

Assessment of the Impact of Climate Change-Related Water Scarcity

on the Livelihoods of Communities in
the Central Marshes and the Western
Hammar Marsh



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About Humat Dijlah Association

Humat Dijlah is an Iraqi non-governmental organization dedicated to protecting the natural heritage of the Tigris River, a source of historical continuity and a vital lifeline for the people of Mesopotamia. The Association connects environmental civil society movements in Iraq with their counterparts in other countries of the Tigris River basin, building bridges of communication and cooperation in recognition of the shared destiny of the region's peoples.

The Association is committed to the principles of voluntary action and promotes the protection of the environment and water resources as matters of public concern. Improvements or deterioration in environmental and water conditions affect all segments of society. Responsibility for these issues should therefore not be limited to governments, public authorities or specialists, but should be collectively shared. The Association believes in the potential of young people and works to strengthen their role in securing a sustainable future.

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About the Save the Tigris Campaign

"Save the Tigris" is a civil society advocacy platform that promotes water justice in the Mesopotamian basin. It connects groups and movements from Iraq, Türkiye, Syria and Iran working to protect the Tigris and Euphrates rivers. The platform fosters international solidarity and supports knowledge exchange. It advocates for policies that advance environmental justice, including the equitable and democratic use of water for all people living in the Mesopotamian region, and promotes water as a tool for peace.

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Executive Summary

This study was conducted in the Central Marshes and the Western Hammar Marsh in southern Iraq, which together constitute one of the region's most important ecological and cultural systems. The Lower Mesopotamian Marshes are among the most significant wetland ecosystems in the Middle East, possessing considerable environmental and social importance and supporting rich biodiversity. The marshes constitute a socio-ecological system that has been inhabited for thousands of years by the Marsh Arabs, whose origins can be traced back to the ancient Sumerian civilization. Marsh communities depend directly on wetland resources through bird hunting, fishing, reed harvesting, water buffalo breeding and agriculture. As a naturally renewable ecosystem rich in essential plant and animal resources, the marshes are of great economic and social importance and provide local communities with a primary source of income.

Iraq is not isolated from the effects of the climate changes affecting the world and has been ranked as the fifth most vulnerable country to climate change. The effects of climate change caused by global warming and changes in weather and climate conditions are already clearly visible, including rising temperatures and declining rainfall. Climate extremes are also evident in Iraq, affecting different parts of the country simultaneously through changing patterns of distribution and reaching levels of intensity that continuously affect the country. These changes have created numerous problems across several sectors that constitute fundamental pillars of the local economy, such as agriculture and livestock. They may also indirectly affect other sectors, in addition to having repercussions at the regional and global levels.

The Iraqi marshes are among the natural areas most severely affected within Iraq. For decades, they have experienced drought crises of considerable magnitude due to declining water inflows, resulting in the destruction of these environments and their biodiversity. This has had a clear impact on the Marsh Arabs, whose way of life depends on the use of natural resources that provide the foundations of their livelihoods. Large numbers of livestock, including water buffalo, have been lost, alongside fish stocks, bird populations and reed-growing areas. Buffalo breeders have faced further hardship because of difficulties in obtaining fodder and weak government support for those affected, creating economic vulnerability among local communities. Specialized sources have indicated that approximately 4,000 water buffalo died during the 2022–2023 drought. This created a new form of competition over the remaining natural resources and led to a decline in livestock numbers and the loss of the natural resources on which Marsh communities depend. Consequently, large numbers of residents migrated to nearby areas or to other governorates in search of water or alternative sources of livelihood, as documented by the present study.

Water scarcity and the recurrent drought scenarios experienced by the marshes have slowed their natural regeneration and left them threatened by water shortages. The Central Marshes and the Western Hammar Marsh experienced drought in 2008–2009, during the summer of 2015, in 2017–2018 and again in 2022 and 2023. These events significantly affected ecosystem services, biodiversity and the communities living in these areas.

Despite the efforts undertaken by the responsible authorities, the marshes continue to suffer from serious neglect in several areas, particularly water management and the conservation of biodiversity and livestock. The absence of an effective role for the relevant authorities has resulted in continuing pressure on, and overexploitation of, natural resources. Moreover, the lack of an emergency plan to avert the risks associated with water scarcity has severely affected natural resources and the economic circumstances of local communities, which have lost essential means of subsistence and whose natural and cultural heritage has been exposed to destruction.

Humat Dijlah Association developed this study to assess the effects of climate change-related water scarcity on water buffalo breeders, livelihoods and the economic life of communities in the Central Marshes and the Western Hammar Marsh, and to develop proposals capable of addressing these challenges.

A field survey and interviews were used to collect information from numerous Marsh Arab residents of the Central Marshes and the Western Hammar Marsh. The study also drew upon relevant references, information made available by civil society organizations and direct field observations.

The study found that 100% of the local residents affected by periods of drought, particularly during 2022 and 2023, depend fundamentally for their livelihoods on the availability of water and environments suitable for raising water buffalo and other livestock, maintaining fish and bird stocks and harvesting reeds, which constitute a primary raw material for many local industries. Water scarcity affected the economic circumstances of local residents and reduced the financial value derived from natural resources. Water buffalo breeding, reed harvesting, fish and bird hunting, and other activities were severely affected in both the Central Marshes and the Western Hammar Marsh. The remaining natural resources and available treatments were insufficient to provide the buffalo with the natural food they require each month, exposing livestock to large-scale losses. Losses among buffalo breeders amounted to 63% in the Central Marshes and 52% in the Western Hammar Marsh compared with herd numbers before the drought. Unemployment also rose to 86% among surveyed residents without permanent jobs or occupations in the Central Marshes and to 84% among surveyed residents of the Western Hammar Marsh. For these reasons, Marsh residents experienced waves of internal and external migration to other governorates in search of water or alternative sources of livelihood. The proportion of residents migrating internally or externally to other governorates, such as Babil, Wasit and Karbala, reached 70% among the inhabitants of the Central Marshes, compared with 60% among the inhabitants of the Western Hammar Marsh.

Reed cutters were also severely affected by the lack of common reeds, which are used as food for water buffalo, sold commercially and employed in local handicrafts and in the construction of reed houses known as mudhifs. In addition, fish catches declined dramatically compared with pre-drought levels, falling to 5% in the Central Marshes and 2% in the Western Hammar Marsh. These quantities were insufficient even to feed fishers' families and generated no monthly income when compared with the period preceding the drought. Bird hunting was also significantly affected in both the Central Marshes and the Western Hammar Marsh because of water scarcity. Birds are hunted mainly for food or sale. The study also found that reed cutters in the Central Marshes and the Western Hammar Marsh suffered from low levels of education: illiteracy affected 39% of the surveyed participants in the Central Marshes and 66% in the Western Hammar Marsh.

The information contained in this study can contribute to determining the extent to which drought caused by climate change has affected the inhabitants of the Central Marshes and the Western Hammar Marsh. If implemented, the study will also be useful to the success of the National Park Management Plan, which will strengthen sustainable support for the livelihoods provided by the marsh ecosystem. This will contribute to preserving the integrity of the ecosystem, the environmental services it provides to local communities and the biodiversity values necessary to maintain its status as a World Heritage Site.

Introduction

The importance of Iraq's marshes lies in the fact that they are home to a unique human community sustained by natural resources and an ecosystem that possesses the essential foundations for sustainable development. The traditional way of life maintained by the Marsh Arabs for thousands of years remains visible in their reed houses and long wooden canoes, known as mashhoof, which have been used for transportation since the earliest civilizations, approximately 5,000 years ago, during the beginnings of Sumerian civilization. The inhabitants of the marshes are among Iraq's earliest communities and have historically been known as the Marsh Arabs or Ma'dan. Many live on floating reed islands separated by waterways and use different types of boats to travel and communicate with one another. They have been described as an ancient and distinctive people whose way of life dates back approximately 5,000 years and reflects the cultural legacy of the Sumerian and Babylonian civilizations. Today, however, this way of life is at risk of rapidly disappearing.

The marshes possess distinctive and enduring geographical and natural characteristics, including their location, area, spatial extent, climate and biological environment, which supports diverse plant and animal communities [31]. Marsh residents depend primarily on water buffalo breeding, fishing and agriculture [10]. The wetlands provide a suitable and sustained environment for traditional agricultural production, including millet, rice and vegetables, as well as livestock grazing and hunting [31].

The Mesopotamian water buffalo represents an important livestock resource with considerable economic value. According to reports by the Iraqi Ministry of Agriculture, water buffalo populations in Iraq can be divided into three ecotypes according to their climatic and environmental conditions:

1. **Marsh ecotype:** This ecotype has the highest population density and is concentrated primarily in the Mesopotamian Marshes across the southern governorates of Dhi Qar, Maysan and Basra.
2. **Euphrates ecotype:** This ecotype is distributed along the banks of the Euphrates River in the central Iraqi governorates of Babil, Najaf and Al-Qadisiyah.
3. **Northern ecotype:** This ecotype is found in the northern region, particularly in the governorates of Nineveh and Kirkuk [7].

Iraq's fisheries constitute an important component of national income and have considerable economic significance. This has encouraged specialists and researchers to study the biological and environmental characteristics of the country's aquatic ecosystems in order to support the development of the fisheries sector [38]. Fish are a staple food for communities living in and around the marshes, while residents of neighbouring areas obtain marsh fish through local markets [9].

Bird hunting, particularly the hunting of ducks, has long formed part of the subsistence practices of Marsh communities [21, 34]. Hunting remains an important activity, and the Marsh Arabs have traditionally depended on a subsistence-based way of life [5]. Waterfowl and fish are integral to the local food system and cultural traditions [44]. Birds are hunted for household consumption and provide an accessible source of protein [15, 36], while fish are among the most important groups of aquatic organisms and constitute a vital source of food [11, 14, 25].

The southern marshes, including the Central Marshes and the Western Hammar Marsh, provide resting and wintering grounds for large numbers of migratory waterbirds arriving from colder regions. They also offer suitable breeding habitats for important bird species and other wildlife. According to studies of Iraq's Key Biodiversity Areas (KBAs), these marshes are among the country's most important biodiversity areas and are also recognized as Important Bird Areas (IBAs) [40].

In recognition of their ecological importance and compliance with protected-area criteria, the Iraqi Council of Ministers declared the Central Marshes Iraq's first National Park in 2013. The Western Hammar Marsh was also subsequently declared a National Park.

In October 2015, the marshes were designated as Wetlands of International Importance under the Ramsar Convention. In July 2016, the Central Marshes and the Western Hammar Marsh were inscribed on the UNESCO World Heritage List as part of The Ahwar of Southern Iraq. This represented a major national achievement and reinforced international recognition of the marshes' global significance.

The marshes have a hot and dry summer climate, with annual precipitation below 200 mm. Winters range from mild to cold, while dust storms and heatwaves are common during the summer [6].

The principal challenges facing the marshes include water scarcity, drought, the absence of water-sharing agreements with neighbouring countries and deteriorating water quality. The degradation and destruction of the marshes have serious consequences for wildlife and biodiversity at both the local and regional levels. Reduced rainfall and declining inflows from the Tigris and Euphrates rivers have caused many parts of the marshes to dry out. Rising temperatures have placed further pressure on the ecosystem services they provide. Environmental degradation has also contributed to the migration of local residents to nearby cities, particularly the administrative centres of Iraq's southern governorates [31].

Study Area

The present study covers the Central Marshes, located at 31°01'10.60" N, 47°03'14.54" E, and the Western Hammar Marsh, located at 30°52'00.86" N, 46°52'33.75" E. Both are situated in southern Iraq (Figure 1).

The Central Marshes form a complex of interconnected wetlands covering an area of 131,780 hectares. They are located west of the Tigris River, are bordered by the Euphrates River to the south, and receive water from both rivers.

The Western Hammar Marsh covers an area of 136,326 hectares. It extends from Suq Al-Shuyukh in the west to the barrier embankment on the Euphrates River in the north, located south of Al-Chibayish District, and to the Main Outfall Drain (MOD) in the south. The Western Hammar Marsh receives water from two sources: the Euphrates River and the Main Outfall Drain.

The Central Marshes form part of the Tigris–Euphrates alluvial salt marsh ecoregion (PA0906) and extend across the administrative boundaries of three governorates: Dhi Qar, Maysan and Basra. The Western Hammar Marsh also forms part of the Tigris–Euphrates alluvial salt marsh ecoregion (PA0906) and is located within the administrative boundaries of Dhi Qar Governorate [40].

The marshes generally have a hot and dry climate. The summer season lasts for approximately six months, from May to October, and is long, hot and dry, while the other seasons are shorter. Annual precipitation is below 200 mm.



Figure 1: Satellite Image Showing the Study Area (the Blue Marker Indicates the Central Marshes and the Green Marker Indicates the Western Hammar Marsh)

The climate of the marshes is arid and subtropical, with hot summers, during which the average maximum temperature is approximately 43°C, and mild to cold winters, during which the average minimum temperature is approximately 4°C. Dust storms are common in summer. During heatwaves, temperatures can rise to 48°C, while in winter they can fall to -8°C.

Humidity is low, whereas evaporation from open water surfaces is high. This contributes to water loss, as evaporation is approximately ten times greater than the contribution made by rainfall in the area. July records the highest temperatures, followed by August, while June generally records the lowest temperatures of these three months [6].

Study Objective



The objective of this study is to assess the impact of climate change, as manifested in water scarcity, on the livelihoods of local communities in the Central Marshes and the Western Hammar Marsh. The study focuses primarily on water buffalo breeders, reed harvesters, fishers and bird hunters. It examines the effects experienced during recent periods of drought, analyses the results and presents recommendations aimed at sustaining Marsh Arab communities, conserving natural resources and preserving biodiversity over the long term.

Methodology

Data was collected through questionnaires and direct interviews with residents of villages adjacent to the Central Marshes and the Western Hammar Marsh, as well as with families living within the marshes. A random sample of 100 respondents was interviewed at each study site, for a total of 200 respondents.

The study was conducted in January 2024 by a field team. Data was collected using a purpose-designed questionnaire form, a digital camera, vehicles and boats for transportation within the study area.

The questionnaire consisted of two main parts:

1. **Part One (Demographics & Baseline Data):** Full name (optional to ensure psychological safety and legal confidentiality), date, place of residence (governorate/district), age, educational attainment, occupation, marital status, total monthly income, family size, and stability of monthly income sources.
1. **Part Two (Resource & Economic Impact Assessment):** Specific questions regarding water scarcity impacts, internal/external displacement patterns and causes, financial losses, livestock herd reduction, challenges in preserving domestic animals, current water viability for livestock survival, milk production impacts, reed harvesting disruptions, fish catch rates, bird hunting yields and species composition, government/NGO emergency relief, environmental degradation perceptions, family conflict arising from financial strain, crisis mitigation solutions, and willingness to participate in natural resource protection initiatives.

Finally, respondents were invited to provide their own recommendations for conserving the natural resources of the marshes and improving resource protection.

Survey Results

Data collection and analysis: a total of 200 interviews were successfully completed during the study period: 100 interviews in the Central Marshes and 100 interviews in the Western Hammar Marsh.

Part One: Basic Information

Place of residence – governorate and district: All respondents were residents of Dhi Qar Governorate. In the Central Marshes, 100% of respondents were residents of Al-Chibayish District. In the Western Hammar Marsh, 52% were residents of Al-Chibayish District living within the Hammar Marsh, while 48% were residents of Al-Hammar Subdistrict, which is administratively part of Al-Chibayish District. Age Range: 21 to 70 years old in the Central Marshes; 24 to 70 years old in the Western Hammar Marsh.

Age: Respondents were then asked about their age. In the Central Marshes, respondents ranged from a minimum of 21 to a maximum of 70 years of age. In the Western Hammar Marsh, they ranged from a minimum of 24 to a maximum of 70 years of age.

Educational attainment: Respondents were asked to indicate their level of education using the following categories: illiterate; able to read and write; primary education; intermediate education; preparatory education; institute or college graduate; or other, with respondents asked to specify.

In the Central Marshes, the results showed that 39% of respondents were illiterate, 53% were able to read and write, 4% had completed primary education, 2% had completed intermediate education, and 2% were graduates of an institute or college.

In the Western Hammar Marsh, 66% of respondents were illiterate, 30% were able to read and write, and 4% were graduates of an institute or college, as shown in Figure 2.

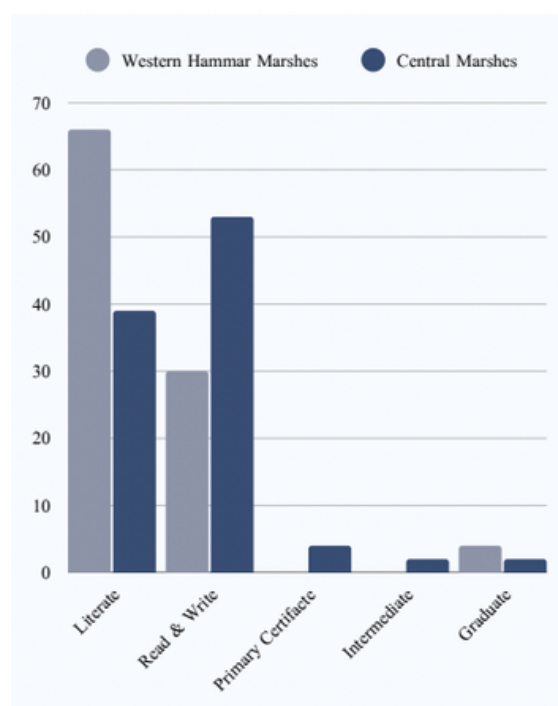


Figure 2: Educational Attainment of Survey Respondents

Employment or occupation: Respondents were asked to select one of the following categories: salaried employee; wage earner or daily labourer; retired; student; or other, with respondents asked to specify.

In the Central Marshes, 86% of respondents were wage earners or daily labourers, 10% were salaried employees, and 4% were retired.

In the Western Hammar Marsh, 84% of respondents were self-employed and 16% were salaried employees, as shown in Figure 3.

Marital Status

The marital status of respondents in the Central Marshes was as follows: 93% were married and 7% were single.

In the Western Hammar Marsh, the results showed that 92% of respondents were married, 4% were single and 4% were divorced, as shown in Figure 4.

Household Size

In the Central Marshes, household size ranged from a minimum of 2 to a maximum of 10 members, with an average of 5 members per household. The overwhelming majority of households had only one income earner.

In the Western Hammar Marsh, household size ranged from a minimum of 2 to a maximum of 11 members, with an average of 6 members per household. Most households also had only one income earner.

Monthly Income

When respondents were asked whether they had a stable monthly income, it became clear that many residents of the Central Marshes received a fixed monthly income from the government or from other sources.

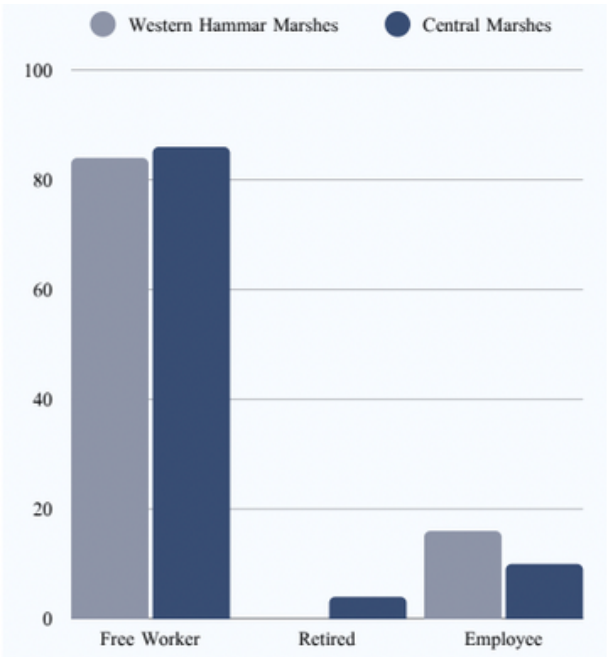


Figure 3: Distribution of Respondents by Employment or Occupation

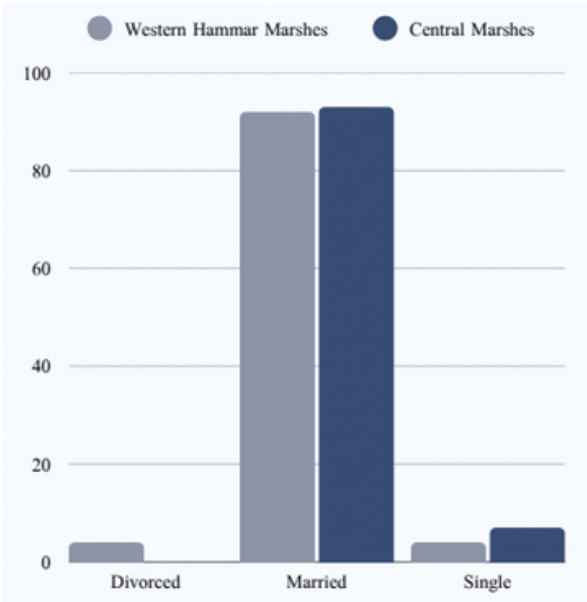


Figure 4: Distribution of Respondents by Marital Status

Monthly income earned from marsh-based activities—including water buffalo breeding, reed harvesting, fishing, bird hunting and other activities—ranged from a minimum of IQD 30,000 (approximately USD 20) to a maximum of IQD 200,000 (approximately USD 133).

In the Western Hammar Marsh, many water buffalo breeders received a government social welfare allowance. Their additional monthly income from other marsh-based sources ranged from a minimum of IQD 40,000 (approximately USD 26) to a maximum of IQD 100,000 (approximately USD 66).

The income generated from marsh resources was insufficient to cover the monthly cost of buffalo feed and necessary veterinary treatment.

Main Marsh-Based Livelihood Activities

The results also showed that, in the Central Marshes, 82% of respondents depended on water buffalo breeding and reed harvesting to earn an income, 12% depended on fishing, and 6% hunted birds, sometimes relying on this activity as a source of income.

In the Western Hammar Marsh, 79% of respondents depended on water buffalo breeding and reed harvesting to earn an income, 16% depended on fishing, and 5% hunted birds and relied on this activity as a source of income, as shown in Figure 5.

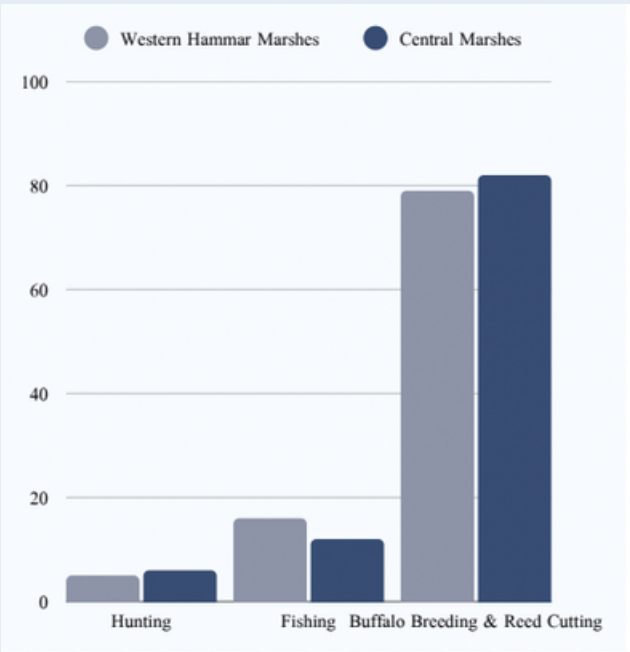


Figure 5: Distribution of Economic Activities Practised by Marsh Residents

Part Two: Questions concerning the Impact on Natural Resources

Respondents were asked how water scarcity had affected their lives. All respondents included in the study – 100% – answered “yes”.

Water scarcity had affected them because their livelihoods depend fundamentally on the availability of water of sufficient quality for water buffalo breeding, reed harvesting, fishing and bird hunting.

Respondents reported that they had begun experiencing these difficulties more than eight years earlier. The severity of the situation varied over time, reaching conditions of complete drought during many seasons in both the Central Marshes and the Western Hammar Marsh. These conditions were also observed during the field survey.

Respondents were asked: “Have you experienced internal or external migration during the past several years?”

In the Central Marshes, 30% answered that they had not moved elsewhere, while 70% reported having experienced internal migration. Some of these respondents had also migrated outside the marsh area to other Iraqi governorates, including Babil, Wasit and Karbala.

In the Western Hammar Marsh, 60% reported having experienced migration within or outside their local area, while 40% had not migrated.

All respondents stated that water scarcity was the main cause of migration. Even those who had not migrated explained that water scarcity had caused a decline in the natural resources on which they depended for their livelihoods in the marshes. However, despite the harsh conditions, they had been compelled to remain.

Respondents were asked whether they had lost a source of income as a result of water scarcity. All respondents – 100% in both the Central Marshes and the Western Hammar Marsh – answered “yes”.

They reported having no alternative occupation through which to compensate for the resulting loss of income, and no alternative source of livelihood was currently available to them.

When respondents were asked whether livestock numbers had been affected by drought, all respondents – 100% in both the Central Marshes and the Western Hammar Marsh – answered “yes”.

The extent of the losses varied, particularly among water buffalo breeders. Among respondents in the Central Marshes, current buffalo numbers had fallen to 63% of their pre-drought levels during 2022 and 2023. Among respondents in the Western Hammar Marsh, buffalo numbers had fallen to 52% of their pre-drought levels, as shown in Figure 6.

Reed harvesters were specifically asked whether drought had affected their work and, if so, how.

In the Central Marshes, 98% answered “yes” and 2% answered “to some extent”. In the Western Hammar Marsh, 100% answered “yes”.

Respondents explained that they had been severely affected by the scarcity of reeds. Reeds are used as feed for water buffalo, sold to other livestock owners for the same purpose, and used in local craft production.

Before the drought, the sale of reeds generated daily earnings of up to IQD 60,000 in the Central Marshes and up to IQD 50,000 in the Western Hammar Marsh. During the drought, however, respondents were forced to depend primarily on fodder purchased from local markets. Rising fodder prices reduced their earnings.

Fishers were also asked how current fish catches compared with previous levels.

In the Central Marshes, current catches had fallen sharply to approximately 5% of their pre-drought level. The quantities caught were insufficient to feed respondents' families and no longer generated a monthly income. Before the drought, a single fishing trip could generate earnings of up to IQD 200,000.

In the Western Hammar Marsh, current catches had fallen to approximately 2% of their pre-drought level. The fish caught had no significant commercial value and were used primarily to feed respondents' families. Before the drought, a single fishing trip could generate earnings of up to IQD 150,000, as shown in Figure 7.

Bird hunters were asked which bird species they currently caught compared with the period before the drought. Responses varied and included waterhens, the bird locally referred to as al-Burhan, coots, grey herons, purple herons, great cormorants, garganey or teal, glossy ibises, and several other species of teal and duck. Respondents reported that these species had previously been found in both the Central Marshes and the Western Hammar Marsh before the drought and that the birds caught were used for household consumption. At present, however, bird hunting is no longer taking place in either area because the wild bird species traditionally targeted by hunters have become scarce as a result of water scarcity in the marshes.

Respondents were asked whether they had received assistance from governmental bodies, organizations, or governmental or health authorities. Most answered "yes". According to respondents, the Ministry of Migration and Displacement had visited them only once and distributed one food basket to each surveyed household in the Central Marshes and the Western Hammar Marsh. The Ministry of Water Resources had also supplied some residents of the Western Hammar Marsh with drinking water for their animals for a limited period during the summer. In addition, during 2022 and 2023, the Food and Agriculture Organization of the United Nations (FAO), in coordination with the Ministry of Agriculture, provided animal feed to some water buffalo breeders.

Respondents in the Central Marshes and the Western Hammar Marsh were asked whether drought had negatively affected the environment and, if so, how. All respondents answered "yes". They reported losses of livestock, fish and wild bird populations, as well as severe damage to the wider ecosystem and to life within the marshes. The remaining water had become extremely saline, to the point that water buffalo would not drink it. This affected the animals' health and caused the deaths of large numbers of buffalo. As a result, the sources of livelihood and agricultural activities on which Marsh communities depended declined, negatively affecting families living in the marshes.

Respondents were asked whether they believed that the lack of financial resources caused problems within families. Most answered “yes”, explaining that declining income and the loss of livelihoods could lead to family conflict and negatively affect both health and children’s access to education in Marsh communities. These effects were particularly evident among water buffalo breeders, whose families were often forced to migrate in search of alternative sources of livelihood.

As part of the questions intended to gather respondents’ views on possible solutions, they were asked: “In your opinion, what solutions could help alleviate the crisis you are experiencing?” All respondents emphasized the need to provide the water on which their livelihoods depend, compensate them for their losses, and manage the crisis in a way that enables communities to adapt to drought until water becomes available again. They explained that these measures would help them remain in the marshes rather than migrate elsewhere.

When respondents were asked whether they would be willing to contribute to protecting the natural environment and resources of the marshes, 90% in the Central Marshes answered “yes”, 5% answered “no”, and the remaining 5% answered “to some extent”. In the Western Hammar Marsh, 95% answered “yes”, 3% answered “no”, and 2% answered “to some extent”, as shown in Figure 8.

Finally, the recommendations made by respondents concerning the conservation of natural assets and the protection of resources were recorded. Their recommendations included maintaining adequate water levels in the marshes; providing employment opportunities for unemployed residents; supporting the purchase of locally produced dairy products; prohibiting fishing during the breeding season; prohibiting the use of poison for fishing; and organizing educational and awareness-raising sessions on the protection of natural resources.

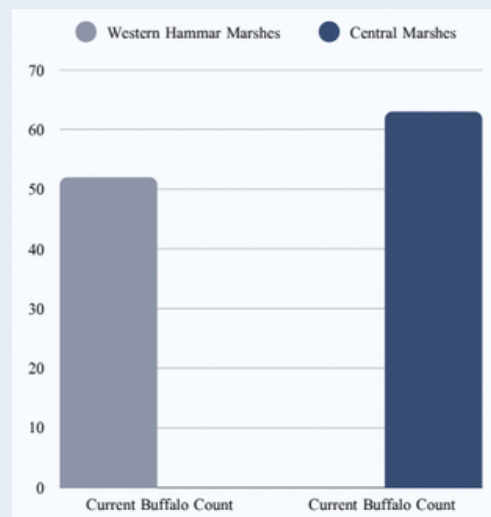


Figure 6: Current Buffalo Numbers as a Percentage of Pre-Drought Levels among Respondents in the Central Marshes and the Western Hammar Marsh



Figure 7: Current Fish Catches as a Percentage of Pre-Drought Levels in the Central Marshes and the Western Hammar Marsh

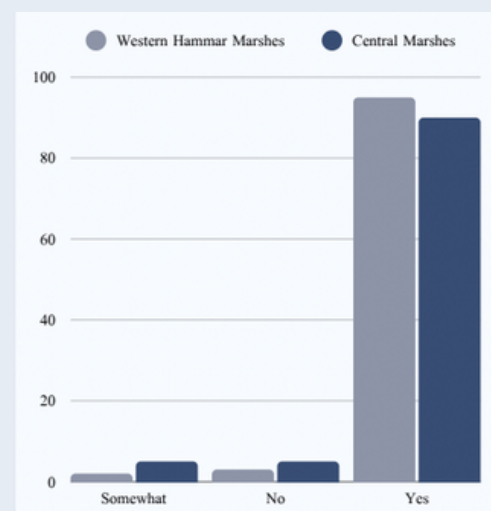


Figure 8: Percentage of respondents willing to assist in protecting natural resources in the central Marshes and the western Hammar marsh

Impact of Climate Change on Water Inflows

Climate change resulting from global warming has affected all weather-related variables in Iraq and neighbouring countries. These effects include changes in temperature, rainfall intensity and its spatial and temporal distribution, and atmospheric pressure. They have also contributed to changes in the annual flows of the Tigris and Euphrates rivers. Climate modelling studies indicate that, if emissions of greenhouse gases, including carbon dioxide (CO₂), continue at their current rates, these adverse changes are expected to persist at least until the end of this century.

The models also indicate that storm activity in the eastern Mediterranean, which is linked to the North Atlantic Oscillation (NAO), will decline during this century if global warming continues. This is expected to result in a 15–25% reduction in rainfall across most of the region, including parts of Türkiye, Syria, northern Iraq and northwestern Iran. These areas include the headwaters of the Tigris and Euphrates rivers, which are of particular strategic importance to Iraq and the wider region [2].

Iraq is a downstream country whose water resources arrive from beyond its borders, primarily through the Tigris and Euphrates rivers. Over recent decades, these inflows have declined because of climate change and the inequitable distribution of water. This has affected water levels in Iraq, including in the southern marshes. Reports indicate that water levels in the Tigris and Euphrates have fallen to less than half their natural levels. Natural river flows have also declined considerably. The situation has further deteriorated because of increasing water withdrawals in the riparian countries, particularly Türkiye and Iran and, to a lesser extent, Syria, as regional demand for water has continued to increase [1].

Other studies have identified significant and concerning declines in rainfall across all areas containing tributaries of the Tigris River in Iraq. They indicate an overall decrease in rainfall during the periods 1980–1990, 1990–2000 and 2000–2010, with a spatial pattern of decline from upstream to downstream and from the eastern part of the basin towards the west. This pattern is explained by the fact that the northeastern and northern parts of the basin are mountainous and receive relatively high levels of rainfall. Rainfall decreases towards the plains and the arid western areas.

Future projections indicate that annual precipitation in the Khabur River basin could decline by 7% during 2046–2064 and by 15% during 2080–2100. Other projections estimate respective reductions of 18% and 38%. The Diyala River basin is also expected to experience declining precipitation, with projected reductions of 17%, 26% and 40% under different future scenarios. The basins of the Great Zab, Little Zab and Al-Adhaim rivers are expected to experience similar reductions over the same future periods [3]. In one projected scenario, annual flow in the Euphrates River could decline by between 29% and 73% [33].

Current and projected climate change impacts will lead to the contraction of lake waters, the drying of wetlands and changes in regional natural habitats [42]. This will hinder ongoing efforts to restore the marshes in Iraq and may cause them to dry out. Given declining rainfall and the continued use of traditional, inefficient irrigation practices in Iraq, the marshes are expected to shrink to a small fraction of their normal extent or disappear entirely [41].

The study confirms that water levels declined substantially from 2022 through early 2024. Water remained only in the deeper channels and in a small number of very shallow inundated areas no more than 30 cm deep. Inundated areas covered less than 5% of the marshes' natural extent in both the Central Marshes and the Western Hammar Marsh. This decline negatively affected biodiversity and the ecosystem services provided by the marshes, on which Marsh communities in particular, and the wider region more generally, depend. Water reached the marshes towards the end of the first quarter of 2024 following delayed rainfall across the country. This partially inundated some areas, but water levels did not reach the required level. These waters are expected to recede again because of intense summer heat and evaporation, together with declining inflows from upstream countries (Figure 9).



Figure 9: A Village near the Central Marshes Affected by Drought

A 2009 report by the United Nations Development Programme described the effects of global warming on Iraq and highlighted the severe changes the country had experienced, including a substantial decline in rainfall across the Tigris and Euphrates river basins compared with natural levels. The report also indicated that these changes would increase the likelihood of major dust storms because of declining soil moisture and the loss of vegetation cover. Moreover, these impacts are expected to become more severe over time and to cause further deterioration in the physical and chemical properties of soils in both arable and non-arable areas of Iraq [43].

It is impossible to determine precisely what climate change will mean for the Tigris and Euphrates river basins. However, the region can expect higher temperatures, more frequent heatwaves and droughts, declining rainfall, and more intense storms. Saltwater intrusion affecting Iraq and Iran is also expected to increase as sea levels rise and freshwater flows in the rivers decline [20].

Although climate change will reduce the overall quantity of water available, it is also likely to exacerbate existing patterns of inequitable water distribution. The most recent projections for the upper basin indicate that surface-water availability could decline by 20% by 2030, 35% by 2050 and 50% by 2100 [17]. Among the projected impacts, more intense rainfall events are expected to increase soil erosion and reduce groundwater recharge [4]. The region may already be experiencing these effects through the heavy rainfall and flash floods recorded across the region, including in Iraq [23].

Impact of Water Scarcity on the Economic Life of the Marsh Arabs

Local communities depend primarily on water buffalo breeding and the use of buffalo products, reed harvesting, fishing and bird hunting. These activities provide food for household consumption and products that can be sold to generate income. In the Central Marshes, water buffalo breeders and reed harvesters accounted for 82% of respondents, fishers for 12%, and bird hunters for 6%. In the Western Hammar Marsh, water buffalo breeders and reed harvesters accounted for 79% of respondents, fishers for 16%, and bird hunters for 5%.

More broadly, fishing, water buffalo breeding and reed harvesting are important resources made possible by the marsh environment, which provides suitable habitats for local communities and supports their principal sources of livelihood [44]. Communities also depend to a considerable extent on bird hunting for subsistence, particularly the hunting of waterbirds, which represents an additional economic activity for Marsh residents [16, 22, 30, 36].

Water availability is fundamental to sustaining these livelihoods. The study found that 100% of respondents had been affected by water scarcity because their lives depend on the availability of water of sufficient quality to support water buffalo and other livestock, fish and bird habitats, and reed growth. Reeds also provide a raw material for numerous local industries.

Marsh communities began experiencing water scarcity more than eight years ago. Its severity varied over time and occurred in successive waves, reaching conditions of complete drought during many seasons across large parts of the Central Marshes and the Western Hammar Marsh. These conditions were also observed during the field survey. The marshes depend on fluctuations in the quantity of water flowing into them from the Tigris and Euphrates rivers.

Water levels in the Tigris and Euphrates rivers have fallen to less than half their natural levels and are currently among the lowest recorded. The discharge of wastewater and rising pollution levels have made access to clean water for human consumption increasingly difficult. This situation has been compounded by the general decline in health services, drought and reduced rainfall.

Water shortages have also degraded natural grazing areas and negatively affected livestock. This has increased the hardship experienced by water buffalo breeders because of the difficulty of obtaining animal feed and the limited contribution made by the relevant authorities to assisting affected communities [31].

Water scarcity has had a direct impact on the economic situation of local residents. The study indicates that monthly income derived from natural resources—including water buffalo breeding, reed harvesting, fishing, bird hunting and related activities—ranged from IQD 30,000 (approximately USD 20) to IQD 200,000 (approximately USD 133) in the Central Marshes. In the Western Hammar Marsh, monthly income ranged from IQD 40,000 (approximately USD 26) to IQD 100,000 (approximately USD 66). In practice, these amounts were insufficient to cover the monthly cost of buffalo feed and the veterinary treatment required by the animals.

Acute water shortages and recurrent droughts during previous years, particularly in 2022 and 2023, led to the loss of these resources. Affected residents were unable to find alternative work that could compensate for their losses, even at the lowest level, during the drought.

The study reports high levels of unemployment and employment insecurity. In the Central Marshes, 86% of respondents were wage earners or daily labourers without permanent jobs or stable occupations. The corresponding figure in the Western Hammar Marsh was 84%. Marsh communities experience high levels of deprivation and poverty [32], while most men are unable to secure stable employment because of the limited availability of income sources and work opportunities [21].

The substantial decline in water availability in the marshes during the 1990s reduced the extent of the wetlands and made many species, particularly migratory birds, more vulnerable to hunting pressure [24]. Hunting contributed to the disappearance of many wild species from large parts of their former range, including species classified as globally threatened that were present in the region. This led either to their local disappearance or to a continued decline in their numbers [36].

For these reasons, the marshes have experienced successive waves of displacement and migration. The field survey conducted for this study found that 70% of respondents in the Central Marshes had experienced internal migration, with some moving outside the marsh area to other Iraqi governorates, including Babil, Wasit and Karbala. In the Western Hammar Marsh, 60% of respondents had experienced migration within or outside their local area. All respondents identified water scarcity as the principal cause of migration. Those who had not migrated explained that water scarcity had caused the loss of the natural resources on which their livelihoods in the marshes depended. Nevertheless, some had been compelled to remain despite the harsh conditions because they lacked the means to move elsewhere.

Migration from rural areas to urban centres will continue because of the effects of declining natural resources, such as agricultural land, and falling agricultural production. This will create additional challenges for local authorities, including the need to provide residents with housing, health services, drinking water, a clean environment and other essential public services. These services are already inadequate because of several factors, including ineffective management and limited resources.

Competition among different users for irrigation water has also strained social relations and contributed to armed disputes among tribes in southern Iraq. In some cases, the security forces have had to intervene to calm the situation. These developments should be regarded as warning signs that conditions could deteriorate further if current trends continue at the projected rates [1].

The destruction of livelihoods may force communities to move to less suitable environments. Environmental degradation can also lead to further conflict over resources, which may in turn develop into displacement. Weather-related disasters can destroy homes, while drought, desertification and sea-level rise can progressively destroy natural environments [19, 39]. These impacts affect the social fabric of communities by contributing to hunger, poverty, disease, limited access to education and the fragmentation of communities [13].

The study also found that 100% of respondents in both the Central Marshes and the Western Hammar Marsh had lost financial resources because of water scarcity during the drought. No alternative source was available to compensate for these losses, leaving affected communities exposed to additional health and economic harm.

All respondents also reported that drought had affected their livestock, both in terms of animal numbers and the products obtained from them. The scale of buffalo losses varied among breeders. In the Central Marshes, buffalo numbers during 2022 and 2023 had fallen to 63% of their pre-drought level. In the Western Hammar Marsh, they had fallen to 52% of their pre-drought level.

The study confirms that water buffalo and other livestock in the study area were affected by drought associated with climate change. The loss of natural reed beds, which the marshes provide as green grazing areas for buffalo, created a major threat to the animals' survival. The availability and quality of water also affected their ability to survive. Water buffalo depend on water both for drinking and for cooling their bodies during the many hours they spend immersed in it. These conditions consequently reduced the production of milk and dairy products, which constitute one of the principal sources of income for water buffalo breeders (Figure 10).

Among respondents working specifically in reed harvesting, 98% in the Central Marshes reported that drought had affected their work, while 2% answered "to some extent". In the Western Hammar Marsh, 100% reported that their work had been affected.

Respondents attributed this impact to the scarcity of fresh reeds, which are used as feed for their water buffalo, sold to other livestock owners for animal feed, used in local craft industries, and used to construct traditional reed guesthouses known as mudhif. Before the drought, reed sales generated daily earnings of up to IQD 60,000 in the Central Marshes and up to IQD 50,000 in the Western Hammar Marsh. During the drought, however, respondents were forced to depend primarily on fodder purchased from local markets. Rising fodder prices reduced their earnings.



Figure 10: A buffalo barn belonging to a drought-impacted resident after losing a significant portion of their herd

Fishers reported that catches had fallen sharply to approximately 5% of pre-drought levels in the Central Marshes. Current catches were insufficient to feed their families and no longer generated a monthly income. Before the drought, a single fishing trip could generate earnings of up to IQD 200,000.

In the Western Hammar Marsh, fish catches had fallen to approximately 2% of pre-drought levels. The fish caught had no significant commercial value and were used primarily for household consumption. Before the drought, a single fishing trip could generate earnings of up to IQD 150,000.

The study also recorded the bird species hunted in the marshes before the drought. These included waterhens, the bird locally referred to as al-Burhan, coots, grey herons, purple herons, great cormorants, garganey or teal, glossy ibises, and several other species of teal and duck. Before the drought, these birds were found in both the Central Marshes and the Western Hammar Marsh and were hunted for food or sale. At present, however, bird hunting is no longer taking place because the wild bird species traditionally targeted by hunters have become scarce as a result of water scarcity in the marshes.

A 2023 report by the International Organization for Migration stated that the declining quantity and quality of water in the rivers and canals of Basra, Dhi Qar and Maysan had become an increasing source of concern and a major focus of research in recent years. The situation had become particularly serious for agriculture and livestock farming.

The report found that 8% of all livestock-rearing households had completely abandoned livestock rearing. Only 31% of households continued to engage in this activity, and 86% of those households had been forced to reduce the size of their herds during the previous five years.

Over the same period, 4% of all households had abandoned fishing or fish farming. Among the 5% of households still engaged in fishing or fish farming, 90% reported that their activities had declined during the previous five years.

Households engaged in agriculture attributed their abandonment of farming, livestock rearing and fishing primarily to the declining quantity and quality of water, particularly water scarcity and increasing salinity [13].

Climate change generally acts as a threat multiplier. It exacerbates existing social, political and economic vulnerabilities, undermines livelihoods, increases the risk of conflict and makes it more difficult for people to remain in their places of residence by affecting their overall socioeconomic conditions.

In Iraq, for example, natural resources are being affected by rapid climate change. These impacts include the increasing frequency and intensity of extreme weather events and other phenomena, such as sea-level rise. If these impacts are not managed or brought under control, they will place increasing pressure on natural resources and on the critical infrastructure that supports water and food security, transportation and energy systems, directly affecting quality of life.

Combined with other adverse factors, these climate-related threats highlight the risks facing social security and undermine the ability of governments to manage unstable situations. This could ultimately lead to what may be described as a failure of the state to address these impacts [45].

An examination of Iraq's socioeconomic development clearly shows that climate change is negatively affecting the country, with more serious adverse changes expected in the future. Agriculture has declined in recent years for several reasons, with climate change becoming one of the principal negative factors.

Agricultural production and the area of land under cultivation have both shown negative trends. These trends clearly point to increasing migration from rural areas to urban centres and a substantial decline in the supply of food and agricultural products. A study cited in reference [18] examined the effects of global warming on agriculture in several countries around the world, including Iraq.

The official designation of the marshes as "protected areas" is a positive step. However, most currently protected sites have yet to receive meaningful protection on the ground. Government initiatives to protect important sites are more likely to succeed when they are planned jointly with local communities. Local conservation initiatives can also play an important role in protecting biodiversity more broadly [12].

Role of Governmental and Non-Governmental Institutions in Raising Environmental Awareness among Marsh Communities, Assessing the Extent to Which They Have Been Affected by the Crisis, and Providing Assistance to Protect the Marshes and Their Natural Resources

The availability and sustainability of natural resources directly affect the economic and social conditions of Marsh communities, which depend on the ecosystem services provided by the marshes. These services can improve residents' living standards when natural resources are properly and effectively managed, while their mismanagement produces the opposite effect.

Responsibility for regulating resource use and achieving an appropriate balance lies with the ministry responsible for managing the marshes, other supporting ministries and governmental bodies, civil society organizations and, at times, international donor organizations working to protect the marshes. Local residents, tribal leaders and other influential figures within Marsh communities also play an essential role in these collaborative efforts.

Low levels of public awareness significantly affect the effective conservation of the environment and biodiversity and the sustainable use of natural resources. Numerous studies and reports have identified limited public awareness of biodiversity conservation and ecosystem services—which form the basis of all human activities—as one of the principal challenges facing these communities [35, 40].

Limited access to education among communities maintaining a traditional way of life can contribute significantly to the unsustainable use of natural resources. It can also hinder efforts to improve conditions in the marshes. These difficulties have been compounded by the effects of climate change, severe reductions in water inflows and rapid development, which has increased environmental pollution and negatively affected the activities practised by Marsh residents.

Harmful and indiscriminate hunting and harvesting practices affecting fish, birds, reeds and other resources are among the damaging daily practices documented within the marshes. These practices result from several factors, including limited public awareness and inadequate access to education.

The study identified low levels of educational attainment. In the Central Marshes, 39% of respondents were illiterate, 53% were able to read and write, 4% had completed primary education, 2% had completed intermediate education, and 2% were graduates. In the Western Hammar Marsh, 66% of respondents were illiterate, 30% were able to read and write, and 4% were graduates.

These findings, together with previous reports, indicate that Marsh communities need greater access to education because illiteracy remains widespread in villages, particularly in the Western Hammar Marsh. Primary-school dropout rates are also high. Many families are

reluctant to send their children to continue their education beyond primary school, and children often leave school at an early stage after learning only basic reading and writing skills.

The marital-status data showed that most respondents were married: 93% in the Central Marshes and 92% in the Western Hammar Marsh. Reproductive practices and their relationship with access to essential services influence whether families can provide an appropriate environment, within their available means, for raising children and preparing them to participate positively in their communities.

In the Central Marshes, households ranged from 2 to 10 members, with an average of 5 members and only one income earner in the overwhelming majority of households. In the Western Hammar Marsh, households ranged from 2 to 11 members, with an average of 6 members and only one income earner in most households.

Governmental bodies have not demonstrated clear commitment to identifying genuine solutions to the problems experienced by Marsh communities during periods of drought. The study found that no effective solutions had been provided to the local residents interviewed that could reduce the damage caused by water scarcity in either the Central Marshes or the Western Hammar Marsh.

In recent years, however, many water buffalo breeders and other families living in the Central Marshes and the Western Hammar Marsh have received a small monthly government allowance through the public social safety net because they were unemployed. This support may have helped them meet some of their most basic food needs. Nevertheless, it was provided after an assessment of their poor living conditions and was not intended to address the drought crisis or its effects on the marshes.

A 2023 report by the International Organization for Migration similarly stated that residents of the governorates included in the study—Basra, Dhi Qar and Maysan—received relatively small monthly allowances through government social safety-net programmes for unemployed people [26].

According to Marsh residents, the assistance provided during drought crises has not amounted to genuine or sustainable solutions. The Ministry of Migration and Displacement distributed one food basket to each family during the drought. The Ministry of Water Resources also supplied drinking water for livestock to some water buffalo breeders in the Western Hammar Marsh for a limited period, although most breeders did not receive this service.

During 2022 and 2023, the Food and Agriculture Organization of the United Nations (FAO), in coordination with the Ministry of Agriculture, distributed animal feed to some water buffalo breeders. The Iraqi Council of Ministers subsequently allocated funding to Dhi Qar Governorate for a programme to purchase and distribute animal feed to buffalo breeders free of charge. Buffalo breeders stated that this initiative would help them considerably, despite the limited quantities of feed expected and the late timing of the assistance.

When these interventions are compared with the scale of the support required to preserve the remaining natural resources and sustain local communities, it is clear that drought has had severe consequences. All respondents expressed profound dissatisfaction over the loss of their livelihoods and the migration of many residents to other areas in search of alternative sources of income. Large numbers of water buffalo died, while biodiversity—including fish, wild birds and green grazing areas—declined or disappeared, severely damaging life within the marshes.

The drying of the marshes means the loss of natural ecosystems and the ecosystem services they provide to Marsh communities and to the climate at both the national and regional levels. During such crises, a clear and practical plan must be implemented to reduce the harm caused by climate change to local communities and natural resources, including the biodiversity that must be protected, at least until the crisis can be overcome with the fewest possible losses.

The study also assessed the willingness of Marsh residents to contribute to protecting the natural environment and resources of the marshes. In the Central Marshes, 90% expressed willingness to participate. Five per cent refused to cooperate because of the successive losses they had experienced over several years and their limited trust in governmental bodies, which, according to respondents, had failed to provide assistance and had instead contributed to their losses and the denial of their rights. The remaining 5% answered “to some extent”.

In the Western Hammar Marsh, 95% expressed willingness to contribute to protecting national natural resources, while 3% refused and 2% answered “to some extent”.

Respondents’ recommendations for protecting natural assets and natural resources and for mitigating future crises were also recorded. They included maintaining adequate water levels in the marshes; providing employment opportunities for unemployed residents; supporting dairy products by purchasing them from local producers or marketing them at subsidized prices; prohibiting fishing during the breeding season; prohibiting the use of poison and electricity for fishing; and organizing educational sessions to raise awareness among residents. Respondents believed that these measures would significantly strengthen environmental sustainability and improve the natural and cultural ecosystem services provided by the marshes.

In addition, environmental laws and regulations intended to protect the natural resources of the marshes have not been adequately implemented. These include the Law on the Protection and Improvement of the Environment and the Law on the Protection of Wild Animals [27, 28], as well as the regulations governing fishing in the marshes [29]. These regulations specify the species and quantities that may be caught and the periods during which fishing is permitted. Their effective implementation would make a substantial contribution to protecting the environment and biodiversity of the marshes [37].

Recommendations

Based on the findings of this report, we present a series of recommendations for protecting the natural resources of the Central Marshes and the Western Hammar Marsh. Their implementation is intended to ensure the long-term sustainability of these resources so that they can continue to be enjoyed by future generations of Iraqis. This will require urgent action and the development of sustainable plans.

The following recommendations focus on raising awareness within Marsh communities, particularly among water buffalo breeders and fishers; identifying solutions to the recurring crises affecting the marshes; improving the implementation of existing regulations; and continuously seeking to improve economic opportunities for Marsh communities.

- Strengthen the capacity and awareness of decision-makers and local communities concerning the management of the national parks in the Central Marshes and the Western Hammar Marsh through targeted training courses and local educational initiatives.
- Establish a dedicated drought crisis team responsible for identifying rapid solutions to emerging problems. The team should include decision-makers from the ministries responsible for the marshes – including the ministries of Environment, Agriculture and Water Resources – as well as other supporting ministries, the governorate, representatives of local communities and experts in the field.
- Develop plans for managing the marshes and proceed with the implementation of management plans for the national protected areas in the Central Marshes and the Western Hammar Marsh. These plans should contribute to environmental sustainability and strengthen the relationship between local communities and the marsh environment.
- Fulfil the obligations required to protect the Central Marshes and the Western Hammar Marsh as part of a UNESCO World Heritage Site and preserve their natural and cultural heritage landscapes.
- Support water buffalo breeders, fishers and bird hunters who depend on the marshes as a principal source of livelihood and whose continued presence in the marshes depends on these activities. Support should include providing water and animal feed and assisting with the promotion and marketing of their products.
- Establish “local protection initiatives” to prevent illegal and excessive fishing and bird hunting, including practices involving poison and nets.
- Raise awareness among local residents about the sustainable use of ecosystem services, including, at a minimum, protecting water from pollution and ensuring sustainable practices in livestock rearing, reed harvesting, fishing and bird hunting.

- Strengthen the capacity of non-governmental organizations, local associations and media institutions to raise public awareness of the importance of ecosystem services, biodiversity conservation and environmental sustainability.
- Increase economic opportunities within Marsh communities by establishing and supporting environmentally sustainable projects—such as ecotourism and nature-based tourism, training local guides and marketing local products—that create alternative employment opportunities and reduce pressure on the natural resources of the marshes.
- Improve the implementation of laws governing wildlife and hunting and strengthen the protection of native species through training, adequate funding and the empowerment of the environmental police.
- Provide funding and support for additional studies and pilot projects assessing the use of different natural resources within the Central Marshes and the Western Hammar Marsh. These wetlands are surrounded by numerous villages and residential areas whose inhabitants carry out a range of daily activities within them.

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