Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 3 [11] October 2014: 187-193

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.533
Universal Impact Factor 0.9804

ORIGINAL ARTICLE

Studying Indicators of Sustainable Housing in Rural Areas (Case Study: Villages of Zarrindasht)

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ABSTRACT
Indicators of sustainable housing as an essential tool for describing sustainability in social, economic and physical aspects of housing have special places in planning the rural housing. Therefore, developing a sustainable rural housing needs identification and analysis of various components of sustainable housing. The purpose of this study was to identify and explore the factors affecting the sustainability indicators for rural housing that has been conducted in the way of case studying of the rural areas of Zarrindasht. Research methodology in this study was descriptive - analytical and correlation that has been taken in a combined approach. The statistical population in this study is the household's heads of the rural residential units in Zarrindasht that using Cochran formula, 346 samples were randomly selected among them, and have been studied by questionnaire. Cronbach's alpha coefficient was calculated to determine the reliability of the questionnaire that, in this study, has been obtained more than 74/0%, which suggests the suitability of research tools. The results of the statistical analysis conducted in SPSS shows that the five factors - welfare facilities, economics, strength of building, productivity and compatibility with the environment– are able to explain about 82% of the variance of the research variables. Consideration of these factors seems to be essential in planning sustainable housing.
Keywords: *index, sustainable housing, rural areas, the city of Zarrindasht.*

Received 12.06.2014 Revised 29.07.2014 Accepted 03.10.2014

INTRODUCTION

Beginning of the twenty-first century, developing countries are facing with major challenges such as housing, environment, sustainable energy, and employment. Among them, adequate shelter is an important point due to the basic needs of family or individuals as sleeping, resting, protection against atmospheric conditions, and briefly, the living conditions against the environment [1]. Housing problem exists in all over the world, however, due to rapid population growth, increasing urbanization, internal migration, the lack of sufficient financial resources, problems related to land supply, supply of construction materials and shortage of skilled manpower and most importantly, lack of clear guidelines on appropriate policies and programs concerning land and housing, that has become more acute in developing countries [2].Given the changes that have occurred in recent years in rural communities, addressing housing issues in rural sustainable development which includes all the features of a full-scale architecture is of particular importance. Accordingly, identifying the most important parameters and expressive indicators for sustainable rural housing and determining the rural housing stability factors influencing housing sustainability in rural areas in ZarrinDasht is a problem that this study seeks to answer.

METHODOLOGY

The research method in this study is descriptive - analytic and correlation. The purpose of this study is taking an applied research which has been conducted in a combined approach. Two methods of library and documentary, as well as field approach and direct observation have been used to collect data. The main tool in this study is a questionnaire which content validity is confirmed by and has obtained views of some of the university professors and experts in The Housing Foundation (BonyadMaskan) of the region. The questionnaire has been distributed among 25 households in the study area, then, using the data

obtained and the special formula Cronbach alpha in SPSS, reliability coefficient of the questionnaire were determined of 0/74.

Family heads in rural residential areas in ZarrinDasht are 3825 ones, who form the study population of the present study; Hence, Cochrane formula is used to achieve the reasonable amount of sample that given to the number of the rural statistical population in ZarrinDasht, a sample of 346 were identified to respond to the questionnaire. Finally, considering that some of questionnaires were confounding as well as constraints in financial resources and time, 300 questionnaires were prepared for analysis. Table 1 lists the selected villages with the number of residential units and the number of samples.

In this study, according researchers aims to find out the latent factors to summarize the variables by latent factors, the factor analysis was used. The purpose of factor analysis studies is to summarize the correlation matrix in a manner that they can be explained in terms of several underlying factors. In other words, factor analysis attempts to identify underlying variables or factors in order to explain the pattern of correlations between observed variables [3]. This procedure is done in a way that the results are summarized conceptually meaningfully [4].

Table 1 - Names of the selected villages and the number of the sample households

Number of sample households	Population of households	Selected villages	Total number of households	Total number of villages
15	738	Taj Abad	3534	21
15	252	Chahzir		
30	704	Haji Tahereh		
20	631	Bon dasht		
40	2225	Khosouyeh		
20	1171	Khalil Abad		
20	701	ChahSabz		
25	1940	Dehno		
15	974	Golkouyeh		
15	996	Galougah		
40	3018	Zirab		
30	1385	Miandeh		
15	881	Telrigi		
300	15616	-	-	-

Source: Census of Population and Housing, 2011

Theoretical Foundations

Housing

The concept of housing, in addition to a physical location, includes the whole residential environment that includes all the necessary facilities and services necessary for a better family life as well as employment, education and health planning of individuals. The general definition and concept of housing is not only a residential unit, but also the whole environment [5]. In other words, it is something more than a mere physical shelter and includes all the general services and facilities required for a better life; and a relatively long and secure lien should be available to all users [6]. Housing is known as a physical facility or as an economic and durable goods that plays a social role, too [7]; in addition to this, it is resolving the financial needs, as well as displaying the socio - economic status of the people [8]. Housing, at the same time, is the main factor of socialization towards the world and a major commodity which is a determining factor in social organization of space that has a crucial role in formation of personal identity, social relations and social goals of individuals [9]. Housing is more than physical,structural, institutional, multi-dimensional function [10], which have different dimensions, location, architecture, physical and physical, financial, psychological and medical [11]. In many cases, the most important factor influencing the satisfaction of living in the neighborhood is housing and environmental conditions [12]. According to Le Corbusier's view, both physical and spiritual aspects of human needs must be responded to organize housing space [13]. Housing is a good indicator of the general welfare and unsuitable housing leads to the undesirable and adverse consequences such as diseases and corruption among the youth community [14]. Economic factors, architectural style, native language, cognitive style trends, climate, geography and local traditions have effects on interactive design and development of housing in different locations [15]. In general it can be said that housing in the rural context is known as a component of the overall identity of the village and play a functional role.

Sustainable Development

The issues about the sustainable development roots from Brandt Land Commission's report entitled "Our Common Future". Also, the best-known definition of sustainable development was presented in the same report. The Commission considers the kind of development as the sustainable development which meets the needs of the present time without having to remove the ability of future generations to satisfy their needs [16].

Therefore, sustainable development, rather than focusing solely on economical aspect, designs a philosophy including social and environmental dimensions as well as economical dimension[17]. According to Taylor, the concept of sustainable development is an important step in environmental theory, because it proves how society should organize itself [18].

Thus, it can be seen as an invitation to achieve a dynamic balance among the social, cultural, economic and political factors, stressing on the necessity of protecting the natural environment and an equation between environmental necessity and development needs [19].

Sustainable Housing

Sustainable housing is defined as housing that is economically suitable, socially acceptable, technically feasible and robust physically and is compatible with the environment [20]. The housing that meets the biological needs of the current generation based on the efficiency of natural resources of the energy yetcatchy and considers safety, ecological, cultural, and economic issues is called sustainable housing. Sustainable housing process should consider the following five areas:

1- Preservation of natural resources (land, energy, water)
2- Making rational use of human resources
3- Preserving the ecosystem and its restoration potential
4- Justice between products , people and Categories
5- Predicting health, safety and security [21].

About the Area:

Zarrindasht is located in Fars province and its capital is City of Haji Abad.Based on the 2011 census, population of the city was 69,438 persons [22]. On 29th February 2000, Zarrindaht was separated from Darab, and includes from two sections of Central and Izadkhast, and three cities of Hajiabad(Capital of the city), Dabiran (at a distance of 32 km from the Capital) and Sahrepir (at a distance of 16 km from the Capital). The city is located 255 kilometers away from the Capital of the Province. It is located on southeast of Fars, among Darab- Lar–Jahrom and Fasa. It has warm weather. Zarrindasht has 53 rural settlements in addition to the cities of Hajiabad - Shahrepir–and Dabiran,that only 21 of them have more than 20 families. Geographically, Zarrindasht is located on the longitude of 535846 to 550140 and the latitude of380031 to 283625; 62% of the total area of 462,600 acres is mountains and foothills and the rest is plain and posts. The city is located in the southeastern of Fars, and involves 8% of the province's and 1% of the country's territory. According to the 30-year census, the average of annual rainfall is232/4 mm, and the average of the temperature is 22/7 [22].

Indices and indicators of the Study

One of the most fundamental elements of the design, manufacture and supply of rural housing, is evaluating its indices or indicators. Using these indicators, we can assess the situation of the rural housing system [23].Rural houses in Iran, due to geographical and climatic diversity have different types. These houses are made according to geographical features, land status, kind of living, way of living, and lifestyles of each area. These factors have caused the geographic characteristics of each region differs from the other regions.

Therefore, the concept of the sustainability of a structure on its essence in every time and every geographical place could be different from every other time and place; thus, we can say sustainability has a relative definition that should be evaluated, assessed and planned based on the definition has in every geographical space. All above factors caused that after a variety of surveys which have been mentioned in the methodology of the study, the below factors (Table 2) were be used for the present study.

Table 2 - Parameters and indicators of research

Indicator	Index	Title
Durability of materials used in the aftermath of residential units Durability of materials used in wall housing unit Durability of materials used in the Chinese Chair residential units Durability of materials used in residential roofing Durability of materials used in the floor residential	Durability of materials used in housing	Housing stability

units		
Enjoyment of the residential units of the substructure Household density residential units Density residential units in the Room Density of people in the room	The amount of housing benefit from space	
Family income The rate of household savings of ability to repay loans	Afford household	
----------	The use of local materials in the standard rural residential	
Production of new housing Sale of Land and Infrastructure	Supply and demand for affordable housing	
The number of openings in the energy saving effect Views on the effectiveness of energy saving	The impact of residential architecture. Rural energy savings	
To benefit from the infrastructure of residential units Enjoyment of residential welfare facilities Enjoyment of residential care facilities	Enjoy the amenities of residential units	
Availability of shopping centers in villages Availability of public transportation Availability of training centers Availability of health centers Availability of cultural and religious centers (Mosques, Libraries, ...)	Availability of facilities	
The amount of funds seized affordable rental housing as ... Afford the cost of such money, power, water and ...	Running costs of housing	
Appropriateness of sewer systems, housing Suitability of methods of sewage disposal village style	The impact of rural residential waste	
Productivity of labor employed in the production of housing Efficiency of materials used in housing production Use of Technology in Housing The amount of time efficiency in housing production	Level of productivity in housing	
Tissue expansion of the rural residential lands Destroy pastures and trees for the construction of housing	The impact of rural residential units in the degradation of natural resources	
Use of bank loans for construction or major repairs Utilization of other resources to build or overhaul Use of grants for construction or major repairs	Use of funds	
The amount of residential space for livelihood The amount allocated to the subsistence level	Livelihood space	
Satisfaction with housing interior The external architecture of satisfaction housing Satisfaction of the materials used in housing	Architecture of Housing	
Durability of residential structures Durability of the roof structure housing unit Enjoyment of the residential units of anti- seismic features	Durability of residential structures	
The skills of the labor force employed in Housing Native employment rate of housing production	The impact of employment land and housing market boom	

Source Field studies and research library

DISCUSSION

Calculations indicate that the internal consistency of the data was good (KMO=0/77) and also, Bartlett's test is at 1% level of significant, which indicates that the factor analysis is an appropriate tool to identify the structure (factor model), and the assumption that the correlation matrix is known is rejected. In this regard, the method of decomposition to the principal components was used to process the data and identify the underlying factors of the variables in the study (Table 3).

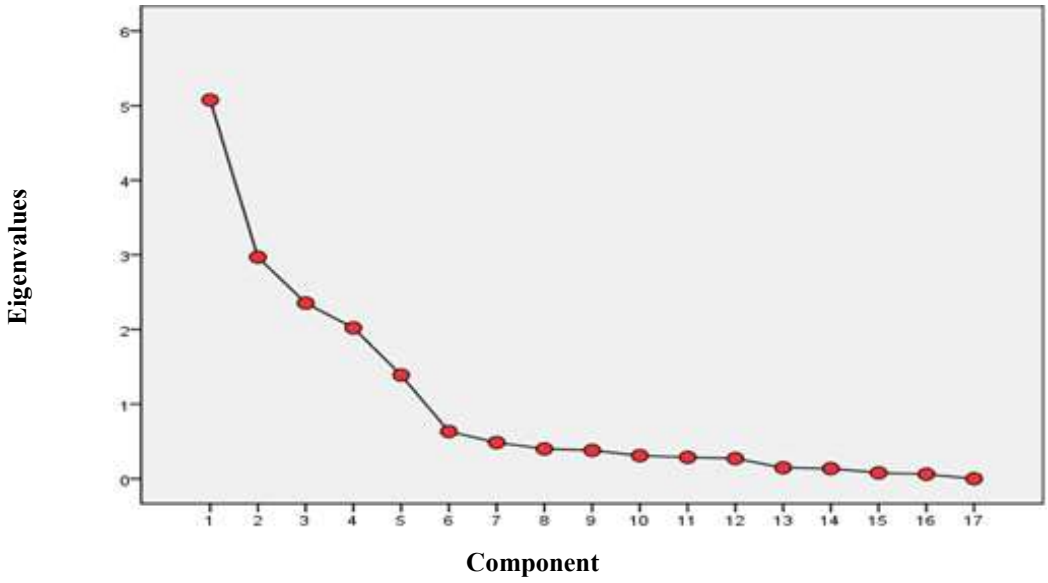
Table 3 - Factor extracted Eigen values of the and percentage variance of the set of indicators

Factors	The initial eigen values			Extraction of total coefficients		
	Total	Variance%	Cumulative%	Total	Variance%	Cumulative%
1	5.075	29.851	29.851	5.075	29.851	29.851
2	2.969	17.466	47.318	2.969	17.466	47.318
3	2.355	13.854	61.171	2.355	13.854	61.171
4	2.021	11.891	73.062	2.021	11.891	73.062
5	1.389	8.168	81.231	1.389	8.168	81.231
6	0.633	3.722	84.952			
7	0.485	2.855	87.808			
8	0.401	2.356	90.164			
9	0.381	2.239	92.403			
10	0.309	1.819	94.222			
11	0.287	1.688	95.910			
12	0.271	1.595	97.505			
13	0.148	0.869	98.374			
14	0.136	0.803	99.177			
15	0.079	0.466	99.643			
16	0.061	0.357	100.000			
17	.E134-16 -3	-E844.1-15	100.000			

Source Conclusions

According to the Kaiser criterion, the first five factors have eigen values greater than 1, and a total of 81/23% of the variances explain mentioned 17 indices. Graphical representation of all the factors that have been considered for mining are illustrated in Figure 1. As this chart shows, only the first five factors are with eigenvalues greater than 1 are and the other factors have an eigen value less than 1 and does not count.

Chart 1 – Illustration of extracted factors based on Kaiser Criterion



After this step, to maximize the relationship between the variables, they are rotated on their own axis; while rotating on the axis of matrix we use Varimax which is the best method for rotation. Varimax is a kind of spin that maintain the independence of the mathematical factors; then, Table 4 has been used to clarify the nature of the extracted factor and to identify the structure (factor model) of the subject of the study and to understand how to load each set of variables. Table 4 contains the coefficients of the variables introduced in the extracted factors that show the importance and role of each variable in formation of the factor. In other words, it is indicating Factor loading from the variables that are obtained from the "decomposition to the principal components" method.

Table 4 –Factors and Parameters pertaining to each factor and factor loadings

Factor	Index	Index Factor
Welfare Factors	Residential Units Enjoy of the Possibilities	0/962
	Availability of the Facilities	0/914
	The Amount of Housings Benefit from Space	0/905
	Architecture of Housing	0/892
	LivelihoodSpace	0/749
Economical Factor	Using Grants	0/878
	Households Afford	0/858
	Running Costs of Housing	0/853
	The Impact of Employment on Land & Housing Market Boom	0/696
	Supply and Demand For Housing	0/530
Strength Factor	Durability of materials used in housing	0/850
	The Amount of the Standard Local Materials Applied	0/834
	Durability of Structures	0/757
Productivity Factor	Level of Productivity in Housing	0/967
	Architectural Impact of Rural Residential Units on Energy Savings	0/951
Harmony with the Environment Factor	The Impact of Rural Residential Units on Waste	0/879
	The Impact of Residential Units in the Degradation of Natural Resources	0/753

CONCLUSION

In total, findings show that the sustainability of the housing in rural areas are not affected only by factors such as durability of the construction or the facilities, but a combination of factors are effective in achieving to sustain the housing in rural areas. It is, therefore, necessary to consider these factors in planning.

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CITATION OF THIS ARTICLE
Mohsen S, Hamid B, Ali A A. Studying Indicators of Sustainable Housing in Rural Areas (Case Study: Villages of Zarrindasht). Bull. Env. Pharmacol. Life Sci., Vol 3 [11] October 2014: 187-193