Evaluation of Sahand New Town Based on Sustainability Indicators

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Abstract: Urban population has been increasing and it is estimated to reach 70%of the total population in the world by the year 2050. The construction of new towns is performed in order to meet the needs such as absorbing the population overflow, providing dwellings and many other factors; but their origin is not considered based on sustainability Indicators during urban sustainable development process. Iran's new towns tend towards unsustainability due to reasons such as inexact determination of new towns' legal position, not defining resources for providing building costs, inconsistency and lack of cooperation among different organizations, also lack of infrastructural facilities, and decision-makers and town-builders' lack of planning in regard to different aspects of sustainability. The purpose of this paper is to investigate Sahand new town success rate based on urban sustainability Indicators. The research method is field and analytical methods. In this paper, sustainability Indicators are selected in seven perspectives, and while evaluating based on these perspectives, proper and effective strategies for sustainable development of Sahand new town determined and introduced for future projects. Research results show that Sahand new town is in very weak environmental sustainability, in medium level of social sustainability, and the subsidies removal and Maskan Mehr (Mehr Housing) plans have been effective in economic sustainability.
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1. Introduction

The sustainability of human–environment systems is determined through three main characteristics: resilience to both natural and anthropogenic disturbances; desirability to human societies; and temporal and spatial scale boundaries (Mayer, 2008). A sustainable development indicator should make it possible to assess whether a country is on a sustainable growth path, but indicators such as the ISEW and GPI do not give this indication because no benchmark value for a sustainable state exists (Nourry, 2008).With increasing urban population in Iran, the metropolitans have experienced many problems and new towns have been located and constructed to absorb the population overflow in these metropolitans. New towns often face many structural, economical and social problems due to lack of compliance of sustainability development indicators. Based on the importance of sustainable urban development, Wolfgang Zax believed that: Development without sustainability and sustainability without development has no conceptual development (Goldin and Dinter, 2000). To evaluate new towns sustainability, first the problem of these towns in three economical, social and environmental areas should be investigated. For this reason, it is necessary to review characteristic of urban sustainability indicators. Urban sustainability indicators are important tools for evaluating the performance of cities that these indicators are used in their environmental, economical and social areas.

Urban sustainability indicators are crucial for helping on target setting, performance reviews and facilitating communication among the policy makers, experts and public (Verbruggen and Kuik, 1991). Urban sustainability indicators and their appropriate selection, play undoubtedly an important role in successfully achieving attainment of urban sustainability (Shen, Shah, Zhang, 2011).

Spangenberg et al believed that: Using indicators to create a tool for helping in sustainable development policies (includes standards control and communications and their results in general scale) (Spangenberg et al, 2002), on this basis, it can be said that sustainability indicators in sustainable cities is the effective step to achieve the planning of a sustainable community and they are considered as the important component in overall assessment of sustainable development. Unfortunately, fewer studies have been done on sustainability indicators of new towns in Iran, especially Sahand new town (Gharakhlou and Abedini, 2009) in this regard; the following questions will be raised:

1- In fact, what are sustainable indicators for measuring sustainability in new towns of Iran?

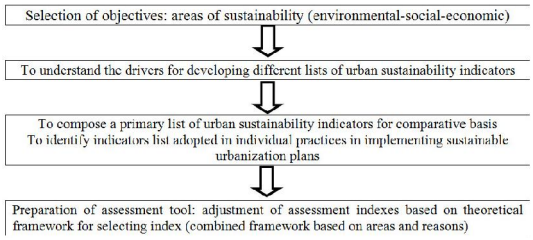
2- How much is the success rate of Sahand new town based on these indicators?

In this research, it is attempted to recognize and explain these tools, and then to be evaluated in Sahand new town. For this reason, first Sahand new town is investigated based on sustainability indicators by field study method and then evaluation way of Sahand new town based on introduced tool and in analytical method will be discussed. Finally, some strategies are proposed for sustainable development of Sahand new town as offer.

2. Methodology

In this study, the conceptual framework of urban sustainable development in terms of sustainability indicators has been studied to assess Sahand new town. Because of the priority of absorbing population, availability and for being the only new town located in Azerbaijan area (cold region), Sahand new town has been selected. This research in term of result is applicable, in time is prospective, in process qualitative and in term of objective is analytical. The method is presence in the location and analyzing the existing condition maps of Sahand new town based on sustainability indicators. It should be noted that in this study, providing an efficient system is considered based on framework of "pressure, condition, respond" to assess sustainability in order to make use of indicators; it is because by relying on pressure indicators, pressure on the system (environmental, economic, social pressures) and also by relying on status indexes, situation and circumstance of Sahand new town can be investigated. Finally, policies making and necessary decisions making were offered using respond indicators.

A comprehensive literature review was conducted to obtain information needed for pursuing the objectives of this research; information obtained from books, academic journals, government and institutional reports, sustainable urban development plans and websites. To review, sustainability criteria have been selected according to Waler and investigated in seven dimensions.



Conceptual model: The process for preparing sustainability assessment tool for Sahand new town

2.1. Assessment tool of Sahand new town based on evaluation and formulation of key sustainability indictors

Row	The purpose (sustainability dimensions)		Local indices
			Name
1	Environmental	Territorial use	• Providing the way of construction during land selling • Street construction coordinated with the area • Density development to reduce infrastructures • Use of natural form of site in urban construction • The development of city center and access to it (metro) • Applying the mixed use • Designing the neighborhood units with regard to vegetation • Design on a specific use in territories of public areas
		Transportation	• Reduction of transport routes by designing with mixed use method (considering commercial spaces in neighborhood units) • Considerable use of transportation network of bicycle and pedestrian • Considering car park in the streets • Streets design to encourage low speed • Use of appropriate route for public transportation to close access to all residential areas (T-shaped route) • Replacing electric vehicle with gasoline and CNG cars
		Ecology	• Maintaining ecological condition of the area (identification of plant fossils, farming history, pattern of land degradation, …) • Creating movement corridors • Woods fire management • Restoration of destroyed biological systems in region's biodiversity

		Energy and recycling	• Waste water management (flood water, underground waters, trade waters) • Training program in relation to water storage and conservation • Waste water recycling • Use of renewable energy (photovoltaic plates, solar water heater, methane gas power plant,…) • Prevention of heat loss in the building (insulation and materials with high thermal capacity,…) • Effective programs for efficiency and energy storage
		Sustainable architecture	• The use of the sun natural light • The use of natural ventilation • Coordination between constructions and environmental conditions • Selection of indigenous materials • Applying renewable materials • Waste management and Prevention of pollution
2	Social		• Safe and friendly public spaces to create a sense of belonging • Educational facilities and workshops • Establishment of social security • Construction of houses suit for different classes (different cultures and different incomes) • Social participation • Preservation of cultural heritage and regarding to folk art
3	Economic		• Reduction of energy consumption (water, electricity, fuel) • Creating employment space • Investment on private departments • Construction of affordable housing • Local protectionism

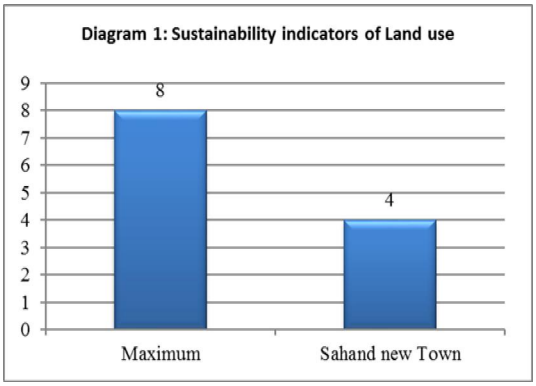
2.2. The situation of the studied town

Sahand new town as a main satellite town is located in 20 km. southwest of Tabriz. The average height of this town is 1600 m. Above the sea level, it is located in longitudes 53º and 37º to 59º and 37º; and in latitudes 15º and 46º to 30º and 46º and in regard to country divisions is a subordinate of Osku city (Municipality of Sahand new town). City's population in strategic studies is estimated at the extremity of population and beyond the planning horizon to seven hundred thousand means the total overflow of population in Tabriz, one or two eighty thousand populations is predicted for the preparation stage of development, this town accepted two hundred thousand populations in the first stage of development. City's population was changed due to next policies, investigations and final decisions. City's population according to current economic conditions for medium-term horizon (10 years) is determined 150 thousand people and 300 thousand people for the final development (25 years).

3. Results and Discussion

3.1. Sahand new town based on sustainability indicators in Land use

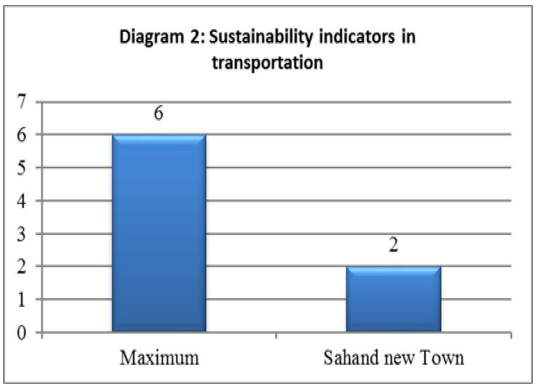
In the context of Land use, Sahand new town was surveyed based on sustainability criteria and according to Calthrope view; the result indicated that Sahand new town with score of 4 has good sustainability.



3.2. Sahand new town based on sustainability indicators in transportation

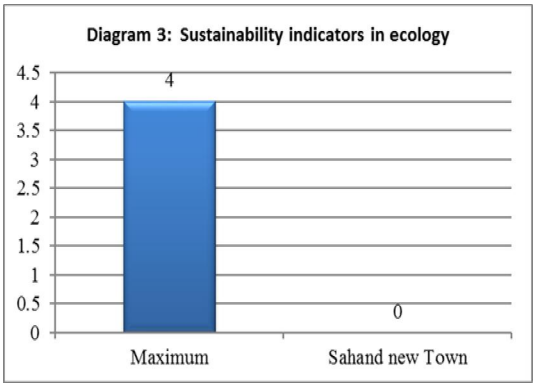
In this regard, Sahand new town with the average score of 3 is at the top of category. Sahand new town has only 2 sustainability indicators that are: having transportation system appropriate to mixed-

use, reducing travel rate and emphasizing on pedestrian axes. By studying case samples, it can be said that: effective sustainability programs have been used in transportation area and these programs are faced with shortage in this area. The score of Sahand new town indicates that: this new town has suitable condition in transportation but to achieve acceptable level needs to new programs such as cycling-axis development.



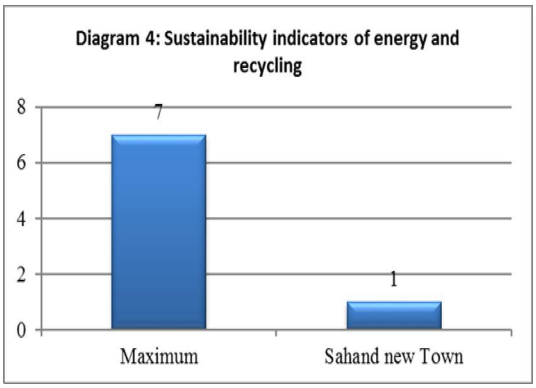
3.3. Sahand new town based on sustainability indicators in ecology

By studying Sahand new town, it can be said that: there is not sustainability indicator in relation to ecology and no specific program is seen in this area. It is necessary to mention that the diversity of vegetation in this area is low and also this area is not a forest area; there is no biodiversity in animal species, therefore, specific programs in relation to maintaining native condition are not seen.



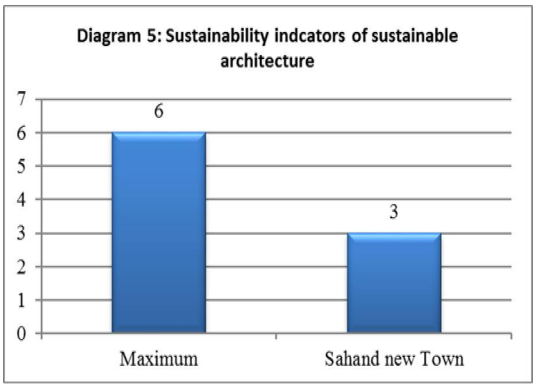
3.4. Sahand new town based on sustainability indicators in energy and recycling

In regard to sustainability indicators for energy and recycling, by studying case samples it can be said: these indicators are often based on applying new systems in the area of using renewable energy and also waste recycling by new and completely modern techniques; unfortunately there is excessive shortage in applying these technologies in our country; and Sahand new town is not excluded from this rule. Having a program in this area and the score of 3, Sahand new town is located in the lower category of energy and recycling sustainability.



3.5. Sahand new town based on sustainability indicators in sustainable architecture

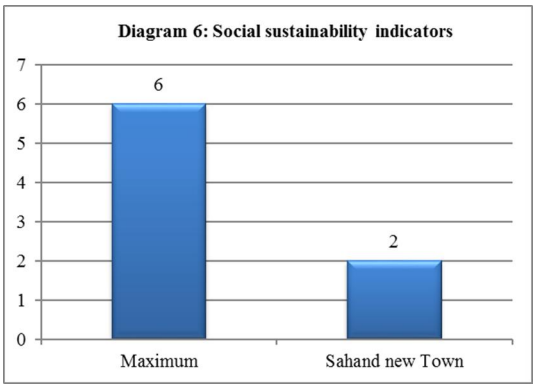
By investigating Sahand new town, it can be said that suitable orientation of buildings for optimal use of light, has reduced the use of fossil fuel. They also have suitable natural ventilation due to local winds in most seasons of the year. The third indicator that is seen in Sahand new town is coordination of constructions with environmental conditions. Using of compressed texture and also coordination with gradient and environmental condition of the region are seen in Sahand new town. Sahand new town is located in a good category of sustainability in relation to sustainability indicator of sustainable architecture and having the score of 13.



3.6. Sahand new town based on indicators of social sustainability

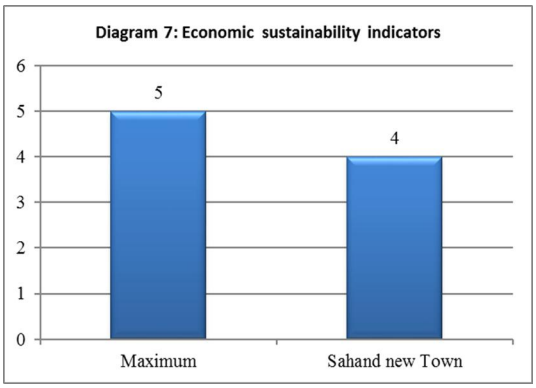
By investigating Sahand new town, it can be said that social indicators existed in this town are: establishment of social security and also creating safe urban spaces. Calculating the scores of the mentioned indicators, Sahand new town with the score of 6 is

located in the lower categories of sustainability compare to the investigated samples.



3.7. Sahand new town based on indicators of economic sustainability

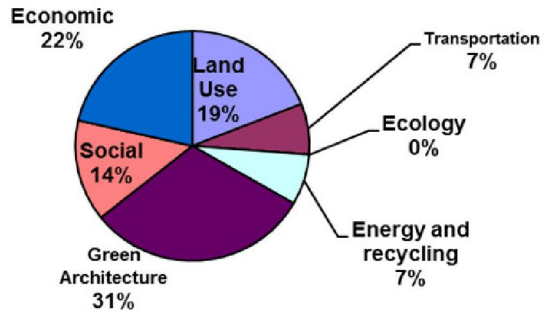
In regard to economic indicator, Sahand new town has 4 indicators. Therefore, this town compare to the studied samples with the score of 9 is located at the top category. It seems that economic programs of Sahand new town have been acceptable and act well in affordable housing and encouraging private enterprises, but in cases like supporting local productions and reducing energy consumption have poor acting. In relation to waste recycling and using renewable materials no politic or specific plan is followed.



3.8. Local sustainability indicators of Sahand new town

According to explanations and tables, the score of Sahand new town can be calculated in each of sustainability dimensions. It can be said that in aspects of energy and recycling, environmental sustainability is very weak and social sustainability is also in the medium or low level. In aspect of economic, the subsidy elimination and Mehr housing programs are effective which these are related to the whole country and there is no special program for this region. Based on the conducted investigations, it can be stated that in what position Sahand new town in the context of environmental, social and economic sustainability is located.

Row	Objective (Sustainability dimensions)		Local indicators
1	Environmental	Land use	*Street lying consistent with texture of residential area in regard to access. *Diverse range of residential area in regard to density. *Applying the mixed-use *Coordination of region shape with natural conditions.
		transportation	*Emphasize on designing pedestrian routes. *Transportation system appropriate to the mixed uses and reducing travel.
		Energy and recycling	*Subsidy elimination program to encourage reducing energy consumption.
		Sustainable architecture	*The use of sun natural light with orientation in east –west axis. *The use of natural ventilation by considering two openings in both sides of building. *Coordination of compressed texture with environmental condition of cold region.
2	Social		*Creating a safe urban space. * Establishment of social security.
3	Economical		*Creating employment space. *Private investment for Mehr housing plan. *Construction of affordable housing. *Lending for local products.



Success rate of Sahand new town in sustainability indicators

4. Conclusion

According to the results obtained from research data, it can be concluded that generally urban sustainable development is based on three economic, social-cultural and environmental pillars; and it is dependent on different dimensions. Sustainable urban structure also affected by dynamics of complex urban systems and flexible nature of the qualities which constantly are adjusting and updating. As it was pointed in recognition and analysis of Sahand new town based on sustainability indicators, this town as Iran other countries faces with deficiencies and disorders in design and performance; and at present meets some problems in regard to sustainable indicators.

5. Proposed solutions to achieve sustainable development in Sahand new town:

Due to conducted survey, to improve sustainability rating of Sahand new town and bringing it to an acceptable level of sustainability, the following guidelines are recommended based on the offered indicator:

1. Construction of public transport stations in the distances from neighboring units, so that 600 m. walking is needed from home to public transport stations.
2. Maintaining a balance at condensation in the design of residential tissue means that buildings ratio is high, average and low condensation.
3. The design of streets in residential tissue is so that all of them are at a convenient distance from main streets and public transport station such as bus or subway (the convenient distance is 310 m. walking).
4. The tissue of the city's neighborhoods and streets are designed tending to natural land slope, so that in regard of slope classification or a harmony with natural complications, the lowest rates of intervention occur in natural land.
5. To encourage citizens to walking and the restriction on using automobile, the design of improving walking routes and also pleasant walking routes appropriate for human are offered for the use of all society members such as children and disabled people. Also, it is offered to consider bicycle route for future plans.
6. The connection of neighborhoods center to each other by public transport routes and also create a suitable access to the neighborhood center for reducing trip duration within the city.
7. The establishment of business service centers in the neighborhood center, so that the resident s' daily needs are provided and this is an effective step on cities sustainability because it has a significant effect on sustainability from different aspects. For example, the factors such as: trip reduction and consequently reducing energy consumption, the reduction of air pollution, reducing urban traffic and anxiety caused by it, creating communal spaces and increasing social communication, making space for identity and etc are mentioned.
8. Promotion and equipment of the buildings for using renewable energy particularly solar energy, using new energy supply systems such as the use of photovoltaic cells in the roofs and the facade of buildings, buildings insulation to prevent thermal waste in buildings' outer shells, effective policies in training of residents to save energy such as removal of fuel subsidy and other actions lead to reduction of non-renewable energy consumption.
9. The suggestion is climate's orientation and proportions of the building to utilize the most benefit from the south light. The establishment of the buildings with east-west extension and the maximum openings toward the south with 4 floors height and the distances at least equal to the height so they never shade each other.
10. The buildings are designed in such a way as to have natural air flow. The use of ceiling fans to help better natural ventilation is suggested.
11. It is considered that the best form and shape of urban tissue is condensation form, so, movement and development is toward condensation of tissue and high density because of reducing thermal dissipation and fighting against coldness of winter in cold dry climate of Tabriz.
12. Social security is increased and lively urban environment created for residents. It is suggested that the most dynamic and lively urban environment at the most daily hours to be achieve for residents using multi user methods. Also, increasing security control and determining high penalties for urban violations by municipal police, the safety can be established and the crimes can be reduced. On the other hand, the safety in the urban environment can be achieved by convenient

urban design, so, it is suggested to observe human dimensions and proportions in the design of public spaces and sidewalks, community disabled and creating appropriate spaces for parents to provide their children welfare to be considered.

13. Application of general policies such as increasing upward of energy consumption and necessary trainings for saving energy are suggested to reduce energy consumption.
14. Creating employment in the region by making new jobs and also, operating new factories convenient to available potentials in the region. Because of lack of local potential or special natural resources, it is suggested that job investment to be done privately in housing and also in Sahand University. Encouraging the increase of private investment in housing and also encouraging the private employer in housing construction are very effective factors in creating employment and increasing the region's economic prosperity. In this regard, the increase of loans granted to affordable housing is also an effective policy.
15. Using the recycled water in green space irrigation or in the houses for consumption grade 2, for example in parking lot, the issue of water and waste recycling is regarded in urban system. Municipal waste is also used as a resource for recycled products.

2/21/2013

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