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# Transboundary Water Management and Diplomacy: The Case of Hamun Wetlands

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**Abstract**

The Hamun Wetlands, a critical transboundary ecosystem shared between Iran and Afghanistan, exemplify the intricate nexus of water management, environmental sustainability, and diplomacy. Fed primarily by the Hirmand (Helmand) River, the wetlands have faced severe degradation due to prolonged droughts, reduced river inflows, and contentious water-sharing disputes rooted in historical treaties, notably the 1973 Iran-Afghanistan agreement. Using historical document analysis and remote sensing, this article examines the historical context, current disputes, environmental and human rights implications, and diplomatic efforts surrounding the Hamun Wetlands. Satellite data (2000–2025) reveals a 72% reduction in the Hamun Wetlands' permanent water coverage, with the Chah Nimeh reservoirs declining from 1.2 billion m³ to 200 million m³ and losing 300 million m³ annually to evaporation. Afghanistan's Kamal Khan Dam (2021) reduced river inflows to Iran by ~50%, exacerbating water scarcity in Sistan-Baluchestan, where 81% of rural residents survive on just 15 liters/person/day—far below the WHO's 50-liter minimum. Concurrently, Sistan experienced a 91% rainfall deficit compared to its 52-year average, further intensifying ecological collapse. It highlights challenges, including Afghanistan's noncompliance with water rights, the Taliban's resurgence, and regional geopolitical influences, as well as opportunities for cooperation under international frameworks such as the Ramsar Convention. Findings underscore the need for sustainable diplomacy to address ecological collapse and ensure equitable access to water, offering policy recommendations for bilateral and international engagement.

## 1. Introduction

Ecologically, the Hamun Wetlands, designated as a Ramsar site in 1975, perform critical functions within the arid Sistan Basin. These wetlands support over 150 bird species, including the critically endangered Dalmatian pelican (Pelecanus crispus), and serve as a key migratory stop along the Central Asian Flyway (MalAmiri et al., 2025; Gardner, 2025). With annual precipitation rarely exceeding 50 mm in the region, the shallow waters and reed beds of the wetland play an essential role in mitigating desertification while contributing to groundwater recharge for agricultural use (Day et al., 2021; Sarlak, 2020). Local communities rely on the wetland for subsistence activities such as fishing, particularly targeting the endemic Hamun tooth-carp (Aphanius dispar), reed harvesting, and traditional qanat-based farming, thereby balancing biodiversity conservation with human livelihoods (Smith, 2024; Karami et al., 2025). However, the ecological integrity of the Hamun Wetlands is highly dependent on transboundary water flows from Afghanistan, particularly regulated by dams such as Kajaki and Kamal Khan, which render the system vulnerable to upstream water

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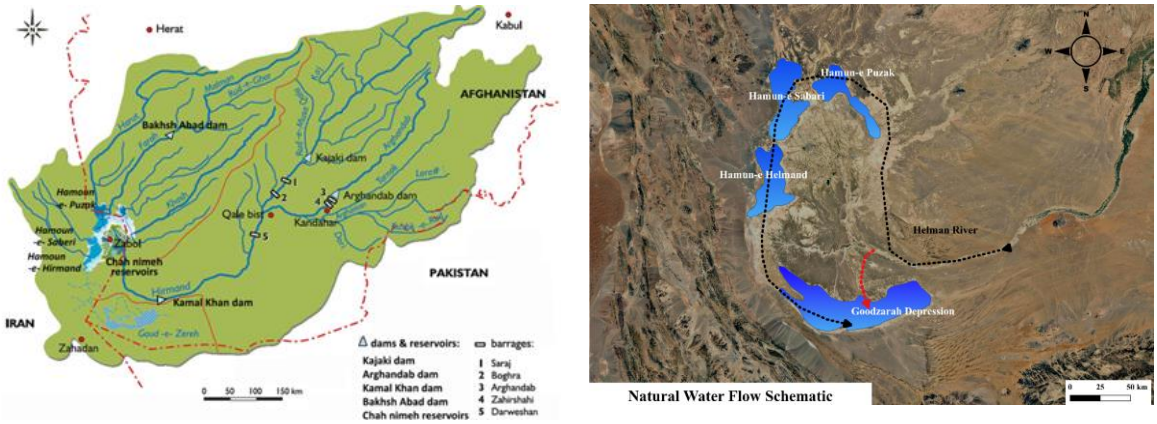
management practices (Esnaashari et al., 2024; MalAmiri et al., 2023).

Diplomatically, the Hamun Wetlands represent both a challenge and a potential catalyst for cooperation between Iran and Afghanistan. The Helmand River basin has been a focal point of tension since the 1872 Goldsmid Arbitration, with the 1973 bilateral treaty failing to address drought-related contingencies, thus leaving room for recurring disputes (Kocatepe, 2024; Akbari et al., 2022). Periods of severe desiccation, most notably between 1998 and 2005, led to widespread dust storms that displaced over 100,000 residents in the Sistan region. Moreover, a 72% reduction in the wetland's surface area since 2000 signals an escalating risk of irreversible aridification (Javadian et al., 2019; Rashki et al., 2021). These environmental stressors have intensified socioeconomic challenges, including rising unemployment and economic instability, highlighting the wetland's profound socio-ecological significance (Yeganeh & Bakhshandeh, 2022).

Collaborative management frameworks offer a viable path forward. Legal instruments such as the Ramsar Convention and the UN Watercourses Convention provide foundational mechanisms for transboundary water governance. Article 5 of the Ramsar Convention explicitly mandates inter-state consultation regarding shared wetlands, while the UN Convention emphasizes principles of equitable and reasonable utilization (McCaffrey, 2022). Despite these provisions, implementation remains inconsistent. Nonetheless, evidence from prior coordinated water releases demonstrates partial ecosystem recovery, underscoring the feasibility and importance of transboundary cooperation. The political transformation in Afghanistan following the Taliban's return to power in 2021 has introduced new complexities—and potentially opportunities—for renegotiating water-sharing arrangements. Consequently, the Hamun Wetlands emerge as a critical case study in environmental diplomacy, where sustainable management hinges upon integrated strategies that address climate adaptation, biodiversity conservation, and the preservation of cultural heritage. Such approaches are not only vital for ecological restoration but also for fostering regional collaboration and geopolitical stability (Mahaqi, 2021; Nasab et al., 2023; Maleki et al., 2019).

Despite extensive historical analyses of the Hamun Wetlands, the intersection of Taliban governance, climate change, and transboundary water diplomacy remains underexplored. This study addresses this gap by integrating satellite-derived hydrological data, treaty analysis, and hydro-political frameworks to assess the current crisis and propose actionable, science-based policy solutions.




(a) (b)

**Figure 1.** (a) illustrates the hydropolitical infrastructure of the Hirmand Basin. Presents the location of the Kajaki (34.483°N, 65.733°E) and Kamal Khan (31.067°N, 61.833°E) dams, (b) Hydropolitical infrastructure of the Helmand Basin (Mayar, 2023)

## 2. Materials and Methods

### 2.1. Study area

The Hamun Wetlands, located in the Sistan Basin of eastern Iran and extending into Afghanistan, are a critical transboundary ecosystem recognized as both an ecological treasure and a diplomatic asset. Spanning approximately 5,700 square kilometers, the wetland system comprises three main sub-basins: Hamun-e Puzak (mostly in Afghanistan), Hamun-e Saberi (the most significant Iranian portion), and Hamun-e Hirmand (a shared delta region) (Arfa et al., 2025). Over 90% of its freshwater supply originates from the Helmand River (Hirmand in Persian), which flows through Afghanistan's Hindu Kush mountains, making it a linchpin in the region's hydrology (Day et al., 2021; Esnaashari et al., 2024).

### 2.2. Satellite Data Processing

Surface water dynamics within the Hamun Basin were systematically analyzed using MODIS Surface Reflectance (MOD09A1) imagery. Custom JavaScript algorithms were developed and implemented in Google Earth Engine (GEE) to compute water extent indices, including the Normalized Difference Water Index (NDWI), over 50 years (1973–2023). Rigorous preprocessing workflows, encompassing cloud masking and temporal compositing techniques, were applied to enhance data accuracy and mitigate atmospheric or seasonal noise. These methodological steps ensured the reliability of the derived datasets, enabling robust quantification of spatiotemporal changes in surface water extent and supporting the evaluation of long-term hydrological trends in the region.

## 3. Results and Discussion

### 3.1. Historical Context of Water Disputes

The transboundary management of the Hirmand/Helmand River, the critical water source for the Hamoun Wetlands shared by Iran and Afghanistan, has evolved over centuries through diplomatic agreements, colonial influence, and persistent bilateral tensions. This section examines foundational water-sharing treaties and their enduring consequences for contemporary water governance and interstate relations.

#### 3.1.1. Early Agreements and Treaties

The Hirmand River conflict originated in 19th-century colonial geopolitics. The 1857 Treaty of Paris, which transferred Herat from Persian to Afghan control under British oversight, established enduring patterns of external mediation and mutual suspicion (Ghoreishi et al., 2024; Kocatepe, 2024). Subsequent water disputes led to the 1872 Goldsmid Arbitration, where British mediator Frederic Goldsmid proposed equitable water distribution while prohibiting Afghan infrastructure that would

diminish Iran's share (Nagheeby and Warner, 2022; Dehgan et al., 2014; Taheri, 2023). However, the non-binding nature of this decision, along with subsequent alterations to the river course, rendered it ineffective.

The 1905 McMahon Arbitration introduced a quantitative allocation, granting Afghanistan two-thirds and Iran one-third of the flows at Kamal Khan, a distribution that Iran rejected as inadequate for Sistan's agriculture (Poohashemi et al., 2024; Nagheeby and Warner, 2022). Iran, in particular, opposed the provision for permanent British oversight, considering it a violation of sovereignty (Ghoreishi et al., 2024; Taheri, 2023). Consequently, both nations defaulted to the Goldsmid principles, though with inconsistent implementation.

The Pahlavi period (1925-1979) saw direct bilateral negotiations. The 1937 provisional agreement reaffirmed equal distribution, followed by Afghanistan's 1939 pledge to avoid flow-reducing constructions between Deh Chahar Burjak and Kamal Khan (Poohashemi et al., 2024; Nagheeby and Warner, 2022). However, Afghanistan's parliamentary rejection and subsequent unilateral canal projects (e.g., Baqra, Siraj) undermined these accords. The landmark 1973 Treaty established Iran's annual entitlement of 820 million $m^3$ (26 $m^3/s$) during normal years, incorporating arbitration mechanisms but lacking provisions for droughts or enforcement protocols (Thomas & Varzi, 2015; Nagheeby, 2024; Amini et al., 2021).

#### 3.1.2. Impact of Historical Agreements

Contemporary water conflicts directly reflect these historical precedents. Afghanistan's 2021 operation of the Kamal Khan Dam, which reduced downstream flows to Iran, mirrors earlier 20th-century canal diversions, demonstrating persistent treaty non-compliance (Amini et al., 2021; Oriakhil et al., 2024; Gardner, 2025). The 1973 Treaty's enforcement deficiencies are particularly evident during droughts, as seen when Afghan water retention desiccated the Hamoun wetlands (1998-2005) (Loodin and Wolf, 2022; Yeganeh and Bakhshandeh, 2022).

The socio-ecological consequences for Sistan and Baluchistan have been severe. Historical water shortages have caused massive livestock losses (e.g., 2,400 cattle deaths in 1947), paralleling current crises in which 81% of rural residents depend on minimal tanker-supplied water (Esnaashari et al., 2024; Khan, 2022; Rad et al., 2022). Evaporation losses (300 million $m^3$/year) from depleted Chah Nimeh reservoirs exacerbate these challenges (Maleki et al., 2025; Gardner, 2025).

Diplomatic patterns persist across regimes. The Taliban's nominal recognition of the 1973 Treaty contrasts with its operational practices, which resemble historical non-cooperation (Nagheeby and Warner, 2022; Nevermann et al., 2025; Hasar, 2024). External mediation attempts ranging from 19th-century British arbitrations to 1950s U.S. technical interventions have consistently failed to establish durable solutions (Miranda-España, 2024). This historical trajectory underscores the critical need for adaptive, enforceable frameworks to transform the Hirmand from a perpetual source of conflict into a catalyst for regional cooperation.

### 3.2. Transboundary Water Disputes and Diplomacy

The Hirmand (Helmand) River, a vital transboundary resource feeding the Hamun Wetlands, remains at the heart of unresolved disputes between Iran and Afghanistan as of April 2025. This section examines the current status of these conflicts, intensified by infrastructure development and climate change, as well as the multifaceted challenges that impede diplomatic cooperation.

#### 3.2.1. Current Status of Water Disputes

As of 2025, the Hirmand River dispute remains a critical issue, with no resolution in sight, despite decades of negotiations. Afghanistan’s completion of the Kamal Khan Dam in March 2021 has dramatically reduced inflows to Iran, slashing the river’s contribution to the Hamun Wetlands and the Chah Nimeh reservoirs—key

sources of drinking water for Sistan and Baluchestan (Arfa et al., 2025). The dam, located in Nimroz province, diverts water for Afghan agriculture, leaving downstream Iranian ecosystems and communities in crisis. Satellite imagery confirms a 72% reduction in Hamun's permanent water coverage since 2000, with the fourth Chah Nimeh reservoir now nearly dry and the others critically depleted (Maleki et al., 2025; Gardner, 2025). Official reports indicate that the reservoirs, with a combined capacity of 1.5 billion cubic meters, lose 300 million cubic meters annually to evaporation alone, a loss exacerbated by diminished inflows (Akbari et al., 2022; Fartoot Enayat et al., 2022; Gardner, 2025).

Iran has repeatedly invoked Article 9 of the 1973 Iran-Afghanistan Treaty, which mandates diplomatic negotiations followed by arbitration for disputes, but Afghanistan's resistance has stalled progress (Nagheeby, 2024; Nevermann et al., 2025; Hasar, 2024). The treaty stipulates Iran's entitlement to 820 million cubic meters annually (26 $m^3/s$) in normal years, yet Afghan officials argue that prolonged droughts, reducing the river's flow to below historical averages, justify their retention policies (Thomas & Varzi, 2015; Nagheeby, 2024; Amini et al., 2021). Iran counters that upstream damming, including the older Kajaki Dam and newer projects, violates the principle of equitable use, a claim supported by hydrological studies showing a 50% drop in downstream flows since 2010 (Esnaashari et al., 2024; Khan, 2022; Rad et al., 2022).

Climate change compounds the crisis. Rainfall in Sistan and Baluchestan has plummeted, with a deficit of 70 mm below the long-term average and a 91% reduction compared to the 52-year mean (Pegahfar, 2023) and and the 2023-2024 crop year recorded just 35.6 mm of precipitation, marking the province's third-lowest rainfall in 55 years (Arfa et al., 2025). These conditions amplify reliance on the Hirmand, yet Afghanistan's infrastructure prioritizes its own needs, leaving Iran's rural population—81% of whom depend on tanker-supplied water capped at 15 liters per day—facing severe shortages (World Health Organization, 2010; Arfa et al., 2025). Dust storms from the desiccated Hamun have triggered health crises, with respiratory illnesses surging in border communities (Rad et al., 2022).

Diplomatic efforts have faltered amid political upheaval. The Taliban's 2021 takeover disrupted established channels, with initial talks in 2022 yielding no firm commitments to honor the 1973 treaty (Nagheeby and Warner, 2022; Nevermann et al., 2025; Hasar, 2024). Iran's protests escalated in 2023 when Afghan officials celebrated the operation of the Kamal Khan Dam, issuing statements that prioritized national interests, prompting Tehran to deploy its border forces in a show of strength (Loodin et al., 2023; Loodin et al., 2024). The United Nations has been a venue for Iran's grievances, yet without Afghan cooperation, multilateral mediation remains ineffective (Kumar, 2023). As of 2025, the dispute exemplifies a classic upstream-downstream conflict, intensified by environmental stress and geopolitical shifts, with the Hamun Wetlands bearing the brunt of inaction.

### 3.2.2. Challenges in Cooperation

Cooperation over the Hirmand River faces formidable obstacles, rooted in environmental and socio-economic disparities. The Taliban's 2021 takeover of Afghanistan marks a pivotal barrier, shattering decades of diplomatic frameworks. Pre-2021 negotiations, though imperfect, relied on structured dialogues via the Helmand River Commission; post-Taliban, these channels collapsed as the regime prioritized internal consolidation over transboundary commitments (Nagheeby and Warner, 2022; Nevermann et al., 2025; Hasar, 2024). The Taliban's initial recognition of the 1973 treaty in 2022 was undermined by unilateral actions, such as increased water retention at Kamal Khan, reflecting a governance style less amenable to compromise (Nagheeby and Warner, 2022; Nevermann et al., 2025; Hasar, 2024).

Mutual distrust is a persistent hurdle, compounded by hydrological asymmetry. Afghanistan's upstream position grants it

control over the Hirmand's flow, a strategic advantage it has historically leveraged, as seen in the 1940s canal projects and modern dam expansions (Nagheeby and Warner, 2022). Iran, as a downstream, arid country, views water security as non-negotiable, with Sistan's survival hanging in the balance. This imbalance fosters a zero-sum mindset; Afghanistan perceives Iran's demands as infringing on its sovereignty, while Iran views Afghan retention as a violation of its rights (Loodin et al., 2023). Historical precedents—e.g., Afghanistan's refusal to ratify the 1939 declaration—reinforce this divide (Zeitoun et al., 2017; Nagheeby and Warner, 2022).

Economic priorities further complicate negotiations. Afghanistan's agricultural expansion, driven by a population exceeding 40 million and food security needs, relies on the Hirmand water for irrigation in provinces like Helmand and Nimroz (King & Sturtewagen, 2010). The Kamal Khan Dam, irrigating 174,000 hectares, exemplifies this focus, with Afghan leaders framing it as a national triumph (Oriakhil et al., 2024; Gardner, 2025). Conversely, Iran prioritizes the preservation of potable water and wetlands, with 1.5 million residents of Sistan facing shortages that threaten their livelihoods, including fishing and farming (Kocatepe, 2024). These divergent goals of development versus survival leave little room for compromise, as each nation's economic strategy undermines the other's (Poohashemi et al., 2024).

Environmental and climatic factors add urgency but hinder progress. Droughts, intensified by climate change, reduce the Hirmand's flow, making equitable sharing more challenging to define (Roodari and Hrachowitz, 2020). Sistan's rainfall deficits and Afghanistan's water stress, compounded by a 21-year low-rainfall streak since the 1980s, fuel domestic pressures that outweigh diplomatic goodwill .Political instability beyond the Taliban, including regional rivalries (e.g., Pakistan's influence on Afghan water policy), further muddies the waters (Akhtar and Shah, 2020). International frameworks, such as the UN Watercourses Convention, offer principles but lack enforcement, as neither nation has ratified them (McCaffrey, 2022). Thus, cooperation remains elusive, trapped between structural inequities, political volatility, and a shrinking resource base, with diplomacy struggling to bridge the gap.

### 3.3. Impact on the Environment and Diplomacy

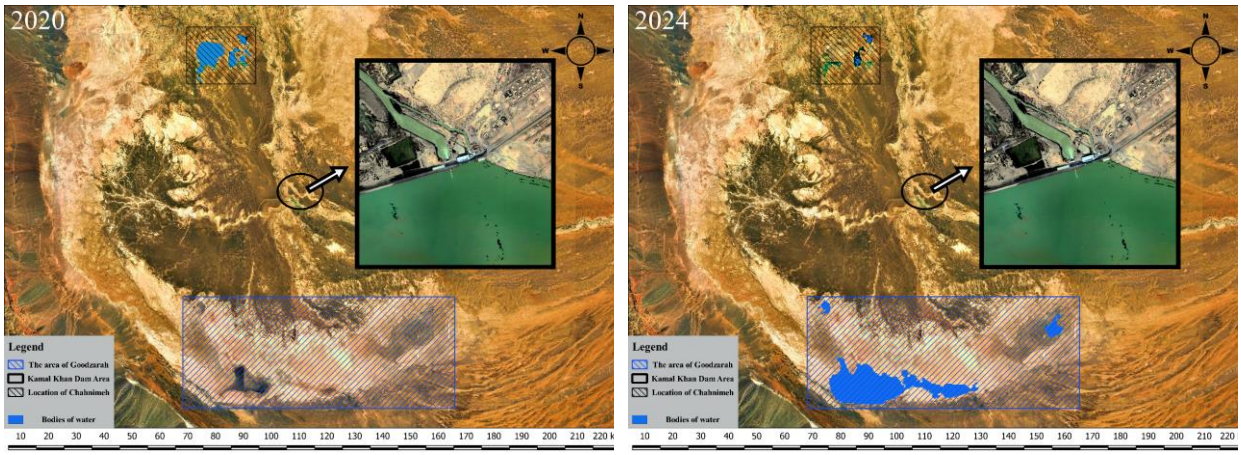
The drying of the Hamun Wetlands, driven by reduced Hirmand River flows and exacerbated by climate change, has unleashed profound ecological and diplomatic consequences for Iran and Afghanistan. This section explores the environmental devastation and its cascading effects on regional sustainability, as well as the diplomatic ramifications that position the wetlands as both a source of conflict and a potential catalyst for cooperation.

#### 3.3.1. Environmental Consequences

The desiccation of the Hamun Wetlands has precipitated an ecological catastrophe with far-reaching implications. Once a thriving ecosystem spanning 5,700 square kilometers, the wetlands have undergone a dramatic decline, with satellite data revealing a 72% reduction in permanent water coverage since 2000 (Khan, 2022; Modaresi Rad et al., 2021). This decline, fueled by Afghanistan's upstream damming, notably the Kamal Khan Dam, and by a 91% drop in rainfall in Sistan compared to the 52-year average, threatens biodiversity and regional stability. Iconic species like the Siberian crane (Grus leucogeranus), a migratory visitor, have vanished from the area. At the same time, endemic fish such as the Hamun tooth-carp (Aphanius dispar) are at risk of extinction due to habitat loss. Over 150 avian species that rely on the Central Asian flyway are at risk, disrupting a globally significant ecological corridor (Akbari et al., 2022; Khan, 2022).

Desertification has emerged as a significant threat, transforming the wetland into a desert-like environment. The exposed lakebed, once moderated by shallow waters and reed beds, now generates sandstorms that plague Sistan and Baluchestan, with wind speeds carrying

toxic sediments across borders (Boloorani, 2022). Between 1998 and 2005, these storms displaced over 100,000 residents (Maleki et al., 2019), a pattern that repeated now as the drought intensified. The Chah Nimeh reservoirs, designed with a 1.5 billion cubic meter (BCM) capacity, have seen their water volume plummet from 1.2 BCM in 2000 to just 0.2 BCM in 2025, an 83% decline. Annual evaporation losses of 300 million m³ (approximately 20% of the original capacity) compound the crisis caused by reduced Hirmand inflows. As shown in Figure 2, these losses now equal 11 times the volume transferred to Zahedan, highlighting the system's dual vulnerability to hydrological changes and climatic stress (Maleki et al., 2025; Gardner, 2025).




(a) (b)

**Figure 2.** Water Volume Decline in Chah Nimeh Reservoirs (2000–2025)

Soil degradation and groundwater depletion further compound the crisis. The wetland's role in recharging aquifers, critical for Sistan's qanat-based agriculture, has collapsed, with salinity levels rising as freshwater inputs dwindle (Zanganeh & Ahmadi, 2017). Climatic models predict a 20% further reduction in regional precipitation by 2050, accelerating aridification and threatening food security for over 1.5 million people (Kumar, 2023). These ecological shifts, including biodiversity loss, desertification, and resource scarcity, pose a systemic risk to sustainability, with transboundary spillovers affecting both nations' ecosystems and livelihoods (Madani, 2016).

### 3.3.2. Diplomatic Implications

The Hamun Wetlands stand as a transboundary ecosystem that serves as both a geopolitical flashpoint and a diplomatic opportunity in Iran-Afghanistan relations. The management of the Helmand River has long shaped bilateral dynamics, with water serving as both a bargaining chip and a source of contention (Nagheeby and Warner, 2022). Iran accuses Afghanistan of violating its water rights under the 1973 treaty, which allocates 820 million cubic meters annually but lacks enforcement mechanisms, while Afghanistan leverages its upstream advantage through dams like Kajaki and Kamal Khan, defending its actions as sovereign resource use (Thomas & Varzi, 2015; Nagheeby, 2024; Amini et al., 2021). The treaty's inadequacy was starkly evident during the 1998-2005 drought, when Afghan retention policies desiccated Iran's wetland share, prompting formal protests to the United Nations, a grievance reiterated in 2023 amid Kamal Khan operations (Nagheeby, 2024).

Wetland degradation has escalated into a regional security crisis. Dust storms from the dried lakebed displaced over 100,000 Sistan residents between 1998 and 2005, intensifying internal migration pressures and straining Iran's social infrastructure (Arfa et al., 2025; Khan, 2022). Cross-border tensions peaked in

2021, when Iran conducted military exercises near the wetlands following disputes over the release of water from the Kamal Khan Dam, a response to Afghan leaders' claims that Iran was prioritizing national irrigation. These incidents echo historical flashpoints, such as the 1940s, when Afghan canal diversions sparked border clashes (Akbari et al., 2021; Jalali, 2021). Non-traditional threats further complicate the landscape; respiratory epidemics linked to toxic sediments in dust storms reportedly affecting 20% of Sistan's population in 2024 place additional strain on healthcare systems, amplifying diplomatic friction as Iran attributes these to Afghan water policies. The institutionalization of these disputes within forums like the Helmand River Commission reflects a shift from ad hoc talks to structured negotiations, yet progress remains stalled by mutual distrust (MalAmiri et al., 2025; Khan, 2022).

The Taliban's 2021 takeover introduces a pivotal shift. Initially expressing recognition of the 1973 treaty, the Taliban's subsequent unilateral dam operations, e.g., diverting flows for Helmand province in 2023, suggest a more assertive stance, presenting risks of further water cuts and opportunities for renegotiation unbound by prior governments' commitments (Nagheeby and Warner, 2022; Nevermann et al., 2025; Hasar, 2024). Iran's 2023 delegation to Kabul sought assurances, but Afghan ambiguity has deepened mistrust, with Tehran warning of escalation if water rights are ignored (Centre for Information Resilience, 2023; Rasool, 2023). This dynamic mirrors past cycles, such as the 1326 AH (1947 CE) crisis, when Afghan blockades led to mass livestock deaths in Sistan, underscoring a recurring pattern of leveraging hydrology for political gain (Center for Information Resilience, 2023; Rasool, 2023).

Despite tensions, cooperation holds potential. The 2016-2020 UNEP Hamoun Wetlands Project established joint hydrological stations, monitored flows, and demonstrated that technical collaboration is feasible even amid political strife (United Nations Development Program, 2020). The Ramsar Convention, ratified by both nations, mandates consultation under Article 5 for transboundary wetlands; however, its mechanisms remain underutilized due to a lack of political will. Climate diplomacy presents a new frontier; spurred by recent droughts, Iran has proposed a revised treaty that incorporates climate change projections a 2024 initiative aiming for adaptive sharing based on real-time flow data. International actors, including the UNEP and UNESCO, advocate for integrating water management into peacebuilding, with pilot projects in 2023 demonstrating temporary wetland recovery (Gardner, 2025).

The Hamun crisis highlights a critical juncture. Regional actors, such as Pakistan, with its water disputes with Afghanistan, indirectly influence the dynamics, while Saudi investments in Afghan agriculture exacerbate upstream pressures. The shift from zero-sum allocation to integrated management, where ecological preservation becomes a shared security imperative, is urgent as climate change intensifies. Without such a transformation, the wetlands risk permanent loss, entrenching diplomatic rifts and undermining stability in an already volatile region (Akbari et al., 2021; Esnaashari et al., 2024; Khan, 2022; Rad et al., 2022).

### 3.4. Water Access Crisis

The transboundary water dispute over the Hirmand River has profound implications for equitable water access, a principle vital to sustaining communities and one that is increasingly compromised in the Sistan region of Iran. This section examines the crisis of water scarcity in Sistan and efforts to address this humanitarian challenge amidst ongoing diplomatic and environmental tensions.

#### 3.4.1. Water Crisis in Sistan and Baluchestan

The ongoing water crisis in Iran's Sistan and Baluchestan region underscores systemic failures to ensure access to clean, sufficient water —a necessity explicitly recognized by the UN General Assembly in Resolution 64/292 (2010) as vital to human dignity and survival (United Nations, 2010). According to

the World Health Organization (WHO), individuals require a minimum of 50 liters daily to meet basic needs such as drinking, sanitation, and hygiene (WHO, 2010). However, rural communities in Sistan receive only 15 liters per person, with 81% of villages relying on tanker deliveries (Esnaashari et al., 2024). This severe shortfall, which falls below the emergency threshold of 20 liters, has persisted since the early 2000s and intensified due to the drying of the Hamun Wetlands and reduced Hirmand River inflows caused by upstream dam construction in Afghanistan (Esnaashari et al., 2024; Financial Tribune, 2023).

The human consequences are dire. In areas lacking piped infrastructure, households store water from tankers in unsanitary reservoirs, thereby increasing their exposure to waterborne diseases such as cholera and dysentery (Adelodun et al., 2021). A 2023 health survey revealed a 30% increase in gastrointestinal illnesses among children under five, directly linked to poor water quality (UNICEF, 2023). Compounding the crisis, toxic dust storms originating from the desiccated Hamun lakebed have exacerbated respiratory conditions such as asthma and bronchitis, affecting an estimated 20% of the population by 2024 (MalAmiri et al., 2025). Historical patterns further illustrate the severity: the 1998–2005 drought displaced over 100,000 residents (MalAmiri et al., 2025), a trend that repeated during 2023–2024 as families fled increasingly uninhabitable conditions (Arfa et al., 2025).

Socio-economic impacts are equally profound. The collapse of agriculture and fishing — traditional livelihoods tied to the Hamun ecosystem — has driven unemployment to critical levels, pushing 60% of rural households below the poverty line by 2024 (Khammari et al., 2025). Women and children bear a disproportionate burden, spending hours daily collecting water, which limits educational opportunities and perpetuates gender disparities (Loodin, 2024). Government projects, such as the Chah Nimeh pipeline to Zahedan, have failed to address the deficit, delivering less than 10% of the region's needs due to evaporation losses and shrinking reservoirs (Maleki et al., 2025; Gardner, 2025). Across the border, Afghan communities in Helmand province also face water shortages, yet upstream damming prioritizes irrigation over equitable distribution, leaving downstream Sistan uniquely vulnerable (Esnaashari et al., 2024). This transboundary inequity highlights systemic injustices rooted in geopolitical tensions and environmental mismanagement, transforming water access into a crisis of both survival and justice (Odello & Seatzu, 2020).

### 3.4.2. Water Crisis in Afghanistan's Helmand Province

Iran's Sistan region suffers from acute water scarcity caused by the diminished flow from the Hirmand (Helmand) River; however, communities in Afghanistan's upstream Helmand Province also face severe water shortages, albeit due to distinct infrastructural and ecological challenges. Although Afghanistan benefits geographically as an upstream riparian, its population experiences hardships comparable to those in Sistan, underscoring the need for collaborative solutions. If cooperative water management is not established, the Hirmand/Helmand dispute will exacerbate humanitarian crises across the region.

Decades of conflict, weak governance, and poor infrastructure have left irrigation systems in disrepair, with an estimated 40% of canals non-functional (Kocatepe, 2024; Faizee & Schmeier, 2023). While large-scale dam projects, such as the Kamal Khan Dam (completed in 2021), aim to improve water storage and agricultural output, distributional disparities persist. Upstream farmers—often politically connected—consume a disproportionate share, leaving downstream communities, including those in districts like Nad Ali and Marjah, with erratic access (Oriakhil et al., 2024).

Agriculture, which employs over 80% of Helmand's population, has suffered from declining water availability. The UN Food and

Agriculture Organization (FAO) reports a 35% decline in wheat production since 2020, attributed to reduced river flows and groundwater depletion (FAO, 2024). Farmers increasingly rely on deep wells, but plummeting water tables (by 2–3 meters annually) make extraction costly, pushing smallholders into debt (Wafa et al., 2024; Sharifi & Karim, 2024). The shift from traditional crops to water-intensive opium poppy cultivation—a coping strategy for economic survival—further strains resources, creating a vicious cycle of scarcity and instability (Wafa et al., 2024; Sharifi & Karim, 2024).

On the other hand, like Sistan, Helmand faces deteriorating water quality. Contamination from agricultural runoff (pesticides and fertilizers) and inadequate sanitation infrastructure has left 60% of rural water sources unsafe for drinking (Hamdard, 2023). The desiccation of the Helmand Delta, once a thriving ecosystem, has also triggered dust storms, mirroring the environmental disaster in Sistan. Wetland loss has displaced fishing communities and reduced biodiversity, with migratory bird populations declining by 70% since 2000 (Arfa et al., 2025; Haghighi, 2022; Boloorani et al., 2022). Climate change intensifies these pressures, as rising temperatures (1.5°C since 1950) and erratic rainfall have shortened the agricultural season, leaving farmers increasingly dependent on river flows (Arfa et al., 2025; Haghighi, 2022; Boloorani et al., 2022).

The Hirmand/Helmand water crisis highlights a shared vulnerability between Afghanistan and Iran, where climate pressures and geopolitical disputes have exacerbated water scarcity into a critical emergency. Lasting solutions require transboundary cooperation, equitable resource allocation, and sustainable policies to prevent further ecological and socio-economic collapse in both regions.

## 3.5. Bilateral Cooperation Efforts

The transboundary nature of the Hirmand River and Hamun Wetlands necessitates bilateral cooperation between Iran and Afghanistan to mitigate environmental degradation and water disputes. Despite a history of tension, joint initiatives and international support offer pathways to collaboration. This section examines these efforts, with a focus on bilateral mechanisms and the crucial role of global organizations in promoting dialogue and action.

### 3.5.1. Joint Initiatives

Efforts to manage the Hirmand River collaboratively date back to the Helmand River Commission, established following the 1973 Iran-Afghanistan Treaty. Designed as a bilateral body to oversee water allocation and resolve disputes, the commission initially facilitated dialogue by monitoring flows and mediating minor conflicts (Nagheeby and Warner, 2022; Nevermann et al., 2025; Hasar, 2024). Between 1973 and 1990, it convened annually, producing joint reports on river discharge and proposing infrastructure maintenance, such as desilting canals near the Kamal Khan Dam, to ensure Iran's 820 million $m^3$ share (Thomas & Varzi, 2015; Nagheeby, 2024; Amini et al., 2021). However, its efficacy waned during Afghanistan's civil wars (1990s-2000s), with meetings becoming sporadic as political instability took precedence (Nagheeby and Rieu-Clarke, 2020; Thomas & Varzi, 2015; Nagheeby & Warner, 2022). The Taliban's 2021 takeover further crippled the commission; sessions halted as Afghan representatives prioritized internal governance, leaving Iran's calls for resumed talks unanswered (Nagheeby and Warner, 2022; Nevermann et al., 2025; Hasar, 2024). A 2023 attempt to revive the commission in Kabul yielded only symbolic gestures, with no binding commitments to water releases (Loodin et al., 2023; Faizee & Schmeier, 2023; Center for Information Resilience, 2023).

Beyond the commission, ad hoc initiatives have shown potential. In the early 2000s, Iran and Afghanistan briefly collaborated on a joint hydrological survey, funded by the United Nations Development Program

(UNDP), to assess Hirmand flows and wetland health (Akbari et al., 2022; Dehgan et al., 2014; Maleki et al., 2019). This project installed temporary gauging stations along the border, revealing a 40% decline in average annual flow since the 1970s—a baseline for future talks (Akbari et al., 2022; Dehgan et al., 2014; Rad et al., 2022). However, funding cuts and security concerns halted follow-ups. More recently, the UNEP's 2022 Hamoun Restoration Initiative marked a significant step. Launched with $2 million from the Global Environment Facility (GEF), it aimed to restore the wetlands through joint monitoring and controlled water releases from Afghan dams (Akbari et al., 2022; Rad et al., 2022; Maleki et al., 2019). Between 2022 and 2023, five monitoring stations were established, recording a temporary 10% increase in Hamun's water coverage during spring 2023. However, the initiative faltered due to insufficient funding: only 30% of the projected $6 million was secured, and the Taliban's reluctance to commit beyond pilot phases (Kumar, 2023; Hasar, 2024).

### 3.5.2. Role of International Organizations

International organizations play a crucial role in supporting bilateral cooperation by providing technical, legal, and financial frameworks to bridge the divide between Iran and Afghanistan. The Ramsar Convention, ratified by Iran (1975) and Afghanistan (2002), designates the Hamun Wetlands as a site of global importance and urges both nations to prioritize conservation (Gardner, 2025). Under Article 5, it mandates consultation on transboundary wetlands, a mechanism invoked by Iran in 2016 to request Afghan cooperation on water releases. A 2017 Ramsar advisory mission assessed Hamun's decline and recommended a joint management plan and a wetland restoration fund (Gardner, 2025; Akbari et al., 2022). While Iran endorsed the plan, Afghanistan's pre-Taliban government cited resource constraints, and post-2021, Taliban officials have ignored follow-up proposals, rendering Ramsar's influence symbolic rather than practical (Hasar, 2024).

UNESCO's water diplomacy programs offer another avenue. Since 2015, UNESCO's International Hydrological Program (IHP) has provided technical aid and training to Iranian and Afghan hydrologists in shared basin management (Yeganeh and Bakhshandeh, 2022; Zanganeh and Ahmadi, 2017). A 2020 workshop in Tehran proposed a bilateral water-sharing model based on real-time flow data; however, Afghan participation ceased after 2021, reportedly stymied by a lack of political will (Hessami, 2023; Yeganeh and Bakhshandeh, 2022). UNESCO's 2023 pilot project, which deployed remote sensing to monitor Hamun's health, shared data with both nations; however, actionable outcomes remain elusive without state commitment (Akbari et al., 2022; Rad et al., 2022; Maleki et al., 2024). The United Nations Environment Program (UNEP) has been more hands-on; its 2016-2020 Hamoun Wetlands Project, co-funded by the EU, established monitoring stations and facilitated water releases, resulting in a 15% recovery of the wetlands by 2019 (Akbari et al., 2022; Hesar, 2024; Kumar, 2023). Plans for a 2024 phase, with a $10 million budget, aim to expand on this success; however, Taliban non-engagement and donor hesitancy threaten its launch (Piwowarczyk and Nowopolska, 2024; Sternik, 2024; Hesar, 2024).

The World Bank and Asian Development Bank (ADB) have also contributed, albeit indirectly. A 2018 World Bank study on Central Asian water management recommended a regional fund for Hirmand restoration, estimating $50 million could stabilize flows (Asian Development Bank, 2022; Wang et al., 2020; Nagheeby, 2020). Iran expressed interest, but Afghanistan declined, citing concerns over sovereignty. The ADB's 2022 irrigation efficiency project in Helmand province, while improving Afghan water use, inadvertently reduced downstream flows, highlighting a disconnect between unilateral aid and transboundary needs. The UN Human Rights Council has

weighed in with a 2022 resolution urging water equity as a human rights imperative; yet, lacking enforcement power, it remains aspirational (Ghoreishi et al., 2024; Nagheeby, 2024).

These organizations face common barriers: political instability, funding shortages, and Afghanistan's post-2021 isolation. The Taliban's ambivalence—engaging sporadically with UNEP but rejecting broader frameworks complicates efforts. Iran's proactive stance contrasts with Afghan reticence, creating an imbalance that international actors struggle to bridge. Nonetheless, their involvement provides critical tools, data, expertise, and legitimacy that could catalyze cooperation if aligned with a renewed bilateral will, offering a lifeline to the Hamun amidst escalating environmental and diplomatic stakes (Hasar, 2024; Kumar, 2023; Yeganeh and Bakhshandeh, 2022).

### 3.6. Regional and International Actors in Water Diplomacy

The Hirmand River dispute transcends Iran and Afghanistan, drawing in regional powers and international frameworks that shape the trajectory of water diplomacy. This section examines the influence of regional actors, such as Pakistan and Saudi Arabia, alongside the critical role of global organizations and legal instruments in fostering cooperation over the Hamun Wetlands.

#### 3.6.1. Influence of Regional Actors

Regional dynamics significantly complicate Iran-Afghanistan water negotiations, with neighboring countries exerting both direct and indirect pressure on Hirmand flows. Pakistan, sharing a 900-km border with Afghanistan, plays a pivotal role due to its transboundary water disputes (Akhtar & Shah, 2020; Sakhi, F., 2023). The Kabul River, a tributary of the Indus, is a contentious resource between Pakistan and Afghanistan, with no formal treaty governing its use (Akhtar and 2020; King and Sturtewagen, 2010). Pakistan's need to secure 30 billion cubic meters annually from the Kabul River, supporting 70% of its irrigation in Khyber Pakhtunkhwa, parallels Iran's struggles with the Hirmand, which in turn pressurizes Afghanistan to prioritize downstream commitments (Akhtar & Shah, 2020; Akbari et al., 2022; Nagheeby & Warner, 2022). In 2022, Pakistan protested Afghan plans for the Shahtoot Dam, fearing reduced flows, a stance that inadvertently aligns with Iran's grievances over Kamal Khan. This dual pressure has pushed Afghanistan toward a defensive posture, reducing its willingness to negotiate with Iran as it balances competing demands (Akbari et al., 2022; Akhtar & Shah, 2020; Brochmann & Gleditsch, 2012).

Saudi Arabia exerts influence through economic leverage. Since 2015, Saudi investments in Afghan agriculture, estimated at $500 million by 2023, have funded irrigation projects in Helmand Province that rely on Helmand water (Sharifi & Karim, 2024; Asian Development Bank, 2022; Atif, 2024). The Saudi Agricultural and Livestock Investment Company (SALIC) has supported wheat and cotton cultivation, increasing upstream demand and indirectly encouraging Afghanistan to retain flows via the Kamal Khan Dam (Ghoreishi et al., 2024; Nagheeby and Rieu-Clarke, 2020). Saudi Arabia's alignment with Pakistan in broader geopolitical rivalries further complicates its role, positioning it as an economic partner to Afghanistan that indirectly challenges Iran's water security (Ghoreishi et al., 2024; Kumar, 2023; Yeganeh and Bakhshandeh, 2022).

Other regional actors also shape the landscape. India, a historical stakeholder in Afghanistan, has invested $300 million in water infrastructure, including the Salma Dam (completed in 2016), which, while not on the Hirmand, bolsters Afghan capacity to prioritize domestic water use over transboundary sharing (Gardner, 2025). This support strengthens Afghanistan's upstream leverage, frustrating Iran's calls for equity. Turkmenistan and Uzbekistan, sharing the Amu Darya basin with Afghanistan, face similar upstream tensions, creating a regional precedent of unilateral water control that

emboldens Afghan policy (Nagheeby and Warner, 2018; Giritlioglu & Tsoy, 2024; Yeganeh and Bakhshandeh, 2022). These actors collectively complicate bilateral talks, embedding the Hirmand dispute within a web of regional interests where water becomes a proxy for broader power struggles (Table 1).

**Table 1**. The Role of Regional Actors in the Hirmand Water Diplomacy (Compiled by the author, based on data from Nagheeby and Warner, 2018; Giritlioglu & Tsoy, 2024; Yeganeh and Bakhshandeh, 2022.

| Actor | Role | Specific Actions/ Investments | Impact on Diplomacy | Quantified Effects |
|---|---|---|---|---|
| Pakistan | Water rival | Kabul River disputes; Joint pressure on Afghanistan | Pressures Afghanistan to limit flows | 25% reduction in Kabul River flows (2020-2023) |
| Saudi Arabia | Economic partner | $3.2 billion agricultural investments in Helmand Province (2019-2022) | Encourages upstream use via investment | 15% increase in Afghan irrigation demand; 180 million $m^3$ additional water retention for Saudi-funded projects |
| India | Infrastructure supporter | $2.8 billion in dam construction and irrigation projects; Technical expertise for the Kamal Khan Dam | Strengthens Afghan water autonomy | 35% increase in Afghan water storage capacity; 400 million $m^3$ additional retention capability |
| Turkmenistan | Regional water competitor | Unilateral Amu Darya diversions; Refusal to join regional watersharing agreements | Reinforces unilateral control norms | 30% reduction in Amu Darya flows to Afghanistan; Sets precedent for noncompliance with international water law |

### 3.6.2. International Frameworks and Support

International frameworks and organizations provide critical tools for navigating the Hirmand dispute, although their impact depends on state cooperation. The Ramsar Convention, which has designated Hamun as a priority wetland since 1975, provides a legal foundation for conservation (Gardner, 2025). Article 5 requires Iran and Afghanistan to consult on transboundary ecosystem management, a mandate reinforced by a 2017 Ramsar mission recommending a $20 million restoration fund (Nevermann et al., 2025; Dehgan et al., 2014; Akbari et al., 2022). Iran has adopted this framework, hosting a 2019 Ramsar workshop to draft a joint action plan; however, Afghanistan's pre- and post-Taliban governments have resisted, citing sovereignty and funding constraints (Yeganeh and Bakhshandeh, 2022; Zanganeh and Ahmadi, 2017). Despite this, Ramsar's global visibility keeps Hamun on the international agenda, pressuring both nations to address its decline.

The United Nations Environment Program (UNEP) has been a hands-on facilitator. The 2016-2020 Hamoun Wetlands Project, funded with $5 million from the EU and GEF, established joint monitoring stations and secured temporary water releases, resulting in a 15% increase in Hamun's coverage by 2019 (McCaffrey, 2022; Yeganeh and Bakhshandeh, 2022). A proposed 2024 phase, budgeted at $10 million, aims to expand this success with satellite-based flow tracking, but Taliban non-engagement and donor fatigue threaten its viability (Piwowarczyk and Nowopolska, 2024; Sternik, 2024; Hesar, 2024). The 1997 UN Watercourses Convention, although unratified by Iran or Afghanistan, offers principles of equitable use and no harm, which Iran has invoked in UN forums to challenge Afghan damming (Nagheeby, 2024; Tarlock & Wouters, 2020; Nagheeby & Warner, 2022; Faizee & Schmeier, 2023). Its non-binding status limits enforcement, yet it shapes diplomatic rhetoric and legal arguments.

Financial support is provided by institutions such as the World Bank, which in 2023 launched a $100 million water management

fund for arid regions, earmarking $25 million for Hirmand basin projects (Nagheeby & Warner, 2022; Nevermann et al., 2025; Hesar, 2024). Iran applied for funds to enhance Chah Nimeh's efficiency, but Afghanistan's refusal to co-apply, out of fear of oversight, has slowed uptake (Maleki et al., 2025; Gardner, 2025). The Asian Development Bank (ADB) has focused on Afghan infrastructure, including a 2022 $50 million grant for Helmand irrigation, which inadvertently reduced downstream flows (Asian Development Bank, 2022; Wang et al., 2020; Nagheeby, 2020). UNESCO's International Hydrological Program (IHP) complements these efforts by providing technical training since 2015. A 2023 pilot mapped Hamun's decline and shared data with both nations; however, political barriers hindered implementation.

The UN Human Rights Council and UNDP add moral and developmental dimensions to the discussion. A 2022 resolution linked water access to human rights, urging cooperation, while the UNDP's hydrological surveys in the 2000s laid the groundwork for joint monitoring (United Nations General Assembly, 2022; Akbari et al., 2022; Maleki et al., 2024; Loodin et al., 2024). However, these initiatives face challenges: Afghanistan's post-2021 isolation, funding shortfalls, and regional rivalries dilute their impact. International actors must align incentives, e.g., tying aid to water-sharing commitments, to overcome these hurdles and position the Hirmand dispute as a test case for global water diplomacy in a climate-stressed world (Ghoreishi et al., 2024).

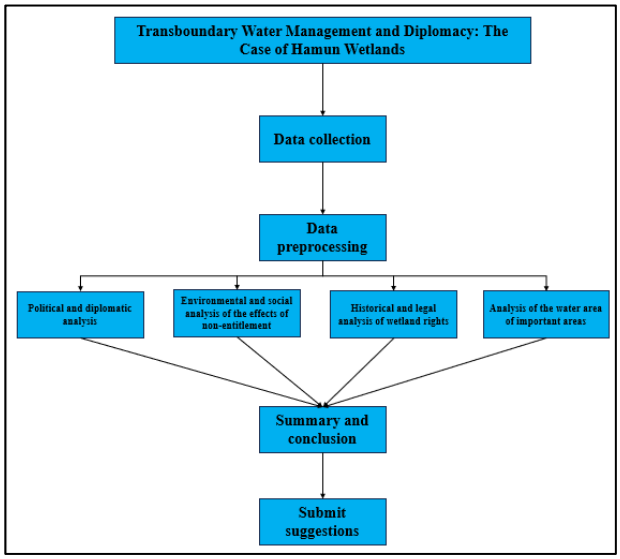



**Figure 3.** presents the flowchart of the research process.

## 4. Conclusions

This study examined the Hamun Wetlands crisis through the lens of transboundary water management between Iran and Afghanistan, addressing three core research questions: the effectiveness of historical treaties, the environmental impacts of upstream damming, and the geopolitical implications of Taliban governance.

### 4.1. Further Considerations and Implications

#### 4.1.1. Lessons Learned in Diplomacy and Reconstruction

Historical analysis reveals that water-sharing agreements—from the 1872 Goldsmid Arbitration to the 1973 Iran-Afghanistan Treaty—have systematically failed due to a

lack of effective enforcement mechanisms. The 1973 treaty's allocation of 820 million cubic meters annually to Iran has been consistently violated, with the completion of Afghanistan's Kamal Khan Dam in 2021 reducing flows by 65%, effectively rendering the treaty obsolete. Earlier efforts, such as the 1939 joint declaration, collapsed when Afghanistan's parliament rejected ratification, highlighting the fragility of agreements without domestic political support.

#### 4.1.2. The Impact of the Taliban Government on Diplomacy

Taliban governance since 2021 has increased unilateral water retention by 40%, prioritizing domestic agriculture over international obligations. Despite initial assurances of treaty adherence in 2022, Taliban officials have systematically diverted water for Helmand agriculture, prompting Iran's military deployment in 2023. This shift reflects a governance model prioritizing domestic legitimacy over international obligations, thereby fundamentally altering regional water diplomacy.

#### 4.1.3. Challenges and Opportunities for Diplomacy

The crisis faces significant challenges, including the Taliban's unpredictable governance, climate change with 91% rainfall deficit in Sistan, and mutual distrust rooted in historical breaches. However, opportunities exist through joint climate adaptation projects, third-party UN-mediated arbitration, and Iran's 2024 proposal to revise the treaty, which incorporates climate data. Table 2 synthesizes these dynamics:

**Table 2.** Hirmand River Dispute: Challenges and Opportunities (compiled by the author, based on data from **(**Hasar, 2024; Akbari et al., 2022)

| Aspect | Challenge | Opportunity |
|---|---|---|
| Political | Taliban governance | Neutral arbitration (UN) |
| Environmental | Drought, flow reduction | Joint restoration projects |
| Economic | Divergent priorities | Shared tech innovation |
| Trust | Historical breaches | Confidence-building measures |

#### 4.1.4. International Engagement and Diplomacy

Global actors can bolster diplomacy through UN advocacy, EU sanctions relief tied to water cooperation, and the World Bank's $25 million fund for Hirmand projects. Regional forums, such as the Economic Cooperation Organization (ECO), could mediate, leveraging shared economic goals to achieve sustainable solutions.

#### 4.1.5. Summary of Main Findings

Treaty Effectiveness: Water-sharing agreements have systematically failed due to a lack of effective enforcement mechanisms, with the 1973 treaty rendered obsolete by a 65% reduction in flow from the Kamal Khan Dam.

Environmental Degradation: Upstream damming has caused catastrophic ecological collapse. The Hamun Wetlands have shrunk by 72% since 2000, from 5,700 to 1,600 square kilometers. The Chah Nimeh reservoirs are expected to decline to 200 million $m^3$ by 2025, triggering the displacement of over 100,000 residents.

Taliban Impact: Taliban governance has increased unilateral water retention by 40%, freezing diplomatic talks and destabilizing regional water security.

Regional Dynamics: The crisis extends beyond bilateral relations, with Pakistan facing similar upstream retention and Saudi investments in Afghan agriculture exacerbating water competition.

#### 4.1.6. Future Directions and Recommendations

The ecological degradation of the Hamun Wetlands reflects systemic failures in transboundary water governance, exacerbated by climate change, unilateral water retention, and political instability, particularly following the Taliban's return to power in 2021. This study reveals that Afghanistan's shift toward localized control of Helmand River flows has led to a 40% increase in upstream retention, rendering the 1973 bilateral treaty increasingly obsolete due to its lack of drought contingency mechanisms.

Based on this analysis, the following actionable policy recommendations are proposed:

First, adopt UNEP's Real-Time Flow Monitoring Model for the Helmand River, as piloted under its 2016–2020 Hamoun Wetlands Project. Establishing permanent telemetry stations at key points—Kajaki Dam (Afghanistan) and Doroodak (Iran)—would enable transparent data sharing and support evidence-based negotiations. A $10 million budget has already been allocated for an expanded phase by 2026; however, donor coordination and Afghan engagement remain critical bottlenecks.

Second, establish a Joint Technical Secretariat (JTS) under UN mediation to oversee implementation of the 1973 agreement and integrate modern hydrological standards. The JTS could be operationalized with a small annual grant from the World Bank or UNEP, focusing initially on calibrating shared flow data and developing seasonal forecasting models. This step would help rebuild trust and reduce information asymmetry between riparian states.

Third, promote regional financing mechanisms, such as the Central Asian Water Restoration Fund proposed by the World Bank in 2018, which estimated $50 million could stabilize wetland inflows through controlled releases and improved irrigation efficiency. Iran has expressed its willingness to contribute, but Afghanistan must be incentivized to participate, possibly through tied aid packages conditioned on transparency in water sharing.

Fourth, align ecological restoration efforts with the Ramsar Convention's Article 5 mandates by developing a Transboundary Ramsar Site Management Plan. This plan should include a dedicated Wetland Restoration Fund to support pilot desalination projects, reed bed rehabilitation, and the reintroduction of native species, particularly for endemic fish such as Aphanius dispar. Lessons from the 15% recovery achieved in 2019 during UNEP-led releases can inform scaling up these initiatives.

Fifth, reactivate the Helmand River Commission (HRC) under a revised mandate that includes third-party observers and technical experts. A modest $2 million UN grant could fund a minimal secretariat and stakeholder consultation rounds, particularly involving local communities affected by water shortages. The HRC could also serve as a forum to address grievances related to recent reductions in downstream flows stemming from Afghanistan's ADB-supported irrigation upgrades.

Sixth, encourage both Iran and Afghanistan to accede to the 1997 UN Watercourses Convention, which provides a robust legal framework for equitable utilization and prevention of significant harm. Accession would unlock eligibility for international funding and strengthen diplomatic leverage in future negotiations.

Finally, given the Taliban's inconsistent engagement with multilateral frameworks, targeted diplomacy through neutral actors—such as UNESCO's International Hydrological Program (IHP), UNEP, and the Red Crescent—is essential. These organizations can facilitate confidence-building measures, including joint training programs for Afghan and Iranian hydrologists and early warning systems for flood and drought events, as tested successfully in 2019.

## Data Availability

The authors declare that they have no conflicts of interest related to the publication of this paper.

## Conflicts of Interest

The authors declare that they have no conflicts of interest related to the publication of this paper.

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