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Iran's Regional Transnational Water Partnerships: Unclear Rules, Unstable Partnerships, and an Unsettled Future

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Abstract: Water resources are the most contentious, scarce, and contestable natural resources at any geographical scale. Where water resources cross international boundaries, additional uncertainties arise for access to and distribution of available water. Here, we examined three transnational water partnerships by focusing on Iran as a dryland country with a developing economy. Thus, Iran has a key interest in water policies and the development and governance of water resources. Within Iran's regional context, we considered whether the country obtained a geopolitical advantage from three regional water partnerships, involving the Caspian Sea, the Helmand River, and the export of hydroelectricity. We used a global database and several years of Iranian newspaper articles to explore possible linkages between contemporary and historical challenges while looking at international laws and conventions. We highlighted (a) the transboundary Helmand River as the most unstable partnership; (b) the complexities of the relationships between the Caspian Sea's beneficiaries, including Iran, in utilising its vast resources in an environment with unclear rules; and (c) the rainfall- and geopolitically dependent hydroelectricity exchange agreements with neighbouring countries. Although Iran pursued such international involvement through treaties and economic initiatives, its water-based geopolitical influence in the region remains constrained by domestic demand, hydrometeorological geography, and the involvement of major world powers.

Keywords: Iran; transboundary water; hydroelectricity; Helmand River; Caspian Sea



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1. Introduction

Contemporary societies face enormous challenges, especially in managing their natural resources which “have played a conspicuous role in the history of armed conflicts” ([1], p. 562). Le Billon categorised freshwater as a ‘Proximate’ resource. According to the Dublin Declaration, Principle 1 [2]: “Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment”; however, water ignores political boundaries and fluctuates both spatially and temporally [3]. With growing populations and declining water access, water is conceived as an instrument for peace and a mechanism of support for the achievement of ‘Sustainable Development Goal 6: water and sanitation for all by 2030’ [4]. As bargaining chips in transnational negotiations, however, water has been used deliberately to foster instability and bring harm to communities, the so-called ‘Weaponization of water’ [5].

In the Middle East, classified as dryland with low precipitation and a hot climate, water scarcity has become a significant challenge [5]. Long-lasting water disputes have been commonplace and contentious: between Pakistan, India, and Afghanistan [6]; Turkey, Iraq, and Syria [7]; Egypt and its neighbours [8]; and Iran and Afghanistan. Problems to be overcome include frequent droughts, lack of investment in constructing water storage facilities, and failure to manage natural resources properly [9]. Of the 37 cases of acute conflict regarding water resources in the past, 30 were recorded for this region [10]. States are, thus, becoming more sensitive and cautious about neighbouring countries seeking access to limited transboundary water resources.

The geopolitical implications for regional water partnerships are immense, as water is one facet of broader international collaboration, neglect, or conflict. Although regional power reconfigurations can be prompted by political changes (e.g., [11]), regional hegemony theory distinguishes four trends [12]: first, the importance of geographical proximity; second, a focus on interdependence at the regional level; third, socio-political culture and economic interactions between countries existing in the same geographical region; and fourth, security interdependence. The three research cases examined here revealed one or more aspects of this notion of regional hegemony trends when applied to water.

This paper investigates the transnational water relations of Iran, a country which, in common with others in the region, has strived to make long-term investments and gain hydropower and economic benefits from developing its water infrastructure. The focus on Iran in this study stems partly from its location within the Middle East: Iran connects Europe to Asia via land routes and connects neighbouring countries to the world via the Persian Gulf. Historically, the country was one of the pivotal Silk Road corridors, making its geographical position a contributor to complex modern-day geopolitical relations. In terms of water resources and agriculture, Iran is different from other countries in the region (except Turkey), as historically, the country utilised innovative underground water canals, Qanats, for irrigation and drinking water throughout the year. However, as in other countries in the region, in recent decades, Iran invested in modern water technologies. Unlike some neighbouring countries, Iran has become largely self-sufficient in providing foodstuffs except during unprecedented droughts [13]. These similarities and differences are highlighted in approaches to water management, especially as Iran shares several rivers with its neighbouring countries. The transnational nature of Iran's water relations is relevant to other developing countries in the world's drylands.

Here, the research goal is to reflect on the strengths or shortcomings of Iran's transboundary regional water partnerships/disagreements while not ignoring the role of national infrastructure capacities and the associated improvements nations gain from water conservation and governance. Key issues addressed include the expansion of domestic water management capacities, and the factors that have shaped a necessity to develop and govern water resources. Important questions relate to (a) the extent to which enhanced domestic capacities have become political agents in Iran's regional leverage in water negotiations; and (b) to what degree transnational partnerships have been perceived as mutually beneficial.

Based on domestic and international literature and analysis of a 7-year record of news articles published in Persian by Iranian newspapers, this paper reviews three regional transnational water partnerships in Iran:

1. A large lake (Caspian Sea in the North: bordered by the countries of Azerbaijan, Iran, Kazakhstan, Russia, and Turkmenistan);
2. A transboundary river (Helmand River in the East, a river basin straddling the Afghanistan–Iran border);
3. The export of hydro-electricity (from several large dams mainly in western Iran).

These three regional water initiatives have been assessed separately elsewhere but primarily on a limited spatial (e.g., provincial) or temporal (e.g., one-year drought) scale without attempting to integrate and evaluate these initiatives together from broader geopolitical, technical, and legal perspectives. In this paper, we focus on the physical and economic context of Iran's transnational water policies, including its water limitations, technical capacities, and infrastructure, using primary and secondary datasets, before highlighting the three specific regional water partnership cases. After reviewing the limitations, strengths, and opportunities for each case, some predictions will be made about the future of these transnational arrangements and their geopolitical importance.

2. Iran's Water Resources: The Regional Context

2.1. Water and Economic Development

The country's population comprises over 84 million, which are predominantly young people. Geographically, Iran has a large area, extensive mountainous terrains along its western and eastern borders, vast and diverse geographical landscapes in the centre, and access to open seas and oceans in the south and north. Geologically, the country enjoys a wide range of mineral resources [14]. Climatically, Iran is regarded as a dryland country with uneven and erratic precipitation and high evapotranspiration [15]. Only small patches of the country in the north receive relatively high precipitation. Hydrologically, this means water resources are scarce and unpredictable from year to year and throughout the seasons in much of the country. Water has always been a challenge for Iran. Since ancient times, local attempts in dryland areas have been focused on developing the traditional underground water canals known as Qanats. In recent times, the country expanded nationwide water networks using modern hydraulic technologies and storage capacities using large dams. Nevertheless, over-exploitation and mismanagement of water resources, combined with climate change, have adversely impacted surface resources and aquifers [16–18].

Following a decade of slowdown or shutdown in economic activities during the 1980s due to Iran's Revolution and the Iran–Iraq war, a nation-building agenda was prioritised by government and massive investment in water infrastructure and agriculture began (e.g., [19]). A wide range of rural developmental activities and large-scale building of infrastructure has been initiated since the 1990s, based on oil revenues which were instrumental in funding modernisation. The country remains desperate to compensate for its developmental backwardness and to control financial deficits caused by international sanctions and embargoes [20]. Over the last forty years, Iran has been able to survive and grow by building on its physical advantages (considerable land area, land, and sea borders), its large-scale oil and gas reserves, and its human workforce strengths, especially a pool of young highly skilled entrepreneurs and professionals (the young age pyramid). Currently, Iran enjoys relatively well-connected and extended transport (air, road, rail), energy, and telecommunication systems, as well as educational infrastructure. Also, the country forms part of a region now having comparatively high territorial stability and, with the exception of Afghanistan, food security.

2.2. The 'Neighbourhood' Factor

Iran's prime location ('centrality': [21]) is a privileged strategic one in the world [22,23] and, apart from facilitating water partnerships, is a pivotal factor in capturing land transit advantages, sea trade opportunities and air spaces. Iran is the link, as an interregional state situated between the Caspian Sea and the Persian Gulf [21]. Such a locational advantage was highlighted when it became a safe air corridor after the Arab Spring crisis in the Middle East [22]. Due to international sanctions, the air hub concept gradually shifted into the expansion of domestic railroad networks with similar goals but at smaller scopes (provincial, national, and regional). Iran's rail network "has the potential to be connected to railroads of Central Asia and West Asia and further to the Northern and Southern Europe" ([22], p. 51), and possibly through China's Belt and Road Initiative [22]. Recent investments in the development of ports created favourable transit routes to connect East and South Asian countries to the northern hemisphere via a sea-railroad network—for example, the Chabahar port on the Persian Gulf in the south [24,25]. Taken together, these developments emphasise the importance placed on national development and opportunities to build on relations with other countries in the region.

Despite such geo-strategic advantages, though, Iran is surrounded by politically and economically shaky and unstable neighbouring countries and this has put the country in proximity to conflict zones [22], creating precarious social or security situations from time to time. A case in point relates to contentious trans-boundary issues, such as drug smuggling across its eastern land borders with Afghanistan and Pakistan [26,27].

2.3. The 'Oil' Factor and Water Resources

Historically, Iran was known as Persia and, since 650–300 BC, was the centre of successive empires which held sway over vast areas in the Middle East. In more recent times, Iran had become almost invisible and unimportant on the global stage, and development lagged: for example, until the early twentieth century, there was no infrastructure for safe drinking water or for distribution of water for agriculture (e.g., [28]). In the mid-twentieth century, oil production directed international attention to the country's enormous oil and gas resources and changed Iran's global standing (e.g., [19]). Two critical timeframes for infrastructure development can be identified. First, from a legal perspective, Iran's legislative foundation was becoming defined and effective, and the 1968 water nationalisation law enhanced the status of water resources by instituting a specialised administration at the national level [29]. This designation had positive impacts on the integrated management of inland and trans-boundary water resources in the country. Second, during the 1950s–1970s, Iran captured the once-in-a-century oil revenues to invest in underdeveloped infrastructure, much of which had not existed previously [19]. Among these grand projects, large-scale water dams were constructed, creating favourable conditions for electricity generation and water management.

Despite inadequate agricultural infrastructure and knowledge, agricultural production had traditionally been relied upon to feed the growing population and historically, agriculture has been associated with dam building for water storage [30]. Since the mid-twentieth century, however, the country shifted its primary attention from agriculture to oil and industrial production. The desire for food self-sufficiency has, nevertheless, remained paramount despite frequent droughts, anthropogenic depletion of aquifers, and social upheavals that have hampered national food security (e.g., [31]). Over time, this trajectory illustrates the changing spatial scale of water management, with its initial local nature (up to 1941) being subsequently overlaid by national development and investment (1941–1979), and both levels eventually involving transnational arrangements (from 1979). Iran's engagement with its developing water resources has, thus, operated at the various scales noted by other researchers (e.g., [32,33]), incorporating both local streams and transnational river basins.

Since the mid-twentieth century, noticeable expansion and development activities have been undertaken in the storage, distribution, and monitoring of water resources [20], mainly for the electricity and food production [13,34]. With such long-term investments in water infrastructure, knowledge-generation and a skilled workforce, the country has been able to become self-sufficient in large-scale water storage, management, and engineering [35]. The water transfer scheme (2020–2021) from the Persian Gulf to the inland provinces is a recent testament to this technical capability [36], although droughts still provide major challenges in meeting water needs of diverse national and transnational stakeholders.

2.4. Historical Transboundary Water Treaties Involving Iran

Transboundary waters mean “any surface or ground waters which mark, cross or are located on boundaries between two or more States; wherever transboundary waters flow directly into the sea, these transboundary waters end at a straight line across their respective mouths between points on the low-water line of their banks” (Convention on the Protection and Use of Transboundary Watercourses and International Lakes—Article 1; [37]). From ‘no designation of institution’ to ‘plenipotentiaries’ to ‘joint commissions’, various managerial and administrative entities have been defined for transboundary waters, with only joint commissions being created to ensure a basin-wide approach [38].

According to the UN General Assembly resolution 1803 (XVII) of 14 December 1962, “Permanent sovereignty over natural resources”: “Violation of the rights of peoples and nations to sovereignty over their natural wealth and resources is contrary to the spirit and principles of the Charter of the United Nations and hinders the development of international co-operation and the maintenance of peace”.

According to Article 2 of the ‘Convention on the Law of the Non-Navigational Uses of International Watercourses’, “International watercourse” means a watercourse, parts of which are situated in different States [39]. Article 5 of this convention, titled: “The equitable and reasonable utilization and participation”, mentions that “Watercourse States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner”. Article 2 of the Helsinki Rules [40] defines an international drainage basin as “a geographical area extending over two or more States determined by the watershed limits of the system of waters, including surface and underground waters, flowing into a common terminus”.

Overall, managing complex systems such as transboundary waters faces socio-economic, ecological, legal, and political uncertainties and constraints [41]. Even in the most favourable scenario, participating states have unequal negotiating power [42] resulting in international and regional agreements being devoid of full clarity and generally lacking arbitration mechanisms, financing, and coordination. Added to these limitations are issues such as climate change, monitoring and evaluation, information exchange, and enforcement mechanisms [38].

The Helsinki Rules (Article V) clearly defines “a reasonable and equitable share” to be based on the relevant factors, including: “. . .(e) the economic and social needs of each basin State; (f) the population dependent on the waters of the basin in each basin State; (g) the comparative costs of alternative means of satisfying the economic and social needs of each basin State; . . .” [40]. Implementing such admirable objectives frequently leads to disputation between nations.

In the OSU database [43], the world’s oldest water treaty dates back to the Tigris River in 2500 BC [44], and the earliest water-related treaties involving Iran were dated 1921 between Iran (Persia) and Russia (the Soviet Union) in relation to the Caspian Sea (Table 1). The only note of caution regarding the OSU Database relates to the date of the Helmand Treaty, which was cited here as 1950, while the Helmand Treaty was signed in 1973 [45].

Table 1. List of all regional and international Iran water-related treaties (modified and summarized based on [43]).

Name	Signatories	Issue Area	Treaty Basin	TFDD Basin	Date
Treaty of Friendship between Persia and the Russian Socialist Federal Republic	Iran, Union of Soviet Socialist Republics	Not available/not coded	Caspian Sea	Unknown	February 1921
International Convention Concerning the Regime of Navigable Waterways of International Concern	Ratified by >20 countries	Navigation	General	General	April 1921
Terms of reference of the Helmand River Delta Commission and an interpretive statement relative thereto, agreed by conferees of Afghanistan and Iran	Afghanistan, Iran	Water quantity	Helmand	Helmand	September 1950
Agreement Between Iran and the Union of Soviet Socialist Republics Concerning the Line to be Taken by the New Frontier Between Iran and the Union of Soviet Socialist Republics. . .	Iran, Union of Soviet Socialist Republics	Not available/not coded	Araxes	Kura-Araks	December 1954
Treaty between Turkey and Iran on the Sarisu and Karasu River	Iran, Turkey	Water quantity	Sarisu, Karasu	Tigris-Euphrates/Shatt al Arab	November 1955

Table 1. Cont.

Name	Signatories	Issue Area	Treaty Basin	TFDD Basin	Date
Agreement between Iran and the Soviet Union for the joint utilisation of the frontier parts of the rivers Aras and Atrak for irrigation and power generation	Iran, Union of Soviet Socialist Republics	Hydro-power/Hydro-electricity, water quantity,	Atrak	Atrak	August 1957
Agreement between Iran and the Soviet Union for the joint utilisation of the frontier parts of the rivers Aras and Atrak for irrigation and power generation	Iran, Union of Soviet Socialist Republics	Water quantity	Atrak	Atrak	August 1957
Boundary Agreement Between Iran and Pakistan, with Exchange of Notes	Iran, Pakistan	Not available/not coded	N.A.	Unknown	February 1958
Additional Protocol to the Agreement Between Iran and the Union of Soviet Socialist Republics. . .	Iran, Union of Soviet Socialist Republics	Not available/not coded	Araxes	Kura-Araks	May 1970
Convention on wetlands of international importance especially as waterfowl habitat (Ramsar) 1971 and Protocol 1972	172 countries	Water quality	General	General	February 1971
Treaty concerning the state frontier and neighbourly relations between Iran and Iraq and protocol	Iran, Iraq	Border issues	Shatt al'Arab	Tigris-Euphrates/Shatt al Arab	June 1975
Agreement between Iran and Iraq Concerning Frontier Commissioners	Iran, Iraq	Not available/not coded	Bnava Suta, Qurahtu, Gangir, Alvend, Kanjan, Cham, Tib, Duverij	Tigris-Euphrates/Shatt al Arab	December 1975
Agreement between Iran and Iraq concerning the use of frontier watercourses, and protocol	Iran, Iraq	Border issues	Bnava Suta, Qurahtu, Gangir, Alvend, Kanjan, Cham, Tib, Duverij	Tigris-Euphrates/Shatt al Arab	December 1975
Agreement between Iran and Iraq concerning the use of frontier watercourses, and protocol	Iran, Iraq	Water quantity	Bnava Suta, Qurahtu, Gangir, Alvend, Kanjan, Cham, Tib, Duverij	Tigris-Euphrates/Shatt al Arab	December 1975
Accord Entre L'Iran et L'Irak Concernant L'Utilisation Des Cours D'eau Frontaliers	Iran, Iraq	Not available/not coded	N.A.	Unknown	December 1975
Framework Convention for the Protection of the Marine Environment of the Caspian Sea.	Azerbaijan, Iran, Kazakhstan, Russia, Turkmenistan	Not available/not coded	Caspian Sea	Unknown	November 2003

TFDD: Transboundary Freshwater Dispute Database.

In the introduction of this paper, we mentioned Iran's uniqueness as a case study by highlighting three features: location, history, and water. Its location ensures it has multiple international neighbours and a dryland climate, with water and its management being key factors in transnational relations and economic development within the country. This section (Section 2) expanded our short review of such components based on evidence. These considerations provided the basis for a link with contemporary data and information extracted from media and global datasets (Section 3).

3. Research Data and Methodology

We considered two types of datasets to elaborate on our discussions in this research, as outlined below. As a rare case study on Iran's regional water, we included news published by the local newspapers. The research- or interview-based information recorded in these news articles (in Persian) assisted us in exploring and examining thoughts prevailing across political spectra in Iran at the time. In addition, we relied on a global dataset that could strengthen our knowledge and understanding of the issues from an historical viewpoint.

3.1. Primary Dataset: Newspaper Analysis

Media provide continuous updated, highlighted, and to some extent, exaggerated information to raise or reflect public awareness on recurring 'hot' topics. The visibility and treatment of our regional water cases in local Iranian newspapers, thus, provides another perspective on water issues in the country. Three major domestic print newspapers—Hamshahri, IRAN, and Jame-Jam—usually allocate a particular page to environmental issues. Hamshahri reports news on Tehran as the capital city, while the others cover nationwide news. With this in mind, we evaluated these daily newspapers published in Persian between 2007 and 2014 using data from an existing broader dataset [46]. Eighty-five news articles with the topic 'water' were included and five themes were then considered: Subject, Message, Contributor, Spatiality, and Allocated space. Under these themes, a few self-descriptive indicators were used: water ('Subject'), Public Awareness, Educating, Alarming ('Message'), Columnist, Researcher, Authority ('Contributor'), International ('Spatiality'), and 10% to 100% ('Allocated space').

3.2. Secondary Dataset: Global Literature

A collection of scientific articles, grey literature (unpublished reports, news items), and websites in Persian and English languages were reviewed. Generally, water is a contentious topic and covers a diverse range of aspects. Here, we did not impose any limitation on the timeframe, political, social, or technical aspects. Several keywords were considered during our search, including 'transboundary water', 'Hamoon', 'Hamun', 'Hamoun', 'Caspian Sea', 'Iran', 'water export', 'water transfer', and 'river' in both Persian and English databases.

We also used the Oregon State University Transboundary Freshwater Dispute Database [43]. As part of the entire OSU project, for instance, the OSU database collected information about all treaties at the global level since 1820. Search queries were used to extract relevant information from their International Freshwater Treaties Database.

4. Results and Discussion

We assessed 85 news articles, consisting of a total of 1275 records/fields covering water issues, to understand how the message is being conveyed to the public in Iran, especially regarding national and international water subjects [36]. It was found that most water-related news articles were attributed to 'Local' (56%) news and that newspapers published only six news articles concerning international water issues (8%). Three of these covered the Caspian Sea, one the Hamoon wetland, one Persian Gulf pollution, and one the Aras River (on the border with Azerbaijan). None of these news articles captured over half a page of any newspaper. Although we strived to mention stakeholders' views as reflected in Iranian newspapers, our study would benefit immensely from interviews conducted with various stakeholders in Iran. In addition, the 7-year timeframe, potential editorial influence in print publication, and lack of inclusion of social media were further limitations. However, our main emphasis was on topics mentioned rather than the public's interpretation of them. The scant attention paid to water in newspaper reporting probably reflected the overwhelming effects of economic sanctions and nuclear issues at the time, with transnational hydroelectricity not being mentioned. The two regional water-related news items of the Caspian Sea and the Helmand River (Hamoun wetland) are discussed here, as well as transnational hydroelectricity.

4.1. Caspian Sea

Based on our newspaper research, only two news articles were published on the Caspian Sea (CS) between 2007 and 2014. Given the importance of CS, the result confirmed how newspapers were inadequately portraying water problems in Iran (e.g., [36]). Possible reasons contributing to this lack may include a dearth of dramatic newsworthy events; an acceptance of unsatisfactory or conflictual circumstances; or a desire to avoid engagement in a potentially contentious national/regional debate. However, these news articles did identify two key inter-related issues relevant to our discussion: CS pollution and CS beneficiaries.

CS pollution. One of the news articles was titled “Pollutants are threatening the Caspian Sea”. Based on our indicators, the news article was written by an authority with an alarming message, but with less than 10% of a full-page coverage.

Recent research, based on satellite data, reported that the CS is eutrophying at an alarming rate [47], despite an international environmental protection agreement now being in place. The Framework Convention for the Protection of the Marine Environment of the Caspian Sea (the “Tehran Convention”) was the first legally binding regional agreement signed by all five Caspian littoral states (Azerbaijan, I.R. Iran, Kazakhstan, Russia and Turkmenistan) in 2003 [38]. “In 1998, the Caspian Environment Program (CEP) as a regional umbrella program was established with its aim to halt the deterioration of environmental conditions of the Caspian Sea and to promote sustainable development in the area for the long-term benefit of the Caspian population” (Ibid, p. 15). On paper, it was supposed that all the Convention’s Articles and Paragraphs would be observed. In reality, however, not only has CS pollution not been reduced, it has worsened over recent decades (e.g., [48]). Although biodegradation by microbial communities may be a potential mechanism for partly addressing this problem (e.g., [49]), efforts to reduce continuing major oil, sewage, and industrial pollutants are lacking.

CS beneficiaries. One of the news articles queried “whether the CS will be finally reclaimed after such devastating exploitation of its surface and sub-surface resources?” It was written by a columnist with the public awareness message and covered almost half a full page. Indirectly, the columnist pointed out the role of beneficiaries and their share in polluting and exploiting the CS environment; the issue, which is still debated, brings to the fore the complexity of transboundary political power relations.

The CS is regarded as a rich water body in terms of both aquatic and mineral resources. Negotiations have been continuing for decades on the multiple beneficiaries’ shares and rights to manage and exploit these resources including access to important oil reserves. However, tensions have risen while no concrete outcomes have been achieved. Considerable differences exist among the five-nation beneficiaries, particularly in relation to undersea gas and oil reserves [50], but the reality is that none of the negotiating countries in the region wants to challenge or could prevail against Russia’s power. This assertion is very relevant to Iran’s political frontier here as the country hopes to make the Caspian Sea a demilitarized ‘sea of peace and friendship’ while considering the economic feasibility of Caspian energy projects [21,51].

Iran considers Russia to be a key ally, defending the country against the West, and thus, it is careful not to lose Russia’s support [21]. While averting any confrontation with the West on Iranian issues, Russia (along with China) has supported Iran in many instances, most recently and importantly regarding the country’s nuclear energy agreement. Yet, the role of Iran in CS negotiations is influenced by US regional policy more broadly [21]. Decades ago, the US explicitly asked the Central Asian countries to avoid any deals with Iran, including energy deals, even if it would be cheaper and safer for the countries to do so (see [52]). Therefore, all successive governments in Iran demonstrated very modest and prudent contributions during negotiations on the CS to avoid any clashes with Russia. In addition, consecutive Iranian governments have been cautious in conveying the content of negotiations to the public, leaving uncertainties about any outcomes of the discussions, which mainly revolve around the littoral shares among the beneficiaries. Each country

made its own calculations and measurements for dividing the benthic spaces in the Caspian Sea, without any agreement having been reached—effectively, the hydro-political actors reached a non-confrontational stalemate while being mindful of the primary position of world powers.

4.2. Helmand (Hirmand) River

Newspaper research showed that only one news article was published to cover this critical issue at the regional and international scales. It was written by an authority with the public awareness message, covering 30% of a full page.

Historically, Afghanistan was part of Iran (the so-called Persia) until 1857. According to *Encyclopaedia Iranica: Anglo-Iranian relations*, “Britain began the Anglo-Persian war (q.v.) which resulted in Iran’s quick defeat and the conclusion of the peace treaty of Paris in 1857, by which Iran finally gave up its claim to Afghanistan” [53]. The Greater Khorasan cities of then Persia, like Balkh and Herat, are now cities in Afghanistan [54]. This historical context may assist in understanding the complicated reality in a region where external powers have meddled on various occasions.

In addition to general issues (e.g., legal), the ‘scale’ aspect is pivotal for managing transboundary water resources [32]. According to the Dublin Statement [2]: “The most appropriate geographical entity for the planning and management of water resources is the river basin”. About 60% of surface water in the Middle East and North Africa region flows across boundaries where all countries share at least one aquifer with a neighbouring nation, but transboundary water is characterised by low and complex cooperative management arrangements [5]. Long-standing issues related to one such controversial transboundary water resource, the Helmand River, flowing between Iran and Afghanistan, have remained unresolved.

The Helmand River basin is the largest in Afghanistan with a long history of agricultural activities [55]. Geographically, Afghanistan is positioned such that four of its five river basins, including the Helmand River, have flows ending in neighbouring countries [55]. Both Iran and Afghanistan encompass vast mountainous and desert areas, and over 90% of water resources in both countries are utilised by their respective agriculture sectors. Therefore, both countries face serious water stress challenges while being affected by recurring droughts and intermittent floods. Nevertheless, the per capita annual water available for Afghanistan is almost twice that for Iran (2500 cubic meters versus 1400 cubic meters) [56].

The regional debate about managing the shared Helmand River has lingered for several decades with no permanent solution. The earlier bilateral treaty between Iran and Afghanistan was finalized in 1973 and included 12 articles plus two annexed protocols [45]. The preamble of the treaty says: “Afghanistan and Iran, desiring to remove permanently all causes of controversy with respect to the water of the Helmand River, and being moved by international comity and by brotherly and neighbourly feelings and having resolved to conclude a treaty [...]” [Ibid]. Based on this treaty, Afghanistan was supposed to provide Iran with water equal to an average flow of twenty-two cubic meters per second and delivered according to a monthly share. The Treaty also encompassed water delivery levels during the non-normal water years [Ibid]. According to Article V of this treaty, “Afghanistan [...] shall take no action to deprive Iran totally or partially of its water right [...]” [Ibid]. The treaty thus delineated applicable conditions in the non-normal water years, which affirmed Afghanistan’s responsibility to inform Iran in such cases if precipitation had been inadequate. This has never been the case for the Helmand River so far. According to Article 18 of the Berlin Conference [57], “In transboundary contexts, affected participants need access to information across borders”.

Since this treaty was entered into, however, both countries underwent unprecedented internal political and social changes. Several governments were installed in Afghanistan, with all ignoring the treaty and, so, the problem of water flows being impounded before reaching Iran is ongoing [58]. Despite repeated Iranian efforts to resolve this blocking of water flow through bilateral cooperation, almost all current negotiations have been futile. Even

considering that legal principles for water management are vague and contradictory [3], the Helsinki Rules (Article V) have been violated in this wetland case over the last half a century. These breaches have impacted the rights of neighbouring Iran's population, but the Helmand water blockage has also affected the security of Iran, the region, and further afield. Regionally, the river has had profound impacts on the daily life of populations in both Afghanistan and Iran, in addition to affecting the natural ecosystems. As a collapsed state [59], Afghanistan has suffered from severe instabilities inside the country for decades. Domestic tensions and conflicts are currently rising due to appalling socio-economic and political conditions, for which there seem to be no ready solutions. This remains the case even though Afghanistan has enormous untouched mineral resources (e.g., [59]) and billions of dollars have been spent there on development projects by international bodies.

As the recipient of the Helmand River water, the Iranian Hamoon (Hamun, Hamoun) wetland is an international wetland designated by the Ramsar Convention. Maintaining ecological health of the wetland was not addressed in the treaty [60] nor were environmental river flows mentioned [61]. In recent decades, water flowing to this wetland almost ceased and the increasing desiccation resulted in severe ecological impacts, dust storm generation, and adverse social consequences. In particular, the severities of a dried Hamoon wetland on the well-being of poor local populations in Iran have become more pronounced.

The regional interference with water flows exacerbated the existing acute problems in Iran's Sistan–Baluchistan province which borders Afghanistan. The most complex challenges regarding Iran's water resources are seen in this under-developed and impoverished province (e.g., [62]). In addition to domestic destitution and malfunctions (low-level infrastructure), the province faces enormous security challenges (cross-border drug and human trafficking, and refugee populations) mostly due to its proximity to politically unstable Afghanistan. Income-generating activities from agriculture are being hindered and impoverished local Iranians are increasingly being involved in drug trafficking. This, in turn, affected other countries, with smugglers exploiting Iran as a transit hub for transferring drugs and humans from Afghanistan to their destinations in Turkey and Europe [63].

Iran, a so-called 'prime regional refugee hub' [21], has hosted millions of Afghan refugees despite its own financial problems and foreign sanctions over the past decades. Iran and Pakistan jointly host 91%—some 2.4 million—of Afghan refugees worldwide comprising 12% of the global refugee population in 2018 [64]. During 2017–18, some 420,000 Afghan children had registered for primary and secondary school in the Iranian educational system [64]. Iran has also supported developmental activities inside Afghanistan [54]: for instance, a railroad extension from Iran to Afghanistan was built in 2020 to provide materials (raw and processed) to Afghanistan and facilitate travel between the countries. However, the 1973 treaty and management of water in the Helmand basin has become increasingly contentious with growing populations depending on unreliable water supplies, a situation which led to calls for the treaty to be revised [65], possibly including Islamic water management principles [66]. A key issue relates to implementation of river flow monitoring and water utilisation, with these data being shared between the parties [67].

4.3. Exporting Hydroelectricity

No news article was published to capture the issue between 2007 and 2014, but it forms an important indirect component of Iran's transboundary water partnerships.

Iran set out a medium-term outlook (to 2025) a decade ago, within which there was a targeted plan to reduce the country's dependence on oil and gas and diversify its energy supply [68]. In particular, Iran's Ministry of Energy was tasked to increase electricity generation at the national level [68]. Prompted by rising domestic energy consumption, there has been a desire to invest more in hydroelectricity generation, due to the long-term physical investment and human capacity-building in technology and engineering involved. Increasing numbers of large dams have been constructed for electricity generation and farming expansion in Iran since the 1950s [69] and these developments are continuing

(e.g., [70]). By 2020, Iran was third in hydropower production (after India and China) in the South and Central Asia region [71]. Given the unreliability of precipitation and potential for ecological disasters, however, domestic pundits question the feasibility and affordability of the construction of large dams. Downstream of such dams, river basins are threatened by low water flow, increased sediment loads and reduced groundwater recharge (e.g., [72]), while associated wetland ecosystems and human settlements are endangered or lost.

Throughout the Middle East region, hydropower suffers from a variable ability to generate electricity due to irregular rainfall regimes, droughts, a climatic trend towards decreasing precipitation, and often inefficient transmission via inadequate national and international power grids. Dams in Iran are multi-purpose, designed to mitigate rare but damaging floods, generate electricity, and store water for drinking and irrigation. The primary destination for stored water is agriculture; the distribution and utilisation of this water can be inefficient, with inadequate pipelines and agricultural systems that often do not employ drip irrigation [73]. Such modern water-saving techniques require substantial capital investment that prevents their widespread adoption, but within-country water management needs to implement the most effective and least wasteful means of distribution and use of this scarce resource.

Over the past few years, Iran has exported its surplus electricity to neighbouring countries, including Iraq in the west [34]. Such an energy partnership strengthened the nation's ties with its neighbouring country. It also acted as a bartering commodity needed in negotiations for easing international sanctions on Iran. In 2021, however, a public outcry criticising electricity export to neighbouring countries was triggered by the Iranian people simultaneously suffering from unprecedented drought and summer electricity outages. Moreover, there was a debate about financial transactions and the pricing of electricity exported from Iran to its regional partners. Hydroelectricity output fluctuates in response to catchment water flows and its contribution to national electricity generation remains low at about 5% [70]. Nevertheless, energy production competes with water needed for agriculture and drinking purposes, leading to local dissatisfaction and indirect involvement in transboundary hydro-politics at the regional level.

Iran's hydroelectricity capacity and export sales can be viewed as a successful investment [34]. While benefiting from export revenues, Iran has also demonstrated the value of hydroelectricity as a means of developing technical capabilities and projecting its partnership messages at the regional level. Nevertheless, Iran's population has increased dramatically over the past forty years, and this growing population needs more electricity than ever before: since 2004, energy consumption in Iran has nearly doubled [74]. In addition, increasing demands for irrigation water place further pressure on already constrained supplies.

4.4. The Three Transnational (Regional) Water Partnerships

At a global level, the largest proportion of transboundary waters apply to border waters (24%) followed by infrastructure (22%) [32]. The problem is lack of coordination on transboundary water issues at the global level [75]. In our research, one of our cases was related to water infrastructure (hydroelectricity), for which planning often spans decades, whereas authorities change posts much more frequently [75] at both national and local levels, thus potentially jeopardising the possibility of timely development and subsequent transboundary utilisation agreements. Further complications arise with construction of dams on transnational rivers in upstream locations, for example, the Aras and Tigris rivers flowing from Turkey to Iran [76,77].

Following established criteria used in other studies, Table 2 illustrates commonalities and dissimilarities that exist among the three transnational water partnerships involving Iran and described in our research cases. Hydro-hegemony [78] is not present for any case, although all are bordering countries with geographical proximity and neighbourhood (rather than regional) interdependence, but socio-political culture and economic interactions are moderate and variable between cases. Security interdependence is not present.

Table 2. Comparison of three regional water partnerships between Iran and its neighbouring countries.

Regional Water Resource	Location (Point ¹)	Water System ²	Damage ³	Scale ⁴	Regional Hegemony? ^{5,*}
Caspian Sea	Proximate	Lake basin	Environmental harm	Shared waters	G, I
Helmand River	Proximate	River basin	Loss of life or personal injury; loss of or injury to property or other economic losses; environmental harm; risk to Ramsar convention	Border waters	G, I, S
Hydroelectricity	Distant	Multiple Iranian river basins	Shortfalls in domestic electricity; competition for scarce water (irrigation, drinking purposes)	Dispersed infrastructure—shared, border and national waters	G, I, E

¹—[1]; ²—[79]; ³—([57]—Chapter 1, Article 3); ⁴—([32], Table 2); ⁵—[12]. * G—geographical proximity (border countries); I—regional/neighbourhood interdependence (water-related); S—socio-political; E—economic interactions.

4.5. Iran's Transnational Water Partnerships: Geopolitical Implications

Pundits emphasise a model based on a shift in the international system from a multipolar system before the Second World War to a bipolar system (USA and Russia) [23]. However, we suggest that Iran's situation over the past century accidentally followed a reverse version of such a polarisation model. While a fragile Iran was supported by Russia and Britain before the Second World War (during the multi-polarization era), the country has since benefitted from cooperation with a broader spectrum of global and regional players by practicing foreign policy initiatives at regional (e.g., water partnerships) and international (e.g., the Nuclear Energy Agreement, hydroelectricity export) levels.

Among the three regional water initiatives studied here, the Caspian Sea and its surrounding debates among the beneficiaries seem to be far from reaching consensus. The annual meetings and negotiations will remain to show outsiders a willingness to resolve this contentious issue. Nevertheless, given the sharp imbalance of power between Russia and other regional beneficiaries, no further progress is envisioned. Politically, Iran's share from the Caspian Sea is not likely to improve, and Iran will not pursue the case further than it does at present.

The transboundary Helmand River shared between Iran and Afghanistan is the most contentious at the transnational level. Despite historical, cultural, and linguistic similarities between the two countries, the socio-hydrological factor prevailed. Non-binding negotiations and treaties will not resolve this long-lasting water disagreement between the two countries. Afghanistan has no proper legal, regulatory, and technical capacities to formulate a cohesive national water plan [56]. In addition to political and economic instabilities, such institutional shortcomings are major impediments for any regional water cooperation. Neither local nor national governments of Afghanistan addressed this issue effectively, given their apparently insurmountable internal insecurities and challenges. The new ruling regime, which took office in 2021, recently gave assurances of its commitment to allow river flow into Iran. In a rare statement in recent decades, released in the Dari language, the Ministry of Water and Energy of Afghanistan reassured its 'friend Islamic neighbouring country' that it will observe all 'technical, legal, and protocols' associated with the 1973 Iran–Afghanistan Agreement [80].

The hydroelectricity exchange agreements between Iran and its neighbouring countries are financially and economically satisfactory for Iran and new agreements are continuing with Azerbaijan [81]. Still, caution is needed as Iran's domestic electricity needs are escalating rapidly, stored water diminishes quickly during droughts, and droughts often simultaneously affect neighbouring countries.

Transnational water-related treaties continue to be entered into since those listed in the 1970s (Table 1). These partnerships are complex, especially in relation to war-damaged Iraq. Despite the imposition of international sanctions, an exception was created for Iran to continue providing transnational hydropower and gas for Iraqi power stations [82]. Difficulties

arose during serious droughts in both countries in 2021, which limited hydropower, and gas-powered plants in Iraq were unable to meet the shortfall. Nevertheless, cooperation continues between the two countries in addressing these and other transnational problems, such as dust storms. Iran launched activities with Iraq to improve transboundary dust issues [83,84], which are often exacerbated by water shortages and poor land management. The region is a hotspot for sand and dust due to lingering issues such as wetland desiccation, lowering of ground water levels, and destruction of vegetation. The regional trajectory of the sand and dust storms, captured by satellite imagery [85,86], is broad and covers several countries. Iran and Iraq, however, are mainly secondary destinations for these dust particles and their severe consequences.

“Infrastructure, technology and institutions enable control and even capture of the resource” ([87], p. 271). Here, we argued that Iran used its water-saving knowledge and infrastructure to leverage its technical capacities and political posture at the regional level. It is believed that for shared transboundary rivers and aquifers, cooperation offers an opportunity to promote peace and stability [5,44], but despite being an active participant in regional partnerships, successful resolutions have not been found to the multi-national Caspian Sea issue or the shared flow of Helmand River with Afghanistan.

Water in Iran evolved from a local asset to being gradually directed toward national objectives and transnational arrangements. This perspective incorporates regional water issues that are not necessarily linked to hydropolitics, such as improving national capacity through water infrastructure or the impacts of regional non-cooperation on local livelihoods. However, foreign policy can help “improve transboundary water governance [...] and encouraging greater cooperation over transboundary waters offers significant prospects for the resolution of political conflicts” ([75], p.i). Despite various treaties and agreements, water is frequently a source of dispute, and transboundary energy generated by hydropower from rivers wholly within Iran has been the only example of the three cases examined here that has not been contentious at the transnational level.

5. Conclusions

While the world has been watching Iran’s foreign policies and reactions for the past forty years, especially the recurring debates on nuclear energy issues, the country has been involved in negotiations on water-based trade at the regional level. The core of these negotiations for Iran has been to benefit from its transboundary water resources (Caspian Sea), from protecting degrading natural landscapes and associated local livelihoods (the Ramsar-designated Hamoun wetland), and from expanding new income-generating avenues (e.g., hydro-electricity export). Its active involvement in securing agreements with neighbouring countries demonstrates regional influence but not water-related hegemony.

Finally, the water initiatives discussed in this paper represent only three examples of transnational water interactions which highlight the complex legal, political, and socio-economic matrix within which such initiatives are conducted. Many countries in the region suffer from the common problems of frequent droughts, low precipitation, growing populations, agriculturally based incomes, and inadequate water and electricity infrastructure. Further attention needs to be directed towards encouraging water management initiatives operating both within and between nations in the region.

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