JUSTICE SOLUTIONS FOR CLIMATE RESILIENCE IN IRAQ

CLIMATE-INDUCED DISPLACEMENT EFFECTS IN BASRA AND JUSTICE SOLUTIONS FOR COMMUNITY RESILIENCE

PAO

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ACKNOWLEDGEMENTS

This study was designed by Cordaid and conducted by

Public Aid Organisation (PAO)
Prof. Dr. Nader Abed Salman, University of Basra

www.cordaid.org
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EXECUTIVE SUMMARY

This study was carried out in conjunction with Cordaid, through its "Justice Solutions for Climate Resilience in Iraq" project carried out from August to September 2021 and Public Aid Organization (PAO). The research carried out in Basra seeks to explore the damaging effects of climate change through the years within the Basra governorate of southern Iraq and the repercussions these effects have had on the local communities, particularly the rural population traditionally reliant on farming, raising livestock, and fishing as their means of livelihoods, that have been forced to relocate to urban areas and adjust to a different lifestyle. Exploration into this phenomenon was carried out at a neighborhood or street-level to understand the physical, social, and institutional aspects involved as well as the socio-economic factors (that is, the environment in which people live) and clashes which have arisen due to climate-induced relocation. Understanding of the communities involved and relationships between rural and urban populations contribute to broader policy development and proposed interventions on supporting those most severely affected by climate change.

Climate change defined is any significant and long-term change in the weather in a particular region, including changing temperature rates, rainfall, droughts, storms or floods, epidemics, and other factors. According to the report of the United Nations Development Programme (UNDP) in 2020, the world is moving towards a temperature rise of at least 3°C this century. To meet the goals of the Paris Agreement of keeping global warming this century below 2 degrees Celsius and to strive for the 1.5 degrees' Celsius target. This would limit the effects of climate change on vulnerable communities and ecosystems. The State of the Environment report in Iraq (2017) refers to indicators of climate change, high temperatures, low rainfall, increased dust intensity, gas emissions and a decrease in green areas. It threatens food security due to declining water resources (Al-Ansari et al. 2014), reduced agricultural production, deterioration of vegetation cover and loss of biodiversity, as well as socio-economic and health effects, spread of diseases and the exacerbation of epidemics.

According to a study carried out by the United Nations Environment Programme (UNEP) in 2020, Iraq was declared the fifth most vulnerable nation on earth because of the long-term effects of climate change. This is due to water shortages, which have caused hundreds of kilometers of agricultural land to dry up, reflecting the deterioration of agricultural production and food production, as well as extreme temperatures, where summer temperatures often exceed 51°C. The average temperature in Iraq has increased by about 2.3°C since the end of the nineteenth century, twice as high as that in the world (Berkeley Earth Foundation, 2021).

Original data for this study was initially collected by surveying 400 inhabitants of Basra, the second-largest city in Iraq and capital of Al-Basra governorate, as well as the principal port of the country. Additional data was collected through Focus Group Discussions (FGDs) across different sectors as well as Key Informant Interviews (KIIs) with officials of government ministries and private sector industrial companies. Farmers and other inhabitants from rural areas, once abundant in fertile agricultural land for farming and raising livestock, have been forced to migrate to urban areas, mainly Basra city. This forced migration (referred to as climate-induced displacement) has resulted in these migrants living within informal settlements in extreme poverty from the city center to the outskirts of the city. These settlements are often dangerous, and its residents survive in inhumane living conditions. This compounds their vulnerability and precarity. Additionally, there are often conflicts arising between urban and rural populations, causing even more problems for both the rural settlers and urban inhabitants, as they struggle daily and compete to find sustainable employment to care for their families and worry about an uncertain future for their children.

Basra governorate, in particular, suffers from a range of climate phenomena associated with global warming and other climate events due to causes of air pollution, triggering serious damage to food and water security. These effects have created pressure on both social and economic development. Among the most prominent of these effects are extreme heat waves, drought, the scarcity of fresh materials and the deterioration of their quality, as well as the deterioration of air quality due to industrial and oil pollution, an increase in dust due to desertification, and the health damages they cause. These climatic occurrences have been accompanied by a clear deterioration in agricultural, animal, and fish resources. This has led to severe social impacts of the population's most vulnerable persons, namely, on the poor, the elderly, children, climate migrants, and people with chronic diseases.

The research in this study is important as it invested the experiences of Iraqi academics and jurists in determining the causes of internal conflicts and ways to solve these obstacles through access to justice solutions. it is also the first of its kind in the governorate to assess cognitive and behavioral awareness among different groups of the Basra community about the dangers of climate change, with hopes to modify trends in human behavior towards environmental norms and adaptation to mitigate risks. The current research is designed to find solutions to help the population adapt to the effects of climate change and reduce the risks of community conflict and rural-to-city migration.

1.INTRODUCTION

Climate Change in Southern Iraq – The Perfect Storm
With extreme temperatures, scarcity of fresh water, years of war and conflict, pollution, increased soil and water salinity, and forced migration, Basra governorate is the most severely affected area by climate change in all of Iraq. There have also been cases in the city of climate change-related diseases, such as warm air effects and diseases associated with air and water pollution.

This study touched on ways to adapt to this phenomenon and presents ways to mitigate it by submitting proposals concerning the energy sector and the transition to clean energy and rationalization of its use, the housing and transportation sectors, the agricultural aspect and vegetation, how to combat desertification across Basra and ways to conserve water resources and rationalize consumption, in addition to improving the economic and social aspects of housing within governorate.

“In southern Iraq, you have an environment that has been damaged by years of conflict, poor environmental management and weak governance. When you add climate change into the mix, you have the perfect storm,” stated Igor Malgrati, Regional Water and Habitat Advisor for the International Committee of the Red Cross (ICRC) in a report published July 19, 2021.
Iraq is facing an immense crisis due to a decline in water which has caused increased drought, in addition to a series of economic, political and health crises that are directly affecting its citizens, specifically farmers, and agricultural areas.

As a result of lower water levels coming into Iraq from Turkey and Iran, as well as the decline in rainfall for the past three years, the Iraqi Ministry of Agriculture recently announced a 50 percent reduction in its agricultural plan in the upcoming three years.

It is notable that 90 percent of water sources of rivers that flow in Iraq come from outside the country.

The average annual temperature in Basra is expected to rise by 2 °C (3.6 °F) by the year 2050. However, the internationally recognized Paris Agreement, a treaty that aims to keep the global increase in temperature “well below” 2 °C above pre-industrial levels, strengthen the ability of all countries to adapt to climate change and build resilience, overall aligning financial flows with “a pathway towards low greenhouse gas emissions and climate-resilient development.”

During the past year, countries sharing the Shatt al Arab water sources with Iraq, mainly Turkey and Iran, did not observe water-sharing quota in the region. From the north, Turkey built dams on the Euphrates River, which greatly reduced the water levels throughout Iraq.

Saroj Kumar Gah, Regional Director of the Mashreq Department at the World Bank, said in a report by Al Jazeera on climate change and water reduction in Iraq, that investing in climate-smart water management provides a good opportunity to stimulate inclusive and green economic growth and development across the country.

Gah also noted that without concrete action, the constraints in the water sector will cause significant losses across multiple sectors of the economy, affecting the most vulnerable Iraqis. The water crisis contributes to a large encroachment from the countryside towards the cities for much of the rural population.

Dr. Mahdi al-Qaisi, Adviser to the Iraqi Ministry of Agriculture, noted two main causes of desertification in the country, the first of which is general climate change which is occurring throughout the world. The second reason is due to the excessive use of Iraqi soil in terms of agriculture.

Iraqi marine engineer, Ali Kazim, added that the total water consumption rate in Iraq is at about 53 billion cubic meters annually, while the amount of river water in normal seasons is estimated to be around 77 billion cubic meters annually, and in dry seasons about 44 billion cubic meters.

Kazem stated that "the shortage of 7 billion cubic meters annually from Iraq's water share coming from Iran means the exit of 300,000 dunams (or 300 square kilometers) of agricultural production."

Kazem also warned of the decrease in the Iraqi per capita share of freshwater to an unprecedented extent, estimated at nearly 865 cubic meters annually. Warnings from other specialists in the agricultural sector are continually increasing regarding the dangers of a mass exodus of residents from rural areas towards the capital.

Agricultural expert, Dr Alla Badran, explained that the decline in the relative importance of agriculture in the gross domestic product through the lack of irrigation water and government support reduces the geographical scope of agricultural land in Iraq.

If rural migration to cities does occur, it will negatively affect the public services and infrastructure available to urban residents as well as generate transportation and housing crises, overcrowding of streets and other public spaces, increased demand for services such as electricity, communications and healthcare, and an overall increase in consumer demand.

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The 2020 UNDP Adaptation Fund Report had concluded the need in Iraq for rapid planning and implementation to bring adaptation projects to the phase where they supply real protection against the impacts of climate change. The report also called for increased nature-based solutions and appropriate local actions to address the societal challenges of climate change. However, in the midst of a global pandemic, it was almost impossible for adaptation projects to be safely carried out beginning in the second quarter of 2020

The yearly Climate Summit, known as COP or "Conference of Parties" has been bringing nations across the globe together since 1995 to adopt and improve climate action. At COP21 in 2015, 196 parties, including Iraq, adopted, or signed, the Paris Agreement. By COP26 held throughout October and November of 2021, 194 states and the EU signed the agreement. Iraq later ratified the agreement on November 1, 2021, and officially entered into the force on December 1, 2021.

The UN in Iraq welcomed commitments made at the COP26 but stressed the urgency to act on their promises to limit the adverse impacts of climate change on human rights and sustainable development in the country.

"Across the UN system in Iraq, we are working on the key components of climate action – from awareness-raising and adapting to climate change, to mitigating its risks. With COP26 now done and dusted, we urge world leaders to make good on their promises, many which are critical to supporting a cleaner, safer, and greener Iraq," stated Irena Vojáčková-Sollorano, UN Secretary General's Special Representative for Iraq and Resident Coordinator.

Although the Climate Pact cites several areas of cooperation relevant to Iraq, perhaps the most important action was Iraq's formal submission of its Nationally Determined Contribution (NDC) – the county's general policy for addressing climate action. Iraq announced that $356 million USD would be designated to the Adaptation Fund, "which will increase the resilience of vulnerable communities on the frontline of climate change. This stronger commitment paves the way for greater resources to avert, minimize and address loss and damage in Iraq."

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- Irena Vojáčková-Sollorano, UN Secretary General's Special Representative for Iraq and Resident Coordinator

2.METHODOLOGY

With the need to further understand the effects of climate change in Iraq and establish actions to help the population understand and contribute to improving climate action, Public Aid Organization (PAO) with support from Cordaid, carried out a study in Basra on "Justice Solutions for Climate Resilience in Iraq" from August to September 2021.

The study used research methodology through a three-pronged approach. The first approach presented a field questionnaire that investigated the opinions of a sample of 400 citizens in the governorate who represented multiple social groups, ages, professions, and different residential areas. Secondly, research included holding dialogue sessions with advisory groups and Focus Group Discussions (FGDs) which included community leaders, academics, judges, municipal councils, industrial companies, and non-governmental organizations. The third source of research included environmental data on climate change from representatives of governmental environmental and health ministries as well as industrial directorates within Basra.

MAIN GOALS OF STUDY

The research aims to:

1. Measure the level of awareness and knowledge of the study sample about climate change using different variables as a means of developing communication, environmental awareness programs, and setting priorities to reduce risks.

2. Determine the natural causes of climate change as opposed to the effects of human activity, including industrial activities important to Basra.

3. Determine the problems of societal conflicts resulting from climate change.

4. Identify the social groups most affected by climate change.

5. Develop fair solutions for the residents of Basra and their activities, including economic and social impacts, as well as increasing their adaptive capacity to mitigate the long-term effects climate change.

2.1: Citizen Surveys

To achieve the objectives of the study, a questionnaire was designed and used as a research tool to understand the most important effects of climate change in Basra. The questionnaire was comprised of 25 questions to measure cognitive and behavioral understanding as well as identify the social groups most affected in the research sample. The questionnaire represented several aspects of the participants, including their biographical data such as age, gender, educational level, occupation, and area of residence. Participants of the citizen surveys included youth (those aged from 15-29), elderly, women, students, university professors (particularly specialists in agriculture and the environment), teachers, judges and judicial staff, media and journalists, government staff (from environmental, agricultural, water resources, oil, and health departments), employees of oil, industrial and other private sector companies, as well as residents of Basra city's neighborhoods, informal settlements, and the rural population on the outskirts of Basra.

2.2: Dialogue / Focus Group Discussions (FGDs)

Over a one-month period, from October 17, 2021, to November 14, 2021, Dialogue and Focus Group Discussions (FGDs) took place. These discussions involved participants from diverse sectors and were divided into four different groups. The first FGD included judges, lawyers, and other court employees. The second FGD included academics, educators, and civil society organizations. The third FGD included governorate departments and municipal councils. The fourth and final FGD included employees of oil companies and other private sector industrial companies with an interest in global warming and climate action.

2.3: Key Informant Interviews (KIIs)

A group of state departments concerned with environmental changes and their societal impacts were identified for the research team to acquire more specialized data. A set of specialized questions were provided to obtain available data and enhance the results of the research. The entities which were interviewed included:

1. The Iraq Ministry of Environment (MoEN)

2. The Iraq Ministry of Health (MoH)

3. Oil Companies/Installations

4. The Iraq Ministry of Water Resources (MoWR)

5. The Ministry of Migration and Displaced (MoMD)

6. Basra Municipal Department


DUHOK
NINEVEH
ERBIL
KIRKUK
SULAIMANIYAH
SALAHADDIN
DIYALA
ANBAR
BAGHDAD
WASIT
KARBALA
BABIL
QADISIYAH
MISAN
NAJAF
THIQAR
BASRAH
MUTHANNA

3. CONTEXT

3.1 : A Look at Basra – Geography

Basra city is the capital of Basra governorate, located in southeastern Iraq and situated on the western bank of the Shatt al Arab waterway. Basra is also the main port area leading to the Persian Gulf and has a population of nearly 1.4 million people. It is one of the hottest areas of Iraq, with summer temperatures often surpassing 50 °C. As of 2017, Basra was also recognized by the Iraqi Parliament to be the country's economic capital. However, while Basra governorate holds 70% of the nation's oil reserves, some 50% of the population live in extreme poverty. This is due to years of conflict and desertification of agricultural land, which once provided an abundance of jobs.

3.2: The Shatt al Arab Waterway – Basra's Main Water Source

The Shatt al Arab is a waterway located in the town of al-Qumah in the Basra governorate of southern Iraq, approximately 200 kilometers in length and formed by the confluence of the Tigris and Euphrates rivers. These rivers are the most important water sources of riparian countries including and originating in Turkey and flowing through Syria, and Iraq. The Shatt al Arab ends at the border of Iran and Iraq and discharges into the Persian Gulf. However, nearly half of the water from these sources is being used in Iraq.

The Shatt al Arab region once held the largest date palm forest in the world, with upwards of 30 million trees, an estimated one-fifth of the world's date palm population prior to the Iran-Iraq war in the 1980s. However, due to decades of conflicts, geopolitical disputes, increased saline, higher temperatures, and water mismanagement, this number has dropped to below half of that today.

3.3 Iraq's Battleground

Basra has been the battleground of various wars and conflicts for over four decades, whether fought internally, with neighboring countries or those waged by external forces on Iraqi land. From the Iran-Iraq war in the 1980s, the fall of Saddam Hussein and the Ba'athist regime in the early 2000s, through the rise of ISIS in 2014, along with other conflicts in between, the citizens of Basra have suffered immensely. The overthrow of the Ba'athist regime in 2003 possibly caused the greatest change in Basra's demographics according to a report published by LSE in May 2020. Numerous armed forces or militias emerged across the governorate, causing family and tribal disputes, and contributed to a vivid change in the region's economy and environment.

"Today, the southernmost province of Iraq is one of the most visible failures of the successive post-invasion Iraqi governments," the report stated. "The city's infrastructure is broken, with its society experiencing severe crises of unemployment, diseases, lack of services, high illiteracy and drug proliferation. Militarism controls the city, which has become a human reservoir of armed factions."

With the number of armed militias on the rise, thus began the migration of rural residents to Basra city, which was further exacerbated by the rise of ISIS in 2014 [see section 3.7].

3.4: Iran-Iraq War and Downfall of Basra's Ecosystem

Throughout the Iran-Iraq war from 1980-1988, more than half of these iconic palm trees were cut down and used for military purposes, greatly affecting the region's ecosystem as well as reducing job and food security for the local population. These date palms not only produced an abundance of fruit, but they also provided shade to crops, the leaves were used to make furniture such as chairs and beds in addition to providing jobs to the local communities. With the decrease in palms, people were forced to give up decades of traditions as well as their ancestor's land and move on to surrounding cities in search of work.Not only did the destruction of palms contribute to an already fragile environment, but the Iraqi marshlands, once called "The Garden of Eden" provided a unique ecosystem at the junction of the Tigris and Euphrates rivers, where some 60% of fish consumed in Iraq came from.

3.5: Destruction of Basra's Marshlands

In the 1990s, oil reserves were discovered in and near the marshlands. With the discovery of oil, then Iraqi President Saddam Hussein executed five major drainage projects preventing water to flow from the Tigris and Euphrates. By 2000, this resulted in roughly 10% of the marshes remaining in the area which once covered nearly 20,000 square kilometers. This would allow troops to enter the area to guard the Iraq-Iran border and carry out military interventions.

Due to these actions, the predominantly Shiite community, otherwise known as the "Marsh Arabs" had participated in reprisals against the Ba'athist regime in 1991 to protect their ancestral homeland. These reprisals led to Saddam's army launching brutal attacks in the region to eradicate the marsh dwellers. The army attacked the area using mortar and ground attacks as well as artillery against some 250,000 inhabitants. The military bombarded villages, setting fires to houses and laid water and land mines.

These military actions not only took a heavy toll on human life, but the ecologically catastrophic drainage of the marshlands also led to the extinction of various plant and animal life as well as mass contamination of the area with army munitions and poisonous gases.

3.6: Basra and the Fall of the Ba'athist Regime

With the onslaught of the Iraq War beginning in March 2003, US Coalition forces attacked Baghdad, initially through use of air power. However, the British, Australian, and Polish militaries entered southern Iraq through Kuwait with the objective of taking control of oil-rich Basra. After a two-week battle, the British were able to capture Basra city and the surrounding area, holding a presence there for over seven years. Geopolitical conflicts with neighboring Iran, in addition to civil wars taking place across Iraq further destroyed Basra's environment and frail ecosystem. Following the capture of Saddam Hussein in December of that year, and the demise of the Ba'athist regime, US and Coalition troops finally pulled out of Iraq in 2011, leaving behind destroyed infrastructure, power grids, and left rivers and waterways filled with military-related contaminants and other pollutants.

3.7: The Rise of ISIS

The rise of ISIS across Iraq in 2014 led to an increase of militias as well as additional displacement and migration as rural migrants were either forced from their homes or chose to flee the conflicts. The LSE report further stated that "Basra became an important center for the making and training of the armed factions, as most of the leaders of the Hashd al-Sha'abi, or the 'Popular Mobilization Forces' are originally from Basra."

The US Coalition then returned to support the Iraqi government. This support was carried out through large-scale military interventions to eliminate the terror group, and again caused mass displacement of farmers and other rural inhabitants which continued over the next three years. When ISIS was announced militarily defeated in 2017, many of these rural inhabitants attempted to return to their areas of origins, only to find their homes and land in ruins, not only from combat, but from environmental destruction as well.

3.8: Environmental Destruction and Protests in Basra

Due to rising temperatures, a lack of rainfall, disputes over the Tigris and Euphrates water sources from neighboring countries, scarcity of clean water, and an increased amount of saline in the soil and water, droughts caused this once fertile land to become unusable, leaving the communities with no other choice but to emigrate to urban areas in search for work to sustain their livelihoods.

On July 15, 2018, mass protests erupted across Basra due to deteriorating economic conditions. Protestors took to the streets, torching the Iranian Consulate, government buildings, and offices of political parties and militias close to Iran. One of the buildings attacked included the base of Iraq's ruling Dawa party, controlled by then Prime Minister Haider al Abadi. Iraq's hottest region had been suffering from crippling power shortages for months, where temperatures often reach or surpass 50 °C (122 °F) in summertime.

Not long after the July protests began, thousands of Basra's residents were faced with further despair by the end of August due to extreme water pollution. Fresh water sources from the Tigris and Euphrates River basins were dwindling, and salt water from the Persian Gulf was making its way up through the area's water canals. Even bottled water was limited, and if it was available, many of Basra's residents couldn't afford it.

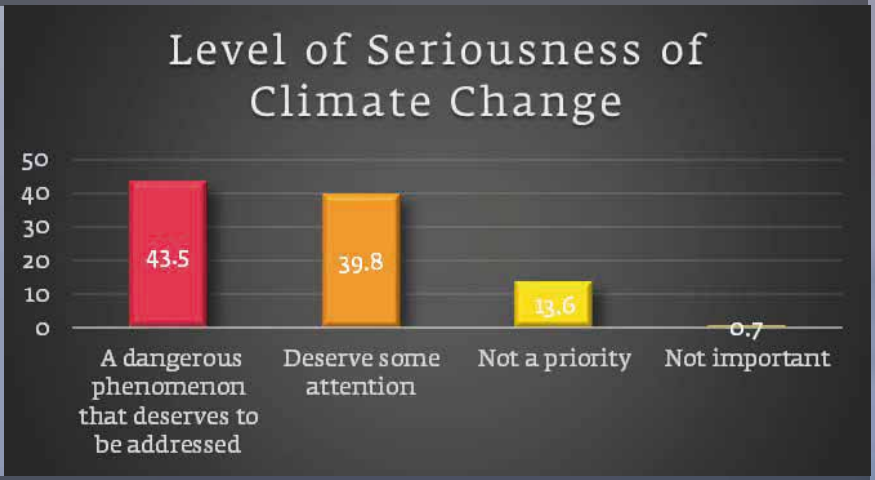
3.9: Basra Health Crisis of 2018

In a statement published on August 28, 2018, the High Commission for Human Rights said it "has found high levels of salinity in the water feeding the Shatt al-Arab, a decline in water levels in the rivers feeding residential areas and an increase in chemical and biological contaminants in the Shatt al-Arab from sewage and industrial waste." The Commission also added that "Residents are drinking water from tank cars, most of which transport sewage waste."

By November of 2018, there had been at least 118,000 people hospitalized due to ailments related to drinking contaminated water such as cholera, diarrhea, stomach and gastrointestinal pain, and skin conditions based on a report by Human Rights Watch in July 2019. This was one direct result of underground water drainage and transport systems being neglected and lacking maintenance for over 30 years, allowing pollutants seep in and mix with freshwater. Additionally, water flowing in the canals of the Shatt al Arab waterway decreased, which resulted in an elevated level of sewage, industrial and agricultural pollution and increased salinity making its way into the fresh water supply.

"One significant gap in Iraq's regulatory regime is the total absence of a public health advisory or directive system that would allow authorities to inform residents when a community's drinking water is, or could be, contaminated, what steps should be taken to mitigate harm, and what protocols are in place for government officials to respond to advisories and to lift them. No such system has been implemented since the 2018 crisis," the report read.

According to statistics released by the Basra Health Governorate in early September 2021, chemical contamination of water stood at 100 percent while bacterial pollution stood at 50 percent.



4. FINDINGS

4.1.1: Basra Today

Political divide, poor government management, years and conflicts, and the mass influx of climate migrants have greatly contributed to the overall instability of urban areas in southern Iraq. Basra and other cities are not physically or economically equipped to handle increased populations from rural communities. Urban populations also lack the ability and willingness to host climate migrants and there is disdain from the urban community over land/property disputes and competition to find work. In addition to the toll taken on the region's natural environment and resources over the years, the spread of the Covid-19 pandemic in early 2020 further strained the overall urban-rural dynamics in already volatile settings.

Although the 15 oil fields throughout Basra governorate are highly efficient, producing 80 percent of the country's oil exports, only 5 percent of the funds are put back into Basra's society. Even though Basra is Iraq's only gateway to the Gulf through its ports and is the location of several international companies, there is still a high rate of unemployment, in addition to lack of services, diseases related to industrial pollutants, and high illiteracy rates. The southern city suffers from chronic blackouts and poor sanitation. It is also ravaged by violence between tribes in the area.

4.1.2: Research Method 1 – Citizen Surveys

The results of the survey indicate that the issue of climate variability is of great interest to the majority of the Basra community (59%). The majority consider climate change to be dangerous and deserves attention and treatment. Most of the participants stated that they felt clear effects of climate change in Basra. The extreme increase in temperature was an important phenomenon that was felt by one-third of participants in Basra (33%). Next in tangible importance is the problem of water scarcity and high salinity (33%). Following this is the problem of declining rainfall and increasing droughts. As for the loss of vegetation and biodiversity and the spread of diseases, they occupied the last ranks among the changes that the residents of Basra felt.

The solution for rural inhabitants and marsh dwellers was to move to Basra city in search for work, which was agreed upon by 55% of participant. The questionnaire made clear the annoyance of the residents of Basra from the effects left by climate change. They considered the effects to be very harmful and negative and might further push migration and displacement.

The following tables indicate the respondents who participated in the survey:

Age Group	Number	Percentage (%)
15-29	234	57.8
30-44	94	23.2
45-60	56	13.8
Over 60	14	3.5
Total	398	98.8

(Table 1) Citizens Surveyed

Educational Level	Number	Percentage (%)
No Primary	91	22.5
Primary & Secondary	171	42.2
Diploma / Undergraduate Degree	122	30.1
Postgraduate Studies	5	1.2
Total	389	96.0

(Table 2) Educational Level

Gender	Number	Percentage (%)
Male	307	75.8
Female	85	21.0
Total	392	96.8

(Table 3) Gender

Occupation	Number	Percentage (%)
Student	89	22.0
Teacher/Professor	25	6.2
Government Employee	60	14.8
Military	6	1.5
Daily Worker or Private Sector	101	24.9
Media	5	1.2
Unemployed	105	25.9
Total	391	96.5

(Table 4) Occupation

Area of Residence	Number	Percentage (%)
Basra City Center	141	34.8
Neighborhoods around City Center	170	42.0
Slums	68	16.8
Suburbs around Basra	2	0.5
Total	381	94.1

(Table 5) Area of Residence

4.1.3: Summary of Survey Results: (Percentages indicative of respondent's answers)

The results of the questionnaire on ways to adapt to climate change indicate the need to rationalize water use and shift to grow less water-consuming agricultural crops. The questionnaire gave these actions a clear priority compared to means of preserving biodiversity and increasing health care to combat diseases arising from climate change.

One of the priorities for collectively addressing the effects of climate change outlined in the questionnaire is to change people's consumption habits, use environmentally friendly techniques, and then develop strict government legislation and regulations that limit gas emissions that cause climate change. The questionnaire also stressed the need to reach agreements with neighboring countries to distribute water shares.

Addressing climate change at the individual level, which includes taking responsibility and playing a role in addressing it, many have expressed a willingness to contribute, but some do not know how to contribute and need someone to lead. As for ways to individually address climate change, the possibility of paying more for environmentally friendly products and services and the possibility of joining environmentally friendly NGOs has received a high percentage. The reason why some respondents chose (do-nothing) was their belief in shortening government regulations and legislation to solve the problem and the fact that environmentally friendly products were often expensive, and some felt that their contribution would not have influence.

As for measures to mitigate the effects of climate change in Basra, the focus has been on improving energy efficiency, using renewable energy and environmentally friendly products, reusing water, as well as using environmentally friendly means of transportation and working to increase vegetation cover.

The research assumed that one of the effects of climate change in Basra is the state of displacement and forced migration from rural areas to the city center and its suburbs. The climatic changes that swept Basra, especially the abnormal rise in temperatures (33%), the scarcity of water sources (33%) and the deterioration of air and water quality, all these changes pushed the inhabitants of agricultural areas and the marshes to emigrate due to the deterioration of the means of living based on agricultural production, animal husbandry and fishing. All these activities were negatively affected by climate change. The solution for participants was to move to areas where job opportunities are available, such as the city center of Basra and its suburbs. This assumption was supported by the respondents in the questionnaire by 55%. This wave of displacement has led to the spread of informal housing in Basra, the deterioration of services (67%) and the exacerbation of social conflict (37%) as a result of competition for job opportunities and services as indicated by 77% of the participants in the questionnaire.

A majority of respondents believed climate change has a major role in forced migration from rural areas to Basra:

Answer	Number	Percentage
Yes	220	55.0
No	179	44.8
Total	400	100.0

Reasons given for forced migration

Reason	Frequency	Percentage %
Sharp rise in temperatures and lack of electrical cooling	86	33.3
Water scarcity that led to the deterioration of agriculture	84	32.6
High levels of salinity in soil and water.	44	17.1
Extreme poverty	39	15.1
Any other reasons	5	1.9
Total	258	100.0

4.1.4: Additional Conclusions of Survey from Respondent:

1. Climate change is caused by human activity that destroys the environment.

2. Climate change has caused displacement and forced migration of some population groups in Basra and has contributed to the deterioration of agricultural activity in the province.

3. There is an increasing awareness among the residents of the governorate of the threat and risks of climate change on the health and safety of their families.

4. The existence of climate change in Basra could cause economic risks to Iraqi families.

5. Extreme temperatures were the most prominent effects of climate change in the governorate, followed by water scarcity, increased salinity, decreasing rainfall rates, increased desertification, loss of vegetation cover, and the spread of diseases.

6. The reasons for indifference to climate change are due to the shortcomings of government procedures and the media lacking to raise awareness of Iraq's citizens.

7. The economic losses arising from climate change are due to the deterioration of agriculture and animal husbandry activities.

4.1.5: Adaptation and Mitigation Approaches to Climate Change:

The Society

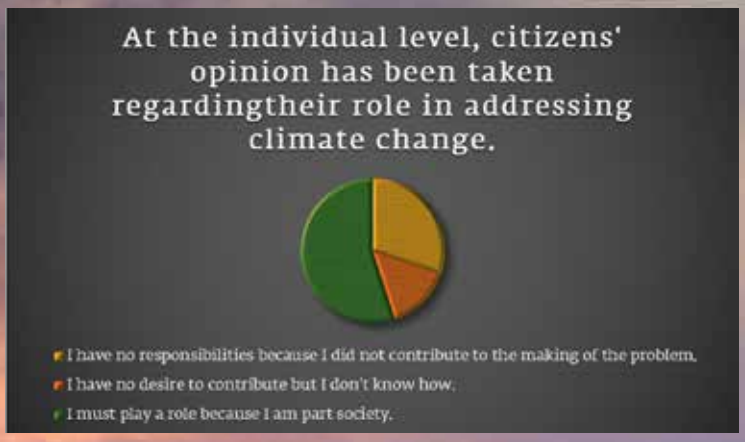
The results of the questionnaire on the means of adaptation to climate change indicate the need to rationalize the use of water and shift to the cultivation of agricultural crops that consume less water. One of the priorities of collective response to the effects of climate change, which was clarified by the survey, is to change people's consumption habits, use environmentally friendly technologies, and then put in place strict government legislation and regulations that limit greenhouse gas emissions. Respondents also stressed the need to reach agreements with neighboring countries to distribute water quotas.

Individuals

As for addressing climate change at the individual level, which includes taking responsibility and playing a role in addressing it, many have expressed the desire to contribute, but some of them do not know how to, and need someone to teach them or guide them. It was suggested that CSOs take the lead in raising awareness on climate action and individual involvement. There were individual interests to join environmental NGOs. Bringing awareness to climate action motivates people to educate themselves about climate change. As for the reasons that prompted some of the respondents to choose "I do nothing" on the survey, they believe that government regulations and legislation are not strong enough to solve the problem, and that environmentally friendly products are often too expensive. Some respondents feel that their contribution will not make a difference, that is, that they are not important. There are also those who do not even believe that there is a problem that needs to be addressed.

The Government

At the government level, the issue of combating desertification ranked first, followed by measures to address migration from rural areas to urban areas, and the establishment of dams. As for the other measures that can be taken is represented in enacting and implementing laws, educating future generations about climate action, and accountability for environmental crimes, the questionnaire confirmed. Its importance in mitigating harmful weather phenomena, and it can limit individual and societal behavior that causes harm to the environment, as well as legal deterrence of industrial bodies that cause air polluting gas emissions and sewage outlets polluting water and other practices harmful to the environment.



4.2.1: Research Method 2 – Dialogue / Focus Group Discussions (FGDs)

4.2.1.1: Outcomes of First FGD: Judges, Lawyers, & Court Employees

This session was devoted to the legal aspects related to the environment and climate change, and resulted in the following outputs:
This group brought to light laws already in place within the Iraqi Constitution, such as Article No.33 approved in 2005 which recognizes the right of Iraqi individuals to a healthy environment, and that the government must guarantee the protection of the environment and biodiversity. Additionally, Law No. 27 passed in 2009 which established judicial legislation for the protection of the environment. However, there are recent amendments to this law which haven't been approved yet.

This FGD also stated the need to activate more environmental laws, establish roles of environmental observers as well as authorize heads of administrative units that have the power to impose fines in cases of environmental pollution. They believe that the government should include environmental protection within the state's budget which could contribute to legal measures being taken against perpetrators of environmental crimes.

Another suggestion put forth is the importance of raising awareness through audio/visual means to reach the general population. By raising awareness, this could prevent citizens from carrying out environmental abuse and encourage or reward citizens committed to improving climate action.

Climate Migrants

"Many are being devoured in conditions that make it impossible to survive. Forced to abandon fields and shorelines, homes and villages, people flee in haste. They set out in hope, meaning to restart their lives in a place of safety. But where they mostly end up are dangerously overcrowded slums or makeshift settlements, waiting on fate."

- Pope Francis: "Pastoral Orientations on Climate Displaced People" – March 30, 2021

4.2.1.2: Outcomes of Second FGD: Academics, Educators, & Civil Society Organizations (CSOs)

The session discussed the educational aspects, awareness of citizens, and the role of scientific research in monitoring and addressing the phenomenon of climate change, and resulted in the following outputs:

Emphasis from this FGD was placed on the need to increase social, cognitive, and behavioral awareness of climate change as well as how to mitigate it for all segments of society, especially those most affected, such as children, elderly, disabled, people with chronic diseases, and climate migrants.

Attendees recommended increasing scientific research in academic institutions with a focus on the environment, as well as providing grants to support this research. Additionally, they believe it is important for CSOs and the society to come together in order to educate the new generation on how to better care for their environment, including activities such as establishing gardens on school grounds which the students would be responsible to maintain.

This group also acknowledged the emigration of Buffalo herders to Basra city who once lived in Iraq's marshes and wetlands but were forced out due to various reasons. They mentioned that the displaced herders caused obstruction of city development projects as well as societal problems and community conflicts.

It was noted that there were initiatives from CSOs and international NGOs to address climate change, but that these initiatives were limited, short-lived, and lacked sustainability. The group also mentioned the lack of governmental services to sponsor sewage projects, which caused leakage into freshwater reserves as well as surrounding rivers, making the water undrinkable.

Finally, the group emphasized the need to encourage international oil companies to take the initiative to improve Basra's environment by reducing pollution and associated gases as well as creating forestation projects to increase vegetation in surrounding areas.

4.2.1.3: Outcomes of Third FGD: Governorate Departments and Municipal Councils

The session discussed the environmental situation in Basra, the most important effects of climate change there, the responsibilities of municipal councils and governorate departments in addressing it, and resulted in the following outputs:

This FGD considered oil installations, vehicle exhaust and extreme temperatures to be a major factor of climate change within Basra governorate and that sewage waste and plastics were the main contaminant of river water. They also noted that the drying of marshes and lack of vegetation was another direct result of climate change.

This group stated that the efforts of the local government departments and local councils are insufficient to confront the effects of climate change, and that they needed more support from the federal government. With funding and support from the federal government, the local government would be able to implement afforestation projects, improve water sources and establish rules and laws for oil companies to reduce the amount of gas emissions and other pollutants. Additionally, they believed that oil companies should contribute more to the improvement of Basra's environment and work to reduce pollution.

4.2.1.4: Outcomes of Fourth FGD: Oil Company & Industrial Private Sector Employees

The session discussed the role of companies in monitoring environmental pollution phenomena, their causes, and their efforts to mitigate them and resulted in the following outputs:

This group confirmed that there are indications of environmental pollution because of gas emissions associated with oil extraction operations. Although oil companies assert that efforts are being made to apply "Green" technologies, which would eliminate toxic gases and oil leaks to surrounding areas.

It was recommended that oil companies increase their financial support of the local community to establish green belts, which would further reduce gas emission from reaching inhabited areas as well as cultivating green spaces in highly populated areas. Shared beliefs among this FDG are that telecommunications companies should adopt fifth generation technologies to reduce radiation emitted from their towers as well as reducing dependence on these towers though more modern means, and that telecommunications companies should be called upon to comply.

Another recommendation was to activate the role of the Ministry of Environment in monitoring all air and water pollution activities in Basra. There was also mention that there are several companies; external, global experts that could also come into Iraq to further monitor air and water pollution.

4.2.2: Research Method 3 – Key Informant Interviews (KIIs) with Governmental and Non-Governmental Entities

4.2.2.1: Ministry of Environment (MOEN)

The study included Key Informant Interviews with the Ministry of Environment (MoEN) in Basra to further understand climate change in southern Iraq as well as solutions to combat the phenomenon. The MoEN stated that they are aware of the rising temperatures and changes in climate in Iraq in general, although it is significantly higher in Basra due to its location, particularly in the last five years. The MoEN confirmed that climate change is mainly caused by the lack of rain which has led to an increase in droughts throughout the governorate. Rising temperatures have also contributed to an increase in the evaporation rates of water, which has greatly affected the lack of freshwater available in Basra governorate. On the other hand, the lack of freshwater released from the Tigris River has reduced the rush of the salt tide to large areas of the Shatt al-Arab. The MoEN also stated that climate change has negatively contributed to the societal damages as caused by the decline of the quality of drinking water which impacts people`s health, livestock, fish, and crops, leading to the migration of people from villages and rural areas to Basra city. The situation has also led to desertification and the decline of vegetation, causing dismantling of soil, increased winds and dust storms. Moreover, among the societal damages, the situation negatively affected on cultivation by the farmers economically, including food security, unemployment, and increasing poverty in the governorate.

As it is clear that gas emissions produced from oil production led to increased air pollution and dust, the MoEN mentioned that the government must considerably monitor oil production procedures. According to a newly enacted law, measures are being taken to prevent investments associated with oil and emission of gases contributing to the rise of temperatures, increased diseases, viruses, and insects as well. The MoEN in Basra also intends to coordinate with other governmental entities in Basra such as Basra Water Directorate and Director of Water Resources to control and monitor the drinking water projects in Basra. Additionally, the MoEN wishes to coordinate with the Groundwater Department in Basra to confirm drinking water cleanliness by sending it to a laboratory for testing before being distributed to the population.

4.2.2.2: Ministry of Health (MOH)

Iraq's Ministry of Health (MoH) was also involved in the KIIs to identify the effects of climate change on people`s health, particularly in Basra. The MoH confirmed the negative effects of environmental polution on the public's health as one member stated, "during 2018 we witnessed a significant increase in illnesses by citizens and the diagnosis of poisoning cases after visiting the centers, hospitals and the health sector due to water pollution. The crisis alarmed the local government and Baghdad government." The MoH stated that asthma and allergies are two most common illnesses in Basra due to the pollutants in the air. One member mentioned, "we see a big rise of asthma cases and allergies during winter and the beginning of the rainy season." Despite the increase of illnesses, there is an inability by the government to address these issues. The reason cited is due to the MoEN and the MoH operating separately, thus being unable to coordinate which has negatively affected their operation towards addressing the people.

The governorate also faced three peaks of deaths over the past three years. Respiratory diseases are most problematic for people in Basra because of climate change and raising temperature. The MoH confirmed that the winter season has more deaths due to climatic changes, rain and dust, toxins that negatively affect children, the elderly and others who suffer from acute respiratory diseases. However, recent statistics showed that the rate of death had increased even during summer, considering the rise of the Covid-19 pandemic in early 2020 and the relationship with climate change and air pollutants, although this has not been confirmed yet.

4.2.2.3: Oil Companies

According to data provided to us by Basra Oil Company, the amount of gas burned annually reached 11.5 billion cubic meters in 2019 and fell to 9.5 billion cubic meters in 2020. The monthly amounts burned ranged from 659 million cubic meters and 832 million cubic meters in 2020 and between 825 million cubic meters and 1 billion cubic meters per month in 2019. Oil companies have reported that modern extraction techniques adopted in new fields significantly reduced gas pollution due to their use of environmentally friendly methods. Green Fields techniques have been applied in new oil fields. These techniques include the disposal of some toxic gases by performing the total combustion of the associated gas as well as the treatment of oil leaks accompanied by water associated with oil extraction through sedimentation basins where leaks are buried and utilized. Moreover, modern technologies have also been used to record high gas flares, which contributes to keeping the risk of contaminated gases away from levels harmful to the population living near oil installations. It has been recommended that they should be applied in old fields as well.

4.2.2.4: Ministry of Water Resources (MOWR)

As climate change has significantly reduced water levels and quality in Basra governorate, it is significant to include the Ministry of Water Resources (MoWR) within this study. Therefore, several members of the MoWR were included in KIIs in order to understand the consequences of climate change on water in the area. The results indicate that not only has climate change affected reduction of water in the governorate, Basra also suffers due to water shortages from its main sources, namely Iran and Turkey, and also lack of water revenues coming from the Karon River. This has a direct impact on the Shatt al-Arab waterway. To address the issues, the MoWR declared that they there are procedures followed in accordance with an annual plan in coordination governmental related entities to clear rivers and remove excesses. The following actions have been taken towards addressing the problem:

- Increasing water releases from Qalat Saleh to reach 117 cubic meters/second.
- All sub-rivers located in the Tigris River, which flow into the Shatt al-Arab are being diverted to push the largest amount of fresh water to southern areas of Basra.
- Installing floating pumps on water channel (PS 2) with five stations and (PS 1) with four stations that helped to increase water.
- Implementing installation of water outlets on canals in the area.
- Activating work on the Abbas Water Project and removal of all excesses on the channel.

Members of the MoWR also addressed the issue of building dams in the area with regards to the negative sides effects. One interviewee stated, "we are neither with nor against the construction of dams, but locations must be considered and its negative and positive impacts because it is not easy due to the location of Basra as well as the infrastructure for the construction of dams." The interviewee stated that the most appropriate location to build a dam is north of the port of Abu Floss because it has lowest challenges compare to the other locations.

Finally, the MoWR mentioned that there are two sources of drinking water in the Basra. The main source is the irrigation canal, which feeds into the city center and provides from 20 to 25 cubic meters/second to meet the citizen's requirements for drinking and irrigation, as well as for production and raising livestock. Approval by the MoWR was given to connect all water intakes to the irrigation canal in the districts of Shatt Al-Arab, Al-Faw, Al-Siba, Al-Maamer and Abu Al-Khasib districts. However, there was no effect of this phenomenon on the availability of potable water for domestic use.

4.2.2.5: Ministry of Migration and Displaced (MOMD)

As climate change significantly affects the migration from rural to urban areas, the Ministry of Migration and Displaced (MoMD) in Basra also needed to be involved in this study. The MoMD mentioned that climate change has a large impact on migration of people from rural to urban areas in Basra. This displacement has had a negative societal impact due to the different cultures between residents of the city center and migrants from the villages and countryside which has led to the outbreak of tribal conflicts. The lack of job opportunities due to climate change in rural areas is considered as a major reason that people to migrate from to urban areas. Moreover, the study also explored that due to this migration the following consequences will be raised:

- Increase in population density which creates informal settlements
- Competition for jobs
- Community conflicts due to different cultures
- Increased begging in the streets by displaced people

Accordingly, to address these issues, the MoMD mentioned that they are attempting to reduce migration through proposing action plans in coordination with environmental institutions by addressing the consequences of climate change in the Basra governorate. Although several initiatives have been suggested by the local authority and the government to address the phenomenon, these issues still have not been addressed, causing Basra to be one of the leading governorates with societal conflicts and a rise in crime such as drug trafficking.

4.2.2.6: Basra Municipal Department

The municipal department of Basra was also involved in this study to identify the consequences of climate change on the city sector. One member stated that an increase in deaths and fainting cases have been registered because of increasing temperature in the city. To mitigate the mentioned cases, the municipality of Basra has changed working hours to avoid high temperatures. Also, there are standards of use for water systems, electricity and sanitation networks. With an increase of informal settlements due to the arrival of climate migrants, it will burden the municipality and could potentially collapse the network or systems already in place.

5. PUTTING THE PIECES TOGETHER

5.1: Summary:

Iraq is the fifth among the world countries that has been significantly affected by the climate changes due to several reasons such as drying seasons. Accordingly, thousands of acres of agricultural lands have remained not cultivated. As a result, local agricultural products have reduced sharply (Berkeley, 2021). More importantly, with the expected increase in the population of Iraq from 38 million today to 80 million by 2050, the economic and social risks of climate change will increase more if the issue is not addressed.

Basra Governorate is the most affected area by climate change in all of Iraq. Basra city suffers from a set of climatic phenomena related to global warming and other factors such as air pollution, which have caused several damages to food and water security (Salman, 2021). It has also impacted fishing and aquaculture activities in southern Iraq. The problem significantly harmed the Basra society in general and economic development in particular. The most prominent effects of climate change are extreme heat, drought, food insecurity and declination of food quality, as well as the air pollution due to industrial and oil pollution, and the increase of dust storms due to desertification.

Thus, in order to address the mentioned issues, an action plan needed develop a blueprint as a solution to the problem. Accordingly, this research is designed to assess the cognitive and behavioral awareness of these climatic phenomena among various groups of the community, which helps in finding solutions for adapting to tolerate the effects of climate change and reduce the risks resulting from it. Below are the founded themes that indicates the consequences of climate change, which presented and concluded:

5.2.1: Awareness:

The study findings indicate that the majority of Basra governorate are aware of climate change and more importantly the consequences of climate change. The study also shows that climate action needs to be addressed as mentioned by the participants of this study. Furthermore, the vast majority of the survey participants mentioned that they are aware of the climate change and its effectiveness on the society and the economic effects in particular in Basra governorate. The extreme increase in temperature was one of the most important issues that people felt in Basra as a reflection of climate change. The people of Basra are also aware of water shortages and high saltiness and the lack of rain which results to increase droughts. As for the of loss of vegetation, biodiversity and the spread of diseases are the issues that significantly affected by the climate change. The study made clear the annoyance of the residents of Basra from the effects left by the phenomenon, and they considered them to be very harmful and that these negative effects might push migration and displacement. Based on this information, it is clear that the level of awareness of the purity of climate change is high among the people of Basra governorate.

5.2.2: The Most Vulnerable Populations:

To answer an important question of this study - identifying the most vulnerable people that have been harmed by the climate changes, the study founded the following themes:

5.2.3: Geriatric/Elderly People:

The research assumed that the elderly group over the age of sixty years is the first to be affected by the consequences of climate change. One of the main research questions in this study is designed to identify the effects of climate change on people from different classes of age in Basra governorate. Accordingly, the study found that elderly people are most expected to be influenced by the consequences of climate change. 82.2% of the study participants (including qualitative and quantitative data) mention that most of the diseases faced by elderly people are because of the changes that happened in the climate in Iraq, particularly in Basra governorate. The participants indicated that the health effects come at the forefront of the negative effects on this category, followed by the social effects and those related to the services provided to them. This age group, with its weaknesses in the various body systems and weak immunity, will be the first to be affected by extreme temperatures, air pollutants resulting from industrial activity, poor quality of drinking water and increasing salinity in Basra governorate as well as the scarcity of clean drinking water.

5.2.4: Populations from Rural Areas:

The second most affected category assumed by the current research is the category of rural residents who practice agriculture, raising livestock, and fishing. The reason for this assumption is that farmers in poor rural areas are the most severely affected by water shortages caused by climate change and lack of water management, as their livelihoods and futures depend entirely on the availability and accessibility of water. This is what was indicated by previous studies and reports of United Nations agencies such as the United Nations Development Program (Al-Quj and others, 2020) and the World Food Program, which indicate that temperatures raised to record levels as the rainfall in 2021 was below average, and this year Iraq witnessed the second lowest drying in 40 years (UN News, Climate and Environment, 2021). Accordingly, climate change reflects on the quality and quantity of the local products in general.

Additionally, this study indicated that 31% of people from rural areas in Basra governorate are dependent on raising livestock such as cattle and buffalo, fishing, and fish farming, especially in the marsh areas, which are the most practiced occupations by these communities. The study also found that 66% people in rural areas are dependent on cultivation of crops of fruits and vegetables, and farm management activities. The study shows that 65% of the people believe that climate change has had a negative impact on their agricultural work, especially the insufficiency of water needed when using traditional irrigation systems. Accordingly, the study also found that supporting and educating farmers to change traditional irrigation methods to modern irrigation methods such as sprinkler systems in also important to mitigate the effects of the lack of water in the governorate of Basra. The most prominent effects of climate change were the decrease in productivity and the spread of plant and animal diseases. Additionally, the quality of agricultural products has decreased and the difficulty of sustaining profits because of the failure of marketing and delivering products to the consumers in a good condition. Although the Iraqi government buys several types of cultivation such as wheat and barley, the agricultural sector remained unsupported. As a result of these negative influences, almost half of the farmers decided to leave their agricultural livelihood and search for other more profitable work in urban areas. Moreover, the study shows that 62% of farmers expected to emigrate and search for a better place to live, while 26% insisted on staying despite the bad conditions of the agricultural sector in the rural areas in Basra governorate.

5.2.5: People with Chronic Diseases:

The study shows that the phenomenon of climate change is not a major cause of the deterioration of the health of the population in Basra governorate, as mentioned by 57% of respondents in this study. The prevalence of chronic diseases that may not necessarily be caused by the effects of this climate change. However, when the study focused on this category of people with chronic diseases, as one of the categories most exposed by the negative effects of climate change and environmental degradation, it appeared that the phenomena still reflected on the mentioned diseases. Regarding the most prominent negative effects on the health of the population with chronic diseases, it became clear that climate change caused an excessive rise in temperatures as well as the gases that causes air pollution are the most prominent influential phenomena with a rate of 50.7%, The issue of water deterioration and its scarcity ranked second in affecting the population category with chronic diseases by 30%. Due to desertification, the spread of dust and those related to the deterioration of food quality, the effect was less significant than the other consequences of climate change, as the percentage ranged between 7-11%.

5.2.6: People with Low Income:

Perhaps it is axioms to assume in a country such as Iraq and a governorate such as Basra that the lower classes are the most affected by climate changes, whether they are rural or urban populations, because they do not have the ability to adapt in the face of these changes. Accordingly, it is significant that the local government of Basra study this situation and take an action to mitigate the effects of these changes, especially related to the quantity and quality of water, reducing pollution sources, and providing the necessary health care in the event of health complications, similar to what is easily accessible to the middle and rich classes.

Additionally, this study sheds light on this most affected targeted group in order to explore the negative consequences of climate change on them. More importantly, 86% of the respondents of this study were from the poor and middle classes, with 47% among them being categorized as poor class. The study shows that the climate change has reduced job opportunities (such as agricultural and construction work). It also decreased the quality of production and the possibility of losing jobs and willingness to search of other job opportunities. Accordingly, the phenomenon significantly decreased job opportunities and increased the number of jobless people, particularly among the poor. More importantly, in related to the level of services that are provided by the government to mitigate the risks of climate change on the poor classes, the study found that the government has not overcome the risks properly, and there were no/limited means of mitigating strategies to reduce the negative consequences of climate change on the lower class in Basra governorate.

5.2.7: Children

According to UNICEF's "Children's Climate Risk Index" which was published in August 2021, Iraq ranks 61st globally in terms of children and youth being at a medium to high climate risk, with vulnerable groups and certain areas of the country at a higher risk. The report published stated that, "Children and young people in Iraq are the most at risk of the impacts of climate change especially water scarcity, threatening their health, education, and protection, and exposing them to deadly diseases." UNICEF is calling on local and federal governments, businesses and other entities to take immediate actions to address the multiple threats that children face due to dangerous environments caused by climate change. The report also provides suggestions to include children in taking part in climate action so that the next generation will be more healthy and stable. Such actions include increasing investment in climate adaptation and resilience services, providing education to children about the effects of climate change from a young age, including children and youth in climate-related decision making, and ensuring a green and inclusive recovery from the Covid-19 pandemic so that, "the capacity of future generations to address and respond to the climate crisis is not compromised."

6. RECOMMENDATIONS

6.1: Adaptation:

Since climate change significantly hampered the agricultural sector in the Basra governorate, adaptation to the problem is quite important. Accordingly, this study aimed to explore the means of adaptation and present the result in order to provide a sustainable solution to the phenomenon.

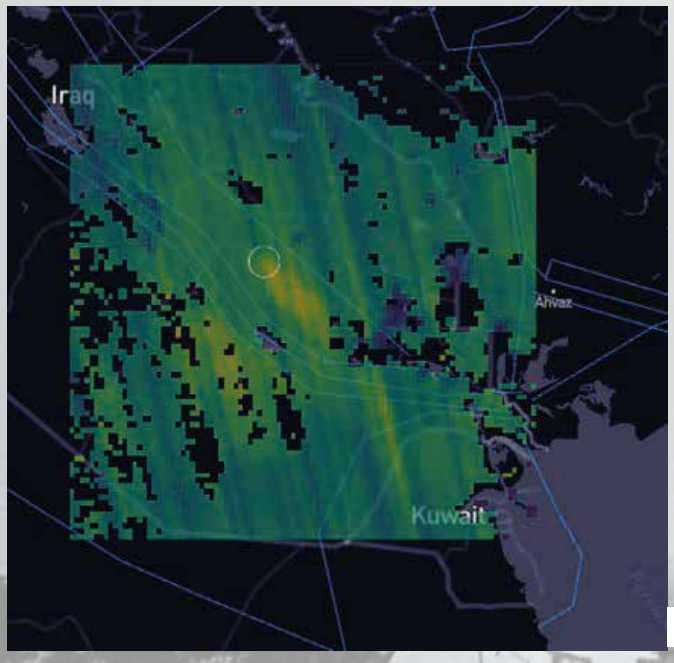
Agriculture accounts for about four percent of Iraq's GDP and contributes to about 20 percent of the labor market, mostly in rural areas such as Basra. Because of the effects of the climate, decreasing water and the intensification of armed conflicts, agricultural production has decreased by about 40 percent since 2014. The World Bank estimates that two-thirds of Iraq's farmers had access to irrigation sources before that year, but after three years, this percentage had dropped to only 20 percent, which also caused the loss of 75 percent of livestock such as sheep, goats, and buffalo.

More than 63 percent of Iraq's water resources go towards agriculture without meeting its domestic need for crops and often depends on imports from abroad, which means that there is water wastage that is not matched by an abundance of produce. the agricultural techniques in Iraq are also outdated, as the ministries of agriculture and water resources do not use modern irrigation techniques in order to rationalize consumption, so there is excessive waste of water with a weak agricultural output. In addition to agricultural waste, Iraq annually loses 14.7 percent of its water reserves because of evaporation due to high temperatures, which is a very high rate compared to other consumption rates. Lake Tharthar in the western province of Anbar - the largest industrial water reservoir in Iraq – loses more than 50 percent of its stored water due to evaporation. As for the marshlands, which are the largest natural water bodies and heritage wetlands in the Middle East, evaporation wastes about 75 cubic meters per second per day.

Our study stresses that there is a massive need to work on educating farmers and assisting them in using new technologies such as closed irrigation techniques and innovative agricultural solutions to reduce water wastage. It's important to also provide treatments for salinization of the land by working closely with the Ministries of Environment and Agriculture to stop or reduce overuse.

It's important to stress there is a need to rationalize the use of water through shifting from a type of cultivation to another type of cultivation crops that consume less water. Additionally, the priorities for collective response to the effects of climate change, which was clarified by the respondents, is to change people's consumption habits, use environmentally friendly technologies, and then put in place strict government legislation and regulations that limit gas emissions that cause air pollution.

Air pollution is greatly increased by industrial and oil emissions containing methane, the major component of natural gas. According to a report by Bloomberg Green, clouds of methane often wander in the airspace of Iraq due to the unclean extraction of oil. In July 2021, the Paris-based company Kayrros, which analyzes European Space Agency satellite data to track emissions, revealed that a field in western Basra was releasing methane at a rate of 73 tons per hour, following two other methane emissions in mid-June. Last June, halfway between Basra and Baghdad, at a rate of 181 and 197 tons per hour. "To be clear, the release of 180 tons of methane per hour is equivalent to the greenhouse effect caused by the average annual emissions of more than 200,000 cars in the UK," the report stated.



Satellites show the methane release over southern Iraq on August 16, 2021. Source: Kayrros SAS

There is a willingness from individuals to contribute to improving climate action. However, few people are aware of the contribution methods necessary. Thus, at the individual level leading and directing the people towards solving the problem is significantly needed. Accordingly, CSOs can take the lead in organizing and training volunteers towards on educating people how to combat climate change. The study also found that educating people towards a clean environment and using environmental protection means are the most productive methods to reduce the climate change and address the problem in Basra governorate. The study also shows disappointment from people about government regulations and legislation while there is a lack of attempts by the government in combatting the problem.

The study also shows several other findings that can be considered as means of mitigation to the effects of climate change in Basra. Improving energy efficiency, using renewable energy and environmentally friendly products, reusing water, as well as using environmentally friendly means of transportation and working to increase vegetation cover are the most means of mitigation that can be taken into consideration to contribute towards reducing the climate pollution.

The study also found out that the university lecturers and university students are the first target group that can contribute towards taking climate action. It is necessary to invest in the scientific energies available at universities that focus on environmental protection, and to provide opportunities for graduate students from environmental, agricultural and science colleges and institutes to be involved in projects that provide opportunities to continue working on improvement in these areas.

Making use of academics and students contributing to climate action is followed by ordinary residents, workers in companies and civil society organizations who are also important in the mitigation process. On the other hand, from the government level, the study found that, the issue of combating desertification is ranked first to be addressed, followed by addressing the problem of migration from the rural to urban areas is also important to be considered, and establishment of dams also could be strategic solution towards the problem. Finally, the study also found that the legislation and law implementation, raising awareness, and accountability for environmental crimes also have their own impact of mitigation process as the government can take these measures into consideration.

6.2: Resilience and Mitigation of the Effects of Climate Change in Basra by Sector:

1. Energy Sector (oil, gas and electricity): Switching to other forms of low carbon energy (hydrological energy, solar wind, geothermal energy - bioenergy), phasing out traditional fuels, oil and gas to renewable energy and motivating citizens to rationalize electricity use.

2. Water, Agriculture and Food Security Sector: Reducing water wastage as a result of using the old watering method for irrigation, agriculture, or domestic uses. Using modern techniques for storing water, reusing wastewater after treatment, and introducing water desalination systems, especially in the southern governorates.

3. Transport Sector: Transport emissions account for about 25% of all emissions in the world (Baban, 2021), especially in Iraq due to the huge inflation in the number of vehicles, which is one of the main sources of gases and air pollution. Encouraging the use of mass transportation systems and switching to the use of modern energy technologies, such as electric or hybrid vehicles and bicycles, and preventing the use of old vehicles.

4. Housing and Construction Sector: Iraq is facing the spread of informal settlements in both urban areas and on agricultural lands. This raises the urgent need for advanced planning and establishment of smart urban areas equipped with necessary infrastructure, including modern technologies in construction methods.

6.3: Additional Recommendations:

1. Achieving Climate Justice: Fragile communities such as and poor areas and informal settlements are the most vulnerable to the effects of climate change, which requires designing effective programs to mitigate climate impacts on them and allocating sufficient funding for these programs.

2. Prevent Dredging of Agricultural Land: Using modern agricultural irrigation methods to ensure maximum water utilization and good production of agricultural yields to achieve food security.

3. Taking Advantage of International Experience and Youth: Mitigation and climate adaptation depends on the youth because of the ease of communication and the positive energy they possess to improve environmental status for generations to come. By utilizing outside, international companies and organizations, Iraq can make great improvements in the environmental sector.

4. Migration Management to Reduce Societal Conflicts: The study found that the 58% of respondents have indicated that societal conflict was significantly impacted by the climate change. Accordingly, the societal conflict happens while the displacement occurs, particularly from rural to urban areas. Therefore, the government holds the main responsibility in addressing the migration problem as a strategic solution to mitigate societal conflict problem in the Basra governorate and to seek justice for those most affected.

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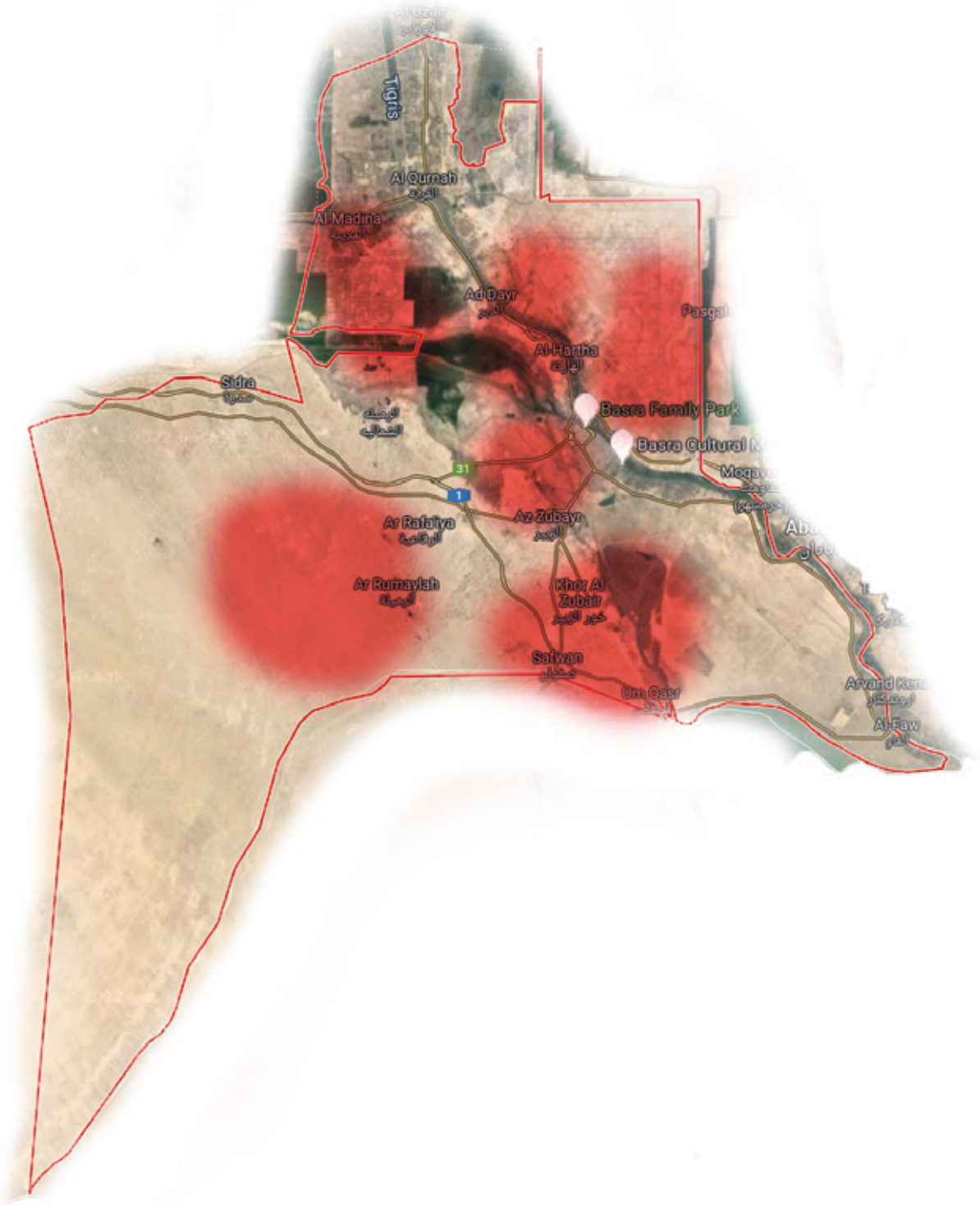

For the purpose of this study, citizens across Basra city who have been most affected by climate change were involved in the survey sample. The districts which have received the highest number of climate-induced migrants, including those living in informal settlements, are Al Hartha, Al Karam, Al Zubair, Khour al Zubair, Basra's City Centre, and Shatt al Arab District.

These areas need considerable attention going forward, as the influx of migrants from Basra's countryside have already negatively affected public services and infrastructure available to urban residents. If rural to urban migration continues in Basra city, it will ultimately generate a transportation and housing crisis, overcrowding of streets and other public spaces, and increased demand for services such as electricity, communications, and healthcare in an already struggling economy.

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CONTACT

Sarmad Mubarak
Security & Justice
Programme Manager
sarmad.mubarak@cordaid.org

Address
Shlama Street
House No. 240/9/652B
Ankawa, Erbil, Iraq

+964 750 766 2555
www.cordaid.org

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