

## Article

# Investigating the Impacts of the Political System Components in Iran on the Existing Water Bankruptcy

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**Abstract:** Iran is suffering from a state of water bankruptcy. Several factors have contributed to the current water resources bankruptcy, ranging from anthropogenic impacts, such as an inefficient agricultural sector and aggressive withdrawal of groundwater, to climatological impacts. This paper suggests that water resources mismanagement in Iran should be evaluated beyond the policy-makers decisions, as it recognizes that the bankruptcy has been intensified due to the structural and institutional form of the political system in Iran. This study discusses the roots of the water bankruptcy and identifies four major shortcomings caused by the political system: (1) the absence of public engagement due to the lack of a democratic and decentralized structure; (2) adopting ideological policies in domestic and foreign affairs; (3) conflicts of interest and the multiplicity of governmental policy-makers and sectors; and (4) a state-controlled, resource-dependent economy. Through the development of a generic causal model, this study recommends a systematic transition towards a democratic, decentralized, non-ideological, and economically diverse political governance as the necessary—but not necessarily sufficient—adaptive and sustainable solution for mitigating the impacts of water resources bankruptcy in Iran. The insights highlighted in this paper could be employed to inform water resources decision-makers and political actors in other non-democratic and ideological political structures struggling with a water resources crisis or bankruptcy.

**Keywords:** water bankruptcy; political structure; water resources; democracy; decentralization; stakeholder engagement



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## 1. Introduction

Iran is suffering from an anthropogenic and socio-economic drought known as “water bankruptcy” [1,2], where the water demand far exceeds the available water supply [2]. Several factors have contributed to the current state of water bankruptcy, including but not limited to an inefficient agriculture sector [3–5], the over-grazing of rangelands and forests [5], the multiplicity of governmental stakeholders, high population growth rates in the 1980s and 1990s [6], the absence of effective and efficient water pricing policies (economic valuation of water) [7], aggressive over-extraction of groundwater resources [8–11], uneducated public stakeholders [12], and the absence of a proactive management paradigm. Climate change and natural climate variabilities should also not be overlooked [13,14], as they have contributed as catalysts to the exacerbation of alterations to precipitation events and air temperature patterns, reducing the freshwater availability [15,16], and leading to more prolonged droughts in the dry regions of Iran [13].

Few studies have evaluated the extent of the existing water bankruptcy and its consequences and attempted to propose technical and fundamental solutions to combat the water bankruptcy and anthropogenic desertification problems in Iran [1,5,17–19]. Despite the importance of the political power structure, no study has assessed the role of political system components in Iran (on a macro-level) regarding the existing water bankruptcy. The current study elaborates implications and symptoms of the fundamental socio-hydrological and hydro-political causes of water bankruptcy given the structure of the political system

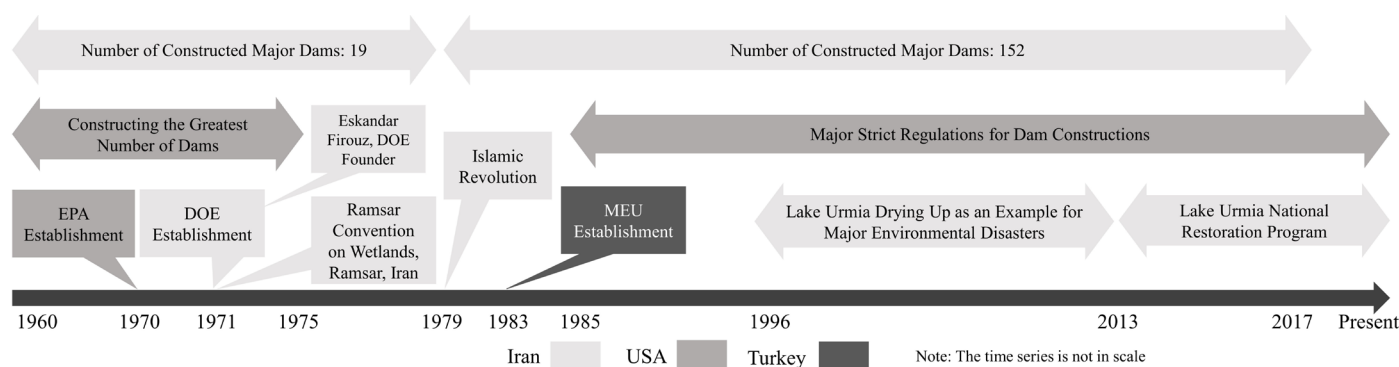
in Iran and provides a wealth of insights into the consequences of the existing water resources managerial system. Having an effectively functioning water management sector in a political structure while other sectors remain ineffective is not feasible [20]; thus, the governing political structure of Iran—according to its constitution—is briefly described in this study in the next section, along with the climatological and water resources challenges and potentials in Iran. The following sections discuss the effects of democracy, decentralization, conflicts of interest between governmental sectors, ideological policies (Islamic idealism) in domestic and foreign affairs, and state-controlled economy on the management of water resources in Iran, and characterize the relationship between the political system and water resources management in Iran using the Eisenhower Matrix. The last two sections of the paper explore the interconnections of several factors contributing to the existing state of water bankruptcy and develop a generic causal model displaying how the nature of the political system in Iran has intensified the state of water bankruptcy; these sections then conclude with a recommendation for a sustainable mitigative and adaptive plan. Although the nature of the study presented in this paper can be considered place-based, the insights highlighted here may be employed to inform political actors and water resources decision-makers in other countries with non-democratic political systems and ideological policy-making (ideologies that are not necessarily Islamic idealism) who are struggling with a water crisis or bankruptcy.

## 2. Biophysical and Sociopolitical Context

### 2.1. Water Resources and Climatological Potentials and Challenges in Iran

Iran is located in Western Asia in the heart of the Middle East, bordering the Caspian Sea, the Persian Gulf, and the Gulf of Oman. The total annual renewable and available quantities of freshwater per capita in Iran were less than 124 billion cubic meters ( $\text{bm}^3$ ) and  $1479 \text{ m}^3$ , respectively in 2021 [21]. The latter exceeds that of a few countries around Iran, such as the United Arab Emirates, or UAE ( $16 \text{ m}^3$  as of 2020) [22], is slightly less than a few countries in the region, such as Turkey ( $\sim 1500 \text{ m}^3$  as of 2020), and is below the global average (i.e.,  $\sim 5730 \text{ m}^3$ ) [22]. Iran's annual average precipitation is approximately 250 mm [23], varying spatiotemporally and disproportionately across the country. Twenty-five percent of the country receives more than seventy-five percent of the annual precipitation volume-wise [18]. Due to the large climatic variability, air temperatures vary significantly by season all across the country, ranging from  $-20$  to  $+50$  °C [24,25]. Unlike the narrow bank along the Caspian Sea (located in Northern Iran) and the regions along the Zagros Mountains, the interior plateau of Iran has a dry climate. Iran enjoys five different climatic zones, ranging from very dry to very humid conditions [26]. The climate of Iran is also classified as arid (42% of the country's land), semi-arid (34% of the country's land) to humid and dry-subhumid (24% of the country's land)—area-wise—based on the aridity index, i.e., the ratio between annual precipitation and annual potential evapotranspiration [27] (refer to Pour et al., (2020) for the spatial variability of aridity across the country).

Iran has experienced a series of significant events in its modern history of water resources management during the last 60 years [21] (Figure 1). These include launching a country-wide land reform named the “White Revolution” in 1963 and beginning the conversion of many pastures to agricultural and irrigated lands, being the first state in the Middle East to form a Department of Environment (DOE) in 1971 (prior to the Islamic Revolution in 1979), holding the intergovernmental convention in Ramsar, Iran, on Wetlands in 1971 [28], and having several considerable environmental hazards and disasters due to a series of systematic problems. The time series of significant events in the history of water resources management in Iran and a short comparison between similar events in the USA [29] and another country in the region, Turkey, is shown in Figure 1.



**Figure 1.** Time series of major events related to the modern history of water resources management in Iran and a comparison with similar events in the USA and a country in the region, Turkey; EPA: Environmental Protection Agency, DOE: Department of Environment, MEU: Ministry of Environment and Urbanization.

## 2.2. The Existing Political Structure

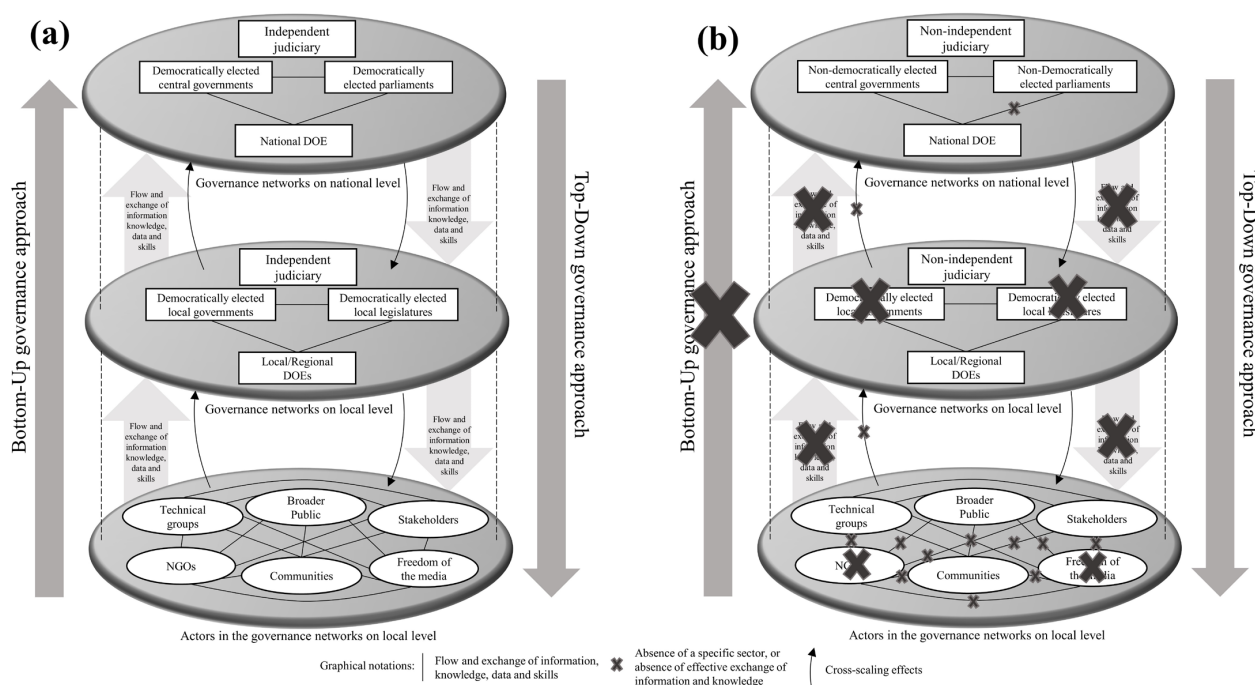
The main core of the existing political system in Iran comprises the supreme leader, president, guardian council, assembly of experts, the Islamic Consultative Assembly (also called the Iranian Parliament), and the judicial system [30]. The head of the judicial system is directly appointed by the supreme leader. The supreme leader appoints half of the guardian council members, and the other half are introduced by the head of the judicial system, who is appointed by the supreme leader to Parliament for approval. The president, Islamic Consultative Assembly, and the members of the assembly of experts are elected directly by citizens; however, all candidates running for presidential, parliament, and the Assembly of Experts elections must be vetted and certified by the Guardian Council in advance to be able to run for the elections. On the other hand, the Assembly of Experts is empowered to appoint and dismiss the Supreme Leader. The supreme leader is also the Commander-in-Chief of the military forces, and appoints Commander of the General Staff of the Armed Forces, Commander-in-Chief of the Army, and Commander-in-Chief of the Islamic Revolutionary Guard Corps (IRGC). There is a main core group of people in the circle of power, where all high-ranking officials are either directly or indirectly appointed by the supreme leader, whose term is unlimited [30]. The unlimited term of service and unaccountability of the supreme leader reinforces the centralized and non-democratic aspects of the political system in Iran [31,32]. The ideological aspect of the system is also defined based on Articles 4 and 177 of the Constitution, as all major legislation should conform to Sharia Law, and Article 154, which is the foundation of ideological foreign policy in the system [30,33,34].

## 3. Necessity of Democracy for Sustainable Management of Water Resources

### 3.1. Importance of Public Involvement and Democracy

In a democratic political structure, a platform is created in which a capacity for preventive, or at least relatively preventive management of water resources can be planned and implemented to prevent a problem from becoming a catastrophe. Extensive citizen and stakeholder involvement [35–38] in water resources management, widespread media oversight of water resources management, input from independent environmental non-governmental organizations (NGOs), officials' fear of losing executive and supervisory positions, input from an independent judicial system, effective linkages between governance networks across scales (cross-scale effects), and having a multifaceted flow between the broader public, technical groups, and governmental sectors [39] (Figure 2a) are elements that shape this capacity. If the institutional and political actors can be considered legitimate by the broader public—through public engagement [35,40] and a democratically elected political structure (Figure 2a)—then water resources management decision-making and water-allocation policies can be subsequently judged as favorable with political buy-in by the public [41]. There have been several case studies in democratic political structures (such

as Spain and the USA) where mismanagement primarily due to the pursuit of short-sighted achievements, accelerated by competitiveness [2], has caused water bankruptcy; in numerous other cases, the interests of farmers and social support for irrigation of agricultural lands have also clashed with environmentalists and regulatory requirements determined by governmental institutions in those democratic systems [42–46]. Although democracy is not a definitive solution, democratic political structures can function as catalysts that shift the accountability for managing water resources, improve citizen participation at all governance scales (Figure 2a), and classify environmental problems as important and sometimes urgent. Unlike deliberative democratic political structures based on the involvement of public and local stakeholders [47–49], in non-democratic political structures where there is no proper platform for citizen participation in decision-making, policymakers generally have a marginal view towards environmental and water resources problems. As a result, environmental problems are not seen as urgent issues [50], unless those issues change from problems to national catastrophes.



**Figure 2.** Simplified conceptual schematic of (a) an effective democratic, multilateral decision-making approach for the allocation and management of water resources, and (b) the existing decision-making approach for the management of water resources in Iran. Note: The schematic design was inspired by Andersson and Ostrom (2008) and Meerow et al. (2016).

As mentioned in Section 2.2, the governing paradigm of Iran, according to various principles enshrined in the Constitution, including Articles 5, 91, and 111, is classified as a non-democratic political structure [30], resulting in a weak legitimacy base of governance arrangements. Accordingly, the problems related to water resources in Iran are not separated from the political and water governance standpoints. Regardless of who is responsible in the main decision-making bodies in Iran (of course, the substantial role of authorities in the efficient management of water resources cannot be denied), and due to the non-democratic nature of the governing structure (Figure 2b), the aforementioned effective democratic, multilateral decision-making approach for the allocation and management of water resources is both complicated and complex to implement in Iran. This complexity then makes the establishment of sustainable and resilient management of water resources in Iran highly unlikely. One of the explicit examples of the lack of an urgent viewpoint and effective democratic, multilateral decision-making approach towards various water and environmental problems is the type of management adopted for hypersaline endorheic Lake Urmia (located in Western Azerbaijan Province) in the 1990s and 2000s prior to it

becoming a national catastrophe [51–53]. The massive water deficit in Khuzestan Province and the Central Plateau of Iran, which was formed after years of excessive water transfer and non-efficient use of water [54] for agricultural purposes, is another example of the lack of an “urgent” policy in water resources management.

### 3.2. *Democracy, Water Resources, and Developing Countries Such as Iran*

While community participation has been proven to enhance the proper establishment of sustainable water resources management [38,55–58], limited stakeholder engagement and a solely top-down approach in water resources decision-making [59] (due to the absence of deliberative and democratic governance) has intensified challenges in the sustainable management of water resources in many developing countries [6,60]. There is a widespread tendency among developed countries [46], and more substantially among developing countries, such as Iran, to use natural resources (such as water resources) to enhance economic development [61,62]. Despite this tendency, the destructive effects of adopting such policies in non-democratic developing countries could be mitigated if a deliberative, democratic and stakeholder-based political structure was established [63,64]. Although there are variations in the levels of environmental sustainability and improvement based on a developing country’s level of democracy, democracy has been observed to be conducive to the improvement and protection of environmental quality and water resources [64–66].

## 4. Decentralization for the Proper Management of Water Resources

In addition to a democratic structure, the necessity of establishing a polycentric [67–69] and decentralized administrative structure—with no major conflicts of interest between governmental institutions and agencies—is one of the necessary (and not sufficient) requirements for the proper management of water resources [19,70]. In such a structure, major water resources decisions are made solely by local governmental and public stakeholders [41], local communities, professionals, and those impacted [71] by the resources, under the extensive supervision and imposed regulations/compliances of a country-wide organization, such as the DOE. Therefore, through the payment of costs by affected local public and stakeholders (e.g., through transparent taxation systems and water pricing), stakeholders can become more conscious and sensitive to the supply of water resources [72,73] and may comply with water-related regulations, resulting in improved management of water resources. In the governing political structure in Iran, most major decisions regarding water resources are made by the center/capital [19,74–76]. Thus, due to the limited office term of the parliament members and ministers, politics plays a critical role, because the number of water resources projects is often used to show the success of the ministries or parliament members over a limited period of four or eight years. This centralized administrative structure persuades authorities (regardless of their work experiences, political background, and education) to prioritize a reactive over a proactive management paradigm, leading to a series of short-term, quick-return, and short-sighted decisions being made, which in the long run, could lead to increased stress on water resources. Decision-making to achieve long-term goals in the fields of water resources management, agriculture, and flood control are made at the discretion of ministries such as the Ministry of Energy (MOE), the Ministry of Agricultural Jihad (MAJ) and some sectors affiliated with military organizations. For electoral (presidential administration and ministries), security (increase in protests), and ideological (military organizations) reasons, short-term economic goals can become more important than long-term environmental impacts; consequently, populist development takes precedence over the development of sustainable water resources projects. Centralized governance could also weaken the “tightness of feedback loops”, increasing the probability of occurring significant regime changes for water resources, primarily due to the inability to detect issues in a timely fashion [77,78].

Examples of damage imposed on the country’s water resources by the non-democratic and centralized administrative structure are the absence of compliance with land use



planning basics and approaches during the transfer of water to the Central Plateau of Iran, the construction of the Gotvand Dam [79], and the insistence on completing the KaniSib Dam and water conveyance tunnel [80] to transfer water to Lake Urmia until the end of Hassan Rouhani's presidency term (July 2021). The first phase of the KaniSib Dam was constructed in January 2021. This dam, which was constructed on the Zaab River, diverts water to Lake Urmia. There was strong political will to complete the construction of the water conveyance tunnel by the end of the administration of Former President of Iran, Hassan Rouhani (which ended in July 2021) to show it as one of the administration's achievements. However, the concept, design, and construction of such projects—which are correlated with the sustainability of the Lake Urmia watershed and beyond—need to be conducted through private, public and governmental stakeholders [12,81,82]. Additionally, the centralized administrative structure, which relies on the demonstration of achievements by parliament and the government over periods of four or eight years, has led to the adoption of poor land use planning strategies, resulting in constructing many high water-intensive sectors (like Isfahan Mobarakeh Steel Company, or IMSC) in the most water-scarce regions in the country, such as Isfahan, Semnan, and Yazd. IMSC was initially planned to be constructed in Bandar Abbas, a port city near the Persian Gulf in 1978, prior to the Islamic Revolution; however, due to intense political pressures imposed by the central government and parliament political actors, it was constructed and initiated operation in the water-scarce City of Isfahan in 1993 [83]. Overall, decentralization based on a participatory approach with no conflicts of interest between governmental agencies, extensive supervision by the DOE, and as a major policy implication, is recommended in Iran [19,70] to improve the sustainability of water resources management.

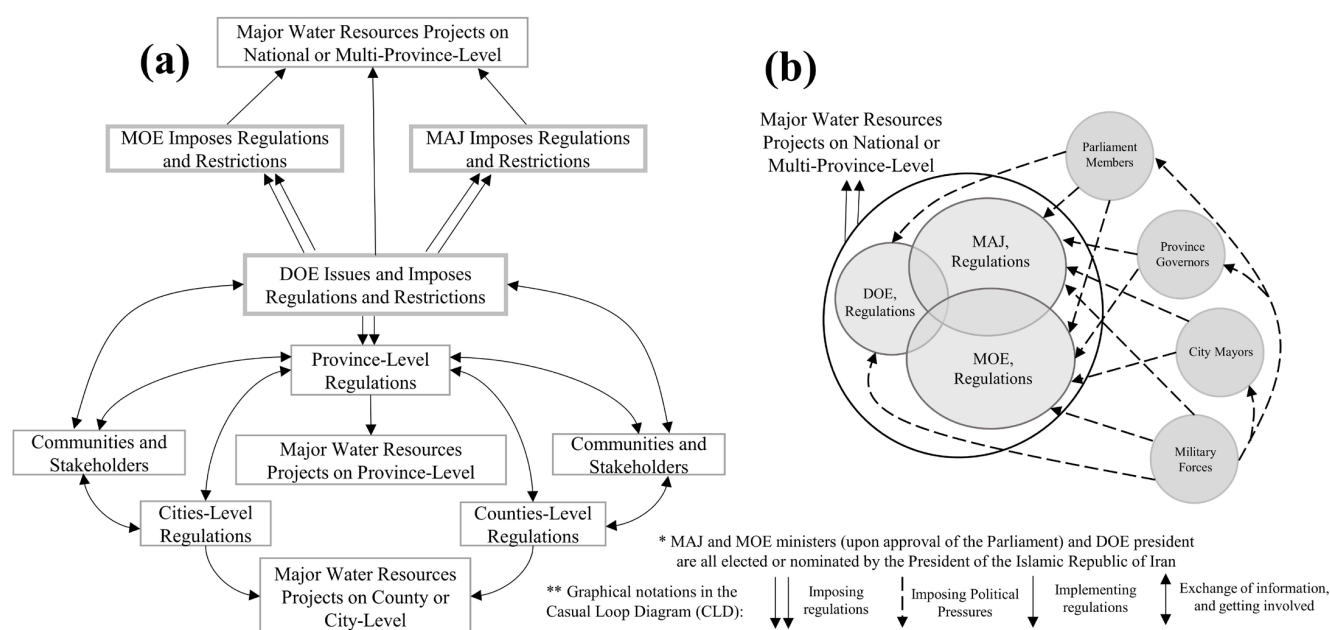
#### *Formation of Committees for Restoring Water Resources*

The formation of committees to restore and/or rehabilitate impaired, degraded, or drying water resources should rely heavily on local public and private sector input [82] (such as that created to mitigate widespread pollution of Chesapeake Bay [84] in the United States), and should not be solely planned by the central government. The formation of such committees could lead to sufficient consideration of local issues, the impedance of socio-hydrological barriers, and the adoption of policy-efforts that match the local cooperation and reality [85]. In Iran, however, this is not the case. The structure of restoration and rehabilitation committees in Iran, such as the Lake Urmia National Restoration Committee or LUNRC created in 2013, which are formed by executive order of a President, may adopt policies that are counter to the needs of local stakeholders. The committee's general policies may also change due to staff changes in the administration offices, and such committees may be removed after changes to the presidential administration.

### **5. Conflicts of Interest between Several Governmental Sectors**

The multiplicity of governmental sectors and parallel decision-makers (DOE, MOE, MAJ, military organizations, parliament representatives, etc.) have intensified the inexorable competition and conflicts of interest between governmental sectors regarding proper decision-making on water management. The multiplicity of decision-making bodies involved in the management of water resources can be considered very similar to the multiplicity of parallel organizations involved in economic, political, and military affairs in the current political system. Based on an effective hierarchical management structure (Figure 3a), the DOE should be in charge of resolving disputes on basin/sub-basin water conflicts, setting nation-wide regulatory requirements for permitting groundwater and surface water withdrawal, ensuring compliance with the enforcement of effective regulations [86], and extending such rules to the MOE, MAJ, provinces, and cities for execution. The provinces and cities may also have their own regulatory requirements given the regional climatological and geological constraints (Figure 3a). However, this regulatory process is not conducted in Iran (Figure 3b). In numerous cases, ministries act in contrast to the regulations set by the DOE and act under pressure from some other institutions. Provincial, military,

and parliamentary organizations also try to advance their “regional” goals by putting pressure on each of the above-mentioned organizations and ministries. This is an issue that even former deputy head of the DOE (in the Administration of Former President Hassan Rouhani) mentioned in one of his interviews [87], exposing parliament’s efforts to influence the MOE regarding the construction of new dams in the Lake Urmia basin. The current non-democratic structure has led to a multiplicity of governmental stakeholders being involved in the management and restoration of Lake Urmia [12], eventually resulting in conflicts of interest and responsibilities. Despite the LUNRC’s emphasis (which operates under DOE) on the suspension of studies and construction of new dams for agricultural purposes, the political pressure imposed on the Minister of MOE by a number of Iranian parliament members to construct the NaazloChaay and BarandoozChaay dams resulted in a feasibility study on the construction of the mentioned dams being initiated [88]. On the other hand, and contrary to the emphasis of the LUNRC and the DOE, the MOE drastically reduced the water supply of Lake Urmia for the 2021–2022 water year for agricultural purposes [89]. A surprising point is that both the LUNRC and MOE presidents are elected directly by the Islamic Republic of Iran’s president; however, the explicit conflicts of interest have caused various approaches to be adopted through different governmental agencies to manage tributaries located in the Lake Urmia watershed [12]. The value-based and effective socio-political hierarchy of governmental sectors decision-making used for setting regulations compared with the current condition of the governmental sector’s decision-making process in Iran is shown in Figure 3 through a causal loop diagram (CLD).



**Figure 3.** Causal Loop Diagram of the processes for setting regulations; (a) An effective value-based socio-political hierarchy of governmental sectors decision-making for setting regulations, with no significant conflicts of interests between the sectors; (b) diagram of the existing condition of governmental sectors decision-making in Iran, which reinforces conflicts of interest between the sectors. MAJ: Ministry of Agricultural Jihad; MOE: Ministry of Energy; DOE: Department of Environment.

## 6. The Impacts of Ideological Policies in Domestic and Foreign Affairs on Water Resources Management

Adopting ideological governmental policies at external and internal levels—as mentioned in Section 2.2 [30]—can shift the policy priorities from sustainable and adaptive development to idealism and ideological goals. These policies, for example, emphasizing high population growth, emphasizing self-sufficiency in agricultural production, and increasing conflicts with neighboring countries have been a few of the main reasons for inadequate water distribution, a decline in water per capita, and a lack of constructive

regional cooperation with countries in the region regarding transboundary water resources in recent decades. The foreign policy of the current political system has intensified regional and trans-regional tensions [90–94]. This has acted as a driving factor for the intensification of international sanctions on the state since the 1979 Islamic revolution, negatively impacting the sustainability of the environment in Iran, particularly water resources, and reinforcing the government's idealism about self-reliance for food and agricultural production. The most significant outcomes of adopting ideological policies in the political structure of Iran are discussed in the following sections.

### *6.1. Population Growth*

An emphasis on increasing the population and a surge in fertility over a period of about ten years after the establishment of the new political system in 1979 were partially driven by religious and ideological pressure from the authorities to create a progressive Islamic State in the region [95]. This emphasis on population growth was exacerbated by widespread migration from rural to urban areas. There is a continued emphasis by the supreme leader and authorities in this regard at the present time (2010s and 2020s), enforcing legislations that encourage increasing the fertility rate and population growth [96]; however, currently Iran is not experiencing a significant population growth rate similar to the 1980s. With a current annual population growth rate of around 1.2%, Iran's population is slightly over 84 million, making it the 18th most populated country in the world.

Although the governmental population control policy was relatively successful in the 1990s, the overall population growth discourse, which indicates the Islamic idealism of the government, has governed the populational aspect of Iran over almost the last four decades [97]. This high population growth rate paradigm has been part of the reason for the reduction in Iran's per capita water availability from about 3800 cubic meters per year in 1977 to approximately 1400 cubic meters per year in 2017 [11]. Due to population increase and politicized decision-making in land-use planning, the spatial distribution of the population has been intensified disproportionately all over the country within the last forty years, particularly in the 1980s and 1990s, creating a mismatch between the regional water supply and demand.

### *6.2. Emphasis on Self-Sufficiency*

Past and ongoing efforts to be self-sufficient in agricultural production at the national level [98] (since the 1979 revolution) have increased hazards and jeopardized the essential elements of sustainable water resources management in Iran. The emphasis on self-sufficiency in agricultural, livestock, and industrial production is enshrined in the Islamic Republic Constitution, such as Articles 3 and 43 [30]. The revolutionary ideals of self-sufficiency have been emphasized by the current system and its custodians in order to establish an inward-looking economy [99] and to implement a policy of cutting dependence on the Eastern and the Western countries. This policy has actually created hazards in the sustainable management of water resources, exacerbating the water supply shortage throughout the country, specifically in the central and eastern provinces. The Islamic Republic declared and celebrated independence and self-sufficiency in wheat production in 2004 during the presidency of Mohammad Khatami; however, such independence did not last long. Extensive political effort to achieve self-sufficiency in wheat production took place in the midst of one of the most severe droughts in recent decades (1998–2002) in Iran [100,101]; this came at the expense of large-scale and intense inter-basin surface water transfer, groundwater withdrawal, and extensive over-exploitation of renewable water resources. The heavy subsidies assigned to expand the production of wheat in the Interior Plateau of Iran, including the heavy subsidization of water-intensive crops in the Lake Urmia basin, such as sugar beet [12], along with massive extraction of groundwater and surface water for irrigation purposes, further triggered economic issues and intensified water-scarcity in the country.



The combination of ideological goals for population growth, an emphasis on self-sufficiency, and disproportional land use planning (due to the absence of a decentralized and responsive administrative structure) led to a sharp increase in the construction of structural mechanisms such as numerous dams and reservoirs in the 1980s and 1990s (a number of those dams were planned prior to the 1979 revolution), and extensive intra and inter-basin water transfer from areas such as the Zagros Mountains tributaries to the Provinces of Isfahan, Yazd, and Kerman primarily for agricultural and industrial uses. Ironically, this approach not only has not improved water supply in destination areas [10,54,73,102], but has also led to water shortages in areas such as Isfahan due to the illusion of abundant and cheap water. In other words, it has triggered an increased water demand, but not necessarily water control. Consequently, a syndrome named “a fix that can backfire” [54] in the hydrology and water governance sciences was created.

### 6.3. *The Importance of Foreign Policy*

The foreign policy of the existing political system [90–94] has created deep obstacles to constructive cooperation and multilateralism with the countries in the region, and it has had an adverse impact on the management of transboundary water resources and watersheds. There are six main water basins in Iran, four of which are transboundary and shared with the neighboring countries, making them potential sources of water resource conflicts with neighbors in the region. In the past, accords such as Algeria on the Arvand River with Iraq or agreements with Afghanistan on the tributaries and catchments of Lake Hamoun were signed. However, due to climate change, increasing water demand, and the changing demographic textures [103] of areas located in the common-pool resources (such as watersheds), there is an essential need to review and revise the current accords based on “mere” national and local stakeholder interests, rather than ideological interests. The main question is this: is the priority of the Islamic Republic in its interactions with neighboring countries the expansion of its ideological goals or not? This is a fundamental question, as it is difficult to achieve the resolution of hydro-conflicts with neighboring countries (such as those with Iraq or Afghanistan) on a permanent basis until an explicit answer to this question is obtained.

In addition to transboundary water resources with neighboring countries with a common land border, there are transboundary water resources with other countries such as Bahrain, Saudi Arabia, and the UAE, which have a common sea border with Iran. These countries have desalinated water in recent decades due to severe water shortages [104]. A country like the UAE has similarities and differences in its water management structure to Iran. The UAE, like the Islamic Republic of Iran, has been thirsty for development in the past four decades, and its non-democratic structure has led to the use of limited renewable and non-renewable water resources in the country as drivers for economic development. Despite this similarity, the main difference between the UAE and Iran in terms of the availability of sustainable water resources should not be overlooked. The amount of renewable water in the UAE in 2017 per capita was about 16 cubic meters per year, far less than in Iran, which was approximately less than 1500 cubic meters per year in 2017. The renewable water in Iran, however, is distributed non-proportionally across the country [1]. In November 2020, the President of the Islamic Republic, Hassan Rouhani, announced the transfer of desalinated water to the central plateau mainly for industrial and agricultural use, during the opening ceremony of the first phase of the salt water desalination site in Bandar Abbas City [105]. He described the project as being completely environmentally friendly and one of the largest national projects in recent years; however, the fundamental questions are as follows: have more environmentally friendly and economically efficient options for the drinking water supply and industry for the Iranian Central Plateau been evaluated? Does the Islamic Republic want to compete with countries around Persian Gulf for water desalination? Is there a consortium between Iran and the countries of the region to cooperate and mitigate the adverse environmental impacts of desalination? Despite these doubts and questions, and in case of the necessity

of the desalination of the water of the Persian Gulf or the Sea of Oman for transfer to the central plateau of Iran and due to the common water bodies (sea of Oman and the Persian Gulf) between Iran and the countries of the region, there is an urgent need to establish a “joint water consortium” between the countries in the region and Iran. Like the agreement signed between Israel and Jordan [106] to manage the “Dead Sea” to mitigate the environmental impacts of desalination (following the 1994 peace accord), there should be a similar consortium between Iran and its neighboring countries to coordinate and mitigate the environmental impacts of water desalination. International relations and the science of hydropolitics have shown that the precondition for the creation of such mechanisms and consortium is political relations based on national interests (and not ideological interests) and mutual respect between countries. Now, the question is, does the nature of the Islamic Republic and the types of relations between the Islamic Republic and the countries of the region allow the formation of such a consortium based on the mentioned preconditions? This could potentially be a major and, of course, worrying issue if such preconditions are not adopted.

#### *6.4. The Environment, and International Sanctions on the State*

The root causes and impacts of destructive sanctions on the environment in Iran are complex and complicated, as a number of multifaceted factors in the context of political, economic, and regional subjects are at play. For this reason, investigating the possible effects of sanctions on the environment without considering the factors affecting its formation simplifies this issue. Some of these factors that need to be considered are the current state of the environment, the analysis of the causes of sanctions, the extent of the impact of sanctions on the environment, a comparative evaluation of environmental management conditions at the time of sanctions being introduced—at a macro level—with pre- and post-sanction conditions, the degree to which the country converges with the world order in the condition of pre-sanctions, and perhaps most importantly, the viewpoint of the political structure under sanctions to the environment. Highlighting one factor without mentioning other factors makes the assessment erroneous.

It should not be overlooked that international sanctions—regardless of whether the sanctioned country is the main culprit behind the sanctions or not—can in general play a catalytic role in the degradation of the environment. It can indirectly affect the quality and quantity of environment and water resources [107,108], promoting non-cooperative behavior and short-sighted attitude in the water management sector [109]. Economic restrictions created due to sanctions can reduce the level of priority given to environmental protection and promote the direct use of natural resources to compensate for economic restrictions, thereby increasing efforts towards self-sufficiency in agricultural production. This may also reduce the involvement of international experts in reducing environmental risks. However, the fundamental question is if the cases mentioned regarding the impacts of international sanctions on a country’s environment could be generalized to the impact of sanctions on environmental management in the Islamic Republic. This is an important and fundamental question that may not have a straightforward answer. However, using a few examples, we can better understand the implications of this question and the depth and extent of the impact of sanctions on the environment in Iran.

##### *6.4.1. Restricting Access to Technology and Travel to Iran*

The implementation of international sanctions has limited Iran’s financial resources for access to new technologies and services over the past decade, causing several technology and service vendors to appeal agreements or not cooperate with Iran due to the fear of receiving a financial penalty or punishment [110]. The Islamic Republic of Iran has blamed international sanctions for restricting the government’s ability to acquire new technologies and the travel of scientists and experts to Iran for environmental projects. Although this claim is true in several cases, there have been a few cases to the contrary as well. In 2019, the Vice President of Iran, Ishaq Jahangiri announced that the “installation of particulate

filters for diesel vehicles will not be required by Iranian automakers due to the oppressive sanctions". On the other hand, shortly afterwards, the deputy head of the DOE claimed that the Iranian automakers, who have a monopoly on car production in Iran, "have not been obliged to install particulate filters for diesel vehicles even prior to imposition of the sanctions, and are still using the sanctions as an excuse for not installing filters" [111].

It has also been repeatedly pointed out that international sanctions have effectively acted as a "catalyst", influencing the government's behavior toward civil society activists, imposing pressure on environmental activists and arresting some of them. Regardless of the accuracy or inaccuracy of this statement, we know that the arrest of a few of environmental activists in 2017 [112] was conducted during the implementation of the Iran nuclear deal, or JCPOA [113], and occurred in the absence of widespread international sanctions. Because of some visa restrictions on some countries, including Iran, imposed by the administration of former US president, Donald Trump, some international environmentalists, who used to travel to Iran to consult on environmental disasters (such as Lake Urmia), had to suspend or postpone their travel to Iran due to fear of losing the opportunity to enter the USA [87]. In addition to visa bans, Iran's viewpoint towards environmentalism as a tool to consolidate power structures [114], which has been exacerbated by the detention of environmental activists since 2017, has also hindered many water and environmental experts from traveling to Iran for consultation.

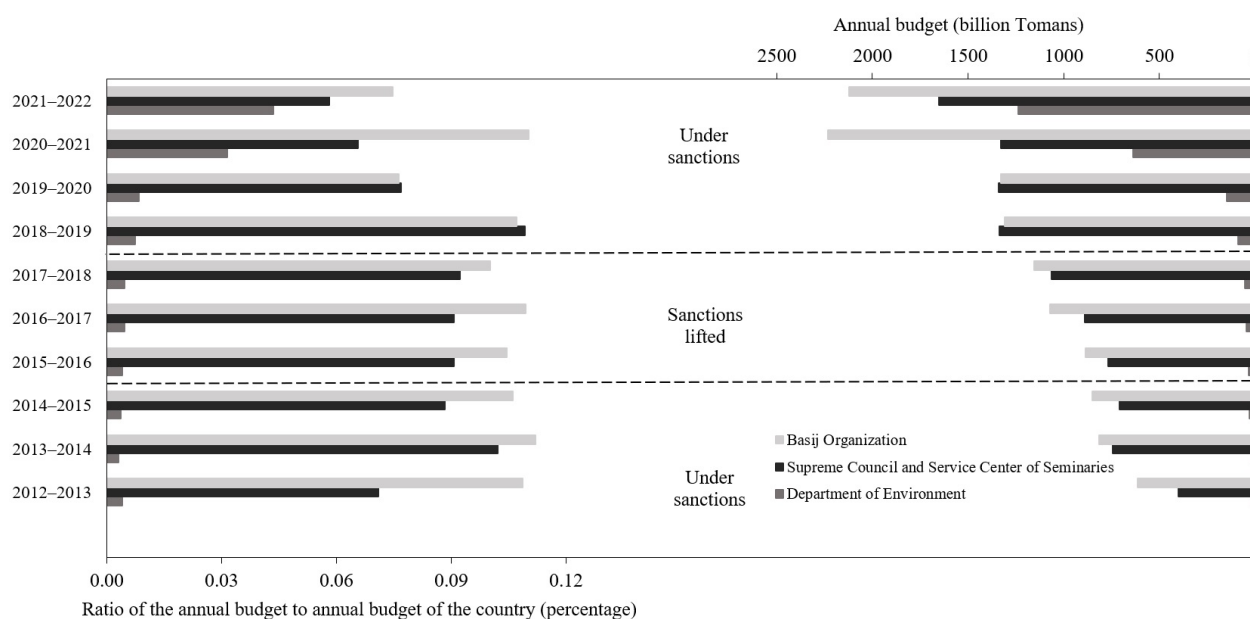
#### 6.4.2. Intergovernmental Financial Aid

The recent international sanctions (2011–2015, and 2018–2021) have limited development funds and loans, regional donors, and international aid from intergovernmental agencies, such as the United Nations Environment Programme (UNEP) and the Food and Agriculture Organization of the United Nations (FAO) [110]. However, the execution history of some (and not necessarily all) of the previously intergovernmental funded water-resources projects has raised serious concerns, and the governmental and intergovernmental agencies have been warned about the feasibility of implementing and accomplishing such projects in Iran. The World Bank site-selected six cities, such as Ahwaz and Anzali in Iran in 2005 (in the absence of widespread international sanctions) and approved more than 150 million USD (US dollars) of funding for the construction of sanitation plants, sewer networks, and water supply [115]. The Anzali wastewater plants were planned to be completed in 2010, and a similar construction schedule was planned for the sanitation system in Ahwaz. Despite some progress, the projects have not been completed more than 10 years after they were scheduled to be. According to several former and current authorities, including the former CEO of the Water and Wastewater Organization of Ahwaz, the funds allocated to the construction of the entire wastewater treatment and collection system in Ahwaz were either missed or never used in a timely fashion due to extensive mismanagement [116]. A similar situation was observed for the City of Anzali. Although the international sanctions have restricted the allocation of intergovernmental funds to several water-resources-related projects and have caused serious concerns, especially for local communities, the history of Iran's governmental sectors in implementing some of those projects should not be overlooked.

#### 6.4.3. Prioritization of the Government in Allocating Budgets

The restrictions imposed by sanctions affect the allocation of financial resources to address water resources and environmental issues (at the macro level). However, such a trend has not been observed, at least for the DOE as the main custodian of the environment in the country in the past decade. The total annual expenditure budget of the DOE and the ratio of the total budget of the DOE to the total budget of the country, both when sanctions were intensified and when sanctions were lifted, between 2012 and 2018, had a steady upward and identical trend, respectively (Figure 4). For example, the proportion of the share of the budget of the DOE to the total country's annual budget in 2015–2016 and 2018–2019 were approximately 0.005 and 0.008 percent, respectively,

and budget growth has also had a steady upward trend between these years (Figure 4). Comparatively, and in approximately the same period (2013 to 2021), the budgets of two leading religious institutions in the country, namely the Basij Organization and the Supreme Council and the Service Center of Seminaries were about two to seven times the budget of the DOE (Figure 4), and the proportions of their budgets to the country's total annual budget (compared to the DOE) were also greater. This indicates that the state did not make a significant difference between the sanction period and the non-sanction period in terms of allocating budget to the main environmental institution of the country (DOE). The ruling political system also did not prioritize allocation of the budget to the DOE over religious institutions in the midst of the imposing sanctions (Figure 4). In both periods (sanctions imposed, and sanctions lifted), a relatively constant and very small share of the total budget of the country was allocated to the DOE. However, more funding was allocated to some religious institutions in the same period. In 2020 and 2021, ironically during the period of existence of sanctions, the budget of the DOE increased relatively more than the previous years. On the one hand, a similar growth was observed for the budget of the aforementioned religious institutions (Figure 4) in 2020 and 2021. The country's total environmental budget and the budgets of religious institutions are not limited to the budgets of the DOE (there are similar organizations such as the Forests, and Watershed Management Organization) and the two religious institutions mentioned above; however, the mentioned organizations and departments can be considered indicators of the prioritization of the political system in terms of budget allocation in existence of sanctions and absence of sanctions periods. The total annual budget of the country and the budgets of the aforementioned institutions and departments were obtained through the Iran Data Portal [117].



**Figure 4.** Comparison of the annual budget allocation of the Department of Environment (DOE) with that of the Basij Organization and the Supreme Council and Service Center of Seminaries, and comparison of the ratio of the annual budget of the DOE in the national budget with that of the Basij Organization and the Supreme Council and Service Center of Seminaries using two conditions: the presence of sanctions and absence of sanctions. “Toman” is the super-unit of the official currency of Iran, “Rial”. On November 2021, one USD was equivalent approximately to 28,500 Tomans.

#### 6.4.4. General Overview of International Sanctions

Overall, the general view of countries under sanctions may not be applicable to the investigation of the impacts of sanctions on the environment and water resources in Iran. As mentioned, in some (and not necessarily in all) cases, the functioning and allocation of funds to the management of environmental resources, including water resources at

the time of international sanctions were not significantly different from when the state was not under sanctions. The use of some of the international loans and funds has also not been clear or beneficial to the country due to the massive mismanagement. Hence, conducting a comparative comprehensive study on evaluating behaviors of the state towards the environment and water management during both “sanctions imposed” and “sanctions lifted” periods is required. Without such a study and investigating the root causes of the sanctions imposed, a balanced understanding of the extent of the impacts of sanctions on the environment is unlikely. The lack of a balanced understanding makes it difficult to provide sustainable solutions to mitigate the adverse effects of sanctions on the environment and more specifically on water resources in Iran.

## 7. The State-Controlled, Resource-Dependent Economy

Iran suffers from a resource-dependent [118] (dominantly oil) and state/military-controlled economy, which extends (on a smaller scale and minus the involvement of military institutions) to the former political system prior to the 1979 revolution [99]. In this structure, the economy, which is overwhelmingly controlled at the macro level by the ruling political system [119], becomes an obstacle to the empowerment of citizens and private sectors and their investment in the economy. For this reason, the government and public sectors try to be substitutes for the private sectors. This substitution could then cause aggressive exploitation of various resources, including national natural and water resources (both renewable and non-renewable), to advance the government’s economic agendas, leading to overlooking the economic efficiency of the water management sector. A decentralized administrative structure can reduce the destructive effects of an oil-based economy [70]. On the other hand, an oil-based, resource-dependent economic approach can cause further income inequality [120,121] and impede the formation of a decentralized administrative structure [70] based on the interests of local stakeholders. It further results in public engagement in water management decision-making being overlooked, primarily due to the illusion of inexpensive water abundance.

The predominantly oil-based economy in Iran, combined with the lack of an effective and transparent macro-scale taxation system (which is one of the consequences of an oil-based state-controlled economy), the absence of a decentralized administrative structure, and the lack of effective participation of citizens in water management decision-making have led to increases in populist policies. These policies have aimed at maintaining the satisfaction of citizens at any expense and “empowering the weak” [75] in the short-term. Examples of such populist policies include but are not limited to: permitting farmers to extract large amounts of groundwater resources nationwide over the last forty years, allowing farmers to cultivate rice in water-scarce provinces such as Isfahan and Khuzestan, widespread heavy subsidies by the central government for drinking and agricultural water (without proper pricing of water), and neglecting the essential policies of natural resources preservation to form efficient water management, such as water pricing, water markets, and income tax [122] for populated water-scarce regions. The absence of water pricing and income tax along with highly subsidized energy [73] has increased telecoupling [123,124] (environmental and socio-economic interactions over distances [125]) in a few water-scarce cities of Iran, such as Rafsanjan for pistachio cultivation. It has caused severely depleted groundwater aquifers in Rafsanjan [73], and has encouraged planning for construction of structural mechanisms such as water transfer [126,127] to respond to the rising growth of pistachio orchards.

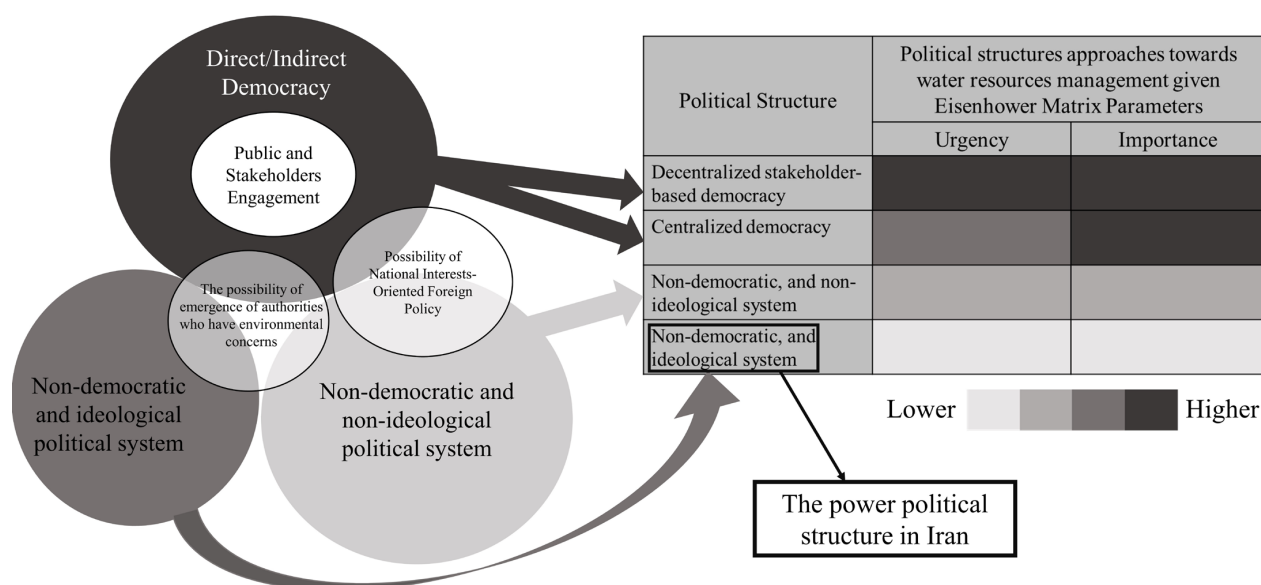
To further mitigate the adverse impacts of a state-controlled, resource-dependent economy on water resources in Iran, improving economic redundancy and diversity [128] and establishment of a non-state-controlled economy are recommended. These can be considered as two of the major requirements for resilient and sustainable water resources management in Iran, contributing to greater groundwater recharge and recovery and preserving surface water resources.



## 8. Characterizing the Relationship between the Political System and Water Resources Management in Iran Using the Matrix of Eisenhower

The urgency and importance assigned to water resources management issues vary in different political structures based on the level of democracy and the adoption of ideological policies. While in decentralized stakeholder-based democracies, there is a greater chance of perceiving water resources management issues to be relatively urgent and important matters through engaging societies [40] in earning high priorities for water problems, non-democratic and ideological political structures, such as the Islamic Republic of Iran, usually overlook the limited time window for addressing water resources issues; they perceive the environment (including water resourced) as an infinite opportunity to boost the economy [129] and address socio-economic and socio-political problems.

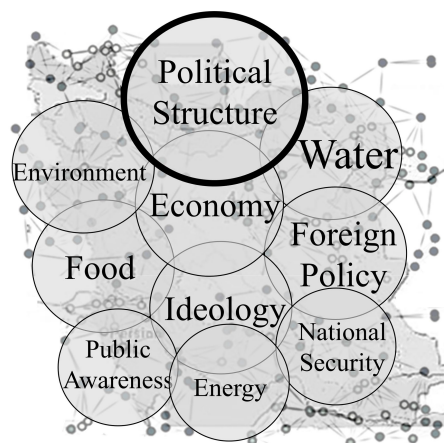
The mutual aspects of different types of political structures and the relationships among them is displayed in Figure 5 through the concept adopted from the Urgency-Importance Matrix of Eisenhower [50]. It indicates the priorities for policy-makers when addressing environmental issues within a specific political structure. Different forms of political structure can explore a series of different theoretical and practical characteristics for managing water resources. There are several common and distinct features of political systems related to management of water resources, ranging from public engagement, constructive foreign policy, and the ideological aspects of a system to the “possibility” of the emergence of authorities who have environmental concerns (Figure 5).



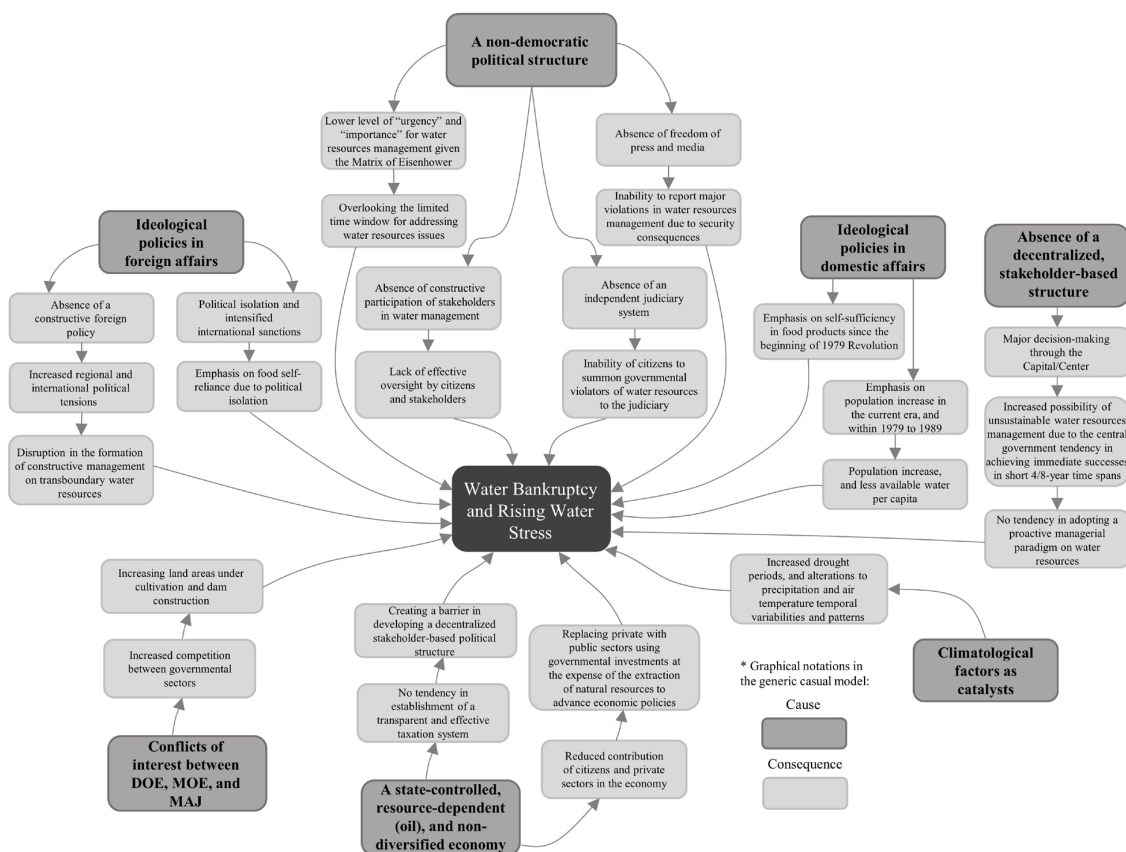
**Figure 5.** The relationships and common characteristics between different types of political structure involved in water resources management in conjunction with the concept adopted from the Urgency-Importance Matrix of Eisenhower. Note 1: The “urgency” component of Matrix of Eisenhower for a centralized democracy is lower than its “importance” primarily due to weakened tightness of feedback loops [77,78]. Note 2: The terms “higher” and “lower” are relative concepts, as for example, water bankruptcy can be also observed in democratic political systems [2,43].

Water, the economy, the environment, foreign policy, etc. are components of a complex policy-natural-human system of systems [130], and are all managed through the major policies adopted by a political structure (state), reaffirming the state as the central object of hydro-politics [131]. The perception of the existence of an effectively functioning water management sector in a political structure while other sectors (Figure 6) remain ineffective is a fallacy [20]. The urgency and importance of water management (as the components of Matrix of Eisenhower) within a society can be determined through the nature of political structures, how they engage stakeholders in decision-making, and the extent to which water issues can be considered urgent from a public-policy standpoint under normal and noncritical circumstances. Iran is no exception, as its political structure (as the top of the

system of systems hierarchy) and other elements (Figure 6), including water sector are interconnected. The tensions caused by the internal and external ideological goals have empowered and persuaded the power structure in Iran to pursue the achievement of the greatest possible economic productivity through the extraction of natural resources (Figure 7). This has been one of the reasons that the environment and, in particular, the water sector has been seen in isolation from other significant sectors (Figure 6) [47]. The conceptual positions of different elements within the complex policy-human-natural management system of Iran—with the political structure standing as the top element in defining policies—is shown in Figure 6.



**Figure 6.** Conceptual positions of different elements within the complex policy-human-natural management system of Iran; the background image is a map of Iran. Note: The schematic design was inspired by Madani (2019).



**Figure 7.** The generic causal model of the main causes and consequences of the existing water resources bankruptcy problem in Iran.

## 9. Final Remarks

A discussion of the often-wrong decisions of Iranian decision-makers and political actors in relation to water resources management that are made without referring to the governance structure in which such decisions are created and developed, at best simplifies the fundamental problems of water resources management in Iran. Apart from climatological factors that accelerate desertification [5,11] and water bankruptcy [1], the main driver of the existing conditions is the absence of necessary components at the political structure level in Iran for sustainable management of water resources. The components, which the effects of their absence are described in the present article and are closely intertwined with sustainable water resources management, are summarized in the form of a generic causal model based on the separation of causes and consequences in Figure 7. These components are: (1) a democratic political structure; (2) a decentralized and polycentric administrative structure to manage competing water users based on the interests of local stakeholders; (3) the formation of a non-governmental and diversified economy; and (4) a non-ideological domestic and foreign policy based on national interests.

Climate change has also acted as a catalyst to exacerbate the current water bankruptcy condition (Figure 7) [13,15]. However, climate change should not be seen as a major cause [18]. Numerous studies on water resources and basins in Iran, including studies on Lake Urmia [132–136] and the Karkheh River Basin, Khuzestan Province [137] have shown that the main drivers of the water bankruptcy have been the anthropogenic impacts. The water resources management approach within the Iranian political structure is very similar to the approach used in the former Soviet Union. The non-democratic and ideological nature of both systems prevented them from observing water as an economic good [138] and flexible resource [139,140], rather than as an endless resource for economic development. Studying the 60-year history of the Aral Sea [141] in Central Asia and how it dried up and shrank [53] during the former Soviet Union governance could provide a lesson for Iranians to learn. The Aral Sea had lost nearly 90% of its total water volume since 1960 due to massive development of cotton production lands and inter-basin water transfer and diversions for irrigation and agricultural uses [141]. The shrinking of Aral Sea had several contributing factors, including having ideological goals about food independence, environmental problems being overlooked, and the absence of local democratic structures to encourage relationships among stakeholders, technical groups, and governmental sectors. The Assad regime in Syria implemented the same policy as the Soviet Union in the 2000s, pushing for food independence and security through encouraging farmers to undergo massive cultivation of cotton and wheat [104] at the expense of intense withdrawal of water resources. Indeed, several basins in Iran, such as the Lake Urmia watershed [142] have been under similar management approach. The LUNRC projects that the Lake Urmia water level will reach its ecological level by 2027 [143]. Regardless of technical issues, the full restoration or rehabilitation of the lake by 2027 does not seem feasible due to the absence of the essential components required for sustainable water resources management discussed in the study, and the probability of a future long drought period [52].

It should be also noted that the technical solutions regularly employed to tackle the water resources problems are not necessarily complex and multidimensional. These include the optimization of agricultural production, efficient irrigation, proper management of groundwater aquifers, recycling and reuse of municipal wastewater, planning to release water behind dams on a regular basis to deliver water to nature, and implementation of Low Impact Development (LID) strategies [144] for the quality and quantity management of urban stormwater. However, policies governing such strategies, which are directly related to the administrative nature of a state, are both complicated and complex. Hence, water resources bankruptcy in Iran must be observed and analyzed beyond the behaviors and actions of the rulers. This claim does not deny the responsibilities of authorities; however, it prioritizes the water governing structure over the water governing authorities in the current state of water management of Iran. Water management and water governance are completely inter-related subjects [122], where the latter has greater priority in the hierarchy

of the exploitation and extraction of water resources. A proper water governance provides the essential components for proper water management [145].

### 10. Recommendation for Adaptation to the Water Bankruptcy Paradigm

Adaptive and mitigative solutions for combating the water resources bankruptcy problem in Iran depend on the establishment of the necessary components mentioned in Section 9, for sustainable management of water resources. Given all the interpretations and subjects discussed in this study, a systematic transition towards a democratic, decentralized, diversified and non-state-controlled economy, and non-ideological political structure is recommended to sustainably mitigate the water resources issues in Iran. A transition to such a structure is not a sufficient, but merely a necessary condition. Such a political structure may not immediately mitigate the impacts of water bankruptcy; however, it does provide the necessary components for sustainable management of water resources and will increase the chance of mitigating the impacts of water resources bankruptcy, and allow for the adaptation of the country's water supply (which is on the verge of territorial destruction) to the existing bankruptcy condition. The findings generated in this study may provide lessons and inform political actors and water resources decision-makers in other countries with non-democratic political systems and ideological policy-making strategies who are struggling with a water resources crisis or bankruptcy. It can also guide policy-planners when considering the most appropriate strategies for mitigating water resources issues and adaptation to the paradigm of water bankruptcy.

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