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Quantifying and Simplifying the 1997 UNWC's Guidelines to Mitigate Hegemony in Transboundary Watercourse Negotiations

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Abstract

The 1997 United Nations Convention on the Law of the Non-navigational Uses of International Watercourses (UNWC) contains a negotiation framework for transboundary water rights. However, it is a subjective document open to a wide range of possibilities and interpretations. Water Rights Allocations (WRAs) as described by Dinar and Nigatu (2013) and Dinar and Tsur (2017) provide a limited number of quantifiable allocation possibilities based on the UNWC. It is suggested that this methodology streamlines the negotiation process and reduces the effects of hydro hegemony. These methodologies are explored and applied through a case study on the Orontes River Basin.

Keywords

Orontes River, Assi River, Transboundary Watercourses, Equitable and Reasonable Utilization, 1997 United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses, Lebanon-Syria Relations

1. Introduction

What does it mean for international waters to be distributed "fairly" and "equitably"? What evidence might be submitted by a riparian state of a given transboundary watercourse in order to support its case for a greater allocation—or different use—of the water resource in question? The position of a riparian on the watercourse will undoubtedly affect this. An upstream state of a transboundary watercourse might argue that as the major contributor to the source of the river's flows, it ought to be permitted to use a larger share of these flows; it may

even view this river as a domestic resource rather than a transboundary one. On the other hand, a downstream or midstream riparian with the long-established historical use of a river might put forth the view that upstream riparians ought to not do anything that would put the quality or quantity of water it is used to receiving in jeopardy. Countries facing heavy pressures on their water resources could advance the position that they should be allocated a greater share of a transboundary river in a case where other riparians have alternative sources of water that would offset the difference. Indeed, answering this question in a practical, "real-world" way isn't clear cut—there are a multitude of statistics that a riparian may submit as evidence that it needs a greater allocation of a transboundary watercourse's resources. Article 6 (factors relevant to equitable and reasonable utilization) of the 1997 United Nations Convention on the Law of the Non-navigational Uses of International Watercourses[1] is a good starting point for considering factors to take into account when formulating possible usage arrangements for a transboundary watercourse. These factors are:

> (a) Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character;
> (b) The social and economic needs of the watercourse states concerned;
> (c) The population dependent on the watercourse in each watercourse state;
> (d) The effects of the use or uses of the watercourses in one watercourse state on other watercourse states;
> (e) Existing and potential uses of the watercourse;
> (f) Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect;
> (g) The availability of alternatives, of comparable value, to a particular planned or existing use.

Article 7 of the 1997 UNWC describes an obligation to not cause significant harm, stating that:

> 1. Watercourse states shall, in utilizing an international watercourse in their territories, take all appropriate measures to prevent the causing of significant harm to other watercourse states;
> 2. Where significant harm nevertheless is caused to another watercourse state, the states whose use causes such harm shall, in the absence of an agreement to such use, take all appropriate measures, having due regard for the provisions of articles 5 and 6, in consultation with the affected state, to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation.

While these factors provide a springboard for negotiations, their qualitative and open-ended nature, however, make its application more difficult. Some literature has suggested that in its pursuit to be a practical framework for attaining the fairest and equitable use of a transboundary watercourse, the 1997 UNWC

[1]Hereinafter, the "1997 UNWC".

takes too many factors into account, while simultaneously failing to demarcate how these factors ought to be assessed in relation to one another; in trying to create a framework that satisfies all demands, the UNWC becomes a document largely "without teeth". In his criticism of Article 6 of the UNWC, Beaumont (2000) states that it is far too open-ended to be of any practical use for negotiators, ultimately concluding that

> an article has been produced which would keep academics in discussion for years even if they were trying to solve the question of what "equitable and reasonable" actually meant in the context of the guidance given in Article 6.

In a case where all of a basin's riparians are vying for what each considers its "fair share" of water, a more appropriate question may be how we can ensure that a transboundary river's waters are distributed in the *most* fair and equitable way possible. One methodology, the Relevant Factors Matrix (RFM), is described by Wouters *et al.* as "detail[ing] the range of factors relevant to assessing a [riparian's] entitlement to the uses of the waters of a [transboundary river], [specifying] the information required with respect to each factor". The RFM is comprised of six separate categories:

- The physical context of the transboundary watercourse ("what?");
- The population of the transboundary watercourse ("who?");
- The uses of the transboundary watercourse and related benefits of the uses ("what uses?");
- The domestic and international outcomes of the uses of the transboundary watercourse ("what impacts?"); and
- Consideration of efficiency of the uses and their alternatives ("what options?") [1].

Although the RFM is a powerful tool for transboundary negotiations, providing a comprehensive methodology for constructive discussion, it lacks specificity.

Water Rights Arrangements/Allocations (WRAs) as described by Dinar and Nigatu [2] and Dinar and Tsur [3] are another possible way to facilitate resolutions between a transboundary basin's riparians and achieve the fairest allocation of water. WRAs are a set of possible allocations of transboundary water resources based on the physical characteristics of the water basin in question. They often utilize concepts espoused in Articles 6 and 7 of the 1997 UNWC. WRAs are advantageous to the formulation of usage agreements on transboundary water basins as they result in the creation of a range of reasonable, quantifiable, and specific possibilities for the use of the water resource in question. In order to *quantify* a fair and equitable schedule for the distribution of a transboundary watercourse's flows, such WRAs can be written to take into account various statistics of the riparian countries in question, including:

- Physical factors of the watercourse in question;
- Population;
- Historical use;
- Location of a watercourse's headwaters;

- Social and economic needs of riparians;
- The effect(s) of the use(s) of the watercourse in question by one riparian on other riparians;
- Existing and potential uses of the watercourse in question;
- Conservation, protection, development, and economy of use of the water resources of the watercourse and the costs of measures taken to that effect; and,
- The availability of alternative sources of water [2] [3].

These above factors are influenced by various articles of the 1997 UNWC, in particular its Articles 5 (Equitable and reasonable utilization and participation), 6 (Factors relevant to equitable and reasonable utilization), and 7 (Obligation not to cause significant harm).

Because WRAs are quantitative and specific, they may have an edge over simple negotiations using the 1997 UNWC as they can provide a minimum and maximum bound of water allocation, possibly reducing the more negative, dominating aspects of hydro hegemony in the negotiation process. Defined by Zeitoun and Warner, hydro hegemony is

> …hegemony at the river basin level, achieved through water resource control strategies such as resource capture, integration and containment…that are enabled by the exploitation of existing power asymmetries within a weak international institutional context [4].

Hegemonic configurations on river basins are not intrinsically "negative" or "damaging"—it is possible for a hegemonic country to play a leadership role, ultimately fostering greater stability and cooperation in a transboundary river basin. However, "[w]hat looks favourable from a hegemonic perspective…may not always be perceived in the same manner from the weaker state's vantage point" [4]. Indeed, hegemonic configurations may result in a situation in which one state makes all the decisions, resulting in inequitable usage conventions.

This article posits that a simpler approach might streamline the negotiation process, and suggests that a paired-down RFM capturing the most pertinent factors relevant to the creation of usage conventions on transboundary watercourses combined with quantifiable WRAs will distill the allocation discussion into a manageable process. What will follow is such a methodology, focusing on the most critical aspects of the governance of transboundary water.

2. Creation of WRAs

The following critical factors of the 1997 UNWC will be utilized for the creation of the WRAs:

- Demographics;
- Socio-economic conditions;
- Physical context;
- Prior use;
- Dependence upon the water resource in question;
- Climate change.

While the "most relevant" factors will vary from basin to basin, this article suggests that the above factors will typically be the "most relevant" over a wide variety of transboundary basin configurations.

Demographics and socio-economic conditions of the relevant parts of a river basin may be some of the most pertinent statistics included in this analysis. A rational line of thought is that an area with more people will have higher water requirements; the socio-economic conditions of the populations in question will, however, change these water requirements. Those suffering from poverty can be heavily affected by water as a direct input into production, such as livestock rearing, agriculture, manufacturing, and fishing, and for health, food security, and welfare in general [5]. In its General Comment on the Right to Water, the United Nations Committee on Economic, Social and Cultural Rights (CESCRs) states that "[t]he human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights" [6]. Ensuring that the inhabitants of a river basin are receiving sufficient water—an indispensable part of maintaining, if not hopefully improving their overall status—will therefore necessitate an overview of their socio-economic conditions. For the purposes of this article, population sizes and poverty rates will be utilized. Ideally, per capita income statistics specific to the article's areas would be taken into consideration; however, such data are often unavailable. Instead, this article will rely upon poverty rates, considering them to be a related statistic from which similar assumptions may be gleaned.

The physical and hydrological context of any transboundary basin will be relevant to an arrangement for the distribution of its flows. A country's relative contribution to the basin is undoubtedly important—one simple line of logic may be that the more water a country contributes to a transboundary watercourse, the more it ought to be allocated. Climate change projections are undoubtedly an important physical statistic to take into consideration when formulating a use convention on a transboundary watercourse. If predicted increases in temperature were to occur, crops grown in the basin would require more water to attain similar crop yields. If climate change affects countries differently, this will undoubtedly affect the allocation of water if we desire to arrive at the most "fair and equitable" distribution of the river's flows.

Prior use regimes are important factors to take into account. Oftentimes, a riparian state will have a well-established prior use regime of a transboundary watercourse upon which it relies for various consumptive or non-consumptive uses. For example, Egypt has relied upon the flows of the Nile for millennia, with Egyptian President Abdel Fatah Al-Sisi threatening that should anyone take "even a drop" of Egypt's water, the region would fall into a situation of "unbelievable instability" [7]. The case of prior users is often contrasted with the rights of "late developers", such as Ethiopia in the case of the Nile River Basin. The 1997 UNWC itself can be seen as an attempt to rectify the differences between these two use cases, with Articles 5 and 6 (reasonable and equitable utili-

zation and related factors) often being seen as representing the interests of late developers on a transboundary watercourse, while Article 7 (obligation to not cause significant harm) is frequently invoked by riparians with a long-established historical use pattern. Beaumont suggests a unique method of resolving the issue of the different use cases of prior users and later developers by which the contributing riparians of a transboundary watercourse are allocated half of its flows by default, with the other half being divided amongst all riparians based upon their prior use regimes [8]. It will be seen that this is an attempt to balance the contributing riparians' rights as described in Article 6 with the prior use rights as described in Article 7, as demonstrated in the following sections.

Finally, a riparian's dependence upon a transboundary watercourse is a relevant factor related to prior use. Does it have any alternative uses it could turn to, or alternative water courses to shift its use to? One proxy for this would be the per capita food value. The per capita food value is the value of food produced within the country divided by the population. The lower the number, the greater the country would depend on any available source of water. Comparing the per capita food value between two countries will give a measure of the value of alternative water courses.

Below are eight WRAs based upon the above-listed criteria:

WRA-I: This WRA simply applies the percentage distributions of the population in a riparian's portion of a given transboundary basin. This WRA is influenced by subparagraph (*c*) of Article 6 of the 1997 UNWC: the population dependent on the watercourse in each watercourse state.

WRA-II: The goods produced from the flows of any river will not only be consumed in its immediate vicinity—grains, vegetables, fruits, fish, and dairy can all be transported with relative ease, reaching markets all over the country or even the world. Could the "population dependent upon the watercourse" described in subparagraph (*c*) of Article 6 of the 1997 UNWC be considered to be the entirety of a nation? This WRA simply allocates riparians of a transboundary watercourse a share of water representing the size of their populations on a national level.

WRA-III: Population figures alone are not sufficient for the formulation of an agreement with fairness and equity as its end goal. Poverty rates are an indicator of a community's vulnerability. This WRA is a modified version of WRA-I. It takes the poverty rates and applies them to each country's population in its portion of a given transboundary basin. This WRA would be in accordance with the abovementioned subparagraph (*c*) of Article 6 of the 1997 UNWC, as well as subparagraph (*b*): The social and economic needs of the watercourse states concerned.

WRA-IV: A country's contribution to a given transboundary watercourse is undoubtedly an important factor to take into consideration. This WRA recognizes this, allocating each riparian half of the flows that are "generated" within its territory, and the other half of the flows to the remaining riparians. This

WRA can be understood as a composite of the 1997 UNWC's Article 6 (specifically, its subarticle (*a*): Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character).

WRA-V: Prior use regimes are some of the most important factors to take into account when formulating agreements for the use of a transboundary watercourse. Riparians may be highly dependent upon the use of a transboundary watercourse, and significant changes to their respective use regimes may have detrimental effects upon their societies. This WRA recognizes this, allocating riparians an amount of water that reflects their historical use regimes. It is in concordance with Article 7's paragraph one.

WRA-VI: Following Beaumont (2000), this WRA allocates each riparian half of the flows that are "generated" within its territory with the remaining flows distributed amongst riparians in accordance with their prior use regimes. Not in exact concordance with any specific article of the 1997 UNWC, this WRA can be understood as a composite of the principles of absolute territorial sovereignty and absolute territorial integrity.

WRA-VII: The Per Capita Food Value (PCFV) will be used as a proxy for alternative water sources. The ratios of each country's PCFV to the average PCFV will be used as a method to even out the differences between the riparians. This assumes that crops of similar value are grown in each country. This WRA is based on subparagraph *g* of Article 6: The availability of alternatives, of comparable value, to a particular planned or existing use.

WRA-VIII: If climate change affects the transboundary riparians differently, this must be accounted for. A calculation will be made on the difference in the estimated increase in consumptive use for each riparian at an agreed upon future date. This WRA is based on subparagraph *a* of Article 6: Geographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character.

In this section, eight WRAs have been created to take into account the most important factors for drafting allocations of water to riparians of a given transboundary watercourse. It is suggested that such methodologies are reasonable, are strongly tied to the 1997 UNWC, and if adopted can provide quantifiable values for a wide range of transboundary basin configurations perhaps lessening some of the more negative, "dominating" aspects of hegemony. The following section will apply these WRAs to a major transboundary watercourse of the Levant—the Orontes.

3. Case Study: WRAs on the Orontes Basin

Lebanon is home to a major transboundary watercourse: the Orontes River. Known in Arabic as *Nahr al-Assi*—the rebellious river—the Orontes springs from Lebanese territory and flows in a northerly direction through Syria and Turkey before discharging into the Mediterranean Sea. In 1994, Syria and Lebanon adopted the "Agreement on the Distribution of the Water of the Orontes River Originating from Lebanese Territory between the Lebanese Republic and

the Syrian Arab Republic" [9], which was amended in 1997 [10], and 2002 [11]. It may be argued that the agreements started off as coercive (1994), with Syria establishing a hegemonic position; with time, the agreements evolved to become more cooperative (1997 & 2002). Allocating Lebanon 80 MCM of 403 MCM as measured at the Hermel Bridge gauge, in addition to 16 MCM of groundwater, many argue that the final 2002 Agreement can be considered to be "fair and equitable" to both Syria and Lebanon[2]. However, other research has shown that the treaties still have room for improvement. Peterson (2022) shows that the treaties contain two inherent flaws: they fail to specify an allocation to Syria, and they fail to account for the fact that Syria was able to drill a quantity of wells magnitudes larger than that in Lebanon before the cut-off date in September 1994 [12]. Kaissi (2014) argues that the series of treaties ought to be invalidated on the basis that they were concluded when Lebanon was under the occupation of Syria [13]. Consequently, this river basin serves as an excellent case study for the exploration of alternative allocations through the application of WRAs.

The following sections will relay the statistics from the Lebanese and Syrian portions of the Orontes Basin; for Syria, statistics will only be gathered from the portion of the basin south of Ar-Rastan, due to this area being fed almost exclusively from water "generated" within Lebanon, as noted by Saadé-Sbeih *et al.* [14]. Peterson argues that the treaties between Lebanon and Syria ought to be confined to this area [12]. For all statistics, every effort was made to find sub-national data; when unavailable, national level data were used instead. Sub-national data for Lebanon were gathered from the Baalbek-Hermel Governorate; as for Syria, sub-national data from the Homs and Rif Dimashq Governorates were used.

A series of WRAs based on said statistics will follow, in which a wide range of possibilities for the distribution of the Orontes' waters between the two countries will be explored.

3.1. Demographics

In order to give precise population figures, Peterson (2022) interpreted population density maps from WorldPop & Center for International Earth Science Information Network [15] with QGIS software. The results indicated that in 2020, approximately 372,614 people lived in the Lebanese portion of the basin, while around 1,675,203 people lived in the Syrian portion of the basin south of Ar-Rastan, for a total population of 2,047,817. As for their total populations at the national level, the World Bank estimates Syria's to be 17.5 million [16], whereas Lebanon's is estimated to be approximately 6.8 million [17].

3.2. Socio-Economic Conditions

Once a middle-income country, Lebanon's overall socio-economic status has

[2]See broadly, Roberta Ballabio *et al.*, Eds., *Science Diplomacy and Transboundary Water Management*: *The Orontes River Case* (Paris, Venice: UNESCO, 2015).

been rapidly deteriorating due to the severe economic crisis which has been ongoing in the country since late 2019. Furthermore, the governorate of Baalbek-Hermel has been noted to be one of the most impoverished areas of the country. A report by ESCWA (2021) states that 57,000 (92%) of the households in the governorate are classified as being poor. According to the report's definitions, "poor" means that the households lack access to one or more of six dimensions (education, health, public utilities, housing, assets and property, and employment and income) [18].

For the better part of a decade, Syria has been gripped by a civil war. The overall poverty rate in Syria has increased from 34% in 2007 to 83% in 2015 [19]. According to Hamati, urban poverty rate estimations from 2015 reveal that the Homs Governorate had an overall poverty rate of 90% [20]. As for Rif Dimashq, urban poverty figures from the same year show that 87% of the governorate's population was living in overall poverty. According to the report, "overall poverty" is defined as "the share of the population whose expenditure lies under the upper poverty line" [20]. For the purposes of this article, an average is taken between the two.

3.3. Physical Context

Estimates show that Lebanon's annual contribution to the Orontes River ranges between 347 - 429 MCM from the Zarqa spring [21]. It also contributes significant amounts of groundwater to the river basin south of Ar-Rastan, Syria, as shown by Saadé-Sbeih *et al.* [14]. The author estimates that approximately 80% of the groundwater in this area originates from Lebanon. The average of the two will be used as an approximation of total water contribution.

3.4. Prior Use

As for prior use, this paper will rely upon the 2002 Agreement—*i.e.* 96 MCM for Lebanon, and Syria's implied allocation of 307 MCM. Peterson has determined that the actual use in Syria is likely significantly higher, as none of the treaties make an explicit allocation to Syria [22]. However, this article will rely on the figures as stated in the 2002 Agreement.

3.5. Dependence upon Water Resource

Using 2010 FAO agricultural production data[3] and 2010 World Bank population data[4], the following calculations were made for Per Capita Food Value (PCFV). Note 2010 was chosen as it was the year before the Syrian civil war, which was noted to have (albeit temporary) detrimental effects on agricultural production in the Syrian portion of the Orontes Basin south of Ar-Rastan [23].

[3]*See* FAOSTAT Value of Agricultural Production; Lebanon and Syrian Arab Republic; Gross Production Value (Constant 2014-2016 Thousand I$); 2010; Agriculture + (Total), https://www.fao.org/faostat/en/#home.

[4]*See* World Bank 2010 Population Data for Syria and Lebanon, https://data.worldbank.org/indicator/SP.POP.TOTL.

Lebanon PCFV = 1.2B (Dollars)/4.8M (People) = 354 Dollars per person (1)

Syria PFCV = 8.7B (Dollars)/21.4M (People) = 414 Dollars per person (2)

The ratio of each country's PCFV to the average of the two countries PCFV will be used to calculate a water allocation.

3.6. Climatic Context

According to a 2019 report by the World Resources Institute, Lebanon is already the third most water-stressed country in the world, being placed into the category of countries considered to be experiencing "extremely high baseline water stress" [24]. Possible future threats from climate change pose a significant threat to the Lebanese portion of the Orontes Basin, with an expected average temperature increase in Lebanon's interior of 2˚C - 5˚C (36˚F - 41˚F) in the next 20 to 50 years [25].

Syria has long been known to suffer from acute water shortages. According to the World Resources Institute, Syria ranks as the 31st most water-stressed country in the world, falling in the category of "high baseline water stress" [24]. Projections show that Syria is expected to suffer from temperature increases in the coming decades, with the World Bank predicting that the Homs and Rif Dimashq Governorates will witness an estimated average temperature increase of 2.2˚C - 3.5˚C (36˚F - 38˚F) in the next 20 - 50 years [26]. As Syria's climate change statistic is so similar to that of Lebanon, it is impractical to use them as a basis for a WRA.

3.7. Results

The relevant statistics gathered in the above sections are shown in **Table 1** for ease of reference.

With the relevant statistics described, they are now applied to the WRA

Table 1. Statistics for relevant areas.

Statistic	Lebanon	Syria
Population—study area (millons)	0.373	1.675
Population—whole country (millions)	6.9	17.5
Poverty rate—study area (% of population classified as "poor")[a]	92%	90%
Contribution to total water in study area	High (~90%)	Low (10%)
Prior use	96 MCM	307 MCM
Per capita food value (I$)	354	414
Climate change statistics	Not used	Not used

It must be acknowledged that the methodologies used in the two reports that these values were taken from are different. Like most other data that this article strives to incorporate, it is extremely difficult to locate poverty rates based on uniform definitions from the same time frame for more than one country in the MENA region.

methodologies described in Section 2 of this article. The final results are shown in Table 2.

Table 2 shows Lebanon's minimum allocation to be 73 MCM, whereas its maximum allocation is approximately 242 MCM. As for Syria, its minimum hypothetical allocation was approximately 161 MCM, whereas its maximum was shown to be approximately 330 MCM. Another finding of particular interest uncovered during this exercise is the number of similarities between the Lebanese and relevant Syrian portions of the Orontes Basin. This is perhaps unsurprising owing to the two regions' being in close geographical proximity to one another, as well as their shared history. Certain statistics—such as the climate change-induced temperature increase predictions—are so similar between the two riparians that it was not possible to make use of them to significantly alter the distribution schedule of the Orontes' flows. This exercise showed that the final 2002 Agreement can be considered to be "fair and equitable" according to the "social" methodologies used in WRAs I–III and V; however, the "physical" methodologies used in WRAs IV, VI, and VII suggest that Lebanon's allocation needs to be increased. Critically, the 2002 Agreement does lie within the bounds of hypothetical allocations defined in this article.

4. Conclusions

Using a limited array of quantifiable social and physical factors, this paper has shown how the application of WRAs results in a methodology that produces a narrow range of hypothetical water allocations that might aid in transboundary water negotiations. It is suggested that such a methodology is superior to negotiations solely relying upon the 1997 UNWC in that it results in quantifiable, restricted distribution schedules. In turn, it has the potential to reduce the negative, dominating effects of hydro hegemony by eliminating the possibility of "extreme" or "unfair" allocations (e.g. a riparian receiving 0% or 100% of a

Table 2. Summary of WRAs.

WRA	Allocation to Lebanon	Allocation to Syria	Source
WRA-I	73 MCM (18%)	330 MCM (82%)	Article 6, ¶ *c*
WRA-II	114 MCM (28.3%)	289 MCM (71.7%)	Article 6, ¶ *c*
WRA-III	76 MCM (18.8%)	327 MCM (81.2%)	Article 6, ¶ *b* & *c*
WRA-IV	201.5 MCM (50%)	201.5 MCM (50%)	Article 6, ¶ *a*
WRA-V	96 MCM (23.8%)	307 MCM (76.2%)[a]	1994 Agreement; Article 6 ¶ *e*
WRA-VI	241.8 MCM (60%)	161.2 MCM (40%)	Beaumont (2000)
WRA-VII	218 MCM (54%)	185 MCM (46%)	Article 6, ¶ *g*
WRA-VIII	Not used	Not used	n/a

It should be noted that this treaty does not contain an explicit allocation to Syria. *See* Peterson, "On the Need for Including Groundwater Allocation".

transboundary basin's resources). The eight WRAs described above are thought to be applicable to a wide variety of basin configurations across many different geographical, political, and potentially climatic contexts, and are thought to contain the most crucial criteria for the governance of transboundary resources.

In this article, these WRAs were applied to the Orontes Basin. This resulted in a range of possible allocations of the basin's resources between Lebanon and Syria. Although the 2002 Agreement is within the maximum and minimum allocation values, some of the WRAs suggest that Lebanon's share should be increased. Future research ought to apply this methodology to a wide range of other transboundary river basins, especially those under conditions of stressed resources and/or political conflict.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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