

An Analysis of the Relationship between Urban Form and Energy Consumption in the Housing Sector (Case Study: Babolsar)

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Extended Abstract

1. Introduction

Nowadays, the importance and role of energy in the life and development of communities are more evident than ever and at the same time, sources and types of energy used by humans exposed to serious changes. Energy problem in our country is not worthy of attention and the government explicit and implicit subsidies always has unaware us of the real value of energy in its various form. However, the growth rate of domestic consumption of energy is to some extent that the present petroleum resources development process, perhaps over the last few years and the other half are not able to export oil. However, more than a third of country energy consumption is also dedicated to the construction sector and heating and cooling systems, are the largest consumers of energy in buildings. Potential relationships between household energy consumption and its impact on urban form, in terms of residential density pattern, urban elements locating, other cases are seen. Density linked to type and pattern of housing. The point is that if we all live in apartments and row houses with high density, what will be its impact on energy consumption and in fact, what kind of link will be exist between energy consumption pattern and size of the house? Urban form

affects the household's lifestyle (for example forced to work at home because of the long distance urban commuting). This potentially can affect energy consumption patterns (Non-city daily traffic). Generally, it can be acknowledged, related studies to examine the relationship between urban form and energy consumption patterns, at the level of what can be called the local aspects affecting the pattern urban form, are still in the early stages.

2. Methodology

This study is applied and in the formulation of this research, descriptive-analytical and documentation-survey methodology has been used. Data related to energy consumption and building quality were collected through questionnaires. Sampling method in this study is a multi-stage cluster, in this way, the questionnaires were randomly distributed among the citizens of the neighborhood based on the number of houses per neighborhood. To determine the sample size due to the limited statistical population, Cochran formula is used and 375 sample is obtained. For this study, data analysis software (SPSS) and (GIS) is used. In order to classify neighborhoods form, the method of simple additive weighting (SAW) was used. Also, to analyze the relationship

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between form and energy, Pearson correlation test, Two-sample t-test and ANOVA test was used.

3. Results

3.1. Determine Babolsar city neighborhoods form

In order to assess and determine the form of Babolsar city neighborhoods, Six main indexes of the form including: mixed-use, density, connection, focus, access to infrastructure and car ownership is used.

3.2. Simple Additive Weighting (SAW) Method to Classify City Form

This model is one of the easiest ways to multiple attribute decision making. At first, the rating is calculated for each neighborhood. Whatever the rating increase, the neighborhood is more compact and on the contrary, whatever the rating is lower our neighborhood is more spread. Hemmat Abad neighborhood with a score of 0/551 have the maximum amount. Also Ali Abadmir neighborhood has the lowest amount among 22 neighborhoods of Babolsar.

3.3. Building Form and Energy Consumption

The results show that there is a positive and meaningful correlation at 0/001 significant level between total household members (independent variable) and the dependent variable energy consumption (0/234), power consumption (0/234), gas consumption (0/339), water consumption (0/488), the cost of fixed phone (0/218) and the cost of households mobile phone (0/262). Namely by increasing the number of family members, energy consumption in various sectors increases. Also, check the relationship between variables indicates that the number of floors (-0/107) and the number of residential units (-0/127) has a significant and negative correlation with energy consumption (the dependent variable). That is mean, there is an inverse relationship between the number of floors

and the number of residential units with energy consumption. As shown in the tables, study shows that there is a positive and meaningful correlation between the number of rooms of housing units (0/153) and energy consumption, and the number of windows (0/139) and energy consumption. Namely by increasing the number of rooms and windows in residential units, power consumption also increases.

3.4. Compare Energy Consumption in Various Forms of Babolsar City Neighborhoods

Comparing energy consumption in various forms of Babolsar city neighborhoods shows that in compact form, the energy consumption is at its highest level. That is, the energy consumption in parking, Sharak Saheli, and Hemat Abd neighborhoods is at their highest level. However, the reality is something else. If we put aside Hemmat Abad neighborhood that has the highest energy consumption among the 22 urban neighborhoods and is one of the oldest neighborhoods in the city of Babolsar and has much old fabric, energy consumption average has the lowest amount in compact form among different forms. So we can conclude, the energy consumption in compact form has the lowest amount among different forms. After compact form, there is an intermediate form and then dispersed form that has the largest share of the city's neighborhoods energy consumption.

4. Conclusion

Checking the relationship between energy consumption and residential buildings form and quality in the city of Babolsar show units that have more rooms and windows, have more energy consumption too, Of course, these two variables can also be attributed to the residential floor area. Residential units with an area of less have less energy consumption compared with the residential units with more area. Checking the relationship between energy consumption in buildings and urban form has shown that the

main relationship is likely to belong to building form. Finally, it should be acknowledged homes with high efficiency in energy consumption, provide a better environment for life and lead to reduce the

destructive effects on the natural environment.

Keywords: Urban form, Building form, Energy consumption, Babolsar.

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