# Ciencias políticas

# Examining the Energy-Water Nexus in Hydroelectric Conflicts: A Global Analysis

## Los nexos entre energía y agua en los conflictos hidroeléctricos: Un análisis global

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**José Antonio Peña-Ramos***
japramos@ugr.es
**Miguel Borja Bernabé-Crespo****
miguelb.bernabe@uam.es
**Chiara Olivieri*****
olivieric@ugr.es



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Maestría en Historia
Acreditada en Alta Calidad
Universidad Tecnológica de Pereira

* Doctor por la Universidad de Granada, España (2009). Profesor Titular del Departamento de Ciencia Política y de la Administración, de dicha Universidad (2019-continúa). Miembro del Grupo de Investigación Ciencia Política y de la Administración SEJ 113 (Andalucía, España).
** Departamento de Geografía, Universidad Autónoma de Madrid. Doctor en Geografía por la Universidad de Murcia, con Mención Internacional y Sobresaliente Cum Laude por unanimidad
*** Doctora en estudios migratorios, actualmente investigadora posdoctoral en el departamento de Historia Contemporánea de la Universidad de Granada

**Abstract**

The 2030 Agenda objectives can be advanced through nonviolent means, with a focus on natural resources. However, hydroelectric power plants are often at the center of global disputes. This study investigates the role these facilities have played as sources of conflict from 1957 to 2018, as well as the conflicts themselves. The scope of our study is limited to freshwater-based energy systems and does not encompass conflicts related to water desalination, aquifers, or water transfers, nor does it include disputes over dams or reservoirs without power plants. The purpose of this article is to demonstrate how the production of hydroelectric energy has led to conflicts around the world. The findings reveal that these power stations have been targeted as a means of gaining control over territory, protecting national interests, accessing water in areas of scarcity, or simply as vulnerable targets.

**Keywords:** sustainability, hydroelectric power stations, strategy, water conflicts, energy production.

**Resumen**

Los objetivos de la Agenda 2030 pueden alcanzarse a través de medios no violentos, centrándose en los recursos naturales. Sin embargo, las centrales hidroeléctricas suelen estar en el centro de las disputas mundiales. Este estudio investiga el papel que han desempeñado estas instalaciones como fuentes de conflicto desde 1957 a 2018, así como los propios conflictos. El estudio se enfoca en sistemas de energía basados en el agua dulce, excluyendo conflictos relacionados con la desalinización del agua, acuíferos, transferencias de agua ni los conflictos por represas sin centrales eléctricas. El objetivo de este artículo es demostrar cómo la producción de energía hidroeléctrica ha provocado conflictos en todo el mundo. Los resultados revelan que estas centrales eléctricas han sido blanco de ataques para controlar el territorio, proteger intereses nacionales, acceder al agua en zonas de escasez o simplemente como objetivos vulnerables.

**Palabras clave:** sostenibilidad, centrales hidroeléctricas, estrategia, conflictos hídricos, producción de energía.

## 1. Introduction

Hydroelectric power is generated using water to produce electrical energy through hydraulic structures, including a dam, a reservoir, and a power station. Hydroelectric plants offer several advantages, such as low operating costs, long lifespan, and reservoirs that prevent dangerous river flooding. They also support other renewable energy sources. Hydroelectric energy is considered environmentally sustainable, as water is reusable. While freshwater systems, including hydroelectric power plants, are vital globally, most scientific research has focused on fossil fuels like oil and natural gas. However, recent studies have examined hydroelectric


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power plants in various regions worldwide, including the South Caucasus[1], Eastern Europe[2], and Central Asia[3], investigating their implications for the European Green Deal[4]. This paper aims to fill the gap in literature by examining conflicts arising from hydroelectric power plants between 1957 and 2018, limited to freshwater energy systems, and excluding disputes related to water desalination, aquifers, water transfers, dams, or reservoirs without power plants. The article highlights how hydroelectric energy production has led to global conflicts.

The hydropolitics literature encompasses several perspectives, including the water wars paradigm[5], legal conflict resolution and hydro-diplomacy[6], hydro-hegemony[7], and joint fact finding[8]. It is noteworthy that that these hydraulic structures are both strategic and vulnerable, and conflicts involving them are often handled with caution to avoid dam failure. However, in some cases, this vulnerability has been exploited as a means of wielding water as a weapon with devastating consequences[9].

Expected global warming impacts on water availability (e.g., reduced rainfall, irregular distribution, and increased snow melting) may escalate tensions among actors, leading to water conflicts viewed as the final stage of disputes that cannot be resolved peacefully. Urbanization and population growth exacerbate water scarcity, causing serious concerns among politicians[10] regarding both water supply for human consumption and hydroelectric power generation. Water is the main driving force behind military actions and territorial disputes, and populations in the driest areas are constantly threatened by wars over this resource. Although water scarcity is a critical factor for water and energy conflicts, inadequate infra-

1 José Antonio Peña, "The Impact of Russian Intervention in Post-Soviet Secessionist Conflict in the South Caucasus on Russian Geo-energy Interests," *International Journal of Conflict and Violence* 11 (2017): 1-13.

2 José Antonio Peña and Dmitry Sergeyevich, "The role of geo-energy interests of Russia in secessionist conflicts in Eastern Europe," *International Journal of Oil, Gas, and Coal Technology* 18 (2018): 485-511.

3 José Antonio Peña, "Russia's geo-energy interests and secessionist conflicts in Central Asia: Karakalpakstan and Gorno-Badakhshan," *International Journal of Oil, Gas, and Coal Technology* 27, no. 4 (2021): 399-423.

4 José Antonio Peña, Philipp Bagus, and Dmitri Amirov-Belova, "The North Caucasus Region as a Blind Spot in the European Green Deal: Energy Supply Security and Energy Super-power Russia," *Energies* 14, no. 1 (2021): 17.

5 Thomas F. Homer-Dixon, "On the Threshold: Environment Changes as Causes of Acute Conflict," *International Security* 16, no. 2 (1991): 76-116.

6 Susanne Schmeier, *The Organizational Structure of River Basin Organizations: Lessons Learned and Recommendations for the Mekong River Commission (MRC)* (Vientiane: Laos, 2010). Susanne Schmeier, *Resilience to Climate Change Induced Challenges in the Mekong River Basin: The Role of the Mekong River Commission (MRC)* (Washington, D. C.: World Bank, 2011).

7 Mark Zeitoun and Jeroen Warner, "Hydro-hegemony—A framework for analysis of trans-boundary water conflicts," *Water Policy* 8, no. 5 (2006): 435–460. Kai Wegerich, "Hydro-hegemony in the Amu Darya Basin," *Water Policy* 10, no. S2 (2008): 71–88.

8 Peter Haas, *Saving the Mediterranean: The Politics of International Environmental Cooperation* (USA, 2008). Victor A. Dukhovny and Joop De Schutter, *Water in Central Asia: Past, Present, Future* (Abingdon, 2011).

9 Peter H. Gleick, „Water and Terrorism," *Water Policy* 8, no. 6 (2006): 481-503.

10 Miguel Borja Bernabé, María Luz Tudela, y José María Gómez, "Water Supply Management in a Semi-arid Region: Analysis of Potable Water Consumption in Campo de Cartagena – Mar Menor, Southeastern Spain (2010–2019)," *Boletín de la Asociación Española de Geografía* 88 (2021): 1-34. Miguel Borja Bernabé, *Los Canales del agua: abastecimiento y saneamiento en la comarca del Campo de Cartagena – Mar Menor* (Madrid: Ministerio para la Transición Ecológica y Mancomunidad de Canales del Taibilla, 2020).

structure development can make energy production sites a matter of national interest, often contested by neighboring countries[11], implying that conflicts are not limited to developing nations. In countries with an abundance of water and energy resources, new sources of water and alternative energy sources are explored to tackle potential shortages[12]. However, in developing nations, the dependence on natural systems for water consumption and energy production increases the risk of conflicts. The construction of hydroelectric energy production infrastructures such as dams and power plants poses hazards during wars, endangering surrounding areas. Thus, considering potential risks and planning accordingly is crucial for preventing conflicts over water and energy.

In conclusion, hydroelectric power stations and freshwater systems play a strategic role in different regions of the world, and their importance has led to conflicts over energy production and water availability. As water scarcity and energy needs increase, the risk of conflicts over these resources becomes more prevalent, particularly in developing countries. However, the use of hydro-diplomacy, or the negotiation of water and energy management at various levels, can help balance the needs of different actors and avoid conflicts. History has shown that cooperation and dialogue can be encouraged through the management of water resources, making it a more effective alternative to conflict.

Joint fact finding is considered a key component of hydro-diplomacy as it supports the development of effective and sustainable agreements on water and energy management, reducing the risk of conflicts and promoting cooperation among nations.

'Hydro-hegemony is hegemony at the river basin level, achieved through water resource control strategies such as resource capture, integration and containment'[13]. Strategies to address power imbalances between neighboring nations can be applied. The 2030 Agenda Sustainable Development Goals focus on fair access to natural resources for all. Identifying potential sources of tension is crucial for success. Hydroelectric plants play a vital role, especially in a changing climate with reduced water and increased pressure on resources. The outcome of the water struggle is determined by hydro-hegemony, which often favors the strongest party. This article examines the role of hydroelectric power stations in conflicts from 1957-2018 and provides conclusions on the impact of the water-energy nexus.

This article is structured as follows: Section 2 provides an overview of the materials and methods used in this research, including a review of relevant literature and the meth-

11 Miguel Borja Bernabé and José Antonio Peña, "The Management of Water Resources in a Disputed Border: The Case of Gazivoda Reservoir (Kosovo)," *Fronteiras: Journal of Social, Technological and Environmental Science* 8, no. 1 (2019): 319-340. Miguel Borja Bernabé, "La Partición de Kosovo: ¿Redibujar Fronteras para Conseguir la Paz?," *Documents d'Anàlisi Geogràfica* 67, no. 2 (2021): 189-218. José Antonio Peña and Fernando Ramírez-De Luis, "Past, Present, and Future Conflicts over Freshwater," *The International Journal of Environmental Sustainability* 17, no. 1 (2021): 1-13.

12 Miguel Borja Bernabé, Encarnación Gil, and José María Gómez, "Desalination and Water Security in Southeastern Spain," *Journal of Political Ecology* 26, no. 1 (2019): 486-499. Miguel Borja Bernabé, Jorge Olcina, and Agustín Lahora, "Examining the Implementation of Potable Water Reuse in Sewersheds of Southeastern Spain," *Urban Water Journal* 19, no. 6 (2022): 629-640.

13 Zeitoun and Warner, "Hydro-hegemony…", 435.


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odology for identifying and analyzing the selected conflicts. Section 3 presents the results, where we chronologically describe and analyze the selected case studies of hydroelectric power-related conflicts from 1957 to 2018. In Section 4, we discuss the broader implications of these findings, focusing on the role of water scarcity and energy needs in exacerbating these conflicts. Finally, Section 5 concludes with a discussion on the potential for hydro-diplomacy and cooperative management of water and energy resources, aligning with the objectives of the 2030 Agenda for Sustainable Development and proposing future directions for research and policy-making.

## 2. Materials and Methods

The approach is primarily qualitative and interpretive, with a focus on reviewing and analyzing relevant literature in the field. The main method involves identifying key sources and specialists in the field and gathering information from books, articles, interviews, and specialized journals, and newspapers. Secondary sources have been essential in acquiring knowledge accumulated by established academics and experts. The legal norms mentioned have been sourced from official gazettes.

The Pacific Institute maintains a comprehensive Water Conflict Chronology that tracks 926 global conflicts related to freshwater that have occurred over the last 5,000 years. The Chronology is frequently updated and reviewed. The focus of this article is on conflicts that took place in the 20th and 21st centuries, covering the period from 1957 to 2018. The Pacific Institute's President Emeritus, Peter Gleick, is a renowned expert in the field of water wars and hydropolitics, so this article is framed within his school of thought, and aims to analyze the role of hydroelectric power stations.

The Pacific Institute categorizes these conflicts into three types:

a) Trigger: Water disputes or scarcity lead to conflict.

b) Weapon: Water resources or systems are used as a tool in conflict.

c) Casualty: Water resources or systems are unintended targets of violence.

In this study, we will cover the three conflict categories defined by the Pacific Institute. According to their definition, a conflict occurs when there is violence or threat of violence, but we will not include unintentional impacts on communities caused by water management.

The Pacific Institute's Water Conflict Chronology covers incidents from 1957 to 2018 involving hydroelectric power plants or aspects connected to their operations, inputs, and outputs. This comprehensive chronology even considers attacks on hydropower facilities in Western and Eastern Europe during World War II[14], like the Dnieper hydropower plant in Ukraine[15], which was targeted by both Soviet and German forces.

14 L.K. Malik, *Factors of Risk of Hydrotechnical Buildings Damage: Problems of Safety - Факторы риска повреждения гидротехнических сооружений: Проблемы безопасности* (Moscow, 2005).

15 Makarov, *To Look in the Shameless Eyes of Officials!* - Взглянуть в бесстыжие глаза чиновника!, http://

However, this paper excludes World War II conflicts. Additionally, we will not consider disputes arising from the construction of hydroelectric power plants or its components that have caused conflict between state or sub-state authorities and local communities, environmental groups or internal conflict between local communities for environmental or socio-economic reasons like labor, agriculture, and population displacement. Conflicts linked to indigenism with undefined political motivations will also be excluded.

For this analysis, we omit conflicts not directly tied to hydroelectric power generation and its elements, as outlined in the Pacific Institute chronology, will be omitted. This includes conflicts related to factors in the operating cycle, inputs, and outputs of hydroelectric power plants, but not explicitly stated. In addition, conflicts arising from energy systems utilizing hydroelectric energy outside of power plants and other infrastructure unrelated to water-generated energy, such as other power plants, water supply systems, and distribution systems, will also be disregarded.

We will focus solely on the conflicts directly linked to hydroelectric plants or elements that make them up, or with their operating cycle and inputs/outputs, as listed in the Water Conflict Chronology. This includes conflicts between states, states and non-state actors (ethnic groups, armed organizations, etc.), and between non-state actors for various reasons (geopolitical, ideological, religious, etc.). We will also include conflicts of unknown or unclear motivation and attacks on hydroelectric plants that aren't claimed by any group.

The study will encompass twenty-seven conflicts, ranging from 1957 to 2018. The research on conflict potential started during the era of decolonization. The conflicts covered in this paper have not been thoroughly examined and this study aims to examine each conflict independently. To date, the destabilizing impact of these conflicts has not been deeply analyzed.

The study of conflicts over natural resources, particularly water, has received attention in scientific literature. However, despite the numerous conflicts that have arisen over hydroelectric power stations in less than 60 years, there is a lack of focus on the direct connection between these conflicts and the power stations themselves. Additionally, a thorough and organized examination of the origins and progression of these conflicts has yet to be achieved. This paper aims to address these gaps in the literature.

The article aims to analyze and highlight the role of hydroelectric power plants in conflicts, focusing on their qualitative impact, rather than quantifying it through statistical analysis. The study is based on the Pacific Institute chronology, which classifies these conflicts as water-related. The research question asks what was the real conflict-generating capacity of hydroelectric power stations, due to their strategic value resulting from unequal distribution of water, from 1962 to 2018. The hypothesis is that hydroelectric power stations were elements

www.whp057.narod.ru/nikopol1-st1.htm, last accessed November 24, 2020. Pagan, "Catastrophic Dam Failures," http://cenews.com/magazine-article-cenews.com-december-2005-catastrophic_dam_failures-4617.html, last accessed November 24, 2020. Axis History Forum, "Dnieper Dam Blown up by Retreating Russians," http://forum.axishistory.com/viewtopic.php?f=55&t=52940, last accessed November 24, 2020. The New York Times. "Act Laid to Stalin: Razing of Dam Reported Ordered to Bar Nazis' Path with Flood." August 21, 1941.


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of great strategic value due to the unequal regional distribution of water and energy, leading to a high conflict-generating capacity in the world from 1957 to 2018.

## 3. Results

We will chronologically describe and analyze the conflicts below.

### 3.1. Kaptai Dam: Struggle and Displacement of Jumma People in Eastern Pakistan (1957)

The Chittagong Hills Tract (CHT) in Bangladesh is inhabited by various tribes collectively called the 'Jumma people.' The Jumma include the Bawm, Chak, Chakma, Khumi, Khyang, Lushai, Marma, Mro, Pankhua, Tanchangya, and Tripura. They are mostly followers of Buddhism and are of Sino-Tibetan origin. Tensions between Bengalis and indigenous peoples in the CHT have a long history, starting with the signing of the CHT 1900 Act during British rule, which granted the territory broad autonomy[16].

The East Pakistan government did not recognize the identity of indigenous tribes and prioritized national development projects, which excluded them. The construction of the Kaptai hydroelectric dam in 1957 was initiated by the Bengali-ruling government, leading to protests by the Chakma Raja (the CHT's king), regional leaders, and students, who were eventually imprisoned[17]. Completed in 1962, the dam flooded 40% of the CHT's arable land, forcing over 100,000 people to migrate, mostly Chakma[18].

Despite generating electricity, the dam failed to provide electricity to CHT's villages[19]. Compensation was inadequate, and about 40,000 Chakmas fled to India, where they remain stateless refugees vulnerable to eviction. Involuntary displacement resulted in economic, food, health, environmental, and political insecurity[20]. The 1979 national-led migration program accelerated Bengali migration and indigenous relocation[21]. The Jumma people's population in the CHT decreased from 98% in 1941 to 51% in 2003 due to relocation[22]. The relocation aimed to isolate the Jumma nationalist armed resistance by clustering indigenous peoples in

16 Iqthyer U. M. Zahed, "Conflict between Government and the Indigenous People of Chittagong Hill Tracts in Bangladesh," *Journal of Humanities and Social Science* 16, no. 5 (2013): 97-102.

17 Arun K. Nayak, "Development Induced Displacement and Arms Conflicts in Bangladesh," *Conflict Studies Quarterly* 11 (2015): 3-23.

18 Syed A. Husain, *War and Peace in the Chittagong Hill Tracts: Retrospect and Prospect* (Dhaka, 1999).

19 Mohammad S. Ullah, M. Shamsuddoha, and Mohammad Shahjahan, "The Viability of the Chittagong Hill Tracts as a Destination for Climate-displaced Communities in Bangladesh," in *Land Solutions for Climate Displacement*, edited by Scott Leckie (New York, 2014), 195-227.

20 Arun K. Nayak, "Involuntary Displacement and Human Security: A Study of the Kaptai Dam in Bangladesh," *Jadavpur Journal of International Relations* 23, no. 2 (2019): 199-231.

21 Ala Uddin, "Dynamics of Strategies for Survival of the Indigenous People in Southeastern Bangladesh," *Ethnopolitics* 15, no. 3 (2016): 319-338.

22 Mohammad F. Salam and Hajera Aktar, "Ethnic Problems in Bangladesh: A Study of Chittagong Hill Tracts," *SUST Journal of Social Sciences* 22, no. 2 (2014): 53-63.

villages[23]. Building the Kaptai dam and amending the CHT Regulation 1900 Act led to ethnic conflict and human rights violations, including massacres, disappearances, rape, torture, and religious persecution[24]. Indigenous guerrillas retaliated with violence, resulting in thousands of deaths, including the notorious Kaukhali massacre[25]. This has been interpreted as ethnocide, driven by nation-building and minority autonomy struggles[26].

In 1990, a commission investigated the conflict in CHT, with testimonies revealing the horrors of the conflict[27]. A peace treaty was signed in 1997, but the situation remains insecure for indigenous people due to intra-group conflicts, economic decline, and poor healthcare and education sectors[28]. The Chakma people continue to suffer from trauma, and efforts must be made to ensure peace and respect for human rights to prevent future conflicts.

### 3.2. South African Troops Occupied Ruacana / Calueque Complex in the Border With Angola (1975)

Ruacana hydroelectric plant is situated in Calueque dam, which stores water coming from Kunene River, in the border between Namibia and Angola. Controversy begins as although Ruacana power plant lies in Namibia, a complex of other several dams are located upstream in Angola, including Gove Dam (whose construction was completed in 1975, and its power station construction had to stop due to the civil war). The scheme of the Calueque/Ruacana infrastructure was signed between Portugal and South Africa in 1969, funded mainly by the latter. It was supposed to generate enough power to meet all Namibian demands[29], so it was of great strategic importance for South Africa, and it was occupied by its troops during the Angola civil war in 1975 when this country became fully independent[30]. In 1977, Angolans closed the sluices on the dam and refused to allow the ongoing construction of the rest of the

23 Papri Chakraborty, "Chakma or Jumma People and Partition: The Case of Perennial Victimhood," *Research Review International Journal of Multidisciplinary* 4, no. 3 (2019): 1553-1561.

24 Nasir Uddin, "Politics of Cultural Difference: Identity and Marginality in the Chittagong Hill Tracts of Bangladesh," *South Asian Survey* 17, no. 2 (2010): 283-294. Jenneke Arens, "Genocide in the Chittagong Hill Tracts, Bangladesh," in *Genocide of Indigenous Peoples: A Critical Bibliographic Review*, edited by Samuel Totten and Robert K. Hitchcock (New Brunswick, 2011), 117-142.

25 Nayak, ""Development Induced Displacement and Arms Conflicts in Bangladesh,"; Arens, "Genocide in the Chittagong Hill Tracts, Bangladesh".

26 Bhumitra Chakma, "The Post-colonial State and Minorities: Ethnocide in the Chittagong Hill Tracts, Bangladesh," *Commonwealth & Comparative Politics* 48, no. 3 (2010): 281-300.

27 Chittagong Hill Tracts Commission, *Life is Not Ours: Land and Human Rights in the Chittagong Hill Tracts Bangladesh*, http://chtcommission.org/Life-is-not-ours-19911.pdf, last accessed June 26, 2021.

28 Pranab K. Panday and Ishtiaq Jamil, "Conflict in the Chittagong Hill Tracts of Bangladesh: An Unimplemented Accord and Continued Violence," *Asian Survey* 49, no. 6 (2009): 1052-1070.

29 Christopher Saunders, "The South Africa-Angola Talks, 1976-1984: A Little-known Cold War Thread," *Kronos* 37, no. 1 (2011): 104-119.

30 Hilton Hamann, *Days of the Generals* (New Holland Publishers, 2001). Richard Meissner, "Hydropolitical Hotspots in Southern Africa: Will There Be a Water War? The Case of the Kunene River," in *Water Wars: Enduring Myth or Impending Reality?*, ed. Helen Salomon and Anthony Turton, Africa Dialogue Monograph Series, no. 2 (Umhlanga Rocks, 2000).


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Calueque dam and left Ruacana useless[31]. After intense negotiations, Angolans stated that they would cooperate in the Ruacana/Calueque infrastructure only if South Africa did not help UNITA.

### 3.3. Cahora Bassa Dam Attacked During Mozambican Civil War (1976)

Cahora Bassa, a hydroelectric dam located in Mozambique on the Zambezi River, was constructed by the Portuguese colonial government in 1974 with the aim of producing energy primarily for South Africa. Despite generating power, the project caused environmental and social damages, including forcing the native population to move without compensation[32]. During the Mozambican Civil War, the power lines were sabotaged for years by RENAMO, which affected hundreds of thousands of residents and paralyzed the hydroelectric project[33]. Cahora Bassa was strategically important, seen as a battle against the African National Congress and preventing attacks on colonial areas[34]. Today, it is the largest dam in Southern Africa and supplies almost 100% of Mozambique's electricity, with potential to supply neighboring countries[35].

### 3.4. Puerto Rican Nationalists Bomb a Hydroelectrical Substation (1978)

The FALN (Armed Forces of National Liberation, Fuerzas Armadas de Liberación Nacional) was an armed group seeking the independence of Puerto Rico from the USA, born in the merge of two movements, the Armed Commandos of Liberation (Comandos Armados de Liberación) and the Armed Independence Revolutionary Movement (Movie-miento de Independencia Revolucionario en Armas), which had been active between 1969 and 1971. FALN started its attacks in 1974 by fire-bombing banks in New York. Sater[36] identifies other seven terrorist Puerto Rican groups, with deadly attacks and threats to energetic installations such as nuclear reactors, considering the Macheteros terrorist group the most dangerous as they even destroyed nine jet fighter planes in 1981. In 1974, pipes carrying water to two refineries on the south coast were also blown up. WWC also relates that these terrorist groups were responsible for the bombing in 1978 of a substation owned by the Water Resource Authority, what left 30,000 people in San Juan without electricity[37].

31 Saunders, "The South Africa-Angola Talks, 1976-1984: A Little-known Cold War Thread,".

32 Alan Isaacman and Chris Sneddon, "Toward a Social and Environmental History of the Building of Cahora Bassa Dam," *Journal of Southern African Studies* 26, no. 4 (2000): 597-632. Alan Isaacman, "Domesticating a White Elephant: Sustainability and Struggles over Water, the Case of Cahora Bassa Dam," *Zambezia* 28, no. 2 (2001): 199-228.

33 Munyaradzi Chenje, "Hydro-politics and the Quest of the Zambezi River Basin Organization," in *International Waters in Southern Africa*, edited by Mikiyasu Nakayama (Tokyo, 2001), 189-208.

34 Alan Isaacman and Barbara Isaacman, "Extending South Africa's Tentacles of Empire: The Deterritorialisation of Cahora Bassa Dam," *Journal of Southern African Studies* 41, no. 3 (2015): 541-560.

35 Germano Vera, "Mozambique Assumes Control of Cahora Bassa," *IOL*, https://web.archive.org/web/20090208193312/http://www.iol.co.za/index.php?art_id=nw20071125231516168C318774, last accessed November 20, 2020.

36 William F. Sater, *Puerto Rican Terrorists: A Possible Threat to U.S. Energy Installations?* (Santa Monica, 1981).

37 Christopher Hewitt, *Political Violence and Terrorism in Modern America: A Chronology* (Praeger Security In-

### 3.5. Iraqi Hydroelectric Plant is Bombed by Iranian Forces (1981)

Iran claimed to have bombed a hydroelectric plant in Iraq's Kurdistan, destroying 50% of the turbines and 70% of the transformers. According to Bass, Iranian warplanes bombed four hydroelectric plants indeed on October 2, 1981[38], in retaliation for Iraqi attacks on civilian targets near the oil complex of Abadan. Iranian sources stated that the attacks caused extensive damages, although US estimated that it did not affect Iraq's power-generating capabilities as each installation counted on a backup system[39].

### 3.6. Rising Tensions as North Korea Builds Kumgang San Dam (1986)

In 1986, North Korea proposed a hydroelectric dam on the Han River's northern tributary, alarming South Korea. The 'water bomb' could hold over 20,000 million tons of water, risking flooding during the 1988 Seoul Olympics. If the dam were to burst, Seoul could be submerged, leaving the country vulnerable to attacks, including US military troops along the DMZ. Although no evidence of North Korea using water as a weapon was found, South Korea organized mass rallies and called for the dam's cessation.

General Lee threatened 'self-defensive measures,' while South Korea's Minister of Construction proposed building the 'Peace Dam' for $700 million. North Korea argued the dam would hold only 2,624 million tons of water[40]. The dam's construction impacted downstream flow, hydroelectric power generation, agriculture, industry, and drinking water availability[41]. South Korea called for joint talks to address these issues and overcome tensions[42].

### 3.7. Cuban Troops in Angola Destroy Ruhakana/Calueque Dam Against South Africans (1988)

Following the ongoing tensions between Angola and South Africa over the control of Calueque/Ruacana, South Africa occupied a portion of Southern Angola including this dam and power station, in 1981. By 1985, although South African troops were retiring from Angola, 60 men remained at Calueque pumping station[43].

ternational, 2005). Pacific Institute, "Water Conflict Chronology." https://www.worldwater.org/water-conflict/, accessed June 26, 2021. National Consortium for the Study of Terrorism and Responses to Terrorism (START), "Global Terrorism Database." https://www.start.umd.edu/gtd, accessed, June 20, 2022.

38 Gail Bass, Actions Against Nonnuclear Energy Facilities: September 1981 - September 1982 (Santa Monica, 1983).

39 Peter H. Gleick, "Water and Conflict: Fresh Water Resources and International Security," *International Security* 18, no. 1 (1993): 5-40.

40 Yates, "Seoul Fears N. Korea Will Wage Water War" (Chicago: Tribune).

41 Gwanjae Lee et al., "The Effect of Reduced Flow on Downstream Water Systems Due to the Kumgangsan Dam Under Dry Conditions," *Water,* 11, no. 4 (2019): 739. Christopher Torchia, "River's Flow Raises Tensions Between Koreas," *Los Angeles Times,* https://www.latimes.com/archives/la-xpm-2001-aug-26-mn-38396-story.html, accessed August 26, 2021.

42 Torchia, "River's Flow Raises Tensions Between Koreas,".

43 Meissner, "Hydropolitical Hotspots in Southern Africa: Will There Be a Water War? The Case of the Kunene


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In July 1988, Cuban troops intervening in Angola launched attacks with SAM-6 air defense missiles against South Africans in the north of the dam. Cubans bombed the bridge, sluice gates of the dam, pump, generator and even the pipe to the town of Ovamboland[44]. This included the killing of several South African soldiers and the inoperability of the dam. After the defeat at Calueque dam, South Africa agreed to a set of Principles on their withdrawal from Angola and Namibia[45]. Nowadays, Ruacana is the largest electricity station in Namibia, which generates almost half of the total generation[46].

### 3.8. Us Destroys Four Iraqi Hydroelectric Plants Amid Gulf War (1991)

During the Gulf war in 1991, the US destroyed four out of five Iraq's hydro-electric facilities: the Saddam and Haditha dams in the first days of the war, and the Samarra and Dokhan dams in early February. Level damage was estimated at 75-100%[47]. It affected greatly its electrical power system with the goal of isolating and incapacitating the regime. According to the Ahtisaari[48] report, 30% of Iraq's electric power was generated by hydroelectric facilities and. In 1987, Iraq became the first country in the region to export electric power to Turkey and planned to Kuwait[49]. The allied bombing paralyzed oil and electricity sectors, resulting that electricity being supplied at only 23% of the pre-war level. The Samarra and Dokhan dam attacks are more controversial as at the time of their attacks, 75% of Iraq's electrical-generating facilities had been already destroyed. One of the reasons may be to put pressure on the Iraqi population to oust Saddam Hussein, as one Air Force planner admitted.

### 3.9. Hydroelectric Station Attacked Amid Moldovan Civil War (1992)

During USSR disintegration, Moldavian SSR declared independence as the new Republic of Moldova within its previous borders, including the territory of Transnistria[50]. Fearing a unification with Romania, Transnistria declared independence from Moldova, in an at-tempt to maintain USSR structures and more ties to Russia, as this was the main language and ethnic composition of this thin area. Transnistrian war started in 1990 between the rebels and the Moldovan forces, with clashes at Dubasari and provoking a 'civil war' in 1992. Transnistrian

River,".

44 Edward George, *The Cuban Intervention in Angola, 1965-1991: From Che Guevara to Cuito Cuanavale* (London, 2005).

45 Horace Campbell, "The Siege of Cuito Cuanavale," *Current African Issues* 10 (1990): 1-30.

46 ESI Africa, "Namibia: NamPower Boosts Ruacana Power Station," *ESI Africa,* https://www.esi-africa.com/industry-sectors/generation/namibia-nampower-boosts-ruacana-power-station/, accessed June 30, 2021.

47 Human Rights Watch, *Needless Deaths in the Gulf War: Civilian Casualties during the Air Campaign and Violations of the Laws of War* (New York, 1991).

48 Ahtisaari Report, *Report to the Secretary-General on Humanitarian Needs in Kuwait and Iraq in the Immediate Post-Crisis Environment by a Mission to the Area Led by Mr. Marti Ahtisaari, Under-Secretary-General for Administration and Management* (New York, 1991).

49 Human Rights Watch, *Needless*…

50 Miguel Borja Bernabé-Crespo. "Geographical analysis for conflict prevention: Moldova, focus of geopolitical tension." *Boletín de la Asociación Española de Geografía* 90 (2021): 1-35.

rebels relied on Moscow's support and the XIV Army, of Soviet descend, that remained there, and other volunteers such as Cossacks. Dubasari was one of the hotspots as it was a strategic crossroad along the Dniester River and the presence of a hydroelectric station. Pacific Institute's Water Conflict Chronology includes that in June 1992, the turbines of the hydroelectric dam at the Dubasari power station were also attacked[51]. Peacekeepers eventually guarded the dam, but Transnistrian authorities built a checkpoint on the bridge across Dniester River in 2005.

### 3.10. Yugoslavian Army Blow Up Peruča Dam in Croatia (1993)

Lake Peruča is Croatia's second-largest artificial lake, located south of Knin where battles were fought during the Croatian War of Independence after Yugoslavia's dissolution. Built in 1958, the dam provided a hydroelectric power system, securing energy supply[52]. In 1992, the Security Council established the third enlargement of UNPROFOR, responsible for monitoring the demilitarization of the Prevlaka peninsula and controlling the Peruča dam.

Although UN peacekeepers controlled the dam after shelling in August and September 1991, the Croats launched Operation Maslenica in 1993, breaking a year-long truce and forcing UN peacekeepers to withdraw[53]. The Yugoslav Army intentionally blew up the dam, flooding Croat villages downstream, with millions of gallons of water pouring from a 200-foot height, causing heavy damage to the power station[54]. United Nations Protection Force's officer Mark N. Gray prevented total collapse by reducing dam levels through water release[55]. Repair works were not completed until 1996.

### 3.11. Ugandan Troops Attack Inga Dams in Congo (1998)

The Congo War led to Kabila's rise to power in May 1997, and was intertwined with other conflicts such as the Angolan and Sudanese civil wars, ultimately becoming a regional conflict involving Rwanda, Uganda, Angola, Namibia, Zimbabwe, and Chad[56]. Rebels opposing Kabi-

51 Malik, *Factors…*; Nataliya Belitser et al., *Transnistrian problem: A view from Ukraine*, Kiev, 2009.

52 UNPROFOR. "Former Yugoslavia – UNPROFOR." Department of Public Information, United Nations, September, 1996. https://peacekeeping.un.org/sites/default/files/past/unprof_b.htm

last accessed May 10, 2023.

53 Laura Pitter, "Croatia fighting spreads to dam, forcing U.N. troops to withdraw." *UPI*, https://www.upi.com/Archives/1993/01/28/Croatia-fighting-spreads-to-dam-forcing-UN-troops-to-withdraw/8073728197200/, last accessed May 10, 2023.

54 Gleick, "Water and Conflict: Fresh Water Resources and International Security,"; Pacific Institute, "Water Conflict Chronology"; E. Rathfelder, "Dangerous forces: Dams, dikes, and nuclear stations," in *Crimes of War* (West Sussex, 2007), 391-250.

55 Ervin Nonveiller, Josip Rupčić, y Zvonimir Sever, "War Damages and Reconstruction of Peruća Dam," *Journal of Geotechnical and Geoenvironmental Engineering* 125, no. 4 (1999): 280

56 Filip Reyntjens, "Briefing: The Second Congo War: More than a remake," *African Affairs* 98, no. 391 (1999): 241-250. John F. Clark, *The African Stakes of the Congo War* (New York, 2002). Chenje, "Hydro-politics and the Quest of the Zambezi River Basin Organization," Marcel Kitissou et al., *The Hydropolitics of Africa: A Con-*


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la, including the Rwandan Patriotic Army and Ugandan Peoples Defence Force, took control of the southwestern coast in August 1998, including the Inga dams - Kinshasa's main source of electricity. Inga I and Inga II, built in 1972 and 1982 respectively, have the potential to produce 39.6 gigawatts from the Congo River. The stopping of the dams' turbines left over five million people without electricity, drinking water, and medical care, causing a surge in mortality rates, especially amongst children[57]. The International Committee of the Red Cross previously called on the rebels not to destroy the dams, as it would violate international humanitarian law. Reports also stated that rebels threatened to destroy the dams if not granted safe passage. On 30 August, government troops and allies recaptured the dams from the Ugandans who were custodians of the dams[58]. Subsequently, the Democratic Republic of Congo requested compensation from Uganda, claiming that Uganda had caused massive electrical power cuts that resulted in significant loss of life in the surrounding area, in violation of international law.

### 3.12. Nato Bombing Targets Bistrica Hydroelectric Plant in Serbia (1999)

NATO intervened in the Kosovo war (1998-1999) to prevent ethnic cleansing of Kosovo-Albanian population. A campaign of airstrikes was carried out under the consideration of 'humanitarian war', which lasted from March to June 1999[59]. The strikes targeted Yugoslavian strategic centers but also affected widely civilians and caused other environmental problems[60]. In this context, Serbian media reported that the Bistrica hydroelectric plant (located near Nova Varos) was also attacked. In a symposium held in London, South African senior Government minister accused of 'war crime' the bombing of dams and other installations and supplies, as they were protected by the Geneva Protocols.

### 3.13. Kajaki Dam Is Damaged After US Bombing in Afghanistan (2001)

Kajaki dam is a 300 feet high and 900 feet long structure that stores 1.85 million cubic meters of water. Built with US funding in 1953 to irrigate the Helmand Valley, the reservoir extends 32 miles and feeds one of Afghanistan's largest power plants. In the 1970s, USAID facilitated the installation of a hydro power plant with two 16.5 MW generating units. On 31 October 2001, the powerhouse was hit by the USAF, which left Kandahar and Lashkargah without

*temporary Challenge* (Newcastle: Cambridge Scholars Publishing, 2007).

57 Mapping Report, "Report of the mapping exercise documenting the most serious violations of human rights and international humanitarian law in the Democratic Republic of the Congo between 1993 and 2003," https://www.mapping-report.org/en/second-congo-war-attacks-on-other-civilian-populations-kinshasa/, accessed February 22, 2021.

58 United Nations. "Integrated Regional Information Network chronology of current crisis as of 30 September 1998." Accessed February 22, 2021. https://reliefweb.int/report/democratic-republic-congo/irin-chronology-current-crisis-30-september-1998.

59 Daniel R. Lake, "The Limits of Coercive Airpower: NATO's Victory in Kosovo Revisited," International Security 34, no. 1 (2009): 83-112. Susan H. Allen and Tiffiny Vincent, "Bombing to bargain? The air war for Kosovo," Foreign Policy Analysis 7, no. 1 (2011): 1-26.

60 Carl E. Bruch and Jay E. Austin, "The 1999 Kosovo Conflict: Unresolved Issues in Addressing the Environmental Consequences of War," *Environmental Law Reporter News & Analysis* 30 (2000): 10069.

electricity and raised fears of the dam breaking[61]. Although the dam was not directly harmed, local leaders warned of potential damage that would flood thousands of people, causing concern even in the UN. The authorities in Quetta declared that the whole Helmand valley would be flooded, risking the lives of tens of thousands of people and destroying the lands benefiting approximately 500,000 people. In 2005, USAID decided to install a third power unit of 18.5 MW, which could potentially reach 51.5 MW of production[62]. However, this plant was further attacked in 2007, and efforts to rebuild have been constant, with some abandoning them due to money waste and an unsustainable economic situation.

### 3.14. Maoists Attack Hydroelectric Plant in Nepal (2002)

In March 2002, Maoist insurrection targeted strategic points such as hydropower projects or water supply systems, attempting to force the government to negotiate. The most flagrant damage was made on 30 March to the Jhimruk hydroelectric plant, which had the potential for 12 megawatts, which cost $ 20 million, and supplied one of the poorest regions in Nepal. Maoists blew the control room and the staircase leading to the gates[63], and water began to flood the turbines and the powerhouse with no possibility of being drained.

### 3.15. Alert Raised Over an Attack on The Dnieper Dam, Ukraine (2005)

In the Dnieper River, upstream of the city of Kiev, there is a system of dams also known as Dnieper Cascade of HES, set with the aim of controlling floods. On 13 April 2005, an alert was raised about an attack, which latter was confirmed to be a fake threat. A police officer called anonymously and told that 40 rail cars were filled with explosives and placed on a portion of levees in the reservoir[64].

### 3.16. Rebuilt Kajaki Dam is Disputed Between Taliban and Allies in Afghanistan (2007)

The Kajaki dam was rebuilt after being bombed in 2001 with support from USAID, the World Bank and others. Operation Kryptonite, which involved a coalition of the UK, Netherlands (representing NATO) and the Afghan National Army, was undertaken to expel Taliban fighters from the area surrounding the dam to allow for its reconstruction. However, security issues

61 Leslie Rose, "US bombing of Afghanistan not justified as self-defense under international law," *The Guild Practitioner* 59 (2002): 65-75.

62 Thomas Caetano, *Managing Afghanistan's Mineral Wealth: Can Afghanistan's Mineral Wealth Be Used to Rebuild the Economy?* (Washington, DC: Publisher, 2005).

63 "Maoists destroy Nepal's infrastructure," *Financial Times Global Water Report*, no. 146 (2002): 4-5.

64 Benjamin K. Sovacool and Götz Walter, "Major hydropower states, sustainable development, and energy security: Insights from a preliminary cross-comparative assessment," *Energy* 142 (2017): 1074-1082. Benjamin K. Sovacool and Götz Walter, "Internationalizing the political economy of hydroelectricity: Security, development and sustainability in hydropower states," *Review of International Political Economy* 26, no. 1 (2018): 49-79.


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delayed the full repair process. Allied forces had to clear out the Taliban for months to allow reconstruction on the dam and the power transmission lines. In January 2007, the destruction of a Taliban camp cleared the way to the Kajaki dam and raised hopes for the rebuilding. In early February, the NATO forces prevented an attack by nearly 700 Taliban fighters who had crossed from Pakistan to target the dam. The Taliban fled after being outnumbered by allied forces, but the dam remained unharmed as both sides understood that damaging it would lead to massive flooding and affect Afghan lives. Restoring the dam was crucial to supplying energy to the population of the region and could produce enough electricity for hundreds of thousands of people in the Kandahar region, which was seen as a priority for the US government. However, the Taliban benefited from the reconstruction as the energy produced was consumed in Taliban-controlled areas and residents were expected to pay their bills to the group. Extending governance into rural areas and providing essential services such as electricity was crucial to stabilizing the country.

### 3.17. Taliban Attacks in Machalgho Dam, Afghanistan (2012)

The Machalgho dam in Afghanistan was intended to irrigate land and generate 800 KW of electricity[65]. However, the project has faced insecurity and violence from the Taliban, leading to multiple attacks and deaths. In 2012, a security guard was killed, possibly by Pakistan, due to downstream effects on water supply. In 2014, a mine blast injured two guards, and in 2019 and 2020, the Taliban attacked security personnel, killing 18 and 14 individuals, respectively. In August 2020, the Taliban took control of the dam and claimed they would continue construction with resident cooperation. The project was initiated in 2009 with a Russian company but was never completed due to insecurity.

### 3.18. Uzbekistan Cuts Gas to Tajikistan to Avoid the Construction of Rogun Dam (2012)

In 2012, Uzbekistan stopped gas supply to neighboring Tajikistan after the contract expired, affecting an aluminum smelter and cement plant and Tajikistan's economy to some extent[66]. Political reasons were suspected behind the cut, as the plants were contributing to the construction of the Rogun Hydropower Plant. The supply was reestablished after two weeks with a new contract.

The tensions between Uzbekistan and Tajikistan over the Rogun Dam on the Vakhsh River must also be mentioned[67]. The dam construction began in the 1980s, relaunched in 2004, and would make Tajikistan energy-independent and an energy exporter. However, Uzbek oppositions fear reduced downstream flow, ecological impacts, and security risks, leading to economic and transportation sanctions. The situation remains unsolved, and Tajikistan plans to invest 1.1 billion USD to continue the project[68].

65 Mujib Mashal, "What Iran and Pakistan want from the Afghans: Water," Time, December 2, 2012, last accessed 30 December 2021, http://world.time.com/2012/12/02/what-iran-and-pakistan-want-from-the-afghans-water/.

66 Pacific Institute, "Water Conflict Chronology."

67 Pacific Institute, "Water Conflict Chronology."

68 Sputnik News, "Shamsullooda: Tretiy Agregat Roguna Zapustyat na Polnuyu Moshchnost v 2025 Godu

### 3.19. Syrian Rebels Take Over Tishrin Dam (2012)

In the Syrian civil war, the control of water resources and its weaponization has been regarded as an effective tool to dominate the territory[69]. Tishrin dam is located 90 km east of Aleppo, northern Syria. It uses Euphrates and Sajur rivers waters to produce 630 MW of electricity through six turbines. With a length of 60 km and a capacity of 1.3 km3, annual power production was expected to rise to 1.6 billion KW/hour[70].

On 26 November 2012, Syrian rebels took over the dam from Al-Assad government forces. After days of heavy clashes, the seizure was described as a 'major blow to the regime'[71]. The dam was undamaged and employees continued to operate, although there were reports of several ammunition boxes and rocket-propelled grenades. This dam supplied energy to a big part of Northern Syria, including second largest city Aleppo[72]. The territorial strategic importance meant a cut from the major government supply line to Raqqa and to Aleppo, whereas it unified the rebel territory[73].

In September 2014, ISIL (acronym of the so-called Islamic State of Iraq and the Levant) captured the dam from these rebel forces. According to Mazlum[74], this terrorist group has deliberately instrumentalized water resources and their systems as a weapon to accomplish political and economic objectives. Between 23 to 30 December 2015, the so called Tishrin Dam offensive took place by the Syrian Democratic Forces (SDF), who snatched the dam from ISIL control. This was seen as an achievement due to the proximity of ISIL's de facto capital Raqqa, only 22 km from here. During these days, ISIL called the people living east on the Euphrates to evacuate their homes as they feared the dam could collapse suddenly, because some reported that although the dam had been in control of SDF for days, an IS (Islamic State) cell remained hidden in the dam planting explosives and threatening to destroy it. Other water-related conflicts in Syria are analyzed by Gleick[75], considering climate change and its impacts.

[Shamsulloda: The third turbine of the Rogun Dam is to be started in 2025]", https://tj.sputniknews.ru/radio/20200515/1031245236/tretiy-agregat-rogunskaya-gas-zapusk.htm last accessed 24 March 2022.

69 Andrea Beck, "Drought, dams, and survival: linking water to conflict and cooperation in Syria's civil war," *International Affairs Forum* 5, no. 1 (2014): 11-22. Peter H. Gleick, "Water as a weapon and casualty of armed conflict: A review of recent water-related violence in Iraq, Syria, and Yemen," *WIREs Water* 6, no. 4 (2019): 1351. Marwa Daoudy, "Water weaponization in the Syrian conflict: Strategies of domination and cooperation," *International Affairs* 96, no. 5 (2020): 1347-1366.

70 Greg Shapland, *Rivers of Discord: International Water Disputes in the Middle East* (New York: 1997).

71 B. Mroue, "Activists: Syrian rebels seize major dam in north", *The Daily Star, Lebanon*, http://www.dailystar.com.lb/News/Middle-East/2012/Nov-26/196180-activists-syrian-rebels-seize-major-dam-in-north.ashx last accessed 25 March 2022.

72 "Rebels Claim Capture of Strategic Dam in Northern Syria", Radio Free Europe / Radio Liberty, 27 November 2012, last accessed 25 September 2024, https://www.rferl.org/a/syria-rebels-claim-tishrin-dam-captured/24781798.html.

73 "Syria rebels build momentum with tactical successes", *BBC*, last accessed 25 March 2022, https://www.bbc.com/news/world-middle-east-20493687.

74 Ibrahim Mazlum, "ISIS as an Actor Controlling Water Resources in Syria and Iraq," in *Violent Non-state Actors and the Syrian Civil War*, edited by Özden Z. Oktav, Emel Parlar Dal, and Ali M. Kurşun (Cham: Springer, 2018), 109-125.

75 Peter H. Gleick, "Water, Drought, Climate Change, and Conflict in Syria," *Weather, Climate, and Society* 6, no. 3 (2014): 331-340.


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### 3.20. Clashes Between Kyrgyzstan and Tajikistan Over a Road and Threats in Nearby Dam (2014)

The Kyrgyz village of AkSai lies adjacent to the Tajik exclave of Vorukh. In this territory, the disputes over the borders have also affected the competition for water resources and have contributed to ethnic hostilities[76]. In January 2014 there were reports about a clash between Kyrgyz and Tajik board guards over the construction of a road[77], and according to Kyrgyz officials, Tajiks targeted a nearby dam with mortars, also including an electricity substation. Both sides accused each other of starting the opening of fire. At least five Kyrgyz and two Tajik guards were injured in the shootings.

### 3.21. Is Take Over Falluja Dam (2014)

In Iraq, Fallujah dam was built in 1985 and is located 5 km south of the city. In February 2014, ISIL took control of the dam and the nearby area, fortifying their positions with blast walls and bags[78]. In April, eight gates out of the total ten were closed, flooding upstream and drying the downstream river course. This was done to force the retreatment of the siege of Fallujah by government forces, but also to cause pressure on availability of water further south (Karbala and Najaf were left without water), and to cause power shortages in other towns that rely on hydroelectric power generated in this dam. As a result, more than 50,000 people were forced to flee their homes because of the flooding upstream[79], reaching even Abu Ghraib, which is located 40 km near Baghdad[80], and troops avoided to deploy in the area, lifting the siege[81]. Others claim that one of IS objectives was to create a drought in Shiite holy sites and disrupt parliamentary elections[82]. However, after a few days, ISIL had to open some gates fearing that the dam would collapse and affect their positions which caused flooding downstream and submerged the homes of 1700 families. As media reported, the risks not only involved the blowing up of the dam and powerhouses and flooding, but also the poisoning of water as it was done in other towns. The IS found in the attacks to water infrastructure a strategic target, launching nearly 20 major attacks against them[83]. In 2016, when IS was expelled

76 David Trilling, "Kyrgyzstan & Tajikistan: Border guards injured in shootout, possibly with mortars," Eurasianet, https://eurasianet.org/kyrgyzstan-tajikistan-border-guards-injured-in-shootout-possibly-with-mortar (last accessed 15 May 2021).

77 Pacific Institute, "Water Conflict Chronology."; Trilling, "K Kyrgyzstan & Tajikistan: Border guards injured in shootout, possibly with mortars."

78 Isabel Coles, "Iraq insurgents use water as weapon after seizing dam," Reuters, https://www.reuters.com/article/us-iraq-security-idUSBREA3A0Q020140411 (last accessed 15 May 2021).

79 Thomas Gibbons-Neff, "This is what could happen if the Islamic State destroys the Mosul Dam," The Washington Post, https://www.washingtonpost.com/news/checkpoint/wp/2014/08/08/this-is-what-could-happen-if-the-islamic-state-destroys-the-mosul-dam/, last accessed 15 May 2021.

80 Fred Pearce, "Mideast Water Wars: In Iraq, A Battle for Control of Water," Yale Environment, https://e360.yale.edu/features/mideast_water_, last accessed 15 May 2021.

81 Alex Milner, "Mosul Dam: Why the battle for water matters in Iraq," BBC News, https://www.bbc.com/news/world-middle-east-28772478, last accessed 15 May 2021.

82 Yonah Alexander and Dean Alexander, *The Islamic State: Combating the Caliphate without borders* (Lanham, MD: Lexington Books 2015).

83 Ambika Vishwanath, "The Water Wars Waged by the Islamic State," *Stratford Worldview*, 24 November

from Fallujah, they blew up six of the gates and water did not reach the crop fields anymore, which caused an extreme drought[84].

### 3.22. PKK Attacks a Hydroelectric Plant in Turkey (2014)

Kurdish militants from PKK (Kurdistan Workers' Party) attacked a hydroelectric power plant by setting it on fire in Kazigman District, Kars, Turkey, on October 24, 2014. Turkish soldiers entered the dam killing three Kurdish soldiers[85]. The next day, three off-duty Turkish soldiers were killed in response to the attack while they were having a walk in the city center of Yüksekova. Kurdish actions seem to be motivated by the Turkish refusal of helping Kurds in Syria against Islamic State.

### 3.23. Is Takes over Mosul Dam, Iraq (2014)

The Mosul dam, the largest in Iraq and built in 1986 on the Tigris River, has a capacity of 11,100 hm3, creating Lake Dahuk for irrigation and hydroelectric energy production with four generators. In August 2014, the dam was captured by IS militants from Peshmerga, raising concerns about restricting water and energy supply and the risk of flooding Mosul and even Baghdad if the dam was blown up. Recapturing the dam was a strategic goal, and it was retaken on 17 August by Kurdish and Iraqi military with the help of US airstrikes. When under IS control, Mosul dam gave control of 75% of Iraq's electricity generation if combined with Haditha dam. Mosul dam produces 45% of Iraq's electricity and drying up downstream Shiite lands is considered an objective. ISIL attempted to reconquer the dam on 3 January 2015, killing 16 Peshmerga soldiers and attacking surrounding towns[86].

### 3.24. PKK Attacks Turkish Soldiers Guarding a Dam (2015)

On 23 August 2015 the PKK attacked a patrol of Turkish soldiers who were guarding the construction of a hydroelectric dam in Kulp, Diyarbakir[87]. The attack was done with rockets and long-range gunfire and killed one Turkish soldier and other three were wounded[88].

2015, last accessed 15 May 2021, https://worldview.stratfor.com/article/water-wars-waged-islamic-state.

84 Peter Schwartzstein, "The Dangerous State of Iraq's Rivers," *Foreign Affairs*, last accessed 15 May 2021, https://www.foreignaffairs.com/articles/iraq/2017-04-07/dangerous-state-iraqs-rivers.

85 H. Pamuk, "Three Kurdish militants killed in attack on Turkish power plant," *Reuters*, last accessed 10 April 2022, https://ca.reuters.com/article/topNews/idCAKCN0ID0SJ20141024.

86 Lee Ferran and Mazin Faiq, "Why control of a terrifying dam in Iraq is life or death for half million people," *ABC News*, last accessed 7 June 2022, https://abcnews.go.com/Blotter/mosul-dam-control-terrifying-dam-iraq-life-death/story?id=24878057; Tobias von Lossow, "Water as Weapon: IS on the Euphrates and Tigris," *SWP Comments*, 3 (2016): 1-8; Vishwanath, "The Water Wars Waged by the Islamic State."

87 Anadolu Agency, "Turkey: Soldier martyred, 3 injured in Diyarbakir attack," *Anadolu Agency*, last accessed 7 June 2022, https://www.aa.com.tr/en/turkey/turkey-soldier-martyred-3-injured-in-diyarbakir-attack/7460.

88 Agence France-Presse, "PKK kills Turkish soldier, abducts customs officials – army," *Jordan Times*, http://www.jordantimes.com/news/region/pkk-kills-turkish-soldier-abducts-customs-officials-%E2%80%94-army, last accessed 7 June 2022.


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### 3.25. Alert of Bombs Found in a Hydroelectric Plant in East Java, Indonesia (2016)

On 23 November 2016, a security guard found some black boxes that supposedly had exploded in Blitar hydropower plant, East Java, Indonesia[89]. Officers from the East Java bomb squad mobile brigade took them to investigate what had happened[90].

### 3.26. Attacks over the Control of Tabqa Dam Amid Syrian Civil War (2016)

Tabqa dam, also known as al-Thawra dam, is in Raqqa and is Syria's largest reservoir with 12 billion cubic meters of water, also known as Lake Assad. Built in 1973, it supplies water for energy (824 MW of installed capacity) and irrigation of over 600,000 hectares of land. In 2013, it fell under control of Islamist fighters, which was significant as it also supplied electricity to Aleppo. Senior ISIS militants were reported to be hiding inside the dam in 2016, and in February 2017, there were concerns about the risk of collapse due to an increase in water levels, deliberate sabotage by ISIS, and damage from US-led coalition airstrikes[91]. Civilians feared that ISIS could flood downstream land to protect Raqqa, and clashes between Daesh and Syrian Democratic Forces erupted in March 2017[92]. SDF and YPG, with US support, launched 'Operation Wrath of Euphrates' to take control of Tabqa dam, leading to reports of heavy bombardment by ISIS and doubts about the dam's safety[93]. Concern grew, and civilians began to flee, fearing massive flooding that would reach Deir-ez-Zor. However, SDF eventually took control of the dam in May 2017, accepting the surrender of 70 IS fighters and dismantling bombs to protect innocent civilians and preserve the dam, which is crucial for water, agriculture, and electricity[94].

### 3.27. Turkish Forces Attack the Kurdish and Take over Afrin Dam in Syria (2018)

Afrin dam, located north of Aleppo, was built in 1977, with a capacity of 190 hm3. It supplies water for human consumption and irrigation, and generates 25 MW of hydroelectricity, being the only source of clean water and electricity for Afrin, a Kurdish stronghold in Syria[95].

89 Pacific Institute, "Water Conflict Chronology."
90 Jakarta Globe, "Bomb at Blitar Hydro Power Plant," *Jakarta Globe*, last accessed 28 May 2022, https://jakartaglobe.id/multimedia/bomb-blitar-hydro-power-plant/.
91 Tom Miles, "U.N. warns of catastrophic dam failure in Syria battle," *Reuters*, February 15, 2017, last accessed 20 March 2022, https://www.reuters.com/article/us-mideast-crisis-syria-dam-idUSKBN15U1DZ.
92 Angus McDowall, "Syrian militia reaches Tabqa dam: SDF official," *Reuters*, last accessed 20 March 2022, https://www.reuters.com/article/us-mideast-crisis-syria-dam-idUSKBN16V1QW.
93 C. Tomson, "BREAKING: Kurdish forces liberate Tabqa Airbase in Raqqa province," *AMN News*.
94 C. Babb, "Islamic State Defeated at Tabqa Dam," *VOA News*, 11 May 2017, last accessed 29 September 2024, https://www.voanews.com/middle-east/islamic-state-defeated-tabqa-dam .
95 R. Hussein and N. Ahmado, "Kurds: Turkish Airstrikes Damaging Historic, Civilian Sites," *VOA News*, 29 January 2018, last accessed 29 September 2024, https://www.voanews.com/a/kurds-say-turkish-airstrikes-damage-historic-temple-dam/4230262.html.

In March 2018, Turkish Armed forces and the Syrian National Army took control of the dam from the Kurdish YPG, resulting in water supply disruption to the city for over a week and destruction of water pumping stations[96]. The population was forced to use unsafe water, leading to a serious humanitarian situation[97], and civilians were evacuated through a special corridor[98]. Turkish airstrikes had previously targeted the dam in January 2018, raising concerns that the dam's collapse would flood surrounding villages and towns[99].

## 4. Discussion and Conclusions

The case studies presented highlight not only the strategic value of hydroelectric power stations but also their vulnerability in times of conflict. The repercussions of these conflicts are far-reaching, affecting not only the immediate availability of water and energy but also contributing to long-term economic, environmental, and social instability. For instance, the displacement of populations and the destruction of infrastructure, as seen in the Kaptai dam and Cahora Bassa dam conflicts, have led to enduring economic hardships and political tensions. These examples underscore the need for more balanced and equitable management of water resources, as well as the development of robust frameworks for the protection of critical infrastructure in conflict zones.

As spotted above, conflicts involving hydroelectric plants and energy production constitute a wide range of different causes and motivations. But which is the role that energy-water nexus plays in these conflicts?

Paying attention to geography, among all the analyzed conflicts in this paper, the major part is in Asia (18 out of 27), while Africa and Europe sum 4 each, and only one is reported in America (Figure 1).

Digging into regions, the Middle East accounts up to 9 conflicts, followed by Central Asia (5), East Europe (4), South of Africa (3), South Asia (2), completed with one conflict in Southeast Asia, East Asia, Central Africa and Central America/Caribbean.

At a first glimpse, this could be related to water scarcity; conflicts in Asia are strongly localized in two main regions: Middle East and Central Asia, where climate is dry and water is scarce. On the contrary, America is the wettest continent and is the least represented in this study.

96 E. Ingram, "Access to Afrin Dam cut off by fighting in northwestern Syria", *Hydro Review,* last accessed 10 September 2021, https://www.hydroreview.com/world-regions/access-to-afrin-dam-cut-off-by-fighting-in-northwestern-syria/.

97 Today Online, "Syria's Afrin cut off from water, thousands displaced", last accessed 10 September 2021, https://www.todayonline.com/world/syrias-afrin-cut-water-un.

98 Al Arabiya News, "Syria's Afrin cut off from water as civilians 'exit through special corridor'", last accessed 10 September 2021, https://english.alarabiya.net/News/middle-east/2018/03/14/Syria-s-Afrin-cut-off-from-water-.

99 Hussein and Ahmado, "Kurds: Turkish Airstrikes Damaging Historic, Civilian Sites."


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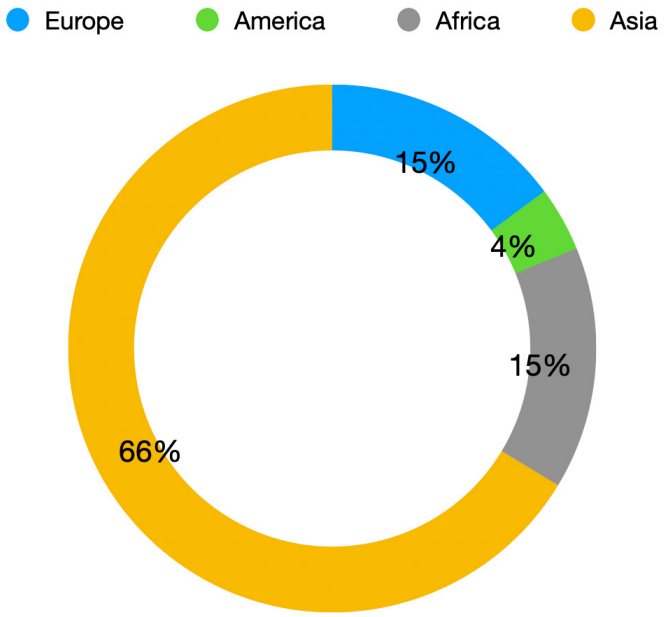
Thus, one can say that it is water scarcity what motivates States to fight for water re-sources and that if these resources are used for energy production, control over water is an effective tool to damage the adversary.

**Figure 1**. Distribution of conflicts involving hydroelectric plants by continents (1957-2018)



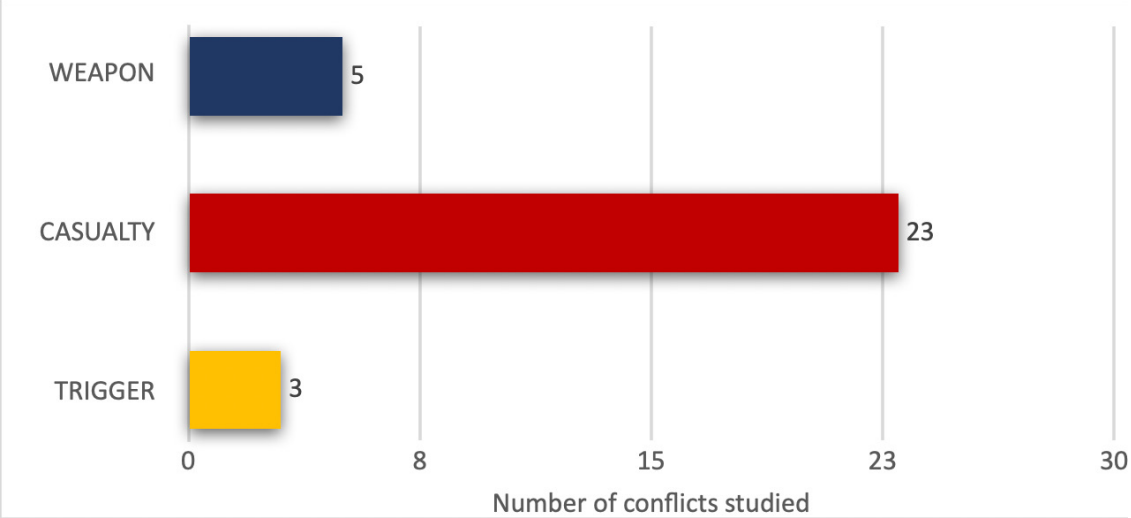

However, we need to consider not only water scarcity, but another sort of scarcity: energy.

This does not depend on climate conditions, but also on the development of countries. This could be one of the reasons why Africa does not appear greatly in this study; likewise, other dry environments which are well developed do not rely exclusively on hydroelectric plants for their energy production, as they are able to turn to other types of energy such as nuclear, wind or solar.

Furthermore, as described previously, other conflicts over hydroelectric plants took place in wet environments where water is not scarce (as in the Mozambique case) but energy does indeed. This shows the complex scenario involving conflicts over hydroelectric plants, which could be vulnerable under different circumstances.

This leads us to frame these conflicts within the role that water used for energy played: as a trigger, weapon or casualty. The most frequent in this study was 'casualty', whereas the former two remained less common (Figure 2). Note that some conflicts could be divided into two categories, so the number in the graph exceeds 27.

**Figure 2**. Conflict type regarding the role of water used for energy




Casualties are the most common and can be found elsewhere, only being related to an ongoing conflict where the damage of this infrastructure would benefit in the damage of the enemy, or the seizure of this site would entail a stronger position for the conqueror.

Examples of these are the case of Cahora Bassa within the Mozambican Civil War (3.3), the Puerto Rican case (3.4), Iranian attack over the Iraqi plant (3.5), the destruction of Calueque/Ruacana by Cuban troops (3.7), Iraqi plants destroyed amidst Gulf War (3.8), the Moldovan plant destroyed during the civil war (3.9), the attacks on the Peruča dam in Croatia during secession from Yugoslavia (3.10), the Ugandan attack over Inga dams in the course of Congo War (3.11), the NATO bombings over Serbia (3.12), or the US bombing over Afghanistan (3.13), the Maoist attack in Nepal (3.14), the alert over an attack in the Ukrainian dam (3.15), the disputes over Kajaki dam between Taliban and allies (3.16), Taliban attacks to control Machalgho dam (3.17), battles around Tishrin dam in Syria (3.19), tensions over the border between Kyrgyzstan and Tajikistan that involved the attack of a nearby dam (3.20), the battles and attacks in Fallujah dam (3.21), Kurdish attacks in Turkish soil (3.22 and 3.24), the seizure of IS of Mosul dam (3.23), alerts of a bomb in Indonesia (3.25), the disputed control by different actors over the Tabqa dam (3.26) and Afrin dam (3.27).

Sometimes dams could be targeted and used as a weapon. This is not very usual, as the potential damage could mean a total devastation of the downstream area, which is condemned and prohibited by international law. Thus, this situation only seems to take place when a total war is being held. For instance, concerns over the North Korea's dam upstream Seoul (3.6); or the total launch over Peruča dam (3.10) and Inga Dams (3.11), or within the Islamic State attacks in Iraq (3.21) and Afrin dam in Syria (3.27). Last, the building of a hydroelectric plant acted as a trigger in the Kaptai dam (3.1), which led to a creation of a war/guerrilla; or in the case of Ruacana/Calueque (3.2) which created an international conflict between Angola and South Africa; or the creation of a dam by Tajikistan that would result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in a reduction of downstream flow and affect Uzbekistan's agri-culture (3.18). Note that only in the latter, scarcity of water played a role – the other two 'triggers' were more about water management, storage and energy production.

This builds on the idea that scarceness both of water and/or energy does not need to be strongly associated to conflict, but a factor that may help in the escalate, or a political rhetoric of confrontation in a scenario where cooperation over shared resources is absent. It seems that it is the high strategic value that these sites represent that turns them into a contested emplacements amidst a war, tensions or threats.

Bearing all this in mind, some considerations appear of interest. First, the need to accomplish a comprehensive plan regarding the security of these strategic sites, reinforcing both security buildings and access; as well as enhancing the respect of international law banning attacks on hydroelectric plants – as energy generated represents a key stone in civilians' life and its disruption may entail serious consequences and humanitarian catastrophes. Second, the strategy of all States of diversifying its energy sector in order not to depend on a single source of energy – promoting new types of energy and making the country energetic autonomous and more resilient to climate conditions, which is even more important in a climate change scenario. Finally, to count on civil compliance when accomplishing projects and raise social awareness of the importance that these plants gather for every action of their lives.

In conclusion, this article analyzes the role that hydroelectric power stations played in recent history regarding conflicts, framed in the hydropolitics perspective. Based on the data displayed by the Pacific Institute Water Conflict Chronology, this article was able to build up on the scientific literature by providing research about hydro power plants and their implications as elements of conflict. Main contributions include:

> Hydroelectric power plants are vulnerable, hindering fair access to water and energy and obstructing the achievement of SDGs. The Pacific Institute's Water Conflict Chronology analyzed 27 conflicts over water for energy, most in water-scarce regions. Conflicts have led to 'water wars' and the seizure of water resources for survival and to harm opponents. In such conflicts, hydroelectric power plants are vulnerable due to energetic scarcity, making them hotspots, targeted during war or pre-war scenarios. A comprehensive security plan, civil compliance, and adherence to international law are essential to secure plant functionality and energy access. States should diversify their energy sector to avoid dependence on natural conditions altered by climate change. International cooperation is imperative for SDGs.

The implications of hydroelectric power conflicts resonate strongly with the objectives outlined in the Agenda 2030, particularly in relation to Sustainable Development Goal 7 (Affordable and Clean Energy) and SDG 16 (Peace, Justice, and Strong Institutions). The promotion of renewable energy sources like hydroelectric power must be balanced with the need to prevent and mitigate conflicts over natural resources. Moving forward, a concerted effort is required to integrate conflict-sensitive policies that ensure equitable access to water and energy resources. International cooperation is key, as is the development of inclusive frameworks for

hydro-diplomacy, which can facilitate peaceful resolutions to disputes over shared resources. This approach will be critical in achieving long-term peace and sustainability in regions most affected by water and energy scarcity, particularly in the face of climate change.

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