

# PRINCIPLES AND CONCEPTS OF SUSTAINABLE ARCHITECTURE IN DESIGNING RESIDENTIAL COMPLEXES

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## Original Article

### ABSTRACT

Several decades have passed from the introduction of sustainable architecture in the architecture area and international forums have proposed many strategies for its development. The ultimate goal of the sustainable design is to find effective and useful psychological, physical, quantitative and qualitative solutions in order to construct buildings for users. There are several possibilities and facilities to achieve such a seemingly difficult goal. The three principles of the sustainable design result the preservation and the survival of resources, designing according to the life cycle and human-oriented designing, providing the wide awareness of environmental consequences related to the architecture. The existing strategies in the hearth of each of these principles guide us to the more terms and criteria. These strategies are investigated to foster the understanding of this issue that how a building interacts with the global, local and internal environments. The principles of the sustainability of the residential complexes from the social dimensions including the justice and aesthetics, comfort, security and children's development, social identity and other similar issues were investigated. The result was as follows: first factor, the physical comfort inside the house; second factor, extendibility of the open and multipurpose spaces for the children; third factor, social identity; forth factor, social order. This paper briefly tried to introduce the general methods to apply the sustainable designing in the architecture that are guidelines for the further research and investigations.

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### KEYWORDS

Residential Complexes, Social Sustainability, Sustainable Architecture, Sustainable Designing, Nature, Climate.

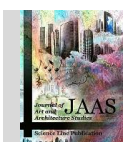
## INTRODUCTION

House is the origin and destination of everyday life. People come out of it for the work and social activities and after work and gaining the experience they go back to the house (house is a place that we go back there after experiencing different dimensions of the environment. House has such importance for the human so that it can be called the center of the person's world) [1].

Today, due to the force of the life or one-dimensional thinking and putting the economy as a principle, many social, cultural and human values are ignored (the human's house is in the residential blocks behind some uniform windows as well as others windows so that it is hard to distinguish it from outside not only for the quests but also for the family's members) [2]. Due to this planning and

designing and especially stereotypical mass building, humans are put together in the form of a mass and a mass of people are formed instead of the targeted social groups that putting them together just leads to the congestion, bustle and chaos. In such a situation, the family members escape from the group to meet minimum safety and peace and take refuge in the corner of the house and the social compensation and exclusion start from here. In this situation, children get hurt more than others. The only space where the children are able to play and frolic, or to just sit down and study is bed. All the common norms in the housing just provide limited space to the child and force him/her to be exposed to the permanent conversations of parents and to unpleasant interactions with them and this are unacceptable [3].

The consequences of this situation are damage to the foundation and the health of family, individuals



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and society. So that, even the family's internal relationships affected by the inappropriate body of the house become weaker and weaker and disrespects are institutionalized in the house (Table 1). With undermining the credibility of the family, addiction and other social disorders and anomalies find opportunity to appear and penetrate to the depths of the society. Considering these disorders, pursuing the sustainability principles of the residential complexes has great importance to achieve the sustainable development.

**Sustainability**

As the participle of the development, sustainability is the situation in which desirability and the available facilities won't be decreased over time. The sustainability in its wide sense is referred to the ability of the society, ecosystems or any current system to continue their function in the infinite future, without it is compulsorily undermined due to the dwindling of the resources that system depends to them or due to the imposition of the excessive load on them [4].

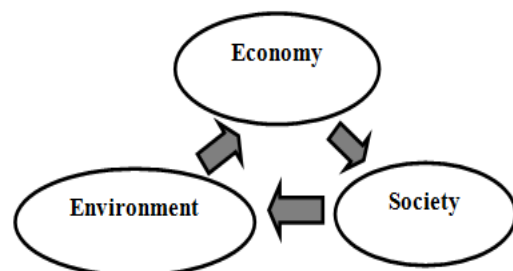
**Table 1:** Definitions of sustainability

Definition of sustainability	Sustainability is a kind of distributive justice and equitable distribution of opportunities between the present and future generations on one hand, and it's all inclusiveness from the other hand, (all inclusive means giving power to the people and supporting and considering all human rights including social, economical and political rights and etc.) [4]
Sustainability in the literally meaning	It means (Tenere), it means bottom up and (sub) and it is composed of two components (sustinere) rooted in Latin (sustain) (the verb of maintain, preserve) and has been used in the English language from the year 1920. This verb has some conceptions in describing (conditions, modes or a thing), (sustainable) such as (protection, support and continuity). [3]
	Dehkhoda Encyclopedia has meant sustainability as durable and viable. [5]
	In the Persian and speaking encyclopedia of Moein, the sustainability has been also meant as the concept of stability and resistance, from the infinitive "sustain" that means resist and showing self-endurance. These meanings have been also expressed to describe the sustainability: having stability, permanent and the resisting. [6]
Definition of sustainable system	The term "sustainability" does not have its current meaning and it relies on the maintenance and stability. The meaning of the term "sustainability" that is considered in this discussion includes: anything that can have continuity in the future. [7]
	The ability of system to endurance and durability inevitably depends to the success that is gained by the system to communicate with the outside environment; the sustainable system needs to the proper inner function and to the consistent relationship with the environment and in the other words to the sustainability in inside and outside (in interaction with the environment) in order to act as a sustainable system. [4]
	<p>The main conditions of the systems' sustainability</p> <ol style="list-style-type: none"> <li>1. Systems require to be consistent with the local and environmental conditions;</li> <li>2. Systems should have compatibility with the future needs and targeted goals;</li> <li>3. Systems need to have sufficient adaptability to changes and to be recovered with minimum cost if the system to be destructed due to the occurrence of unintended events;</li> <li>4. Systems' development should not cause damage to the systems protecting the human life including water, air, soil and biological systems. [4]</li> </ol>

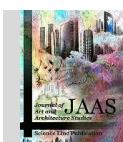
**1- Concepts of sustainability**

What is discussed in the expression of the concept of sustainability as the principle considers the construction of the artificial environment with respect to the conservation of the natural resources and their continuity for the posterities. In the following of the controversial discussions about the sustainable development followed by the sustainable architecture, the general discussion is raised on the relationship between the natural environment and the building located in it. Now, it is possible to see this relationship through different ideas of sustainable architecture (Diagram 1). From another perspective, it can be said that sustainable

development is realized when the elements of economy, environment and society interact with each other [8].



**Diagram 1:** Sustainability as an interactive system [8]



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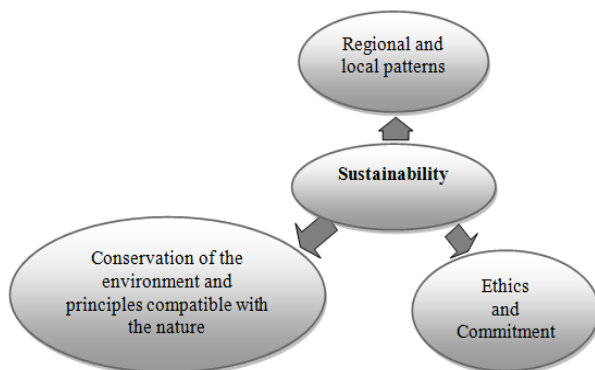


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Regarding the mentioned issues, sustainability can be understood as the ability to remove material and spiritual needs with respect to the future generations and the conservation and survival of resources for the future generations that in these concepts, in one hand, the conservation principles of the environment and principles compatible with the nature as well as having the regional and local patterns, and on the other hand, (Diagram 2) other concepts related to the ethics and commitment with the approach of non-degraded resources for the posterities are the three vertices of the sustainability triangle. [9]



**Diagram 2:** Sustainability triangle [9].

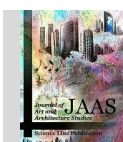
## 2- Definition of sustainability

As the part of the development, sustainability is the situation in which desirability and the available facilities won't be decreased over time and it has been driven from the word "sustener" ('Sus' means from bottom and 'Tenere' means maintenance, that totally means keeping alive or keeping) that implies to the support or long-term durability. The sustainability in its wide sense is referred to the ability of the society, ecosystems or any current system to continue the function in the infinite future, without it is compulsorily undermined due to the dwindling of the resources that system depends to them or due to the imposition of the excessive load on them [10]. On the other hand, the ability of system to endurance and durability inevitably depends to the success that is gained by the system to communicate with the outside environment [11]. In the other words, the system sustainability completely depends to the system's ability to adapt, change and accountability to the environment and since the environment is constantly changing, this process of system's adjustment and adaptation should be a sensitive and dynamic process [13]. Therefore, the sustainable system needs to the proper internal function and

compatible relationship with the environment and in the other words to the sustainability in inside and outside (in interaction with the environment) in order to act as a sustainable system. From the other perspective, life itself is worthy and life demands make it necessary to preserve and revive the environment for the future and thereby it binds today's development to the future development. Therefore, it can be said that sustainability is a kind of distributive justice: equitable distribution of opportunities between the present and future generations on one hand, and its all-inclusiveness from the other hand, (all inclusive means giving power to the people and supporting and considering all human rights including social, economical and political rights and etc. [4]. The social sustainability in the residential complexes is a situation in which residents are satisfied by living in their house and enjoy from neighborhood with other residents. The total of living conditions is so that more social interactions are increased over time and most of the people belong themselves to their living place. So, they unconsciously are protecting its stability and health and they contribute to its maintenance and improvement of the existing situation. As the result, the useful life and material value of the housing units of such residential complexes are higher than other residential buildings in the equal conditions. The social sustainability maximizes the efficiency and productivity of the residential complexes. An important issue in the discussion on sustainable development is development of capitulation and a good index in this field is per capita capital. The capital can be divided into three categories:

- Physical capital or human made capital
- Natural capital (natural resources)
- Social capital

Therefore, development should generally increase the per capita capital (per capita of physical capital+ per capita of natural capital+ per capita of human capital). This means that if the natural resources are used, then natural capital should be converted to the physical or human capital (may be it can be compared with converting energy to each other) and the sustainability also can be considered as the non-decrease of this per capita capital over time. However, unchangeable per capita capital is required to realize two important issues: compensation of the overpopulation and devaluation over time. In addition, sustainability, in practice, is a balance between the environmental necessities and development needs and it is realized in two ways: decreasing the pressures and increasing the available



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capacities [12]. Therefore, the main conditions for the sustainability are:

- Systems must be compatible with the local and environmental conditions;
- Systems must be compatible with the future needs and desired goals;
- Systems must be adaptable to changes and in the case of damage to the system caused by the unexpected events, they can be restored with the lowest cost;
- The development of the system should not result in damage to the systems protecting the human life including air, water, soil and biological systems.

### 3- Sustainability in architecture

The world commission on environment and development has provided this definition to the sustainability: meeting today's needs without endangering the abilities of the future generations for meeting their needs (our common future, 1987). This meaning of sustainability does not characterize the ethical duties of human for their eternal existence on the earth. Additionally, it denies the acceptance of the effect of other components contributing in the world ecosystem. The need to find long-term solutions that guarantee the continuation of the human life and his welfare is more considerable rather than finding the pleasant terms to describe the human needs. During the lifetime of the building, it influences the global and local environments and natural processes as the series of interlinked human activities. In the first stage, the development of building and its location affect the climatic characteristics of the place. Even temporary, the construction process disturbs the effect of construction equipment in the construction site of the environmental region. Construction operations have irreversible effects on the environment. Architecture professionals should accept this fact that the economical situation of the society is improving and its demands (the growth of the society's economy) for architectural resources, land, building products, energy and other resources are increasing. This demand is constantly increasing and causes the increase of multiple impacts of construction on the global ecosystem; the ecosystem that is consists of inorganic elements, living organisms and humans. The goal of sustainable designing is to find architectural solutions that guarantee the welfare of these three main and constructive groups [14].

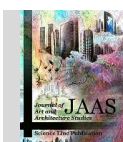
### 4- Sustainable architecture

In the issues of sustainable architecture that is a sub-branch of sustainable development, the goal is to find the architectural solutions to provide the proper environmental conditions using the climatic designing methods and utilization of ecological materials in order to decrease the negative effects of the existing architecture on the environment. The sustainable architecture means designing the buildings that impose the lowest damage to the environment in terms of energy and exploitation of the natural resources. It is the building that has the minimum incompatibility and contradiction with its surrounding natural environment and in the wide area with the region and the world. According to the design (O-E-C-D), the sustainable buildings are those that have the least damaging effects on the built (artificial) and natural environment (artificial) next to and around themselves as well as surrounding area and the overall context. The sustainable buildings consider all life cycle of the building, qualified environment, desired function and the future [15].

### 5- Principles of the sustainable architecture

The aim of sustainable designing is to find the architectural solutions that guarantee the welfare of the triple elements (ecosystem of inorganic elements, living organisms and humans) (Table 2). Accordingly, the principles of the sustainable architecture have been expressed as follows [14].

The common trends in the sustainable architecture have more recognized as a noble morality rather than as a scientific knowledge in which creating the skills, technologies and methods to change the lifestyle are necessary in dealing with the global and local environment and developing and implementing the goals of the environmental designing. In order to increase the environmental sustainability, the building needs to create the stable balance between the three principles of the sustainable designing in designing, constructing, exploiting, repairing and maintaining, recycling and re-using the natural resources. This approach helps designers to find their solutions rather than to present them a set of predefined solutions (Table 3). On the other words, the following ten principles driven from the concepts of the building designing can be used to observe the general goals [14].



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**Table 2:** Some principles of the sustainable architecture from the different perspective [14]

Sustainable architecture	<ul style="list-style-type: none"> <li>- Affectability from cultural, environmental and climatic conditions</li> <li>- Having harmony and compatibility with the nature and environment</li> <li>- Saving energy</li> <li>- Appropriate response to the functional needs</li> <li>- Affectability from the local architecture, but as of today</li> <li>- Correct use of material, in terms of both visual and environmental coexistence aspects</li> </ul>
Iranian residential architecture	<ul style="list-style-type: none"> <li>- Reduce the composition of non-renewable resources</li> <li>- Develop the natural environment</li> <li>- Remove harmful and toxic materials to the nature in the building industry</li> <li>- Save the energy</li> <li>- Coordinating with the climate</li> <li>- Decrease the use of new resources</li> <li>- Meet the residents' needs</li> <li>- Coordinating with the site</li> <li>- Holism</li> </ul>
Iranian traditional architecture	<ul style="list-style-type: none"> <li>- Minimize the use of non-renewable resources and utilize the natural and renewable energies;</li> <li>- Improve the quality of the environment and extend the natural environment;</li> <li>- Destroy or minimize the use of contaminated materials;</li> <li>- Preserve the cultural and ethnic identity;</li> <li>- Promote the healthy life;</li> <li>- Rational use of the land and assimilating the building with the environment;</li> <li>- Economically of the constructing using the alternative technologies;</li> <li>- Coordinating the building with the environment and constructing with the local materials</li> </ul>

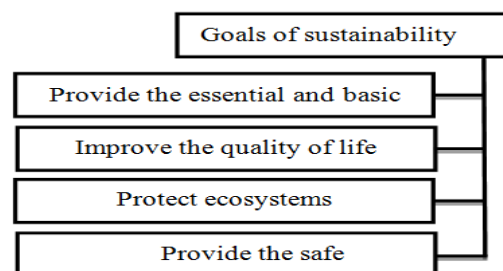
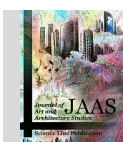
**Table 3:** Ten principles driven from the concepts in the building designing [14]

Ten principles driven from the concepts in the building designing	<ul style="list-style-type: none"> <li>- No use of the fossil fuels;</li> <li>- 50% reduction in energy used for transportation;</li> <li>- 60% reduction in the household energy consumption compared to the English houses;</li> <li>- 90% reduction in the heating energy requirements;</li> <li>- Use of renewable energies;</li> <li>- 30% reduction in the water consumption;</li> <li>- Reduce the waste and promote recycling;</li> <li>- Using the constructing material of the local manufacturer including brick, recycling steel (in a radius less than 60 km);</li> <li>- Produce the local resources (agriculture network for the local foods);</li> <li>- Develop the environmental diversity in the natural environment.</li> </ul>
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## 6- Goals of the sustainable architecture

Many scholars and experts have expressed the threatening factors of ecosystems and the present patterns of the development as unacceptable. Therefore, it is necessary to seek sustainable solutions. So, the discussion on the sustainable development can be considered on the base of the new complex interconnection networks between subjects, areas, fields and different factors. As mentioned before, one of the important goals of the sustainability is to compensate damages that human have lost during the industrialization and the apparent progress and promote to think about the protection of ecosystems and optimal use of the available potentials in the nature in order to survive and preserve them for the future generations so that not only it will provide comfort and improve the quality of life, but also it will prevent their destruction. Another goal of the sustainability discussions is to consider the natural environments,

because issues such as greenhouse effects and destruction of the ozone layer have been seriously discussed. Most modern societies could have met the essential needs and obvious characteristics to improve the quality of human life and in the industrial and developing societies the emphasis is on the quality of human life and the healthy environment, recreational facilities and to provide dwelling [16] (Diagram 3).

**Diagram 3:** Basic elements of the sustainable architecture [16]

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## 7- Methods for achieving the sustainable designing

The sustainable architecture like other architectural concepts has its own principles and rules and it includes these three steps: saving resources, designing to return to the life cycle and designing for the human that each of them has their own special strategies (Table 4). Understanding and studying these strategies help architect to get better understand from the environment in which the designing will be done [17].

## 8- Physical planning for the design

Physical planning and designing are effective in the level of the social interactions and the security of the residential buildings (Oscar Newman believes that the residents of the residential complexes should be able to control open spaces of their living environment and don't allow any stranger to exceed to these spaces. Therefore, defensible space is one that facilitates the recognition and control of the activities for the residents). (Coolman in this regard has stated that: whatever the number of floors, units, blocks, communicational corridors and runaway corridors increase, the social situation becomes worse) [18].

It is better that the number of residential units in each neighbor unit to be so that a social group to be formed and no congestion and or on the interpretation of Anthony Giddens no mass to be created: (social group is a number of people who come together or regularly interact with each other. The mass is referred to the people who are simultaneously present in one place but they don't have any defined and common relationship with each other). Therefore, it is necessary to observe the identification and resolution limit and the number of the residential units in each block in order to increase the social interactions and more security. In the planning of the residential complexes, especially in the planning of the residential lands higher than six square meters that have the capacity of containing more than twelve residential units, regarding the present findings in the most of cities, inadequacy of the current regulations and terms of Tehran municipalities and other similar cities are clear inside and outside. According to the current terms, the number of units in each block is a function of the area of the land, density of the place and total provided parking. In Tehran and other similar cities, for example, in the land with the

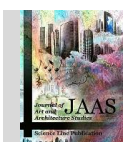
dimension of 50\*20 in the area of 1,000 square meters it is possible to build a complex with 20 residential units with substructure 150 square meters or a complex with 30 residential units and substructure 100 square meters or a complex with 40 residential units and substructure 72 square meter. In the current terms and regulations there is no speak about the number of the residential units and providing the security and increase of the social interactions and or the sustainability of the residential units.

## 9- Important factors in designing the residential complex

**First factor: (physical) comfort in the house.** One of the key concepts understood by experts is one that is named the "physical comfort in the house". It should be noted that this factor is very crucial and determinant and has first priority considering the achievements in this area as well as consensus of many experts on its high importance. That is to say that the experts believe people are more concerned about the quality and quantity of interior design of the house, so increasing the level of comfort into the house results the increase in the social sustainability and on the other words, according to experts, the sustainability of residential buildings is affected before any factor by the comfort inside the house.

House comfort is the intermediate dependent variable and affects the sustainability and it is affected by the variables such as the quantity and quality of the main spaces (living room, dining room and bedrooms), the quantity and quality of the servicing spaces (kitchen, restroom, bathroom), the ability to change the interior design of the house, lighting of the interior and exterior spaces of the house, size and total area into the house, kind of material used inside and outside the house, the quality of interior design and its classification into the public and private section [19] (Diagram 4).

It is clear that decreasing and increasing of the mentioned variables are effective in the decrease and increase of the comfort inside the house. Therefore it is necessary to consider the mission of the house and factors affecting the social sustainability in addition to the study of the house and avoid from the one dimensional thinking. Table 5 is an example of the results of studies that have been conducted with the aim of extracting the housing area [19].



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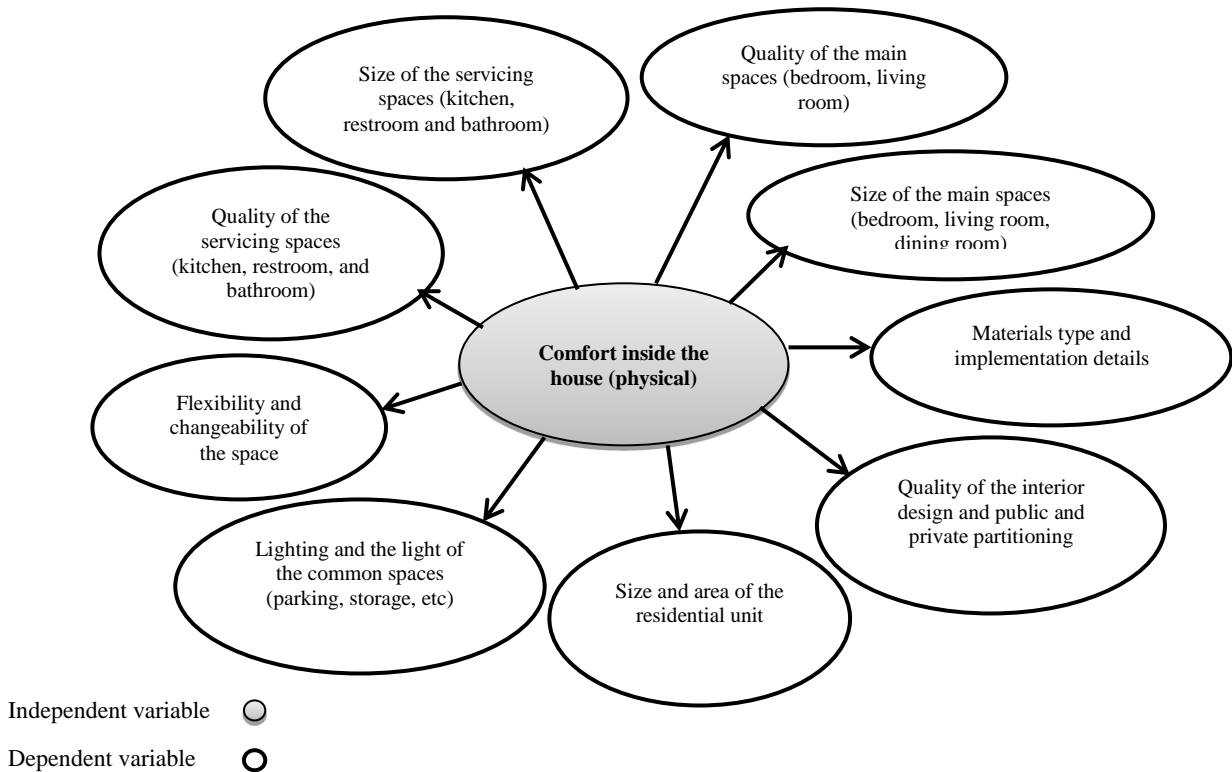
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**Table 4:** Steps to achieve the sustainable design [17].

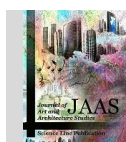
Steps to achieve the sustainable design	First step: saving resources, this principle from on hand, considers the appropriate exploitation from the resources and renewable energies like fossil fuels in order to decrease the consumption and on the other hand, it seriously considers the control and better use of the natural resources as the lasting and renewable resources
	Second step: designing to return to the life cycle, it is based on this idea that the substance is convert from a useable form to another form without any damage to its usefulness
	Third step: designing for the human, this principle is the last and perhaps most important principle in the sustainable architecture. This principle has rooted in the needs that are necessary to be guaranteed in order to protect and maintain the chain elements of ecosystems. This principle has three strategies of preserving the natural resources, urban planning and site planning and human comfort that are concentrated on the increase of symbiosis between building and outside environment and the people who use them.



**Diagram 4:** Graphical representation of the first factor [19]

**Table 5:** The proposed dimensions for the least spaces of an Iranian house according to the population density. [19]

Type of the performance space	1-2 individuals	3-4 individuals	5-6 individuals	7-8 individuals
Main living space	12	12	15	18
Multipurpose	9	12	12	12
Multipurpose	-	-	12	12
Multipurpose	-	-	-	12
Multipurpose	-	15	15	12
Kitchen	3/6	5	6/5	15
Changing room and shower	2/1	2/1	2/1	8
Restroom and toilet	1/5	2	2	2/1
Space of sleeping 3facilities	0/8	0/8	0/8	4
communicational	3-4	5-6	6-8	1/6
Total	33	55-56	74-76	8/10
Capitation in ratio of per person to per square	16/5	10-14	10-13	96-98



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Shrinking the bedrooms in the modern houses along with the wardrobe, bed and other facilities create irrespirable spaces that many people try to escape from them and to refuge to the living room or reception space for the study or chores instead of using them (un-sustainability). The fact is that each member of family needs their own time and place. This situation leads to different behaviors and expectations in one place and one time and creates family problems and disruption of the comfort. The lack of kitchen space is one of the common problems of the modern houses (Table 5). The women are more vulnerable in the home environment, because they spend more time in the kitchen and inappropriate dimensions of the kitchen with undesirable quality like being in the public leads to the loss of their mental tranquility in the house. Another reason for the instability of the today's houses is the removed spaces for the subsidiary activities and dirty works at home. There is no place for the wet coats, muddy shoes, detergents and storage space and it leads to the conversion of the living rooms and bedrooms to the unsanitary spaces. In addition, the lack of proper interior design of the house like the lack of entry way is one of the important instability factors or withdrawing factor of comfort inside the house. According to a survey in Iran, under studied families defined house as a set of open, semi-open and closed spaces. They respect the specified boundaries inside the house and public and private privacy and they are concerned with the large kitchen in order to accommodate different service machines. The following terms should be observed in the residential units:

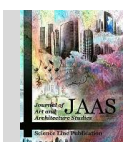
- The yard should be enclosed and independent
- House should be protected from visibility
- There is a covered porch as the pre-entrance space
- The reception room should be separated from the private section
- The necessary facilities should be anticipated to welcome to the guests and their stay
- Direct lighting should be provided for all spaces
- Direct access of kitchen to the living room and dining room to be possible
- All spaces must have the air ventilation [20].

**Second factor: the ability to extend the space to be as the playing and multipurpose spaces for the children.** From the view point of the architecture, urban planning experts and behavioral sciences, the first factor in the sustainability of the residential complex is the ability

to play in the open and multipurpose areas for the children. The variance of this factor is 10%.

• After the comfort inside the house, the playing and pleasure of children and their growth and security have the greatest importance for the families and thereby, this concept is the main second variable in the sustainability of the residential complexes. Of course, this variable like the first factor is a dependant variable that acts through the mediator. Its independent variables are the size and the quality of the playing space of children, the quality of the common and multipurpose spaces and green and open spaces in terms of the ability to be a place for the children's play. One of the key factors in the children's growth and development is their direct relation with the open spaces or the living nature that provides the possibility of the growth and development of children's talents, respiration and health. As the result, providing the playing place for the children and their satisfaction and insuring the parents from the children's healthy recreation and growth as well as the quality of this space are one of the affecting factors on the children's play. [21]

The children's safety can be provided through the direct supervision of parents and their dominance on the children from the space inside house to the common or intermediate area of units. As the human grows, the individuals' behaviors become different and so new centers are evolved as the main and primary supplement of the house. All centers are the place of movements and behaviors, that is, the places in which social interactions take place, such as the playing spaces and other open spaces of the residential complexes that have the ability to be a place for playing and have great importance in formation of children's memories and their recognition from their residence. Considering the importance of the second factor in social sustainability of the residential complexes, it is necessary to predict some facilities in their designing and planning. The physical and space requirements for the improvement of the situation of this intermediate variable, as it has been extracted from the concept of questions, are as follows: in planning the residential complexes, the recreational and playing spaces should be the main space and the essential component of the project, the necessary measures should be predicted in positioning and establishing plan for the ability of parents to monitor their children and the quality of the space in terms of ability to be as a playing place and the safety and security should be considered in the designing. In many residential environments including the



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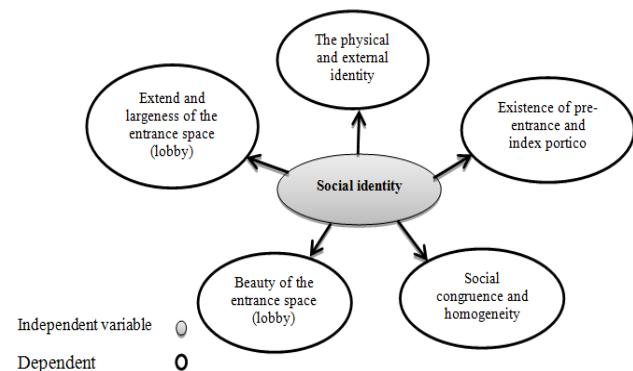
residential complexes and settlements, the remaining green spaces are the built residential spaces that have not been planned or designed. Such green spaces are arisen in inappropriate and out of sight places. Some of these spaces even though are in the viewing area of the residents, but it does not create any sense of belonging or ownership in them. Therefore, the residents do not commit themselves to preserve these spaces. The open spaces should be designed in such a way that they have the ability to be as a playing place. The spaces like parking, especially temporary parkings as well as other multipurpose spaces should have the potential to be set as the playing place for the children [21].

**Third factor: Social identity.** Another factor that has been extracted from the results of the questionnaires in the third level is social identity. This factor has been respectively obtained from the questions that measured the static social congruity and homogeneity, beauty of the entrance space, extend and magnitude of the entrance space, the existence of the pre-entrance and portico, the physical index and identity and the external solemnity. The variance of this factor is 9%.

From the view point of scholars and experts, stability of the residential complexes is the congruity of the residents. Sociologists consider the social identity related to their social classes. The social class is not specified through the profession, wealth, financial ability or education, rather the social class of everyone is identified through his/her resident and the relationship between the residence, social class and social identity of the society members is interlinked and uninterruptable (Diagram 5). The bodies of complexes indicate their identity. Then it can be concluded that the social identity and class of people and social identity of the residential complexes depend on the architectural body of the residential complexes and are affected by it. The architecture body is affected by the size and quality of the entrance, portico, pre-entrance, lobby, view, external solemnity and other similar factors [18].

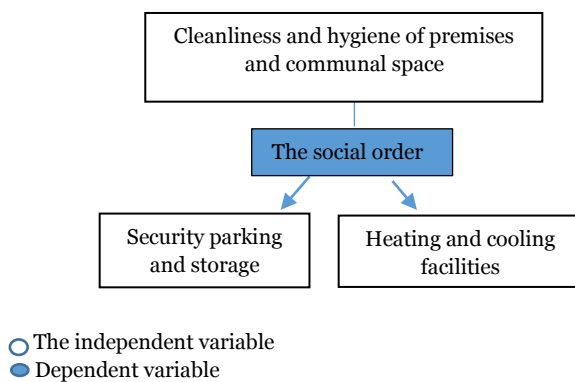
The family system in Iran's urban society is a core or inter-oriented system that its result is more attention to the internal comfort and welfare of members and children's health and safety compared to the others and other factors. As the results of research in following the principles of the sustainability of the residential complexes until this step have showed, in the first level, the internal comfort of house, in the second level the satisfaction and providing the children's needs in terms of

playing and recreation and in the third level, the social identity and sense of belonging are the effective factors in the social sustainability of the residential complexes [18].

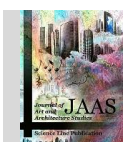


**Diagram 5:** The graphical representation of the relationship of intermediate variable of social identity with its independent variables

**Forth factor: social discipline.** Another factor derived from the questionnaire is discipline and order of the common and semi-public spaces of the complex that can be called the social discipline. The variance of this factor is 8%. From the view point of scholars and experts, a significant percentage of the sustainability of the residential complexes is related to the social order and discipline of its common spaces. The intended order here is the result of the correct performance of the supplementary and service spaces (parking, storage), heating and cooling facilities, and cleanness of the environment, quality of supervision and their utilization and maintenance. The building regulation, structural techniques and the building requirements should be provided so that the residence has applicability in each time and each culture. [22]



**Diagram 6:** The graphical figure of the fourth factor [22]



The factors producing this order such as the availability of a parking and storage for each unit in a predefined and specified place will create the order and discipline in the appearance of the complex as well as the relationship of residents with each other. It reduces the conflicts resulted from the uncertainty or parking the automobile in other place and as a result it will realize the mental comfort and the health of the relations and being satisfied by the neighbors. Moreover, the proper performance of the heating and cooling facilities and cleanness of the environment and common spaces will have great effect on the mental comfort of the residents and as a result on the social sustainability. The primary and physiologic needs of human that Maslow believes they are prior than other needs can be interpreted as the physical needs of comfort of the internal spaces inside the house in the residential complexes. In the findings of the present study, the comfort or physiologic needs with the first priority affect the sustainability of the residential complexes. The sense of security and safety that has specified second place in the Maslow's pyramid of needs for itself can be interpreted as the sense of the security of the people who are subjected in more dangers, I. e, children in the residential complexes. So that, children's play away from any danger will follow the mental comfort of parents. Placing the security in the second level of Maslow's pyramid and as the second effective factor in the sustainability of the residential complexes is meaningful. The social identity can be equated with the need to be belonged and self-esteem that are in the third level of the Maslow's pyramid of needs.

The self-esteem and being verified by others (humans forth need) can be consequence of

realization of the third factor (social identity). In the present study, the social identity is the third factor or on the other words the third series of need to achieve the sustainability of the residential complexes that is placed after factors of comfort, security and growth of children. This finding is correspond with the Maslow's theory and examines and verified it in the field of architecture and residential complexes. The self-efflorescence and the potential ability to meet the relish needs that is in the fifth level of the human's needs can be recognized as the consequence of the realization of the forth factor (social discipline) in the residential complexes. The observance of the building regulation and contribution of neighbors in order to preserve and keep the residential complex well and ordered and cleanness and health and the correct function of the facilities will result the social discipline and order that will cause the more communication of residents and the reduction of the conflicts and tensions (order and beauty) and softening of the environment and relationships. As the result, the mental comfort and safety of relations and satisfaction of neighbors will be established.

Therefore, Maslow's theory that has been presented in the field of psychology in the western world will be confirmed in the field of architecture and residential complexes in Iran's society. Maslow's theory has expressed the hierarchy of the needs. The present study in addition to the determination of the discussed preferences will identify their level, primacy and subsequence compared to each other (Diagram 6).

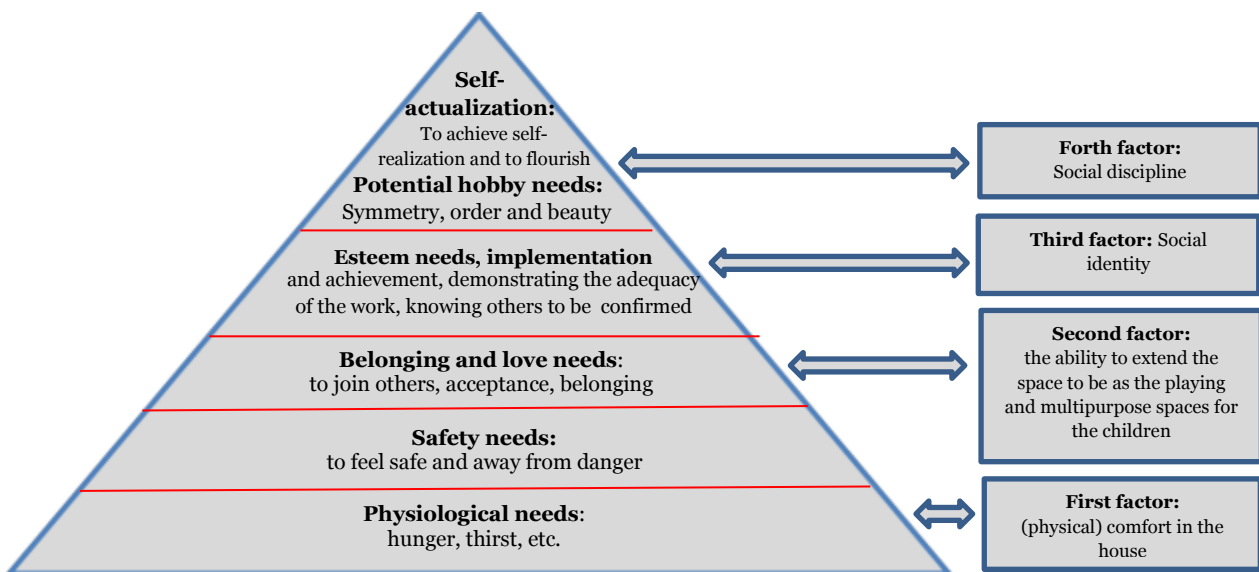
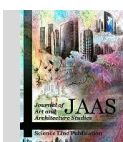


Diagram 6: hierarchy of needs the Maslow's view [22]



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## CONCLUSION

This paper totally was to introduce the sustainability in the architecture, because global warming, thinning of the ozone layer, increase of the pollution of the environment, extinction of the biological species, the loss of the agricultural lands, soil erosion, enlargement of the public health and are some of the phenomena that justify the necessity of the issue of the “sustainability” in all areas related to the human life. The sustainable architecture is created from the harmony and sustainable and homogenous coordination between components of the architecture and the elements of the nature. As we have seen, a sustainable design forms according to three principles: preservation and conservation of the resources, design based on the life style and human-oriented design that the strategies available in each of these principles lead us to a series of terms and criteria.

- The interaction of architecture with the spirituality is a definite and certain issue, because the architecture should place three crucial principles (human, spiritual space and physical space) as a priority in order to consider what human needs as the main concept of sustainability and it should consider that the God is the creator and the human is the explorer.

- The architecture should recognize the nature as its physical body and life and respect it and avoid its indiscriminate destruction.

- The work of architecture from the spiritual and mental aspect is giving shape to the life place; therefore the task of architecture is the simultaneous attention to a container named building for the utensil of the human life. Ensuring the basic needs of human, improving the life level for all people are the goals of the sustainable development in the better management of the ecosystems and safer future.

- In the biological architecture, the following issues should be considered: the relationship between the nature and architecture, preservation of the environment, environment engineering, psychology of the environment, climatic considerations, recycling the materials and energy, preventing the loss of energy, global warming, considering biological, ecological, economical and social conditions.

- In Islam and Quran and Nahj al Balageh, nature and environment have the worthy and excellent position and nobody has right to destroy

the divine natural resources for any reason, rather he/she should try to preserve it as a duty.

- Nature, architecture and human are not against each other; rather they are mutually integrated and complete each other.

## DECLARATIONS

### Authors' Contributions

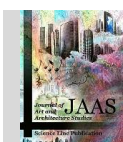
All authors have directly participated in the planning, execution, or analysis of this study, and have read and approved the final version submitted.

### Competing interests

The authors declare that they have no competing interests.

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