

# An Investigation on Sustainable Development of Yasuj Downtown, using Artificial Neural Network Model

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**ABSTRACT:** Undoubtedly, city centres, are the most important platform for various activities consistent with the city. As a result, a new attention must be paid to these spaces (urban centres) so as based on sustainable development approach, a suitable place for citizens, especially those living in urban core neighbourhoods, be created. This paper along with explaining the position of city centre in Yasuj, tries to codify and analyse of land use areas. The present paper reviews the central areas of Yasuj based on sustainable development approach and also has a comparative compares between these areas with each other using a model of artificial neural networks, and using this model in ARC/GIS tries to predict the selected sustainable development indicators in the addressed area.

**Keywords:** City Centre, Sustainable Development, Neural Network, Central Area's Land Use, ARC/GIS

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## INTRODUCTION

City center is the heart of the city somehow, and clarify its identity and function. A successful city center should be the focus of socializing and social interaction, commerce and cultural activities, not merely a combination of non-relevant and discrete functions. Considering the opportunities and threats of any urban center, we should find a way to create a dynamic urban center. If we accept the city center as the most important and effective part of city in the quantity and quality of performance in any City, then its characteristics must be specified, its potential must be measured and some ways should be suggested to improve it. The last view that seems to satisfy all the objectives for the inhabitants of the land use planning, is sustainable development perspective, because it has an overall look to urban land use (social, economic, physical, environmental) and can be successful at creating a proper and efficient communication between all aspects of urban life, especially in urban center.

In the new century, new look to medical science and the use of the simulated mechanism of the human brain to predict human behaviour and activities, day to day increases, and the use these up to date methods in the humanistic sciences is indisputable. This paper aims to integrate sustainable urban development with downtown views and artificial neural network to have an appropriate analysis of Yasuj Downtown.

## MATERIAL AND METHODS

This is a descriptive –analytic paper. This paper is going to collect theoretical valid resources to attempt at a comprehensive understanding of the sustainable development of urban center and city and then by removing a square from the center of the Yasuj field, necessary information for land use mapping in ARC/GIS

has been obtained and unemployment forecasts and reviews as well as environmental forecast indicators using artificial neural network model was done in MATLAB environment and the output is shown in ARC/GIS.

### The central part of the city, land use and sustainable development

The emergence and growth of the central part of the cities, in major geographical areas, has a historical background which among them the Middle East region, has been the center of the first human civilizations (Shakuie, 2006). Sociologists considered city center as an important sociological category and as a multi-functional social space, specific urban space with a high focus on various social institutions, social activities, social relationships, and a space that urban social life is concentrated on it is defined. This section is the heart of the city which is the gathering place and center of all activity types and crosses the vital arteries of the city (Mashhoodi, 2001). Very distant past, signs of central ideas clearly has been seen in our cities. Ecbatana circular city in 715 BC when the city was Median capital was formed with a network of seven concentric walls. The downtown is the core of forming a city which the most important monuments are located there. Downtown plays the major role in the city life and in fact the most important investments is done at this point, and provides a framework for activities and economic and social transactions (Rahnama, 2009). Indeed, the central part is the most active part of each city which all residents are commuting (Ashrafi, 2001). And place people refer because of different cultural, commercial and psychosocial needs (Abbaszadegan, 2001). Thus the convergence of the various components with special target (meaning and function) a certain proximity relation within specific space, provides a structure called the center or

collection. Of special and important points in the definition of downtown is that by mark, we do not necessarily mean the geometric center of the city. Since urban development rarely takes place on an equal basis in all aspects (Ashrafi, 2001). City center generally consist of hierarchy of a dwelling unit as a center of the micro-level city itself as a center in macro-level city, even sometimes a city acts as a center for satellite cities. According to what Maryland Brandt has defined and accepted by the majority, Sustainable development meets the needs of the present generation without compromising and discouraging the ability of future generations at meeting their needs. The concept of sustainable development has several dimensions: Environmental sustainability of ecosystems, natural resource sustainability, economic and human well-being sustainability (Hossein Zadeh, 2003). Simply, sustainable development in an environment with regard to: the ecological potential, human resource, technology and financial resources of its own country or the environment can be realized and it would be sustainable only in coordination with these four parameters (Yazdi, 2007). The early 1990s, the idea of sustainable urban development has become a fundamental and important issue among decision-makers and thinkers (Moharamnejad, 2004). The importance of this issue is to the extent that the United Nations has created Sustainable Cities Program. Sustainability of development in a urban society, means the optimal level of economic production growth, and employment rate, social welfare and the environment is healthy (Masoomi Eshkevari, 2008). If through other planning activities in urban land use regulation is in line with targets and also quality and urban development has a crucial role (Hatami, 2006). On the other hand, urban land use planning is the organization of urban activities in line with special targets and in quality as well as urban development plays a crucial role (Hatami, 2006), and to understand how various activities distributed in city, we need to study a lot about land use (Razavi, 2002). In fact, urban land use can mean the spatial distribution of urban functions, such as residential areas, industrial, commercial and urban center as well as planned areas for organizational functions leisure time (Chapin, 1965). Following the failure of past views at achieving land use planning goals, as well as introducing new demands for new residents, there was a change in land use goals which now land use objectives are based on two main bases, i.e. the values of sustainable development and on the other hand enhancement in life quality which includes four major environmental, economic, social and the physical areas (Mehdizadeh, 1999).

### **Determining the central part of the city**

Downtown is the city's core which valuable monuments usually are located there. This area represents the largest land's value, usually high density and also provides a location framework for economic and social trades and activities (Rahnama, 2009). There are different criteria for identifying other Metropolitan areas, which Bazrgar and et.al have expressed these criteria in this way: The gross density of population, land value, number of employees, number of travels within the city, and symbolic and significant urban elements (Blood Transfusion et al, 2005). Elsewhere Doctor Shakuie give

more emphasis to checking local views and city maps and information on trade, administrative agencies and the service sectors to identify city center and has stated the feature of central part of the city as below: A) the existence of major economic activity which is more affected by state, nation, and sometimes the world than other areas, B) Population density in the city center at certain day hours and reaches its maximum while at the same area is quiet at night, C) Book publishing, newspaper and magazine industries are important activities in the central part of the city, D) The number of people daily commute to the central part of the city is more than other parts of the city, E) The existence of administrative function that is important to direct people to the city center, F) a variety of functions in comparison with any other area in the city, G) Sometimes in the central part of the cities, there are independent sectors around a street or a market (orders) (Shakuie, 2006). In city center, the most important shops, banks and other financial functions are concentrated with maximum access (Guide, 2009). To identify this region, three factors should be identified: population destiny, purchasing power, traffic and commercial properties.

### **Dimensions of sustainable urban development**

Sustainability must be achieved at different levels and scales. Internationally, the United Nations Environment Programmers and the International Union for the nature preservation are intended to develop and expand the concept of sustainability. Nationally, sustainable development councils, committees which are mostly depended on the highest decision making positions, have been formed. More recently, urban and regional planners have been thinking about finding the situations related to sustainability and sustainable development on smaller and more administrative scale in far distant areas. While we have the history of urban planning in terms of performance, both urban and regional scale put forward the most appropriate positions for achieving the stability goals. Planning as a discipline and a field of professional practice is capable to create an appropriate stake at sustainable human settlements, including city or region. In these two levels a new professional planner can be formed according to this speculation, "Think Global, Act Local" (Bahraini, 2011).

From this perspective it can be concluded that sustainable urban development, is a large-scale and complex phenomenon with social, economic and environmental aspects. Relying on a single factor, shaping the sustainable development action is not a deliberate and conscious act (Masoomie Eshkevari, 1999).

Sustainable urban development is trying to solve urban problems according to four economic, social, environmental and institutional aspects. So that human rights, democracy and social justice are discussed in the social sector and meeting the basic needs of the people, avoiding poverty and planning for people's participation in economic activities in the economic sector is desired. Also there must be harmony in economic, social and environmental aspects within urban planning. Social dimensions of sustainable development should be the same weight and importance of the environmental aspects (Civilian and Courage, 2009).

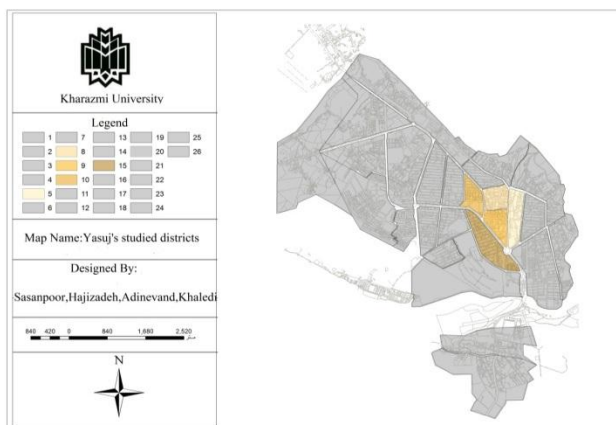
### Determining the central part Yasuj

In classifying the neighbourhood usually residence and employment of 700 to 1250 households is within a range from 375 m to 300 foot radius (5-4 minute walk) which the indicative mosque element and cultural education indicators (Elementary) is defined. Each neighbourhood with a local roadway network is separated from other nearby neighbourhoods (Ziyari, 2003). The studied central district in this research is the city center with 5 domains which lies between the Artesh Street from West, Ayatollah Kashani Street from East, Imam Hussein Square to the south and Motahari Ave to the North. This area has an area of about 197 acres. As mentioned above, to determine the central part of the city, there are different ways which according to the explanation above seems the best way to identify a neighbourhood center is to identify the features and specifications of this part of the city which by recognizing and identifying the centrality of the neighbourhood, the diagnosis can be realized. As a result, properties that have had a major role in identifying Yasuj center can be outlined as follows:

1. The existence of hospital and emergency in the city
2. The highest rates of employment services at the neighbourhood level
3. The existence of the second largest mosque of the city (Vali Asr Mosque) in this neighbourhood
4. The existence of markets, malls and the tallest commercial building in the neighbourhood
5. The highest population and structure density, as compared to other neighbourhoods in the city
6. High land prices compared to other places in the neighbourhood
7. The existence of education use in different levels (primary school, junior high and high school)
8. The existence of administrative functions that is important to direct people to this part
9. High population density of refers in this part of town (filling and emptying the day and night)
10. Existence of traffic because of locating between Imam Hossein Square in south, and Shohada Square in the north.

**Table 1.** Yasuj's studied district area

District	Area (M <sup>2</sup> )
5	41
8	39
9	22
10	31
15	64



**Figure 1.** Yasuj's studied districts

### The features of central part

#### a- Socio – Economic

Central part of YASUJ with a population of 11,287 is located within the range of Imam Hossein Square to Motahari Boulevard and Ayatollah Kashani Street to Artesh Street. Number of households in the region is 1980, with a 5.7 average household size. This range consists of five identified metropolitan areas in the Municipal Development Plan, which includes areas 5, 8, 9, 10 and 15. Of these five areas, area 15 is with the highest population and area 9 the smallest. Area 9 has the highest level of education and area 10 has the lowest surface. Households in these areas are almost the same, and the average is about 5.7.

**Table 2.** The population features of Yasuj's studied districts

District	population	Male population	Female population	Family dimension	Education
5	1450	774	676	6.1	97.1
8	2777	1513	1265	5.7	97.11
9	1149	572	577	5.8	97.12
10	1734	948	786	6	64.35
15	4177	2375	1802	5.7	97.1
<b>City center</b>	<b>11287</b>	<b>6182</b>	<b>5106</b>	<b>5.7</b>	<b>90.56</b>

#### b- Physical – environmental

Of the total 354,308 square meter in area 5, 199, 331 square meters belongs to residential users which is approximately 56.25% of the total area applications and its per capita population of the area is 137 square meters which is more than per capita standard. Educational land use has covered 13.86% of the surface area which an amount of primary education is 0.59 percent with 0.59 square meters per capita, middle school is 4.34 with 4.34 square meters per capita, high school is 8.93 percent with 21.8 square meters per capita that primary and middle education space per capita is less than the standard per capita and higher secondary schools per capita are more than the standard. Business in the area has been of both local regional which 0.63 percent are local, and 13.55% act regional which their per capita has been 1.5 and 8.6 square meter respectively while local business per capita is less than standard per capita and regional per capita is higher than the standard. One of the criteria for being a downtown is due to the existence of office center and the people influx to these centers during the day. 14.66% of this area has been allocated to the user and per capita usage is 35.82 square meters, which is higher than the standard per capita. Green space in this area has devoted an area of 63,145 square meters to itself and usage per capita is 35.82 square meters which is more than the standard. Green space in this area is accounted for 63,145 square meters which is of 1.78% of the total area with 4.3 square meters per capita that is less than the standard. Sport usage has occupied 2.12% of the surface area which has a 0.88 square meter per capita and is lower than standard. It is clear that other required usages in the city center including religious, service, health care, cultural, and military is lacking in this area.

From 219,489 m<sup>2</sup> of total area 8, about 55,531 square meters allocated to residential users which is



approximately 25.3 percent of total applications area with 20 square meters per capita that is lower than the standard. Educational usage has covered 5.09% of the surface area of which 1.39 per cent is elementary education with 1.1 per capita, 2.01 percent is guidance school with 1.69 percent per capita and 1.09 is high school with 1.34 per capita, which the total education usage is less than the standard per capita. Business in the area has been regional trade, which 41.77% of the surface area is covered that represents area 8 has been of more centrality than area 5 in Yasuj and much of the area allocated to the Regional Commercial functions and it has 33 square meter per capita. One of the criteria for being a downtown is the existence of office center and the people influx during the day to these centers. 6.65% of the area is allocated to user accounts that per capita use is 5.2 which its per capita area is less than area 5 per capita and that is because of population in this area. Health usage area is about 3792 square meters covering 1.72 and considering to its population, per capita use is 1.36 which is lower than standard. Therapeutic use with 2943 square meters, has occupied 1.34% of the surface area. Also there is military-administrative usage in this field which has 11,258 square meter area, and has occupied 5.12% of the surface area. It is clear that other required users in downtown areas such as business community, religious service, and culture are not in this area.

From the total area of 195,234 square meters, 9, 132,561 square meters belongs to residential users which approximately 67.89% percent of the total use is 115 square meters per capita, which is higher than the standard. Educational use has covered 4.59% of the area which 1.65 per cent is for elementary education with 2.8 per capita, 1.78 percent is for guidance school with 3.02 per capita and 0.43 percent for high school with is 0.74 per capita and other education use is 1.09% with 1.86 per capita which total educational use are lower than standard. Business use in the area has been of both local and regional which has covered 4.71% of the area with an approximate 3.28 square meter per capita. In this area 9.61% belongs to administrative user with a 16.33 per capita. 209 square meters of surface area belongs to health use which has covered 0.1 of the area and considering the resident population it has a 0.18 per capita lower than the standard. There is also military-administrative use with a 10008 square meter area which has occupied 5.13 percent. Service use with an area of about 2107 square meters has occupied 1.07% of the area with a 1.83 equivalent per capita. Religious use with 11,304 square meter area, has occupied 5.78% of the area with 9.8 per capita. It is worth noting that one of the most important needed applications, i.e. cultural use is not in this area. Of 187,652 m<sup>2</sup> in area 10, about 72,228 square meters belongs to residential use which is almost 34.49% of the total area of applications with 34.49 square meters per capita, which is less than standard. Educational use has covered 4.38% of the surface area of which 0.5 per cent is primary school education with 0.54 per capita, 2.75 for high school education with 2.9 per capita and other educational use has an area about 1.13% which is 1.23 per capita; All educational use are lower than standards. Business use is in both local and regional business which has covered 8.77% of the surface area that local business per capita is about 4.84 square meters and regional trade is 4.75. In this

field, administrative use is 10.20% of area that its per capita is 11. Health use area is about 5672 square meters, which has covered 3.02% of the surface area and according to the population, per capita is 3.24, which is higher than the standard. Service use with an area of about 1647 square meters, has occupied 0.87% of the areas, equivalent to 0.94 per capita. Religious use area is 961 square meters, which has occupied 0.51% of the area with 0.55 per capita. Therapeutic use in this field has an area of 37,142 square meters, which occupies 19.79% of its capital with 21.41 per capita. It is worth noting that one of the most important needed applications in this area, that is cultural use, is not in this area.

From the total 370,712 square meter in area 15, about 124,710 square meters belongs to residential use which approximately 33.64% of the total area of applications is 29 square meter per capita, which is less than standard. Educational use has covered 2.84% of the area of which 0.09 per cent is for primary education with 0.08 per capita, 0.82 per cent is for high school with 0.73 per capita and user and educational guidance use has an area of approximately 1.93 per cent with 0.72 per capita; All educational use are lower than standard per capita. Business use in this field is of both local and regional which has covered 3.63% of the area, local business is approximately with 1.09 square meters per capita and regional is with 2.41 per capita. About 39.43% of the area belongs to the administrative use with a 35 per capita. Health use has an area about 30,249 square meters which has covered 8.15% of the area and according to the resident population, the per capita is about 7.24 which is higher than standard. Service use with an area about 656 square meters has occupied 0.17% of the area with a per capita equivalent to 0.15. Religious use has 2157 square meters, occupying 0.58% of the area with 0.52 per capita. Occupies 0.6% and per capita is 0.53. Sport use occupies 0.22% of the area with 0.19 per capita. Military use is 2248 square meters and occupies 0.6 percent with 0.53 per capita. Cultural use does not exist in this field.

Residential use, with 584,360 square meters per capita is around 51.77 and this value is greater than the per capita standard. Commercial which is considered of both local and regional, is about 144,200 square meters, and occupies 14.48 per cent of the city center with 1.48 per capita at local level and 11.29 at the regional level. Educational use is also 80,175 square meters occupying 6.44% of the downtown. The per capita for this application is 0.85 in primary school, 2.69 in guidance school, 3.93 in high school and in other educational use is 0.27. One of the most important applications of a downtown is administrative office that is 250,665 square meters of the city center, occupying 16.11% percent with 22:20 per capita. One of the main User Account a downtown office those 250,665 square meters of the city center, occupying 16.11% of the per capita is 22:20. Green space use is 6143 square meters occupying 0.35% of the surface area with 0.55 per capita. 24,005 square meters belongs to sport use, 2.37 occupying per cent and with 2.12 per capita. Services use is 4410 square meters and occupies 0.42% of the surface area with 0.39 per capita. Health use is 39,920 square meters, occupying 2.59 percent with 3.53 per capita. Therapeutic use is 400,085 square meters, which occupies 4.22 percent, with 35.44

per capita. Military use is 23,510 square meters and occupies 2.168 percent with 2.08 per capita.

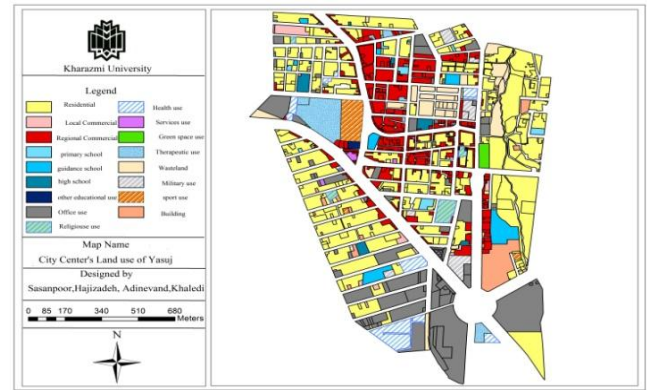
Culture use is also an important application in the downtown there is no cultural use in this part of town.

**Table 3.** The per capita of Yasuj's districts

Land use	The per capita						standard per capita
	District No.5	District No.8	District No.9	District No.10	District No.15	City center	
Residential	137	20	115	41.65	29	51.77	50
Local Commercial	1.5	0	1.36	4.84	1.09	1.48	(2-4)3
Regional Commercial	8.6	33	5.2	4.75	2.14	11.29	(2-4)3
primary school	1.4	1.1	2.8	0.54	0.08	0.85	9
guidance school	10.6	1.09	3.02	0	1.72	2.69	11
high school	21.8	1.34	0.74	2.9	0.73	3.93	12
other educational use	0	0	1.86	1.23	0	0.37	-
Office use	35.82	5.2	16.33	11	35	22.2	(1.5-2.5)2.5
Green space use	4.3	0	0	0	0	0.55	(7-12)9
sport use	0.88	0	0	12.63	0.19	2.12	(2-2.5)2
Services use	0	0	1.83	0.94	0.15	0.39	(2-4)2
Health use	0	1.36	0.181	3.24	7.24	3.53	(0.75-1.5)0.75
Therapeutic use	0	1.05	0	21.41	0	35.44	(0.75-1.5)0.75
Military use	0	4.05	8.71	0	0.53	2.08	-
Culture use	0	0	0	0	0	0	(0.75-1.5)1.5

**Table 4.** Difference between the per capita and standard per capita of Yasuj's districts

Land use	Difference between the per capita and standard per capita					
	District No.5	District No.8	District No.9	District No.10	District No.15	City center
Residential	+86	-30	+65	-8.25	-21	+1.77
Local Commercial	-1.5	-3	-1.64	+1.84	-2.91	-1.52
Regional Commercial	+5.6	+30	+2.2	+1.75	-0.86	+8.29
primary school	-7.6	-7.9	-6.2	-8.64	-8.92	-8.15
guidance school	-0.4	-9.91	-7.98	-11	-9.28	-8.31
high school	+9.8	-10.66	-11.26	-9.1	-11.27	-8.07
other educational use	0	0	0	-	-	-
Office use	+33.32	2.7	+13.83	+8.5	+32.5	+19.7
Green space use	-4.7	-9	-9	-9	-9	-8.45
sport use	-1.18	-2	-2	+10.63	-1.81	+0.12
Services use	-2	-2	-0.2	-1.06	-1.85	-1.61
Health use	-0.75	+0.61	-0.57	+2.49	+6.49	+2.87
Therapeutic use	-0.75	+0.25	-0.75	+20.66	-0.75	+34.69
Military use	-	-	-	-	-	-
Culture use	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5



**Figure 2.** City Center's land use of Yasuj

## RESULTS AND DISCUSSION

### Artificial Neural Networks

From about 1940, simultaneously but separately, on the one hand neurophysiologists tried to explore the brains' learning and analyze system and on the other hand mathematicians tried to build a mathematical model that has the ability to acquire and analyze issues in general. This happened several times since then mathematicians and neurophysiologists' findings were implemented, without knowing why, and in the process observed that the performance of the system implemented by the natural system is amazing. This happened several times since then that mathematicians would implement the findings of neurophysiologists, without knowing why, and in practice they observed that the performance of the implemented system is an amazing natural system. Then they were able to understand the underlying logic of the natural system. However, from the outset, mathematicians were able to construct a mathematical model of a nerve cell, or neuron, but until about 1974 knowledge about the connection between these neuron-like units to each other has not been evolved.

Artificial neural networks are, in fact, a triangle with 3 sides: 1) Data Analysis System, 2) neurons or nerve cells, 3) neurons network or teamwork law.

In a classic definition: a neural network consists of a large set of parallel processors that have a natural talent to store experimental data and use the applications and this networks is similar to brain at least because of two aspects: 1 - a step is called learning - 2 synaptic weights is used to store knowledge (Jalilian and Nojaba, 2009).

### Neural Network Modelling

Input parameters, in the form of stimulate electrical signal are sent to the input channels of nerve cell mathematical model. Each input channel has a numerical coefficient which is called the synaptic weight. This electrical stimulation intensity is multiplied in this factor and is sent to the cell body. If the total sent cell body stimulations has been enough, the neuron is fired and causes a constant electrical current in the output paths. Stimulation in the input layers of the cells will be sent to one or more intermediate layers called hidden layers. The continuance of the stimulation in these layers is driven in a way that simulates the complexity of the current inflow effects. Then the stimulation is sent to output layer that is our ultimate goal.

If the objective of a neural network has a little predictability, its value would be similar to the total intensity of latest output nerve stimulation. If neural network's objective is classifying the goals, the activity or inactivity in the last layer of neurons will reflect this fact.

One neuron's input can be from 1 to n. We will represent input by  $x_1, x_2, \dots, x_n$  we show, and weights  $w_1, w_2, \dots, w_n$ . Sum of the weights multiplied by the inputs will be represented by  $1.w_1 + 2.w_2 + 3.w_3, \dots + N.w_n$ . (Jalilian and Nodaba, 2009).

### Feed forward networks

Feed forward neural networks are the most widely used type of neural networks. Because we can prove that feed forward neural networks with a hidden layer, logistic activation function in the hidden layer, linear activation function in the output layer and a sufficient number of neurons in the hidden layer, can destroy any function with a desired accuracy. So this type of neural network with mentioned structure is called holistic approximate pulsing. This means that, with a sufficient number of hidden units, the network can almost approximate any linear or

nonlinear function to a desired level of accuracy (Najafi and Tarazkar, 2006).

Feed forward networks are the networks that the responding the way is processed always forward and will not return to the previous neurons layer. In this kind of network allow the signals to pass through only a single direction, from input to output. So there is no feedback. This means that the output of any layer does not affect the layer. Also in the human body, nerve signals move in one direction, from the dendrites to the cell body and to axon. The simplest of these networks are perception networks (Jalilian and Nodaba, 2009).

### Analysis of sustainable development indicators in the studied region using neural networks

For analysis of sustainable development indicators in the studied urban center, a lot of investigations have been conducted by the author. Finally and according to research done and provided sustainable indicators by the United Nations, the sub-indicator of sustainable development selected for the city center and is given in Table 5 below:

**Table 5.** Indicator and sub-indicator of sustainable development by the United Nation

Indicator	Socio – culture	Physical	Environmental	Economical
Sub-indicator	-Family Dimension Education Residential net Density	-Area of Educational use - per capita of Educational use -Area of sport use -per capita of sport use -Area of Services use -per capita of Services use -Area of cultural use -per capita of cultural use -Area of Religious use -per capita of Religious use -Area of office use -per capita of office use -Area of commercial use -per capita of commercial use	-Area of Residential use - per capita of Residential use -Area of Green space use -per capita of Green space use	- Unemployment rate - Occupation rate - Active population -Inactive population

To achieve a proper analysis of neural networks in the studied urban center, we have made use of the combination of two indicators of socio - cultural, economic and physical environment to achieve the unemployment rate as well as environmental quality. For the analysis of the mentioned network area, we have used the feed forward networks.

In these networks, the responding way is always forward, and the process is not open to the neurons of the previous layer. And will lead their only path to the target or output.

In this process, the criteria and the sub indicators for sustainable development are embedded in the input layer which in the second phase they will form the hidden layer by combining the 20 hidden neuron layers. 70% data are embedded for the training systems in this layer, 15% of data are used to validate the network and 15% of data are used to test the network. In the final layer which is the result of the using the sustainable development criteria and sub indicators in the hidden layer and also the effectiveness of hidden layer and neural network logic in the middle layer, the output layer and the final evaluation grid is answered. In the box below, you can see a program coding in MATLAB for research on the analysis of sustainable development indicators using neural network:

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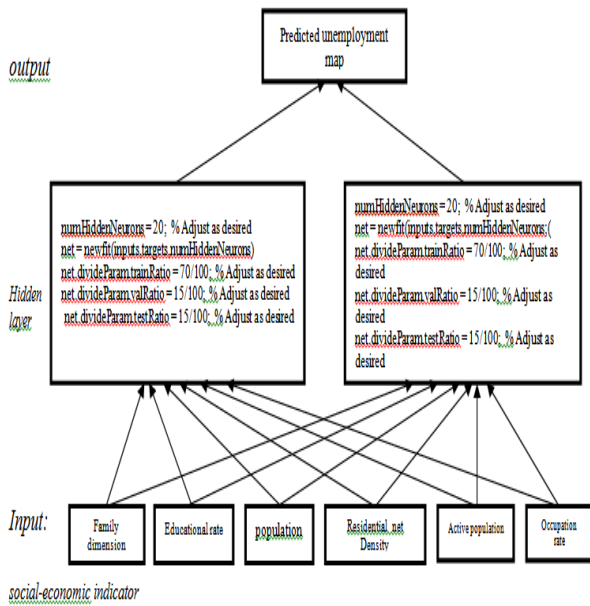
a=input ('enter your inputs;(' :
b=input ('enter your targets;(' :
Inputs=a; targets=b;
%Create Network
numHiddenNeurons = 20; % Adjust as desired
net = newfit(inputs,targets,numHiddenNeurons;(
net.divideParam.trainRatio = 70/100; % Adjust as desired
net.divideParam.valRatio = 15/100; % Adjust as desired
net.divideParam.testRatio = 15/100; % Adjust as desired
%Train and Apply Network
[net,tr] = train(net,inputs,targets;(
outputs =abs(sim(net,inputs;(
%Plot
plotperf(tr(
plotfit(net,inputs,targets(
plotregression(targets,outputs(

```

**Figure 3.** the programming taken to investigate in MATLAB software



According to the above description, two models, each of which combines two sustainable development indicators, is observed. In the first model, to achieve the level of unemployment, the network is embedded in the feed forward network below.



To evaluate and predict the desired parameters in the neural network, the defined sub indicator will be sent to IDE and a report about the state will be presented to the researcher with a physical schema as Map No. 4:

### The true unemployment map

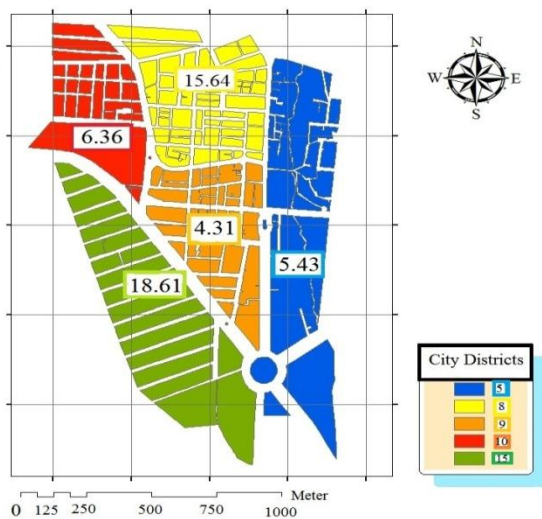


Figure 4. the true unemployment map by integrating the sustainable development social-economic indicators in Yasuj Center

With providing the related sub indicators and creating different layers and combining multiple layers together, there came an output as displayed. To determine specifically the output in an IDE, there are codes which are the mentioned sub indicators. In other words, if the inputs are the desired sub indicators, output (current unemployment) will be as follow. However at any time by giving input with titles in advance but with different

values (as in the other sub-indices), the neural network considering the pervious pattern will predict the desired process.

### The predicted unemployment map

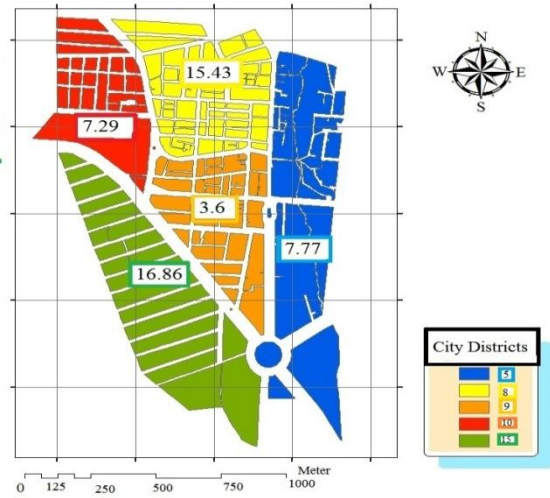
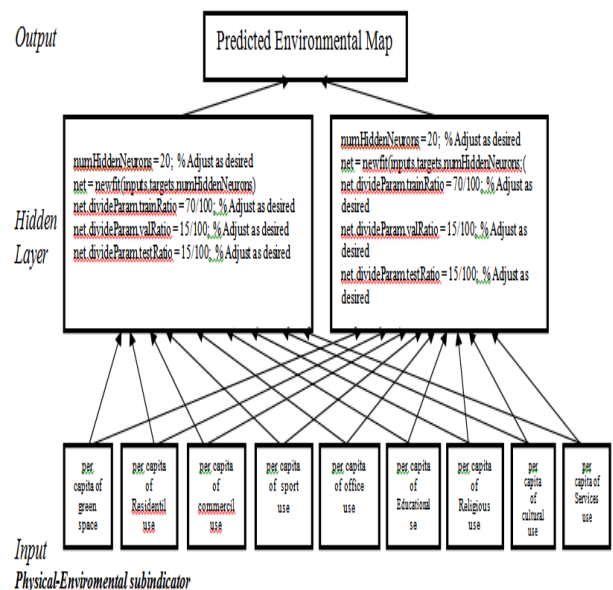


Figure 5. predicted unemployment using an artificial neural network for Yasuj city center

For the analysis and investigation of two other sustainable urban development factors, i.e. the environment and the physical indicators, the following criteria defined as neural network model:

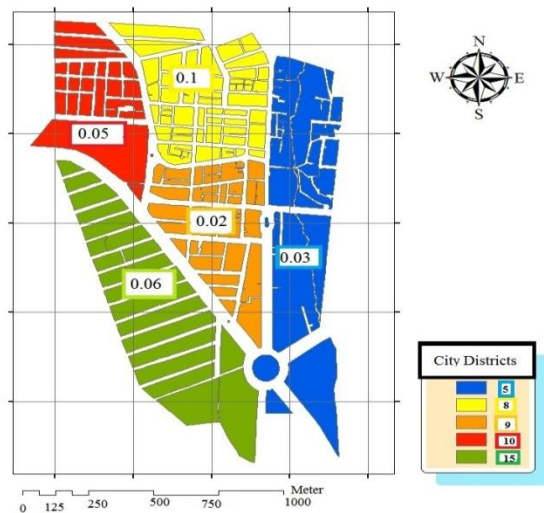
1. Residential use per capita
2. Green space per capita
3. Training use per capita
4. Service use per capita
5. Cultural use per capita
- 6 – Religious use per capita
- 7 - Administrative use per capita
8. Business use per capita

These sub-indices are sent to the IDE as input layer and by combining them, the neural network of environmental indicators in the status quo as the output layer provided as follows:



Neural network output for this model is as follows:

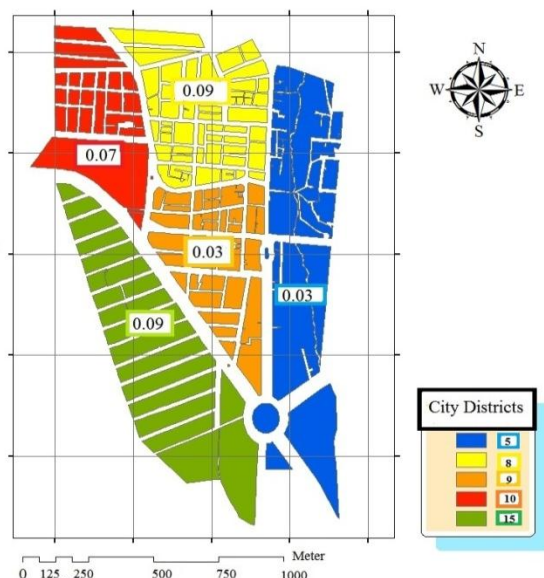
## The true Environmental map



**Figure 6.** Environmental indicators located in Yasuj center

The present neural network has shown the ecological indicators in Yasuj downtown as above to use these outputs as a prediction for this area; in a way that the proposed program will be used for the evaluation indicators in other states and other inputs to this region.

## The Predicted Environmental Map



**Figure 7.** Map of predicted environmental indicators using neural network pattern in Yasuj center

## CONCLUSION

The idea of sustainable development has been one of the most important ideas which in urban planning and urban development is unavoidable and since the central part has been one of the most evolved parts of the city, so combining them and examining them together is essential to all programmers. However, attention to engineering and applied science and is increasingly important and integrating in the scientific world and the integration of science with humanity science can help many problems

facing human societies. Combining the ideas of sustainable development, downtown and the neural network model is used for the first time in this study. Using these methods, researchers have achieved good results:

1-Contrary to what the community is talking about the unemployment rate, by combining the actual indicators for evaluating, we will achieve real data and the difference is quite evident with other statistics.

2-Down towns has long been the center of commercial activities, administrative services which caused immigration to these part of city in order to meet their needs. According to the survey, we found that in order to achieve sustainable development in older urban centers, we require careful and appropriate planning which in addition to the common use in these areas, we need to expand our sustainable development.

3-The use of engineering models and useful patterns in twenty-first century comes first character is very decisive and can be a very important help for issues and problems that the humanities have to grapple with.

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