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Dams, hegemony and beyond: China's hydro-stability in the evolving world order

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Abstract
Water has remained a source of contentious and cooperative politics among states since the Sumerian civilization. The field of hydro-politics, since its emergence in the 1990s, had taken note of dams as both a source of conflict between riparian neighbors owing to their threat to the life and property along the transboundary banks, and as a source of cooperation through effective water and knowledge sharing and infrastructural development, promoting peaceful negotiations in good faith in these matters. In this regard, the narrative and practice of infrastructural development by the great powers in their weaker riparian states to enhance their growth has emerged as a new means to increase great power states' power and influence in the international arena. China, in its race against the United States, has emerged as the world's largest dam builder, having extended its construction footprints across many parts of the globe. As rapid industrial development and resultant climate change intensifies the hitherto prevalent water crises, China, through a spate of dam-building among other things, has ensured its water, and consequently food, supply through the accumulation of real and virtual water networks, in a world where basic necessities are gradually becoming scarce. Through a descriptive study, this paper attempts to answer the question of what the implications of China's domestic, regional and global behavior of extensive hydro-infrastructural development are beyond the contemporary economic and political gains for itself. It argues that the objectives of China's dam-building transcend short-term economic and political gains, as it attempts to ensure the possibility of China's long-term hydro-stability in its quest to emerge at the lead of the evolving global order.

Keywords Dams · Hydropolitics · China · Hydro-stability · Hydro-hegemony

1 Introduction

Water has been a source of cooperation and contention in international relations since the ancient times. The earliest known water-based interaction, which incidentally was a conflict, was in Mesopotamia when Lagash deprived Umma of water through diversion projects [1, 2]. Similarly, water-based infrastructural development—particularly the ones that promote transboundary water management and cooperation such as dams—have also existed since times immemorial. For instance, the kallanai (grand anicut) built by Karikalan, a Chola king from the southern part of Tamil Nadu in the Indian subcontinent, was reputed for its infrastructural innovations and durability, as well as for improving irrigation in the neighboring regions, which thrived on agriculture and its consequent trade. Similarly, China's recently unearthed Liangzhou flood-control dam relics, (5100—4700 BCE) is the oldest known flood-control mechanism in China, with a scale larger than most known contemporary flood-control projects [3]. Despite the political intrigues that hindered the

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progress of water-based infrastructural development in ancient China, it nevertheless seems to have made a significant headway in flood-prone regions, such as in the yellow river, as a forerunner to its contemporary state as the largest dam-builder in the world.

By the second half of the nineteenth century, dam constructing strategies had reached their peak in the rate of innovation. This had triggered collaborations between states, particularly imperial Britain, and its water rich but infrastructurally-underdeveloped colonies, in constructions of dams and barrages. The Aswan Low dam is one of the earliest of such examples, having been constructed through the collaboration between the Egyptians and the British. The trend continued with the rise of the United States and the Soviet Union as the undisputed superpowers of the Cold War era, both using it as means to improve infrastructure development and increase the circle within which their respective ideologies were accepted as legitimate. In recent times, China has emerged as the most prominent dam-constructing state. This is more so with China's dam construction spreading to other parts of Africa, Asia, and Latin America.

Dams have been a significant part of the infrastructural development of the twentieth century [4], with such projects having entered over one-hundred and forty countries at the turn of the twenty-first century. China is the largest dam-builder at present [4, 5], surpassing the United States. The study of dams seems to have gained more attention with the birth of the field of Hydropolitics in the 1990s, transcending the study of its role in the mainstream questions of regional/interstate politics and later, in environmental discourse [6]. Hydropolitics, in its core, is the intersection of politics with the affairs at the freshwater-basin level, significant enough to direct politics or create changes in political affairs through happenings like policies, laws, and interactions with other state/non-state entities, so far as these pertain to the said basin. Allan's [7] exposition of the concept of 'virtual water' further broadens the implications of dam construction. Furthermore, dams have been identified as one instrument in the various means of displaying hegemonic ideologies [8], or the exertion of hydro-hegemony [9], which is hegemony at the freshwater basin level, achieved through strategies of control of water resources, through tactics such as coercion, etc. characterized by weak international institutions and power asymmetry [10]. On a similar note, Allouche and others analyze the role of water-nationalism in building hegemonic relationships between riparian states, based on the norms of this nationalism. Dams are one way in which this water-nationalism induced hegemony manifests [11, 12]. It could be argued that the larger the dam, the greater its scope of influence, be it material or immaterial, political, environmental, social, or economic. According to the International Commission on Large Dams, which was the first proper international organization on large dams when the dam export industry was booming, a large dam is more than fifteen meters tall, and a mega-dam is one hundred meters tall [13]. It is to be assumed that anything smaller will be a small dam. Hussein et al. trace the discursive power of large dams, and the definitions they set for a relationship among countries related to that dam [14]. In this regard, given the rapid changes that seems to herald the emergence of a new world order, this paper seeks to answer the following question: from a hydro-political perspective, what is the primary implication of China's spate of dam construction in other states given the emergence of a new world order?

The paper argues that China's extensive dam construction is a means to secure its hydro-stability in the emerging world order. Hofstedt's work is the closest to the attempt of this paper. He looks at the policy responses of the Chinese government to water scarcity, and how these responses have the potential to create social, political and economic stability or instability [15]. This paper differs in that it focuses on the stability through water, instead of the stability from the policy responses to water scarcity. For the purposes of this paper, hydro-stability is defined as the stability of a state that is based on and a result of water, present either physically or virtually [?], either at the basin level or as the subject of infrastructure on one hand, and a strengthening and stabilizing of riparian relations through mutual, symmetric or asymmetric interdependence, which subsequently stabilizes the said state in the regional and international system on the other. In other words, it is the stability at the economic, social, and predominantly political levels of a state as the result that transcends intense and prolonged passive acceptance of benign hydro-hegemony, one's own attainment of the status of a hydro-hegemon, cooperation over a transboundary waterbody, the collaboration over a water-based infrastructure such as a dam and hydrological data-sharing, etc., which transcends short-term goals of national interests to be reflected in the long-term, far-reaching gains of these interests, reflected in the international politics of the regional or global arena. It is characterized by the presence of a state with superior material capabilities and influence to set in motion the prerequisites for its hydro-stability at the primary level, and/or a regional/international regime/organization to regulate the pursuit of hydro-stability at the secondary level. Stability is the regularity of the exchanges between actors [hydro-stakeholders?], in this context, political, with a larger equilibrium in the regularity indicating a greater stability. For the purposes of this article, the states that receive the aid or technical assistance for the infrastructure, specifically dams, or on whose territories the dams are constructed, are termed as recipient states.

The following sections discuss the benefits derived by China from its dams abroad and how these play a role in its hydro-political outlook in the emerging world order. In its attempt to answer the above question, the paper is structured thus: the next section briefly lays out the foundations of the notion of hydro-stability, the following section discusses the role of dams in Hydro-politics and international relations, and the subsequent section discusses the politics behind China's dam-building engagements in other states, with the succeeding section laying out the implications of the same for China's changing role in the emerging world order from the aspect of hydro-stability. The conclusion carries a summary of the key points raised by the paper with a brief note on probable directions for future research in this vein.

2 Hydro-stability

The notion of hydro-stability is predominantly based on the stability that water provides to various aspects of a state's structure and functions. Water is a crucial necessity for a state's population, through the overall development through agriculture and industrialization, as well as the growth and intensification of a society, the evolution of a culture, and consequently, the identity of people. It is also essential in the fabric that forms cultures. Water-based interactions both at the individual and state levels have been discussed in laws and norms that form the Hindu, Islamic and Jewish cultures [16]. For example, Jewish water law as expressed in the Talmud give priority to those located near a shared water body and/or an upstream riparian, and finally, the entire populous of a city prior to the sharing of the waterbody with another group/city [17]. On a contrary note, Ancient Hindu law pertaining to water had advocated the maximum sharing and harmless usage of transboundary water resources during the time of peace; but it allowed for water to be both a weapon and casualty in the case of conflict between two groups/villages that happened to share a waterbody [18]. Ancient Chinese civilisation had viewed water as the means to maintain peace, stability, and control over people [19]. Surprisingly, Sharia law does not possess strong rules about the use and governance of water, despite the importance of water in Islamic culture. Much of water-based norms that are followed in the Islamic culture today arises from customs and consensuses that strictly align with the laws and moral obligations prescribed by Sharia [20]. Similarly, beyond the general practice of protecting and managing clean water, the flood control measures to manage dry land and the practice of separating clean from waste water are seen as a continuation of the processes initiated at the creation of the World by God, according to Christianity [21]. For a state to be stable, therefore, this often-ignored but crucial nontraditional element is necessary. It is one of those resources the lack and/or inadequate distribution of which has been noted to incite violence among people, thereby leading to a social conflict [22, 23], which could have adverse effects on the state.

Water-based interactions are either conflicts or cooperations among political entities, which are states at the international arena. Conflicts involving water are of three types—water as the trigger of the conflict, water as a weapon in a conflict that may or may not be about water, and water as the casualty in a conflict, which again may or may not be centered on water. While a conflict based on water as the trigger seeks primarily to attain control over, and consequently, stability over, the concerned water source, a larger conflict wherein water is a weapon or casualty may view the attainment of hydro-stability as a collateral long-term benefit. One such example among a long list of many would be the Assyrian kings using water to drive off their enemies from their lands, and for capturing new land, diverting it into a dam at least once [2]. Dams prove to be a huge asset with long-term benefits. Robust water resources translate into wealth, and consequently, stability, for the state, and a state without adequate water, like in food and fertile fields, have proven to be a discouragement for invaders.

Cooperation in hydro-politics is through several means such as treaties, cooperative infrastructural development, and adoption of and adaptation to newer techniques and methods in response to a host of endemic and systemic changes, such as climate change. This results in hydro-stability as well, but it is an interdependent hydro-stability, reliant on the cooperation of all the states concerned. The Nile basin is one such contemporary example from many, which has overcome the hydro-hegemony exerted by Egypt. To establish a mechanism to govern the sharing of the Nile's resources among all concerned riparian states [24], which sustains and stabilizes hydro-political, economic and political relations among them.

Hydro-stability could be of two kinds, categorized through the means of attaining the aforementioned stable posture. On one hand, a richly endowed state, with the means to feed its population and to further its developmental interests, with more to spare to the extent that it could be utilized to feed the people of other states, or else to promote the infrastructural development of another state, is hydro-stability at the systemic level, be it regional or international. The difference lies in the sphere of this assistance and consequently, this influence. On the other hand, a state that possesses the previously mentioned conditions, but with an excess of material capabilities, can promote infrastructural development

in regions of its choosing. It can also wield the influence to prevent open and undue attention toward its exploitative resource extraction practices and the effect on the recipient state's domestic and foreign policy. This is evidenced by the case of China in Myanmar, Africa and some Latin American countries, which derive immense short-term benefits by assisting and associating with China, that the long-term deterioration hardly, if ever, crops up in their foreign relations.

Resource extraction by the benefactor is an inevitable consequence of the means of attaining hydro-stability. It goes without saying that the key aspects and means of hydro-stability is founded at the level of water. This is because of water's intricate role as the basic need for human life, the success of societies and civilizations, and one of the factors that determines a crucial dependence or independence of any given state in the contemporary, largely interdependent world. While it is acknowledged that water acts in concert with other elements that assures the productions of the basic needs of life, it must also be recognized that factors such as climate change and a vastly improved hydro-infrastructural development have highly politicized water, ascribing a central role to it in many debates. A compelling process in the establishment of hydro-stability is that, while it involves at least a minimal cooperation among states over water and water-based fields, it would inevitably pass through some form of hydro-hegemonic politics.

The stability among riparian relations, be it over transboundary basins or virtual water resources, is of two types, namely, stable-dependent and stable-independent. While dependency in relation to stability in terms of a resource like water is imprecise due to a mutual overlap, it nevertheless is a key aspect that determines the hierarchal nature of hydro-stability relations. Dependence is predicated on the assumption that an increase in need for infrastructural and developmental assistance regarding water with a corresponding lack of power to fulfill such a need, domestically or externally, determines the dependent riparian in hydro-stability. Consequently, independence in hydro-stability is a state's ability to fulfill such needs at the primary level, and fulfill such needs for dependent states at the secondary level. However, it is acknowledged that water is the need that induces states to seek stability. A stability in riparian relations results, which has a chain reaction, in inducing stability horizontally across various interconnected spheres, and vertically at the levels of the region and the international arena. For example, at the horizontal level, stability among riparian states could induce the consequent stabilization of a sphere such as trade, or, at a larger level, the economy of states of similar power. At the vertical level, hydro-stability could lead to the stabilization of hierarchal positions of states in the structure of the international arena.

Hydro-stability also transcends the immediate hydro-politics of friction, cooperation, or conflict, beyond the aim of establishing hydro-hegemony, and seeks to insulate its hydro-politics and its spillover effects from internal or external shocks, including a change to the regional/international system. But it must be acknowledged that the type of hydro-political interaction of a state, its dependence on other states, and its consequent stability drawing from water could be either overlapping, or else be a contrast from one riparian to another. Besides, as physical borders are no longer central to international politics in a globalized world [25], so is hydro-stability, like most aspects of hydro-politics, not strictly adherent of physical boundaries in a globalized era. As proven by an evolving global infrastructure network, the hunt for stability at the level of hydro-politics has also become globalized.

3 Dams in international hydropolitics

Big dam projects are a characteristic unique to the twentieth century. While the century commenced with about six-hundred such dams, reaching about five-thousand dams with ten major dams around 1950, it closed with about forty-five-thousand dams out of which three-hundred were major dams [4, 26]. Egypt's collaboration with the French and the British for technical knowledge of constructing dams over the Nile at the turn of the twentieth century is perhaps one of the earliest instances when dams served as a means of cooperation among states [27]. The Aswan Low Dam, both at the time of its initial completion in 1902, and its subsequent raising in 1933, have been among the major international cooperative infrastructural work of the British [4]. With an increased interest in providing financial and technical assistance to less developed countries for large dam projects by the developed states, the International Commission on Large Dams came into existence in 1928, bringing together technical and financial resource providers together in an informal international dam-construction network. After its inception in 1944, the World Bank took over the promotion of large dam projects, for which the demand increased with the wave of decolonization that began in 1947 in South Asia [4]. The Aswan High Dam, often seen as a reflection of state-building and economic policies of the pre-existing institutions of Egypt, is also a reflection on the fields of river-basin development and economic statistics within the framework of Egypt's then transnational linkages [28]. Moreover, this dam, heavily invested with the Cold War rivalry between the

United States and the Soviet Union, was declared by the then general secretary of the Communist Party of the Soviet Union to be the first step through which the Soviet Union would drown capitalism in Africa [29].

In recent times, big dams have gained significant focus as indicated by the trends such as increasing funding, collaboration, and construction of large dams both at the intrastate and the interstate levels. Dams, especially large ones, have also been at the centre of geopolitics at the regional and global levels, owing to their ability to bridge the boundaries between technology, nature, and politics [8]. Big dams are one of the infrastructural means through which states extend their power over other states [8]. Moreover, when large dams are built in upstream locations in developing countries by developed countries, it is found that states free ride on the exploitation of the waters of the developing regions through dams, that were primarily constructed for agriculture and hydropower [30].

On the other hand, as indicated by Khagram [4], groups considered as minorities at the grassroots levels have not only managed to alter the progress of these dam projects within many industrialized countries, but also have sought to reorganize international institutional perspectives toward large dam projects. They have also attempted to set a global norm favoring the critical consideration of socio-environmental impacts caused by these projects. However, the success of these groups largely depends on their position within a democratic state, and the level of influence that the concerned state is able to wield in the international arena [4]. Similarly, riparian states which were less advantaged in terms of their material capabilities have also used dams as a means of retaliation against the hydro-hegemony of a riparian over a crucial and shared river. Cascao cites the example of The Grand Ethiopian Renaissance Dam (GERD) where the less-advantaged Ethiopia (in terms of material capabilities), forced Egypt to cooperate over the Nile in her formulation of the framework of counter-hydro-hegemony, thus transforming the prevalent hydro-hegemony over the Nile basin [31].

China is the most prominent dam-builder of the contemporary times. While the number of dams constructed by China cannot be accurately detected, owing to a stream of approved projects disapproved by the activists, as well as a lack of an active tracking of the same [5], where possible, the lack of match for its skill and ambition is undisputed. It is roughly estimated that China has funded and built, or is in the process of building, 320 large hydropower dams in over 140 countries, most of which are Low- or Middle-Income states [32]. However, given that the Chinese government doesn't make much data available to the public, it is harder to determine the accurate extent of China's delving into the dam-export industry. The following section discusses China's role and ambitions intertwined with its dam-building, and how it signifies in the hydro-politics of China.

4 China's dams: source of hydro hegemony

China has long been an agrarian society. Hence, water allocation and management has long been an integral part of Chinese politics [33]. The earliest known specimen of Chinese flood-control dam was built approximately around 3000 BCE [3]. Rowe outlines the role of civil society and key provincial government officials in the Fankou dam controversy, reflective of both the concern over available water resources and the political processes in this regard of the Qing era [33]. Moreover, the flood-prone Yellow River led to an increase in the dam and canal projects that China undertook to improve farming in these plains [34]. Han and Webber state that Chinese dam players are connected through the 'Chinese Water Machine' which is the network of actors who involve in water management in China, with their own functions and rules [33]. After a long history of domestic dam-construction, China has begun to focus on dam construction in international sites in Low and Middle Income (LMI) countries in Asia and Africa [5].

China's extensive dam building, in recent years, is seen as a part of the Belt and Road Initiative (BRI) [35]. The BRI is an extensively infrastructure-based project, that involved both investment and construction, covering many regions of the globe, increasing China's economic and political influence manifold in these regions [36]. Given China's rise and the transformation of its role in the international arena, the BRI has often been compared to China's tributary system. Dogan terms it as the 'neo-tributary system', and states that while China declares that its intentions are not hegemonic, its expansionist policies, deceptive nature in international relations, and an intolerance of cultures and identities independent of itself indicate that Chinese aspirations do not involve peace at all times. China's past conduct of international relations indicate a strong motive to domineer over other states, prevalent in the 'neo-tributary system' [37]. Contrarily, Hobson and Zhang [38] argue that if at all the BRI could be likened to a neo-tributary system, then it is indeed a peaceful coming together of states, as it will increase the legitimacy of the Chinese Communist Party (CCP) and the economic benefits of the recipient states. Given that China does not altogether avoid interacting with democratic states, scholars state that China's hegemony is based primarily on flexibility to suit the environs of the concerned recipient state, tempered by a policy of alleged non-interference in internal affairs [39, 40]. Its single-minded focus on state capital dynamics instead of

the state political structure has enabled its success amidst the recipient states [39]. Harrell mentions that China's pursuit of hydro-power and dam construction, especially in Southeast Asia, within the fabric of the BRI, results in the foundations for China's imperialism, as dam construction gives China access to several aspect of the politics of the recipient states [41].

It is no wonder that China, being the second largest economy in the world approximately worth $18321.2 billion (18.04%) [42] with a still booming economy, with a growth of 4.9 percent during the third quarter—July to September—2023 [43] is able to instigate such debates around its hegemonic perceptions in the international arena. It is also due to this that China has emerged as a key player in the promotion of infrastructural development, particularly dam-building. China plays the roles of financier, builder, developer, subcontractor, or a combination of all these in its dam-construction engagements abroad [5]. Given China's role as an extensive dam-builder, primarily through Sinohydro, the global dam-building firm [5], Chinese dams and its impacts have been the subjects of several scholarly discussions. For instance, Odoom mentions that while ideology and alliance may have been the primary motives for China's commencement of an infrastructure-based relationship with Ghana, at present, it is significantly with the view of economic, political, and geopolitical prizes of the resource-rich state [44]. Somewhat contrarily, Freeman argues that given the lack of absolute control of the Chinese state over either the dam-building process or the companies that involve in them, China does not utilize the dams as a means of hydro-diplomacy with the recipient states [45].

China has often downplayed the role and impact of its upstream dams over its transboundary rivers, while actively promoting developmental goals in its narratives, as has been the case in its dams over the Mekong River, to effectively discourage any opposition to its activities [46, 47]. Liebman indicates that furthermore, China's gains from the dams over the Mekong is its zero-sum gain, be it in terms of water or its potential electricity [8]. He terms it as 'trickle-down hegemony', given the nature of water's flow from the upper riparian to the lower riparian, and the more it is dammed or utilized by the upstream states, the less benefits trickle down to the lower riparian states. Dam-building firms are also being encouraged to construct dams abroad, through an array of political and economic hindrances for intrastate dam construction and incentives for overseas construction [5]. Most of the infrastructure constructed by China, outside its territory, while promoting development, are located in states with a non-democratic regime with an extremely weak or nonexistent civil society [40, 48]. Even when the voice of the civil society is raised in protest, it is often quelled by the states, which has resulted in the construction of concerning dams, and a brewing discontent and suffering amidst the affected population [49]. It has often served to aid Chinese dam construction in geographically unadvisable cites or socially unfriendly locations. For example, the Latin American region has seen a sharp rise in the number of commissioned dam projects, and an increased role for Chinese dam-builders in these projects. However, these dams are often constructed at the expense of the rich environment of these regions, displacing many people who cannot demand renumeration, uncaring of standards to be maintained in the safeguarding of flora and fauna along the dam's site, all trumped by opaque deals between the firms and the recipient states that could be interpreted ambiguously [50]. In fact, the Myitsone dam on the Irrawaddy River, falling within the territory of Myanmar, is one of the few rare instances when Chinese infrastructure met with opposition strong enough to halt and eventually decommission a project that unequivocally favored China's energy sector [51]. The Table 1 displays a few of China's projects that faced opposition owing to its environmental and social impact.

China's rapid economic growth has resulted in its importing of raw materials at a large scale, particularly from Africa [39]. These raw materials consist of crude oil, minerals and ores, and products imperative in making electronic goods or else contribute to the equipment used to create renewable energy. Given China's increasing industrialization, the rate of its consumption of energy sources such as crude oil is set to increase drastically [57]. In 2022, the Latin American and Caribbean region's imports to China amounted to 184 billion dollars, predominantly consisting of iron and copper [58]. Similarly, the Chinese imports from Africa was valued at 117.51 billion dollars in 2022 [59], which predominantly consisted of fuel related products. The Eastern and Northern parts of Africa exported agricultural products such as cotton and foodstuffs to China [60].

China has a different story pertaining to its dam-based relationship in Asia, as China's need for hydropower has a rather forceful hand in China's dam constructions in this region. Kong identifies China's competitive hydropower market abroad, offset by a set of hindrances for the same at home, being the cause for The China Development Bank and the Chinese Export Import Bank to assist Hydropower enterprises extensive assistance in overseas hydropower projects [61]. China is the largest producer of hydropower in Asia, and in fact, the world, having produced about 1300 Terawatts per hour in 2021 [62]. As of May 2023, China has approximately 479 hydropower-producing facilities that have a capacity equal to or more than seventy-five Megawatts [62]. China is the largest consumer of hydropower as well, with its hydropower consumption about 12.23 exajoules in 2022 [63, 64]. The Table 2 indicates China's consumption of hydropower between 2004 and 2022 to indicate the trends therein.

Table 1 China's Environmentally Detrimental Dams

Project Name and year	Country and Region	China's Role	Socio-Environmental Impact
Sesan 2, Completed in 2018	Cambodia, Asia	Financier	Large-scale flooding and consequent impact on lives and livelihood of ethnic and indigenous minority people
Grand Ethiopian Renaissance Dam, 2011	Ethiopia, Africa	Financier, Constructor	Increased salination of Egypt's agricultural lands, increased intrusion of salt water, and environmental degradation
Mphanda Nkuwa dam, Proposed and stalled	Mozambique, Africa	Financier	Massive displacement of people, destruction of the ecosystem and reduction of productivity of the lands nearby
Belo Monte Dam, 2016	Brazil, Latin America	Financier	Destruction of livelihood and ancestral lands of the indigenous people
Coca Codo Sinclair Dam, 2016	Ecuador, Latin America	Financier, Builder	Environmental impact due to poor construction
Pak Lay Dam, Under Construction	Laos, Asia	Financier, Builder	Destruction of the biodiversity of the Mekong River, Displacement of local communities and an impact on their livelihoods

Sources: [52–57]

China is also the upper most riparian state for all the significant rivers that it shares with other Asian states. Under these circumstances, while China's use of renewable sources of energy is still meagre, it is increasing, with hydropower making up almost one-third of the twenty-six percent that makes up the share of its renewable energy sources that meets its energy needs [67]. In this regard, China's dams on various rivers have been targeted to increase its hydropower production in the coming years, in a bid to reduce its heavy dependence on fossil fuel [68–70]. Bilateral or multilateral Agreements in this regard have not only failed to highlight that China would be gaining significantly from these projects, be it in terms of hydropower or other products, but the detriment caused to the ecosystem, which in turn has an adverse impact on the lower riparian states is hardly discussed. Its ability to construct a large hydropower dam in an earthquake-prone part of the yarlung Zangbo or Brahmaputra and refusing to acknowledge it, or the impacts of its various dams on the Mekong is proof of China's hydro-hegemonic tendencies [71]. Furthermore, China could also gain materially owing to its dams and other infrastructural projects, such as through virtual water networks and resource extraction sites. Thus, sites closer to home indicate China's proactive measures to safeguard its water security, employing its superior material and hegemonic position.

The idea of virtual water hegemony, which is hydro-hegemony over the virtual water in predominantly food products, is relevant in this regard, as, in the ongoing bid to overthrow the West's virtual water hegemony [72], China is gradually harnessing the rich water resources of the Asian, African and Latin American regions. A quarter of the world's water utilized in food production is acquired through virtual water trade [73]. China's rapid economic growth has led to an inadequacy in its water resources to meet its goals, and the little water it possesses is rapidly being polluted, thereby forcing China to seek virtual water options abroad [74]. China is one of the top net importers of virtual water on the BRI Scale, according to the study of Fang et al. [75]. It is more so with agricultural products, where China promotes economic development in states exporting virtual water, while augmenting its water scarcity and export needs [76]. Given that most of China's firms are state-owned, the virtual water hegemony would pass from a group of western conglomerates to a set of representatives of the CCP. Further, the virtual water hegemony could also be stretched to accommodate the outputs of mining, especially as it is also dependent on water. In this regard, Chinese imports from Africa and Latin America hold the possibility of a Chinese virtual water hegemony over these regions.

China's international relations is extensive, spanning over most, if not all, states of the globe. Furthermore, the BRI gives China accesses that transcend the extremely narrow scope of a bilateral relationship. This, in turn, expands the sphere within which China could potentially exercise economic and political control. It has also bitten off substantially

Table 2 China's Hydropower Consumption

Year	Hydropower consumed	Percentage of Hydropower in total electricity consumption
2004	3.45	16.045858
2005	3.84	15.8791485
2006	4.19	15.206999
2007	4.64	14.787569
2008	6.05	18.220932
2009	5.81	16.573343
2010	6.68	16.908792
2011	6.83	14.598707
2012	8.52	17.298908
2013	8.92	16.746538
2014	10.33	18.288015
2015	10.8	19.167679
2016	11.11	18.803846
2017	11.16	17.640558
2018	11.42	16.729927
2019	12.08	16.959444
2020	12.5	16.990591
2021	12.25	15.232721
2022	12.23	14.726746

Sources: Statista [65] and Our World in Data [66]

from every pie that is related to water, such as energy, resource extraction, agriculture-based raw material, etc. The following paragraphs seek to indicate the durability of this hegemonic control established by China over the recipients of its infrastructural assistance from various perspectives.

5 Hydro-stability within China's hydro-politics

Chinese hydro-politics is characterized by both conflicts and cooperations, and the factor deciding the nature of China's hydro-political relationship with its riparian neighbors have been their willingness to overlook China's vagueness and discrepancies and the undertaking of practices that are often harmful to the economies of the recipient states. This contrast is proven by India, on one hand as both states battle for freedom of action and usage over shared rivers like the Brahmaputra, and the other Southeast Asian states on the other hand, which placidly cooperate with China, particularly on the Mekong River projects that has deteriorated the environment and living standards of people dependent on this river, for other, seemingly temporary benefits [77]. China, being the world's fifth largest holder of renewable freshwater resources [78], has the potential to be a stable-independent state in its search for hydro-stability. However, given the vast and rapidly intensifying pollution of these water resources, China will gradually become a stable-dependent state, relying more and more on its water resources abroad for irrigation, electricity, and virtual imports through other products. This will also enlarge the window of China's resource extraction, which subsequently can introduce a stronger Chinese influence in other states, both economically and politically. At present, China is one of the most powerful hydro-hegemons of the international arena, which is a step in ensuring the long-term hydro-stability of a given state.

Through an array of cajoling, coercing, or aiding weaker states, China has undoubtedly chosen the most important state actors who would aid it in its aspirations in the changing climate of the international arena. These states, as indicated, are rich in resources, highly underdeveloped, prone to internal violence and civil wars, and owing to a nondemocratic or authoritarian political regime, lacking an organized civil society and the cordial support of the West. All these circumstances, coupled with these states' inability to pay back any debt to China, have made these alliances extremely important for all the stakeholders. China overtook the US long ago in the race to construct dams, a key measure to secure water and water-based gains, both material and immaterial. In this regard, with the rise in the demand for water, both for immediate and virtual purposes, China's extensive dam-construction has sought to harness the immense natural resources of these regions. This creates the possibility for hydro-electricity production and utilization, even as it lessens the visibility of the people impacted by these water governance and harnessing projects. While an alliance with infrastructural gains undoubtedly benefits the recipient states, China receives an asymmetric profit—the promise of sustained stability in the international arena in the long term, well-structured at the regional level. It also augments China's rising need for water in an era when most of its abundant water resources are polluted, unfit to fulfill most of its uses [79, 80]. China has made intense efforts to clean the taint in its water resources through a wide array of projects including water-cleansing mechanisms and apps to notify concerned authorities of extensive pollution [80, 81]. In accordance with President Jinping's conceptualization of an ecological civilization [82, 83], China has set up Water Ecological Civilization Pilot Cities [84]. These display a downward trend in water pollution [85] The Table 3 indicates a few measures taken by the Chinese government to reduce water pollution from various sources.

Despite these efforts, the continuing flow of pollutants, coupled with the long-term pollution of water, China will undoubtedly face water pollution well into the future [80]. It has several facets to it.

Economically, the recipient states hold a huge number of benefits for China. The dam-constructing industry is not the only source of employment for Chinese citizens. The resource-extraction, predominantly through mining, has also gained significantly owing to the harnessing of water resources and hydro-power in these resource-rich regions. Chinese engineers especially, gain significantly from these overseas projects, both through construction and through long-term maintenance contracts. China imports raw materials such as crude oil, copper, cobalt, and iron ore, while its exports to these states mainly consists of finished products [59]. While it is acknowledged that the proven resources in Africa (nine percent) and Latin America (eighteen percent) does not trump China's sources in the Middle East (sixty-two percent) [90], it nevertheless offers China a greater monopoly into hardly tapped resources, as opposed to resources that are widely sought after. Should the amount of polluted water within China ever trump the needs of China's residents, it could briefly rely on the import of virtual water through agricultural products and renewable energy while it seeks a more durable solution to its water insecurity. The importing of crucial raw material from resource-rich recipient states further allows China to retain its own resources, which would prove more valuable in a transformed international order when the currently mined states would have depleted resources, especially if these resources are mined with precious quantities of water.

Table 3 China's measures to reduce water pollution

Year	Name of measure	Scope
2015	Water Pollution Prevention and Control Action Plan	A comprehensive legal framework on conserving water and curtailing pollutants discharged into water
2014	Sponge City Initiative	Management of Urban surface flooding and the purification of such runoff water
	Ecological Restoration Projects	This series of projects aims to Conserve water by maintaining the ecology and natural eco-systemic functions
	Water Pollution Charge System	Industries are charged when they fail to adhere to permissible levels of pollutants discharged into China's water sources
2011	Three Red Lines Policy	scale of water usage control, increase water utilization efficiency, and limit sewage discharge
2007	River Chiefs System	Maintaining water resources at various levels of the local government

Sources: [86–89]

These states would be a more viable market for Chinese products when their stores are significantly lower than at the commencement of their economic engagement with China. These interconnected implications would have a push–pull impact on the recipient states in their producer–consumer roles viz-a-viz China, one that will take a significantly long time to alter drastically. This is due to its dependence on various factors such as available labor, resources, their rate of replenishment, the development, maintenance and proper functioning of critical infrastructure, the trade relationship between the concerned states, etc.

Politically, the recipient states benefit from a greater international recognition through an alliance with China, without having to reorder their internal political structure—the demand that lost the resource-rich region for the United States. At the regional level, states with more dams, and more technologically innovative dams with greater capacities, naturally have the potentiality to exert greater influence over states that lack in the quantity, technical innovation and capacity of their dams. This reflects on the possession and harnessing of water resources, and the consequent ability to utilize it for self-sustainment and leading, in however small a capacity, in sharing the excess with the less-advantaged states in one's own terms. Dams also help states in selling their developmental successes at home, as dams, apart from storing water and aiding in irrigation purposes, also assist in harnessing hydropower, thereby ensuring some indigeneity to the energy utilized by these states.

China's dam-constructions in nondemocratic, if not completely authoritarian regimes, has curtailed the chances for the rise of civil society movements. This greatly reduces the quantity and ability of strong voices to question both the tangible socio-environmental impacts of Chinese dams in their states and the erosion of their economies and political structures in the near future. This adds a point in favor of China's possible ambition for the attainment of hydro-stability. The chances for them to develop a strong and critical voice to condemn the practices of their governments at home and the hegemonic interference and influence of Chinese dams, and its consequent natural resource exploitation, should they form, requires more time. The Asian Infrastructure Investment Bank (AIIB), which is at the head of many of China's overseas projects, including rehabilitation of dams, has a few prescriptions that provide a space for the civil society to share objections and feedback, and to raise grievances about any of its commissioned projects [91]. However, in practice, the civil society has been increasingly disappointed in AIIB's increasing lack of recognition or redressal of their concerns [92, 93]. Moreover, given the slower rate of development and extremely weak economic circumstances of these recipient states, compared to China, the beneficial appearance of the short-term, tangible, material gains render these states ignorant of, or unwilling to, demand their share of the long-term stability offered by these dams. Thus, the asymmetric hydro-stability of China is set to continue well into the transformation of the emerging world order, and afterwards as well, securing a small but significant portion in China's position in a changing world order. Under these grim circumstances, the norms of environment would be the sacrifice at the altar of the search for stability from dams.

a comprehensive grooming and monitoring of various aspects of the overall development of the circumstances that conditions an entity's stability is a fruit attained over a long period of time. Stability is not the absence of shocks or fluctuations. It is the ability of an entity, (a state), to withstand such shocks from internal, regional or the international system, and from the reflections of the past actions like massive pollution or future repercussions like climate change, to the best possible extent. Moreover, stability is also layered, increasing in intensity with the increase in the level of externality of the state—internal, regional, and international. Furthermore, water, despite its rapidly increasing pollution and its depletion from the groundwater tables, will take a significantly longer period of time before its course is drastically altered, or a waterbody is completely dried up. Owing to the continuation of the water cycle, the complete extinction of water within the lifespan of this transforming world order is almost nonexistent. Therefore, even if waters in overpopulated and highly industrialized states become toxic for human usage, the untapped water resources, at a greater risk to the environment and life, could still be utilized through virtual water networks. This might impact the benefit of the stability of hydropower attained from those infrastructures closer to China's territory, not only because of rapid climate change, but other, perhaps related factors such as changing economy and fluctuations in the costs for constructing such infrastructure. This would be offset by the other sources of renewable energy that China has already begun to expand, foremost among them being solar and wind energy. However, water, and consequently, hydro-stability is still essential to produce primary products of food and medicines, and the secondary, but equally essential products that leads to a constant advancement of human civilization. Given that humanity will live alongside politics, even international politics, and given that water is a basic essential for humanity, hydro-stability is an essentiality for survival in this increasingly interdependent, but increasingly competitive, world.

Under these circumstances, water-based stability has, at the threshold of an emerging world order, a durability and constancy. This hydro-stability, owing to China's strategic maneuvers, would aid it in its larger aspirations. Given the asymmetric benefit for China through this hydro-stability, the most disadvantageous outcome for the recipient states

would be that their development would continue at a slow rate. It would be never enough to threaten China's stability, especially its basis in water, but never too less to be an anchor on Beijing's growth. It will effectively bring a status quo rate of development for states to remain China's satellites in the international arena.

6 Conclusion

It is evident from the above sections that China, through its spate of dam-building, has secured for itself not only immediate benefits at the level of water and through water in the economic and political fronts; its gains transcend short-term gains with the strong possibility of factoring in its stability, a means and an end attained over a long period of time. However, it is also to be noted that in the emerging world order, through its dams in various parts of the world, China has significantly influenced regional political orders, which has a profound and prolonged impact in stabilizing its position in the emerging world order. This could be either through the means of benign influence, coercion, or material gains for all states and regions involved. Its occurrence when the world hurtles toward the precipice caused by climate change and the inadequate reactive responses to it is all the more portentous for a small but important part of China's switch into the emerging world order.

While China's stability, based on infrastructure oriented toward water management, would arise out of cooperation induced by its hydro hegemony, it will also, for the most part, set the precedence for massive cooperation over shared water resources, both physical and virtual in the emerging world order. While this would immensely improve potential water-based discord and nurture cooperation, only a willing transformation of all hydro hegemons into benign hydro hegemons, if not willing cooperators, could effectively normalize water-based cooperation into the ever-evolving international norms and bring stability at the level of Hydropolitics, and could keenly influence other interconnected aspects such as energy. Any state with the means to extend hegemonic influence over a transboundary water resource through infrastructure construction like dams, unilateral policymaking, and with a natural advantage while negotiating water sharing agreements is a hydro-hegemon. These means could be the capabilities born out of material and cultural power, as well as need born out of inadequate water or related resources. The degree and extent of hydro-hegemony varies with the nature of the exerted hydro-hegemony (malign or benign), and the amount of water resources under such hegemonic influence.

China, being an extremely powerful player in the international arena, one who also happens to know the game of hydro-politics well, has at its disposal the means of bringing about this transformation through cooperation, through its dominant positions in both bilateral and multilateral spaces meant for climate and water-based discussions. These discussions, if set on fruit-bearing courses such as the prevention of resource and human rights exploitation of the recipient state, or the building of a powerful international regime against harming the larger ecosystem while constructing hydropower infrastructure, and complemented with larger climate-change-mitigation goals would go a long way in not only ensuring China's hydro-stability, but also solidifying its position as a very strong power in this evolving world order. Due to their position at the intersection of water, resources, environment and human security, Dams are an excellent point of commencement of diplomacy based on water, to avoid the unpleasant manifestations of selfish national interests in a shared transboundary basin, and to promote collective and cooperative goals [94]. Given that water-based diplomacy transcends the immediate issue area of water and spills over into other issue areas with a deeper and longer political engagement [95], it is more suitable to attempt a comprehensive collective engagement among states. This is more so given that China has already lent its powerful voice to international climate governance in various fora [96]. Another tool to consider using in establishing water-based cooperation among China's water-based allies is informal diplomacy, as a means to circumvent the extensive asymmetric differences of power among states to establish a mutually beneficial hydro-stability. In this regard, Mirumachi indicates the reasonable success of informal diplomacy on the issue of dam-building on the Mekong River, even while it was subject to the power-politics of financial flows of these dam-construction projects [97]. However, it must be noted that such powerful instruments like agreements and policy implementations must succeed the Chinese example in practice toward the recipient states of its infrastructural assistance. It could perhaps induce recipient states to join a fruitful water-based cooperation, in search of a collective hydro-stability, of their will, without the added threat of the withholding of Chinese knowledge and monetary assistance.

A collective effort in this regard would also prevent a dominant China, in the question of water and its political impacts, in the emerging world order. This norm-setting is essential to ensure the mutual gains of all involved in an emerging

world order where water security will have a deeper implication than its current form under the prevailing international and environmental conditions.

This paper also seeks to lay out the preliminary foundations of the notion of hydro-stability. Future research in this direction could focus on the idea of stability within the context of hydropolitics, given the rapid emergence of water as an important component of conflict, cooperation, discontent, hegemony, and stability. Even as it broadens one's understanding of the field of hydropolitics, it would also greatly enable the comprehension of state behavior, and perhaps even the behaviors of non-state entities such as civil societies, as it pertains to the questions of water within a political frame. This would, in the long run, help a wide set of audience in attempting to design a mutually beneficial stability based on water.

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Declarations

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