The Potential Impact of the Emerging Issues in the Future Housing Development

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Abstract: Housing research involves examination of the social, economic, political and other aspects that center on housing. There are several emerging issues that may have direct or indirect impact in the housing sectors. The purpose of this study was to highlight the potential impacts of emerging issues in the future housing sector. Throughout reviewing the literature of housing, four emerging issues were identified as the most critical emerging issues namely; information and communication technology (ICT), smart and sustainable home concepts and urbanization. Reducing space consumptions in residential buildings, increasing the degree of flexibility in locational limitations as well as increasing the demand of residential buildings were discussed as the future potential impacts of the identified emerging issues in the housing sector.

Keywords: Emerging issues, Urbanization, Smart home, Sustainable home, Housing issues.

1. Introduction

Housing is a collection of several systems such as wall systems, roof, mechanical and electrical systems that comprise the constructions within which people live. However, housing research does not only cover the construction aspects of housing. They equally clearly involve the examination of the social, economic, political and other aspects that center on housing. Therefore, housing research can be defined as the study of the social, political, economic, cultural, technological and other aspects and relationships that establish the provision and utilization of dwellings [20]. As result, there are several emerging issues included in the literature of housing. Such emerging issues_ such as information and communication technology (ICT) and sustainable home concepts_ may have direct or indirect impact in the housing issues.

Several issues are always raised in housing development [39,44]. Such issues of housing development are no more the new issues, and they include the high price of the house, the too bureaucratic procedures with policy and legalities, the patterns and trends in rental housing affordability, the selection of the housing location and the consumption problem where there is a demand but shortage of supply and vice versa [44].

In this paper, mainly aimed as a background for further research through highlighting the potential impacts of emerging issues in the future housing sector, the authors identify the most important issues that may have direct or indirect impact in the housing and discuss their future potential impacts on the housing issues.

2. Methodology

The research methodology includes two main tasks which are subdivided into phases and parts. The tasks, phases and parts of the methodology pave the way to fulfill the goal of the study throughout achieving the objectives of it.

2.1 Task-one; Identification of the most important emerging issues that may have direct or indirect impact in housing future.

This task was designed to fulfill the first objective of this study through the following phase:

2.1.1. Literature Review

There are three steps for carrying out an effective literature review process [23]. They include inputs (gathering and screening the references), process (knowing, comprehending, applying, analyzing, synthesizing, and evaluating the references), outputs (writing the literature review). These steps are implemented in this study as follows:

• **Inputs (gathering and screening the references)**

In these studies, the published references (English–language) are gathered, these references either directly or indirectly illustrated the potential impact of the emerging issues in housing future. Several computer databases are used in the searching process include ABI Inform Global,

Science Direct, Emerald and Springer. As search terms, several terms are used include the impact/influence/effect of emerging issues AND house /housing/ dwelling future.

- **Process (analyzing, synthesizing, and evaluating the references)**

    In this step the gathered references were analyzed, synthesized and evaluated to clarify and identify the most important emerging issues that may have direct or indirect impact in housing future.

- **Outputs (writing the literature review)**

    The final products of the literature review were reflected in two ways including 1) a list of the most important emerging issues that may have direct or indirect impact in housing future, and 2) a brief description of the identified emerging issues.

2.2. Task-two; Identification of the potential impact of the Information and communication technologies (ICT) and Smart home systems

This task was designed to fulfill the first objective of this study through the following phase and steps:

2.2.1. Literature Review

There are three steps for carrying out an effective literature review process [23]. They include inputs (gathering and screening the references), process (knowing, comprehending, applying, analyzing, synthesizing, and evaluating the references), outputs (writing the literature review). These steps are implemented in this study as follows:

- **Inputs (gathering and screening the references)**

In these studies, the published references (English and– language) are gathered, these references are either directly or indirectly discussing the potential impact of the information and communication technologies (ICT), smart/sustainable home concepts, and urbanization in the future of housing issues. Several computer databases are used in the searching process include ABI Inform Global, Science Direct, Emerald and Springer. As search terms, several terms are used including the impact/influence/ effect of ICT, smart/intelligent/ automation/sustainable/ green home/house concepts, urbanization AND future of housing issues.

- **Process (analyzing, synthesizing, and evaluating the references)**

    In this step the gathered references were analyzed, synthesized and evaluated to discuss the potential impacts of the identified emerging issues in the future of the housing issues.

- **Outputs (writing the literature review)**

    The final products of the literature review were reflected in two ways including a brief description of the potential impacts of the identified emerging issues in the future of the housing issues.

3. Literature Review:

3.1. The Emerging Issues in Housing

In its simplest and crudest sense, Housing is a collection of several systems such as wall systems, roof, mechanical and electrical systems that comprise the constructions within which people live. However, housing research does not only cover the construction aspects of housing. They equally clearly involve the examination of the social, economic, political and other aspects that center on housing. Therefore, housing research can be defined as the study of the social, political, economic, cultural,

technological and other aspects and relationships that establish the provision and utilization of dwellings [20]. A result, there are several emerging issues included in the literature of housing. This study introduces some of the emerging issues that may have direct or indirect impact in the housing issues namely (ICT, urbanization, smart and sustainable home concepts). The following subsections include a brief description of these issues and their revise spelling impact in housing:

3.1.1 ICT

In general, Information and communication technology, or ICT term, is always used to cover any goods that store, retrieve, manipulate, transmit or receive information electronically in a digital form by individuals, businesses or organizations in order to accomplish several of supports information-related activities, such as social networking, tele-shopping, tele-working and tele-learn. Such goods include, for instance, personal computers, smart phones, internet servers, digital television, email, robots [21-40-9]. Several studies have been carried out to examine the potential impacts of the ICT on human life, a wide variety of ideas about the role of the cities, their features, or even their survival in the future. Such research address usually the blend of hardware, software and human-ware in the ICT field. In the literature the potential impacts of the access and use of the ICT are classified in three dimensions namely, economic, social or (less frequently) environmental [9,18]. The following table includes some of the potential positive or negative impact of the access and use of the ICT [34,21].

Table 1. Examples of the potential positive and negative impact of ICT

Potential Positive Impact of ICT	*Potential Negative Impact of ICT*	*Housing-related Impacts of ICT*
• ICT has a positive impact on economic welfare and gross domestic product (GDP). For instance; every ten percentage point increase in broadband penetration accelerates economic growth by 1.38 percentage points.	• Techno strain and addiction	• Technological stress may affect housing sector professionals reducing efficiency and the quality of housing projects.
• ICT adaption enhances entrepreneurship and job search, since it reduces the costs of starting a business; further, it reduces information asymmetries and market inefficiencies and, in some instances, it might substitute transportation.	• Alienation and Burnout	• Excessive reliance on digital systems may reduce human interaction in neighborhood planning and housing services, leading to socially disconnected communities.

• Availability and easy access to a wide range of information.	• ICT dependency	• Heavy dependence on smart systems in housing management can make housing projects vulnerable if systems fail or experience technical disruptions.
• Increased independence because of better information.	• Complex interdependencies between subsystems of organizations	• Integration of smart housing technologies (e.g., security, energy, internet) may lead to major failures if one system crashes.
• Increased on economic welfare and gross domestic product.	• Reduced privacy.	• Use of smart devices in homes (like sensors and cameras) may lead to privacy breaches or data leaks affecting residents.
• More and better feedback		
• Many new opportunities to learn	• Job displacement in the housing sector	• Automation of administrative and service roles may lead to job loss in traditional housing-related positions like leasing agents or front-desk staff.
• Increased productivity	• Digital exclusion	• Vulnerable groups such as the elderly or rural populations may struggle to access digital housing services, creating
• Cost reductions		
• Inclusion of all minority groups		

In terms of urban development, The ICT plays a large role in formulating the shape, structure, organization and function of cities. The impact of ICT on the various sectors reflected in the primary land use patterns of the cities. For instance, Tele-activities have the ability in reducing the consumption of land uses of office, retail and residential as well as freedom in locational constraints of such land uses [23-25-4-39].

The increase in the use of ICT may also intensify digital needs, resulting in increased pressure on housing, such as increased dependence on remote work after the COVID-19 pandemic, which has led to permanent changes in housing behaviour [33].

3.2.1 Urbanization

Urbanization can be defined as the increasing number of people that live in urban areas. It predominantly results in the physical growth of urban areas, be it horizontal or vertical. It was estimated that half of the world's population would live in urban areas at the end of 2008 and by 2050 the number will be increased to 64.1% and 85.9% of the developing and developed world countries respectively [27]. During the 19th and early 20th century, in Europe, Northern America, and Japan, urbanization and industrialization described the economic development, and led to a continuous economic, demographic, functional, and extensive growth of cities. Such development has not yet appeared in most developing countries. In these countries, the economic development was limited to an elementary form of industrialization that also determined the design, infrastructure, and function of cities. Nowadays, in Africa and Asia, the developing countries experience an average degree of urbanization that developed countries were having between 1900 and 1925[30].

On the local urban level, urbanization is affecting the urban infrastructure and building stock. The lack of land and the necessity to erect multi-level buildings and clustering in the inner city have resulted the concentration of economic activity in the cities. Such outputs_ due to urbanization_ result in both direct and indirect impacts on energy consumption. The direct impact is related to energy used in the cities by their actors for the purpose of achieving tasks such as lighting, cooling, heating, or producing things inside city spaces. The indirect impact of the urbanization energy consumption is greater than the direct one and it is related to the production of the construction materials, such as cement or steel. In general, the construction, development, usage and maintenance of the urban infrastructure such as roads, bridges, office buildings, housing, sewage networks, power plants, are associated with a high-energy consumption [30,28].

A distinctive feature of compact and dense cities is the urban heat island (UHI) effect. The main cases from UHI are the modification of land surfaces, which use materials that effectively store heat and waste heat of space heating and cooling, and traffic increase the UHI effect further [19]. The UHI effect increases the city air temperature by 1–3 °C relative to the surrounding area. The UHI increases energy consumption due to cooling and the use of air conditioners, however high-density cities show far lower transport energy

consumption than low density. In general cities characterized by urban sprawl tend to be less energy efficient. Apart from impacts on the local urban level, economic development and urbanization also affect global issues, such as climate change and increasing scarcity of resource [30].

In terms of housing, increasing housing demand and housing shortage in the city, are some of negative effects of urbanization as well as urban poverty especially, among low-income earners, resulting in decreased housing affordability for decent shelter, and generally worsening housing conditions. In several developing countries the rapid urbanization and poor performance of the economy are the major reasons for having the formation of slum settlements [3,30].

3.1.3 Smart home concept
• What is Smart Home?

A smart home (also known as a smart\intelligent house or home) contains highly advanced smart technologies for automated controlling, monitoring and managing of its systems, equipment and users activates. A smart home appears "intelligent" because its abilities of perception, cognition, analysis, reasoning and anticipation about many aspects of daily life and can accordingly take proper reactions [35,5]. For instance, the refrigerator may be able to detect what was stored in it, propose menus, define healthy alternatives, as well as suggest a list of groceries. The cat's litter box may be cleaned by the smart home systems, and they may have the capability to feed the plants [7].

The smart home sometimes seems like utopian concepts that is impossible, however, smart home technology is real and is becoming increasingly sophisticated and widely implemented, a signal can be sent either locally or remotely for controlling the systems of the home such as lighting, HVAC, fire safety and security systems [7]. The rapid development of the smart home systems will have direct impact in future user lifestyles and needs as well as the real estate decisions are going to be affected by these developments [5]. The following sections discuss the future smart home technologies and their potential impact on the housing decisions.

• The future of the smart home systems technology

Several autonomous systems and networks applications are included in our traditional homes, such as telephony, access control and security, household appliances, television, PC (data) networks, audio and video information and entertainment systems, lighting, electricity, (HVAC) heating ventilation, air-conditioning, water supply and more [32]. However, almost in all cases, these systems and applications can be described as standalone systems due to that they are not connected or functionally integrated into each other. The integration of the building systems initially focused on commercial premises, i.e. offices and industrial buildings throughout (BMS) buildings management systems that control and monitor and manage the operations of building these systems. Nowadays, the discussion turned from operation (of buildings) to living in buildings (homes), the term smart homes became generally used [35,42]. Smart homes with the use of new revolutions communication and artificial intelligence systems offer double-potential

residential homes as producers and energy consumers, but emphasis on economic benefits should come along with a comprehensive analysis of impacts of smart home on electrical networks and the environment [16].

The question now, what are the components _different spaces_ and the future appliances of these components in the smart home [5]. three main components of the smart home can be distinguished namely, ambient intelligent space (AmI-S) and virtual space (VR-S) combined with physical space (PS). In this study, the authors define these components as follows; AmI-S is the " environments that are equipped with computers and sensors, in such a way that they can adapt to user activities through an automated form of awareness. An example of this space is the context around smart kitchen table", The VR-S "consists of ICT appliances such as smart walls and smart furniture that are connected to an information network. It supports information-related activities, such as social networking, tele-shopping, tele-working and tele-learning" and The PS is "the traditional space where people actually are with their bodies". The previews definitions include some of future smart systems. Potentially, these new systems will dramatically change our activity-lifestyles and as a result the space need in the future dwellings. The followings describe the potential changes of these systems.

1. Smart/Interactive kitchen table; is one of smart systems that has the potential to bring dramatic changes to the future of home. It is an interactive table that has multipurpose space which can make the kitchen environment more social and convenient. It is having the ability to bring several social settings together include kitchen and dining room, host and guest, preparation and consumption, serving and sharing. It forms an in integrated tool that allows family and friends to share a healthier lifestyle and a greener cooking experience. It is look like conventional table with following features [5,15]:

• **A flat touch screen surface** lets users to adjust the size and temperature of the hot cooking\heating zone as well as to surfs the internet.

• **Multimedia networking** allows users to control and operate several buildings services such as internet, recipe database, television and more. The multimedia networking feature of smart kitchen table supports the concept of internet of things throughout letting the electrical appliances to communicate with each other [24-22-15-5].

• **Dynamic top surface** allows users to cook anywhere, anytime on the table due to that the table to surface are made of wireless power which makes it possible to have no preset cooking zones.

• **Energy management feature** allows users to monitors the energy consumption of the table over a long period of time by energy performance indicator at the corner of the table monitors consumption over longer periods of time. The table also supports the energy savings throughout displaying the energy use in a constant but unobtrusive way [15-5-13].

2. Smart wall; is the result of integrating ICT such as TV and computer in room wall [5,37]. The high degree of flexibility of such revolutionary piece of equipment allowing the user to create an interactive working and living

space in almost any location. The following features are assassinated with such revolutionary piece of equipment [5,15]:

• **Changeable scenery system** allows users to create different scenery on the wall throughout integrating the elements of entertainment and sensitivity to the wall.

• **Interactive electronic surfaces** let users to interact with displayed information on the wall by a touch-sensitive information device.

• **Internet connected system** allows users to carry out several tele-activities such as tele-educating, tele-caretaking, tele-team working.

• **Environmental control system** enables users to control, monitor and manage   the functions of the home different systems and appliances.

3. Smart furniture; enables users to have different interface and interaction styles from current furniture. Standard desktop PC, single user display, keyboard, and mouse of the traditional computers are going to disappear and the future computers are going to be embedded in tables, seats and mobile devices. They support the concept of internet of things throughout connecting to each other and to the whole home network and the data can easily transfer among them [5]. Several features of the smart furniture are defined by [5] as follows:

• **Automated detection** of the users need and preferences, due to several sensors.

• **Capable of responding** to the user's activity, due to being programmable.

• **Interactive screen** lets users to interact with displayed information on by a touch-sensitive screen.

• **Multifunction,** allows user to preform different physical and virtual activities such as entertainment, relaxing, working, seating, sleeping as well as managing, controlling and monitoring other appliances and home systems; and

• **Flexible and movable;**

At the present time, the home design is based on allocating the different daily activities to specific functional spaces. On other words, there is a specific space for sleeping, dining, working and, etc. However, _as mentioned above_ the future technological developments of the smart home systems have the potential to bring different perceptive of accommodating any activities in any space. Smart home spaces are interactive, responsive and capable to create different contexts for different activities. The final results of this theme of accommodation in the smart home is space saving [5]. Home space saving is one of the most significant concerns of long-term sustainability practices [1]. There are several reasons that demonstrate the contributions of smart home to long-term sustainability throughout bringing space saving possibilities. Some of these reasons are listed by [5] as follows.

• The necessity for district physical spaces for special activities is decreased. Activities are not limited in specific

space due to the pervasiveness of computing and data network.

• The necessity for district physical spaces for home office is because of the integration between work activities and private life.

• Reducing the number of devices in a house.

• Mixing several zones with each other and blurring the boundaries by multitasking.

• Use of virtual activities (such as virtual communication with friends) instead of physical activities (such as home visiting) by several tele-activities.

3.1.4 Sustainability concept

• **What is sustainability?**

According to English Longman dictionary, the meanings of the term sustainable include: "able to continue without causing damage to the environment" and "able to continue for a long time". In term of research studies, several debates about the concept of "Sustainability" are still ongoing. Implicit in these debates are criticisms of the values, attitudes, tools, and processes that have been produced and have prevailed in the built environment industry. These opinions of critics have given the sense that we understand nowadays of "sustainability". While certain definitions emphasize the environmental criteria, others consider that the very meaning of "Sustainability" should not and cannot be understood without its sociocultural dimension [8,32].

Basically, two independent aspects are implied in sustainability concept include Socio- cultural on one hand and Economic/environmental on the other hand. Sustainable societies are societies that are wise enough in using the natural resources_ on other words societies thinking about needs of the future generations_ and social, economic and political systems that supports them [12].

• **Sustainable house**

Several terms have been used to explain the sustainability in housing. For example, sustainable house was labeled as ''low carbon,'' ''zero energy,'' ''high performance'' and most commonly ''green'' House [43,45]. A sustainable house should not, however, cover only the ''green'' aspect of energy efficiency, but include many other aspects. Several definitions were developed to cover the different aspects of the sustainable house [26]. A sustainable house can be defined as "*embraces the collective and integrated aspects of environment protection (energy, water, materials, land), resource management (natural, built and economic resources) and social well-being (personal values, health, comfort, community)*". In this definition, the authors include three core principles of the   sustainable house namely; resource management, life-cycle design and design for humans. These principles could be potentially achieved through attributes of the product itself (sustainable house) and the processes through which a sustainable house is envisaged, designed, constructed and occupied (Figure 0; [26].
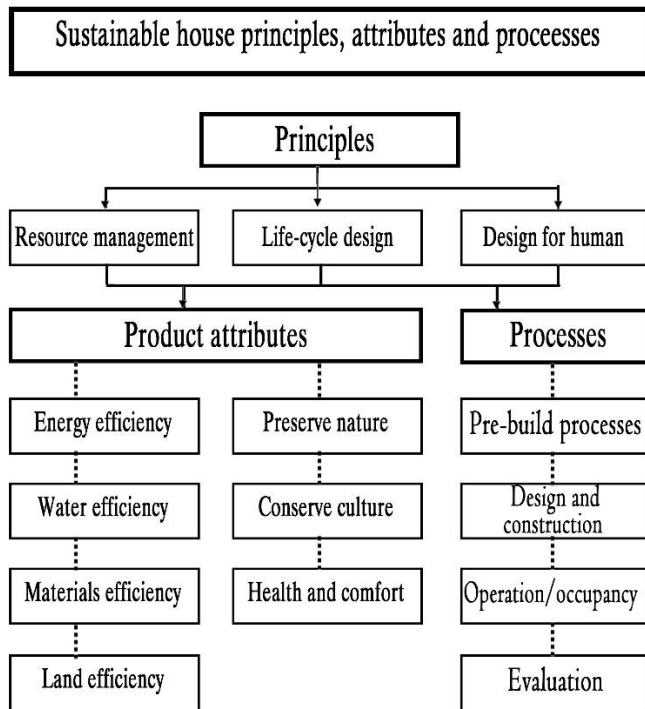
Sustainable house principles, attributes and proceesses

Figure 1. Framework for defining and evaluating a sustainable house [26].

In terms of the sustainable technologies for housing sectors, many of them have been gradually introduced. These technologies can be divided in two groups namely, low-hanging fruit and Cutting-edge [43,26].

• Low-hanging fruit (easily achievable), such as structural insulation, glazing, passive heating and cooling design, built space saving, large external living space, the flexible use of internal and external spaces and the use of recycled materials.

• Cutting-edge (energy saving measures) such as the use of wind turbines, solar panels and biomass.

Many advantages can be achieved from implementing the sustainable technologies in housing. Including sustainable features in the built housing estates not only have the potential to receive green grants and streamlined land-use permits in the development stage, but also lead to direct cost savings for end users over the house lifetime. In addition, the sustainable features have the potential to increase property values in several countries, especially countries where sustainable features are an important determinant of market value. Moreover, many social advantages can be derived for sustainable housing such as better consumer confidence, increased functionality and durability, less maintenance, a better reputation and most importantly, improved public health [43].

3.2. The potential impacts of emerging issues in Housing issues

Several issues are always raised in housing development [39,41,44]. Such issues of housing development are no more the new issues and they include the high *price* of the house, the too bureaucratic procedures with *policy and legalities*, the patterns and trends in rental *housing affordability*, the selection of the *housing location* and the *consumption* problem where there is a *demand* but shortage

of *supply* and vice versa [44]. The following discussion is intended to briefly elaborate the potential impacts of the previous emerging issues on the housing issues.

• **House prices**

In the literature of housing, the price estimation of housing buildings is described as a function of structural, environmental, locational (neighborhood) and household dimensions. These dimensions are constituted of smaller variables such as floor area, age, view, location, transport, etc. thus making it a non-homogenous commodity [36]. Nowadays, smart and sustainable home features are attracting some home buyer and are adding value to properties, the complexity and increase risks associated with sustainable projects may also exceed costs [6] therefore, [31] stated that green features (smart and sustainable features) have a significant and positive correlation with residential buildings price. They increase the residential buildings price by range of .46 percent and 6.61 percent. In the future, the smart and sustainable home feature as well as access and use of ICT by households will potentially still have a significant correlation with residential buildings price due to the following reasons;

• Smart, sustainable home feature as well as ICT contributions in reducing the *space consumptions* for residential buildings.

• ICT and smart home feature contributions in increasing the degree of flexibility in locational limitations of residential buildings.

• Smart, sustainable features of the homes will be the *defacto standard* for renovated as well as for new homes in the future

Demographically, Urbanization in any urban areas are mainly described by two main factors account for the massive urban transformation in less-developed countries in the post-Second World War period – first, greater levels of natural increase in towns and cities (especially larger cities) and, second, migration. Several studies stated that the regional variations in the urbanization level would have impact on the price houses [10,11,38]. Increasing housing demand and housing shortage as well as inappropriate housing policies and legalities of the local government are the main causes that may explain the impact of the urbanization in houses prices. Hence, the parentage of the urban populations will increase in next years, the potential impact of the urbanization in the house prices will continue in the future.

• **Housing affordability**

Urbanization is virtually synonymous with slum growth [14]. The other impact of the rapid urbanization especially in low-income countries is decreasing housing affordability for decent shelter, and generally worsening housing [3,14,20]. From the 1950s until the 1970s, the appearance of slums and squatter settlements was described as a short-term result of massive rural–urban migration and would disappear in time. Nowadays, (and will continue in the future as a result of the rapid and continue urbanizations) in many countries the evictions have been followed by the removal of slums by physical demolitions and eradication

[14]. stated that there is no easy solution to housing the poor especially in developing countries because it is a manifestation of generalized poverty in such countries. In this study, the author added that such situation will not change without sustained economic development and political reforms and the appropriate housing policies can only help in mitigating the housing problems of the poor.

In its generall definition, the housing affordability is described by the relationship between housing expenditure and household income. The inability of such definition to account for issues like housing quality and environmental and social sustainability make it a target for a criticism over the literature of housing [2,29]. In this context, sustainable house concepts and housing affordability, both of them are recognized as being important to one another. Now and in the future, the affordable houses have to be located within sustainable development and sustainable development must provide affordable housing products. Several benefits can be archived by implementing the sustainable housing concepts in the affordable housing projects and they can be summarized in three main groups namely; environmental, economic and social benefits [2].

4. Conclusion and findings

The main findings of this study may be summarized as follows. First, the study reveals that there are several emerging trends have either direct or indirect impacts on the housing issues. For example, smart and sustainable home concepts have direct impact in the home price throughout increasing the home selling price as well as urbanization have the same impact in home price due to negative of urbanization in increase the demand of the home.

Second, the findings of this study also confirm that in the future, the impacts of the identified emerging issues namely; ICT, smart and sustainable home concepts as well as urbanization will continue to correlate with the housing issues. However, due to the future direction of the identified emerging issues in reducing the space consumptions for residential buildings, increasing the degree of flexibility in locational limitations as well as increasing the demand of residential buildings, it is not easy to predict the sign of the relationship between the identified emerging issues and the housing issues such as houses prices and the housing affordability.

In conclusion, the results of this study infer that future studies could focus on modeling and sharpening the impacts of the identified emerging issues in housing issues.

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التأثير المحتمل للقضايا الناشئة في تطوير الإسكان في المستقبل

الملخص: هناك عدد من القضايا المعاصرة التي قد تؤثر بشكل مباشر أو غير مباشر في قطاع الإسكان، تستهدف هذه الدراسة تسليط الضوء على التأثيرات المحتملة لهذه القضايا المعاصرة في قطاع الإسكان المستقبلي. ومن خلال مراجعة الأدبيات المتعلقة بالإسكان، تم تحديد أربع قضايا معاصرة عدت الأكثر أهمية، وهي: تكنولوجيا المعلومات والاتصالات (ICT)، والمنازل الذكية والمستدامة، والتحضر. وقد نوقشت في الدراسة التأثيرات المحتملة لهذه القضايا المعاصرة في المستقبل، والتي شملت: تقليل استهلاك المساحات في المباني السكنية، وزيادة درجة المرونة فيما يتعلق بالقيود المكانية، فضلاً عن تزايد الطلب على المباني السكنية.

الكلمات المفتاحية: القضايا المعاصرة، التحضر، المنزل الذكي، المنزل المستدام، قضايا الإسكان