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# Theoretical evaluation of integrated Basin at Risk (iBAR) method for international water conflict-cooperation analysis

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Comprehensive analysis of water interactions enhances understanding of the dynamic and complex conditions in transboundary river basins. The Basin at Risk (BAR) method is among common methods to analyze water interactions. The integrated Basin at Risk (iBAR) method has recently enhanced BAR. As an extension of BAR, iBAR emphasizes hidden drivers of water conflict and cooperation, whereas BAR includes visible ones. The novelty of iBAR is grounded in Johan Galtung's theory of violence and the concept of positive peace. This method emphasizes the importance of capturing the hidden aspects of water conflicts as well as the concept of positive peace in water interactions. While iBAR has made significant improvements in addressing water conflicts, some challenges remain. This paper provides a review and theoretical analysis of iBAR. Initially, the iBAR development phases are reviewed in terms of positive peace conceptualization and contextualization in water interactions. Following this, the theoretical background of this method is discussed. The results suggest that the iBAR method could be further enhanced by revising concepts of positive peace, social justice, and environmental justice in water interactions.

## KEYWORDS

positive peace theory, transboundary river basin, water cooperation, water conflict, environmental justice

## 1 Introduction

Water systems are composed of numerous interacting complex components which incorporate various scales (local to global), levels (physical to political), and domains (infrastructural to cultural) (Islam and Susskind, 2013; Di Baldassarre et al., 2019). Moreover, the interactions among natural, social, and political subsystems along with different preferences and values of stakeholders mainly contribute to the complexity of water systems (Mianabadi, 2016). All individuals, groups, and organizations who have some interest (stake) in the use or management of water resources are considered stakeholders (Hermans et al., 2006). Stakeholders have different values and preferences regarding water resources (Hermans et al., 2006). Their preferences may relate to how water resources are allocated, managed, or used (Laurita et al., 2021), while their values can be described as principles or standards of life

(Mostert, 2019) (e.g., sustainability, equity, or economic development). Depending on the convergence of the stakeholder's preferences and values, water interactions can result in cooperation or conflict.

While the occurrence of water-related conflictive events has increased in recent years [Giordano et al., 2013; Schmeier et al., 2018; United Nations Children's Fund, 2019; Gleick et al., 2020; Angelakis et al., 2021; Zikargae et al., 2022], employing appropriate methods to analyze water interactions can facilitate the transformation of destructive conflicts into productive cooperation (Zeitoun et al., 2019; Gleick, 2022). Understanding the dynamics of conflicts allows for the examination of interactions among stakeholders and drivers, thus enabling the exploration of scenarios that promote mutually beneficial outcomes and help alleviate conflicts (Ercoskun, 2021).

Various disciplines have therefore investigated what may contribute to conflict and cooperation in STRBs, covering a wide variety of approaches in their studies (Wei et al., 2021; Offutt, 2022). Economic approaches focus on how water resources are economically valued, traded through market mechanisms, or distributed among different stakeholders, and how economic incentives influence cooperation or conflict in managing these resources (Blatter and Ingram, 2000; Arjoon et al., 2016; Zeng et al., 2016; Hossen et al., 2021). Statistical and data-driven approaches rely on historical data to identify patterns and correlations among the drivers of water interactions and provide insights for future scenarios (Vieira and Ribeiro, 2010; Farinosi et al., 2018; Veisi et al., 2020). Game theory studies aim to mathematically analyze the strategic interactions among the stakeholders in a transboundary context in order to understand the decision-making processes and outcomes (Madani et al., 2011; Debnath et al., 2018; Jhavar et al., 2018; Mehrparvar et al., 2020). Finally, political studies tend to understand the nature of the water interactions by adopting political geography-oriented frameworks such as hydro-hegemony and water diplomacy (Zeitoun and Warner, 2006; Islam and Repella, 2015; Islam and Madani, 2017; Vij et al., 2020).

Basin at Risk (BAR), proposed by Yoffe (2001), is a well-known analytical method for characterizing the history of conflict and cooperation over water. According to this study, the BAR method was utilized to analyze all identified transboundary river basins worldwide between 1948 and 1999. Its worldwide application describe international river basin conflict and cooperation, as well as prediction and forecasting methods in BAR, has attracted several international researchers and policy makers' attention (Stahl, 2007; Bigas, 2012; Bernauer and Böhmelt, 2014; Ballabio et al., 2015; UNEP-DHI and UNEP, 2016). According to the BAR, to determine the types of interactions governing transboundary river basins, Yoffe (2001) suggested the following steps: (1) Developing a list of transboundary river basins around the world. (2) Investigating and recording riparian countries' interactions using reports from 1948 to 1999. (3) Presenting a set of historical indicators based on the investigated events, as well as a 15-point spectrum to examine the water interactions of riparians and (4) developing a Geographical Information System (GIS) with about 100 layers for predicting transboundary river basin interactions. Based on the above mentioned layers, water interactions typology can be analyzed in each transboundary river basin (Yoffe, 2001).

However, there are challenges and limitations with the BAR method, as reported by several researchers. Zeitoun and Mirumachi (2008) criticized the BAR method for its absolute consideration of conflict and cooperation and developed Transboundary Water Interaction Nexus (TWINS) to address this criticism. Bernauer and Böhmelt (2014)

introduced a set of predictors supported by robust empirical evidence which generates a significantly revised list of basins at risk. They systematically connect ex-post empirical analysis and the "Basins at Risk" agenda. De Stefano et al. (2017) identified transboundary river basins at risk of hydropolitical tension that could experience tensions due to the stress related to development of water infrastructure (such as dams and water diversions) and can be exacerbated by other contextual factors (including environmental, political, and economic influences). Despite the numerous researches that have attempted to improve BAR's performance, integrated Basin at Risk (iBAR) remains one of the most comprehensive studies to date in this field. iBAR was proposed by Watson (2015) as a modification to the BAR method. iBAR intended to modify the analytical approach and the classifications used in the BAR scale. Compared to the BAR, iBAR considers a broader range of water-related conflict drivers when analyzing water interactions in transboundary river basins. It considers two basis for facilitating transboundary cooperations. First, understanding the roots of conflicts, and second, navigating towards social justice (Watson, 2015).

Although iBAR is a new method and it enhances BAR, there are some theoretical challenges with conceptualizing positive peace in STRBs like defining positive peace, social justice, and environmental justice. This paper aims to analyze and discuss theoretical challenges of iBAR method. In this paper, we analyze the theoretical background of it of iBAR and shedding light on its strengths and weaknesses in addressing conflicts within STRBs. The remainder of the paper is composed as follows; the theoretical background of the study was introduced in more detail in Section 2, wherein Galtung's conceptualization of violence and the concept of positive/negative peace is explained. Sections 3 and 4 introduce the BAR and iBAR methods, respectively. Section 5, scrutinize the iBAR method in terms of its pros and cons in analyzing water interactions, while in Section 6, we provide a more general reflection and conclusions.

## 2 Theoretical framework

Water conflicts can be categorized into four levels including non-politicized, politicized, securitized and violozed (Zeitoun, 2007). The government does not get involved in non-politicized conflicts. If the conflict reaches the public policy debates, it gets politicized, and the government should be involved (Buzan et al., 1998). As a result of the different perspectives and interests regarding the allocation and management of water resources, these issues are easily changed to a political one (World Water Council, 2004). If the conflict is considered a threat to human life, it gets securitized and requires more than business-as-usual intervention from the government (Buzan et al., 1998). Securitization is usually the result of highly influential actors' efforts to convince other stakeholders that the matter in interest contradicts the society's collective values in a way that the stakeholders deem the matter in interest as an existential threat (Julien, 2012). If the securitized conflict gets intensified to a level that the parties take violent measures against each other, the conflict will be categorized as violozed (Buzan et al., 1998).

Violence in water systems refers to the escalation of conflicts, controversies, and disputes resulting from diverse activities undertaken by riparian entities (World Water Council, 2004). Water resources and water infrastructure have historically been used as tools and targets of violence (Zeitoun, 2006; Kremer, 2012). Violent

conflict is caused by a variety of factors including water scarcity, the absence or inefficiency of water institutions, population growth, disputes over shared water resources, and power asymmetry (Hensel et al., 2006; McCracken and Wolf, 2019). Such conflicts often pose significant threats to human and environment security. It is therefore necessary to conduct a scientific and in-depth analysis of water conflicts.

Galtung's violence triangle is a theory to investigate the factors that lead to the emergence of violence. Galtung argues that "violence is present when human beings are being influenced so that their actual somatic and mental realizations are below their potential realizations" (Galtung, 1990). According to this theory, three types of violence should be specified in order to conduct a comprehensive analysis: direct violence, structural violence, and cultural violence (Galtung, 1996). Picturing violence as an iceberg, the direct violence is the visible part above the water, but the much bigger and greater part obscured under the water can be considered structural violence and cultural violence.

Direct violence can be defined as intentionally causing injury or trauma or even causing deprivation and limitation to a person (Galtung, 1990). This type of violence is visible and has physical manifestation (Kaufman, 2014) and, therefore, can be recorded (Galtung, 1990). Structural violence is defined as harm to humans due to social injustice and unequal distribution of power, resources, and responsibilities (Galtung, 1990). This type of violence is incorporated into structural features, where the prevailing societal patterns prevent human beings from reaching their full potential in meeting their basic needs (Farmer et al., 2006). Studying structural violence requires examining the different ways in which the social structures can cause negative impacts on particular groups and communities (Lewis, 2020). Social structure is "the organized set of social institutions and patterns of institutionalized relationships that together compose society (Crossman, 2020)." Social structures, such as economic, political, medical, and legal systems (Lewis, 2020), have both visible and hidden aspects and affect all dimensions of human life in society (Crossman, 2020). Cultural violence is defined as using specific facets of culture to legitimize direct and structural violence (Galtung, 1990). This type of violence can benefit from cultural tools such as religion, ideology, art, language, empirical science, and formal science (Galtung, 1990).

Galtung proposed two types of peace analogous to the violence classifications (Galtung, 1996). He argued that peacebuilding calls for taking into account both types of peace, namely, negative peace and positive peace. "Negative peace is nothing but the absence of violence or fear of violence" (Institute for Economics and Peace, 2022). In this type of peace, short-term outcomes are emphasized, which reinforces the tendency to see the job as finished after the conflict is over (Shields, 2017). The use of negative peace undermines efforts for a broader peace, as it freezes the status quo, which may permit human rights abuses to continue (Shields, 2017). However, positive peace transcends simply the absence of direct violence to encompass justice, fairness, and wellbeing for individuals and groups (Galtung, 1996). The purpose of this theory is to address structural and cultural violence and transform conflict to cooperation (Galtung, 1996; Hefny, 2011).

### 3 BAR

Obtaining a clear and in-depth picture of the conflict's dynamics and nature is the first step of any intervention in conflicting parties'

relationships (Lyamouri-Bajja et al., 2013). Likewise, analyzing riparian countries' water interactions comes before prescribing any measures or approaches. The introduction of the BAR method was a response to the call for an overarching analytical framework for evaluating conflicts and cooperations in transboundary river basins. BAR's objectives were threefold: (1) Identifying the historical indicators for conflicts and cooperation in transboundary river basins; (2) Using the indicators to establish an analytical framework for evaluating the potential for future conflicts and cooperations; and (3) to better understand the factors that can cause water to be the driver of the conflicts and cooperations (Yoffe, 2001). In order to accomplish these objectives, Yoffe (2001) followed these steps: (1) developing a database documenting cooperation and conflict in international rivers basins from 1948 to 1999. (2) Developing a GIS map of these river basins. (3) Analyzing the relationship between recorded events and various biophysical, socioeconomic, and geopolitical indicators at different spatial and temporal levels.

Yoffe (2001) identified 1831 water events in 263 transboundary river basins (shared by 124 countries) between 1948 and 1999. The intensity of cooperative and conflictive interactions among riparian countries was measured on a 15-point scale. The BAR scale is shown in Table 1. According to the results of the analysis, three categories of basins at risk were identified. The first category includes basins currently engaged in conflict negotiations, known as "hot spots" where conflicts are likely to continue in the near future. In the second category, there are basins where factors in which future conflict, where upcoming water projects or other stresses have sparked protests. The third category is similar to the second in that it indicates a confluence of factors indicating future conflict. Unlike category 2, however, public policies or news fora do not exhibit the tensions of category 3. In 2008 and through the Water Conflict Management and Transformation Program, the information on conflictive/cooperative water interactions in transboundary river basins was updated, and 755 water events in 276 river basins were studied from 2000 to 2008 (United Nations Development Group, 2016).

Yoffe's study was ahead of its time, and it is frequently cited in literature (Bernauer and Böhmelt, 2014). However, some researchers have criticized the BAR scale to improve it. One of the most critical shortcomings of the BAR scale is that it presumes that conflict and cooperation occur in an absolute and separate fashion. In fact, it does not acknowledge the co-existence of conflicts and cooperations in transboundary river basins (Zeitoun and Mirumachi, 2008). The tendency towards this separation can be attributed to: first, the complication of paying simultaneous attention to both types of interactions (conflict/cooperation); second, failing to acknowledge the network of drivers leading to them; and third, the dynamic nature of conditions prevailing in a transboundary river basin (Zeitoun and Mirumachi, 2008). Regarding this critique, Zeitoun and Mirumachi (2008) suggested considering water interactions as coexistence of conflict and cooperation. To address this issue, the TWINS was developed. TWINS uses a matrix consisting of cooperation intensity and conflict intensity in order to analyze water interactions. This matrix identifies five levels of cooperation intensity, including (1) confrontation of issue, (2) *ad hoc*, (3) technical, (4) risk-averting, and (5) risk-taking. There are also four levels of conflict intensity: "non-politicised, politicised, securitized/opportunised, and violised." Therefore, the TWINS is used to analyze the coexistence of cooperation and conflict in water interactions.

TABLE 1 Water event intensity scale in BAR (Yoffe, 2001).

Event description	BAR scale
Formal war	-7
Extensive war acts	-6
Small-scale military acts	-5
Political/military hostile acts	-4
Diplomatic/economic hostile acts	-3
Strong/official verbal hostility	-2
Mild/unofficial verbal hostility	-1
Neutral, non-significant acts	0
Mild verbal support	+1
Official verbal support	+2
Cultural, scientific agreement/support	+3
Non-military econ, techni, indust. agrmnt	+4
Military, econ., strategic support	+5
International water treaty	+6
Unification into one nation	+7

Another criticism of the BAR scale is its negligence of power distribution in transboundary river basins, which plays a pivotal role in water interactions (Zeitoun and Warner, 2006). In its most sustainable manner, a shared resource would be managed through the participation of all parties negotiating its utilization. Applied to shared water resources, this is called positive hydro-hegemony. Contrarily, when the hydro-hegemonic party tries to maximize its benefits by controlling the resource through unilateral measures, the situation is called negative hydro-hegemony. It would result in unsustainable relationships, making the weak riparians even weaker and more water-scarce. In addition, BAR's recommendations regarding enhancing institutional capacity can strengthen the negative hydro-hegemon party and result in social injustice in the river basin (Zeitoun and Warner, 2006).

Moreover, the BAR scale views conflict as destructive and cooperation as constructive, although they may be of opposing natures. There are traditional and contemporary views regarding the destructive or constructive nature of conflict (Hussein and Al-Mamary, 2019). In the traditional view (1930–1940), conflict is always destructive and should be avoided (Hussein and Al-Mamary, 2019). Researchers have, however, discussed conflict's positive effects on human interactions and proposed an updated view of conflict (Tjosvold, 2006). In contemporary view, conflict is an inevitable part of social life, which can be constructive (Hussein and Al-Mamary, 2019). A constructive conflict considers the interests of all stakeholders and seeks win-win outcomes (Reimer et al., 2015). Whether or not a conflict is destructive depends on how it is approached. In general, properly dealing with conflicts requires identifying and analyzing the visible and hidden drivers of the conflicts. It also entails recognizing the key actors, and eventually pursuing a win-win situation for all the conflicting parties. Besides, not all cooperations can be considered constructive. Many riparian countries in transboundary river basins do not cooperate voluntarily. In fact, they are forced to cooperate by hydro-hegemonic parties through power leverages. This kind of interaction lacks the true spirit of cooperation and might not result in sustainable and peaceful relationships in transboundary river basins (Warner and Zeitoun, 2008).

## 4 iBAR

iBAR stands out as one of the latest methods for improving BAR scale (De Stefano et al., 2017). Water science has benefited from some theoretical advances in PACS (Peace and Conflict Studies) through the iBAR method. Watson (2015) was one of the first scholars to argue that relying solely on direct violence in analyzing water interactions oversimplifies the nature of water conflicts and peacebuilding. She pointed out that structural and cultural violence must be considered in the analysis of water conflicts as well as direct violence. Furthermore, she linked water cooperation to achieving positive peace in STRBs. A more detailed explanation of the iBAR method's development process can be provided by dividing the process into two steps: conceptualization and contextualization. The conceptualization phase is primarily concerned with recognizing existing research gaps (Upadhyay et al., 2015), and strives to advance scientific understanding by offering precise definitions (Gerring, 2012). Subsequently, during the contextualization phase, the positive peace concept is tailored to the specific context of water systems, enabling a deeper comprehension of its unique implications and details. It can be argued that the conceptualization phase serves as the cornerstone upon which the structure of the contextualization process is built. Following is a more detailed discussion of the conceptualization and contextualization steps.

### 4.1 Conceptualization

Three key steps are involved in the conceptualization of positive peace in water systems by iBAR: (1) Aligning positive peace with social justice is the first step. (2) Environmental Justice is further associated with Social Justice. (3) The third step considers the EPA's two core components for Environmental Justice: fair treatment and meaningful involvement. "Fair Treatment means no group of people should bear a disproportionate burden of environmental harms and risks, including those resulting from the negative environmental consequences of industrial, governmental, and commercial operations or programs and policies" (United States Environmental Protection Agency (EPA), 2011, p. 3). "Meaningful Involvement means that: (1) potentially affected community members have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; (2) the public's contribution can influence the regulatory agency's decision; (3) the concerns of all participants involved will be considered in the decision-making process; and (4) the decision makers seek out and facilitate the involvement of those potentially affected" (United States Environmental Protection Agency (EPA), 2011, p. 3). iBAR's steps for conceptualizing positive peace in water systems are shown in Figure 1.

### 4.2 Contextualization

iBAR contextualizes positive peace in water systems in two primary steps: (1) anchoring environmental justice on the fulfillment of human needs, (2) linking water needs to human basic needs and creating the iBAR scale. Accordingly, water needs align with human needs in various perspectives including Maslow's hierarchy, Galtung's proposed needs, the chakras, the Universal Declaration of Human Rights, and recommendations by Kellert (1993), and the iBAR scale developed. The iBAR scale is a modification of the BAR scale and follows the same

scoring criteria (+/−). Table 2 shows the iBAR scale, and Figure 2 shows iBAR’s steps for contextualizing positive peace in water systems.

Since iBAR requires a wide range of data and information, its worldwide application is impossible. Thus, Watson (2015) applied it to the Mekong River Basin to analyze water interactions. In this study, data were collected based on the iBAR scale. Data were coded to identify the roots of conflicts in the Mekong Transboundary River Basin. The results indicated that 61.4 percent of the conflictive events in the Mekong River Basin were associated with the dam construction. The number of dam buildings, losses in fisheries, negative impacts on food security, and the unbalanced distribution of the dams’ benefits were among the most critical factors contributing to the environmental injustice and water-related conflicts in this river basin.

Following an analysis of the root causes of the conflict, the role of existing institutions and stakeholders in addressing injustices was also considered. The results show that although the institutions in the Mekong river basin promote environmental justice, their existence *per se* cannot resolve the ongoing conflicts (Watson, 2015). Moreover, stakeholder involvement is insufficient due to numerous factors, such as the absence of some riparians within the treaties, hydro-hegemon riparians’ reluctance to reduce their benefits, and a lack of trust. Finally, policy recommendations were made regarding meaningful involvement of stakeholders in decision-making processes, reassessment of the parties’ adherence to the treaties, reviewing environmental laws and regulations, transparency in projects’ impacts on stakeholders, trust-building in the basin, and capacity-building to move towards social justice (Watson, 2015).

## 5 Results and discussion

Following a review of the iBAR method, this section focuses on its theoretical analysis. The analysis is based on conceptualization steps of this method (Figure 1). In each step, the most significant theoretical criticism is presented, along with suggestions for addressing it. Following are the analysis and suggestions:

- In iBAR’s conceptualization process, positive peace is limited to social justice manifestations, which is the primary critique.

Despite social justice’s undeniable importance, it cannot ensure positive peace on its own. Scholars (Barash and Weibel, 2013; Bond, 2014; Gleditsch et al., 2014; Tilahun, 2015; Pathak, 2016; Shields, 2017; Schade, 2021) have underscored the necessity of considering a broader spectrum of components to navigate towards positive peace. Cooperation, justice, equality, and harmony are commonly used to define positive peace in different fields of study. In addition, Galtung highlights the need to consider a broader concept for positive peace. Galtung (2015) redefined the concept of positive peace into “the presence of cooperation and harmony.” He contends that advancing towards positive peace requires an increasing emphasis on cooperative endeavors for mutual and equitable benefits, as well as a heightened focus on nurturing empathy to cultivate harmony. Therefore, we suggest that positive peace be defined broader than social justice in STRBs.

Enhancing the focus on the societal relational dimensions can augment the efficacy of iBAR. Advancements in disciplines such as peace psychology and sociology furnish invaluable insights into cultivating ‘positive relationships.’ Positive peace thrives in these relationships where all parties are actively engaged, maintain equitable power dynamics, and genuinely care for each other’s well-beings (Standish et al., 2021). Constructs such as empathy (Christie and Morrison, 2021), solidarity (Tormey, 2021), and social capital (Kilroy, 2021) can collectively serve as instrumental tools in transcending the boundaries of social justice, thereby facilitating a more holistic conceptualization of positive peace within the complex context of STRBs. While empathy fosters understanding and connection in diverse communities, solidarity promotes collective action for shared goal and social capital builds trust and reciprocity for dealing with conflict. In this manner, conflicts characterized by identity-driven dynamics will also be duly acknowledged.

- Second criticism of iBAR’s conceptualization process is the narrowing down of “society” to “environment” within the framework of justice. “Society” is inherently a complex multi-faceted system with numerous dynamically interacting components, including the economy, institutions, policies, and the

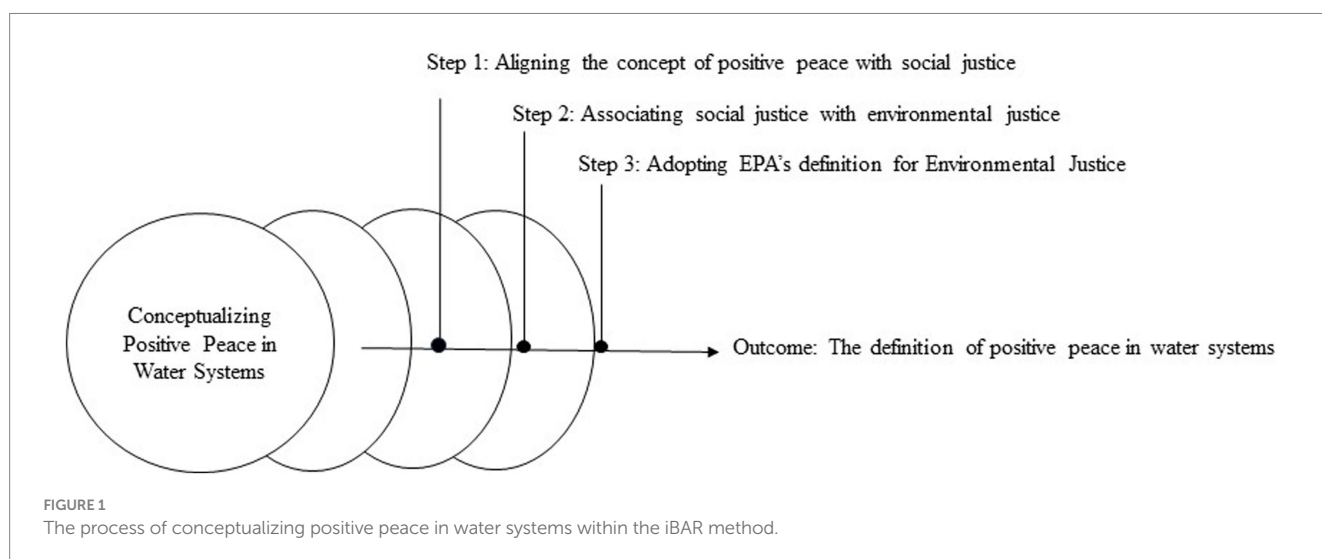
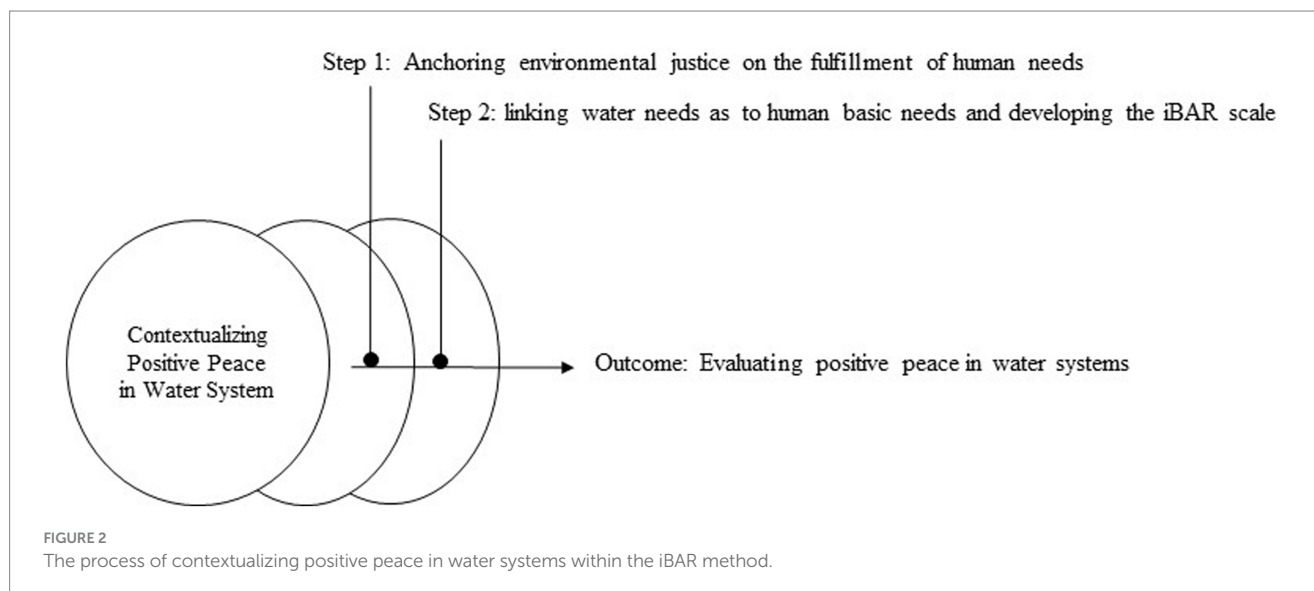


TABLE 2 iBAR scale (Watson, 2015).

Description	iBAR	Affirm/secure	Block/deter
Drinking water, subsistence agriculture irrigation, food security	Survival	+9	-9
Water for health and well-being (wash, waterborne disease), boundaries, water-related disaster protection (e.g., drought, monsoon), stability, basic economic security (including existing economic functions, poverty alleviation)	Safety/Security needs	+8	-8
Water facilitated gathering, family/community traditions, culture, water facilitated relationships (e.g., between countries, communities)	Social needs	+7	-7
Development, economic growth, status symbols (dams, fountains, pools, lawns, showy projects)-high level	Esteem needs (external)	+6	-6
Trade/craft mastery, independence, sovereignty	Esteem needs (internal)	+5	-5
Data, access to science and knowledge about the water source, monitoring, water technology	Cognitive/knowledge/understanding/science needs	+4	-4
Beauty in nature, recreation, ecotourism	Aesthetic needs	+3	-3
Spiritual practices/rituals, seeking growth and fulfillment	Spiritual needs	+2	-2
Needs beyond human (e.g., intrinsic value of nature)	Transcendent needs	+1	-1



environment. While the environment and environmental challenges hold undeniable significance within the societal framework (Gupta et al., 2023), they represent only a fraction of the broader concept of “society.” Consequently, constraining the concept of social justice to environmental justice carries the inherent risk of disregarding other vital components of society that may prove pivotal in the pursuit of social justice and, by extension, positive peace.

Social justice is viewed differently by various theories (e.g., Capitalism, Socialism, Communism, and Marxism). The concept of social justice in positive peace theory follows Marxism (Rummel, 1981; Sharp, 2020). Marxism views social justice as the elimination of social classes and the equal distribution of resources (Engels, 2018). To achieve social justice in positive peace, it is also necessary to create equality in society (Rummel, 1981) and to equally distribute power and resources (Galtung, 1969). Therefore, we recommend that social justice and environmental justice not be considered equally. Social

justice can be defined in STRBs based on positive peace theory. The term can refer to different aspects such as equal water consumption, equal water withdrawal, and equal environmental harm.

- The third critique of iBAR’s conceptualization process relates to its adoption of a human-centered definition of environmental justice. Environmental justice is viewed differently by researchers in different sciences (Gupta et al., 2023). There are three broad categories of views: the human-centered perspective, the environment-centered perspective, and the holistic perspective (Miller and Spoolman, 2011; Brunner and Urenje, 2012). The human-centered perspective gives humans the right to take advantage of all earth’s resources for their benefit (Horton and Horton, 2019). It presumes that intelligent and controlled exploitation of the environment would lead to sustainability (Horton and Horton, 2019). Through this approach, environmental conservation is in accordance with preserving human interests and guaranteeing human well-being (Miller and

Spoolman, 2011). However, the other two perspectives blame this human-centered attitude towards the environment for many environmental crises (Horton and Horton, 2019). Environment-centered perspective appreciates the intrinsic value of nature and condemns the materialistic exploitation of its resources (Miller and Spoolman, 2011). The holistic approach takes a more balanced standpoint and acknowledges the overlap between human rights and environmental rights. It values meeting the current generation's needs while considering the necessity of preserving environmental services for future generations (Brunner and Urenje, 2012). As a result, environmental justice can be defined comprehensively while establishing a holistic perspective. The Earth Commission has previously presented a holistic definition of environmental justice.

The Earth Commission's definition of Earth System Justice (ESJ) serves as a prominent illustration of adopting a comprehensive and holistic perspective in the realm of environmental justice. As outlined by Gupta et al. (2023), ESJ is characterized by its definition as "an equitable sharing of nature's benefits, risks, and related responsibilities among all people in the world, within safe and just Earth system boundaries to provide universal life support (Gupta et al., 2023, p. 3)". This definition takes into consideration three pivotal dimensions: (1) Interspecies justice and Earth system stability, which addresses the intricate interactions between humans and the environment. (2) Intergenerational justice, encompassing the equitable treatment of past, present, and future generations. (3) Intragenerational justice, involving a focus on justice within countries, communities, and among individuals. ESJ not only concurrently addresses the present and future states of the Earth system but also rejects the notion of human exceptionalism, which involves exploiting environmental services solely for human interests. Instead, it emphasizes the imperative of minimizing harm to the environment.

The ontological dynamics within the STRBs hold promise for advancing environmental sustainability through the recognition of more-than-human worldviews in justice frameworks. These worldviews recognize the togetherness between human and non-human worlds when it comes to experiencing and addressing injustice (Gesing, 2021). While the consideration of multispecies justice remains largely absent in the discourse surrounding STRBs, lessons gleaned from movements such as 'Rights of Nature' (La Follette and Maser, 2017; Alves et al., 2023) and 'Rights of Rivers' (O'Donnell and Talbot-Jones, 2018; Boelens et al., 2023) offer valuable insights for reshaping the human-centric orientation of iBAR in conceptualizing environmental justice. These movements advocate for granting legal personhood to non-human entities, thereby affirming their political agency and rights within the broader distributive, recognitional, and procedural aspects of justice. Based on these hints, a more holistic and comprehensive approach to justice, such as the ESJ, can modify the human-centered approach of iBAR.

## 6 Conclusion

Comprehensive analysis of water interactions enhances understanding of the dynamic and complex conditions in transboundary river basins. iBAR is a novel method for analyzing

water interactions. This method facilitates the integration of advancements from Peace and Conflict Studies (PACS) into water-related issues. Despite the innovations made, there are challenges in this method. By addressing these challenges, this method can be improved and peacebuilding can be facilitated in STRBs. The developmental phases of iBAR were analyzed in this research. The analysis involved breaking down the development process of iBAR into two phases: conceptualization and contextualization. In iBAR's conceptualization of positive peace within the water systems, three key steps are discernible: (1) The initial step involves aligning the concept of positive peace with that of social justice. (2) Subsequently, social justice is further associated with environmental justice. (3) The third step centers on the consideration of the EPA's definition for environmental justice. We analyze the iBAR method theoretically, focusing on the conceptualization phase.

A significant criticism of iBAR's conceptualization is its restriction of the concept of positive peace to social justice. Studies suggest that the concept of positive peace goes beyond social justice, and concepts like cooperation and harmony must be used to define it. The second critique in iBAR's conceptualization process involves the narrowing down of the concept of "society" to the concept of "environment" within the justice framework. While the environment and environmental concerns hold undeniable significance within the societal framework, they represent only a fraction of the broader concept of "society." Consequently, constraining the concept of social justice to environmental justice carries the inherent risk of disregarding other vital components of society that may prove pivotal in the pursuit of social justice and, by extension, positive peace. The third critique of iBAR's conceptualization process pertains to its adoption of a human-centric definition for the concept of environmental justice. The human-centered perspective asserts humans' right to utilize all of the earth's resources for their benefit. Conversely, the holistic approach adopts a more balanced standpoint, recognizing the intersection between human rights and environmental rights. As a result of the criticism of human-centered perspective to environmental issues, it has been suggested to use holistic perspective, such as the ESJ definition.

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