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Al-Hafith, O

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A Review of the Iraqi Housing Sector Problems

Omar A. Al-Hafith[1], BK Satish, Pieter De Wilde[2]

Abstract— **Housing is one of the important necessities for people. It comes after food and drink according to Maslow's pyramid of human needs. It also influences countries' social cohesion, stability and development and at the same time is affected by their general conditions. Iraq has a housing sector crisis. The county experiences a large housing shortage. The Iraqi National Housing Policy identifies critical challenges in seven housing-related fields: housing production, land management, housing finance, infrastructure, construction materials, housing stock status and slums. This paper aims to present a better understanding of these housing challenges as a first step to the development of appropriate solutions. It presents a critical investigation of the housing sector's issues through exploring a wide range of literature to build a framework that critically evaluates and identifies the problems. The paper also quantifies the current housing shortage at around 1 million dwellings. Based on the extrapolation of trends towards 2030, it is estimated that Iraq has to build around 230000 dwellings annually to satisfy future demand. Results confirm the importance of the issues identified in the National Housing Policy, which gives it more validity. The paper concludes by proposing a series of measures to address Iraq's housing challenges.**
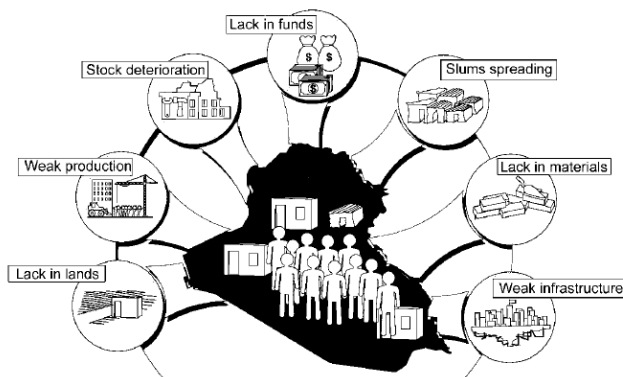
Graphical Abstract

Index Terms—**Iraq, Housing sector problem, housing shortage, housing need, housing policy.**

I. INTRODUCTION

Housing is a complex issue that relates to many fields and is affected by the general conditions of countries (Iraqi Ministry of Construction and Housing, 2010). Since the 1950s, the Iraqi housing sector has been challenged by several difficulties. Various housing policies, studies and strategies have been conducted on Iraqi key housing issues including slums, urban growth, housing shortage, housing production and housing policy. Key works have concentrated on investigating the housing situation and proposing solutions to deal with the dilemmas (Al-Hamawandi & Al-Qaisi, 2010; Al-Adhami, 1975). These efforts led to significant improvements in the housing sector during the 1970s and the 1980s (Iraqi Ministry of Planning, 2010; Yousif, 2012), however, the housing problems have never been totally solved. Since the mid-eighties, the housing conditions have deteriorated as a result of the war with Iran (1980 – 1988), the Gulf war 1991 and the following UN sanctions (1990-2003) and conflicts (UN-Habitat, 2003); in that period some studies, strategies and development activities were undertaken but did not manage to change the situation. Currently, the housing sector suffers from several problems that have led to slums spreading, overcrowding and stock decay. The housing shortage in the recent period is estimated to be between 1 – 1.5 million dwellings, which represent around 25% of the housing stock (PADCO, 2006; Iraqi Ministry of Construction and Housing, 2010).

In 2010, new national housing policy was prepared by the Iraqi government in cooperation with the UN to address the issues in the housing sector. According to this new national housing policy, there are problems in seven fields (Iraqi Ministry of Construction and Housing, 2010):

- Housing production: the current housing production does not satisfy population needs.

- Land management: there is not enough residential land for housing developments.

- Finance: there is a lack of financial resources for housing projects.

- Infrastructure: existing infrastructure does not match current needs.

- Housing stock maintenance: a part of the housing stock is deteriorating.

- Construction materials: are unavailable and expensive.

- Slums: they spread rapidly with the related negative impact.

As a result of these issues, the country suffers from a large and increasing housing shortage, which has been identified as the most important problem. To mitigate the identified problems, the National Housing policy has proposed five principles: (Iraqi Ministry of Construction and Housing, 2010):

- Identifying the public sector role in being responsible for supervising, putting main guidelines and policies and providing help for low-income households.
- Encouraging the private sector to take the main role in housing production.
- Modifying the current legislation and avoiding centrality in planning and decisions making to facilitate housing sector growth.
- Providing the required financial resources.
- Adopting new innovative ways to increase housing production.

This paper presents a critical investigation of the housing problems that are identified by the national housing policy. It also estimates the current housing shortage and future housing needs.

II. Study scope, objective and methodology

The study's scope is the housing sector in Iraq since the end of the kingdom era in the 1950s, focusing on the current housing issues that are identified by the national housing policy. Exploration of these challenges will form the basis for the development of appropriate and context-specific solutions in future work. This review paper has three goals:

- To explore the housing sector in Iraq.
- To critically investigate the identified problems of the national housing policy.
- To estimate the current housing shortage and the housing needs by 2030 to indicate the current and the long term demand.

The study's methodology to achieve these objectives has included conducting an extensive exploration of books, previewed research studies and formal reports about the housing sector. The references investigated were mainly collected from the following resources:

- The Iraqi Scientific Journals website which provides all Iraqi previewed journals' researches.
- Formal Iraqi agencies including the Iraqi ministries of Housing and Planning and the Iraqi Central Statistical Organization. They provide statistics and studies about the current and previous housing conditions in the country.
- The United Nations Organizations' reports about the housing sector in Iraq.
- A collection of books and theses about the Iraqi housing sector that has been obtained from some universities' websites.

The exploration of this wide-ranging literature has provided the required information to investigate the housing conditions in the country. It has also provided the required data to estimate the current housing shortage and future needs. The results of this integrated investigation give a clear picture of the previous and current housing conditions.

III. Investigating housing challenges

Each of the identified problematic fields was investigated through a review of previous studies that have focused on the housing sector in Iraq.

A. . Housing production

Housing production in Iraq passed through various stages during the last 60 years. Several studies have been conducted to manage housing production in addition to other housing issues. Among the most important studies are the Doxiadis plan in the 1950s that focused on slums and urban management in Baghdad and the Polservice study in the 1970s that investigated the housing conditions at that time. The latter was more holistic; it gave an estimation of the total housing need of the period 1980-2000 and proposed policies and guidelines to manage the housing sector (Al-Hamawandi & Al-Qaisi, 2010; Al-Adhami, 1975; Shaikley, 2007). By virtue of these efforts, there was notable progress during the 1970s and the 1980s, particularly in Baghdad. The annual housing production increased significantly and reached to 50000 dwellings per year, which led to a reduction in slums from 79.4% of the housing stock in 1956

to 56.9% in 1965, 44.0% in 1977 and to 10.0% in the eighties (Iraqi Ministry of Planning, 2010; Ellis, 1985; Yousif, 2012; Al-Rahmani, 1986). Unfortunately, this reduction did not last for a long time. A decline in the housing sector started in the mid-1980s because of the war with Iran. The situation became worse after the Gulf war in 1991 and the UN sanctions (1990-2003) (Al-Shock, 2008; Nashoor, 2012). The housing production reached its lowest level by 1996. After that, the production increased slightly because of the food for oil program that had positive impacts on the housing constructions. The production increased from around 400 dwellings in 1996 to around 24000 in 2002 (PADCO, 2006; Shaikley, 2007). In 2003, the US-led collation invaded Iraq and the housing production deteriorated once again. The production decreased to around 8000 dwellings in that year which represented around 25% of the pre-war construction rate. After that, It has gradually recovered and the production increased to around 32000 per year in 2012 (Shaikley, 2007; Central Statistical Organization (m), 2014). However, there are significant regional differences in the country. An active housing development can be seen in the Kurdistan region since 2003. By dedicating more than USD 13 billion investment capital for the period between 2006 and 2015, this region has witnessed significant housing progress since 2006 as a result of the private investment that has been encouraged by the investment law and stability (Investment Board/Directorate of Information, 2012).

B. Residential Land management

Land represents one of the main resources for the housing sector and its unavailability is one of the significant obstacles that stop housing sector progress. In Iraq, the government has been always responsible for planning, developing and delivering the urban plots. It has kept distributing plots to people as one of the strategies in its subsidized housing policies (PADCO, 2006). Urban planning is regulated by master plans

that have been developed in Baghdad for the whole country, with only a limited role for the local municipalities, which have been responsible for implementing the centrally decided plans. Unfortunately, the planning activities have retreated after the 1980s, which has led to weak and unplanned expansions of the Iraqi cities (UN-Habitat, 2003; United Nations,World Bank(A), 2003). Within this context, and as land is state-owned by default, around two million urban plots were delivered between 1980 and 2000 (PADCO, 2006). The current policy does not foresee changes in this process and delivery speed. Hundreds of thousands of urban plots were announced to be distributed within the "National Initiative for Housing" that was proposed in 2013 (Talqani, 2014; Prime Minister's website, 2013). Currently, despite of the fact that large numbers of plots have been distributed by the government since the 1950s, the number of available vacant plots is still insufficient to satisfy the housing needs. In addition to that, they suffer from lack of sufficient infrastructure services. As a result, people find obtaining land a challenge as plots are expensive. (Nikonorow, 2012; PADCO, 2006). Around 34% of households in six main Iraqi cities reported in 2006 that the high price of land had prevented them from buying or constructing a house (PADCO, 2006).

C. Housing finance

Finance is one of the main factors in implementing housing policies. It is the keystone that enables the housing sector to grow. Its role is in providing the required financial resources for people and the related institutions to construct housing projects (Ekram & Almlahoiesh, 2008;
Al-Mutlaq, 2011; Dora, 1988). The financial resources in Iraq are provided in two ways: the first one is by the public or private financial institutions and the second way is by households themselves (PADCO, 2006). The public sector's financial institutions, which include Real Estate Bank and National Housing Fund, deliver long term low-interest loans for housing construction purposes (Ekram & Almlahoiesh, 2008; Al-Mutlaq, 2011). However, these funders are inexperienced in dealing with low-income households and suffer from scarcity in capacity, shortage in supply, difficult mortgage conditions, deficiency in collateral and inefficient administration procedures (Al-Mutlaq, 2011; PADCO, 2006; Mumtaz, 2009). On the other hand, there are only a few private-sector financial institutions active and their role has been limited to the provision of a small number of short-term loans (Iraqi Ministry of construction and housing, UN, 2011; PADCO, 2006). This is due to the fact that the private financial institutions suffer from the current existing unstable conditions, lack of capital and the inappropriate mortgage and property legislation. In addition to that, they cannot compete with the public sector's "easy loans" programs (Nagy, 2006). One of the indicators of financial system failure is that according to a survey conducted by PADCO study in 2006 in six main Iraqi cities, 40% of the surveyed households reported that the reason for their inability to obtain a house had been the lack of the access to finance. On the other hand, less than 8% of the households that built a house had obtained funds from the financial institutions while the

remaining 92% depended on their savings or loans from relatives and friends (PADCO, 2006). Thus the current housing sector's financial system is considered to be weak and incapable of responding to the housing need (PADCO, 2006; Nagy, 2006).

D. Infrastructure

Infrastructure, like electricity, water supply, sanitation, waste collection and transportation, is highly important to give a residential environment the ability to support its occupants with healthy modern living conditions. Insufficient infrastructure in terms of quality and quantity may threaten people's health and productivity (Graham, 2010). In Iraq, the infrastructure was considered efficient until 1990. However, it has deteriorated after 1991 as it was severely damaged by the Gulf war in 1991, the US-led invasion in 2003 and suffered further from weak developments during the UN sanctions' period (UNDP - Iraq, 2012; United Nations-World Bank(B), 2003). In 1990, Iraq was producing around 9000 MW and the need was around 4500 MW. Currently, the electricity network meets around 50% of the local consumption, which forces people to manage private or shared generators to supply electricity for significant parts of the day (Al-Juboori, 2015; PADCO, 2006). The water supply system struggles from the problems of both quality and quantity. The sanitation system hardly manages to serve Baghdad, the capital, with many defects. The situation is even worse in other cities, where most houses use on-site septic tanks (Al-Juboori, 2015; United Nations-World Bank(B), 2003; United Nations-World Bank(B), 2003; United State Department of State, 2003). Many households suffer from low-quality roads and approximately half of them, especially in the cities' peripheries, have issues with garbage collection and typically have refused in front of their doors (Al-Juboori, 2015; PADCO, 2006; Al-Alaak & Al-Hadawe, 2007).

E. Housing stock repair

Most of the Iraqi housing stock, except the damaged dwellings by fighting, is still in relatively good conditions as it has been built of durable materials including stone, brick, cement and steel (PADCO, 2006). However, this does not mean that no deterioration has taken place. Naturally, buildings are threatened by decay through time because of many factors even if they have been designed and constructed properly (Hutchinson, Barton, & Ellis, 1975). Many dwellings in Iraq, especially in the poor old districts of Baghdad, Mosul, Basra, Karbalaa and other cities, are facing deterioration due to four factors (Al-Sadoon & Al-Mosawi, 2011; Jumaa & Abdul Hussain, 2011; Hasan, 2010; Kharofa, 2014; Raoof, 2010; Mohammad & Hadi, 2011; Al-Akkam, 2013): the environmental conditions, especially the impact of high-temperature differences, strong sunlight and humidity on buildings' construction materials (Hutchinson, Barton, & Ellis, 1975), buildings misuse and weak maintenance (PADCO, 2006), war damage (Human Rights Watch, 2015; Prados, 1999) and finally buildings aging (Hutchinson, Barton, & Ellis, 1975). By 2006, it was estimated that 18% of the stock was in poor quality and in need of major structural repairs; and 1.9% was

considered to be inhabitable (PADCO, 2006).

F.   . Slums in Iraq

Iraq's housing also includes one of the most important challenges around the world, which is the slum problem. In Iraq, slums are the human settlements that are constructed by people randomly and illegally on a state's plot or a private plot. These suffer from a severe lack of services (Central Statistics Organization, 2013). The construction quality of slums varies widely; slums may also illegally occupied governmental buildings (Mahood & Khalaf, 2011; Abdul Aziz, Ugaili, & Othman, 2009; Rasham, 2014; Abd Alhasan, 2013). Slums have evolved in Iraq since the 1950s (Mirza, 2014; Talib & Fadhel, 2015) as result of housing shortage, population growth, rural-urban migration, inefficient national policies and finally the long period of wars and conflicts (Rasham, 2014; Al-Baldawi, 2008; Al-Zubaidi, 2011; Talib & Fadhel, 2015). After a long period of a gradual decrease in numbers, this again increased significantly after the war of 2003. Some people took the chance offered by the collapse of the state to occupy lands and construct dwellings illegally. In Baghdad, these slums have amplified dramatically. The number of slum areas increased from 25 in 2003 to more than 200 in 2012 (Abdul Aziz, Ugaili, & Othman, 2009; Al-Amar, Khuthair, & Al-Hamawandi, 2012). Currently, they spread in many Iraqi cities, especially in Baghdad. They represent around 7.3% of the housing stock and provide shelter for around 2.4 million persons (Central Statistics Organization, 2013). Baghdad has the largest concentration of these slums where around 750000 persons live (Central Statistics Organization, 2013, p. 8; Hamza, 2015). Their main features are randomness, lack or absence of infrastructure and services and being unsecured. Their dwellers typically suffer from poverty, overcrowding, lack of education and being unemployed (Abdul Aziz, Ugaili, & Othman, 2009; Mahood & Khalaf, 2011; Hamza, 2015). All these features turn slums into unhealthy and unsuitable living environments where they harm their dwellers and have negative impacts on the whole neighbour societies (Al-Baldawi, 2008; Hamza, 2015).

G. Construction Materials

One of the main basic issues in developing the housing sector is the availability of construction materials and products. In Iraq, brick, cement blocks, stone, cement and steel are the main construction materials. (Juma & Abdul Hussein, 2011; Al-Saadi R. S., 2012; PADCO, 2006). Currently, they are obtained in two ways: the first one is by the local industry and the second one is by importing from abroad. (PADCO, 2006). The local industry is generally dominated by the public sector. It provides several kinds of basic materials like brick, cement, glass, ceramic and steel (State company for construction and industries, 2015), but it suffers from shortage of energy, with many plants seriously damaged during the wars, undeveloped and limited, which are preventing them from providing sufficient supply for the local market. The number of local industrial institutions decreased from 367 in 1980 to 184 in 1989 and to 146 in 1999 (PADCO, 2006; Mohammed F. M., 2010). This has led to increased imports from abroad, which is the second way of supply, to satisfy the shortage of local production. Presently most of the basic construction materials are imported to satisfy the local construction activities. For example, in 2012, Iraq imported 4 million tons of steel, about 65% of the local need, and 12 million tons of cement (State trading company for construction materials, 2011; Taib, 2014). Because of the high import, as well as other factors including economic changes and energy shortage, material costs have raised significantly, especially after 2003. This has added extra costs to the construction costs of houses and has hindered housing projects, leading to a situation where materials' costs in Iraq represent 55% to 65% of the total construction expenditures (Juma & Abdul Hussein, 2011; Iraq Building Materials Market Analysis, 2005). The main problem of materials in Iraq, next to high prices, is unavailability, which is attributed to the insufficient local materials industry. 81% of builders and contractors reported these problems in a survey conducted in 2006 by PADCO study (PADCO, 2006).

IV.   HOUSING SHORTAGE AND FUTURE NEEDS

A.   . Previous literature

A housing shortage has existed for a long time in Iraq. Because of that, it is not a new subject. There is a relatively long history and many related studies; among these studies are (Table 1):

TABLE 1
PREVIOUS STUDIES ABOUT THE HOUSING SHORTAGE AND NEED IN IRAQ

The author/s	Year	Housing shortage		Housing need		Notes
		For the year	The Estimates	For the year	The Estimates	
Hasan [1]	2013	2007	3207033	---	---	The estimate determined the housing shortage for nine cities and extrapolated the results for all Iraq, which may reduce its accuracy. There might be differences between cities and it may not be accurate to give an estimation for the whole country depending on a number of cities.
Al-Masody& Al-Saadi [2]	2012	2020	2200000	2020	5400000	Comparing with the currently available reports from the Iraqi ministry of housing and Iraqi central statistics organization, this study has exaggerated future dwellings' obsolescence rate and did not accurately estimated construction rate which has led it to give exaggerated and inaccurate estimates for the year 2020.
PADCO [3]	2006	---	---	2016	1200000	The estimate determined the housing needs in six cities and extrapolated the results to include the whole urban areas, which may reduce the accuracy as the unexamined cities may be different in their conditions. It also did not estimate the housing shortage.
ICSO [4]	2005	---	---	2012	2370000	It is outdated.
Polservice [5]	1980	1980	400000	2000	3380000	It is outdated.
Al-Ahami [6]	1975	1975	934000	1990	3500000	It is outdated.

Source: ((1)Hasan A. A., 2013; (2)Al-Saadi & Al-Masodi, 2012; (3)PADCO, 2006; (4)Central Statistical Organization, 2005; (5)Al-Rahmani, 1986; (6)Al-Adhami, 1975)

All these studies have helped to guide the previous housing policies and strategies, documenting the housing situations of their phases and providing the required base to continue the research in this field. However, their estimates may not be correct and realistic for the current shortage and the future need. This is due to several reasons, including of lack of accuracy, being outdated, being limited in their temporal and geographical scope or being structured depending on assumptions in estimating the current conditions. This research, therefore, adopts more recent data to present accurate assessments of the current conditions.

B.   Estimating housing shortage and future needs

To have a more comprehensive picture of the housing shortage, this research collected the related housing data from previous studies and formal statistics to have a better identification of the previous housing conditions and more accurate estimates of the current housing shortage and the future need. The following formulas were used for the estimates:

- *Quantity shortage = Households number – Formal housing stock*
- *Quality shortage = Households number –Total housing stock*
- *Housing needs = Future household number – (Total housing stock + Future deteriorating dwellings)*

Depending on what has been adopted by the previous studies, calculating both of the current quantity and quality housing shortage has been done simply by applying the first two stated formulas using the available related date. For the housing need, the research first adopted the exponential non-linear growth mathematical model to calculate the increase in households' number and used the resulted number in the third formula.

The quality shortage does not consider slums as a part of the housing stock. It indicates the shortage of adequate living environments. The quantity shortage considers any structure having the status of being a permanent living place as dwellings, thus including slums. The housing need indicates the basic number of dwellings that are required to be constructed in the future.

According to the estimates in Table 2, the current total quantity shortage and quality shortage are around 1 and 1.4 million dwellings respectively. The total housing needs until 2030 is around 3.4 million dwellings (Fig.1), (Fig.2).

TABLE 2: THE ESTIMATES OF THE CURRENT HOUSING SHORTAGE
AND THE FUTURE NEED
SOURCE: (AL-ADHAMI, 1975; SALEM, 2011; AL-RAHMANI, 1986)
(PLEASE REFER TO APPENDIX A FOR FURTHER DETAILS)

| Year	Population (000)	No. Households (000)	Housing stock (000)	Slum dwellings (000)	Quality shortage (000)	Quantity shortage (000)	deteriorated dwellings Estimation	Housing need (000)
1956	6135	1014	766	609	857	248	---	---
1965	8047	1087	1104	629	612	0	---	---
1977	12000	1538	1461	646	723	77	---	---
1987	16335	2192	2031	406	567	161	---	---
1997	22046	2863	2568	25	320	295	---	---
2007	29682	4301	3242	116	1776	1059	---	---
2011	33330	5207	4717	344	834	490	---	---
2015	36833	5940	4845	353	1448	1095	---	---
2030	50645	8440	---	---	---	---	57270	3537
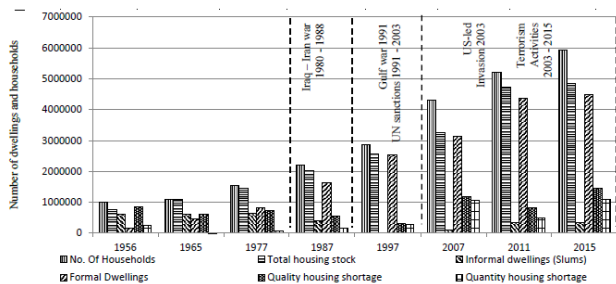
Fig.1: The housing conditions in Iraq 1956 - 2015
An analysis by the author depending on (Al Adhami, 1975 ; Salem, 2011 ; Al Rahmani, 1986) (Please refer to appendix A for further)
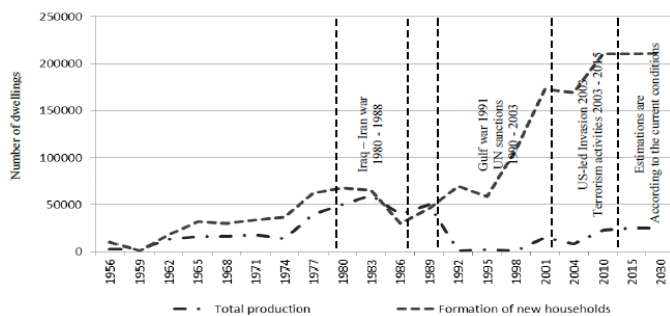

Fig.2: Housing production and new households formation in Iraq (1956-2030)
An analysis by the author depending on(Al-Adhami, 1975; Salem, 2011; Al-Rahmani, 1986)
(Please refer to appendix A for further details)

V. RESULTS DISCUSSION

The results indicate that, in spite of the relative improvements during the 1970s and the 1980s, the housing problems in Iraq have never been solved, which can be traced mainly to the consequences of wars and the inappropriate policies.

The current investigation reveals that the defects that are identified by the national housing policy are valid and indeed significantly affect housing development. The working of these factors is interrelated, leading to a significant housing shortage and, thereby, increasing the development of slums (Fig.3). Due to the inappropriate policies and general instability, the infrastructure has deteriorated, the financial system has been inefficient, and construction materials and the urban plots have been unavailable and expensive. These defects have led to a continuous shortfall between the production and need;

insufficient maintenance is putting further strains on the housing stock. As a result, the country has suffered from increasing housing shortage which has led to slums evolution and growth. According to this, after achieving stability in the country, a holistic and comprehensive solution approach is required to deal with the problems which may start from solving the defects of four fields: financial system, infrastructure, and land management and construction materials. The current housing production and the current housing stock status will be developed eventually by solving the previous defects. Slums will be decreased gradually as a result of increasing housing production, satisfying the housing need and having good quality stock.

Giving priority to the challenge of housing shortage has been a logical priority as, according to the current estimates, Iraq is required to build around a quarter of the current housing stock in the country, including all related facilities and provisions, to satisfy the current housing needs. The current quantity housing shortage is assessed to be around 1 million dwellings and the quality housing shortage is around 1.4 million dwellings. The housing need is estimated to reach about 3.5 million dwellings in 2030, which means that Iraq has to develop a plan to construct around 230000 dwellings annually until 2030 to satisfy the housing need. Furthermore, the estimates indicate that within the next 10 years, the Iraqi housing stock should approximately be doubled, which is a very quick expansion in such a short period and which requires to have new policies.
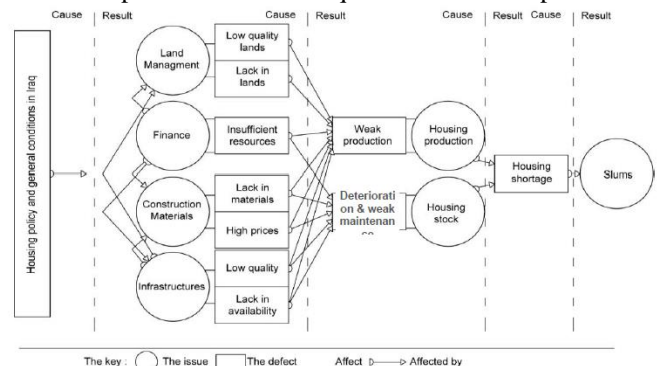

Fig. 3: The Interrelated problems and their sequence in the Iraqi housing sector
(Cause –result relationship)

CONCLUSIONS AND RECOMMENDATIONS

From the review of previous studies on housing in Iraq, as well as sources from the government-industry, the following conclusions can be drawn:

- The Iraqi housing sector has suffered from many challenges and defects since the 1950s. There was notable progress in the 1970s and the 1980s, but this did not last and the housing problems have never been solved.
- In addition to the possible weakness of the housing policies, it is clear that the three decades of wars and conflicts have stopped the progress and led to continuous deterioration in the housing sector.

- Currently, seven interrelated fields have severe consequences and cause issues for the housing sector in the country. The housing production is weak, the financial system is inefficient and there are dilemmas in the residential land in terms of quantity and quality, which can be said also about the infrastructure. Construction materials and products also represent an obstacle because of being expensive and unavailable. In addition to all of this, part of the current housing stock is deteriorating and in need of maintenance and repair.

- As a result of all these defects, the housing sector suffers from slums and large housing shortage. The latter is the most significant challenge and has the highest priority because of its vast extent and impact.

- The current housing shortage is assessed to be around 1 million dwellings and 1.4 million dwellings as quantity shortage and quality shortage respectively. The housing need in 2030 is estimated to be around 3.5 million dwellings, which means that Iraq has to build more 230000 from now until 2030 to satisfy the housing need.

- Providing stability and a suitable environment for housing development in the country is essential to start solving the problems. Regarding the housing sector-related fields, the solution approach should start from developing the basic housing development foundation which includes the financial system, land management, construction materials, and infrastructure services. The housing production and housing stock status developments will be supported by developing these interrelated fields. Slums and the informal settlements may shrinkage as a result.

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Appendix A: Housing sector statics in Iraq

Year	Private sector's Production (1)	Public sector's Production (2)	Total Production (3)	Formation of new households (4)	No. Of Households (5)	Household size (6)	Population (000) (7)	Total housing stock (including slums) (8)	Formal housing stock (9)	Overcrowding Households/dwellings (10)	Slums percentage (11)	Quantity Shortage (12)	Quality Shortage (13)	Estimated Housing Need (historical estimates and future estimates) (14)
56	----	2626(a)	2626	10178	1014049	6.05(a)	6135(k)	1956 Housing stock						10000
57	----	2896(a)	2896	5614	1024227	6.15(2)	6299(n)	766185(p)	157988(p)	1.1(p)	63.3%(o)	247864	856061	10000
58	----	1490(a)	1490	14221	1029841	6.3(2)	6488(n)							20000
59	----	3028(a)	3028	1276	1044062	6.4(2)	6682(n)							20000
60	12280(a)	1376(a)	13656	14064	1045338	6.65(2)	6885(n)	1965 Housing stock						20000
61	13170(a)	1773(a)	14943	1612	1059402	6.7(2)	7098(n)							20000
62	12140(a)	894(a)	13034	18128	1061014	6.9(2)	7321(n)							30000
63	12830(a)	250(a)	13080	3913	1079142	7(2)	7554(n)							30000
64	14430(a)	250(a)	14680	4377	1083055	7.2(2)	7798(n)							30000
65	16370(a)	86(a)	16456	32112	1087432	7.4(a)	8047(n)	1104452(p)	475250(p)	1.2(p)	56.9%(o)	None	612182	30000
66	18270(a)	105(a)	18375	28833	1115167	7.45(2)	8308(n)							30000
67	14810(a)	150(a)	14960	29509	1144000	7.5(n)	8580(n)							56600(a)
68	15735(p)	248(p)	15983	30306	1173509	7.55(n)	8860(n)							56600(a)
69	17140(p)	466(p)	17388	30171	1203815	7.6(2)	9149(n)							56600(a)
70	15730(p)	607(p)	16337	32247	1233986	7.65(a)	9440(k)	1977 Housing stock						138700(a)
71	15930(p)	2055(p)	17985	33637	1266233	7.7(2)	9750(k)							138700(a)
72	14363(p)	2900(p)	17263	35130	1299870	7.75(2)	10074(k)							138700(a)
73	14841(p)	1230(p)	16071	36337	1335000	7.8(2)	10413(k)							138700(a)
74	12123(p)	1605(p)	13728	36764	1371337	7.85(2)	10765(k)							138700(a)
75	14816(p)	1231(p)	16047	57504	1408101	7.9(a)	11124(k)	1461888(p)	815395(p)	1.3(p)	44.2%(o)	76573	723066	138700(a)
76	17173(p)	1230(p)	18403	72856	1465605	7.85(2)	11505(k)							138700(a)
77			46150(p)	62184	1538461	7.8	12000(k)							138700(a)
78			46150(p)	64419	1600645	7.75(2)	12405(k)							138700(a)
79	90183(p)	94417(p)	46150(p)	65393	1665064	7.7(2)	12821(k)							138700(a)
80			46150(p)	68095	1730457	7.65(2)	13238(k)	1987 Housing stock						138700(a)
81			46150(p)	70322	1798552	7.6(2)	13669(k)							138700(a)
82	---	---	60000(e)	75926	1868874	7.55(2)	14110(k)							138700(a)
83	---	---	60000(e)	65535	1944800	7.5(2)	14586(k)							138700(a)
84	---	---	50000(e)	95746	2010335	7.45(2)	14977(k)							138700(a)
85	---	---	50000(e)	56335	2106081	7.4(i)	15585(k)	2031888(4)	1625510	1.2(m)	10.8%(o)	160729	567107	138700(a)
86	---	---	40000(l)	30201	2162416	7.45(2)	16110(k)							138700(a)
87	---	---	10324(w)	58316	2192617	7.45(2)	16335(k)							138700(a)
88	---	---	11977(w)	72800	2250933	7.5(2)	16882(k)							138700(a)
89	---	---	20571(w)	45803	2323733	7.5(2)	17428(k)							138700(a)
90	---	---	15354(w)	70066	2369536	7.55(2)	17890(k)	1997 housing stock						138700(a)
91	---	---	6043(w)	53687	2439602	7.55(2)	18419(k)							169000(g)
92	---	---	1250(a)	69605	2493289	7.6(2)	18949(k)							169000(g)
93	---	---	1250(a)	52400	2562894	7.6(2)	19478(k)							169000(g)
94	---	---	1250(a)	69150	2615294	7.65(2)	20007(k)							169000(g)
95	---	---	2000(f)	58932	2684444	7.65(2)	20536(k)	2568592(6)	2542906	1.3(m)	1%(5)	294524	320210	169000(g)
96	---	---	400(f)	119740	2743376	7.7(2)	21124(k)							169000(g)
97	---	---	1000(f)	85195	2863116	7.7(2)	22046(k)							169000(g)
98	---	---	1000(f)	108159	2948311	7.7(2)	22702(k)							169000(g)
99	---	---	2000(f)	112740	3056470	7.65(2)	23382(k)							169000(g)
00	---	---	4000(f)	112523	3169210	7.6(2)	24086(k)	2007 Housing stock						169000(g)
01	---	---	15000(q)	172996	3281733	7.5(2)	24813(k)							169000(g)
02	24000(d)	---	24000(q)	153483	3454729	7.4(2)	25565(3)							169000(g)
03	53000(d)	---	53000	161093	3608212	7.3(2)	26340(l)							169000(g)
04	8000(d)	---	8000(q)	169145	3769305	7.2(2)	27140(l)	3242220(m)	3125500	1.3	3.6%(5)	1059519	1176239	169000(g)
05	8000(d)	---	8000	177264	3938450	7.1(2)	27963(l)							169000(g)
06	13000(d)	---	13000	186025	4115714	7.0(2)	28810(3)							200000(v)
07	9000(d)	10283	19283(c)	320724	4301739	6.9(a)	29682(l)							200000(v)
08	10000(d)	12126	22126(c)	103507	4622463	6.9(2)	30572(l)	2011 Housing stock						200000(v)
09	11000(d)	10918	21918(c)	271106	4725970	6.7(l)	31664(l)							200000(v)
10	13000(d)	9805	22805(c)	210736	4997076	6.5(2)	32481(l)							200000(v)
11	14000(d)	9656	23656(c)	233457	5207812	6.4(c)	33330(l)	4717622(u)	4373236	1.3(e)	7.3%(f)	490190	834576	200000(v)
12	16000(d)	12096	32196(t)	224995	5429682	6.3(2)	34207(l)							200000(v)
13	11000(d)	13526	22122(t)	141290	5654677	6.2(t)	35059(l)							200000(v)
14	---	---	25000(l)	144839	5795967	6.2(2)	35935(3)							200000(v)
15	---	---	25000(l)	148520	5940806	6.2(2)	36833(3)	4845596(4)	4491867	1.2	7.3%(5)	1095210	1448939	200000(v)
30	---	---	---	---	8440833	6.0(2)	50645(3)	Housing need (2015 – 2030) = 8440833- 4845596- 57270 (Deterioration per year is considered as constant number 3818(3))						3537967 (Annually 235864)

Appendix A Key Notes

	Referenced data
	(Al-Adhami, 1975)[a]; (Housing Association, 2013)[b]; (Central statistcal organization (f), 2012)[c] ; (Central statistcs organization (d), 2013)[d]; (Iraqi Ministry of Planning, 2010)[e]; (PADCO, 2006)[f]; (Al-Hamawandi & Al-Qaisi, 2010)[g] ; (Salman, 2007)[i] ; (Salem, 2011)[k] ; (Fayyad, 2012)[l]; (Al-shock, 2008)[m]; (Jan Lahmeye, 2006)[n]; (Yousif, 2012)[o]; (Al-Rahmani, 1986)[p] ; (Shaikley, 2007)[q] ; (Central Statistics Organization, 2013)[r]; (Central Statistical Organization, 2005)[s]; (Central Statistical Organization (m), 2014)[t]; (Central Statistical Organization (U), 2011)[u] ; (Iraqi Ministry of Construction and Housing, 2010)[v]; (United Nation, 1995)[W]
---	**Data is not available and cannot be estimated**

Values were estimated depending on calculations based on the available referenced values <u>1. Estimating through formulas :</u>

- Total production = private sector's production + public sector's production.
- New households formation = households number in a specific year – households number in the previous year.
- Household size = Total population / No. of households.
- Number of households = total population / household size.
- Formal housing stock = Total stock – slums dwellings
- Future deterioration = the estimated number of the annually deteriorated dwellings × number of years

<u>2. Estimating by assumptions depending on the available data (only in the following cases);</u>

(1) The total housing production data for the year 1986 and the period 2014 -2015 is not available. The relevant values estimated according to previous and following years.

(2) Household average size. The available data are for 1956, 1965, 1977, 1987, 1997, 2007 and 2011. The other values were estimated with values that represent a bridge between the two identified limitations.

(3) Total population in Iraq: The unavailable values were estimated according to the growth rate of the previous year.

(4) The total housing stock for 1987 was calculated from the summation of 1977 stock with the production of the period 1977-1987. The stock of 2015 was estimated depending on the summation of 2011 stock with the production of the period 2011-2015.

(5) Due to the lack of the available data regarding the slums percentage for the years 1997, 2007 and 2015 the estimation was done according to the following:

- The slums for the year 1997 was estimated building on that slums grown in Baghdad from 25 to 200 between 2003 and 2012 which represented an eight times increase. Accordingly, the percentage of slums of 2011 divided over eight to make an estimate of 1% for the year 1997.
- 3.6% was given to the year 2007, which is a value between 1997 estimated value and 2011 referenced value.
- The same value of 2011 referenced value was given to the year 2015.

(6) The formal census of the year 1997 included only 15 governances and excluded the Kurdistan region. Because of data unavailability, 20% of the census's value was added to estimate the total housing stock as the share of the Kurdistan region's housing stock has been always around that percentage.