

Legal Obstacles to Water Harvesting in the Kurdistan Region of Iraq and Their Legislative Treatment: A Legal Geography Study

Hewa Ibrahim Al-Haidary¹, Hadeia Mohammed Ahmed²

¹ Consultant at Shura Council – Kurdistan Region-Salahaddin University – Erbil

²Salahaddin University – Erbil

DOI: <https://doi.org/10.31918/twejer.2584ELI.10>

Published:2/11/2025

Abstract

This study addresses the legal obstacles facing water harvesting projects in the Kurdistan Region of Iraq from a legal-geographical perspective, considering the Water Management and Protection Law provisions in the Kurdistan Region No. 4 of 2022 and other applicable laws. Due to climate change indicators and the scarcity of water resources caused by decreased precipitation, rising temperatures, and the misuse of water resources, attention has shifted toward methods for renewing and developing water resources, with water harvesting being one of the most prominent. Despite the significant importance of this technique in ensuring water security in the Kurdistan Region, it has not received adequate attention from the relevant authorities. The study concluded that the absence of a specific law on water harvesting and the inadequacy of existing water resource laws are among the primary legal obstacles to implementing water harvesting in the Kurdistan Region. Therefore, the study recommends legislative reform in water resource laws, encouraging investment in water harvesting projects, and activating the Water Council in the Kurdistan Region to fulfil its intended objectives.

Keyword: Water harvesting, water resources, water legislation, legal obstacles, Kurdistan Region – Iraq

Legal Obstacles to Water Harvesting in the Kurdistan Region of Iraq and Their Legislative Treatment: A Legal Geography Study

Prof. Dr. Hewa Ibrahim Al-Haidary¹, Assist. Prof. Hadeia Mohammed Ahmed²

¹ Consultant at Shura Council – Kurdistan Region-Salahaddin University – Erbil

² Salahaddin University – Erbil

Introduction

There is no doubt that the water demand is continuously increasing due to population growth, which raises the need for water in various sectors, particularly in meeting food requirements through agriculture and other human activities. However, this growing demand is met with a shortage of water resources due to climatic, political, and human factors, among others. This situation necessitates adopting specific techniques to address the acute shortage of water resources, optimize their use, and reduce water losses through what is known as "water harvesting." This technique aims to collect, divert, store, and utilize rainwater for agricultural land and human consumption, improving vegetation cover, halting environmental degradation, and combating desertification.

The Importance of the Research

The Kurdistan Region is expected to face a water scarcity problem shortly if appropriate measures are not taken. This is due to several factors, most notably climate change, which has altered rainfall patterns, increased pollution, and caused political disputes over water sources such as the Tigris and Euphrates rivers. The annual inflows of these rivers have significantly decreased as neighbouring countries have moved to retain water within their borders. This poses a threat to various sectors in Iraq, including the Kurdistan Region, with the agricultural sector being the most affected. This reality underscores the need for water harvesting techniques as a complementary solution to ensure the sustainability of water resources. Water harvesting is considered a vital tool for water resource management worldwide and contributes to reducing the consumption of groundwater. Hence, there is a pressing need to identify and address the legal obstacles to water harvesting and to regulate it through legislation. Mismanagement and inefficient use of water resources, despite their abundance in some areas

of the Kurdistan Region, could lead to the depletion of the region's water resources, threatening water and food security and necessitating legislative intervention.

Research Problem

The research problem lies in the existence of legal obstacles to water harvesting in the Kurdistan Region of Iraq. These obstacles have not received sufficient attention from the relevant authorities, nor have legislative solutions been developed to address them.

Research Objectives

The research aims to clarify the concept of water harvesting and its role in the development of water resources in the Kurdistan Region, identify the water resources available in the region, determine the main legal obstacles to water harvesting that hinder its implementation, and propose legal solutions to promote water harvesting by drawing on the experiences of successful countries in this field.

Research Methodology

The analytical and descriptive methodology has been adopted to achieve the research objectives and thoroughly examine its content, considering the Water Management and Protection Law provisions in the Kurdistan Region No. 4 of 2022 and other applicable laws

Research Structure

To achieve the research objectives using the chosen methodology, the study is divided into five main sections: First, defining the concept of water harvesting and its importance in the development of water resources. Second, identifying the legal framework for water resources in the Kurdistan Region. Third, the legal obstacles to water harvesting in the Region. Fourth, the financial and administrative obstacles of a legal nature. Fifth, solutions to address the legal obstacles to water harvesting in the Kurdistan Region.

1. The Concept of Water Harvesting and Its Importance in Developing Water Resources

1.1 Definition of Water Harvesting

The term "water harvesting" refers to any morphological, chemical, or physical process applied to the land to utilize rainwater. This can be achieved directly by enabling the soil to

store as much rainfall as possible and reducing runoff speed to minimize soil erosion rates. It can also be achieved indirectly by collecting surface runoff in a drainage area and storing it in a non-erodible site for various uses (Al-Louzi, 2008, p.16; Ghanem, 2010, p.199).

Water harvesting is defined as the process of collecting rainwater during the rainy season and directing it toward low-lying areas for use during dry periods for agricultural and domestic purposes before it infiltrates into groundwater (Al-Mansouri, 2018, p.321). A water harvesting system consists of (1) the Catchment area, which is a part of the land where rainwater flows as surface runoff toward the target area, (2) target area (or cultivated area), which is the area where the collected water is used, (3) storage facility, and (4) the runoff, which is the surface flow of rainwater that does not infiltrate the soil (Nafi', 2018, p.172).

Thus, water harvesting involves the collection and storage of rainwater for irrigation and other uses. It also includes capturing rainwater from a surface and directing it using appropriate methods to a suitable location for later use for various purposes.

1.2 Types of Water Harvesting Techniques

Water harvesting occurs in two ways: either naturally, by directing heavy rainfall towards low-lying areas for collection, or through human intervention by preparing the land surface, creating depressions, and directing water runoff paths towards low-lying areas (Al-Mansouri, 2018, p.321).

Estimating the amount of water that can be harvested is the first step in planning and designing water harvesting systems, along with gathering topographic, meteorological, hydrological, and climatic information. The quantity depends on the watershed area and the average annual rainfall in the region. Surface runoff is directly proportional to rainfall, so the more rainfall, the more surface runoff. All of this is influenced by three main factors (Abdul-Ghani et al., 2022, p.308): topography characteristics, soil characteristics, and the characteristics of the rainstorm in terms of intensity, duration, and amount. In general, water harvesting technologies are divided into two main categories (Mukhlif et al., 2023, p.227):

A- Micro-catchment systems: These systems collect surface runoff from a small catchment area, from which water flows over a short distance. They are used in rural areas, on farms, or rooftops. The most important types include: (1) Contour ridges and bunds. (2) Semi-circular bunds. (3) Small pits. (4) Small runoff basins. (5) Meskat. (6) Terraces. (7) Surfaces.

B- Macro-catchment systems: These systems collect surface runoff from a large catchment area, often at the level of valleys and flood basins, and are characterized by their large capacity. The most important types include: (1) Water spreading systems. (2) Large bunds. (3) Hafairs and tanks. (4) Cisterns. (5) Hillside-runoff systems. (6) Bridges.

1.3 The Importance of Water Harvesting in Developing Water Resources

Water harvesting techniques have proven successful in various environments worldwide. Countries such as Australia and Mexico are among the most reliant on water harvesting methods to increase agricultural production and develop water resources and grazing areas (Mukhlif et al., 2023, p. 224). Water harvesting is typically practiced in areas where the annual rainfall is no less than 100 mm in winter and 150 mm in summer. In the Kurdistan Region, rainfall generally occurs over approximately six months of the year, meaning that natural recharge of groundwater reserves is limited to this period (Karim, 2013, p.1072; Al-Sakni, 2011, p.162).

The importance of water harvesting in developing water resources can be highlighted through the following points (Abdulghani et al., 2022, p.303; Joudat et al., 2016, p.135):

1. Water harvesting is a crucial method for utilizing seasonal water resources, particularly rainwater. It contributes to achieving food security, developing natural pastures, strengthening water security, protecting against floods, increasing agricultural productivity, and supporting livestock and forestry development.
2. Rainwater harvesting is especially vital in arid and semi-arid regions compared to humid areas. Its importance increases in areas with limited alternative water sources, such as groundwater or transported water. In such cases, water harvesting becomes the most viable method for sustaining human, plant, and animal life.
3. Water harvesting technologies provide additional water sources to ensure the supply of drinking water for rural populations and local communities. They also enhance soil moisture for agriculture and help replenish groundwater levels.
4. Water harvesting has significant environmental benefits, including reducing soil erosion, mitigating the effects of floods, improving groundwater recharge through infiltration, supporting fish farming, and minimizing pollution impacts.

5. Water harvesting yields economic and social benefits by preventing land degradation and combating desertification, providing essential water for humans and animals, and enhancing agricultural production, which in turn improves living standards.

1.4 Water Resources in the Kurdistan Region

The annual renewable water volume in the Kurdistan Region exceeds 24 billion cubic meters, while the annual water flow of the region's rivers is approximately 36.3 billion cubic meters. Notably, 42% of the water flow of the Tigris River tributaries and the entire Tigris River originates from outside the Kurdistan Region (Naqshbandi, 2022, p.462). This makes the region rich in diverse water resources, including precipitation (rain and snow), surface water (rivers and lakes), and groundwater.

1.4.1 Precipitation in the Kurdistan Region

Precipitation is the most important water resource in the Region, as it serves as the primary source for other water forms, including surface and groundwater (Naqshbandi, 2022, p.463). The Region experiences various types of precipitation: rain, snow, and hail, with rain being the dominant form, influenced by the Mediterranean climate.

The Region's water availability is directly affected by its climate system. Rising temperatures, low and irregular rainfall, and seasonal fluctuations make groundwater the primary source for most human activities. Geographical studies (Majeed, 2024, p.70) show a water surplus during winter months, extending into early spring (March and April). However, a water deficit becomes evident during the summer and early autumn (September) due to increased solar radiation, long daylight hours, lack of rainfall, and low humidity. This deficit gradually decreases in September and October, restoring water balance as the rainy season begins.

1.4.2 Surface Water in the Kurdistan Region

Surface water in the Kurdistan Region primarily comes from the Tigris River and its tributaries, including the Khabur, Greater Zab, Lesser Zab, Al-Adhaim, and Sirwan Rivers (Susan, 2007, pp.36-37; Mohammed, 1981, p.101). Several other tributaries flow into the Greater Zab, including the Azraq, Rezan, Rawanduz, Mawaran, and Bastora Rivers (Ismail, 2006, p.131; Sharif, 1999, pp.134-135).

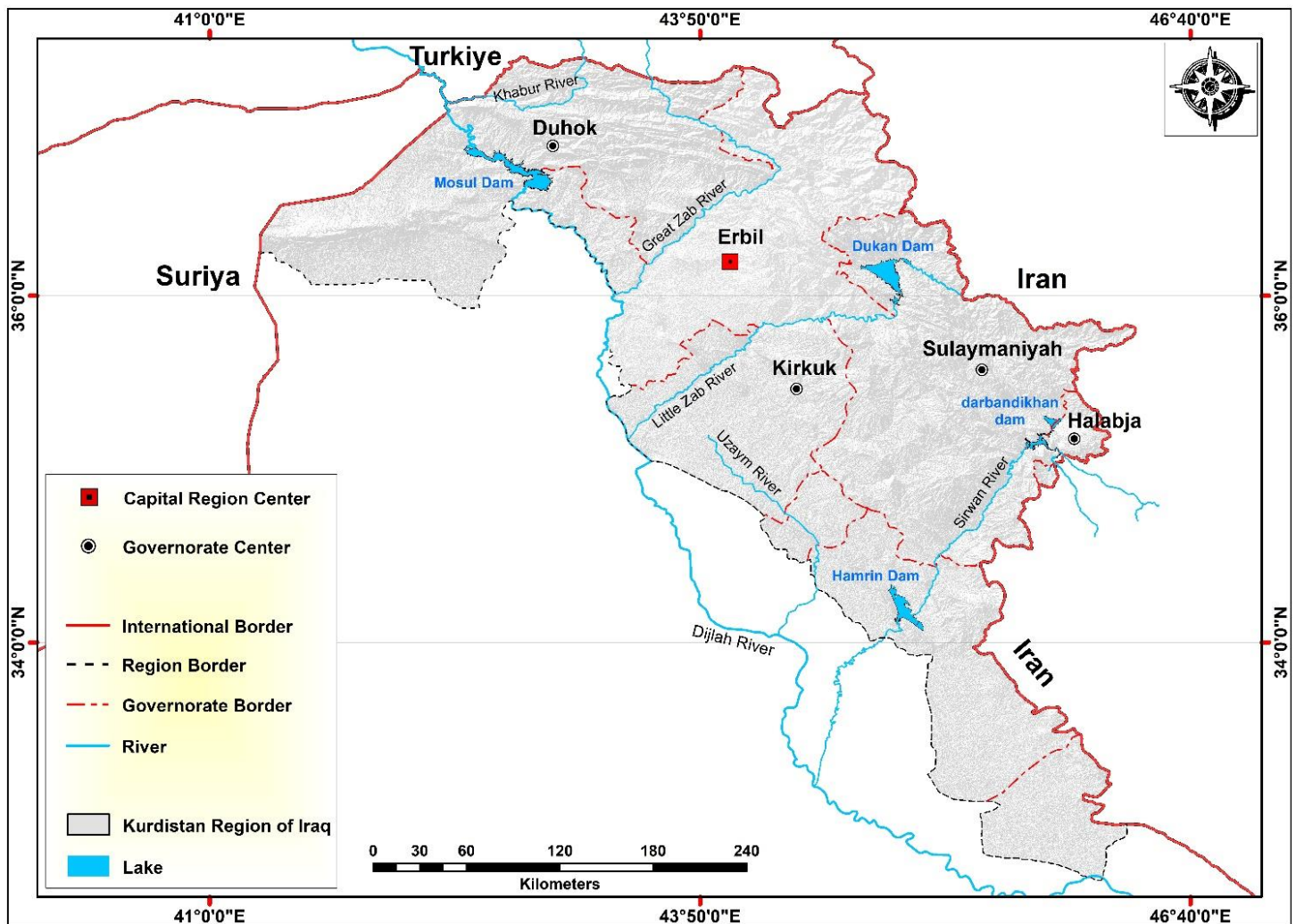
The Region also contains both natural and artificial lakes, including five major reservoirs - Mosul, Dukan, Hamrin, Darbandikhan, and Al-Adhaim, with a combined storage capacity of approximately 29.25 billion cubic meters (Naqshbandi, 2022, p.465), alongside several smaller mountain lakes.

1.4.3 Groundwater in the Kurdistan Region

The Kurdistan Region is rich in groundwater, although its distribution varies geographically. Beneath the Region lie large aquifers with high-quality water suitable for domestic, agricultural, and other uses—except in some areas like the Makhmour Plain, where mineral content is higher (Shwani, 2008, p.2; Abdulbaqi, 2010, p.21). The mountainous areas are especially water-abundant due to heavy rainfall, snow accumulation, and low evaporation rates (Omar, 2013, p.51; Al-Haddad, 2000, p.140), making them the richest in groundwater compared to other regions (Majeed, 2024, p.77).

According to studies by the Iraqi Ministry of Water Resources, the Region has approximately 3.72 billion cubic meters of exploitable groundwater (Taha, 2017, p.94). Groundwater appears naturally as springs and artesian wells, with notable examples including Bekhal and Zalam springs, which provide fresh, clean water suitable for various uses (Aziz, 2007, p.114). Additionally, human intervention through wells and kaharez (ancient underground channels) also taps into groundwater. However, climate change in recent years has caused the drying of most kaharez, particularly in lowland areas.

Map of Surface Water Resources in the Kurdistan Region



Source: created based on data from the Kurdistan Region's Ministry of Agriculture and Water Resources (2025) using ArcGIS software.

2. The Legal Framework for Water Resources in the Kurdistan Region

In addition to the legislation issued by the Kurdistan Parliament, Iraqi legislation is also applicable in the Region due to its status as a federal region within the Republic of Iraq. According to Kurdistan Parliament Decision No. 11 of 1992, Iraqi laws enacted before October 23, 1991, remain valid in the Kurdistan Region unless repealed later. However, Iraqi laws issued after this date are not automatically enforceable in the Region unless approved by the Kurdistan Parliament. Based on this framework, we talk sequency about the constitutional

framework for managing water resources, Kurdistan Region Legislation on water, Iraqi Laws applicable in the Kurdistan Region, and legal disputes regarding water resources.

2.1 The Constitutional Framework for Managing Water Resources

According to Article (4) of the Kurdistan Region Water Resources Management and Protection Law No. 4 of 2022, the Kurdistan Region Government (KRG) participates in coordinating with the federal government to formulate water policies. This is based on Article (114/seventh) of the Iraqi Constitution (2005), which states that developing and regulating internal water resource policies to ensure fair distribution falls under the shared jurisdiction of both federal and regional authorities.

However, planning policies related to transboundary water resources (including the Tigris River, its tributaries, and the Euphrates River), ensuring water flow levels, and guaranteeing equitable distribution within Iraq by international laws and norms are exclusive powers of the federal authorities. This is explicitly stated in Article (110/eighth) of the Iraqi Constitution, as the responsibility to protect and secure water resources and ensure their sustainability for the Iraqi people is a core function of the federal government (Al-Mufriji, 2023, p.59).

2.2 Kurdistan Region Legislation on Water

2.2.1 The Law on Water Management and Protection in the Kurdistan Region

The Kurdistan Region Water Management and Protection Law No. 4 of 2022 consists of 24 articles. It was enacted to ensure water security in the region due to the vital role of water in human life and its social, economic, and political impact as a national resource. The law aims to prevent misuse, ensure the sustainability and fair distribution of water resources, and protect and revitalize these resources. Clause (tenth) of Article (1) defines water resource protection as a technical and legal process that aims to enhance water sustainability, maintain availability, and prevent depletion, wastage, and pollution. The clause (eleventh) defines water resource management as an organized process that ensures the sustainable and efficient consumption of water resources quantitatively and qualitatively for all consumers. Clause (twelfth) describes water resource revitalization as a systematic process aimed at the proper

restoration of water resources. Meanwhile, Clause (thirteenth) defines water storage as the collection of rain and snowmelt. So, the primary objectives of the law include managing and protecting water resources to achieve optimal consumption, revitalizing water supplies, and regulating the quantity and quality of water use to ensure water security and protect the rights of future generations.

According to Article (6/third), the Kurdistan Ministry of Agriculture and Water Resources is required to develop water management and revitalization plans in coordination with relevant government entities while involving local communities, NGOs, and the private sector. Under Article (8) of the mentioned law, the Kurdistan Water Council, established under Article (7) of the law, is responsible for: Approving investment plans for managing and protecting water resources (Clause fourth), adopting the national climate strategy and regulating its effects on water resource revitalization (Clause fifth), securing funding for large and medium dam projects and other water-related initiatives (Clause seventh). The law also establishes the Water Resources Protection and Revitalization Fund under Article (13/first).

Although the law addresses the management and protection of water resources, it does not explicitly mention water harvesting. However, Article (1/thirteenth) refers indirectly to water harvesting by defining water storage as the collection of rain and snowmelt.

2.2.2 The Law on Protecting Water and Sewerage Projects in the Kurdistan Region

The Kurdistan Region Protecting Water and Sewerage Projects Law No. 4 of 2021 consists of 28 articles. It was enacted to protect these projects from encroachments and violations, ensure their technical efficiency, safeguard the environment, provide clean water equitably, and protect public health and infrastructure while preventing the waste of public resources.

Clause (tenth) of Article (1) covers all water and sewerage projects, including water purification and treatment plants, wells, water intake systems, water storage facilities, and secondary transport stations. According to Article (2/third), one of the key objectives of the law is to protect and develop water resources as a vital component of public wealth.

Article (14/first) prohibits any construction activities, including the installation of internet and electricity networks, or any other work within the boundaries of water and

sewerage projects without prior approval from the relevant authority. Under Article (18) of the mentioned law, compensation is required for land and property utilized for water and sewerage projects through expropriation or extinguishment by applicable laws and in coordination with the relevant authority. It is worth noting that this law, like the previous one, does not explicitly address water harvesting.

2.2.3 The Ministry of Agriculture and Water Resources Law in the Kurdistan Region

The Kurdistan Region Law No. 6 of 2010 on the Ministry of Agriculture and Water Resources, which consists of 10 articles. It is enacted to develop and improve agricultural and water resource sectors, address challenges, and promote the optimal use of natural and human resources. The law aims to facilitate the reconstruction of agricultural and water infrastructure while ensuring food and water security and reviving rural areas.

Under Article (2), the Ministry is tasked with several objectives, including developing strategies, policies, and plans for the agricultural and water sectors to ensure optimal use of surface and groundwater (Clause first), conducting feasibility studies and scientific research, including soil surveys and agricultural mapping, and monitoring project implementation (Clause second), establishing strategic projects such as dams, irrigation systems, and water conservation initiatives using modern technologies (Clause third) implementing integrated water resource management policies and coordinating with government and international organizations, including UN agencies, to develop the agricultural and water sectors (Clause fifteenth). Like the previous laws, this law does not explicitly address water harvesting.

2.3 Effective Iraqi Legislations in the Kurdistan Region

These are the legislation issued before October 23, 1991, and the subsequent legislations enacted by the Kurdistan Parliament. Among the most prominent legislations aimed at regulating the use of water resources is the amended Iraqi Irrigation Law No. 6 of 1962, which remains in effect in the Kurdistan Region despite its repeal in Iraq under Article (15/Second) of the Iraqi Irrigation Law No. 83 of 2017. Additionally, the amended Iraqi Law for the Maintenance of Irrigation and Drainage Networks No. 12 of 1995 also applies. These two laws regulate the use of water for irrigation purposes and address issues related to water distribution, the establishment and maintenance of irrigation projects, and the protection of water facilities.

Article (1/2) of the Iraqi Irrigation Law stipulates that public irrigation works refer to artificial channels created by the state for the storage, distribution, or discharge of water. In this context, it can be said that an artificial channel constructed by the state to store water is a form of water harvesting, although it is not explicitly stated as such. Furthermore, the law associates this activity with irrigation rather than other purposes.

Other laws are not in effect in the Kurdistan Region, including the amended Iraqi Ministry of Water Resources Law No.50 of 2008, which, despite emphasizing planning for the utilization of Iraq's water resources and the exploitation of surface and groundwater for optimal use of water wealth, does not explicitly address water harvesting. Similarly, the amended Iraqi Ministry of Agriculture Law No. 10 of 2013 regulates irrigation and agricultural practices in Iraq and promotes the use of modern irrigation techniques. Although some agricultural projects may use water harvesting techniques, this law does not contain specific provisions supporting this field.

In this regard, the National Strategy for the Protection and Improvement of the Environment in the Republic of Iraq (2024-2030) has been launched. It includes specific objectives to enhance water resource management, such as implementing integrated water resource management approaches, increasing investments in water infrastructure, and developing water harvesting projects to achieve a water storage capacity of approximately 136 million cubic meters. Additionally, the strategy emphasizes maintaining and developing dams and operational regulators, particularly as reports indicate that Iraq may face a water deficit of up to 10 billion cubic meters annually by 2035 (<https://shafaq.com/ar>).

2.4 Legal Disputes Related to Water Sources

Legal disputes concerning water sources involve the intersection of local and international laws, especially regarding transboundary resources. The Kurdistan Region of Iraq shares several water sources with neighbouring countries, such as the Tigris River and its tributaries, increasing the complexity of water rights issues and leading to disputes with neighbouring states over water allocations.

There are international understandings and agreements between Iraq and Turkey, Syria, and Iran regarding Iraq's share of water. However, these agreements are not always implemented as required, resulting in legal disputes between Iraq, including the Kurdistan

Region, Turkey, and Syria over water rights to the Tigris and Euphrates Rivers, as well as with Iran regarding the Sirwan River. Such disputes affect the distribution of water resources. This underscores the necessity for the Kurdistan Region to adopt water harvesting projects if Iraq's water share is reduced due to conflicts with neighbouring countries. Water policies implemented by Turkey and Iran have led to a continuous decline in water flows to the Tigris River and its tributaries and the Euphrates River (Naqshbandi, 2003, p.10-11), thereby impacting agricultural production in Iraq (Hussein & Ibrahim, 2017, p.625).

National laws address these issues at the local authority or central government level, while international agreements govern the distribution of transboundary waters (Abdullah & Ibrahim, 2023, p.406). To enhance the role of the Iraqi Parliament in exercising its legislative and oversight functions for the public interest and given the lack of reference in the draft Comprehensive Partnership Agreement between Iraq and Turkey to Iraq's most pressing issue, which is water scarcity, the Iraqi Parliament issued Decision No. 25 of 2009. Clause First of this decision mandates the federal government to include a provision in the draft Comprehensive Partnership Agreement between Iraq and Turkey to secure and determine Iraq's water shares in the shared waters of the Tigris and Euphrates Rivers and their tributaries based on historically acquired rights under international law. Clause Second of the decision requires the federal government to ensure that partnership agreements between Iraq and both Syria and Iran include provisions securing Iraq's water share in the shared waters to safeguard the national interest. This decision was published in the Iraqi Gazette, Issue 4160, on August 2, 2010.

According to Article (2/Third) of the Law on the Management and Protection of Water Resources in the Kurdistan Region, one of the objectives of this law is to protect and establish the Kurdistan Region's right to shared waters with the federal government and neighbouring countries, ensuring the region's supreme interests in water provision by international laws and standards.

3. Legal Obstacles to Water Harvesting in the Kurdistan Region

There are numerous obstacles to utilizing water harvesting techniques in the Kurdistan Region, including natural obstacles such as evaporation, seepage, leakage, soil erosion, and siltation, all of which have negative impacts on the volume of stored water. Additionally, there are technical obstacles, such as the lack of specialized personnel, insufficient work equipment

and laboratory devices related to data collection, storage, and analysis, limited use of technology in this field, and the unavailability of accurate hydrological and climatic data required for design purposes. Alongside these mentioned obstacles, there are legal obstacles, which we will discuss in the following sections.

3.1 Absence of Specific Legislation on Water Harvesting

Despite its importance, there is no specific legal framework for water harvesting in the Kurdistan Region. There is no law, regulation, or instruction on this matter. This legislative gap hinders water harvesting, as the lack of a clear framework outlining how to establish and manage water harvesting systems may create difficulties for individuals and companies in implementing such projects in a legal and organized manner. Consequently, large quantities of rainwater that could be utilized are wasted, impacting water security, agriculture, and food security (Sabri, 2017, p. 88). Furthermore, the increased reliance on unsustainable sources, such as groundwater, will lead to their depletion over time.

Some may wonder: How can the absence of a law become an obstacle? To answer this, we explain that the lack of a legal framework regulating water harvesting poses a significant barrier to effectively implementing such projects. This absence leads to disorganization and poor planning. Without a legal structure outlining how water harvesting should be conducted, there is no clear strategy for managing water resources, resulting in uncoordinated project execution and difficulties in collaboration among various entities. Furthermore, the lack of legal provisions undermines funding and support. Without regulations requiring government or private sector backing for water harvesting initiatives, there will be no financial allocations or incentives to foster investment in this area. Additionally, the absence of legal guidelines leads to disputes between individuals or communities over rights to collect and distribute water, further obstructing the implementation of water harvesting projects.

The absence of a specific law on water harvesting also results in a lack of strategic policies. The absence of legal frameworks leads to delays in formulating effective water policies for managing and regulating the use of water resources (Ali, 2020, p. 165). There are no clear water policies that integrate water harvesting as part of a comprehensive water development strategy, which hinders the organized implementation of water harvesting projects. This is despite Article (2/First) of the Kurdistan Region's Ministry of Agriculture and

Water Resources Law, which obligates the Ministry to develop strategies, policies, and plans to enhance, develop, and invest in water resources (both surface and groundwater) in the region to achieve the optimal use of water resources. It also mandates the establishment of strategic projects and projects for preserving surface and groundwater resources through modern technologies, as well as adopting policies for integrated water resource management.

3.2 Legislative Deficiencies in Water Resource Management

Legislative deficiencies in the management of water resources are reflected in the lack of regulation regarding water harvesting in the applicable laws. Although the Law on the Management and Protection of Water Resources in the Kurdistan Region addresses the revitalization of water resources as an organized process aimed at proper water resource recovery (Article 1/twelfth), and although the Ministry of Agriculture and Water Resources in the region is required to develop water recovery and management plans in coordination with relevant government entities (Article 6/third), and the Water Council in the Region is tasked with approving investment plans for water resource management and protection, as well as approving the national climate strategy and its impact on protecting and reviving water resources and securing the necessary budget for implementing various water projects (Article 7/fourth, fifth, and seventh), the mentioned law does not explicitly address water harvesting. This omission is significant because water harvesting is one of the most critical methods for revitalizing water resources.

Moreover, although the Law on the Protection of Water and Sewerage Projects in the Kurdistan Region was issued to prevent water resource wastage and provide clean water to citizens, and although Article (2/Third) of the law emphasizes the protection and development of water as an essential part of public wealth, it does not mention water harvesting.

Additionally, while Article (2/Third) of the Law on the Ministry of Agriculture and Water Resources in the Kurdistan Region states that one of the ministry's tasks is to establish projects for preserving surface and groundwater resources using modern technologies, it does not explicitly mention water harvesting. Under Article (2) of the same law, the Ministry of Agriculture and Water Resources is responsible for implementing specific tasks and achieving defined goals, including developing strategies and policies for the development, management, and investment of water resources (surface and groundwater) in the region to ensure the optimal

use of water resources (Clause First) and establishing strategic projects and projects for preserving water resources using modern technologies (Clause Third). However, the law does not specifically address water harvesting. This indicates a significant legislative deficiency in these laws, despite their modernity, as they lack details on how to regulate and store harvested water.

One reason for this legislative deficiency is the failure to update laws in alignment with climate change and population needs. Additionally, the absence of clear policies due to a lack of government strategies means that water harvesting projects remain unsupported. This deficiency stems from a lack of awareness about the importance of water harvesting and the failure of communities and decision-makers to recognize the value of these techniques, leading to their exclusion from water policies. Furthermore, the absence of a coherent legislative policy prevents the realization of the law's philosophy and objectives, affecting the stability of the legal system and its connection to social foundations (Za'nun, 2022, p.415).

3.3 Fragmentation of Laws and Overlapping Water-Related Authorities

Water harvesting in the Kurdistan Region faces challenges related to the coordination of laws, regulations, and instructions among different regulatory bodies. The multiplicity of authorities involved in the water sector in the Region – including the Ministry of Agriculture and Water Resources, the Ministry of Municipalities and Tourism, the Environmental Protection and Improvement Board, and the concerned governorates – often leads to overlaps in authority and conflicts in water-related laws and regulations. These legislative frameworks pertain to different sectors and lack a comprehensive legal framework that unifies water resource management efforts. Effective institutional coordination is required among the relevant entities, but the weakness of such coordination, manifested in the lack of collaboration between governmental bodies, has complicated the effective implementation of water policies, including water harvesting.

Conflicts regarding water harvesting may arise when different regulatory bodies issue contradictory decisions on how to collect, store, and use rainwater. For example, even within a single ministry – namely, the Ministry of Agriculture and Water Resources in the Region – there are two general directorates with overlapping responsibilities related to water harvesting. The General Directorate of Dams and Water Reservoirs is responsible for preparing the

requirements for large and small dam projects, implementing, supervising, operating, and maintaining their facilities, and managing water storage and release (Article 3/sixth/2 of the Ministry Law). Similarly, the General Directorate of Water Resources supervises the implementation of surface and groundwater projects, including irrigation projects, evaluates groundwater reservoirs, drills wells, and provides water for multiple purposes (Article 3/Sixth/9 of the Ministry Law).

Moreover, some environmental bodies, such as the Environmental Protection and Improvement Board in the region, may impose strict regulations on water harvesting to protect groundwater, while other entities, like the Ministry of Agriculture and Water Resources, encourage water harvesting to improve irrigation. Additionally, urban planning authorities may impose restrictions on the construction of rainwater collection tanks, while water authorities – such as the Ministry of Agriculture and Water Resources and the Ministry of Municipalities and Tourism – advocate for their use to alleviate pressure on urban water supplies.

3.4 Water Ownership Disputes

Water ownership rights significantly impact how water resources are managed and utilized. Legal disputes can arise between individuals, companies, and the government regarding the right to use these resources, complicating water management and harvesting processes.

In many countries, including Iraq and the Kurdistan Region, water ownership is considered public property. According to Article (3) of the Water Resources Management and Protection Law in the Region, water is a national resource and public property that can only be utilized under license and by the provisions of the law. Additionally, Article (2/Third) of the Law on the Protection of Water and Sewerage Projects in the Region states that one of the law's objectives is to protect and develop water as a vital part of the public wealth, prohibiting any activity – such as construction – within the boundaries of water projects and networks without the approval of the relevant authority. This means that all individuals or entities must obtain governmental authorization to use water resources, leading to disputes when authorities regulate these resources while private individuals or companies seek to benefit from them independently.

In some cases, individuals or communities may possess historical rights to use water from specific sources, such as rivers or groundwater basins. Conflicts arise when these historical rights clash with modern usage rights, urban expansion, or infrastructure projects requiring additional water resources.

Therefore, water ownership disputes are among the most significant legal issues affecting water harvesting projects in the Kurdistan Region. Historically, farmers and agricultural workers have relied on groundwater or rivers without a precise legal definition of their rights to harvested water. This ambiguity leads to disputes between farmers and the Ministry of Agriculture and Water Resources regarding the right to use harvested rainwater, which may delay water projects and hinder the implementation of water harvesting initiatives in certain areas.

4. Financial and Administrative Obstacles of a Legal Nature

Other legal obstacles to water harvesting in the Kurdistan Region include financial and administrative challenges related to investment and environmental legislation, as well as bureaucratic complexities and the legal procedures required to obtain licenses for water harvesting projects. Additionally, financial constraints under the general budget law pose further challenges, which will be discussed in the following sections.

4.1 The Impact of Investment Legislation on Financing Water Harvesting Projects

Investment laws directly affect the ability to finance and implement water harvesting projects, either by facilitating investors' entry into this sector or hindering it due to bureaucracy and legal complexities. One of the positive impacts of investment laws is the provision of investment incentives, such as tax exemptions and customs reductions in the water sector. Additionally, these laws open the door for private sector investment in water harvesting, facilitating financing procedures by enabling investors to obtain bank loans or enter partnerships with international organizations to support water harvesting projects.

However, on the other hand, investment laws present challenges such as licensing and bureaucracy. Water harvesting projects require approval from multiple government entities, which delays financing and implementation. Furthermore, there is a lack of clear classification for water harvesting projects, as investment laws in Iraq and the Kurdistan Region focus on

industries such as agriculture, tourism, and health without specific provisions to encourage investment in water resources, including water harvesting.

A review of Article (2) of the Kurdistan Region Investment Law No. 4 of 2006 reveals that investment in water resources is not explicitly mentioned among the investment sectors identified in the law. Although paragraph (Eighth) of the same article refers to infrastructure projects such as irrigation and dams, it would have been more appropriate to explicitly include water resources projects, including water harvesting. Nevertheless, Article (2/Eleventh) of the law allows any project in other sectors to be subject to the provisions of the investment law with the approval of the Kurdistan Region Investment Board. In contrast, the amended Iraqi Investment Law No. 13 of 2006 provides a more comprehensive framework. According to Article (1/Sixth) of this law, investment is defined as the employment of capital in any economic activity or project that benefits the national economy under the provisions of the investment law, thereby expanding the scope of investment through broad and general provisions (Jasim, 2024, p.470).

4.2 The Impact of Environmental Legislation on Water Harvesting Projects

Environmental legislation has undeniable positive effects on water resources. These regulations aim to protect water resources by ensuring that water harvesting projects do not lead to excessive resource depletion or negatively impact surface and groundwater. They also help reduce pollution by ensuring that rainwater and floodwater collection is managed and stored without contaminating the environment or harming human health. Furthermore, these regulations protect biodiversity by requiring environmental assessments for projects that may affect local ecosystems, such as wetlands or agricultural lands.

Conversely, environmental legislation can pose significant challenges to the implementation and development of water harvesting projects, especially when such projects involve sensitive lands or legally protected natural resources. For instance, projects requiring the construction of reservoirs or water storage systems may face legal hurdles under environmental protection regulations. The Kurdistan Region Environmental Protection and Improvement Law No. 8 of 2008 imposes strict conditions on biodiversity protection and limits activities that could harm natural ecosystems.

In other words, when water harvesting involves the use of sensitive ecosystems such as protected areas or fragile environmental systems, legal environmental challenges may halt or delay project implementation. Specific restrictions on project locations can lead to delays or even the cancellation of some water harvesting projects due to environmental protection measures. Additionally, complex licensing procedures require comprehensive environmental impact assessments before granting permits for water harvesting projects, often causing project delays. Administrative authorities frequently use licensing as a regulatory measure to protect water resources (Al-Hijami, 2023, p.808). Furthermore, environmental legislation may impose restrictions on the use of groundwater in harvesting projects for irrigation or drinking purposes, limiting the project's ability to utilize available resources.

Finally, compliance with environmental regulations can be costly. For example, companies may be required to invest in additional infrastructure, such as water treatment facilities or advanced technological systems, to reduce environmental impacts.

4.3 Bureaucracy and the Complexity of Legal Procedures for Obtaining Licenses

Bureaucracy in granting licenses for water harvesting projects in the Kurdistan Region is one of the main obstacles to adopting these techniques on a large scale. The multiplicity of regulatory bodies and overlapping authorities lead to procedural complexity, delaying or even halting many projects that could contribute to improving water resource management. Obtaining the necessary permits to establish water collection tanks can take several months, resulting in project implementation delays. Additionally, the involvement of multiple responsible authorities necessitates obtaining approvals from several ministries, such as the Ministry of Agriculture and Water Resources, the Ministry of Municipalities and Tourism, the Environmental Protection and Improvement Board, and sometimes the concerned governorates. This leads to conflicting decisions and further delays in the process. The overlapping jurisdictions and lack of coordination contribute to the legal procedural complexity and delay project implementation.

Moreover, there are complex legal procedures to obtain licenses. A project requires environmental permits from the Environmental Protection and Improvement Board, engineering permits from the Ministry of Planning or urban planning authorities, and the

Ministry of Municipalities and Tourism, in addition to water-related licenses from the Ministry of Agriculture and Water Resources, which slows down the implementation process. According to Article (9/fourth) of the Water Resources Management and Protection Law in the Region, any activity involving the storage or reduction of water resources is prohibited without prior licensing. Article (1/thirteenth) of the same law clarifies that water storage refers to the collection of snow and rainwater, thus explicitly prohibiting water harvesting without prior authorization. Additionally, under Article (14/first) of the Law on the Protection of Water and Sewerage Projects and Networks in the Region, any work, such as construction, laying internet and electricity networks, erecting electric poles, or any other activity within the restricted areas of water projects and networks, is prohibited without the approval of the relevant authority.

According to Article (16/first/2) of the Water Resources Management and Protection Law, licenses for all investment projects are granted by the Ministry of Agriculture and Water Resources in the region by the applicable laws, after obtaining non-objection letters from relevant authorities. Furthermore, under Article (16/Fourth) of the same law, the ministry has the authority to review licenses and the quantities of licensed surface and groundwater in light of the process of water resource revitalization.

4.4 Financial Challenges within the General Budget Law

The current legislation related to water resources does not provide sufficient incentives for investors in water harvesting projects, making these projects largely dependent on government funding – if available – which may not be adequate to meet the needs of all areas. Financial incentives to support water harvesting projects in the Kurdistan Region are absent from the General Budget Law. Additionally, projects require approval from the Ministry of Finance and Economy and the Ministry of Agriculture and Water Resources, but the absence of direct financial support or tax incentives hinders the implementation of such projects.

Funding water resources projects, including water harvesting projects, is one of the major legal obstacles in the Kurdistan Region. Government institutions, particularly the Ministry of Agriculture and Water Resources, often face challenges in allocating sufficient budgets to implement water harvesting projects. The lack of necessary allocations in the general budget for the water resources sector, especially since dam-related activities require substantial financial resources, and the failure to allocate the necessary funds for water harvesting have

led to the continued lack of activation of water harvesting mechanisms for water resource development in the region.

Although the (Water Resources Protection and Revitalization Fund in the Kurdistan Region) was established under Article (13/First) of the Water Resources Management and Protection Law, and according to Article (14) of the same law, the fund's revenues consist of allocations from the region's annual budget and any assistance or support provided to the fund under the law, it has not to our knowledge been effectively established.

Furthermore, some water harvesting projects may require private sector funding, which can be challenging in the context of an unstable economic environment and the absence of governmental encouragement in this field. Despite the urgent need for water harvesting, there are insufficient incentives, such as tax exemptions or financial support, to encourage investors to enter this sector.

5. Solutions to the Legal Obstacles of Water Harvesting in the Kurdistan Region

There are several legislative solutions to strengthen the legal framework for water harvesting in the Kurdistan Region, benefiting from the experiences of leading countries in this field, which we dedicate a separate section for. Additionally, we dedicate separate sections for legislative reform, activating the Water Council in the Kurdistan Region, and enhancing public-private partnerships in water resource management, respectively.

5.1 Learning from International Experiences – The British Experience

The British experience in water harvesting is a successful model for sustainable water management. Although the United Kingdom does not suffer from acute water scarcity, challenges such as climate change, population growth, and increasing demand for water have driven it to adopt effective technologies for managing water resources, including rainwater harvesting and providing alternative water resources. This has been achieved through supportive legislation, financial incentives, and modern technologies, enabling the UK to be one of the leading countries in applying water harvesting solutions (Fuller, 2020, p.31).

The Water Act 2003 aims to regulate water management and protection, indirectly supporting water harvesting by encouraging sustainable solutions such as collecting rainwater

in residential areas. However, its application faces economic challenges due to the high cost of implementing some projects. Similarly, the Environmental Protection Act 1995 regulates environmental protection and encourages sustainable practices in natural resource use, such as rainwater harvesting, though its application may face challenges in environmentally protected areas where environmental legislation can be strict. The British government also encourages rainwater use in agriculture, irrigation, and even daily activities such as home garden watering in its environmental guidelines. Additionally, the Building Regulations 2009 require that new buildings be equipped with a rainwater harvesting system, regulating how to collect and store water for household use. However, older buildings may face difficulties in implementing this system due to high installation costs (Williams, 2016, p.23).

Before leaving the European Union, the UK also benefited from the EU Rainwater Harvesting Directive, which encourages the increased use of rainwater as a sustainable water source, including guidelines for building rainwater harvesting systems in new buildings and encouraging the use of these systems in older ones.

Regarding government policies and programs, the UK launched several awareness and funding programs, including the "water efficiency" program, which supports rainwater harvesting techniques such as rainwater collection tanks for homes. Some local governments provide financial grants to citizens who install water harvesting systems to improve water use efficiency (for further details, see the UK's Water Strategy, which includes rainwater harvesting policies and their implementation through local legislation and financial incentives – UK Government's Water Strategy/DEFRA, 2021). Institutionally, there is good coordination between various government agencies, such as the Environment Agency, local water authorities, and local councils. This coordination helps ensure that water harvesting projects are implemented more smoothly (Faure, 2019, p.49).

5.2 Legislative Reform in Water Resource Domain

Legislative reforms are a key factor in developing and implementing water resource projects, including water harvesting in the Kurdistan Region. These reforms help establish clear laws to regulate water harvesting processes, enhance comprehensive project planning, define the responsibilities and powers between government bodies and investors, and involve local communities in water harvesting projects. This ensures that everyone benefits from these

projects and helps reduce conflicts over water rights. Moreover, having a unified legal framework accelerates procedures such as issuing licenses and completing necessary environmental studies.

Therefore, there is an urgent need to update existing legislation to align with current challenges and climate change. This can be achieved by reviewing and amending old laws to ensure they align with environmental and technological developments and meet the growing needs of the population. Although the Kurdistan legislature has tried to establish a comprehensive legal framework for water through the Water Resources Management and Protection Law, which reflects water policies and strategies, it still has some legislative gaps, particularly in regulating water harvesting and addressing issues related to investment, the environment, and government support.

The path for legislative reform in the Kurdistan Region's water resources sector involves amending the Water Resources Management and Protection Law to include clear legal provisions for regulating water harvesting. This includes specifying details regarding usage rights, water collection and storage mechanisms, and licensing procedures under a water harvesting regulation that would be issued based on the aforementioned law. Thus, we propose adding a provision (clause) to Article 6 of the Water Resources Management and Protection Law in the Region, as follows: "Develop water harvesting plans in the Region in coordination with relevant authorities, and regulate the mechanisms for collecting and storing water, licensing procedures, and usage rights through a regulation issued by the Cabinet."

Furthermore, issuing specific legislation that requires the construction of rainwater collection tanks in cities and rural areas would revitalize water resources by incorporating water harvesting into urban planning to maximize the use of rainwater.

The legislative reform aimed at encouraging investment in water harvesting should explicitly include water harvesting projects under the investment sectors in the Kurdistan Region, unify procedures, reduce bureaucracy through a one-stop investment window, and launch a government support fund with investment guarantees for water infrastructure projects. In this regard, we recommend amending Clause 8 of Article 2 of the Investment Law in the Region as follows: "Infrastructure projects, including construction, housing, roads and bridges, railways, airports, irrigation and dams, and water harvesting projects."

Regarding environmental legislation, it is essential to simplify environmental licensing procedures to expedite the water harvesting licensing process while maintaining necessary environmental standards. Water harvesting projects should be integrated into environmental protection programs, promoting sustainable technology and encouraging the use of eco-friendly technologies in harvesting projects, such as filtration and safe water storage techniques. Collaboration between the Environmental Protection and Improvement Authority, the Ministry of Agriculture and Water Resources, and the private sector should also be strengthened to ensure the integration of efforts in water harvesting projects.

5.3 Activating the Water Council in the Kurdistan Region

It is crucial to activate the Water Council in the Kurdistan Region by formulating policies and enhancing institutional coordination. The role of relevant institutions in organizing water harvesting projects is vital, as they are responsible for setting policies and strategic planning related to water harvesting. These institutions can contribute to developing comprehensive strategic plans aimed at improving the collection and storage of rainwater and runoff, directing this water to areas that ensure its sustainable use. Government institutions are responsible for determining the priorities for water harvesting projects based on the actual needs of the most arid areas or those suffering from resource scarcity.

Article (2/fifteenth) of the Ministry of Agriculture and Water Resources Law in the Region emphasizes the adoption of policies for integrated water resource management, stressing laws and requiring sectors using water resources to implement them to preserve water wealth in the region. It also highlights working in coordination with other government ministries, institutions, and UN-affiliated organizations to develop the agricultural and water resources sector and play a crucial role in local, national, regional, and international water resources decisions and recommendations.

Moreover, the role of institutions extends beyond planning to supervising the implementation of water harvesting projects. They also contribute to ensuring that these projects do not negatively impact the environment by reviewing the necessary environmental studies for these projects. Strengthening coordination between different agencies, simplifying procedures, and stimulating investment can improve water resource management in the Kurdistan Region sustainably.

To enhance cooperation between the relevant government agencies, the Water Council of the Kurdistan Region was established under Article (7/first) of the Water Resources Management and Protection Law. The council is chaired by the Minister of Agriculture and Water Resources, with membership from the Undersecretary for Water Resources Affairs, the Head of the Environmental Protection Board, the Director General of Water and Sewage at the Ministry of Municipalities and Tourism, the Director General of Water Resources, the Director General of Dams and Reservoirs, the Director General of Research, and the Director General of Horticulture, Rangelands, and Forestry at the Ministry of Agriculture and Water Resources. According to Article (7/second) of the same law, representatives from the Ministries of Planning, Electricity, Interior, and Health participate in Water Council meetings.

Article 8 of the law outlines the duties of the Water Council, including formulating the internal water policy for the region, approving water use plans across all sectors, endorsing water resource projects and their consumption, approving investment plans in water resource management and protection, ratifying the national strategy for climate and controlling its impacts on water resource protection and revitalization, securing necessary budgets for large and medium dams and various water projects, developing modern irrigation systems to improve agricultural production, and formulating plans to address drought, flooding, and water pollution in coordination with relevant bodies.

However, to our knowledge, this council has not convened yet, despite the passage of approximately one and a half years since the Water Resources Management and Protection Law came into force. According to Article 24 of the law, it came into effect 60 days after its publication in the Official Gazette on July 7, 2022 (Volume 284 of Kurdistan's Gazette), meaning it came into effect on September 5, 2022. Therefore, we urge the relevant authorities to activate the Water Council in the Kurdistan Region to achieve the goals for which it was established.

5.4 Strengthening Public-Private Partnerships in Water Resource Management

Supporting public-private partnerships (PPP) in water harvesting management is an effective tool that can enhance water harvesting efforts in the Kurdistan Region, especially given the challenges faced by the public sector due to a lack of financial and technical resources.

Effective partnerships between the government and the private sector can contribute to improving the efficiency and expansion of water harvesting projects across various regions, thus promoting the sustainability of water resources.

The importance of public-private partnerships in water harvesting lies in improving financing and project execution. Water harvesting projects are often large-scale and require substantial funding, which may exceed the capacity of the public sector alone. The private sector often possesses advanced technology and expertise in designing and implementing water-harvesting projects using innovative solutions. Additionally, through public-private partnerships, projects can be designed not only to collect water but also to manage water resources sustainably. For example, water harvesting projects can be designed in a way that ensures groundwater replenishment and equitable distribution.

In a public-private partnership, the private sector shares part of the financial and administrative risks, helping reduce the burdens on the public sector. Moreover, by collaborating with the private sector, government institutions can learn from modern techniques and technologies in water resource management, which will, in the long term, strengthen the capacity of the public sector to manage water harvesting projects more effectively.

Conclusion

1. Despite the great importance of water harvesting, there is significant neglect by the authorities responsible for this technique, resulting in a large proportion of rainwater going unused.
2. Legal obstacles to water harvesting in the Kurdistan Region exist, mainly due to the absence of specific legislation for water harvesting, as well as deficiencies in related laws on water resources, notably the Water Resources Management and Protection Law, as it does not explicitly regulate water harvesting.
3. The lack of explicit regulation for water harvesting in the Kurdistan Region has led to the absence of clear water policies integrating water harvesting as part of the water development strategy, hindering the implementation of water harvesting projects.

4. Water harvesting in the Kurdistan Region faces challenges related to the coordination of laws, regulations, and instructions between the various regulatory bodies, given the multiplicity of agencies involved in the water sector and the non-activation of the Water Council in the Kurdistan Region.
5. Investment laws directly impact the financing and execution of water harvesting projects, either facilitating or hindering it due to bureaucracy and legal complexities.
6. There are no financial incentives to support water harvesting projects in the Kurdistan Region, and the "Water Resources Protection and Revitalization Fund" has not been established as per Article 13/first) of the Water Resources Management and Protection Law.
7. Supporting the public-private partnership (PPP) model in water resource management is an effective tool to enhance water harvesting projects in the Kurdistan Region, particularly considering challenges faced by the public sector due to a lack of financial and technical resources.

Recommendations

1. Conduct legislative reforms in water resources by amending the Water Resources Management and Protection Law to explicitly mention water harvesting as a mechanism for water resource development, leaving details to a system issued by the region's Cabinet.
2. Propose adding a provision to Article 6 of the Water Resources Management and Protection Law as follows: **"Develop water harvesting plans in the region in coordination with relevant authorities, regulating the mechanisms for collecting and storing water, licensing procedures, and usage rights through a system issued by the Cabinet."**
3. Encourage investment in water resource management, including water harvesting, by explicitly including it in investment sectors in the Kurdistan Region.
4. We propose amending Clause (eighth) of Article (2) of the Investment Law in the Region as follows: **"(Infrastructure projects, including construction, reconstruction, housing, roads and bridges, railways, airports, irrigation and dams, and water harvesting projects)."**

5. Simplify environmental licensing procedures to expedite water harvesting licenses while maintaining necessary environmental standards and integrate water harvesting projects with environmental protection programs.
6. Urge the relevant authorities to activate the **Water Council** in the Kurdistan Region to achieve the goals for which it was established.
7. Activate the **Water Resources Protection and Revitalization Fund** in the Kurdistan Region to increase government support for water infrastructure projects, including water harvesting.
8. Strengthen public-private partnerships in water resource management, including water harvesting projects.
9. Conduct more legal research to shed light on effective water resource management and enhance the Kurdistan Region's ability to face water challenges and ensure the sustainability of its resources for future generations.

References

First/ Books:

1. Al-Lozi, Dr. Salem (2008), "Enhancing the Use of Water Harvesting Technologies in Arab Countries," Arab Organization for Agricultural Development.
2. Chris J. G. Fuller (2020), "Rainwater Harvesting: A Guide to Implementation," RIBA Publishing.
3. Ghanem, Ali Ahmed (2010), "Applied Climatology," 1st edition, Amman: Al-Maseerah Publishing and Distribution.
4. Michael M. Faure (2019), "The Law of Water Resources," Oxford University Press.
5. Naqshbandi, Azad Mohammed Amin (2003), "The GAP Project and Its Effects on the Countries of the Region and Kurdistan," Publications of Salahaddin University – Erbil.
6. Sabri, Mohammed (2017), "Water Policy in Iraq and Its Impact on Sustainable Development after 2003," Baghdad: Iraq Centre for Studies.
7. Stephen S. Williams (2016), "Water Law: A Practical Approach," Edward Elgar Publishing.

8. Sharif, Azad Jalal (1999), "Geography of the Kurdistan Region of Iraq," Publications of the Barayati Centre, Erbil.

Second/ Thesis:

1. Al-Haddad, Hashim Yaseen Hamad-Ameen (2000), Atlas of Natural Resources of Erbil Governorate and Land Management for Agricultural Purposes: A Cartographic-Geographical Study, Part One, master's thesis, Erbil: Salahaddin University.
2. Aziz, Tahseen Abdulrahim (2007), "Spatial Variation of Spring Water in Sulaymaniyah Governorate," Ph.D. thesis, Baghdad: Al-Mustansiriya University.
3. Ismail, Ismail Saad (2006), "Characteristics of the Flow for the Large Zab River in the Kurdistan Region of Iraq," master's thesis, Erbil: Salahaddin University.
4. Kamel Ahmed, Susan (2007), "The Small Zab River Basin in Iraq: A Hydrometeorological Study for the Period (1978-2007)," master's thesis, Baghdad University.
5. Majeed Bayda Mahmoud, (2024), Geographical Analysis of Natural Resources and their Investment Prospects in Erbil Governorate, Ph.D. thesis, Erbil: Salahaddin University.
6. Mohammed, Kazem Mousa Mohammed (1981), "The Large Zab River Basin in Iraq: A Hydrological Study," master's thesis, College of Arts, Baghdad University.
7. Omar, Lukman Wasu (2013), "Climate Change and Its Impact on Agricultural Development Requirements in Erbil Governorate," Ph.D. thesis, Faculty of Education, Koya University.
8. Shwani, Shwan Omer Ismail (2008), "Hydrogeology and Hydrochemistry of Bashtapa Sub-basin in Erbil Governorate, Kurdistan Region, Iraq," master's thesis, Erbil: Salahaddin University.
9. Tahe, Rizgar Khader (2017), "Water Security in the Kurdistan Region of Iraq: A Study in Political Geography," master's thesis, Raperin University.

Third/ Legal Articles:

1. Abdullah, Ilham Dia and Ibrahim, Dr. Wadi' Dakhil (2023), "The Role of International Agreements in Reforming Iraqi Water Protection Laws," *Anbar University Journal for Legal and Political Sciences*, Volume (13), Special Issue, November, (pp.404-427).
2. Ali, Anfal Essam (2020), "Legislative Gaps in Organizing the Use of Water and Rationalizing Its Consumption in Iraq: A Comparative Study," *Al-Kufa Journal for Legal and Political Sciences*, Volume (12), Issue (1/44), (pp.151-172).
3. Al-Mufriji, Dr. Ahmed Khorshid Hamidi and Al-Azzawi, Dr. Hussein Talal Mallah (2023), "Legislative Issues of Managing and Organizing the Water Resources Facility in the Iraqi Constitution of 2005," *Al-Mustansiriya Journal for Arab and International Studies*, Special Issue for the 13th Conference Proceedings, (pp.49-69).
4. Al-Hajami, Dr. Amin Raheem Hamid (2023), "Administrative Control Methods for Protecting Water Resources: A Comparative Study," *Basra Studies Journal*, Supplement Issue (48), Year (18), June, (pp.804-828).
5. Hussein, Dr. Zeina Khaled and Ibrahim, Abir Dheyad (2017), "International Water Policy, Treaties, and Agreements and Their Impact on Agricultural Production in Iraq," *Journal of the Faculty of Basic Education*, Volume (23), Issue (97), (pp.607-634).
6. Jassim, Ali Kazem (2024), "The Role of Laws in Encouraging Investment in the Field of Water Resources," *Wasit Journal for Humanities*, Volume (20), Special Issue for the 5th Scientific Conference of Imam Al-Kadhim College (pp.465-476).
7. Zanon, Dr. Abdul Rafi, "The Dilemma of Legislative Deficiency in the Arab World: Roots, Manifestations, and Approaches," *Journal of the Faculty of Law for Legal and Political Sciences*, University of Kirkuk, Volume (11), Special Issue, (pp.413-422).

Fourth/ Geographical Articles:

1. Abdulbaqi, Shihab & others (2010), "Multivariate Analysis of Ground Water Quality of Makhmor Plain/North Iraq," *Damascus University Journal*, Vol. 26, No.1.
2. Abdulghani, Imad Telfah, Abdulrahman, Wael Fahmi, and Abdulhamid, Issam Mohammed (2022), "A General Review of Water Harvesting in Arid and Semi-Arid Regions," *Kirkuk University Journal of Agricultural Sciences*, Volume (13), Issue (3), (pp.302-320).

3. Al-Mansouri, Dr. Mohammed Hussein (2018), "Enhancing Water Resources in Iraq with Water Harvesting Technologies Using GIS," *Al-Qadisiyah Journal for Humanities*, Volume (21), Issue (4), (pp.316-334).
4. Al-Sakini, Dr. Abir Yahya (2011), "Water Harvesting Technologies: Their Role in Developing Arab Water Resources," *Al-Mustansiriya Centre for Arab and International Studies Journal*, Volume (11), Issue (33), (pp.149-167).
5. Joudat, Nada Shaker, Munkh, Saadia Aakol, and Shnwan, Falah Hassan (2016), "Water Harvesting and Its Impact on Water Resource Development in Iraq," *Kufa Journal of Arts*, Volume (1), Issue (29), (pp.115-152).
6. Kareem, Ibtesam R. (2013), "Artificial Groundwater Recharge in Iraq through Rainwater Harvesting – Case Study," *Engineering & Technology Journal*, Vol. 31, Part (A), No. 6, (pp.1069-1080).
7. Mukhlif, Fadhil Hussein, Raja, Ali Mohammed, Awad, Sanaa Rashid, Ayyed, Inam Mohammed, and Alalwany, Abdulkarem Ahmed M. (2023), "The Role of Water Harvesting in the Development of Vegetation Cover and Reducing Desertification within the Desert Dry Areas," *Kirkuk University Journal for Agricultural Sciences*, Vol. 14, No. 2, (pp.223-237).
8. Nafea, Dr. Faisal Abdul-Fattah (2018), "Using Water Harvesting Technologies for Developing Iraqi Water Resources," *Al-Mustansiriya Centre for Arab and International Studies Journal*, Volume (14), Issue (60), (pp.164-184).
9. Naqshbandi, Dr. Azad Mohammed Amin (2022), "Planning for Water Resource Management in the Kurdistan Region of Iraq: A Geographical Perspective," *Duhok University Journal*, Volume (25), Issue (1), (pp.462-476).

Fifth/ Constitutions, legislation, decisions, and reports:

1. The Iraqi Constitution of 2005.
2. Law for Investment in the Kurdistan Region – Iraq No. 4 of 2006.
3. Law for Protecting and Improving the Environment in the Kurdistan Region – Iraq No. 8 of 2008.

4. Law for Ministry of Agriculture and Water Resources in the Kurdistan Region - Iraq No. 6 of 2010.
5. Law for Protecting Water Projects and Networks in the Kurdistan Region – Iraq No. 4 of 2021.
6. Law for Managing and Protecting Water in the Kurdistan Region - Iraq No. 4 of 2022.
7. Iraqi Irrigation Law No. 6 of 1962 (repealed).
8. Iraqi Maintaining Irrigation and Drainage Networks Law No. 12 of 1995 (amended).
9. Iraqi Investment Law No. 13 of 2006 (amended).
10. Iraqi Ministry of Water Resources Law No. 50 of 2008 (amended).
11. Iraqi Ministry of Agriculture Law No. 36 of 2013.
12. Iraqi Irrigation Law No. 83 of 2017.
13. Environmental Protection Act 1995, United Kingdom.
14. Water Act 2003, United Kingdom.
15. Building Regulations 2009, United Kingdom.
16. Resolution No. 11 of the Kurdistan Parliament (1992).
17. Resolution No. 25 of the Iraqi Council of Representatives (2009).
18. World Bank Water Resources Management Reports, 2020.
19. Department for Environment, Food & Rural Affairs (DEFRA), UK Government's Water Strategy, United Kingdom, 2021.