Journal of Civil Engineering and Urbanism

Volume 4, Issue 2: 110-119 (2014) ISSN-2252-0430

Assessment and Classification of Environmental Problems Based on Sustainable Development Indexes (Case Study: Cities of Yazd Province)

Mehdi Salehi[1], MirNajaf Mousavi[2*], Ali Bagheri Kashkooli[3]

[1] *PhD in Geography and Urban Planning,, Department of Geography, Baku University, Azarbaijan*

[2] *Assistant Professor of Geography and Urban Planning, Department of Geography, Urmia University, Urmia, Iran*

[3] *PhD Student in Geography and Urban Planning, Department of Geography, University of Isfahan, Iran*

*Corresponding author's E-mail: Mousavi424@yahoo.com

ABSTRACT: Spread of urbanization lead to increasing the environmental problems for urban residents that it hasn't agreement with sustainable development purposes. The aim of this paper is assessment and survey of environmental problems in cities of Yazd province base on urban sustainable development indexes with emphasize on the environmental aspects. Thus, methodology is applicable –developmental and statistical population is 24 cities of Yazd province. Based on last political division in 2011, Yazd province has 11 cities, 24 town, 20 section and 51 rural districts. Based on statistical data in 2011, the city of Yazd with population 489152 persons, has about 7 Equal population than the second Meybod city in the province. Survey of environmental problems in Yazd province shows that rapid developmental in industrial fields raised from economical needs and increasing of population in urban regions. In fact in the Yazd province region, most of industrial installation and plants has been built in city of Yazd and they (plants and industrial installation) are important factor for environmental pollution in Yazd. Pollution from slaughter-houses and mines operations is some other environmental problems in Yazd. Rubbishes contaminate underground water in several ways. Analysis base on mean cluster levelling k show that cities of Yazd, Meybod, Ardakan, Aghda, Marvast and Zarch with 71.35 percent of urban population are unstable cities and cities of Shahedieh, Mehrdasht, Hamiidia, Khezrabad and Ahmadabad with 6.99 percent of urban population are stable cities. Spearman coefficient also shows that there is high difference between amount of population and environmental instability. Finally, following solutions are presented for reducing the environmental problems in cities of Yazd province and get to urban sustainable development.

Keywords: Environment, Sustainable Development, Pollution, Waste Waters, Cities of Yazd Province.

ORIGINAL ARTICLE

Received 15 Jun. 2013
Accepted 03 Oct. 2013

INTRODUCTION

Spread of urbanization lead to first UN conference about human residence in 1979 that was known as human conference. This project resulted construction of -UN center for human residence- and this development is known -UN human settling- now (Navabakhsh, 2008). Following this trend, in decade of 1980 -urban development section of the world bank- provided some instruction about environmental problems that is called brown instruction (Cohen, 1991). Purpose of this instruction was providing plans and program for reducing negative effects of cities on environment and solving environmental problems by using urban sustainable development and strengthens the potential power of cities (McGranahan and Satterthwait, 2003). Base on rapid increasing of human population, especially urban population and renewable energies consumption, over using of natural resources and negative operation against environment and urban spaces by current generation haven't agreement with sustainable development aims (Cohen, 1991). Changing the viewpoint of development for stability of traditional strategy that follow the industrial growth can change environmental quality of cities. In the field of urban sustainable development, economy, technology, energy and environment construct conceptual framework (Byrne et al, 1991). Redefinition the role of the local government, correction the construction of local sharing (cooperation) and proper distribution of urban welfare are necessary for employment of effective urban management (Van Dijk and Mingshun, 2005). Thus, urban sustainable development should make some correction and improvement in urban services and instability patter of consumption for rich sections of society. Institutional and political factors should be considered about environmental problems (Aina et al, 1994). Capacities of different parts of city can prevent problems quality of life and should be balancing between activities and capacities. Since there are some limitation such as absence enough information of environmental conditions, using very general indexes and public partnership, methods for preserving the natural potential during now and future together optimum using of earth and reducing wastes of nonrenewal able resources should be considered by comprehensive studies about environmental problems. It should be emphasized on prevention of urban and regional pollution, no

To cite this paper: Salehi M, Mousavi M, Kashkooli A.B. 2014. Assessment and Classification of Environmental Problems Based on Sustainable Development Indexes (Case Study: Cities of Yazd Province). *J. Civil Eng. Urban.*, 4 (2): 110-119.
Journal homepage http://www.ojceu.ir/main/

supporting the injurious development and gap between Rich and poor (Heidari, 1997).

This paper studies and assessment environmental problems in cities of Yazd province base on the urban sustainable development indexes and emphasize on the environmental aspects, that is, this paper is trying to get a comprehensive plan for reducing the environmental problems and access to sustainable cities.

A- Research question: Is there any relation between environmental in stability in cities and number of population?

B- Research importance and necessary: The pattern of the sustainable city should have necessary conditions for acceptance changing the public tacks and because population is an important of sustainability, it should be considered that how affect growing of population, especially urban population, on the environmental resources that construct uniform and continuous arrangement of cities. This study is important and necessary, because it includes basis of stability and proportion of population spatial distribution, environmental power of regions for remove obstacles in front of the urban sustainable development, growth and spree ding of urban sustainable development indexes in the field of environment in cities of Yazd province and make proper opportunity for growing and development of cities of Yazd province.

C- Research hypothesis: It seems there is a significant relation between instability of environmental indexes in cities and amount of population in cities?

D- Research Literature and Theoretical Foundation: Development is one of concepts that has been introduced after Second World War in science, economy, and society, politic and international issues. Mentioned phenomenon is affected by many factors and also affect on human life, has many application in human life (Hosseinzadeh dalir, 2001), that include changing of economical, social, cultural and political structures, increasing of production, receive infrastructure facilities and services, using of new technology and increasing of investment and consumption rates (Kalantari, 2003). The benefits of the development include escape of food-poverty, scientific poverty, cultural poverty, political poverty and making of sustainability. Stability is a regional, conscious, collaborative and equilibrium Process that alts in an ecological balancing and doesn't produce problem out of its territory or doesn't send to future. in fact, this stability ensures healthy life for next generations or in another sense, development is sustainable. This means use of natural resources without destroying the natural arrangement of environment and without pollution for environment.

After one century of reigning the industrialization, trading and urban is as national development indexes, sustainable development can be considered us return to nature (Redclift, 2000) that during this period environment protection is considered together proper quality of life and needs of next generation (Hosseinzadeh dalir, 1996). In fact, urban sustainable development is a process that during it, circulation of energy will be maximum efficiency together minimum operational condition and will be made same distribution in order to make movement for elements as a connected and incorporated set. Not only this space operate as a internal driver motor for moving the potential capabilities in the component's but also operates as a external growing driver and make a movement at the hidden matters by connection to internal elements. This trend has minimum negative effects on the environment (Haughton, 1997).

It is emphasized on kind of urban sustainable development theory that has maximum efficiency and reduces negative effects to a minimum level (Haughton, 1997).

Therefore, process for reach to urban sustainable development has not a special trend. The important point in urban planning is consideration of environment indexes and social healthy in cities and this need will be reached only by combination of several cases in different scales (Marcotullio, 2001) such that constraints and micro – organism condition in the earth should be considered in the use of production resources and collection and removing rubbishes (Egger, 2005).

There for, sustainable development is a reasonable substitute for destructive attraction of cities in 20^{th} century and this process it should be considered that together page attention to environmental problems, social problems and human matters such as proper housing and a minimum e level of life should be considered (Bahraini, 2002). On the other hand, stability concept of development include several conception include stability of environmental eco system, stability of natural resources, stability of economical development and stability of human welfare (Gale and Cordary, 1994) that by acceptation the systematic theory as a thought resource in new period, it should be accepted that different direction of human behavior in this period in the fields of economy, culture, social communication, policy and environment affected by these principles (Khatoonabadi, 1994).

Thus, modification foundation of systematic theory with six basic principal is necessary for clarification the nature of new behavior and prediction human reactions during next century. Appearance characteristic principal the is sixth one of principal systematic principal has relation with hierarchy concept and totalizing in survey of environmental problems says that study of a matter without information's about its role in whole of system, will give limited and insufficient knowledge (Haughton, 1997). This recognition of inefficiency of the cities, that is base on improper market and improper subsidies for some resources, lead to some suggestion finally. It is concluded that we can reduce widespread use of resource by determining the resource price and services and delay the costly investments (World Bank, 1997). In this part of discussion there are four urban sustainable development models include self-reliance, urban integration or redesign of city, external dependency and equitable balance or fair towns in relation with planning and sustainable development of cities and relation between cities and their environmental reactionary. In the self-reliance city model, this case require using of local environmental resource and taking care to minimizing and recycling the waste materials until people can reuse of them or remove with minimum ecosystem damages. Redesign of cities approach is a

more human based method than nature based method (Figure 1).

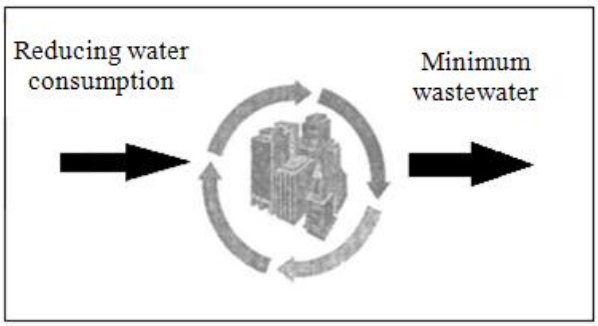


Figure 1. The pattern of urban Redesigning

External dependency and equitable balance or fair town (equity, share city) emphasize on the benefit of improved market mechanisms instead of rearrangement of urban environment that is a market based milder green approach in the urban sustainable development (Figure 2).

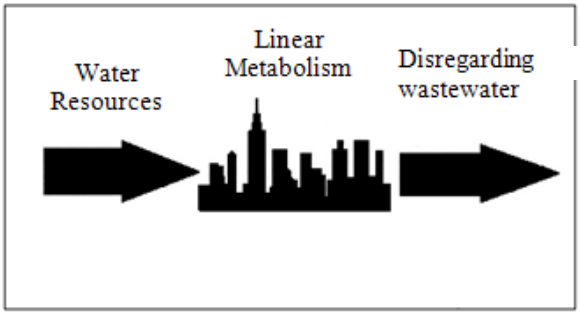


Figure 2. Pattern of dependent cities on foreign sources

Cities that have proper share (equity share), as a last version of urban sustainable development, pay attention to some the most useful aspects of earlier models and, with explicit relationship, addresses environmental justice and social justice and combines them with each other. Consequently, use of some innovation and safe technology in the viewpoint of environment is always desire, whereas inequity geographical distribution of resources and quality of their growing (like agriculture products) probably makes desire some problem in exchange process, even though high demand advocates (Haughton, 1997).

MATHERIALS AND METHODS

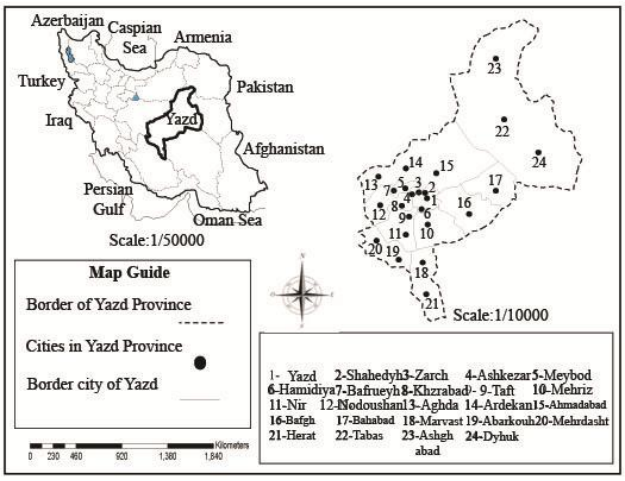
Base on aims and the components of study, methodology is applicable- developmental that using several environmental indexes measures stability and development level for cities of Yazd province. These combined indexes can display a level of growth and welfare for regions and development and stability of a city base on selected criteria's. Statistical population is 24 cities of Yazd province, information and dada has been collected from human and housing public census, statistical year- book, housing and urban development organization, department of education and statistical center of Iran. Urban and regional planning models have been used for analysis of data and information that include analysis of data using common methods and techniques in urban planning such as factor analysis. Deduce statistic examine includes correlation coefficient, regression coefficient, t- test examine and variance analysis have been used for cities classification and survey relation between independent and dependent variables.

A- The study area

Yazd province with area about 129214 km2 (7.49%- from total area of Iran) is third largest province in Iran. Based on last political division in 2011, Yazd province has 11 city, 24 town, 20 section and 51 rural district (statistical center of Iran, 2011), according to statistical data in 2011, city of Yazd with population 486152 persons has about 7 equal population than the second largest city Meybod, in this province. The highest population density between cities in province belong to city of Yazd with 32.7 persons/km^2 and the lowest density belong to Nir with 1.6 persons/km^2 (table 1, map 1).

Table 1.Structural divisions of Cities in Yazd Province 2011

Cities	Population	Area(He)	Net Density
Abarkouh	23986	2856	8.4
Ashkezar	15663	2504	6.3
Ardekan	56776	3997	14.2
Ahmadabad	5019	1168	4.3
Bafgh	33882	2343	14.5
Bafrueyh	6486	1152	5.6
Bahabad	7652	1367	5.6
Taft	15717	2487	6.3
Hamidiya	37428	1216	30.8
Khzrabad	581	311	1.9
Dyhuk	3346	1022	3.3
Zarch	10753	973	11.1
Shahedyh	16571	1845	9
Tabas	35150	2602	13.5
Ashghabad	4623	577	8
Aghda	1809	637	2.8
Mehriz	28483	3590	7.9
Meybod	66907	5906	11.3
Mehrdasht	7390	1089	6.8
Marvast	8865	576	15.4
Nir	1620	1035	1.6
Nodoushan	2332	452	5.2
Herat	12392	1033	12
Yazd	486152	14877	32.7



Map 1: Political - Office Divisions of Yazd Province cities (Source: Statistical Center of Iran, 2011)

RESULTS AND DISCUSSIONS

A- Survey of Environment Problems in Cities of Yazd Province

Healthy environment provides background of human development by protection and improvement of human health. In human development approach protection of environment in economic development process is considered as the basis of sustainable development. Take pay attention to the environmental development dimensions has been being come to the impotent international issue. The main resource for pollution of the water and soil in this regions are mainly include household wastewaters, industrial wastewater, plagues elimination poisons and chemical fertilizers, waste solid materials and microbial and chemical pollutants. Increasing of household wastewater, by consideration of annual amount of water for house hold consumptions, indicates that underground water resources is threated by wastewaters and a large amount of this resource are destroying now.

Two major's factors include rapid increasing of population and urbanization in one hand and industrial and agricultural development in the other hand, not only caused increasing of drinking water consumption but also provided back ground of decreasing of underground water resources. Over extraction from underground water resources and over using the drinking water resources are main factors for instability of water level in these regions. Chemical pollution of the underground water is a very important matter. The main origins of these populations are including increasing of nitrates detergents and heavy metals in water. Because of many active iron mines in these regions, there is possibility for pollution of some regions near of these mines. In recent decades, erosion and destruction of soil have been created by population growth, immigration of rural population to the cities and low level technology in agriculture. Several of important threatening factors soil is include shortage of raining (falling), reducing the organic materials in soil, increasing of salinity alkalinity in soil, changing the application and industrial pollutants.

Increasing of residential and industrial application that has been created by cities rapid development, have reduced good agricultural lands and pastures that help reducing the quality of soil and its stability. On the other side, industrial and urban wastewater reduce quality of soil by enter heavy elements such as cadmium, lead and zinc. Pollution rises from plagues elimination poisons are also added to pollutants.

Human factors

A- Mineral and industrial activities: Rapid growth of industries this region raised from supply of economical needs and employment of human resource in urban areas specially. In recent decade, because of activities against environmental problems, industrial have reached a ordered approach, such that because of prevention of environmental pollution in residential areas, construction industrial zone has been recommended out of cities. The main part of Yazd industries have been located around it that sometime enter Wastewater into absorption wells without refinery or directs it into the old Qanat and pollute. Underground water directly or indirectly and in fact, in Yazd province territory, all of industrial plants have been concentrated around the city of Yazd. Concentration, rapid growth of population and spreading the city of Yazd and also industrial growth specially textile and brick-burning in the center of province in compare of other cities in province is very high and because of get larging this city, cities of Yazd, Shahedieh, Zarch and Ashkezar have been change into an independent cities. Totally, there are 8 active industrial towns and one special economical zone in yazd province that their characteristics base on position, area, number of active units and status of removing the rubbish are listed following:

- Yazd Industrial Town (Zone): This town with area about 688 hectare is located in 5th km of Khezrabad road. This town has 235 active units in the fields of food, chemical, metal, cellulose, power and electronic, textile and service.

- Jahan abad industrial town: This town with area about 438 hectare, is located in 10th km of yazd-meybod road. This town has 66 active units. Wastewater collection network and refinery for wastewater have been predicted.

- Mehriz industrial twon: This town with area about 30 hectare is located in 30th km of Yazd – Kerman road. This town has 38 active units. This town hasn't wastewater collection network.

- Ardakan industrial town: This town with area about 349 hectare is located in 5th km of Ardekan-naein road. This town has 21 active units and hasn't wastewater collection network.

- Taft industrial town: This small town with area about 42 hectare is located in 9 km of taft-yazd road. This town has 11 active units. Wastewater collection network has been predicted for the town.

- Tabas industrial town: This town with area about 150 hectare is located in the beginning of tabas-dyhouk road. This town has 9 active units and hasn't wastewater collection network.

- Bafgh industrial town: This town with area about 100 hectare is located in 100 km of yazd-bafgh road. This town has 2 active units in the field of chemical and metal. It hasn't Wastewater collection network.

- Yazd special economical textile zone: This zone with area about 570 hectare in located in 15 km away from yazd and it has one active unit. Wastewater collection network has been predicted for this special zone. New industrial town that are prospering meybod 2, sadogh foulad, taft 2 and mehriz.

Water for these towns is provided by wells and except yazd industrial town that has predicted wastewater collection network, rest of the other towns haven't plan or program in this field. The rubbishes of the industrial town haven't predicted position for collection and most of them deliver their rubbishes in nearest improper regions that some of them pollutes environment. Soil and water pollution is one of issues from production of industrial wastewater. Base on quantity and quantity viewpoint, textile industry has a special position. This industry because old history in Yazd, has a high briskness. There are many operations in textile industry that produce large wastewater. At this

wastewater, there are variety of material include organic materials, acids, bases, heavy material (corom, cobalt, copper, detergent materials like soap and powder sodium salts, peroxides, silicates, formaldehyde.

After textile industry, human and animal and animal food industries have the largest amount of wastewater. After pasteurized milk plants, the largest amount of wastewater is produced by Yazd Meikhoosh factory. Daneh sa-e-yazd factory is the largest flour company in yazd province. Wastewater of this factor is delivered in near lands around it.

Slaughter –houses are the other resource of water pollution in Yazd province. In the all cities of Yazd province, only Meybod and Ardekan have Slaughter –houses the largest Slaughter –houses in Yazd province is located in city of Yazd. There are many materials such as blood, parts of skin, waste meat and silt in the Slaughter –houses wastewater in which BOD of wastewater is decreased rapidly if these waste materials are collected. In the delivering and draining of Slaughter –houses wastewater into the dried canal, in addition to pollution of soil and underground water, there is a probability of parasite and microbe in this case. Wastewater of taft Slaughter –houses first drain in a soil hole and transports to position of urban rubbish collection every week.

Pollution from activities of mines is also an environmental problem in Yazd province. Wastewater from mines, special lead and zinc (Bafgh iron ore mine), drain in mine environment without refinery process that in addition to air pollution (putrefied smell) and noise, it pollutes underground water and soil in that region (table 2, 3, 4).

Table 2. Specifications Sample From Textile industry wastewater

Row	Parameter	Industries Woolen	Cotton industry
1	Color	brown	-
2	PH	9-10.5	9.8-11.8
3	Cream	4	12.5
4	BOD	900	760
5	Total Materials	3000	6170
6	Total suspended matter	100	-
Total		600	-

Table 3. Specifications of Wastewater Yazd Baf Factory, Soap making factory And Company of Grain making

Parameter	Rate	Parameter	Rate	Parameter	Rate
BODS	850	BOD	5920	BOD	840
COD	1080	COD	32030	COD	2688
TDS	2120	TDC	241900	TDC	1175
TSS	1200	CL-	44375	CL-	131
CL	476	PH	13.03	PH	5.54
PH	8.15-8.5	Alkalinity	57500	Acidity	245
CO	0.016	Saponification		Grain making	
Cr	0.624				
Cu	0.058				
Alkalinity	200				
Yazd baft					

Table 4. Rate of industrial waste According to Yazd province City (2011)

Name city	Other machinery	Transport	Fabricated Metals	Basic metals	Non-metallic industries	Paper, printing	Chemical Industries	Textile industry	Food Industry	Total
Ardekan	45.0518	47.75	227.806	4417.8	8.3805	2.274	136.454	3451.5	71.5473	8486.4
Abarkouh	4.5558	0	2.0788	7.3575	5.0238	0	51.4176	5.032	28.7496	104.47
Bafgh	2.2779	3.416	1.9688	1936.4	1323.56	0	136.454	2.516	32.0166	3441.08
Taft	71.6273	10.25	18.7596	44.957	30.7285	7.0494	326.304	119.88	153.549	786.984
Khatam	2.0248	0	0.3061	0	0	0	0	1.184	7.8408	11.3557
Sadogh	19.7418	14.64	27.6312	22.89	15.6436	15.1221	566.912	145.93	83.3085	914.008
Tabas	3.5434	0	1.136	24.525	16.761	0.5685	63.9424	6.364	29.0763	145.917
Mehriz	34.1658	8.784	18.6497	27.795	18.9958	5.3439	268.954	48.248	173.478	605.919
Meybod	56.6944	29.52	39.3556	464.34	317.342	6.1398	566.253	134.24	345.649	1962.91
Yazd	979.7501	113.7	329.036	1889.2	1291.16	100.283	3412.68	2988.1	855.627	11987.7
Total	1174.384	180.3	438.922	4417.5	3019.21	134.507	5392.92	3451.5	1709.29	19960.3

B- Urban Development

Rapid growth of population in two recent decades has provided background of changing in urban and rural pollution combination in Yazd province and lead to urbanization. This case has been remained many destroy effects on environment, special on large cities in this region such as city of Yazd. These effects can be seem in different demotions such as quality of air and water resident area, sound pollution, energy consumption, natural resources. Rapid growth of cities in this region was a main factor that takes plans and a program for protection of environment wasn't possible. Weakness of these processes in the field of air and water pollution and insufficient execution of environmental standards in urban residents and sound pollution are clear than the other cases.

Uncontrolled spreading of the city of Yazd on the geographical bed was very high such that amount of its spreading-out in duration 1966-2002 increased from 700 hectare to 11000 hectare and its level reached more 15.7 equal than before whereas, its population at same equal has been increased about 4.1 equal than before and reached from 93000 persons to 380000 persons. The speed of physical development was more than the speed of population growth and this case has been causes that gross density of population of the city of Yazd decreased during these several decades. Gross density of population in the city of Yazd in 1966 was 133 persons/hectare and this index in 1976, 1986, 1996, 2006 and 2011 has been reached to 117, 83, 38, 35 and 32 persons/hectare while, in 1976, density in rural regions around the city was computed to 60 persons/hectare and recent density of city is lower than last rural density. Low density of the city of Yazd are mainly raised from empty lands and without application spaces that creates some problems in the city such that most of this lands changes to position for rubbishes and can result in sanitary problems and environmental pollution.

During the physical development in the city of Yazd, agricultural and rural lands jointed to this city and after several decades integrated with city. Destroying of garden and agricultural lands around the city increases continuously and in the next future, city of Yazd in fronts with urban brackish if this trend of destroying the environmental continuous.

C- Pollution of Urban and Household wastewater

Urban and house-hold wastewater is an important factor for environmental pollution. Urban wastewaters are hog-wash water (or waste) that rose from house-hold consumption of water and include wastewater from washing protection and health and sanitary, etc. drinking water for cities of Yazd province are supplied from deep and semi-deep wells and Qanat. Status of the cities of province for quality and wastewater collection and refinery system is listed below:

City of Ardakan: Biological quality of drinking water in Ardakan is on the allowable level and base on the chemical quality compare with drinking water standard is in allowable limit. This city hasn't wastewater collection and refinery and wastewater drains into underground water supply that wastewater in resident area remove by absorption wells.

City of Ashkezar: The chemical quality of the regional wells is on allowable level for drinking and biological quality is on the allowable level if continuous and enough clorization is done, this city hasn't wastewater collection and refinery network.

City of Bafgh: Chemical and biological quality of the drinking water is on the allowable levels. Wastewater system in this city is absorption wells (traditional) and wastewater drains into the underground water resources. Since this city is located near iron ore and coal mines, it has high capacity for accept population. This case increases water shortage problem.

City of Bahabad: Chemical quality of bahabad drinking water is relatively good and biological quality is on the normal level. Wastewater system in this city is traditional absorption wells and all wastewater drains into the underground water resources.

City of Taft: Chemical quality of the drinking water in this city is on the allowable level and biological quality of drinking water is on the allowable limit. Wastewater system in this city is traditional absorption wells and all of wastewater drains into the underground water resources.

City of Zarch: Chemical quality of the drinking water in this city is acceptable level and base on biological characteristic is clean and health. This city hasn't wastewater collection and refinery system. Wastewater enters to the underground water resources and house – hold wastewater removes into the absorption wells.

City of Shahedieh: Chemical quality of the water drinking well is on the allowable level. This city hasn't network or plan for proper distribution of water and accessory equipment.

City of Marvast: Chemical quality of the drinking water is on the allowable level and from the biological viewpoint; quality is on the accepted level. Wastewater system in this city is traditional absorption wells and all of wastewater drains into the underground water resources.

City of Mehriz: Chemical quality of water wells is on the allowable level and its biological quality has been reported in normal level. It hasn't wastewater collection and refinery network, thus all of wastewater drains in to the underground water resources, and wastewater in resident area remove into the absorption wells.

City of Meybod: Biological quality will be accepted if continuous and enough colorization is executed. Chemical quality of the drinking water is on the allowable level. This city hasn't wastewater collection network and refinery system and all wastewater drains into the underground water resources by absorption well.

City of Nir: Chemical quality of the drinking water is on the allowable level and its biological quality is on the accepted level. Wastewater system is traditional adsorption wells and house hold small pool. In some regions of this city collected material in small pool is used as fertilizer for gardens.

City of Harat: Chemical quality of the drinking water is on the allowable level and its biological quality is on the accepted level. Wastewater system is traditional absorption well and all of wastewater, surface water and agricultural water drain into the underground water resources.

Chemical quality of drinking water is on the allowable level and its biological quality is good. Surface water and flooding flow are directed to channels around the street and transfer to dessert. In this city some activities has been done for execution of wastewater collection and refinery system for city, special for factories are near each other and similar production and common wastewater characteristics, that is, base on density of industrial line of wastewater, between Yazd bat cross- road and location of refinery in north of darvazeh- e- Quran, has been constructed.

D- Rubbish pollution

Rubbish pollutes surface and underground water

in many and different ways. Because accumulation rubbishes in one location, after sometimes, it produces black putrefied viscose liquid that is very pollution and as known rubbish. This liquid moves in surface gradient direction and it will pollute water and soil if level of underground water is high.

Base on collected data from municipalities of yazd province in 2006, total average amount of collected rubbishes in urban regions of province for this year, was 652.025 ton. 49.28% of this rubbish has been collected in city of yazd, after yazd, most of this rubbish has been collected and removed in ardakan, tabas and meybod respectively. From 23 cities in this study, eight of mayorshave said that there were not credits and budgets for collection and removing rubbish in 2006. Thus between rest of 12 cities, the most value of credit has been allocated to abarkouh, ardakan and taft.

Rubbish production by families is one of the most important indexes for compare cities of province in the field of collection and elimination of urban waste materials.

Per head of rubbish production in all regions of yazd province 690 gram/day. City of eshghabad with Capitation of rubbish production 1350 gr/day has the highest index. After this city, the largest amount of rubbish are 1110, 1020, 990 and 970 gram/day that belong to cities of bafgh, nir, marvast and abarkouh respectively. The lowest amount of rubbish belongs to ashkezar with 130 gram /day. After city of ashkezar, cities of mehrdasht and ahmadabad with 330 and 400 gr/day have the lowest of rubbish respectively Capitation of rubbish production in urban regions of province. Base on produced rubbish by each family in each day, city of eshghabad, with average number of 4.5 persons, produces 7 kg.day. Bafgh is located in second position. Dimension of family in this city is 4.3 persons and each family produces 4.77 kg/day. In ashkezar, a family with average demotion of 4 persons produces 520 gram/day in which this amount cause's ashkezar is posited on 20 levels. Meybod with average dimension of 3.3 persons has the lowest position between cities of yazd province, each family in this city produces 1920 gram/day rubbish. Average amount of produced rubbish but each family in city of yazd has been computed 1850 gram and family dimension in this city is 4.7 persons.

E- Energy consumption and pollutant issuance

Pollution of energy consumption in clued commercial and house- hold consumption, industrial consumption and vehicles are main factors in air pollution specially, carbon- monoxide, carbon- dioxide, sulfur, sulfur dioxide, nitrogen- dioxide, hydrocarbon and halogen.

Because of pollutants resources activities in yazd province, several ton dangerous and destroy effects on humans and other creatures.

In commercial and resident space in this region, several light and heavy fuels are used every day that pollutant gases such as carbon monoxide (Co), burned hydro carbon (Hc), android sulfur (So2), hydrogen oxide (Hoax) suspended particle and lead are produced and vented to atmosphere.

Most of pollutants industries in yazd province are located around the city of yazd. Therefore, its environmental problems such as air pollution are higher than the other cities in this province.

In yazd province, brick- burning furnaces (manual and automatic) and pottery ovens are main industries that pollute the air. Many of thisindustries are located in north and north east part of the yazd. Operation of these industries lead to producing several dangerous include Co, So2, nox, Hc, ash and smoke that because of Air reversal phenomenon in winter, breathing in distance of 2000 m away from of these furnaces is very hard. Base on surveys, about 30 percent of pollution in city of yazd raised from brick-burning furnaces.

F-Grading of Cities of the Yazd Province Base on Environmental Problems

Base on factor analysis, special amount of this factor is 3.10 that it along can be computed 38.82 percent of variance and descript if (table 5). Eight index have been loaded in three factors that first factor with 5 indexes has most Influence between the other factors. Second factor has 2 indexes and third factor includes Per capita rubbish production. Leakage inverse index because computation in first factor and reputation in second factor. In this index, amount of KMO is 0.477 and amount of SIG is 0.0001 that shows data with reliability level of 99 percent are proper for factor analysis.

Table 5. Environmental factors are extracted and specific values Related to it

Factor	Eigenvalues	Percent of variance	Percent of cumulative variance
1	3.10	38.82	38.82
2	2.13	26.64	65.46
3	1.14	14.35	79.81

Source: authors

This factor includes eight Per capita indexes that contains Per capita of rubbish production, Per capita of wastewater production, Per capita of water consumption, inverse percent of water leakage, Per capita of water consumption Per capita, Per capita of total water production, Per capita of surface water production and Per capita of underground water production. Indexes of this factor show that amount of activity and level of urban Spreading is high. Per capita of surface and underground water production is indication of wide spreading the industrial and agricultural activities in yazd province that lead to more income in cities. Indexes of this factor, after loading, were located in three factors. Such that first index includes Per capita of rubbish production, Per capita water consumption water leakage water consumption Per capita underground water production that with special amount of 3.10 has most Influence in development of the cities of province. Second factor includes three indexes of Per capita of total water production, Per capita of surface water production and Per capita of underground water production that index of underground water production has been acted as a natural index in this factor. And finally, in the third factor includes index of the Per capita of wastewater production that with special amount of 1.149 has the lowest Influence on the development of province. Base on table 5 and base on mean cluster leveling K, cities of yazd, meybod, ardakan, aghda,

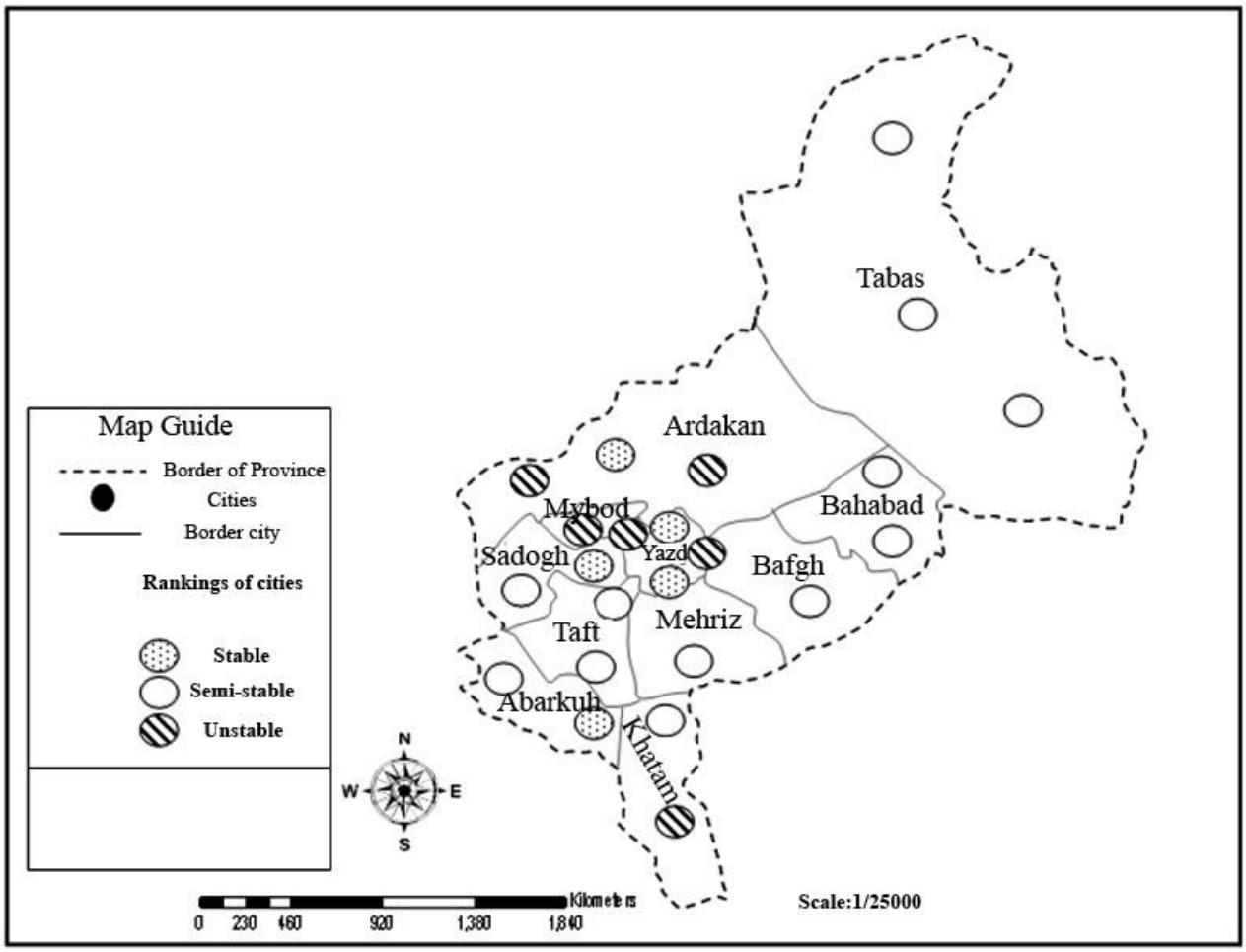
marvast and zarch with value of 71.35 of urban population are considered as instable cities. 12 cities with about 21.56 percent of urban populatin considered as semi-stable cities and cities of shahedieh, mehrdasht, hamidia, khezrabad and ahmad abad with 6.99 percent of urban population are considered as stable cities. Base on computations, it should be said that, because of immigration, many production industries and workshops, city of yazd has the highest position in all environmental indexes between the other cities in province whereas, in the field of water production for drinking and factories has many problems. Cities of shahedieh and hamidia are located in 19 and 20 position respectively.

Because of pendulum immigration into the city of yazd, increasing trend of environmental resources consumption Added that city will had many problems in a long term. About position 5 for city of marvast several factors should be considered, these factors include relative good geographical conditions, permanent rivers for surface and underground water production and few growth of population. City of yazd its water a little from subterranean and from west big cities and zayandeh Rood River (Table 6) (Map 2).

Table (6): Ranking of Province Yazd Cities According to environment Indicators

Rank	City Name	Index Value	Level of Development	Rank	City Name	Index Value	Level of Development
1	Yazd	3.85		13	Bafgh	-0.52	
2	Meybod	2.36		14	Nir	-0.61	
3	Ardekan	2.31	Unstable	15	Herat	-0.72	Semi-stable
4	Aghda	2.28		16	Mehriz	-0.93	
5	Marvast	1.32		17	Dyhuk	-0.95	
6	Zarch	1.13		18	Bafrueyh	-1.02	
7	Ashghabad	0.84		19	Nodoushan	-1.07	
8	Bahabad	0.71		20	Shahedyh	-2.03	
9	Abarkouh	0.64	Semi-stable	21	Mehrdasht	-2.04	
10	Ashkezar	0.50		22	Hamidiya	-2.29	Stable
11	Tabas	0.49		23	Khzrabad	-2.30	
12	Taft	-0.37		24	Ahmadabad	-2.61	

Source: authors



Map 2. Ranking of Province Yazd Cities According to Status of environment

To cite this paper: Salehi M, Mousavi M, Kashkooli A.B. 2014. Assessment and Classification of Environmental Problems Based on Sustainable Development Indexes (Case Study: Cities of Yazd Province). *J. Civil Eng. Urban.*, 4 (2): 110-119.
Journal homepage http://www.ojceu.ir/main/

F-The Hypothesis Test

It seems there is a significant relation between urban environmental instability and number of population. In this part of study, relation between numbers of population as an instability factor and environmental index as a stability index is examines. In this study, relation between number of population and environmental instability in cities has been surveyed by spearman coefficient. Results indicate that there is a relative strong relation between number of population and environmental problems in cities of yazd province. At this case, spearman coefficient was 0.608 that indicates there is relative strong relation between number of population and instability of environmental problems in cities of yazd province. Base on column (d2) in table 6 it is clears that is some cities there is very high difference between number of population and environmental instability. For example whereas grade of enjoyment of the environmental indexes in cities aghda, bahabad, zarch, marvast and Eshghabad are 4, 8, 6, 5, 7 respectively, base of number of population are locate in 22, 16, 13, 14, 19 position respectively also, cities of bafgh, mehriz, hamidia and tabas base on enjoyment of the environmental indexes are located in 13, 16, 22, 11 position respectively wheres base on number of population are located in 4, 7, 6, 5 position respectively (Table 7).

Table 7. Calculation of Spearman correlation coefficient between populations Rank and Rank of Compilation Indexes in Province Yazd cities

Row	Cities	Pop-Rank	(Rank) Environment indicators	d	d2	Row	Cities	Pop-Rank	(Rank) Environment indicators	d	d2
1	Ardekan	3	3	0	0	13	Zarch	13	6	7	49
2	Ahmadabad	18	24	-6	36	14	Meybod	2	2	0	0
3	Aghda	22	4	18	324	15	Mehrdasht	15	21	-6	36
4	Bafrueyh	17	18	-1	1	16	Abarkouh	8	9	-1	1
5	Bahabad	16	8	8	64	17	Nodoushan	21	19	2	4
6	Bafgh	4	13	-9	81	18	Khzrabad	24	23	1	1
7	Taft	9	12	-3	9	19	Ashkezar	11	10	1	1
8	Nir	23	14	9	81	20	Herat	12	15	-3	9
9	Mehriz	7	16	-9	81	21	Marvast	14	5	9	81
10	Yazd	1	1	0	0	22	Ashghabad	19	7	12	144
11	Shahedyh	10	20	-10	100	23	Tabas	5	11	-6	36
12	Hamidiya	6	22	-16	256	24	Dyhuk	20	18	2	**4**

Source: authors

$$\sum d^2 = 1399$$

$$r = 1 - \frac{6\sum d^2}{N^3 - N} \Rightarrow r = 1 - \frac{6 \times 1399}{13824 - 24} = 0/608$$

r = Calculation of Spearman correlation $\sum d^2$ = Sum of squared N= Number of cities

According to this table, it seems that there is a relative strong relation between number of population and environmental indexes in most of cities in province but most of cities have not been enjoyed from environmental indexes equally and enjoyment of stability indexes but have low population of course population is a important factor for environmental problems, but in Yazd province other environmental indexes and lack of planning are more important than population for developing the urban environmental problems. Therefore, mentioned hypothesis doesn't accept.

Conclusion and Suggestions

Aim determining and spatial strategies for urban sustainable development have been done by consideration of advantages and disadvantages. Decreasing of problems in each city in one hand, according to possibilities, urban development capabilities, doing activities for individual and social welfare and Upgrades quality of life and urban healthy on the other hand, are aims of researches and planning, for maintain and protection of population, increasing of environmental capabilities and decreasing of environmental problems in each of city, Influence planning and programming are needed. That is several suggestions are listed following:

- Proper distribution of environmental spaces and different application with proper uses of urban lands.
- Connection between human and environment through increasing green spaces for spend of Spare time.
-Enhancing to stability indexes in the instable cities and semi-stable cities in province.
- Correct determination of pollutant industries location and the other obtrusive activities such as Slaughterhouses and semi-heavy industries. Desire planning for elimination of wastewater from these industries in middle cities in province such as Meybod, Bafgh, Ardakan.
- Brick-burning furnaces (manual and Compression) and also pottery ovens are main pollutants factors in city of Yazd. These furnaces are located in north and north east part of Yazd. This case needs to planning for solving (this non distributed furnaces should be distributed).
- Decreasing air pollutant resources that lead to sound pollution too.

REFERENCES

Aina, T.A., F.E. Etta, and C.I. Obi. (1994). The search for sustainable urban development in Metropolitan Lagos, Nigeria: Prospects and problems. Third World Planning Review 16

Bahraini, SH. (2002). Sustainable urban development from thinking to practice, Journal of Environmental Studies, No. 25.
Byrne, P.J., Toensmeyer, U.C., German, C.L. and Muller, H.R., (1991). Analysis of consumer attitude toward organic produce purchase likelihood. Journal of Food Distribution Research, 22(2).
Cohen, M. (1991). Urban Policy and Economic Development: An Agenda for the 1990s, World Bank Policy Paper, and Washington DC.
Egger, S, (2005), Determining a Sustainable City Model, Environmental Modeling & Software.
Gale, Richard P., and Sheila M. Cordray, (1994). Making sense of sustainability: nine answers to 'what should be sustained?' Rural Sociology. 59(2).
Haughton, G. (1997). Is developing sustainable urban development models. Cttles, 14(4): 189-195.
Heidari, R. (1997). International Seminar towns and people; Tabriz University, Tabriz.
Hosseinzadeh Dalir, K. (1996). Principles of Land Development, Tabriz University, Tabriz, Iran.
Hosseinzadeh Dalir, K. (2001). Regional planning, samt publisher, Iran.
Kalantari, KH. (2003). Processing and data analysis in social - economic research, sharif Publishing, Tehran
Khatoonabadi. A. (1994). Systemic Communication and Performance, Ph.D. Dissertation. U. W. S. Hawkesbury. Australia.
Marcotullio, Peter J. (2001). Asian Urban Sustainability in the era of globalization, united Nation University, Institute of Advanced Studies", tokoyo, Japan.
McGranahan, G. & Satterthwaite, D. (2003). Environmental Health or Ecological Sustainability? Reconciling the Brown and Green Agendas in Urban Development», in Zetter, R. & White, R. (eds.) (2003). Planning in Cities: Sustainability and Growth in the Developing World, Practical Action Publishing, and Warwickshire.
Navabakhsh, M. (2008). Sustainable urban development: A review of concepts, processes and events, Research Institute for Strategic Studies, Tehran.
Redclift, M, (2000). Sustainability: change life and livelihood, Routledge, London.
statistical center of Iran, (2011). General Census of Population and Housing.
Van Dijk, M. P., Mingshun, Z. (2005). Sustainability indices as a tool for urban managers, evidence from four medium-sized Chinese cities". Environmental Impact Assessment Review 25.
World Bank, (1997). Expanding the Measure of Wealth. Indicators of Environmentally sustainable Development, Washington D.C., The World Bank.