

Research Article

Sustainable development in informal areas

Reham Ibrahim Momtaz*

Department of Engineering Architecture, Modern Academy, Al Maadi, Egypt

Received 15 Aug 2017, Accepted 01 Oct 2017, Available online 10 Oct 2017, Vol.7, No.5 (Sept/Oct 2017)

Abstract

Egypt and some third world countries suffer from the existence of informal areas, which are increasing in growth and impacting the neighboring areas, leading to their deterioration and lack of services. Informal areas are considered as a solution to some housing problems as the residents are providing their own dwelling by themselves. However, on the other hand, it has a negative impact in terms of urban and economic deterioration and the spread of ignorance and social indifference and the lack of health and educational services, in addition to that, informal housing is characterized by the fact that it does not conform to the design and construction fundamental rules and lacks public spaces and green spaces. Accordingly, It was necessary to go to find solutions to these problems through sustainable development to improve these areas to reach a better quality of life for residents, taking into account the rights of future generations. From this point of view, the main points of this research can be summarized as follows:

- Informal areas
- The emergence and exacerbation of the phenomenon of informal areas
- Sustainability - Concepts
- Fundamentals of sustainable development
- Global experiences for the study of sustainable development
- Proposed sustainable development indicators

Keywords: Informal areas – sustainability - sustainable development- Sustainable Cities- indicators

1. Introduction

There are many principles and theories of sustainable development processes (economic, social, environmental, urban and architectural). These theories have neglected attention to informal areas, including a special nature that requires development differently. Therefore, it was necessary to find criteria for sustainable development for those informal areas to reach a better standard of living and better quality of life

1.1 General framework of research

The study focuses on identifying the most important definitions and characteristics of the informal regions and the reasons for their emergence and rapid growth in Egypt, then studying the concepts of sustainability and sustainable development and developing a fixed framework for the study by reviewing and analyzing the main indicators of sustainability used in many international and local experiments to reach relative weights of development bases Sustainable development of informal regions.

1.2 Research Objective

The main objective of the research is to study the social, architectural, urban, economic and environmental indicators that must be available in the society to achieve sustainability, then to define a set of criteria and indicators that represent the basis of sustainable development in informal areas that are suitable for improving their quality of life and achieving a better standard of living for the residents and for the city as a whole.

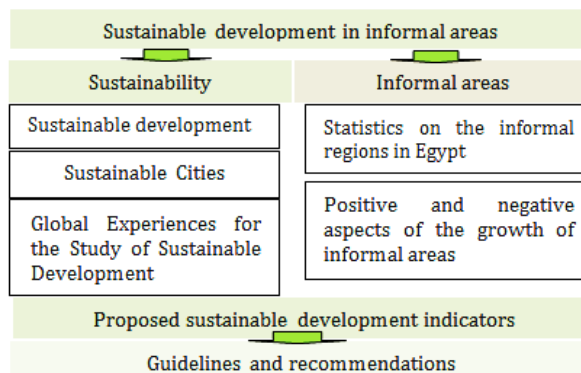


Fig.1 Sustainable development

*Corresponding author's ORCID ID: 0000-0001-8370-932X

2. Informal areas - concepts and opinions

The various definitions of slums have been varied and each has been based on some of the features characterized by the informal areas of being illegal and unplanned, The General Authority for Urban Planning has defined the slum areas with everything that has been built by self-effort, whether buildings from one or more houses or nest in the absence of the law and have not been planned by urban planners. These areas were built on land- not designated for construction -as outlined in the general city Master Plan, and despite the state of buildings may be good but can be unsafe environmentally or socially and lacking basic services and facilities(Maha, 2017).The UN Human Settlements Organization (UN-HABITAT) considers any area with a population density (overcrowding of more than two people / room), unsecured ownership, deterioration of the infrastructure and low construction quality of the buildings to be classified as informal (UN-HABITAT, 2003). Non-formal housing often grows on agricultural land and sometimes on the desert lands associated with cities, especially large cities. Often these informal areas do not have the minimum number of facilities and lacks health, education and social facilities, and in most cases absence of urban public and green spaces.

2.1 The emergence and exacerbation of the phenomenon of informal areas

The problem of slums dates back to the beginning of the 20th century as a result of the non-compliance with the Ministerial Circular No. 28 of 1914 concerning the return of all land belonging to the State of the Amiri Property Authority. That led to its transformation into informal areas due to lack of supervision and guarding for these areas, and as a result of the unprecedented urbanization movement witnessed by Egypt during the second half of the last century for several social, economic and political reasons. The reason for the growth and spread of informal settlements is the increase in population , migration from rural to urban developments, the lack of physical capacity , high prices of land and housing units in official areas, the absence of planning for their rural communities, the desire of the rural people to live in the outskirts of the city because of their proximity to workplaces, and complacency with violators of laws, which helped the rapid growth and exacerbation of the phenomenon(Maha, 2017) (Figure 2).

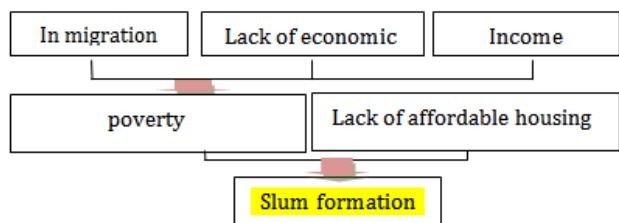


Fig.2 The Challenge of Slums – Global Report on Human Settlements Source: UN-Habitat. (2003)

2.2 Statistics on the informal areas in Egypt

The percentage of informal urban area in Egypt is 37.5% of the total area of urban areas and is divided into unplanned areas with 97.1% and unsecured areas 2.9% of the total area of informal areas. The percentage of informal areas varies from one governorate to another where the largest percentage is in Sohag with about 70.1% and the lowest percentage in Port Said Governorate with 1.3%.The spread of informal areas is one of the most challenges and problems facing the sustainable development of cities in Egypt and other countries with its many disadvantages both in the region itself and the neighboring areas.

2.3 Positive and negative aspects of the growth of informal regions

There are many pros and cons in the growth of informal areas in terms of economic, urban, architectural, social and demographic.

Table 1 A comparative analysis of the positive and negative aspects of the growth of informal regions

	Positive aspects	Negative aspects
Economic dimension	Contributing to solving the housing problem The method of dealing and financing for these areas is commensurate with the capability of its residents and without the assistance of the state	Repairing these areas after their ramifications will require considerable costs compared to areas that are developed according to planning rules and standards. The regulation of these areas is a very difficult problem due to the large number of Laws and regulations violations, which requires many exceptions. Transforming agricultural land into urban areas, which negatively affected the economic situation.
Architectural dimension	Accommodation suiting the needs and potentials of users Regularity of building heights. Population willingness to participate positively in the improvement and maintenance of their areas.	Congestion, poor ventilation and sun can't reach homes Lack of public services, green areas and infrastructure. Narrow streets, leading to difficulty in traffic and fire fighting .The existence of informal areas next to high-end neighborhoods causes a kind of architectural identity loss.
Social dimension	The existence of a harmonious society as a result of unity of interests	Low income people are concentrated in these areas in addition to part of the middle class. Random growth helps the appearance of crime the growth of violence, the spread of unhealthy habits, and the lack of cleanliness and pollution of all kinds. Social isolation and the spread of poverty Weak cultural and educational level and high child mortality.

3. Sustainability

With the increase of urban and environmental degradation and the spread of ignorance,

unemployment and social indifference, it was necessary to find solutions to these problems through sustainable development in order to reach a better quality of life.

3.1 Sustainable Development

Is the development that works to improve the quality of human life, social, economic and environmental. That is through living within the capacity limit to support ecosystems and the resource base. The same was defined by the British government as "the development that is going to ensure the quality of life for everyone now and for future generations."

3.2 Sustainable Cities

Sustainable cities are the cities that achieve the concepts of social justice for the population, where the concepts of democracy and participation in decision-making are strengthened. The sustainability of cities comes through satisfaction of its community to local production, meeting its basic needs and reducing the gap between the rich and the poor. As well as it also balances the capacity limit of local resources and ecosystems by raising the efficiency of resource use and minimizing pollution and waste (Carmona, 2003).

3.2.1 Criteria for sustainable cities

A sustainable city is a city in which the principles and frameworks of environmental, economic, social, architectural and urban are embodied in an integrated system, governed by symbiotic relations Sustainable economic development of society. The aim is to strengthen and multiply community resources, not only to preserve natural materials but to improve economic capacity and social well-being. It is the process by which societies can begin to find solutions to their common economic problems, build long-term community capacity and promote integration of economic, social and environmental goals. The following are some trends to achieve sustainable economic development of society, including (Mark, 2000):

- Redesign and improve infrastructure and services based on knowledge and environmental technologies and expand the implementation and use of information technology.
- Learn how to live on natural resources rather than depleting natural resources.
- Increase self-reliance in society, such as food and energy production
- Product development, manufacturing, marketing, materials and technologies
- Attention to sustainable tourism activities
- Waste Recycling.
- Improve material and energy efficiency and reduce consumption
- Increasing reliance on renewable energy sources

Sustainable social development of society: Sustainable social development aims to help human and natural societies to flourish and gives priority to achieving equality and human resource development at the level of the individual and society, with maximizing the assets of the community, including social norms and traditions (INSS, 20016). Social sustainability consists of social justice, social resources, community stability and the development of a sense of belonging. In addition to the feeling of security, safety and non-fear for the society (Natalie, 2010).

Sustainable environmental development of the community

Sustainable environmental development is that the use of energy and materials is consistent with production. This means increasing self-reliance and society limits dependence on imports, so consumption of energy and materials is reduced. Accordingly the urban pattern becomes more compact, interspersed with energy producing areas, crop cultivation and waste recycling (Mark, 2000).

Sustainable architectural and urban development of the community

Sustainable Urbanization is an application of sustainability principles at the level of design, planning, management and operation of cities. It aims to eliminate the environmental impacts of urban development and provide all resources locally to achieve self-sufficiency within the city in a sustainable manner (Sharifi, 2016). To achieve urban sustainability, we have to reduce environmental pollution and provide different opportunities for housing for the diversity of individuals, cultures and income levels (Shabnam, 2011).

3.3 Local and global experiences to achieve sustainable development in societies

Through the study of some of the previous global and local experiences to measure the most important indicators that have been used to achieve sustainability and its impact in urban communities, it has been found that the most cities that have been interested in studying the concept of quality are the most advanced cities in the field of development and creation of indicators, Where the countries in these experiments prepare a set of indicators in a number of integrated areas for all aspects of development to create a clear general framework of indicators

Curitiba, Brazil

In the middle of the twentieth century, Brazil experienced large-scale rural-urban migration, which put pressure on urban infrastructure and services. The shortage of cheap housing to new residents in cities caused the emergence of favelas.

The Curitiba Institute of Studies has developed a blueprint based on three basic principles for creating a successful city: mobility, sustainability and identity. It has established the first fully pedestrian shopping center in Brazil in the city's main commercial district, as well as Bus transport system "to recognize that the quality of life depends on the ability of the population to move within the city as shown in fig.(3) .



Fig.3 Rabid Transportation System in Curitiba

This means necessity for a public transport system of high quality and low cost that allows the population to move easily within their city. The public transportation system became the basis of development under special land use laws, which led to the growth of the city and the preservation of the historic heart of the city. It has also established an industrial zone dedicated to non-polluting industries. By 2003, these industries accounted for 20 percent of Brazil's exports(Irazabal,2004), setting up gardens and turning old mines and landfills into public spaces, while preserving Curitiba's architectural heritage by using old buildings to host cultural institutions and preserve the city's identity. The municipality allocated large areas of land for cheap housing near the public transportation lines and workplaces, and provided technical assistance to residents to build and design their own homes. The municipality has also established a recycling program that has achieved one of the highest recycling rates in the world and has become a regular source of income for the city's poor(Washburn,2013).

San Jose's green vision²

The full integration of economic development and environmental sustainability efforts creates more jobs, prosperity and clean technology to transform the global economy as a whole. The basic framework for achieving a green economy is illustrated by stimulating economic growth by influencing both supply and demand as shown in Fig. 4.



Fig.4 Illustrates different methods to achieve environmental sustainability

Al Darb Al Ahmar District - Egypt

Despite Al Darb AL Ahmar district is distinguished by important architectural buildings and social activities related to traditional industries, the life circumstances were degraded due to accumulated problems that negatively affected the area throughout years.

As per the United Nations developing program for Cairo issued in 1997, Aghakhan association and other financing partner companies with participation of social efforts, shared in the development of the area socially, economically and environmentally and to enhance the quality of life as indicated in Figure 5.



Fig. 5 Aspects of cultural and environmental development in AL Darb AL Ahmar

Several suggestions were established related to rehabilitation of buildings, the reinstatement of historical Cairo fence, construction of health unit and service center in addition to implementation of urban programs through taking care of economical aspect by providing loans for workshops owners and arranging training programs to workers implementation and also establishing programs for enhancing economical capabilities as feasibility and market studies (Historic Cities Support Program on Cairo,2009). Regarding the social aspect, programs were arranged for literacy, women awareness through the program of women working together, in addition to cultural programs for children and youth.

The following is a comparative analytical study of sustainable development in experiments as shown in Table (2):

²http://www.globalurban.org/San_Jose_ECPA_Curitiba_Presentaion.pdf access 19-6-2017

Table.2 Comparative analytical study of sustainable development in experiments

Indicators of sustainable development		Curitiba City	san José's green vision	Al Darb AL Ahmar
<i>Social Sustainability</i>				
Education	Literacy			
	Increase community awareness and culture			
	Provide infrastructure and facilities for education			
	Ratio of basic education			
Protecting Human Health	Improving public health			
	Environment free of pollution			
	Health Awareness Centers			
	Waste disposal			
	General situation of children			
Community Safety	Social balance			
	Sense of security and safety			
	Availability of cultural services			
	Availability of open and green areas			
	Social justice and the promotion of gender equality			
Participation	Promote community participation in different stages of development processes			
	Participation of government agencies			
	Participation of non-governmental organizations and civil associations			
Environmental Sustainability				
Natural resources	Control of CO2 emissions and poisonous gases			
	Adapting to climate change			
	Rainwater Management			
	Water Recycling			
	Annual water consumption per capita			
	Access to improved sanitation services			
Infrastructure	Waste recycling			
	Exploitation of renewable energies in energy			
	Use environmentally friendly technology			
	Providing infrastructure for bicycles			
	Provide good road networks			
	Provision of multimedia transport networks			
	Improve communication quality and connectivity between neighborhoods			

Indicators of sustainable development		Curitiba City	san José's green vision	Al Darb AL Ahmar
<i>Architectural & Urban Sustainability</i>				
Architectural field	Flexibility in exterior and interior design			
	Reuse existing buildings			
	Use clean energy in buildings			
	Designing of smart buildings			
	Use local recyclable materials			
	Architectural and architectural aesthetic quality			
	Promote the identity, culture and preservation of heritage buildings			
Urban Field	Appropriate Density of construction			
	Diversity of Land Use			
	Redevelopment of Used Land			
	Provide a good urban environment			
	Characteristic Local Character			
<i>Economic Sustainability</i>				
Main Needs	Eliminate hunger and poverty			
	The ability of society to provide basic needs			
	Providing safe tenure			
Work	Eliminate unemployment and provide job opportunities			
	Encouraging small enterprises			
	Employment training for the labor market			
Productivity	Providing transportation systems for goods and individuals			
	Promoting multi-axis urban development			
	Promote the diversity of land uses to strengthen economic bloc			

4. Indexes of the Proposed Sustainable Development of Informal Areas

According to previous experiences in sustainable development and its various indexes, there is a big difference between the main criteria according to the priorities of each society. Therefore, this study will focus on the different criteria of sustainable development to determine the areas of concentration and shortcoming of each criterion to reach the most important points that must be available for sustainable development in informal areas as shown in Table (2) which illustrates the set of indexes whose importance was established in past experiences with the addition of a set of other indexes), which play an important role in the development of informal areas in a way appropriate for the Egyptian society.

4.1 Methodology

The research methodology depends on identification of the study sample in terms of the features and specifications of the samples to which the

questionnaires are applied, and selection of the research tools, which include designing and applying questionnaires to the sample.

4.2 Identification of Research Samples

The sample comprises one hundred and fifty development experts represented in the engineers of districts, governorates, university professors and engineers with experience in the development of informal areas. The research sample was characterized by diversity in education to include Egyptian education and scholarships, to ensure presenting diverse views and thinking directions.

4.3 Selection of the Search Tools

4.3.1 Questionnaire Design

The questionnaire was designed by posing and formulating a set of questions which can determine the significance of points and the relative weight of each point.

4.3.2. Questionnaire Application

Copies of the questionnaire were distributed to the experts. The researcher had to explain and clarify the questionnaire type every time, but without clarifying the purpose of the questionnaire to avoid directing the answers to a certain direction.

4.4 Data Analysis

All questionnaires were and manually tabulated, and information was processed on the computer using the statistical research program "SPSS" in preparation for performing the following statistical process:

Descriptive Analysis: Descriptive analysis was used to determine the central tendency of the sample, where a variable are collected in the scales. It was used to calculate the values of the different variables of the questionnaire. *Standard deviation:* It shows the degree of dispersion and distribution of the values of the variables, i.e. the extent of dispersion of these values with respect to a variable, i.e. the degree of proximity or distance among them as well as the frequency through which it shows the number of experts who chose the relative weight of the question between (1-5) as (1) is the lowest relative weight, and (5) is the highest relative weight and (0) is inappropriate (Elsayed, 1957). *Component Analysis (Factor Analysis)* Analysis of the experts' opinions on the bases of the sustainable development of informal areas (variables) to determine the weight and significance of each variable and to be able to reduce the variables to less ones. If the number is greater than 0.5, the variable is strong, and if it is less than 0.5., the variable is weak (Elsayed, 1957).

4.5 Results

4.5.1 Descriptive analysis of the bases of the sustainable development of informal areas

Table 3. Descriptive analysis of the bases of the sustainable development of informal areas source

Sustainable Development Indexes		Mean	Std. Deviation	Variance
Social Sustainability				
Education	Elimination of illiteracy	4.000	1.0664	1.137
	Increasing community awareness and culture	3.884	1.1182	1.3898
	Providing infrastructure and facilities for education	4.019	1.1797	1.392
	Ratio of basic education	4.192	1.1032	1.217
Man's health protection	Improving public health	4.1154	1.2626	1.594
	Pollution-free Environment	4.307	1.2133	1.472
	Health Awareness Centers	3.653	1.3845	1.917
	Waste disposal	3.416	1.1632	1.292
	General condition of children	3.773	1.1176	1.3789
Society Safety	Social balance	4.057	1.3635	1.859
	Sense of safety and security	3.326	1.1327	1.283
	Availability of cultural services	4.153	1.2269	1.505
	Availability of open and green areas	3.653	1.3458	1.915
	Social justice and the promotion of gender equality	3.615	1.2857	1.653
Participation	Promoting community participation in the different stages of the development processes	3.970	1.2601	1.588
	Participation of government agencies	3.903	1.2408	1.540
	Participation of NGOs Public Societies	4.269	0.8881	0.789
Environment Sustainability				
Natural Resources	Reduce CO2 emissions and toxic gases	4.0769	1.23401	1.563
	Adapting to climate change	3.4325	1.29965	1.662
	Rainwater Management	3.9023	1.34201	1.773
	Water Recycling	3.5715	1.70101	2.657
	Annual water consumption per capita	4.0778	1.23201	1.563
Infrastructure	Access to improved sanitation services	3.5679	1.54385	2.367
	Waste recycling	4.4615	0.87361	0.764
	Exploitation of renewable energy	4.0134	1.48182	2.137
	Using environment friendly technology	3.6932	1.57852	2.492
	Providing infrastructure	2.9038	1.50032	2.285
	Providing good road networks	4.0879	1.00128	1.014
	Provision of multimedia transport networks	3.9423	1.24321	1.546
Improving the quality of communication and connection among districts	4.1143	1.26264	1.546	
Sustainable Development Indexes		Mean	Std. Deviation	Variance
Architectural and Urban Sustainability				
Architectural Field	Flexibility in exterior and interior design	4.002	1.10257	1.219
	Reusing existing buildings	3.961	1.20394	1.449

	Sustainable Development Indexes	Component	
		2	1
Environment Sustainability			
Urban Field	Using clean energy in buildings	4.306	0.78054
	Designing smart buildings	3.832	1.34221
	Using local recyclable materials	3.970	1.22985
	Architectural and architectural aesthetic quality	3.596	1.17654
	Promoting identity and culture and preservation of the heritage buildings	3.769	1.09835
	Appropriate construction density	3.615	1.22305
Urban Field	Diversity of Land Use	3.936	1.57861
	Used land redevelopment	3.846	1.37785
	Providing a good urban environment	3.657	1.55781
	Local Urban Character	4.215	1.36264
Economic Sustainability			
Basic Needs	Eliminating hunger and poverty	4.038	1.38566
	The ability of society to provide basic needs	4.000	1.103248
	Providing safe tenure	3.776	1.16151
Work	Eliminating unemployment and providing job opportunities	4.567	1.16180
	Encouraging small enterprises	4.078	1.06435
	Training labor to be suitable for the labor market	3.634	1.2315
Productivity	Providing effective transport systems for goods and individuals	3.767	1.21546
	Promoting multi-axis urban development	3.465	1.27651
	Promoting the diversity of land uses to strengthen economic bloc	3.443	1.40561

4.5.2 Component analysis of the bases of the sustainable development of informal areas

Table 4 Component analysis of the bases of social sustainability development of informal areas

	Sustainable Development Indexes	Component	
		2	1
Social Sustainability			
Education	Elimination of Illiteracy	-0.09	.777
	Increasing community awareness and culture	-0.209	.780
	Providing infrastructure and facilities for education	-0.153	.834
	Ratio of basic education	-0.247	.813
Social Sustainability			
Man's health protection	Improving public health	-0.209	.794
	Pollution-free Environment	-0.078	.784
	Health Awareness Centers	.053	.833
	Waste disposal	-0.122	.519
	General condition of children	.645	.524
Society Safety	Social balance	-0.210	.700
	Sense of safety and security	-0.285	.600
	Availability of cultural services	-0.070	.839
	Availability of open and green areas	.053	.833
Participation	Social justice and the promotion of gender equality	-0.012	.701
	Promoting community participation in the different stages of the development processes	.369	.747
	Participation of government agencies	.152	.737
	Participation of NGOs Public Societies	.665	.574

As shown in Table 4: the component analysis of the indexes of social sustainability of informal areas greater than 0.5. This means the significance of all indexes, but the degree of significance is different as the number approaches 1 such as the provision of infrastructure and facilities for education, and the availability of cultural services.

Table 5. Component analysis of the bases of environment sustainability development of informal areas

	Sustainable Development Indexes	Component	
		2	1
Environment Sustainability			
Natural Resources	Reduce CO2 emissions and toxic gases	.292	.832
	Adapting to climate change	-.148	.662
	Rainwater Management	-.070	.892
	Water Recycling	-.299	.829
	Annual water consumption per capita	.721	.378
Infrastructure	Access to improved sanitation services	-.348	.787
	Waste recycling	-.001	.761
	Exploitation of renewable energy	-.251	.860
	Using environment friendly technology	-.272	.835
	Providing infrastructure	.376	.419
	Providing good road networks	.344	.715
	Provision of multimedia transport networks	.051	.808
	Improving the quality of communication and connection among districts	.048	.877

According to table 5. the component analysis of the indexes of Environment sustainability of informal areas, whatever is greater than 0.5 represents a strong and weighty relationship such as reduction of CO2 emissions and toxic gases, and water recycling. The weakness points less than 0.5 are represented in the difficulty of providing the grade infrastructure and annual water consumption rate per capita in informal areas.

Table 6. Component analysis of the bases of Architectural and Urban sustainability development of informal areas

	Sustainable Development Indexes	Component	
		2	1
Architectural and Urban Sustainability			
Architectural Filed	Flexibility in exterior and interior design	-0.222	.770
	Reusing existing buildings	.275	.730
	Using clean energy in buildings	-.290	.803
	Designing smart buildings	.584	.378
	Using local recyclable materials	-.147	.780
	Architectural and architectural aesthetic quality	.083	.792
Urban Field	Promoting identity and culture and preservation of the heritage buildings	.065	.726
	Appropriate construction density	.684	.478
	Diversity of Land Use	-.045	.741
	Used land redevelopment	.107	.856
	Providing a good urban environment	-.306	.835
	Local Urban Character	.789	.467

Through the component analysis of the indexes of Architectural and Urban sustainability of informal areas, whatever is greater than 0.5 represents a strong relationship and weight in significance, such as the promotion of identity and community culture, and using recycled local materials. The weakness points less than 0.5 are represented in the difficulty of designing smart building in informal areas. However, with respect to urban development sustainability indexes, we find the significance of the index for reused land development and the provision of good urban environment despite a weakness in the index of treatment of structural density in those areas.

Table 7. Component analysis of the bases of Economic sustainability development of informal areas

Sustainable Development Indexes		Component	
		2	1
Economic Sustainability			
Basic needs	Eliminating hunger and poverty	.369	.477
	The ability of society to provide basic needs	.729	.379
	Providing safe tenure	.565	.583
Work	Eliminating unemployment and providing job opportunities	.110	.846
	Encouraging small enterprises	-.096	.683
	Training labor to be suitable for the labor market	.722	.313
Productivity	Providing effective transport systems for goods and individuals	.073	.693
	Promoting multi-axis urban development	-.425	.761
	Promoting the diversity of land uses to strengthen economic bloc	-.261	.810

Through the component analysis of the indexes of Economic sustainability of informal areas, whatever is greater than 0.5 represents a strong and weighty relationship such as promoting multi-pronged urban development, enhancing the diversity of land uses to strengthen the economic bloc. The weakness points less than 0.5 are represented in eliminating poverty and hunger and the ability of society to provide the basic needs and train labor to suit the labor market.

5. Bases of the Proposed Sustainable Development of Informal Areas

According to this study conducted on the rise and proliferation of informal areas and highlighting the bases and standards of sustainable development in addition to studying various local and international experiences, a questionnaire for development experts was conducted to determine the importance of indexes and their relative weight to form a comprehensive vision. This aims to develop the bases of development suitable for application in informal areas according to the weight and significance of each index according to the experts' opinions and to correspond to the special circumstances of these areas.

Table 8. Relative weights of the bases of the proposed sustainable development of informal areas

Sustainable Development Indexes		Relative weight	
Social Sustainability		25	
Education	Elimination of illiteracy	1.5	.777
	Increasing community awareness and culture	1.5	.780
	Providing infrastructure and facilities for education	1.8	.834
	Ratio of basic education	1.7	.813
Man's health protection	Improving public health	1.5	.794
	Pollution-free Environment	1.5	.784
	Health Awareness Centers	1.8	.833
	Waste disposal	1.1	.519
	General condition of children	1.1	.524
Society Safety	Social balance	1.4	.700
	Sense of safety and security	1.2	.600
	Availability of cultural services	1.8	.839
	Availability of open and green areas	1.8	.833
	Social justice and the promotion of gender equality	1.4	.701
Participation	Promoting community participation in the different stages of the development processes	1.5	.747
	Participation of government agencies	1.4	.737
	Participation of NGOs Public Societies	1	.574
Environment Sustainability		25	
Natural Resources	Reduce CO2 emissions and toxic gases	2.2	.832
	Adapting to climate change	1.6	.662
	Rainwater Management	2.2	.892
	Water Recycling	2.2	.829
	Annual water consumption per capita	.8	.378
	Access to improved sanitation services	2	.787

Sustainable Development Indexes		Relative weight	
Environment Sustainability		25	
Infrastructure	Waste recycling	2	.761
	Exploitation of renewable energy	2.2	.860
	Using environment friendly technology	2.2	.835
	Providing infrastructure	1.2	.419
	Providing good road networks	2	.715
	Provision of multimedia transport networks	2.2	.808
	Improving the quality of communication and connection among districts	2.2	.877
Architectural and Urban Sustainability		25	
Architectural Filed	Flexibility in exterior and interior design	2.4	.770
	Reusing existing buildings	2.2	.730
	Using clean energy in buildings	2.5	.803
	Designing smart buildings	1.0	.378
	Using local recyclable materials	2.4	.780
	Architectural and architectural aesthetic quality	2.4	.792
	Promoting identity and culture and preservation of the heritage buildings	2.2	.726
Urban Field	Appropriate construction density	1.3	.478
	Diversity of Land Use	2.3	.741
	Used land redevelopment	2.6	.856
	Providing a good urban environment	2.5	.835
	Local Urban Character	1.2	.467

Economic Sustainability 25			
Basic needs	Eliminating hunger and poverty	2.2	.477
	The ability of society to provide basic needs	1.8	.379
	Providing safe tenure	2.7	.583
Work	Eliminating unemployment and providing job opportunities	3.8	.846
	Encouraging small enterprises	3	.683
	Training labor to be suitable for the labor market	1.5	.313
Productivity	Providing effective transport systems for goods and individuals	3	.693
	Promoting multi-axis urban development	3.4	.761
	Promoting the diversity of land uses to strengthen economic bloc	3.6	.810

Table 8. shows the bases and indexes of sustainable development of informal areas and their relative weights through the averages of the opinions of experts and the weight and significance of each index. There are 51 indexes divided among social sustainability (17 indexes with relative weight of 25); environmental sustainability (13 indexes with a relative weight of 25); architectural and urban sustainability (12 indexes with a relative weight of 25); and economic sustainability (9 indexes with a relative weight of 25) making a total of 100 degrees to serve as a measure guideline for assessing the informal areas with a view to achieving sustainable development there.

6. Conclusions and Recommendations

6.1. Results

Informal areas are characterized by special features and nature that make their development different from the development of the formal areas, because they must be developed in all aspects without ignoring any aspect.

The development of informal areas must be based on sustainable development means to ensure continuity and improve the living standards. Sustainable development can meet the needs of present generations without compromising the ability of future generations to meet their needs. Sustainable development is divided into four pillars:

- 1) Sustainable development of the society, which depends on increasing the effectiveness of community participation in development processes at various stages, as well as the participation of governmental bodies, and NGOs.
- 2) Sustainable environmental development takes care of the use of clean and renewable energy and development of environment friendly products to reduce the depletion of agricultural land.
- 3) Sustainable development of architecture and urbanism takes care of the cultural dimension of society, reuse of existing buildings, taking into account the aesthetic dimension and design of smart buildings to reduce environment pollution.
- 4) Sustainable economic development through which the society can find solutions to its economic

problems by increasing self-reliance, eliminating poverty and hunger, providing jobs and encouraging small enterprises.

The importance of using sustainable development indexes as a guiding tool to understand the current status of informal areas and identify the needs and inputs required for comprehensive development and to draw accurate indexes that monitor progress in solving the informal areas problems on a regular and ongoing basis and to study the impact of applying policies, strategies and inputs in the urban, economic, social and environmental aspects.

6.2 Recommendations

Paying attention to informal areas to reduce their growth and impact on formal areas through:

- 1) Activating the participation of the government, NGOs and the community in evaluating and developing the informal areas and coordinating them to unify their objectives and divide the tasks among them.
- 2) Providing security systems in informal areas to curb crime.
- 3) Setting a national strategy for the development of informal areas on the short and long terms which includes the employment of sustainable solutions with their various pillars to solve the problems of informal areas.
- 4) Assessment and development of informal areas using the bases of sustainable development of informal areas, providing regular maintenance systems and continuous follow-up of the development processes.
- 5) Raising the cultural awareness of the inhabitants of the informal areas by paying attention to cultural centers and reducing illiteracy.

References

A. Washburn, (2013), *The Nature of Urban Design, A New York Perspective on Resilience*, Island press.

C. Irazabal, (2004), *City Making and Urban Governance in the Americas; Curitiba and Portland*, Antony Rowe Ltd, Chippenham, Wiltshire.

Historic Cities Support Program on Cairo, (2009), *Urban Regeneration in the Darb Al-Ahmar District - a Framework for Investment*.

Integrated Network for Social sustainability (INSS), (2016), *What is Social Sustainability ? , Paths to Social Sustainability Building a Research , Teaching, & Action Agenda for the Southeast*, Georgia Institute of Technology, Atlanta.

Maha.M. Sameh, (2017), *Upgrading the Informal Areas by Employing the Foundation for Sustainable Development*, Master Thesis, Faculty of Engineering, Cairo University, p.77-80.

- M. Carmona, (2003), Public spaces, the dimension of urban design, Oxford, *Oxford architectural press*.
- M. Roseland,(2000),Sustainable Community Development: integrating Environmental ,Economic, and Social Objectives" , *Progress In planning Volume 54, Issue 2*.
- Natalie Rosales, (2010),Towards a Design of Sustainable Cities Sustainability, indicators in urban planning, *46th ISOCARP Congress*
- S. Ayyoob,(2016), Form Garden City to Eco-urbanism :The quest for Sustainable neighborhood Development, *Sustainable Cities and Society*.
- Shabnam H.,(2011) Traditional Neighborhood Development Indicator of Sustainable Urban Landscape, *5th SAS Tech, Khavaran Higher-education Institute, Mashhad, Iran*.
- The General Authority for Urban Planning, (2007): Improving the Urban and Living Conditions of Slums through Participatory Planning: General Framework for Development of Slums and Borders, Cairo, *General Authority for Urban Planning*.
- United Nation Human Settlements Program, (2003),The Challenge of Slums Global Report on Human settlement 2003. *UK&USA: Earth scan*.