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Study the Economic Value of Tabriz Metropolitan Housing Based on Environmental Factors with Sustainable Development view

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ABSTRACT

Features of current era urbanization include population growth and consequently the development of small and big cities. Predictions indicate further environmental destruction and pollution in cities and urban areas due to continuity of cities. Sustainable urban development is a comprehensive development that refers to different aspects. One of the main axes of sustainable urban development is good housing and living environment; given that 50 percent of urban spaces include residential spaces. In many cases, the most important factor affecting people satisfaction from living in a region is housing and environmental conditions affecting that area. Nowadays, environmental problems including air pollution are the most significant issues in major cities such as Tabriz that influence on prices of residential houses. In this study, welfare-oriented economic valuation method (Hedonic method) is used for environment; according to valuation results, this study shows the realization of sustainable development based on opposite effects of pollutants on housing price in Tabriz.

KEYWORDS: city, Hedonic methods , housing, pollution, sustainable development.

1. INTRODUCTION

The city is one of human phenomenon in environment for housing, livelihoods, social and economic relations and affects quality of human life as living place of citizens.

According to urban sprawl in recent decades, addressing the problems and environmental effects on megacities and their assessment, knowing the importance of different types of destruction and their effects on human health, economy and ecosystems are essential. The need for making appropriate decisions in order to prevent and reduce air pollution, environmental waste and damage on environment is essential. The most important challenge of recent years is pollution of large cities. Air pollution includes all kinds of pollutants including solid, liquid, gas or radioactive and non-radioactive radiation in air that endanger life quality of humans and other animals during a period. The most important air pollution includes endangering human health, disorder in his welfare, reducing visibility, weather effects and damages to plants [1].

According to continued development in future, predictions suggest increasing environmental destruction and pollution in cities and urban areas. Following these developments and concerns, sustainable development theory is strengthened that its origin goes back to last decades of twentieth century [2].

In recent decades, sustainable urban development has affected social, economic, cultural, political and environmental aspects of human life. Introduction of sustainable development and sustainable urban form are effects of cities on biosphere and different aspects of human life. Undoubtedly, sustainability and sustainable development issues will be meaningless without attention to cities and urbanization. Cities are considered as the main cause of instability in world. Accordingly, identification of key factors in achieving stability and sustainable urban form looks necessary due to inherent complexity of cities and various aspects of their effects that is one of the significant issues in achieving a sustainable urban housing.

One of the most important sectors of economy is housing and settlement conditions, especially in metropolitan where environmental effects are very evident; because housing constitutes a large part of human wealth in most societies, and an apartment or house is usually the biggest shopping that a person does in his life [3]. The importance and role of housing in economy and its effects on developing countries is a known discussion so that housing is a commodity that has no mobility and succession feature.

Environment and climate are public goods which are not traded in market and people do not pay to use them. So, they are not aware of their real value and use indirect method in order to evaluate them. For example, it is true that people do not pay directly for clean air but they generally prefer to live in an area of city with clean air. This preference will ultimately increase housing demand and housing price in that area. Accordingly, it can be interpreted that people paying more for housing, spend more indirectly for clean air [4].

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In recent years, Tabriz pollution has been increasingly so that the amount of pollution at times has exceeded warning level. Pollution emission resources in Tabriz must be studied determining the effects of air on housing prices.
The main objective of this study is to determine the types of pollutions, their effects on housing prices and sustainable development of Tabriz metropolitan. In fact, this study tries to answer the question of "How much air pollution affects housing prices at micro level.

2. LITERATURE REVIEW

2.1. Theoretical literature

McDougall [5] studied the effects of public goods and services on residential housing prices in Los Angeles Metropolitan area. This study was performed using a cross-sectional statistics of 35 urban areas and two models. The results showed that local police services and Education have the highest effects on prices.

Murdoch &Tyre[6] in a study entitled "Hedonic price equation of urban air quality variable" tested the hypothesis of using mean air pollution in Hedonic model against the hypothesis of using possibilities related to air pollution levels.

Freeman [7] announced the observed prices in balance conditions as indicator of maximum utility of buyers and maximum earning of sellers. This means that if prices are adjusted quickly, the estimated coefficient must show the preferences of buyers and sellers; therefore, the effect of an unpleasant environmental factor such as air pollution on reduced preferences of buyers is possible through research in market.

Tuohy[8] has examined history of discussion on sustainable housing and concept of sustainability in housing. Then, he has stated factors affecting stable housing as well as introduced the best examples that are done in this field.

2.2.Experimental history

Hassan Shahi [9] has conducted a study entitled "an estimation of air pollution economic damage on Shiraz". Part of this research is dedicated to Hedonic method where devaluation of residential homes due to air pollution is studied. In this study, a total damage of urban houses is estimated as 221 million dollars annually per 1% increase in aerosols. Sadeghi et al (2008) in a study examined the effects of air pollution on housing value in Tabriz using Hedonic price function. The study suggests that area of housing infrastructure, tenant income and Education as well as air pollutants are detected as three important variables affecting housing rent. Khosh Akhlaq et al (2008) have estimated in a study the urban housing demand of Khomeini Shahr using Hedonic Pricing Model including 190 observations and ordinary least squares method. The results show that physical, environmental and neighborhood features of residential units have the most effect on prices. Paul et al (1997) in a study entitled "living in crowded and contaminated streets (strategy for environmental assessment) evaluated the utility of healthy and non- healthy environment using hedonic model. This study uses the comparison between houses located in busy and contaminated streets and houses located in quiet and clean streets as well as the effects of air pollution and noise pollution on housing.Boyle and Kyle (2001) reviewed the researches done on twelve cities of United States and concluded that main negative effect of air pollution on property values is evident as well as implies people willingness to pay for improved air quality.

2.3 Conceptual model

Kim et al.[10] measured benefits of improved air quality in Seoul through combining spatial econometric methods and Hedonic price model. The main result of study is that end willingness to pay for 14% improvement in air quality per household (owner) is around 3,000 to 3,300 $ (1.2 to 1.5 percent of housing prices).

Ridker and Henning [11] examined the effects of air pollution on housing prices of US, St. Louis using hedonic price function. According to this study, pollution play main role in housing prices of this area. Astrozhim (1973) studied on housing market of San Francisco using Hedonic model. He showed that there is a linear relationship between value of residential units and their characteristics such as type of ownership, infrastructure area, structure life and total cost construction. Dokmiki, Önder, Yavas (2003) in a study divided Istanbul into 18 areas, including 12 European areas and 6 Asian areas. In this study, Hedonic model was used in order to estimate housing demand function. Hedonic model variables that are used in this study were classified into 3 groups including: a) local or regional characteristics, b) property characteristics, c) external characteristics (external factors).

Behnamiyan[12] estimated the cost of housing units' rental function in Tehran using Hedonic model. In this study, two functions were estimated separately for apartment and villas units. The most explanatory power of dependent variable is related to independent variable of infrastructure with elasticity coefficient of 0.66. Dwellings age with statistical coefficient is important from consumers' prospect.

Griliches[13] had important role in introduction of Hedonic models and techniques of dealing with heterogeneity and multidimensionality of goods. Griliches refers to Kurt article (1939) in his articles as the first article on Hedonic methods and considers this article as the first study on using these techniques and Hedonic word in analysis of heterogeneous or multi-dimensional goods price.

3. Definitions

3.1Sustainable Development

Sustainable development means a development that meets the needs of present generation without compromising the ability of future generations in meeting their needs [14].

Sustainable development is a development that could be continued in the long term without any damage to environment. In this regard, sustainable urban development refers to balance between social, economic, environmental aspects of urban and their simultaneous development. Urban is an interlocking whole from combination of different components.

3.2 Air pollution

Air pollution is the presence of one or more pollutants in air in sufficient quantities with specific and steady properties which can endanger human, animal, plant life and human assets or disrupt greatly desirable life process [15].

Air has natural pollutants such as CO2 due to natural decomposition of methane, hydrogen sulfide and methane due to anaerobic decomposition of organic matter.

Many of these harmful substances are released into the atmosphere through resources that are currently not under human control. However, the main source of this pollution is human activity in most areas with high population density, especially in industrialized countries. These activities are closely related to proper patterns of life and limiting them leads to lower life quality.

There must be three factors at the same time including the source, a tool for pollution transfer and a recipient for the occurrence of a disaster or air pollution problem [16].

Figure 1 shows the process as well as agents affecting each factor.

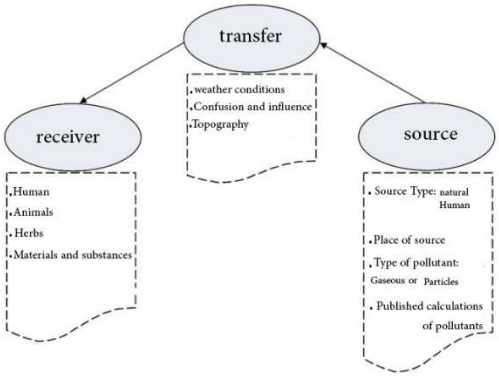

Figure 1: Triple factor: source - transfer – receiver

4. Classification of pollutants resources

There is variety of air pollutant resources in cities, given the complexity and development of modern life in cities. The resources of pollutant are very diverse and varied but they can be classified into four main groups due to production resources: Transportation (including motor vehicles, air vehicles, trains, ships and any use and evaporation of gasoline), stationary combustion (including energy supply resources and heating for residential, commercial and industrial purposes, power generation plants that work with steam power), industrial processes (such as chemical industry, metallurgy, paper production and oil treatment refinery) and waste excretion (including waste from households and businesses, coal and ash waste of burning agricultural residues) [17].

In modeling discussions, the pollution resources of air in cities, especially in metropolitan areas are classified into three groups as follows:

4.1 Temporary resources

Temporary resources are primary pollutants that are produced by different activities or processes other than combustion and evaporation. These pollutants are resulted from diverse activities in different parts of mining industry, agriculture and services, such as chemical industry, glass manufacturing, acid production, rubber making, mineral processing, food processing, etc.

4.2 Stationary sources

Stationary sources are resources that are always deployed in an area such as settlements and industrial zones, industrial complexes, factories, small and great workshops, power plants, refineries, airports, commercial centers, and service centers and residential.

4.3 Mobile sources

These resources include a variety of private and public cars, small and great transportation systems of goods and passengers, air planes, helicopters and ships.

4.4 Metropolitan Tabriz

Tabriz is located at an elevation of 1340 meters above sea level and at 46 degrees east longitude and 38 degrees north latitude in terms of geographical features. Tabriz is surrounded by Eynali highlands from North and West, Sahand mountains from south and opens up Tabriz Plain flat lands from East and Southeast. [18]

According to census of 2011, Tabriz estimated population is1494998 people. The city area is over 23,745 square meters[19].

5. Types of pollutants

The major pollutants that are considered in determining the amount of cities pollution is as Table 1. Published calculations of pollutants are related to these pollutants. Emission resources are classified into three major groups of mobile, industrial stationary and non-industrial stationary resources.

Table1. Classification of emissions in Tabriz (assuming oil fuel consumption in thermal power plants)

References	Total	Pollutants (t/y)				
		SO2	NOx	CO	HC	SPM
Stationary	68،199	31،380	25،721	1،373	1،554	8171
Mobile	190،855	4،036	13،149	146،930	16،073	10،666
Total	259،054	35،416	38،870	148،303	17،627	18،837
Stationary resources percent	26	88	66	1	9	43
Mobile resources percent	74	12	34	99	91	67
Share percent in total pollution	100	14	15	57	7	7

Statistical analysis shows that HC and CO emissions are only due to vehicles and particulate matter emissions are mostly due to vehicles. High emission of sulfur oxides is due to stationary resources and oil fuel consumption by power plants. According to Table 2, removing the oil fuel consumption in plants leads to dramatic change of emission percentage.

Table2. Classification of emissions in Tabriz without oil fuel consumption

References	Total	Pollutants (t/y)				
		SO2	NOx	CO	HC	SPM
Stationary	35,376	953	24,614	1,223	1,595	6,991
Mobile	190,855	4,036	13,149	146,930	16,073	10,666
Total	226,231	5,001	39,370	148,393	17,669	17,812
Stationary resources percent	16	19	62	1	9	39
Mobile resources percent	84	81	38	99	91	61
Share percent in total pollution	100	2	17	65	8	8

Comparing both tables 1 and 2 shows that HC emissions from mobile resources and NOx emissions from stationary resources are the most sensitive cases. The main contribution of SO2 emission is related to oil fuel consumption in thermal power plants.

It must be noted that mobile resources play major role in production of 3 types of pollutions (CO, HC over 90% and SPM over 60%).

The production percentage of pollutants in different areas of municipality is offered separately. Areas 11, 12 and 13, represent refinery, petrochemical and thermal power plants, respectively.

Table3. Stationary pollutant production percent in different areas of municipality in summer

Pollutants					
NOx	SO_2	CO	SPM	HC	Areas of municipality
14	14	14	14	14	One
9	9	9	9	9	Two
16	16	16	16	16	Three
20	20	20	20	20	Four
4	4	4	4	4	Five
6	6	6	6	6	Six
7	7	7	7	7	Seven
2	2	2	2	2	Eight
4	4	4	4	4	Nine
12	12	12	12	12	Ten
2	2	2	2	2	Eleven
1	1	1	1	1	Twelve
3	3	2	3	2	Thirteen

Table4. Stationary pollutant production percent in different areas of municipality in winter

Pollutants					
NOx	SO_2	CO	SPM	HC	Areas of municipality
13	1	14	13	14	One
9	0	10	9	9	Two
16	1	17	15	16	Three
20	1	21	19	20	Four
4	0	4	4	4	Five
5	0	6	5	5	Six
7	0	7	6	7	Seven
2	0	2	2	2	Eight
4	10	4	3	4	Nine
12	1	13	12	12	Ten
3	24	1	4	2	Eleven
1	14	0	2	1	Twelve
4	48	1	6	4	Thirteen

Table5. Mobile pollutant production percent in different areas of municipality

Pollutants					
NOx	SO_2	CO	SPM	HC	Areas of municipality
32.28	34.79	29.19	29.49	26.21	One
7.79	6.22	5.53	6.88	6.45	Two
1.04	2.9	1.22	2.44	0.95	Three
37.72	44.22	61.23	44.73	48.09	Four
18.68	18.17	17.51	22.54	21.06	Five
79.36	72.63	66.05	74.15	75.52	Six
4.9	6.19	6.56	7.09	6.51	Seven
3.57	2.35	1.78	2.26	3.49	Eight
3.89	3.33	3.46	3.16	2.97	Nine
9.91	6.7	6.67	6.2	7.77	Ten
0.74	0.56	0.44	1.03	0.69	Eleven
0	0	0	0	0	Twelve
0	0	0	0	0	Thirteen

6. RESEARCH METHODOLOGY

Study model is based on housing Hedonic pricing model:

Equation 1 $HOP_t = f(CO_4, SPM_4, HC_4, NO_4, SO_4)$

That is clarified as below

Equation 2 $HOP_t = \propto_\circ + \propto_1 LCO_t + \propto_2 LSPM_t + \propto_3 LHc_t + \propto_4 LNO_t + \propto_5 LSO_2 + u_t$

Clarified model is logarithmic so that percent changes are extracted.

Table6.

Probability	t statistics	Standard deviation	Estimation coefficient	Variable
0.0000	-15.1278	0.0684	-1.03623	LCO
0.0000	-11.7481	0.0555	-0.65208	LSPM
0.0000	-5.9039	0.2574	-1.5196	LHC
0.0001	-4.9329	0.2275	-1.1225	LNO
0.0002	-4.3204	0.1600	-0.6916	LSO2

Study models will be evaluated as follows, according to Table 6 based on model output and cross- sectional regression estimates for year 2014:

Equation 3 $HOP_t = -1.036\ LCO_t - 0.652\ LSPM_t - 1.519 LHc_t - 1.122 LNO_t - 0.691 LSO_2 - u_t$

All coefficients have significant effect on housing prices at 0.05 levels.

7. RESULTS

- One percent changes of CO have 1.036 percent negative effect on housing prices of metropolitan Tabriz.
- If SPM changes one percent, housing prices in metropolitan Tabriz will be affected negatively as 0.652percent.
- One percent changes of HC leads to 1.519 percent negative effects on housing prices of metropolitan Tabriz.
- If NO changes one percent, housing prices in metropolitan Tabriz will be affected negatively as 1.122 percent.
- One percent changes of SO2 leads to 0.6916 percent negative effects on housing prices of metropolitan Tabriz.

8. Conclusion

Examine Hedonic price function in Tabriz ten housing areas led to examine of the most important and effective factor on residential units price that is air pollution index. This factor was investigated by variable such as hydrocarbons, particulate matter, carbon monoxide, sulfur oxides and nitrogen oxides; on percent changes in hydrocarbons of air among these factors have the greatest effect on housing prices of Tabriz. Population growth is along with increased demand in the field of housing. Ignoring the negative effects on housing development in cities leads to destroyed environment as a result of not- reaching sustainable development aims.

9. Recommendations

According to results of modeling, housing demand is strongly influenced by air pollution of Tabriz. This influence destroyed housing market of metropolitan cities like Tabriz because the housing market is leading part of economy that must be controlled.

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