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Sustainable Solutions to the Housing Crisis in Iraq

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Abstract

Iraq's housing sector faces major challenges affecting citizens' daily lives. These challenges lead to increased demand for basic services and infrastructure, which negatively impacts the quality of daily life. These challenges have arisen due to a lack of security and political stability, the absence of effective urban planning policies, a lack of a comprehensive vision for urban development and expansion to accommodate population growth, high population growth rates, economic crises, and insufficient financing to support housing projects.

This has resulted in a gap in the housing sector and a shortage of housing units, as Iraq needs millions of housing units in the coming years. These challenges affect citizens' daily lives by increasing the demand for basic services and infrastructure, which in turn negatively impacts the quality of daily life. Additionally, the problem of informal settlements has emerged in the country, which is one of the main challenges facing the housing sector.

Furthermore, the increasing demand for housing and urban expansion has led to the depletion of natural resources, the loss of natural vegetation cover, the encroachment on and degradation of agricultural lands, and a reduction in green spaces across the country. This is compounded by poor waste management, the worsening environmental situation, and the effects of climate change, which put additional pressure on the population. These challenges have led to a decline in agricultural productivity, the loss of important food crops, rising food prices, the loss of livelihoods, displacement, and the emergence of social tensions.

Based on this, this paper recommends a shift towards sustainability in urban development and housing as a response to these challenges. Green buildings are considered an integral part of the global response to increasing challenges related to housing and the environment. Experiences from other countries that

have adopted sustainability in the housing sector through green buildings can be utilized. Examples include the United Arab Emirates with the "Masdar City" project and the "Msheireb" project in Qatar, which reflect these countries' vision for sustainable development and cultural heritage preservation.

In the Iraqi context, the application of green buildings is essential to address harsh climatic conditions, including high temperatures, water scarcity, drought, and increasing dust storms. Green buildings play a role in mitigating the housing crisis by providing sustainable and affordable housing solutions.

This is because green buildings achieve sustainable development, reduce harmful emissions, conserve natural resources, provide affordable housing with efficient resource use, and lower ownership and operational costs. They are significantly cheaper than traditional buildings in terms of heating, cooling, and lighting costs, thus providing comfortable living and working spaces and representing a sustainable housing option.

Introduction

Iraq faces major challenges related to the housing crisis, climate change, and environmental degradation, coinciding with rapid population growth and increased demand for housing and public services, which exacerbates the housing crisis. These challenges place varying burdens on different segments of society, particularly marginalized and poor groups who suffer most from the housing crisis, facing difficulties in finding adequate and affordable housing. With rapid population growth and increased demand for housing and public services, pressure on limited infrastructure increases, leading to deteriorating services and worsening housing crises.

Rural populations are also affected by the impacts of climate change, facing difficulties in practicing agriculture and securing water, which drives some to migrate to cities in search of a better life. This means that these challenges contribute to widening the gap between different segments of society and deepening economic and social disparities.

This research paper is of great importance to policymakers in Iraq, as it provides a comprehensive analysis of the housing crisis and the factors that have exacerbated it, with a focus on climate change and environmental degradation. The paper highlights the role of environmentally friendly buildings as an innovative and effective solution to the housing crisis, which are considered sustainable alternatives that contribute to improving the quality of life and reducing the burden on infrastructure. Based on the findings, policymakers can develop strategies and policies that promote sustainable housing and meet the needs of the population, guiding decisions related to urban and environmental planning, thereby enhancing the effectiveness of public policies and achieving sustainable development in the country.

The methodology of this paper is based on a comprehensive review of various studies, literature, statistical records, and relevant international and national reports on housing crises and environmentally friendly buildings.

The Housing Crisis in Iraq

The housing crisis in Iraq has been characterized by complexities since the establishment of the modern state in August 1920. The housing sector has faced major challenges that have intensified over more than forty years due to the failure of governments to formulate and implement comprehensive national strategies for developing this sector and its infrastructure [1].

Attempts at reform have been limited to patchwork measures and partial reforms that have not kept pace with social, economic, and cultural transformations in the country, except for the period of President Abdul Karim Qasim's government (1958–1963), which witnessed some notable improvements. [2].

Over the years, the housing sector in Iraq has been affected by a complex set of intertwined factors that have exacerbated the housing crisis. The most prominent of these are:

1. **Lack of security and political stability, and prolonged conflicts** that the country has witnessed, which have led to the destruction of infrastructure, migration, displacement, and the destruction of residential areas [3]. The lack of stability has also weakened the private sector and the investment environment, resulting in limited and non-competitive projects. [4].

1.Ridha Khalid Abdul Wahhab Abu Kull Al-Taie. Al-Ghari Journal of Economic and Administrative Sciences.The Problem of the Housing Crisis in Iraq and Proposed Solutions (Challenges of Attracting Public Housing Projects—A Case Study).2015. https://journal.uokufa.edu.iq/index.php/ghjec/article/view/5824/5438 (Visited on 18/5/2024)

2. Ibid.

3. Al-Khaleej Online. UN Statistics: The War on "ISIS" Exacerbated the Housing Crisis in Iraq. 2016. https://2u.pw/8Xx7e10o (Visited on 18/5/2024)

4. Al-Hafith, O., Satish, B., & Wilde, P. (2019). Assessing housing approaches for Iraq: Learning from the world experience. Habitat International. https://doi.org/10.1016/J.HABITATINT.2019.102001. (Visited on 18/5/2024)

Lack of effective urban planning policies and a comprehensive vision for urban development and expansion to accommodate population growth. Government policies over the years related to addressing the housing crisis have often been ineffective or delayed, increasing the severity of the crisis. This has led to the growth of informal settlements in cities and limited effective use of land, impeding the development of housing solutions. There is a need to review urban planning laws to allow for mixed-use developments and higher population densities [5].

2. **High population growth rates with limited resources** to meet the needs of the population, leading to increased demand for housing [6].

3. **Corruption and poor management in state institutions** have led to the disruption of many housing projects and their failure to be implemented as required [7].

4. **Insufficient and inappropriate financing to support housing projects** by the public sector in terms of providing and pricing loans and interest rates.

5. **Financial and administrative corruption** are among the causes that have contributed to the growth of the crisis, as they hinder the implementation of housing projects and lead to the misallocation of resources and delays in infrastructure completion [8].

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5. Saad Khudhair Al-jumaily. IISTE. Art and studies. Recycle ineffective buildings on the main streets to solve the housing crisis in Iraq (Street 60 in the Dora area of the city of Baghdad as a case study). 2020. https://iiste.org/Journals/index.php/ADS/article/view/52199 (Visited on 18/5/2024)

6. Al-Latif, P., & Abdullah, D. (2018). The Problem of Urban Settlement in Iraqi Cities and It Solution. Al-Ustath Journal for Human and Social Sciences. https://doi.org/10.36473/ujhss.v225i2.148 (Visited on 18/5/2024)

7. Shatha Khalil. Rawabet Center for Research and Strategic Studies. Corruption Scandals and Waste of State Funds Surround the Housing File, and the Iraqi Citizen is the Victim. 2022. https://rawabetcenter.com/archives/144375 (Visited on 18/5/2024)

8. Dr. Mohammed Muslim Al-Husseini. Al-Alam. The Housing Crisis in Iraq... Causes Have Increased and Solutions Are Absent. 2023. https://2u.pw/5o44oTGP (Accessed on 18/5/2024).

Finally, the rentier economy linked to oil price fluctuations has produced a budget deficit, reduced investment in housing projects, increased unemployment rates, and reduced individuals' ability to buy or build new homes. This is accompanied by rising prices in the housing sector, making it difficult for individuals to obtain financing and discouraging investors from investing in the housing sector, which has exacerbated the housing crisis.

There have been attempts to address this crisis, as the government of Mohammed Shia' Al-Sudani has intensified efforts to address the housing crisis and announced the formation of a government team led by the Minister of Construction, Housing, Municipalities, and Public Works. The team includes the Ministers of Environment and Planning, the head of the advisors' body, the mayor of Baghdad, the governors of the relevant provinces, and other officials. The team's tasks include planning and supervising the establishment of new cities, supporting housing projects for low-income groups, and encouraging the private sector and investors. [9].

The team is also responsible for setting criteria for land distribution, facilitating the granting of investment licenses, and improving government services. The team has been granted the authority to approve urban development plans, negotiate with developers, and prepare partnerships with the private sector. In addition, it studies investment requests, forms technical teams and executive committees, and submits periodic reports to the Prime Minister [10].

It has also been announced that a plan to establish four new residential cities in Baghdad, Babylon, Karbala, and Nineveh is underway. These cities are expected

9. Republic of Iraq, General Secretariat of the Council of Ministers. Decisions of the Tenth Regular Session, Held on 7/3/2023.https://www.cabinet.iq/ar/category/JuAoUXmXs8rR2zM/JuAoUXmXs8rR2zM (Accessed on 18/5/2024)
10. Ibid.

to provide about 700,000 housing units, designed according to modern standards and targeting low- and middle-income groups. However, these projects may not be sufficient to address the growing housing crisis in Iraq. [11].

Reports indicate that there is a gap in the housing sector and that Iraq needs nearly three million housing units. [12]. The deficit in the number of housing units in all of Iraq (excluding the Kurdistan Region) was 1,379,594 units in 2013 and rose to 1,961,036 units in 2016 [13]. This gap in the housing sector means a shortage in the number of available housing units compared to demand, thus affecting individuals' right to obtain adequate housing.

According to estimates from the Ministry of Construction, Housing, Municipalities, and Public Works, housing needs in Iraq are expected to continue increasing over the next ten years. This growth reflects the increasing population and the ongoing need for housing infrastructure. It is expected that housing needs will increase from 3,073,606 units in 2020 to 5,503,145 units in 2030, as shown in Table 1.

Table 1: Actual Housing Needs in All Provinces (Except Kurdistan Region)

Year	Actual Housing Needs in All Provinces
2020	3,073,606
2021	3,341,478
2022	3,570,766
2023	3,798,673
2024	4,031,731
2025	4,267,985

11. Iraq Observer. New Housing Projects... Do They Solve the Suffocating Crisis in Iraq? 2023. https://2u.pw/yhbnxe9w (Accessed on 18/5/2024)
12. Al-Mada. The Housing Crisis Expands and Planning Confirms: Iraq Needs 3 Million Housing Units to Solve It. 2024.https://almadapaper.net//view.php?cat=312677 (Accessed on 18/5/2024)
13. Ministry of Planning. Iraq's Sustainable Development Vision 2030. 2019. https://www.iraq-databank.org/ar (Accessed on 19/5/2024)

Year	Actual Housing Needs in All Provinces
2026	4,507,600
2027	4,750,749
2028	4,997,604
2029	5,248,343
2030	5,503,145

(Source: Ali Fadhil Mohsen Al-Rifai. Parliamentary Research and Studies Department. Administrative Units and Completed Housing Complexes.)

As for the completed projects of housing complexes and units, the Ministry of Planning has shown the completed projects for complexes and residential houses in several provinces. In Anbar, 508 housing units were completed and distributed to beneficiaries, with a capacity of 3,305. In Diwaniyah, 509 units were completed with a capacity of 104. In Wasit, 283 units were completed with a capacity of 1,811. In Kirkuk, 120 units were completed with a capacity of 600. In Muthanna, 70 units were completed with a capacity of 427 [14].

The Ministry of Construction, Housing, Municipalities, and Public Works has also indicated that delayed projects have reached 29 projects in various provinces, with completion rates ranging between 3.9% (in Shatt al-Arab, with 1,176 housing units) and 84% (in Hit, with 432 housing units). The main reasons for delays are limited financial allocations, which have led to the suspension of projects. [15].

According to Table 2, estimates for the number of households in 2020 for all provinces (excluding the Kurdistan Region) are 5,759,742 households, and the number of suitable housing units by 2020 is 2,759,459. The housing deficit by 2020

14. Ali Fadhil Mohsen Al-Rifai. Parliamentary Research and Studies Department. Administrative Units and Completed Housing Complexes. 2023. https://2u.pw/u4Chz7r0 (Accessed on 19/5/2024)
15. Ibid.

is 3,000,283 units. Comparing the housing deficit, Baghdad governorate has the highest housing deficit, with 800,918 units, followed by Nineveh with 319,252, and Basra with 248,578.

Table 2: Housing Deficit by Province (Excluding Kurdistan Region) for 2020

Province	Number of Households (2020)	Number of Suitable Housing Units (2020)	Housing Deficit (2020)
Nineveh	604,341	285,089	319,252
Kirkuk	373,958	150,624	223,334
Diyala	307,900	149,341	158,559
Anbar	270,408	129,451	140,957
Baghdad	1,528,326	727,408	800,918
Babylon	339,810	181,721	158,089
Karbala	210,407	112,523	97,884
Wasit	250,346	115,886	134,460
Salahuddin	284,748	129,728	155,020
Najaf	221,398	130,346	91,052
Qadisiyah	202,932	108,497	94,435
Muthanna	115,899	62,473	53,426
Dhi Qar	324,487	157,821	166,666
Maysan	169,826	88,526	81,300
Basra	478,603	230,025	248,578
Total	5,759,742	2,759,459	3,000,283

(Source: Sara Omar Ali. Parliamentary Research and Studies Department. Reality of Housing Complexes in Iraq According to Spatial Distribution for 2020, 2021.)

Therefore, the high housing deficit indicates shortcomings in planning and government policies over the years, reflecting economic and social challenges such as poverty, unemployment, and declining quality of life due to inadequate housing

conditions and increased population density in urban areas. It also highlights the need to develop new housing projects and rehabilitate existing housing units to improve living conditions and strengthen infrastructure to meet the needs of the population. These figures reflect the importance of strategic planning by the Ministry of Construction, Housing, Municipalities, and Public Works to meet the increasing demand for housing and to implement effective policies to expand housing projects and provide the necessary financing to ensure adequate housing for all members of society.

Among the most prominent challenges facing the housing sector in Iraq is population growth, which leads to increased demand for housing units and services. The Ministry of Planning estimates that Iraq's population has reached more than 43 million[16]. This increasing demand leads to higher rents and real estate prices, making it difficult for many families to secure adequate housing at a reasonable cost.

The increasing phenomenon of urbanization and internal migration is another challenge for the housing sector. Neglect and poor management in rural areas, and the deterioration of agriculture and grazing over the years, have forced rural residents to migrate and settle in cities in search of a better life and employment opportunities. [17].

Additionally, high unemployment and poverty are other challenges. According to the United Nations World Food Program, the unemployment rate reached 35%, and poverty rates have increased since 2018. Figures indicate that 29.6% of Iraqis are below the poverty line [18]. This means that a large number of individuals do not

16. Mohammed Al-Talibi. Iraqi News Agency. Planning: Developing Policies to Absorb Population Growth. 2024. https://www.ina.iq/207489--10-.html (Accessed on 19/5/2024)
17. Ministry of Planning. Iraq's Sustainable Development Vision 2030. 2019. https://www.iraq-databank.org/ar (Accessed on 19/5/2024)
18. World Bank. Climate Change Complicates Efforts to End Poverty. 2015.https://www.albank-aldawli.org/ar/news/feature/2015/02/06/climate-change-complicates-efforts-end-poverty(Visited

have a steady or sufficient income to buy or rent housing, making it difficult for many families to secure adequate housing, which increases congestion in urban areas, forcing families to live in small and inadequate housing units in terms of infrastructure and services. [19].

Real estate prices in Iraq have also seen a noticeable rise, adding a significant burden on individuals and preventing them from obtaining adequate housing. This increase is due to several factors, including economic inflation, increased demand for real estate with limited supply, as well as political and security impacts, and financial corruption, all of which contribute to economic instability. [20].

In recent years, the problem of informal settlements in Iraq has emerged as one of the main challenges facing the housing sector. The Ministry of Planning, in cooperation with the United Nations, reported in 2017 that there are 3,687 informal settlements, with the highest number in Baghdad (1,022), followed by Basra (677), Dhi Qar (333), and Kirkuk (279).

Table 3: Number of Informal Residential Settlements by Province

Province	Informal Residential Settlements	Percentage
Baghdad	1,022	28%
Basra	677	18%
Dhi Qar	333	9%
Kirkuk	279	8%
Maysan	243	7%
Diwaniyah	229	6.2%
Babylon	225	6.1%

on 20/5/2024)

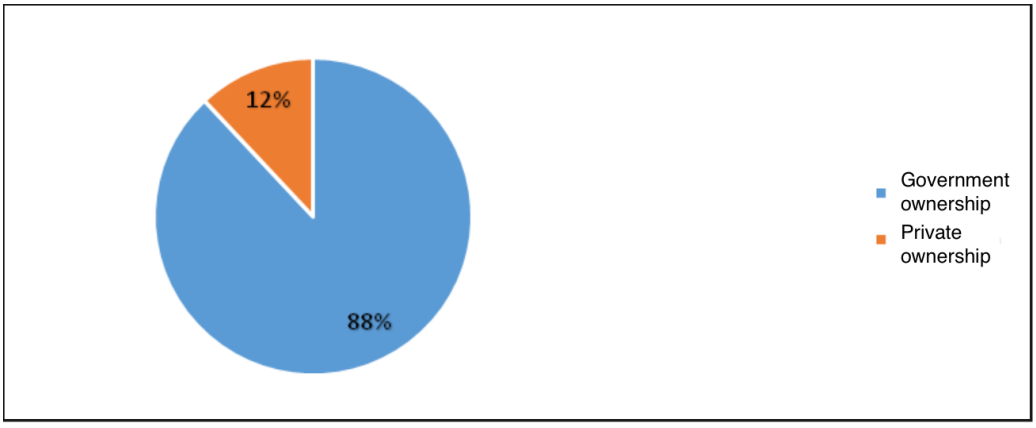
19. Marwan Al-Jabouri. Al Jazeera. Dividing Houses in Baghdad... A Threat to the City's Face. 2018. https://2u.pw/ro9AgOKA (Accesed on 19/5/2024)

20. Roj News. Real Estate Prices in Iraq Continue to Rise Amid Demands for Serious Government Action to Address Them. 2023. https://rojnews.news/ar/?p=151250 (Accessed on 19/5/2024)

Province	Informal Residential Settlements	Percentage
Wasit	210	5.7%
Diyala	172	5%
Muthanna	120	3%
Najaf	89	2.4%
Karbala	88	2.3%
Iraq	3,687	100%

(Source: Firas Jassim Mousa. Iraqi Parliament. Parliamentary Research and Studies Department. 2022.)

Regarding the ownership of informal housing complexes, it appears that 88% of the largest informal complexes in Iraq belong to the state, and only 12% are owned by individuals or the private sector. This may reflect several points, such as land encroachment or insufficient infrastructure in some areas, and the challenges governments face in regulating or controlling these settlements, as shown in Figure 1.



(Source: Ministry of Planning. Fixing the Locations of Informal Settlements, Executive Strategic Management for Poverty Alleviation. 2017.)

As shown in Table 4, regarding land use distribution, residential land use accounted for 26% of the total area in these settlements, while non-residential land use accounted for 74%. Green areas represent the largest share within non-residential uses, accounting for 36%.

Table 4: Percentages of Residential and Non-Residential Land Uses

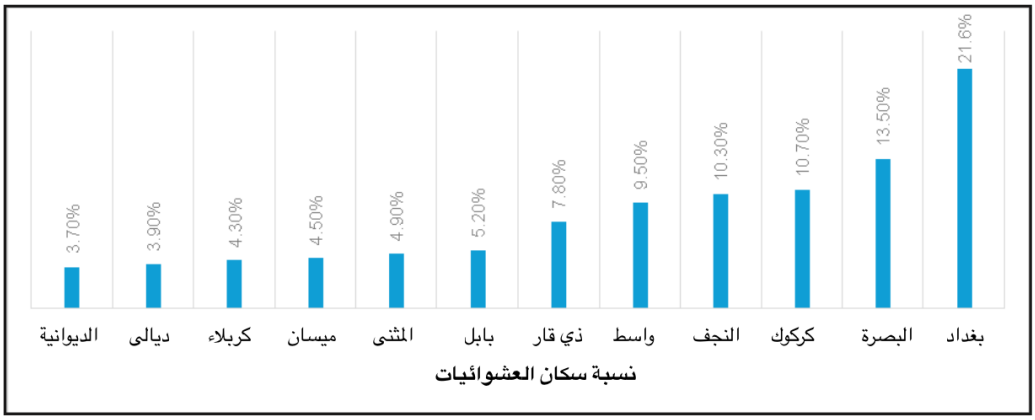
Province	Residential Use (%)	Non-Residential Use (%) by Province						
		Commercial	Green	Public Buildings	Services	Industrial	Mixed	Prohibited
Kirkuk	49	6	14	4	12	1	11	3
Diyala	34	2	27	13	11	1	9	3
Baghdad	20	5	44	5	16	2	4	4
Babylon	38	3	22	5	12	3	9	8
Karbala	36	2	26	12	18	0	5	1
Wasit	27	2	30	15	12	0	7	7
Najaf	55	4	17	3	19	2	0	0
Diwaniyah	30	6	35	10	14	1	2	2
Muthanna	53	0	26	3	8	1	4	5
Dhi Qar	35	0	23	8	14	1	15	4
Maysan	18	0	44	8	19	2	8	1
Basra	17	2	42	3	31	1	0	4
Iraq	26	3	36	7	18	1	5	4

(Source: Ministry of Planning. Fixing the Locations of Informal Settlements, Executive Strategic Management for Poverty Alleviation. 2017.)

The number of inhabitants of informal settlements has been estimated at 3,292,606 people, representing 12.9% of Iraq's total population.[21]. Baghdad governorate has the highest proportion of informal settlement inhabitants at 21.6%, followed by Basra at 13.5%, while Diyala and Diwaniyah have the lowest proportions at 3.9% and 3.7%, respectively, as shown in Figure 2.

21. Ministry of Planning. Fixing the Locations of Informal Settlements, Executive Strategic Management for Poverty Alleviation. 2017. https://mop.gov.iq/archives/12869 (Accessed on 19/5/2024)

Figure 2: The Relative Importance of Informal Settlement Population based on Province



(Source: Ministry of Planning. Fixing the Locations of Informal Settlements, Executive Strategic Management for Poverty Alleviation. 2017.)

The results of the latest survey on fixing the locations of informal settlements in Iraq (2021–2022) show that the Baghdad governorate has the highest number of informal settlements, with more than 1,000 settlements, representing 23% of the total in Iraq, which is 4,679 settlements. Basra comes next with 715 settlements, while Najaf has the lowest number with 89 settlements, followed by Muthanna. The report also indicated that 87% of these settlements are government-owned and only 13% are privately owned. The population of these informal settlements is estimated at 3 million and 725,000 people, representing 8–10% of Iraq's population.[22]

This means that the phenomenon of informal settlements is widespread throughout Iraq and is not limited to a specific region, and is increasing continuously. A large number of people live in inadequate conditions, lacking

22. Mustafa Mohammed Raed. Iraqi Parliament, Parliamentary Research and Studies Department. The Impact of the Environment on Informal Housing and How to Manage Housing Projects in Iraq in a Way that Enhances and Protects the Environment. 2023. https://2u.pw/nKvnk6Ll (Accessed on 19/5/2024)

basic services such as health, water, and electricity, and lacking employment and educational opportunities. This also highlights the major challenges the Iraqi government faces in addressing the phenomenon of informal settlements. [23]

Environmental Impacts of the Housing Crisis

The housing crisis contributes to the exacerbation of environmental challenges in the country, as the increasing demand for housing increases the consumption of natural resources such as land, water, and energy to build homes and provide basic services to the population, which contributes to the depletion and exhaustion of resources. Urban sprawl and the expansion of informal settlements lead to multiple environmental impacts, including pollution, loss of green spaces, and the deterioration of agricultural lands[24].

This is evident in Baghdad, where figures indicate a decline in green spaces from 28% of Baghdad's area a decade ago to about 12% today. [25].

This is the result of widespread destruction of green areas and their conversion into informal residential areas without consideration for environmental balance. [26].

23. Ministry of Planning. Ministry of Planning Launches the Results of Updating the Survey of Informal Settlements in Iraq. 2023. https://mop.gov.iq/archives/12869 (Accessed on 19/5/2024)
24. Al-Bayan Center for Studies and Planning, Research Unit. The Housing Crisis in Iraq: Seeking Solutions through International Initiatives. 2021. https://www.bayancenter.org/2021/06/7094/ (Accessed on 20/5/2024)
25. The Impact of Informal Housing on the Environment and How to Manage Housing Projects in Iraq in a Manner that Enhances and Protects the Environment. https://2u.pw/nKvnk6Ll 2023 5 (Accessed on 5/2024)
26. Aliya Haider Abdul Yameh. University of the Future. Destruction of Orchards and Real Estate Expansion. 2022. https://uomus.edu.iq/NewDep.aspx?depid=5&newid=13966 (Accessed on 19/5/2024)

Informal areas suffer from neglect and a lack of basic services such as sanitation and waste disposal, and the use of land for undefined purposes without commitment to urban planning systems. There is a noticeable accumulation of waste, sanitation problems, the raising of animals in residential units, and the spread of various types of insects that transmit dangerous diseases. [27].

There are also some factories in these areas for recycling used plastic products, processing canned soft drinks, and reusing lead-containing batteries, which cause gas emissions that affect the health of residents and the environment. [28].

Moreover, urban encroachment on agricultural lands has led to their reduction, which has many negative impacts on the environment and society, most notably the decline in agricultural production, the destruction of large areas of agricultural land, and the deterioration of environmental and community services in residential areas. [29].

This is accompanied by environmental challenges and climate change, including

27. Saleh Daoud Salman Al-Zubaidi. Diyala Journal. Informal Areas in Baghdad: Their Reality and Environmental, Economic, Social, and Security Impacts. 2011. https://www.iasj.net/iasj/download/a122ef832e7793b7 (Accessed on 20/5/2024)
28. Ibid.
29. Hamoudi Hassan, H., and Majid Rashad, M. Madad Al-Adab Journal. The Negative Effects of Residential Expansion and Planning Solutions and Future Expectations for Population Growth in Al-Rashidiya District. 2023. https://digitalcommons.aaru.edu.jo/midad/vol31/iss1/30/ (Accessed on 20/5/2024)

pollution, drought, desertification, and dust storms that Iraq faces[30]. These challenges have led to land degradation, a decline in agricultural productivity, the loss of important food crops, rising food prices, threats to food security, and the exacerbation of displacement and social tensions in the country[31].

Figures indicate that Iraq loses about 100,000 dunams of agricultural land annually [32]. It is expected that the gross domestic product will decline by 2.4% to 3.1% if drought and desertification in the agricultural sector are not addressed [33]. It is also expected that 7 million Iraqis will face difficulties in accessing water in the coming years [34].

Therefore, these challenges will exacerbate the housing crisis, as climate change forces people to migrate from areas affected by drought, floods, and resulting damage, including loss of property, destruction of homes and infrastructure, loss of livelihoods, and loss of fresh water necessary for agriculture and drinking, forcing them to migrate or move to cities. It may be difficult for them to obtain adequate housing [35]. These conditions naturally lead to economic losses, which

30 Independent Arabia. What Solutions Will Iraq Adopt to Face Climate Change? 2022. https://2u.pw/My3AkTS (Accessed on 20/5/2024).

31. Norwegian Refugee Council. Iraq: Climate Change Causes Crop Loss and Contributes to Displacement. 2023.https://www.nrc.no/arabic/news/2023/iraq-climate-change-causing-crop-loss-contributing-to-secondary-displacement/ (Accessed on 20/5/2024)

32. Raise Your Voice. Including Water Harvesting. Projects of the Iraqi Ministry of Agriculture to Combat Desertification. 2022.https://2u.pw/TDdT2o (Accessed on 20/5/2024)

33.World Bank. Iraq Country Climate and Development Report. 2022. https://www.albankaldawli.org/ar/country/iraq/publication/iraq-country-climate-and-development-report (Accessed on 20/5/2024)

34.Hareth Al-Abadi. Iraqi News Agency. 7 Million Iraqis Threatened with Lack of Access to Water in the Coming Years. 2022. https://www.ina.iq/152522--7-.html (Accessed on 20/5/2024)

35. United Nations Human Rights Office of the High Commissioner. Towards a Just Transformation: The Climate Crisis and the Right to Housing—Report of the Special Rapporteur on Adequate Housing as a Component of the Right to an Adequate Standard of Living, and on the Right to Non-Discrimination in this Context. 2022. https://www.ohchr.org/ar/documents/thematic-reports/ahrc5228-towards-just-transformation-climate-crisis-and-right-housing (Accessed on 20/5/2024)

reduce individuals' income and increase the suffering of marginalized and poor groups, making inadequate housing even more difficult for affected individuals [36].

Thus, pressure on the housing market in safe areas increases, forcing poor and marginalized families to live in informal areas, which exacerbates the housing crisis in the country. As a result, it is necessary to consider the interplay between environmental challenges, climate change, and the housing crisis to achieve sustainable development in Iraq.

Environmentally Friendly Buildings

In recent years, there has been a growing trend towards a sustainable approach to green urbanism—"environmentally friendly buildings"—to address challenges related to housing and the environment, as awareness of the impact of buildings on the environment has increased [37]. Environmentally friendly buildings, or "green buildings," are defined as buildings that are designed, constructed, and operated in a way that minimizes their negative impact on the environment. These buildings consider all stages of their life cycle, from design and material selection, through construction and operation, to demolition and recycling, thus achieving social, economic, and environmental sustainability [38].

Green buildings are an integral part of the global response to increasing environmental challenges resulting from human activity, especially regarding

36. World Bank. Climate Change Complicates Efforts to End Poverty. 2015. https://www.albankaldawli.org/ar/news/feature/2015/02/06/climate-change-complicates-efforts-end-poverty (Accessed on 20/5/2024)
37. Qais Najat. A Look at Social Law Journal. The Environmental Dimension in Housing Policies: Green Housing, Sustainable Housing? 2021.https://www.researchgate.net/publication/357048987_albd_albyyy_fy_syasat_alskn_alskn_alakhdr_skn_mstdam (Accessed on 20/5/2024)
38. Ismail, Nabil Taha; Hassani, Abdul Hassani Ali. Iraqi Council for Architecture and Planning. Obstacles to the Application of Green Buildings in Iraqi Cities. 2019. https://www.iasj.net/iasj/download/3007c4a2eba4ffae (Accessed on 20/5/2024)

climate change. Buildings play a central role in carbon dioxide (CO2) emissions, contributing more than 40% of total global emissions. [39].

Countries turn to green buildings for several main reasons:

1. Achieving sustainable development without compromising the quality of life for all inhabitants of the Earth.

2. **Increasing concerns about the depletion of natural resources and increasing harmful emissions.** Data from the U.S. Green Building Council indicates that residential and commercial buildings are responsible annually for 39% of total energy use, 68% of electricity consumption, and 30% of greenhouse gas emissions.

3. **Green buildings are a means to eliminate inequality in resource distribution** by providing affordable, healthy, and more resource-efficient housing with lower ownership and operational costs.

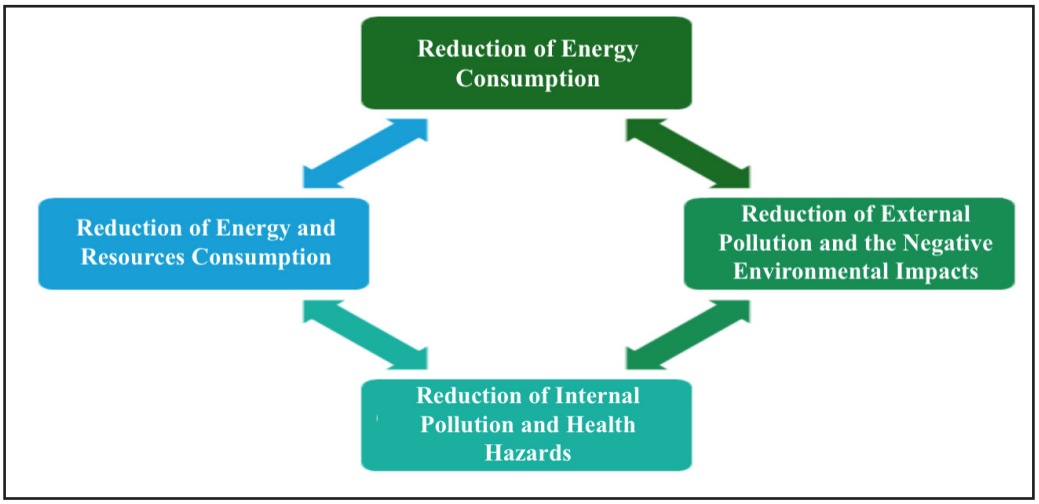
4. **Green buildings are much cheaper than traditional buildings** in terms of heating, cooling, and lighting costs, as they consume much less energy and produce less pollution, reducing service bills and making them more economical. In addition, these buildings provide comfortable spaces for work and living, enhancing their quality and value as a sustainable housing option[40].

In the Iraqi context, applying green buildings is essential to address harsh climatic conditions, including high temperatures, water scarcity, and drought. Green buildings can play a role in mitigating the housing crisis by providing sustainable housing solutions.[41]

39. Ibid.
40. Ibid.
41. Ibid.

The design of environmentally friendly buildings is based on a set of basic principles to ensure their sustainability (as shown in Figure 3).

Figure 3: The design of environmentally friendly buildings is based on a set of fundamental principles to ensure their sustainability.



(Source: Ismail, Nabil Taha; Hassani, Abdul Hassani Ali. Iraqi Council for Architecture and Planning. Obstacles to the Application of Green Buildings in Iraqi Cities. 2019.)

In addition, environmentally friendly buildings play an important role in addressing the housing crisis by reducing operational costs, improving quality of life, and supporting economic and social sustainability. [42]. This is because environmentally friendly buildings have many benefits:

- **They reduce greenhouse gas emissions, conserve natural resources, and reduce pollution,** meaning they contribute to environmental preservation.

42.Qais Najat. A Look at Social Law Journal. The Environmental Dimension in Housing Policies: Green Housing, Sustainable Housing? 2021. https://www.researchgate.net/publication/357048987_albd_albyyy_fy_syasat_alskn_alskn_alakhdr_skn_mstdam (Accessed on 20/5/2024)

According to a 2014 study conducted at the University of California, Berkeley, buildings constructed according to LEED standards contributed to a 50% reduction in greenhouse gas emissions compared to traditionally constructed buildings[43].

- They improve the health and comfort of residents by providing a healthy indoor environment.
- They contribute to creating more sustainable and environmentally responsible communities.
- **They achieve economic benefits** by reducing energy and water consumption and lowering long-term operational and maintenance costs [44]. Studies have shown that the economic benefits of green buildings include reduced operating costs and increased asset value. In the United States, figures indicate that maintenance costs have decreased by 20% in LEED-certified buildings compared to traditional commercial buildings, and operating costs for green building renovations have decreased by 10% in the first year. Investment in green buildings also increases property value, with increases reaching 10% or more, a rate that has doubled since 2012. LEED-certified buildings attract tenants willing to pay 35% higher rents compared to traditional buildings [45]. As demand for sustainable building increases, it is expected that the global green building market will reach $140.18 billion by 2028 [46].

43.Ahmed Shawky. Energy. Green Building: A Golden Opportunity to Reduce Carbon Emissions. 2022.https://2u.pw/yxaNcs8A (Accessed on 20/5/2024)
44. Ismail, Nabil Taha; Hassani, Abdul Hassani Ali. Iraqi Council for Architecture and Planning. Obstacles to the Application of Green Buildings in Iraqi Cities. 2019. https://www.iasj.net/iasj/download/3007c4a2eba4ffae (Accessed on 20/5/2024)
45. U.S. Green Building Council. Benefits of green building. https://www.usgbc.org/press/benefits-of-green-building (Visited on 20/5/2024)
46. Dina Qadri. Energy. The Carbon-Neutral Building Market Rises to $140 Billion by 2028. 2021. https://2u.pw/7bbABgVd (Accessed on 20/5/2024)

- Green buildings have also contributed to the creation of millions of jobs and generated hundreds of billions of dollars for the U.S. economy. Between 2011 and 2014, these buildings contributed $167.4 billion to the gross national product [47].

- **A case study conducted on green buildings in Japan to assess benefits** found that these buildings achieve major benefits, including reduced energy consumption and carbon dioxide emissions, cost savings, and improved health. They achieved reductions of 26–33% in energy consumption, 32–38% in carbon dioxide emissions, and savings of $1–1.5 million annually per building[48].

This indicates that adopting sustainable design principles can create buildings that minimize their negative impact on the environment, improve the health and comfort of residents, and provide affordable housing and savings in the long term.

Furthermore, several countries in the Middle East have adopted green buildings and various applications of sustainable design, most notably:

- **The United Arab Emirates:** Statistics from the Dubai Municipality show that the number of buildings that meet "green building" standards in Dubai is about 72,000, representing 58% of all buildings in all areas of Dubai by the end of the second quarter of 2023. These buildings contribute to achieving sustainability goals and preserving the environment by adopting standards for efficient resource, water, and material use, rationalizing energy consumption,

47. U.S. Green Building Council. Benefits of green building. https://www.usgbc.org/press/benefits-of-green-building (Accessed on 20/5/2024)
48. Balaban, O., & Oliveira, J.A. (2017). Sustainable buildings for healthier cities: assessing the co-benefits of green buildings in Japan. Journal of Cleaner Production, 163, 1-11. https://www.semanticscholar.org/paper/Sustainable-buildings-for-healthier-cities%3A-the-of-Balaban-Oliveira/970dace0cc548b2cabae3059bd62cb64fe1f192b (Visited on 20/5/2024)

recycling water and materials, thermal insulation systems, and waste separation and treatment [49].

- **Masdar City in the UAE:** This is one of the most prominent environmentally friendly cities, with construction beginning in 2008 to build a low-carbon sustainable city that relies entirely on renewable energy. Masdar City is considered the most sustainable city in the world [50]. These buildings consume 40% less energy and water compared to traditional buildings, reducing operating costs and improving resource sustainability. The buildings are constructed using low-carbon cement and 90% recycled aluminum, in addition to other locally sourced materials. The city relies on a 10-megawatt solar power plant, in addition to rooftop solar panels with a capacity of 1 megawatt, contributing to clean electricity and reducing carbon emissions.[51]. Construction costs are reasonable, as shown in the environmental villas project in Masdar City, where construction costs can be similar to traditional buildings, enhancing the economic feasibility of green buildings and making it accessible to a wider range of residents. [52]. The city also achieves economic and social sustainability, as it is an integrated environment that includes technology companies, research, and educational institutions, creating job opportunities that contribute to the sustainable development of society. [53].

49. Al-Khaleej. Green Buildings Enhance Dubai's Inspiring Model for Future Environmentally Friendly Cities. 2023. https://2u.pw/Zu26NBGJ (Accessed on 20/5/2024)
50. Cityscape Intelligence. Why Masdar is the world's most sustainable city. 2021. https://www.cityscape-intelligence.com/architecture/why-masdar-worlds-most-sustainable-city (Accessed on 20/5/2024)
51. Ibid.
52. Masdar. Masdar City - A template for sustainable urban development. 2019. https://masdar.ae/en/news/newsroom/masdar-city---a-template-for-sustainable-urban-development (Accessed on 20/5/2024)
53. Cityscape Intelligence. Why Masdar is the world's most sustainable city. 2021. https://www.cityscape-intelligence.com/architecture/why-masdar-worlds-most-sustainable-city (Accessed on 20/5/2024)

- **Msheireb City in Qatar:** This project reflects the country's vision for sustainable development and cultural heritage preservation. The project aims to revive the old Doha area with a focus on sustainability and innovation. The city is designed to reduce high temperatures using environmentally friendly materials such as heat-insulating glass and solar energy. The solar panels generate 1,400 megawatts annually and reduce energy consumption by 30%. The city relies on water reuse by 70%. Local plants resistant to heat and drought are used to reduce water consumption for irrigation. A waste collection and sorting system is followed, with most waste being recycled [54].

We conclude from this that the application of green buildings is an important step towards solving the housing crisis in Iraq sustainably. If applied widely, it will achieve a set of benefits, the most important of which are providing adequate housing, improving living conditions for residents, and preserving the environment by providing housing units that rely on renewable energy and sustainable construction technologies. It also provides economic benefits by creating many job opportunities in renewable energy and sustainable construction, providing a healthy and sustainable living environment, reducing operating costs, and increasing the value of buildings in the long term. It also contributes to reducing carbon emissions and increasing green spaces, helping to adapt to climate change and improve the environment, achieve well-being for residents, and improve the local economy.

However, some challenges may hinder the application of environmentally friendly buildings in Iraq, the most prominent of which are:

- Lack of effective laws for the construction of green buildings, which may make implementation difficult.

54. Msheireb Downtown Doha. Sustainability. https://tinyurl.com/23ycungf (Accessed on 20/5/2024)

- Shortage of sustainable building materials and necessary technical tools for green buildings.
- Lack of experience in designing and implementing green buildings.
- Current housing plans focus on the use of non-environmentally friendly materials, which hinders the adoption of sustainable methods.
- Lack of necessary financing from the public and private sectors to build green buildings is a barrier to the implementation of these projects.
- Lack of awareness and application of the concept of sustainability and green buildings at the level of government institutions and society, which hinders efforts to achieve social and economic comfort and well-being, and the preservation of resources.

Conclusion and Recommendations

Considering the many challenges facing Iraq, whether related to the housing crisis or environmental and climate change challenges, resorting to the construction of environmentally friendly buildings becomes an urgent necessity. Adopting sustainable construction technologies provides a comprehensive solution to a range of problems. By reducing energy and water consumption, improving the quality of life for residents, and enhancing economic and social sustainability, environmentally friendly buildings can significantly contribute to addressing the housing crisis.

Recommendations:

1. Develop supportive policies and legislation:

○ The Iraqi government should adopt policies and legislation that support and promote the construction of environmentally friendly buildings. This includes reviewing and amending current laws to encourage the use of sustainable materials and the application of green building techniques.

2. Provide financial and technical incentives:

○ Provide allocations and financial and technical incentives to encourage the private sector and investors to adopt environmental initiatives in housing projects. These incentives may include tax reductions, soft loans, and direct government support for green projects.

3. Enhance public awareness and train human resources:

○ Public awareness of the benefits of sustainable construction should be enhanced, and human resources should be trained to be able to efficiently implement and design these projects. Awareness campaigns and educational and training programs targeting engineers, architects, and contractors can be organized.

4. Encourage innovation in construction technologies:

○ Support research and development in sustainable construction technologies and environmentally friendly materials. The government and private sector can work together to finance and support research projects that contribute to developing new solutions for sustainable construction.

5. International partnerships:

○ Benefit from international partnerships and cooperation with global organizations specialized in sustainable construction. Iraq can learn from the experiences of other countries and adopt the best global practices in the field of green buildings.

6. Monitor and evaluate performance:

○ Establish a system to monitor and evaluate the environmental performance of new and existing buildings to ensure that environmental goals are achieved. These systems may include environmental performance indicators and periodic sustainability reports.

Conclusion

Environmentally friendly buildings are a comprehensive and necessary solution to the challenges related to housing and the environment in Iraq. By adopting these buildings, Iraq can achieve major economic, environmental, and social benefits, which will contribute to improving the quality of life for residents and enhancing long-term sustainability. This requires joint efforts from the government, the private sector, and society to achieve this ambitious goal.

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The center aims to utilize the vast amount of potential in Iraq's human resources by organizing programs to prepare and develop promising young people, including leaders capable of proposing, adopting and implementing visions and future plans that advance society and preserve its value-system based on the commitment to a high moral standard and rejection of all types of corruption.

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