Identification of Effective Integrated Indicators for Sustainable Affordable Housing Provision

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Abstract: The affordable housing sector is receiving increasing attention in developed and developing countries. That attention increased due to the economic inflation and the increasing population growth, which generated a housing deficit affecting low and middle-income households. Accordingly, the research gap emerged with the need to search for affordable and sustainable housing in the residential built environment that meets low- and middle-income family groups’ economic, social, and environmental sustainability criteria. This paper focused on identifying the most important planning and design indicators contributing to affordable housing provision, integrated with sustainability criteria to achieve part of the comprehensive sustainable development vision. This study aims to identify indicators and produce a framework that works as a guideline to provide reasonable housing that is adequate for low and middle-income groups and to reduce householders’ tolerance of its operational costs. A preliminary list of 72 sustainability performance indicators of affordable housing was identified through an extensive literature review. This was followed by a derived two stages framework to define housing affordability. These findings provide useful references for policymakers as well as industry practitioners to develop affordable housing programs sustainably. This helps to achieve the sustainable development at the regional scale.

Keywords: Affordable housing; affordability; sustainable housing; indicators.

1. Introduction
The wave of rapid urbanization that swept the entire world was accompanied by an unprecedented increase in population growth rates across all countries. According to the “World Population Prospects: The 2015 Revision”, the expectation of the world population will reach 8.5 billion by 2030, and 9.7 billion in 2050 [1]. Massive population inflation accompanied by economic inflation caused a new housing crisis that most of the world's major cities, centers and developing countries suffer from, resulting in many economic, social and political problems. This is what pushed countries to readopting affordable housing policies for citizens, especially for low and middle-income groups, to respond to major cities' social and political agenda solving the crisis of the growing demand for housing [2].

However, the implications of the policies and directions of global organizations calling for sustainable development in the housing sector, and the significant impact on the consumption of materials and natural resources and the continuous need for operational energies that have been proven by recent studies [3]. All of that affected the specifications of affordable housing and changed the prevailing view by limiting it to the necessity of achieving optimal solutions on the economic side only, which led to serious problems at social levels, like cultural and psychological problems[4]. All of that led us to the research gap for finding affordable and sustainable housing in the residential built environment that meets the economic, social, and environmental aspects for low and middle-income family groups. Accordingly, the research problem emerged with a lack of clarity in planning and design...
indicators to integrate affordable housing requirements and the criteria of economic, social, and environmental sustainability aspects to produce affordable and sustainable housing.

2. Research methodology
- The theoretical framework of this research will depend on the following steps:
  - Defining the concepts of integration, sustainable development, and affordability in architecture.
  - Adopting a group of specialized studies and research in affordable housing, referred to in the theoretical framework of this study, is a source for identifying the most significant indicators for affordable and sustainable housing provision within the economic, social, and environmental aspects.
  - Present a framework that concludes the direction of indicators in the planning and design process to provide affordable and sustainable housing, to be adopted as a knowledge base for specialists and designers in the housing sector.

2. Integration in architecture
The term "integrated" in architecture refers to the design process that has been completed. In contrast, the term "integrative" indicates that it requires a proper understanding of the interrelationships between materials, natural resources, systems and design, and spatial elements. However, they both share the preparation for the conceptual design of sustainable buildings and how to turn them into reality. Often the integrated design of buildings is the actual application of the design process according to the requirements of sustainability [5], and it requires thinking in a holistic view rather than dealing with it fragmentary [5].

Accordingly, any project will require an understanding for the physical, social, economic, ecological, climatic, and organizational context. The integrated design becomes basically dependent on the strategic organization of all the above data [6].

Based on the clarification mentioned earlier of the term integration in architecture, we emphasize that integration is usually done by adopting multiple intellectual approaches (with scales and variables that may be similar or contradictory, or compatible with each other) to produce an integrated product according to the data of a specific time and place. The integrated design approach has been linked to sustainability applications because it is based on multidisciplinary approaches. Accordingly, the generalizations of the concept of sustainable development and the intent behind its applications and their foundations will be presented.

3. Sustainable development
The concept of sustainable development generally refers to the necessity of expanding people's choices and capabilities in improving the quality of their living through social capital. That can be employed with the most significant possible degree of equality to meet the needs of current generations without endangering the needs of future generations [7]. So That goal needs to be achieved to limit the usage of natural resources because we humans are consumers at rates greater than the earth and its resources can produce and support. Furthermore, to achieve an ecological balance between consumption and replacing, controlling the waste amounts that earth cannot contain [4].

Accordingly, sustainable development can be considered an application that integrates multiple standards and approaches, including efficiency by using; renewable energies, minimizing waste generation, controlling pollutants, reducing the cost of the product, and minimizing negative social influences. Increasing the quality of the internal environment, focusing on the environmentally friendly user, user comfort, and many social, cultural, religious and entertainment aspects [4].

Sustainable housing has become one of the global sustainability issues that concern stockholders and researchers in all fields, especially those interested in issues of environmental preservation and the ecological balance that can only be achieved by completing the sustainable development aspects of all forms, including housing development that meets the human need for adequate housing which meets all needs [8].
To sum up, sustainability in architecture is the product of the practical application of the integration process that includes several criteria, including energy efficiency, durability, reducing waste and social impacts, generating a good internal environment, controlling pollution, reducing building operating costs, environmental friendly users, and users comfort. This emphasizes how significant the impact of both the construction and operation of the building is to achieve sustainability.

4. Sustainable housing development
Since sustainable housing is part of the comprehensive vision of sustainable development, which means meeting the needs of the present without compromising the ability of future generations to meet their needs. The application of the sustainable development idea has become vital and obligatory to achieve a balance between human activities and the components of nature, such as water and depleted energy resources, without threatening the economic and social systems of future generations, which leads us to consider sustainability as a fundamental principle in housing design. At the same time, it is becoming one of the most important dimensions that must be adopted in evaluating housing quality. Moreover, sustainable housing should be socially acceptable, economically viable, environmentally friendly and technically feasible [9]. The provision of sustainable housing does affect the criteria of planning, designing, constructing, and operating it, especially in specifications of building materials, operational components, design decisions, and the implementation process. The relationships generated by the integrative design are essential for the continuity of operation and avoiding the temporal obsolescence of use. To be accurately sustainable, it must be characterized by durability of the physical structure, social, and environmental aspects [4].

So, the availability of quality housing that provides comfort to its residents is necessary and a required right for every citizen and an essential duty on the state administration. This necessity is one indicator of sustainable development in society [10].

5. Affordable housing
Below, we refer to some different opinions regarding affordable housing in the architecture field, as Sivam and Karuppannan [11] defined affordable housing as small housing units usually constructed from low-cost building materials for houses located in the suburban’s. Wallbaum, Ostermeyer [12] described it as the dwelling that can be transferred to family ownership after a certain period, usually between (15-30) years. Frank [13] described their concept of affordable housing as being available to all household groups with different incomes, as affordability is an interactive result for the cost of land, construction, household income, and the behavior of expending and saving money, along with other demographic factors such as family size.

Al-Hazzaa [14] stated that the process of obtaining affordable housing means the ability to obtain adequate housing to ensure his basic needs within his financial abilities, whether at present or in the foreseeable future. While Abdellatif and Al-Fortea [15] define it as That house that fulfills the necessary interests of the individual and his family meets the minimum needs shelter, at a reasonable cost commensurate with their income in the current and foreseeable future.

On the other hand, the term "affordable housing" was used to represent all types of housing that are provided by governments and their housing agencies and private sector companies cooperating with the public sector [4]. According to financial ability limits, this housing needs to cover qualities that suit the family’s current needs and accommodate its future desires within acceptable standards, considering that no financial efforts are imposed to operate or maintain it during the occupancy phase [16]. According to the definitions above, it appears that the term “affordable housing” is closer to understanding its problem is related to the social class and financial ability of households rather than the requirements of performance according to the prevailing concept. However, the modern lifestyle demands have led to a change in the known concept of basic demands. Where today, families are looking beyond having shelter.

Accordingly, affordable housing can be procedurally defined as housing in which most of life’s needs are met in quantity and quality at costs that do not cause financial overhead for the individual or family and without failing the ability to meet basic needs of providing the living place”, while the process of housing affordability will be a process of managing and coordinating housing and non-housing inputs,
so that the outputs lead to ensuring the availability of affordable housing first. Secondly, affordable the process of living in it, based on the type of inputs and the extent of their interconnectedness and complementarity with each other, which may require the state to contribute to the coverage of affordable housing for the poor segments of society, especially the youth, by ensuring the availability of free lands, with all their support and logistical services, with Partial participation from the value of the housing unit cost, as well as securing financial loans for periods of time commensurate with the incomes of poor families, especially similar young families.

6. Integration of affordable housing and the pillars of sustainability

The process of affording to house is a complex issue. In order to improve the quality of living and achieve a sustainable society, all aspects and standards of sustainability must be taken into account. Previously, affordable housing was known as (the resident's ability to cover his housing expenses), which is a precise definition. However, the new measurement standards, such as integration between housing and place adds an essential criterion for measuring the availability of affordable housing for people and society as a whole [17]. So, the need for a framework to achieve economic, social and environmental sustainability to ensure the availability of public and affordable housing, which is an urgent and essential requirement for three direct reasons as [18] described the first reason that housing is a natural human right with far-reaching consequences for the individual, and the most important of which are a sense of well-being, belonging and patriotism. The Second, about the implications of housing type that link the quality of housing and performance provided by the residents. The third one is about its ability to provide safe and reliable housing that contributes to establishing the foundations for all segments of society and provides comfortable living at the individual and nation level by linking it with non-residential institutions such as education, health, amenities, and achieving Social cohesion.

In a study of Dezhi, Yancho [19] defined sustainability in the housing aspect procedurally as the development of affordable housing that meets the current requirements and housing needs of low and middle-income groups, provided that the possibility of meeting the future housing needs of the same groups. So the main goals is Achieving an integrated quality that includes environmental, social and economic performance. Whereas sustainable housing was defined as housing that is affordable and available in the housing market, ideal in the use of green materials, reducing non-renewable energies and maximizing the use of renewable energies, and has the quality and good accessibility to all facilities and services of daily life [9].

In another definition, affordable housing has been described as housing that reduces or removes the pressures that the housing acquisition process force for low-income groups and households that need shelter, to assist them in obtaining the necessary needs according to sustainable principles, in compliance with the housing need and with the lowest acceptable standards. On top of that, it has to get good accessibility to work sites and services of all kinds [18]. While another study proposed a definition that brings the two previous variables together, adding to them the characteristic of integration. So that the definition of integrated sustainable affordable housing is a combination of housing that can be owned at the lowest possible cost, taking into account public safety conditions, meets healthy living, and covers all aspects of sustainability [9].

When detailing the abovementioned terminological definitions, we find that the first characteristic of sustainable housing is the necessity of affordable housing in areas with good accessibility to all living facilities. In comparison, the definition of affordable housing raises the necessity of establishing it in accordance with the principles of sustainability and at possible costs so that the mutual relationship by describing the terms requires that they are integrated. Earlier discussion confirms the need to reach a practical framework that integrates the various inputs for the availability of affordable housing according to the three sustainability pillars. To begin with, the current study will adopt the procedural definition of (integrated of affordable and sustainable housing) as “a house that meets the requirements of economic, social and environmental sustainability and the requirements of affordable housing, to produce a house that requires the lowest material costs to own and operate, and is characterized by its availability, ease of acquisition, design, flexibility, and quality, and fulfills the requirement for accessibility to all facilities with the lowest consumption of non-renewable energy. It will be presented in the following sections to clarify the expected impact of integrating sustainability pillars with affordable housing programs.
6.1 The impact of applying economic sustainability on affordable housing

The main goal of affordable housing programs is to enhance and facilitate housing for households with low incomes and achieve the integration of the economic sustainability aspect. Moreover, it requires achieving two critical aspects: covering the cost of tenure and covering the costs of transportation and energy expenditures for housing (i.e. coverage of operating costs with transportation expenses) [20]. When the operational (i.e. the bill of gas, water, electricity, etc.) and transportation (i.e. transfers between the dwelling and worksites) costs are reduced, families with low incomes will be able to redirect their financial resources to non-residential needs. In the event that affordable housing programs exceed consumers’ expectations, it can be considered an essential indicator for the aspect of economic sustainability. In affordable housing programs, Developers and investors should adopt cost reduction strategies, like using locally available building materials and techniques, which saves some of the financial costs added to the whole production process for developers and investors [21], as well as the increase in housing densities, construction, the proximity of work sites, and logistical and support services.

6.2 The impact of implementing environmental sustainability on affordable housing

Environmental sustainability often highlights issues related to climate change and carbon emissions. This is what leads us to adopt environmental sustainability indicators in the planning and design processes of affordable housing programs. As an example, maximizing the efficiency of renewable energy, water use efficiency, efficient use of natural resources, waste management, flexibility and durability, ensuring the availability of a healthy and comfortable internal environment, and reducing the environmental footprint to reduce the deficiency of biological diversity [20]. Concerning families with low incomes, environmental sustainability is a significant entry point to improve their health status because any negative impact on their physical and mental health will negatively affect their economic situation. This requires following a set of strategies followed in sustainable planning and design, including [21]:

- Adopting correct and appropriate planning for land uses and moving away from areas that cause immediate or future health hazards.
- Creating functional use diversity in the uses of the land and its natural and logistical components. It is a very desirable proposal in affordable housing programs because it facilitates access to various service facilities, reduces transportation costs, and ensures the efficient use of the land and its natural environmental resources.
- Achieving the idea of adaptation flexibility over time in affordable housing is one of the most important strategies to be applied in sustainable housing. Adaptation satisfies the changing needs over time of the inhabitants and avoids the occupants changing their dwellings that negatively affect the natural environmental resources.
- Creating green public spaces for the residents is one of the important keys to living in a healthy and comfortable environment and has good and positive effects on healthy and comfortable living, which is often neglected in traditional affordable housing programs.

6.3 The impact of applying social sustainability on affordable housing

The importance of social sustainability in affordable housing programs is evident in the equitable distribution and consumption of housing sector resources, focusing on horizontal and vertical equity. Horizontal equity refers to providing equal opportunities to people with similar circumstances and needs. In contrast, vertical equity refers to providing unequal and greater opportunities for people who had financial and housing needs, so specific limitations or barriers should not be imposed or included in the housing distribution process. However, equal opportunities are given to all qualified by subscribing and submitting applications for affordable housing [21]. Furthermore, social sustainability is related to the Local culture, aesthetic values, safety, and security of the housing community, and the quality of housing and neighborhood, which should be taken into consideration in housing planning and design [21].
In this regard, the indicators of the social sustainability pillar in the affordable housing provision process will be comprehensive for all of its planning and design facilities, starting from the indicators of its housing units to all its supportive and logistical services. The importance of integrating the pillars of sustainability and the requirements of affordable housing is evident, which will not be limited to raising the level of affordable housing for families with low and middle incomes but will also map and clarify the future of affordable housing programs in general. Also, it forms an essential part of the housing sector, whose positive results will flow into the achievement of sustainable development goals. This does not mean that the integration process between planning and design approaches for affordable housing and the approaches to sustainability applications is free of challenges. The most important of which is pushing governments, developers, and agencies for affordable housing projects to accept the principle of integration, providing support with obligatory policies for investors and engineering teams, and spreading awareness among the beneficiaries of the importance of the paradigm shift.

7. Findings and discussion

According to the definitions of affordable housing, the agreed problem concerns the definition of affordable housing from an economic perspective only, where the price of the house is the only criterion adopted for measuring affordability in the market. The modern concept took multiple dimensions to be compatible with global sustainable and affordable housing standards. Sustainable development aims to stimulate the development and growth of societies at all levels by following a holistic approach with multiple dimensions and inputs related to economic, social, environmental, and cultural aspects of life. To identify indicators for sustainable affordable housing, a comprehensive review for (21) study was first conducted. Consequently, a list of (72) potential effective indicators for sustainable affordable housing was established. These indicators were derived mostly from peer-reviewed articles. These indicators are categorized as economic, social, and environmental aspects, as shown in Tables 1 to 3.

| No. | Indicators                                      | Reference          |
|-----|------------------------------------------------|--------------------|
| 1   | House Price in relation to income               | [17, 21, 22, 23]   |
| 2   | Rental costs in relation to income              | [17, 21, 22, 23]   |
| 3   | Running costs for public housing                | [22]               |
| 4   | Site preparations costs                        | [22]               |
| 5   | Minimize design standards to lower the costs    | [24, 25, 26]       |
| 6   | Mandatory inclusion of affordable projects in privet sector projects | [27]               |
| 7   | Lower the interest of housing loans for developers | [27, 28]     |
| 8   | Ease and reduce the occurrence of litigation and disputes | [27]               |
| 9   | Improve the land supply from government to lower housing costs | [27, 28, 29] |
| 10  | Transportation costs                            | [17, 21, 23, 24, 29, 30] |
| 11  | Infrastructures costs                           | [26, 27, 29]       |
| 12  | Formulate supportive housing policies           | [27, 28]           |
| 13  | Ensure balanced housing market                  | [21]               |
| 14  | Cost effectiveness                              | [21, 26]           |
| 15  | Non-housing costs                               | [21, 23]           |
| 16  | Providing human resources for housing development| [21]               |
| 17  | Mortgage availability and interest rates         | [3, 17, 23]        |
| 18  | Availability and access to employment           | [17, 23]           |
| 19  | Availability of housing accommodation           | [23]               |
| 20  | Module system and units standardization         | [25, 31, 32]       |
| 21  | Housing Mass production                         | [25, 32]           |
| 22  | Financing system                                | [25]               |
| 23  | Funding organizations                           | [24, 28]           |
| 24  | Value of housing units after use                | [30]               |
| 25  | Mechanism of pricing housing units              | [33]               |
Table 2. Social Sustainable Indicators for affordable housing.

| No. | Indicators                                                                 | Reference                  |
|-----|---------------------------------------------------------------------------|----------------------------|
| 1   | Performance of housing units                                              | [22, 27]                   |
| 2   | Providing Users needs and achieve satisfaction                            | [17, 22]                   |
| 3   | Managing and maintaining housing units and facilities                     | [8, 21, 22, 29, 30]        |
| 4   | Adherence to projects schedules                                           | [22, 27]                   |
| 5   | Achieve project Team satisfaction                                         | [22]                       |
| 6   | Effect of disputes on the involve parties                                 | [22, 28, 32]               |
| 7   | Performance of housing project                                            | [21, 22]                   |
| 8   | Project Aesthetics                                                        | [22]                       |
| 9   | Technical specifications of housing units                                 | [22]                       |
| 10  | Application of building technology                                         | [22]                       |
| 11  | Marketing the housing project facility                                    | [22]                       |
| 12  | Construction cost performance of project facility                         | [22]                       |
| 13  | Waiting Time before receiving housing unit                                | [22]                       |
| 14  | Subsidies provision for housing                                           | [27]                       |
| 15  | Equal and balanced distribution of housing units for households           | [3, 21, 24]                |
| 16  | Tenure security                                                           | [21, 28]                   |
| 17  | Harmonious social relationship                                             | [21]                       |
| 18  | Social acceptability                                                      | [21, 33, 34]               |
| 19  | Security                                                                  | [17, 23, 24, 28, 30, 34, 36]|
| 20  | Privacy                                                                   | [21, 23, 24, 32, 34]       |
| 21  | Suitability                                                               | [21]                       |
| 22  | Quality of housing units                                                  | [30]                       |
| 23  | Multi type and size of housing units                                      | [3, 29, 33, 36]            |
| 24  | Organizing the human scale                                                | [34, 36]                   |
| 25  | Desirability                                                              | [33]                       |

Table 3. Environmental Sustainable Indicators for affordable housing.

| No. | Indicators                                                                 | Reference                  |
|-----|---------------------------------------------------------------------------|----------------------------|
| 1   | Energy efficiency                                                         | [8, 17, 21, 22, 23, 26, 29, 30, 33, 36, 37] |
| 2   | Housing Life cycle cost                                                   | [8, 22]                   |
| 3   | Housing environmental performance                                          | [8, 27, 37]               |
| 4   | water efficiency                                                          | [8, 21, 29, 30, 31, 33, 36, 37] |
| 5   | Selection of housing projects location                                     | [27, 29]                  |
| 6   | Mix land use Planning                                                     | [3, 8, 27, 31, 34, 36]    |
| 7   | Land use efficiency                                                       | [8, 21, 25, 29]           |
| 8   | Housing density                                                           | [3, 21, 24, 29, 31, 33, 36]|
| 9   | Disaster resistance                                                       | [21]                      |
| 10  | Adequate living space within small size units                              | [21]                      |
| 11  | Availability of green public spaces                                       | [3, 17, 21, 23, 36]       |
| 12  | Housing quality( reliability and durability)                               | [17, 21, 35]             |
| 13  | Effective utilization of resources                                        | [8, 21, 29, 31, 36, 37]  |
| 14  | Accessibility to public transportation                                     | [3, 8, 17, 23, 24, 29, 31, 36] |
| 15  | Waste management for housing project                                       | [23, 29]                 |
| 16  | Local design                                                              | [26, 34, 37]              |
| 17  | Functional efficiency                                                     | [8, 17, 24, 25, 26, 37, 38]|
| 18  | Functional and structural Space flexibility                               | [24, 25, 26, 38]          |
| 19  | Building material efficiency                                              | [8, 25, 26, 29, 30, 34, 35, 36] |
| 20  | Environmental design criteria                                              | [8, 30, 34]              |
| 21  | Compact planning and design                                               | [26, 31, 36]             |
| 22  | Recycle and reuse construction material                                    | [29, 30, 36]             |
These studies showed the real shifting of the global trend towards the availability and accessibility of housing, and the affordability of its acquisition method for all household groups, especially for the young groups. It focused on adopting sustainability characteristics, especially for family groups with low and middle income, indicating the effective inputs that can be integrated at multiple levels. These integrations include housing government policies, planning, and design stages of public housing. All of that contributes to making an easy living of individuals and households and not being burdened financially and physically due to lack of consideration for details that may negatively affect the social and environmental aspects and affect subsequent and cumulatively on the family’s economic side.

These inputs are framed as indicators, which being identify according to the sustainable aspects. The following discussion will take into consideration the ranking of each indicator based on the number of occurrences found in the literature. Table 1 shows indicators of sustainable performance of the economic aspect, which were represented by each of the transportation cost indicators that is the most effective in the process of affordable housing. Following by the two indicators of the cost of owning and renting housing in relation to household income, the indicator of land availability and infrastructure costs, minimum design standards, standard units, and modular frequency, in addition to housing loan interest rates and others. Table 2 shows Indicators of the sustainable performance of the social aspect, the highest-ranked indicator is security, followed by the social acceptance index, privacy, management and efficient maintenance. Indicators of securing ownership and quality of performance of the housing project, the housing quality indicator for the residential unit, and the performance of the residential building as a whole integrated. Social harmony, application of technology, and commitment to the time of housing unit’s delivery. According to Table 3 Indicators of the sustainable performance of the environmental aspect, which shows that the highest-ranking indicator was the energy use efficiency, followed by the accessibility indicator for public transport centers, the efficiency of building materials, housing density, environmental design criteria, and achieving space and construction flexibility, efficient land uses, functional efficiency, local design, and availability of public spaces.

The potential indicators obtained showed that the affordability is not limited to the stage of housing acquisition, as the need extends to the occupancy phase. Also, based on the review of the (21) study that earlier presented, an outline is drawn showing the two main stages where the application of affordability and sustainability criteria are needed, as shown in Figure 1, in which the real need for affordability emerges, as follows: The first stage: Affording the initial housing costs of housing acquisition, which are directly related to the cost of the house and the extent of availability and contribution of government or private agencies that support and prepare the acquisition process, which in turn is related to housing policies, as it is the fundamental guide and determinant of the overall process. The second stage: Affording the running costs of operating and using the dwelling, which depends on planning and design decisions that precede the housing production process, where the principles and sustainability criteria can be applied.

![Figure 1. Stages of affordability in the housing sector.](image-url)
8. Conclusions
The term "affordable housing" was often associated with economic aspects (how to reduce design standards and construction costs to the lowest possible), which left many problems related to the operation and maintenance of housing and led to occupants’ vulnerable physical and psychological health. The recent international studies and organizations put the term of affordability in a new context that requires considering the social and environmental aspects with the economic aspect.

Many of these studies agreed that housing price is not the only criterion adopted for measuring affordability in the market. The modern concept took multiple dimensions to be compatible with global sustainable and affordable housing standards.

This study aimed to investigate the effective indicators to assist researchers, planners, designers, and policymakers in affordable housing provision and studies. It took reviewing the literature of 21 studies to identify 72 indicators. These potential indicators indicate that affordability is not limited to the stage of housing acquisition, as the need extends to the occupancy phase, influenced by a set of inputs that varied between economic, social, and environmental. Based on that, a two stages framework was presented to define the modern concept of housing affordability. These two stages focus on ensuring the availability of affordable housing first, then secondly, affordable the process of living in it.

The concluded concept of affordability is trying to ensure the availability of free lands, with all their support and logistical services, with partial participation from the value of the housing unit cost, and securing financial loans. On the other hand, it recommends producing a house that requires the lowest material costs to own and maintain. And ensure the ease of acquisition, design, flexibility, and quality and fulfills the requirement for accessibility to all facilities with the lowest consumption of non-renewable energy. A limitation of this study the indicators was ranked based on their occurrence in previous studies. Future research opportunities exist to investigate the effectiveness of these indicators by conducting a qualitative and quantitative study.

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