for them to agree on how water should be allocated as mostly all states claim that they need water more.

There are several mathematical methods and approaches proposed for sharing transboundary waters. They are generally complex, not easily understandable, and not practical to apply. This article proposes a simple water-sharing method based on the 1/3 ratio. This method foresees 1/3 of the water of the shared river coming from the upstream state to be released to the downstream state. Additionally, 10% of the water flow is proposed to be discharged from the upstream to the downstream country for the needs of the environment. If the downstream country needs more water (more than 1/3 of the transboundary water flow) than it should make a payment to increase its share. Similarly, if the upstream state uses more than 2/3 of the transboundary water, it should make a payment to the downstream state(s). Such allocation is beneficial for the riparian states as each riparian state, especially the downstream state, would know how much water is allocated to it from the river flow. So, states can divide the water between different uses or build different water infrastructures considering their guaranteed share of water. In that respect, the proposed water share approach may avoid disputes among riparian states as it can also end the existing ones.

Such sharing has successfully been applied since 1944 when a treaty between the USA and Mexico to share one part of the waters of the Colorado River was concluded. [1] Also, when Turkey applied to the World Bank to obtain credit for the construction of the Keban Dam, one of the conditions that the Institution has set was Turkey to agree to release a certain amount of water from Euphrates river for the downstream states which was at the end equal to 500 m^3/sec. [2] This flow quantity corresponds approximately to 1/3 of the total flow quantity of the Euphrates-Tigris (E-T) river basin flow.

This article aims at proposing a simple method for riparian states to share the water of transboundary rivers. This article examines some examples that are currently applied when sharing the water of the transboundary rivers between the riparian states and suggest a new simple model by also considering the environmental needs. The proposal is based on the fact that riparian states are eager to accept such an allocation which would help to decrease the political tension based on the obscurity occurring from the idea that the upstream state will control the water flow and the downstream will not get enough water.

2 How Water Allocation is regulated under International law

Water has been a vital source. That's why civilizations have started to develop on the edge of the water resources in different parts of the world. [3] People constructed dams since ancient times to facilitate access to water and to have it throughout the year whenever needed. [4] Water was so precious that they have fought over it and have concluded agreements following it. [5] Oregon University Register of International River Basins shows that waters of the shared rivers created disputes among states as states have different perceptions and understanding of how water should be used and allocated. [6] Upon the Register, there are 310 international river basins in the world. [7] This is the number of rivers that at least two states use and benefit. States are sovereign however this sovereignty is not without limit. They need to consider other states when they use the water of a transboundary river.

Both national and international and mostly non-binding studies were concluded on different aspects of transboundary watercourses including especially the rights and obligations of riparian states. They tried to establish general principles on the use and management of transboundary waters based on customary law codified in the both the 1992 Convention on the Protection and Use Of Transboundary Watercourses and International Lakes [8] and 1997 Convention on the Law of the Non-navigational Uses of International Watercourses [9]. The mentioned Conventions indicate generally accepted principles of international water law; "equitable and reasonable use", "obligation not to cause significant harm" and "general obligation to cooperate". These were also emphasized in different agreements, court, and arbitral decisions as to the customary principles of the international water law. Nonetheless, these are vague regulations that do not help states to define how water should be shared exactly. The customary law principle, "equitable and reasonable use", is a vague one as it does not specify a certain number that leads to an unpredictable scenario on how much water a state might utilise. This also causes problems in water management [10] and makes it more difficult to plan future water uses. "Equity does not mean equality" [11] and these regulations have not set specific standards nor made concrete suggestions on how water should be allocated to in-between states.

None of the existing international regulations has foreseen any direct means to allocate water between riparian states. More general regulations were made to gather the maximum number of states on common points and to put forth generally accepted international water law principles on transboundary watercourses. A minimum level of rights and obligations tried to be accepted by a maximum number of states so minimum standards can be set internationally. These conventions were important milestones for the international water law; hence they do not contain any direct suggestion on how to allocate waters of the shared rivers. Such a suggestion would not restrain the sovereignty of states on how to allocate water in-between them but would guide them when negotiating. However, no such rules or direct suggestions are made in the international conventions.

These international conventions encourage the signatory states to conclude other agreements to regulate different aspects of transboundary waters. Upon this, some states have concluded bilateral or multilateral agreements to allocate the waters of the shared river waters. These agreements help to concretise the rights and obligations defined under the customary international law. As states are sovereign, they are free to conclude agreements to regulate different aspects of water use and management including how to allocate water to a shared watercourse. Besides, there are riparian states that have not agreed on how to use and manage the shared watercourse. Therefore, the bilateral or multilateral agreements do not constitute a general departure point for the water allocation either. During the Global Workshop on Water Allocation that took place on the 16 - 17 October 2017 in Geneva, Switzerland, Aron Wolf demonstrated in his presentation that 68 of the 145 states have concluded water allocation agreements among which 15 have shared water equally, 39 of

them had a complex but clear system and 14 of them were made in an unclear way. [12] These statistics show that there is not a standard for water allocation followed by states when concluding agreements.

The United Nations Economic Commission for Europe has been working on how to allocate transboundary waters between riparian states through a Transboundary Water Allocation book for which the expert group has already had two meetings on 21 October 2019 and 30-31 March 2020. [13] The latest one will be held on the 20-21 October 2020 where the full manuscript of the mentioned Handbook is expected to be completed. [13] This work is expected to fill the gap in this area.

2.1 Benefits of water allocation

One of the advantages of the suggested water allocation method is every state to know the amount of water they will receive. As states will know their allocated percentage, using the long-term data on the river flow in different seasons and months, they would have an idea of the average amount of water they should receive from the shared river. This leaves less room for surprises both for the upstream and downstream states. This also will provide the chance to states to plan freely how to use and manage their share. They would allocate the water freely and easily in-between different uses upon the needs of the country. Besides, it will force states to use their share in the most optimum way possible. They may buy water from other riparian states through agreements they conclude. However, it will have a cost. Also, they would try to avoid possible dependency. This will ensure that water is used with maximum efficiency as aimed which will render states more careful about water utilisation.

This method is also expected to reduce conflicts between states. Especially on the arid basins, where every water infrastructure project is a potential source of tension. States follow closely water infrastructure projects that other states plan and construct to see whether their share of water will be affected by the new project and whether this new project will harm the environment. The E-T basin is a good example of that. Syria, Iraq, and Turkey are examples of states that did not conclude any trilateral agreement to assign a certain quantity of water to each state. This causes the tension to increase between states every time one of them intends to construct a water infrastructure project.

Most states have been reluctant to conclude water allocation agreements for the transboundary freshwaters as they predict that would cause disputes between riparian states. That's why they tend to conclude benefit-sharing agreements such as agreements for the constructions of dams to use for irrigation [14], hydropower [15] or flood protection [15]. Also, some states do not need to share water as there is excessive water in the basin or the country. These states that are rich in water, like some European countries, prefer to conclude agreements on other water-related aspects such as hydropower, flood control or water quality. Water allocation is mostly needed on the basins where the water is scarce and the fact that states do not allocate water causes tensions to increase.

Also, this method will ensure that every state is affected by changes disturbing the water quantity of the river flow upon their proportion. As this method foresees the allocation per percentage, this will lead each riparian state to be affected according to their proportion. Thus, they will bear the consequences of a possible flow change at the same rate as they benefit from the river. Scientists foresee that climate change will have different impacts on different parts of the world. [16] However, in general, precipitations and climate of different parts of the world are expected to change causing climate unpredictability. Scientists expect precipitations to decrease and become unstable in different parts of the world which might render the land more arid, and in other parts the precipitations to be more sudden and intense which is predicted to lead to more floods. These changes in climate and precipitation might likely have negative impacts on riparian states as sudden and unforeseen changes in the

quantity of the water flow has a burden to bear when the range of motion is limited for states. This allocation proposal will make states bear the change depending on their share.

This proposal, however, is not made to end existing cooperation between states or to prevent the possible ones. In most basins where the riparian states cooperate, better results were obtained on water use and management [17]. However, in some basins, it is not very easy for states to cooperate. This allocation method intends to provide states with the possibility to act alone when they need by keeping the possibility to cooperate aside. Application of that method will provide convenience to riparian states.

3 Minimum Environmental flow

The proposed method foresees a minimum water flow to be released only for the environment. The environmental flow (e-flow) is a new concept that developed after the high number of dams constructed in the 1950s. [18] After these dams had negative impacts on the environment, studies focused on the environment and how to preserve it. The focus then moved to river flow, "river connectivity" and river ecosystem. [18] Brisbane Declaration, which is a non-binding declaration drafted in 2007 after the 10th International River Symposium in Australia, has codified e-flow as "describes the quantity, quality and timing of water flows required to sustain freshwater ecosystems and the human livelihoods and well-being that depend on these ecosystems" [19].

Minimum e-flow exists on several agreements under different names. Agreement on the cooperation for the Sustainable Development of the Mekong River Basin signed in 1995 between Cambodia, Laos, Thailand, and Vietnam emphasized under article 6 (A) that states should foresee "the acceptable minimum monthly natural flow during each month of the dry season" to be kept in the watercourse. [20] Even though the amount of the minimum e-flow is not explicitly written, it has been defined. It is mentioned that the Committee will publish a related guideline on "the locations and levels of the flows".

A similar regulation exists in the Minutes prepared as a part of the 1944 USA-Mexico water share agreement. Parties to the 1944 Treaty between the United States of America and Mexico relating to the waters of the Colorado and Tijuana Rivers, and of the Rio Grande (Rio Bravo) from Fort Quitman, Texas, to the Gulf of Mexico agreement on the allocation of the waters of Colorado river have accepted that the agreement might be changed or expanded through Minutes. [1] The Minute 319, prepared on November 20, 2012, under the 6th part of the proposed measure, accepts to release a base flow for the environment. [21] To follow the impacts of the mentioned e-flow that states have decided to release to the watercourse, the International Boundary and Water commissions, that was co-founded by USA and Mexico to work on the bilateral treaties [22] and problems, have published reports [21].

Also, in the Kishenganga arbitration, the arbitral tribunal emphasised the importance to consider the water need of the environment and both parties and the tribunal have made calculations by considering it. [23] Also, in the same decision, the arbitral court emphasised in the award that downstream states' water need should be considered when water released for the downstream states is calculated. [24] The fact that e-flow is regulated through the soft and hard law instruments and case law shows that it has been accepted in international law.

E-flow is important to conserve the environment and the river habitat and to comply with the sustainable development goals which is one of the 17 goals of the United Nations [18]. The water-related sustainable development goal aims from one-part providing water needed to people and from the other part to preserve the environment so that an adequate amount of water can still be supplied to the future generations. [18] This brings the need to safeguard e-flow for the preservation of the watercourse for the environment and future generations [18].

Regarding these developments and the importance given to the environment, it was not possible to foresee a method that does not include a minimum amount left to the environment as it requires a regular minimum amount of water. There are different methods of how the shares should be calculated. [25] However, there is not an international regulation that regulates or proposes an exact amount of water for the minimum flow. So, the departure point is taken as the national laws of the states [26].

In determining the amount of 10% the main departure point was the Turkish regulation entitled "The Rules on The Procedures and Principles for Signing The Right To Use Water Agreement in Order to Make Production Work In The Electricity Markets" indicated under the article 15 that at least 10% of the average flow of the last 10 years will be left to the environment for the continuity of the natural life. [27] 10% has been mentioned in the literature. One of them was again for the minimum amount released for the environment from the River Mrežnica, Croatia, despite the remarked that it is not applied. [28] The Global Environmental Flow Information system [29] shows the percentage of the e-flow for each basin under different conditions. To maintain the basin close to its natural state 40-60% of the water should be saved for the environment. However, in most basins, this is not possible as the water need has increased in parallel to the increasing population and developing technology.

Thus, for the proposed method states are required to release 10% from their water share for the downstream environment. This amount is chosen as it has been codified, utilised, or proposed by states. Also, it is an easy amount to calculate which was aimed with this method. As it is a small amount when compared to their water share, it is probable that states comply with it and release that mentioned amount for the environment contrary to 40-60% that was not realistic. Certainly, states might agree to increase that amount through agreements.

4 The Proposed Method

The method proposes, the upstream state to be entitled to 2/3 of the water flow. Also, 10% of the flow from the upstream state's share is reserved for the downstream environment. The rest 1/3 of the river flow will be left to the downstream states' use together with the mentioned 10% that was set aside. This allocation will be followed the same way by the downstream states with the same ratio without using the mentioned 10%. So, if the river water flow of the source country, country A, is shown as QA, as the first country A will get

$$2/3 Q_A - 0,1 Q_A \tag{1}$$

of the water. This would be equal to

$$0,66 Q_A - 0,1 Q_A = 0,56 Q_A. \tag{2}$$

The rest which is equal to

$$1/3 Q_A + 0,1 Q_A = 0,33 Q_A + 0,1 Q_A = 0,43 Q_A \tag{3}$$

is released from the Border A-B (B1) to the downstream state, state B. The water flows through the second state, state B. State B will be entitled to use 2/3 of what it acquires from the B1 point, without considering the 10% which is expected from the states to be left to the watercourse at all times. Nevertheless, the river that stays in the border of the state B might also have tributaries. They should also be calculated and added to the total that passes through the state C. In Figure 1, the exemplary calculations are only made for the main watercourse.

So, according to this example, 1/3 of that water and 10% for the downstream environment is also released to state C.

The totality of the water that is proposed to be released to the state C is equal to

$$\frac{QA/3}{3} + 10\%(QA) \tag{4}$$

This calculation is made as neither A, B nor C states have tributaries. If they have, then the situation turns into more as it is prescribed in Figure 2.
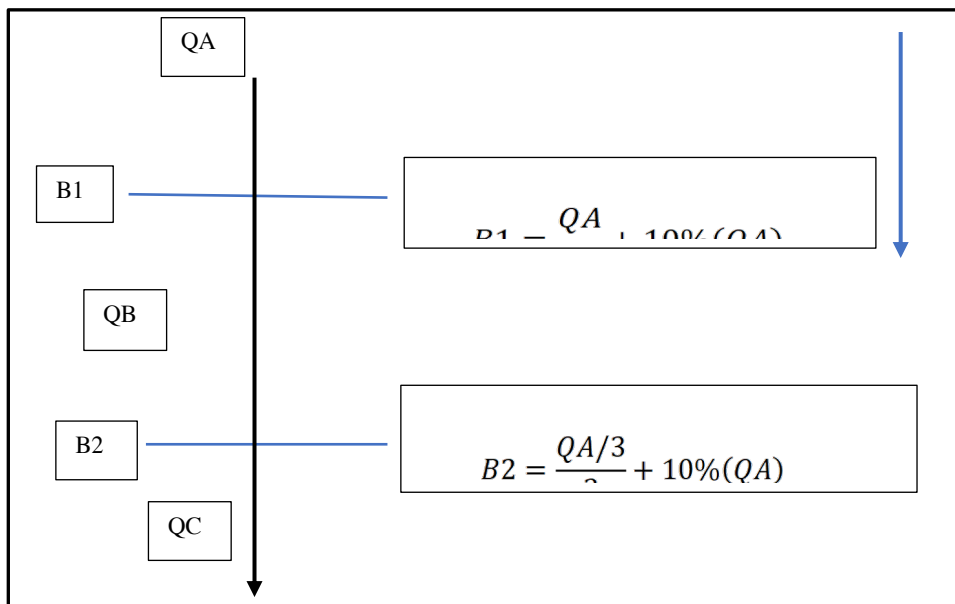

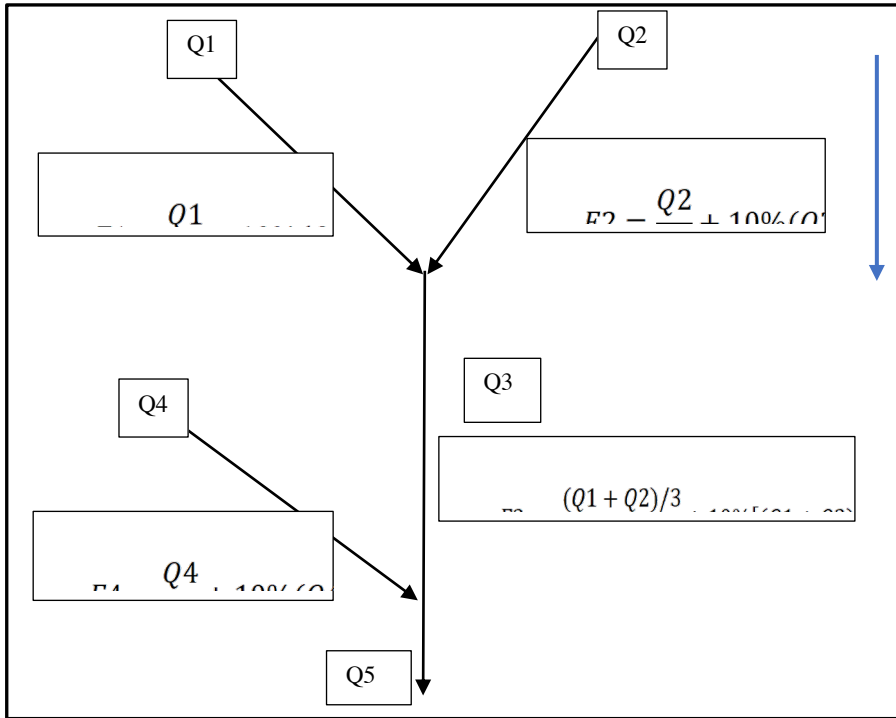**Fig. 1.** Proposed water share method.

Fig. 2. Another example for the proposed method.

Figure 2 intends to provide a more detailed version of Figure 1 by also considering the tributaries shared upon the proposed method. If the fleshes are considered as state borders, and Q1 and Q2 are in the borders of the first upstream state,

$$\frac{Q1}{3} + 10\%(Q1) \tag{5}$$

will be released from the first river and

$$\frac{Q2}{3} + 10\%(Q2) \tag{6}$$

will be released from the second river for the downstream state. The third state will receive

$$(Q1 + Q2)/3 + 10\%(Q1 + Q2) \tag{7}$$

from the upstream state from the 1st and 2nd rivers. If it is considered that no tributary is added to the main flow in the third state, the third state will have the responsibility to release

$$\frac{(Q1+Q2)/3}{3} + 10\%(Q1 + Q2) \tag{8}$$

for the downstream state which in this case will be the fifth state. If another flow from the 4th state contributes to the main flow,

$$\frac{Q4}{3} + 10\%(Q4) \tag{9}$$

of the 4th river flow will be released for the water use of the 5th state. And as the 5th state is the last one in the Figure 2 example Q5 at the end will be equal to

$$\frac{(Q1+Q2)/3}{3} + 10\%[(Q1 + Q2)] + \frac{Q4}{3} + 10\%(Q4) \tag{10}$$

The data to determine the quantity of water that should be released downstream part should be calculated using the average flow of the river. Precipitations and evaporation may cause differences in the water flow, but states should have an idea of the average water flow of the river.

The proposed method is for transboundary waters that pass-through states. Where the water forms the border between two states, equal share thus ½ ratio will be recommended between states after 10% is reserved for the environment and 1/3 is released for the downstream state. If for the mentioned example the water flow will be taken as Qx, So, in such a case each state will be entitled to

$$\frac{\frac{2}{3}(Qx-10\%(Qx))}{2} \tag{11}$$

which will be equal to 0,3Qx for each state.

5 Is it being applied?

The proposed method is not applied per se. However, there are examples where the 2/3 share for the upstream state and 1/3 for the downstream was used in the agreements and practice. In the E-T basin when the data is examined, the amount of water released downstream shows that these ratios apply in practice. Also, in 1944 the USA and Mexico have signed an agreement where they have allocated the Rio Grande river water partly accordingly.

5.1 The Euphrates Tigris Basin

The water of the E-T rivers has been a source of dispute between Turkey, Syria, and Iraq. While it is an arid and populated basin, downstream states approach any water infrastructure construction attempt of upstream states with prejudgment considering that they will have less water. There were no important irrigation work or water infrastructure on the basin before the 1970s. As Turkey wanted to construct Keban Dam in 1973 and demanded financial support from the United States Agency for International Development (USAID) and the World Bank, both institutions have preconditioned the downstream states to be consulted and their concern to be considered [2]. During the negotiations with USAID, Turkey first agreed to release 350 m³/sec which was increased to 450 and 500 m³/sec gradually. [2] As both Turkey and Syria impounded the Keban and Tabqa dams at the same time in 1978, water scarcity occurred in the basin. [30] This led to water scarcity in Iraq and a water crisis between Syria and Iraq. Iraq held Syria and Syria held Turkey responsible for the sudden

decrease in the Euphrates flow. [31] Things are settled thanks to the mediation of Saudi Arabia and the Soviet Union. [31] If the water of Euphrates was allocated between states in advance, none of these problems would have occurred as states would be able to prove mathematically that they have received less water, if it is the case, and might have demanded their attributed ratio. Besides, states continue to develop water infrastructures on the basin as the climate change is expected to cause water scarcity in the future. [32] As states do not seem to be eager to develop projects in cooperation, there might be tensions regarding water politics.

The minimum downstream flow of 500m³/s is agreed upon in the 1987 Turkish-Syrian Protocol. [33] In the basin there is one more water agreement between Iraq and Syria where they have agreed to share the waters of the Euphrates river 58% and 42% respectively. [34] However, there is not a trilateral agreement on the basin.

Table 1. The flow quantities of E – T rivers [35].

	Turkey [36]	Syria (Jarabolus Station)[37]	Iraq (Mosul Station)[38]
Euphrates River	31.61BCM/year (983m³/sec)	25.1BCM/year (796m³/sec)[39]	-
Tigris River	20.84BCM/year (660.8m³/sec)	-	19.5BCM/year (618.34m³/sec)

Q=500 m³/sec water that Turkey agreed to release during the Keban Dam construction. When this amount is considered and compared with the data above in the table, the water promised to be released from the Euphrates river corresponds approximately to ½ of the basin flow. However, it should be remembered that Turkey accepts the E-T as one basin and insisted this be accepted by the riparian states also as such in the international area. [40] So, when the calculations are made considering the Turkish point, the sum of water quantity that Turkey has from Euphrates 983m³/sec and Tigris 660.8 m³/sec equals 1.643,8 m³/sec. When the calculations are made it can be understood that Turkey has promised to release approximately 1/3 of the E-T basin water, as no agreement on the release of water from Tigris exits between Turkey and another downstream state.

The main problem of the basin is to obtain reliable data as E-T flow is indicated with different rates in different sources. The data stated in Table 1 were also collected from different sources as mentioned states are generally reluctant to share data on the rivers.

5.2 The USA-Mexico water share agreement

The Treaty between Mexico and the United States for the Utilisation of Waters of the Colorado and Tijuana Rivers and the Rio Grande concluded in 1944 [1] contains a similar regulation to what was proposed in this paper. Among other regulations, both states have agreed under article 4 to share the waters of the downstream part of the Rio Grande (from Fort Quitman, Texas to the Gulf of Mexico). Upon this article, some of the tributaries of Mexico, that is explicitly cited in the agreement and are taking their source from Mexico, are allocated in-between Mexico and the USA as of 2/3 and 1/3 of ratio respectively. The same agreement leaves the water of some of the Mexican tributaries that have their sources in Mexico totally to Mexico and others that have their sources in the USA to totally to the USA. The water of the main river is divided equally. When the basin is examined, USA has

managed to obtain most of the basin water, however, for the downstream part of the Fort Quitman, a similar method to the proposed method was accepted and applied by the parties.

6 Challenges against the application of this method

One of the biggest problems against the application of this method is to reach reliable data on the river flow. To calculate the exact amount of water that every riparian state will receive, long term data is needed. Some states are reluctant to publish data, as they find that it is related to state security. Thus, it becomes hard to calculate the real quantity of water flow. This is especially accurate when the upstream states do not share their data with others. For this system to work, states need whether to share data between the riparian states or as an alternative, they need to agree to found a joint basin organisation or institution to determine the total river flow quantity so the amount every riparian state will receive will be known transparently. This transparency would help to prevent possible disputes among states.

Another possible reason for the dispute is riparian states which would not agree to receive the suggested amount of water as the current amount of water they use is more than what they will receive if this method is applied. One of the states that will possibly oppose the application of this method will be Egypt. Egypt is the main Nile water user on the basin. Egypt has concluded a water share agreement with Sudan where Egypt is allocated most of the water. [41] Egypt has also agreed with Ethiopia but for several reasons, Ethiopia does not accept its validity. [42] However, there is no trilateral agreement. Egypt takes the lion's share from the Blue Nile. If the suggested ratios are used, the amount of water that Egypt receives will decrease significantly. On the other hand, Ethiopia has constructed the Grand Ethiopian Renaissance Dam (GERD) on the Blue Nile and might construct others. If Ethiopia constructs irrigation or water supply dams, then they might decrease perceptibly the water quantity of the Nile and might cause serious problems especially for Egypt, the last riparian state. Applying this proposal might help to ensure a certain quantity of water by leaving the option of buying water from upstream states open.

There might be objections to the idea of the sale of water between states. However, the water sale has been done between states indirectly since they started trading. Through all goods that they import, states also import the water used when producing or cultivating that good which is called virtual water trade. [43] This is vital, especially for the water-scarce states. Virtual water trade happens mostly through agricultural product sale as it consumes the most water in the world. [44] As states import virtual water through the goods that they import from other states, direct water sale in case of need does not seem irrational. Besides, states trade excess energy obtained from their dams, and it is a generally accepted behaviour. The sale of water to the downstream state may become normal in the future.

Also, as 1993 was a dry year for Turkey, it has proposed Bulgaria to buy water from the Tunca river which is a transboundary river between Turkey and Bulgaria. [45] They have agreed with Bulgaria to release 25 m^3/sec for five days (together with alternatives) mentioned in the Enclosure-1, where Turkey has agreed to pay 0.12 US\$ per m^3 of water provided by Bulgaria (Article 2). [46] This compensation may be monetary payment, as in the example or it can be made as electricity, food, petrol, or mine, depending on the agreement between states.

Water also has economic value. As the proposed method foresees that upstream states get a higher proportion of water, the downstream states are deprived of potential economic benefit, including but not limited to the hydropower. Since states lead to different economic activities, the economic benefit they are deprived of changes upon the situation. Thus, it would be fair for the upstream state to pay compensation to the downstream states which the amount can be finalized in-between them. Indeed, this paper focuses on water allocation.

Depending on the basin, compensation could be made in different ways depending on the states' demands.

7 Conclusion

Allocating water of a shared river to every riparian state is a complex and sensitive issue. Therefore, most riparian states do not allocate water between themselves. They generally prefer to share the benefits that they obtain from these rivers. Most of the proposed models in the literature are complex methods. This approach proposes an easy way of water allocation between riparian states by using 2/3 and 1/3 ratio. Also, 10% of the flow released from the river for the environment, tries to set a minimum for the sustainable use of the water resources and to preserve the ecology.

This water-sharing method might help to prevent possible future water disputes between states and political tension between states especially for the ones that are located on the arid or semi-arid basins. As states will know how much water they will receive, since they may easily calculate it using their existing data on their transboundary waters, there will be less dispute on the water quantity released from the upstream states for the use of the downstream states. This can be used to decrease the political tension between Ethiopia and Egypt which started with the construction of the GERD. Another possible conflict that can be resolved by using this method is an ongoing dispute on the share of the Silala River water between Chile and Bolivia.

This method also intends to prevent the state's wasteful water uses and to force them to develop alternative methods that will use less or no water. The proposed method aims to lead to more effective use and better planning of water for the riparian countries. Also, as the proposed method allocates water through ratios if the water quantity of the river changes all riparian states will be affected per their ratios.

References

1. Treaty between the United States of America and Mexico relating to the waters of the Colorado and Tijuana Rivers, and of the Rio Grande (Rio Bravo) from Fort Quitman, Texas, to the Gulf of Mexico, signed at Washington on 3 February (1944)
2. I. Turan, "The Water Dimension in Turkish Foreign Policy", Turkey's water policy: National Frameworks and International Cooperation, 181 (2011)
3. M. Everard, The hydropolitics of dams: engineering or ecosystems?, Zed Books Ltd., 24 (2013)
4. Ibid, 8-9
5. World Conflict Chronology, http://www.worldwater.org/conflict/list/. Accessed September 30 (2020)
6. Transboundary Freshwater Dispute Database, Oregon State University, https://transboundarywaters.science.oregonstate.edu/content/register-international-river-basins, Accessed September 30, 2020 (2018)

7. M. McCracken, A.T. Wolf, "Updating the register of international river basins of the world", International Journal of Water Resources Development (2019)

8. Convention on the Protection and Use Of Transboundary Watercourses and International Lakes, Helsinki, 17 March (1992)

9. Convention on the Law of the Non-navigational Uses of International Watercourses, New York, 21 May (1997)

10. UNESCO, Water-related vision for the Aral Sea Basin for the year 2025, 49 (2000) https://unesdoc.unesco.org/ark:/48223/pf0000126259, Accessed September 30 (2020)

11. S. C. McCaffrey, "Some Developments in the Law of International Watercourses", Promoting Justice, Human Rights and Conflict Resolution through International Law, 787 (2007)

12. A. Wolf, Allocations in Practice: What happens in the room, in Global Workshop on Water Allocation, 16-17 October 2017, Geneva, Switzerland (2017)

13. Transboundary Water Allocation Handbook, https://www.unece.org/environmental-policy/conventions/water/areas-of-work-of-the-convention/water-allocation-in-a-transboundary-context.html, Accessed September 30 (2020)

14. Doosti dam (Iran-Turkmenistan Frendship Dam), J. Vatanfada, C. H. Mesgari Doosti Dam Progress on Water Cooperation, 9-10 April 2014 Geneva-Switzerland (2014)

15. Treaty relating to cooperative development of the water resources of the Columbia River Basin, 17 January (1961)

16. The Effects of Climate Change, https://climate.nasa.gov/effects/, Accessed September 25 (2020)

17. Water Basins in Africa can be given as example, J. Anders, "Transboundary water management–why it is important and why it needs to be developed", Free Flow–Reaching Water Security through Cooperation; UNESCO: Paris, France, 49-52 (2013)

18. A. Sood, et al., Global environmental flow information for the sustainable development goals, International Water Management Institute Research report **168**, 1 (2017)

19. The Brisbane Declaration: Environmental Flows are essential for freshwater ecosystem health and human well-being, Declaration of the 10th International Riversymposium and International Environmental Flows Conference, Brisbane, Australia (2007)

20. Agreement on the cooperation for the sustainable development of the Mekong River Basin, Mekong River Commission (1995)

21. Minute 319 Colorado River Limithrophe and Delta Environmental Flows Monitoring Final Report, November 28 (2018)

22. International Boundary and Water Commission, United States and Mexico, https://www.ibwc.gov/home.html, Accessed September 30 (2020)

23. Indus Waters Kishenganga Arbitration (Pakistan vs. India), Final Award, The Hague, 20 December 2013, PCA Award Series, Record of Proceedings (2010- 2013)

24. Ibid, paragraphs 54-70 and 97-104 (2010- 2013)

25. R. Speed et al., Basin water allocation planning: Principles, procedures and approaches for basin allocation planning, 58-62 (2013)

26. World Meteorological Organization, Guidance on Environmental Flows: Integrating E-flow Science with Fluvial Geomorphology to Maintain Ecosystem Services, 10 (2019)

https://library.wmo.int/doc_num.php?explnum_id=9808, Accessed September 30 (2020)

27. The rules on the procedures and principles for signing the right to use water agreement to make production work in the electricity markets, Article 15, translated by the author

28. I. P. Dujmović, WWF Adria, Application of environmental flows in the region, Expert Group on Flow Regulation and Environmental Flows (11-12 June 2019), https://www.unece.org/fileadmin/DAM/env/water/meetings/2019/11-12_June_Zagreb/5_Implementation_of_e-flow_in_the_region_WWF_Adria.pdf, Accessed September 30 (2020)

29. The Global Environmental Flow Information system, International Water Management Institute (IWMI), http://eflows.iwmi.org/, Accessed September 30 (2020)

30. A. J. Kirschener, K. Tiroch, The Waters of Euphrates and Tigris: An International Law Perspective, Max Planck Yearbook of United Nations Law Online, **16**(1), 339-340 (2012)

31. Ibid, p. 347-348

32. D. Bozkurt, and O. L. Sen., Climate change impacts in the Euphrates–Tigris Basin based on different model and scenario simulations, Journal of hydrology, **480**,149-161 (2013)

33. W. Scheumann, et al., "Environmental Impact Assessment in Turkish Dam Planning", Turkey's water policy: National Frameworks and International Cooperation, 150 (2011)

34. Law No. 14 of 1990, ratifying the Joint Minutes concerning the provisional division of the waters of the Euphrates River

35. Ö. Türk, N. Türk, Fırat-Dicle Havzası Sularının Uluslararası Hukuk Yasaları Çerçevesinde Değerlendirilmesi, presented in Workshop of Water and Environment (SUCEV), 22-24 March 2018, Bursa, Turkey (2018)

36. Devlet Su İşleri (DSİ), Turkey Water Report. DSİ, Ankara (2009)

37. United Nations Economic and Social Commission for Western Asia, and Bundesanstalt für Geowissenschaften und Rohstoffe, Inventory of shared water resources in Western Asia. United Nations Economic and Social Commission for Western Asia, XX, measured at Jarabolus (2013)

38. Ibid, XX, measured at Mosul (2013)

39. This amount is provided by Turkey as 15.6 BCM/year which is equal to 500 m^3 /sec

40. G. Kut, Burning waters: the hydropolitics of the Euphrates and Tigris, New Perspectives on Turkey, **9**(3),10(1993); Inventory of shared water resources in Western, 121

41. Agreement between the Republic of the Sudan and the United Arab Republic for the full utilization of the Nile waters, signed at Cairo, 8 November (1959)

42. M. Kimenyi, and J. Mbaku, Governing the Nile River basin: The search for a new legal regime. Brookings Institution Press, 58-59 (2015)

43. J. A. Allan, "Fortunately there are substitutes for water otherwise our hydro-political futures would be impossible", Priorities for water resources allocation and management, **13**(4), 26, (1993); J. A. Allan, "Virtual Water: A Strategic Resource, Global Solutions to Regional Deficits", Groundwater, **36**, 545–546 (1998)

44. E. B. Weiss, L. Slobodian, "Virtual Water, Water Scarcity, and International Trade Law", Journal of International Economic Law, **7**(4), 719 (2014)

45. The Agreement between the Government of the Republic of Turkey and the Government of the Republic of Bulgaria on Assistance and Cooperation in the Field of Water for Reducing the Negative Effects of the Drought of 1993

46. A. Kibaroglu, W. Scheumann, A. Kramer, Turkey's Water Policy: National Frameworks and International Cooperation, Annex 5, 354-355 Springer-Verlag, Heidelberg (2011)