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Investigation of urban aggregative area in Iran from compact city theory point of view Sample: Yusuf Abad area, 6th zone, Tehran city



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Abstract

This paper introduces compact urban form as one of the stable urban development forms, and in the meantime investigates some experimental information whether compact urban forms are stable or not. After reviewing some categories and theories, we find some theorists in the field of compact urban form principles and access rate to environmental stability that depict four criteria for reaching urban stable development as followings: Aggregation, stable transportation, practical composition, and variety,

In addition, we have assessed in this research four criteria and sub-criteria, using AHP hierarchical method with the aid of library research, local investigation and questionnaire technique, environmental stability rate in Yusuf Abad area as an aggregated urban zone in comparison to compact city Grand hill.

Finally, we concluded that Yusuf Abad area has some weakness in stable transportation system criteria and practical composition. Meanwhile, high aggregation with inappropriate transportation system is one of the important factors on instability of an area.

Key words: compact city, sustainable urban development, aggregative, transportation

1. Introduction

In these days, half of the world population live in urban areas, and consume most of resources, which cause pollution in different aspects. Existing pattern of urban sprawl and human activities has been grueling the environment and threaten future life of human and his life. It is suggested that there are various communications and fortifications in city shape and sustainable development.

The advent of stable development as a common word causes various discussions in the field of city forms in this era. Undoubtedly, this word has stimulated many scientists and researchers in different fields to look for multiple forms of human settlement. There are forms, which provide a stable condition and allow established environment to play much

more important role than the past. The concept of stable development is principal incentive for questioning of involvement by its mean different special urban forms may reduce the level of energy consumption in addition, air pollution.(Jabareen, 2006,1)

Discussions about impacts of urban form on travelling patterns probably excite us in pursuing compact urban forms.

2. Data and Material

2.1. Case Study

The region of study is Yousofabad area located in sixth region of Tehran city. Yousofabad area with 120 individual per hectare gross population compactness, 244 individuals per hectare net population compactness, and building compactness percent 183%, can be assigned as one of the most compact form of a city. From this viewpoint, the identity of most parts of this area is housing which it is necessary for correcting accomplished studies based on the compact form of a city specifications. From one hand, due to using comparative research method of AHP hierarchical, we should compare it with another case per se. Therefore, we choose Garn Hill compact city form: Garn Hill is located in Western north of Glasgow city in the north part of England. In 1820, it had been expanded as a suburb, and nowadays it has been connected to the city center completely. (www.garnhill.com).

2.2. Data and Material

The data includes physical data, traffic, social - economic neighborhood Yousef Abad through the study of relevant documents and field surveys will be collected (studies, design and urban development issues 6th district of Tehran, detailed design plans and regional development model 6, the comprehensive plan transportation and traffic, Tehran Master Plan (transport studies and transport network Communication comprehensive plan of Tehran)) . In addition, collecting data will be done from a sample population using a questionnaire technique.

3. Research Methodology

In the present survey, based on nature of subject, we have tried to utilize quantitative research method with analogical-analytical inclination.

Therefore, in order to achieve our goal, in the beginning and according to some studies, we introduce some standards and substandard to assess the survey study.

At first, we continued studying specifications of each standard in the area of investigation with scrutiny of plans and related documents to Yousof Abad area. After that, we analyzed the information gained by questionnaire technique and expert interview.

In the second step, AHP hierarchical analysis method used to determine the rate of influence on each of variables and relationship between them and indexes which comprised of a qualitative and quantitative collection. We accomplished all of the above-mentioned criteria to determine weight of variables, amount of its impact in access to the aim.

4. Results and Analysis

4.1 Introduction

Nowadays, form of a city has been recognized as a source of environment problems (Albert; et al. 2003; Beattey and Maming 1997).

Advent of stable development as a common word causes various discussions in the field of city forms, in order to search for different forms of human settlement. The forms which

provide stable conditions, and allow community to play its role much more drastic than before.

Based on accomplished surveys under title of an essay from Mr. Yousof Rafegh Jabareean with the name of sustainable urban forms, the form of compact city has had the highest rate among the others. (jabareen.2006)

4.2 Compact City

Some patterns of cities that resist to ultra sprawling, and assure this situation that the entire city parts, even castaway and silent areas have access to transportation system facility. Compactness, applicable composition and intensifying in application are three criteria of the compact city theory, regretting to three criteria altogether can guarantee successful city pattern in reaching sustainable urban forms.

Table 1 illustrates preliminary list of compact city specifications. Available specifications on this table are based on applicable considerations, related words, and different observations.

| Compact city specifications | |
|---|--|
| <ol style="list-style-type: none"> 1. Inhabitant area and big active population. 2. Different land applications. 3. Delicate usage of land. (vicinity of various applications and fairly small sizes of land) 4. More social and economical interactions. 5. Continuous growth.(some pieces may be intact or an space for parking lot) 6. Border determination for city by rule limitations. 7. Availability of urban infrastructures, especially urban sewage system. 8. Different transportation system. 9. High rate of accessibility: in local and regional level. 10. Very high proportion of street connections. (Domestic and foreign) include sidewalks and special cycling lines) 11. High proportion of street cover. 12. Low rate of place-space. 13. Supervision of unit on growth program and development or supervision and intensified controlling or coordination. 14. Profound fiscal capacity of government for allocating budget in urban facilities and its infrastructure. | |

Table 1: Compact city specifications

(source:Burton,2000.Galster,2001.Song,Knapp,2004.Newman,2005)

Finally, we indicated four principal criteria to consider compact city form in reaching urban environmental sustainability include sustainable transportation, applicable composition, and variability.

| Standard | Definition | | |
|--------------------|---|-----------------|---------------|
| compactness | Increasing in compactness, enhancing development compactness in city lands. | | |
| | Theories | Theorist | Result |
| | 1.75-125 individuals compactness per hectare (Aminzadeh, 1387) | Tabibian | |
| | 2.Capability in walking in leisure time between the farthest | Tabibian | |

| | | | |
|-----------------------------------|--|----------------------|---|
| | positions in 10 minutes (Aminzadeh, 1387) | | |
| | 3.Through changes in city form (compactness) and reduction in car transportation, about 6 to 7 percent energy consumption can be saved via this procedure. (Wilkenfeld et al, 1995) | Stroton | |
| | 4.Compactness development in the urban areas and reduction in distance of urban transportation accordingly cause diminishing in poisonous green gases.(ECOTEC,1993) | Michael Janks | |
| | 5.A compact city causes 43% reduction in fuel consumption among other urban forms (Newton, 200). | Peter Newton | |
| | 6.Compactness and dependency to cars: 6-1.Low compact cities of USA and Australia = the highest rate of dependency to car. 6-2.Moderate compact cities of Europe = lower dependency to car 6-3.Rich and compact Asia cities = low dependency to car 6.4.Compact Asian cities and under development = higher dependency to car.(Newman and kenworthy,1999) | Newman and kenworthy | Population and building increase compactness + |
| | 7.The compact city should have a suitable form for pedestrians, cycling, effective public transportation and that form of urban compactness, which causes social interactions.(Elkin,1991) | Elkin | sustainable usage of city lands through developin |
| | 8.Combing factors such as higher settlement compactness, different forms of transportation system can reduce time, distance and expenditures of transportation.(Buxton,2000) | Buxton | g undeveloped lands and redevelopin |
| | 9.Increasing in compactness and different applications of public transportation system causes people find their way in a very short period.(Buxton,2000) | Buxton | g existing buildings |
| | 10.Compactness of 25 to 40 people per Hectare .(Buxton,2000) | Buxton | |
| | 11. Impact of compactness in some of transportations (transportations which is related to work place).(Masnavi,2000) | Masnavi | |
| | 12.Compactness of city should be accomplished in places with low job opportunities, because makes higher transportation to neighbor settlements.(Banister,1997) | Banister et all | |
| Standard | Definition | | |
| Sustainable transportation | Suitable forms and sizes for walking, cycling, and efficient public transportation | | |
| | Theories | Theorist | Result |
| | 1.Through changes in city form (compactness) and reduction of travelling by car approximately 6 to 7 percent of energy can be saved. (Wilkenfeld et al, 1995) | Stroton | Car ownership and usage ratio of public transportat |
| | 2.Tough and spread communication between automobile usage and parameters like: public transportation amount, public transportation speed in comparison to traffic speed, road length, parking allocation.(Newman and kenworthy,1999) | Newman and kenworthy | ion + |
| | 3.The most common compactness of variable explaining energy amount consumption in public transportation system . (Newman and kenworthy,1999) | Newman and kenworthy | |

| | | | |
|--|---|----------------------------------|---|
| | 4.Compactness is the major factor in depending on automobile.(Newman and kenworthy,1999) | Newman and kenworthy | Public transportat ion system conditions -distance for work travelling |
| | 5.Realization of sustainable urban form essentially includes development of compactness, which they can illustrate public transportation, walking and cycling as choices. (Newman and kenworthy,1999) | Newman and kenworthy | |
| | 6.Development of regions near to public transportation area. (Buxton,2000) | Buxton | |
| | 7.Direct correlation between car ownership and increasing the number of trips.(Hanson,1982& Ewing,1995& Naess et all,1995) | Hanson, Ewing, Naess et all | |
| | 8.Regions with high compactness that they have less tendency toward car ownership.(Levinson and Kumar1997& Naess et all,1995) | Levinson and Kumar, Naess et all | |
| | 9.Mutual correlations between urban compactness and average time of work trips have weaker relationship. We can see just 6.4% average changes in the time of work trip in correlation with changes of urban compactness.(Oberol, 2004) | Oberol | |
| | 10.There is a trivial correlation between population of region with kind and ratio of using public transportation system (16.37). (Oberol, 2004) | Oberol | |
| | 11.A very weak and indirect relationship between compactness and automobile ownership. (Oberol, 2004) | Oberol | |
| Standard | Definition | | |
| variety | Variety in economical and social groups and variety in their activities | | |
| | Theories | Theorist | Result |
| | 1.Relationship, social, behavioral and economical rules in different patterns of a trip.(Williams et all,2000) | Simondz &combez | Varity in social and economica l Group(inc ome, age group, culture, and behavior patterns |
| | 2.Automobile ownership and income amount. (Williams et all,2000) | Simondz &combez | |
| | 3.Direct relationship between income increase = increase in number of trips. (Hanson,1982) | Hanson | |
| | 4.Direct relationship between income increase = increase in gone trips per individuals.(Cervero, 1996) | Cervero | |
| | 5.Direct relationship between income increase = increase in energy consumption. (Nass,and Sandberg,1996) | Nass,and Sandberg | |
| 6.Direct correlation between family dimension and trip amount. (Hanson,1982& Ewing,1995) | Hanson, Ewing | | |
| Standard | Definition | | |
| ble co m | Suitable vertical and horizontal facilities and services in a way that all of residents have a fair access to all of them | | |

| | Theories | Theorist | Result |
|--|---|-----------------------|--|
| | 1. More than 70% of consumed energy depends on programming of field application. (Barton, 1990) | Barton | Suitable spread of vertical and horizontal facilities and services |
| | 2. Suitable accessibility can cause some changes in travelling behaviors of people at that region. (Reneland, 2000) | Reneland | |
| | 3. Applicable composition vertically or horizontally causes to use land in a very sustainable form, reduces the number of trips, and increase energy reduction through increasing in compactness of buildings. (Williams et al. 2000) | Williams et al | |
| | 4. Vertical application of this composition is one of the principal elements for solving traffic. (Williams et al. 2000) | Williams et al | |
| | 5. Different limitations of applicability have a large amount of pedestrians in comparison to ad hoc regions. (Masnavi, 2000) | Masnavi | |
| | 6. In compact regions with multiple applications, public transportation system is used with low proportion. (Masnavi, 2000) | Masnavi | |
| | 7. Different usage (vertical and horizontal spread of facilities) = reduction of the private car usage. (Frank, Pivo, 1994) | Frank, Pivo | |
| | 8. Compact city with multiple usages causes reduction of private car usage to 70%. (Masnavi, 2000) | Masnavi | |
| | 9. High compactness along with multiple applications can increase sustainability. (Masnavi, 2000) | Masnavi | |
| | 10. Positive impact of multiple applications on trip behaviors. (Frank, Pivo, 1994 & Cervero, 1996) | Frank, Pivo & Cervero | |

Table 2: A summary of theorists' comments in the field of each compact city form standards (based on accomplished studies in theoretical basics section)

In conclusion, based on implicated considerations in previous chapters and assigned results in Table 3, we depicted following substandard in order to consider each of standards in reaching sustainability of our environment.

| Standard | Substandard |
|--|---|
| Compactness | 1. Population compactness (individual per hectare) 2. Structural compactness (number of buildings per hectare) 3. Re-development of available buildings 4. Extension of previous undeveloped buildings |
| Sustainable transportation system | 1. Automobile ownership percentage 2. Public transportation usage percentage 3. Accessibility to preliminary services 4. Average gone distance for work trips |
| Application composition | 1. Horizontal composition (facilities extension) 2. Vertical composition |
| Variety | 1. Variety in economical and social level 2. Variety in the kind of settlement |

Table 3: Suggested standards and substandard

4.3. Data Analyses

As we said before, in order to determine importance coefficient of each compact city form standards in achieving sustainable city form, we used hierarchical AHP analysis. According to hierarchical AHP analysis, in first step, for finding important coefficient of standards, we should consider them pair by pair.

The aim of this research is access to an environmental sustainability with using this table (the amount of clockwise quantity 9 for comparison of pairs in standards).

| choice | compactness | | | | Sustainable transportation | | | | Applicable composition | | variety | |
|-----------------------|--|------------------------------|---|---------------------------------------|----------------------------|--------------------------------------|---|---|------------------------|----------------------|---|----------------------------|
| | Population compactness(individual per hectare) | Unit compactness per hectare | Development of previous undeveloped lands | Redevelopment of existing settlements | Car ownership percent | Public transportation system percent | Walking accessibility to essentials of life | Average distance for work travelling | Horizontal composition | Vertical composition | Verity in economical and social context | Variety in settlement kind |
| Garnthill(A) | 110 | 46 | moderate | moderate | % 68 | % 7 | Fair accessibility | 2-3 kilometers | moderate | moderate | low | Not exist |
| Final result | 0.1439 | | | | 0.1183 | | | | 0.2671 | | 0.0377 | |
| Yousofabad (B) | 120 | 98.15 | Fairly suitable | unsuitable | % 77 | % 33 | Fairly low accessibility | 52% of residents higher than 3 kilometers | Fairly unsuitable | unsuitable | low | Very limited |
| Final result | 0.3039 | | | | 0.0299 | | | | 0.0496 | | 0.0423 | |

Table 4: Assessment matrix between two choices and final rate of them for environmental sustainability

Compatibility of considerations in judgments:

The mechanism, which is used in consideration of these judgments incompatibilities so called (I.R), resulted from index of incompatibility (I.I) to regression index. Whereas, the coefficient is smaller or equal to 0.1, compatibility in judgments will be acceptable, otherwise, we should revise judgments again: $CK = < 0.1$ ok

5. Conclusions

We achieved to the following results in the field of environmental sustainability amount of Yousofabad area from results of theoretical discussion and analysis of informative chapter:

- 1.Yousofabad area, according to standards of sustainable form of a compact city, is not in a good situation from environmental sustainability viewpoint.
- 2.Yousofabad area in comparison to compact city theory has some weaknesses in transportation system standards and application composition.
- 3.High compactness along with unsuitable transportation system is one of the most important factors in unstable in the studied area.

According to the accomplished studies, compact form of Yousofabad region does not own a suitable transportation system.

From one point, due to

1-Lack of mini-bus transportation system with high flexibility in comparison to bus is determined as departure vehicle.2-Inaccessibility of walkers to essentials of life.3-Long distance between workplace and home.4-Behavioral pattern of settlers(427. Prefer to use their private car in transportation)

It is concluded that weakness in transportation system along with lack of suitable programming for lands is one of the major factors in instability at our studied area.

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