Ukrainian Journal of Ecology

Ukrainian Journal of Ecology, 2017, 7(4), 304–315, doi: 10.15421/2017_121

ORIGINAL ARTICLE

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Submitted: 01.11.2017. Accepted: 09.12.2017

Explaining the Effects of Industrial Estates on the Sustainability of Rural Settlements: A case study of Binaloud Industrial Estate in Mashhad

The development of industrial areas in villages can have many positive socio-economic effects. Results of studies indicate an improvement in the living conditions of villagers after the establishment of industrial areas in villages. Establishment of industrial estates in different provinces of the country has been followed by numerous environmental, economic, social, and physical effects on the region, especially the rural community. Thus, the present study seeks to do a case study concerning the effects of Binaloud Industrial Estate on the sustainability of rural settlements in Ahmadabad district of Mashhad city while considering the place and importance of industrial estates in rural areas. This research is an applied study in terms of purpose, whose results can be used in planning. For measuring the effects of industrial estates, three economic, social and environmental dimensions have been taken into account, which have been evaluated by multiple questions in the questionnaire. Thus, of 58 villages existing in Ahmadabad district of Mashhad city where Binaloud Industrial Estate has been located (research statistical population), 42 villages were selected. To determine the number of sample villages, demographic factor (villages with more than 100 inhabitants) was used. Then, considering the factor of distance dimension and access to Binaloud Industrial Estate, 10 villages were selected out of 42 villages and were used as the population of the research sample. Based on Cochran formula, unlimited population size is used to determine the sample size. Accordingly, the sample size was obtained to be 279. The sample size of each village has been calculated with regard to the proportion of the size of households in each village. In order to compare the average of respondents' opinions regarding the effect of industrial estates on the sustainability of rural settlements, comparison of the average of this variable (including three economic, social and environmental dimensions) was done with the aid of t-test with number 3 (medium), whose results indicated that p-value divided by 2 of this test is lower than 0.05 and t-statistic is positive (16.732). Hence, it can be concluded that the creation of industrial estates is effective in the sustainability of rural settlements; that is, the research hypothesis is approved with 95% confidence. Ultimately, the impact of the industrial estate on the studied villages is greater in the social and economic dimensions, and in the environmental dimension, the industrial estate has had a significant impact on only 3 villages (Avareshk, Seidabad and Fakhr Davoud).
Key words: Rural settlements; industrial estates; economic; social and environmental effects; Binaloud Industrial Estate in Mashhad

Statement of the problem

Not so long ago, Iranian economy was dependent on agriculture with its own sub-sections (farming, ranching, forestry, fishing and hunting). Workers in the country have mainly been engaged in agricultural activities. The transformation that has come about in Iran's biological environment has also changed the livelihood status of inhabitants of this land. Knowledge and recognition on a case-by-case basis have caused that a large number of people living in rural areas become aware of their biological problems and deficiencies and look for a solution. Therefore, in near and far prospects, they have found their shelter in cities since city has been the embodiment of clear horizons with open doors for villagers (Moti'ei Langroudi, 1991: 486).

One of the solutions to reduce the gap and increase the fields of employment and income in rural areas is the development of activities that are less dependent on environment and environmental conditions. Agriculture is traditional in rural areas of the country and depends largely on environmental and climate conditions. In such circumstances, the search for activities that are less dependent on climatic conditions is among the most important measures to strengthen rural economy, which can be highly effective in the adjustment of problems and provision of employment and income for villagers without production factors. Currently, provision of employment in rural areas through the agricultural sector is faced with difficulty due to the lack of soil and water production factors and this has led to irregular migrations from rural areas. In such conditions, considering the rural power of industries is very effective for rural efficiency because rural development is not just the development of agriculture

and agricultural development is considered as one of the rural development sub-systems (Qasemi, 2004: 6). Overall, the development of industrial areas in villages can have many positive socio-economic impacts. Results of studies suggest an improvement in the living conditions of villagers after the establishment of industrial areas in villages.

Establishment of industrial estates in different provinces of the country has numerous environmental, economic, social and physical effects on the region especially the rural community. The current fundamental problem is the uncertainty regarding the impact rate of industrial estates on the sustainability of rural settlements. Hence, the present study seeks to do a case study concerning the effects of Binaloud Industrial Estate on the sustainability of rural settlements in Ahmadabad district of Mashhad city while considering the place and importance of industrial estates in rural areas.

This industrial estate was approved on 5/17/1992 by the Cabinet of Ministers and was set up in 1993. This estate with an area of 110000 hectares and an industrial size of 70 hectares is located in 50 Km from Mashhad-Neyshabur road. The number of units put into operation is more than 54 units and there are 3,399 people working and about 514 projects are under construction (Khorasan Razavi province industrial estates website).

Based on the foregoing, the present study is intended to answer the following question: What is the impact of establishing an industrial estate on the sustainability of rural settlements?

With respect to the research questions, the research hypothesis, which is in line with the questions raised, is as follows:

It seems that the establishment of industrial estates is effective in the sustainability of rural settlements.

Research background

Barqi et al. (2013) conducted a study entitled "Evaluating the economic impacts of industrial estates on the development of neighboring rural areas: A case study of Aqla Industrial Estate" and came to the conclusion that the establishment of Aqla Industrial Estate has had significant impacts on the development of neighboring rural areas in economic terms.

In a study entitled "Evaluating the social effects of industrial estates on rural areas: A case study of Khayyam Industrial Estate in Neyshabur", Hamzeei et al. (2014) concluded that in most social and cultural indicators, especially relationship with the media, enjoyment from services for Khayyam Industrial Estate in Neyshabur has caused positive changes in the condition of rural workers and this can finally be regarded as a step towards the influence of industrial culture on rural areas and cultural change.

Sa'di et al. (2015) carried out a study entitled "The effects of industrial micro-projects on rural settlements: A case study of Shahanjarin village in Razan County" and argued that the implementation of the above-mentioned industrial project has the greatest effect on the improvement of village communication path to the city, increased income of villagers and increased employment opportunities for villagers and the village air pollution.

In a study entitled "Evaluating the impact of industrial estates on the quality of life in peripheral rural areas: A case study of Sharif Industrial Estate in Abhor County", Qadiri Ma'soum et al. (2015: 313-367) reported that the creation of Sharif Industrial Estate has made a desirable effect on total quality of life indicators in studied villages. Meanwhile, the transport index has taken the greatest effect and the health index has taken the least impact from this estate.

Hajinezhad and Mozaffari (2016) performed a study entitled "Investigating the effectiveness of non-agricultural activities in the development of economic and social dimensions of rural settlements under study (Firouzeh mines in Khorasan Razavi). The results obtained from one sample t-test indicate the positive effects of mines on the growth of social indicators in Firouzeh village.

Lanjouw (2000) carried out a study on the consequences of the establishment of industry in rural areas of Latin America (Ecuador and El Salvador) and observed that employment generation in the non-agricultural sector is an appropriate strategy for rural employment.

Paul Weick conducted a study entitled "Rural industrial estate, a live treatment for regional disputes in India" and announced that industrial estates in rural areas play an important role in modifying regional imbalances.

In a study entitled "The role of non-agricultural income in reducing rural poverty and inequality in China", Sadelt concluded that non-agricultural activities have a positive effect on reduced poverty and inequality, raised quality of income and family production.

Elabras and Magrini performed a study entitled "Development of industrial estates in Rio de Janeiro and Brazil" and found that the formation of industrial units in villages increases awareness about development, strengthens economic foundations and leads to coordination with the processes of development and application of human resources (Elabras Veiya, mayrini & Lb, 2009).

Sundar and Srinivasan (2009) conducted a study under the title of "Village industrialists: Challenges and reports" and came to the conclusion that industrial areas cause to increase the income of villagers and reduce the difference in income between townspeople and villagers.

Das et al. (2007) carried out a study entitled "Examining the industrialization pattern in the northeast" and stated that the expansion of industries has been able to reduce the poverty of villages and has led to sustainable livelihood of villagers.

Tauffiqu Ahamad and Jitendra Kumar Pandey (2015: 23-96) performed a study entitled "Investigating the development of rural areas through industry in India" and concluded that industrial development in rural areas causes to reduce migration rate and create job opportunities.

Research method

The dominant research approach is descriptive and analytical in terms of nature and method, but besides that, documentary and field methods have also been used so that in the stage of description, the required data has been obtained through documentary and field methods. The field section, in addition to direct observation and interview, is based on the preparation and completion of questionnaires in two levels of the head of rural households and experts (head of rural municipality, head

of the district, governor, experts of the Agricultural Jihad and the Islamic Revolution Housing Foundation). In the analytical method (statistical analysis), Wilcoxon statistical test, t-test, Kruskal-Wallis test, Kolmogorov-Smirnov test and SPSS software have been used for the inference of results and analysis of information obtained from field observations. To measure the impacts of industrial estates, three economic, social and environmental dimensions have been considered, which have been assessed by multiple questions in the questionnaire. Among them, a number of indicators are related to income, employment creation, investment, job satisfaction, income satisfaction, literacy, insurance, motivation to stay, quality and quantity of rural housing, increased construction in the village, change in use, quality of drinking water resources, satisfaction with wastewater disposal, satisfaction with sewage disposal health network and so on. Considering the scope under study, the selection and share of each homogeneous village have been taken into account.

Statistical population and sample size

Of 58 villages in Ahmadabad district of Mashhad city where Binaloud Industrial Estate has been located (research statistical population), 42 villages were chosen. To determine the number of sample villages, demographic factor (villages with more than 100 inhabitants) was used and then, the villages were classified into three demographic groups (100-499, 500-999, 1000-2499). Afterwards, considering the factor of distance dimension and access to Binaloud Industrial Estate, 10 villages were determined out of 42 villages and were used as the population of the research sample. Based on Cochran formula, unlimited population size is used to determine the sample size. Accordingly, the sample size was obtained to be 279. The sample size of each village is calculated with regard to the proportion of the size of households in each village. Given that less than 15 samples cannot be representative of the village, in villages where the sample size is less than 15, the number 15 is considered.

Table 1: Number of questionnaires set for each of the studied villages

Village population classification	Frequency number	Village name	Population number	Number of households	Sample size proportion	Estimated sample size (rounding the obtained numbers upward)	Sample size after considering at least 15
100-499	23	Qasemabad	105	244	0.08	23	23
		Derakht-e Sefidar	100	32	0.01	3	15
		Jamal Deh	358	108	0.03	9	15
500-999	11	Seidabad	959	280	0.09	26	26
		Fakhr Davoud	878	274	0.09	26	26
		Pivehzhan	776	287	0.09	26	26
		Hoseinabad	590	183	0.06	17	17
1000-2499	8	Avareshk	2135	652	0.21	59	59
		Soltanabad-e Namak	2152	622	0.20	56	56
		Dizbad-e Sofla	2138	569	0.18	51	51
Total	42	10	10330	3112	1	296	314

Source: Health statistics house of sample villages in 2016

For the statistical population including 3112 research households (heads of rural households), the total sample size was 314 households. Given that there is a possibility of non-return or incomplete filling of the questionnaire, about 34 more questionnaires have been distributed and reviewed so that if a questionnaire is deleted, the required sample size exists. The questionnaires have been distributed in proportion to the frequency of households in each village. Sampling of the head of rural households was done through systematic random method.

Theoretical foundations

The concept of sustainability within the framework of rural sustainability suggests balance and dynamism of rural settlements in relation to natural, ecological, social, cultural and physical structure of the environment so that it guarantees the sustainability of settlements during temporal and spatial trends (Moti'ei Langroudi & Yari, 2010: 48). In general, rural sustainability can be considered as a process during which the well-being of rural inhabitants and ecosystem are preserved and improved altogether. Economic growth is accompanied by social justice and environmental protection, and capability and durability of settlements are added. Economic diversification and income sources increase and social cohesion and participation are institutionalized. So, rural sustainability greatly depends on their reproduction capacity over time in different natural, social and economic dimensions and is largely based on flexibility, participation, social cohesion and economic diversification (Yari Hesar et al., 2012: 131).

Sustainability indicators of rural settlements

Sustainability indicators are the most important tool that help individuals, institutions, communities and societies make better and more appropriate decisions about their future (Shah Vali et al., 2006: 50). Therefore, one of the issues raised at the first meeting of the UN Commission on Sustainable Development was the development of standards for measuring sustainability (Moldan & Bilharz, 2002: 1). To assess the sustainability of rural settlements, there is a wide range of indicators and in the indexology of sustainability based on an area, city or village, it is necessary to consider some indicators to examine the status quo for each of sustainability, ecological, economic and social dimensions ('Ameri Siyahkouei et al., 2011: 168).

These limitations further become manifest when measuring the sustainability of rural settlements since many of standard indicators and methods are not suitable for local levels and also much of the data required in villages does not exist or its collection through field operation is faced with limitations. Thus, many studies on the assessment of the sustainability of rural settlements have used integrated methods or local indicators (Tavakkoli & Rostami, 2013: 65). However, understanding the sustainability of rural settlements involves attention to all human-environmental dimensions on the local, regional and trans-regional scales of the studied area.

Economic indicator

Today, economic sustainability is recognized as a crucial factor in the survival of rural populations (Qadiri Ma'soum et al., 2010: 1). Spengenberg defines economic sustainability as the creation and maintenance of a permanent and stable income for individuals in society without a decrease and decline in the capital and reserves. He argues that the economy is sustainable when it does not harm the sustainability of natural, social and human systems. Some believe that in the assessment of economic sustainability, non-economic components such as human needs, well-being, education and health should be taken into consideration (Raeisi, 1999: 120). When discussing social and environmental sustainability, it is necessary to know that both of these require a system of economic activity which must be compatible with the ecological network of life and also social network of life, of which we are a part and on which we are dependent for our health, well-being and quality of life ('Ameri Siyahkouei et al., 2011: 168).

Briefly, the sustainability of economic activities can be explained from different perspectives as follows:

1. A situation in which the desirability of society is not reduced over time is called sustainable.

2- A sustainable situation is the one in which the management of natural resources is such that production opportunities in economic growth remain sustainable for the future.

3- In a sustainable situation, natural capital reserves will not decrease in the course of economic growth and development (Khalilian, 2005: 135). In economic sustainability indicators, growth of income, increase in economic welfare, eradication of poverty, efficiency, justice and economic stability are of crucial importance and many of the components associated with the quality of life of societies, including rural and urban, are influenced by economic factors, especially the above components (Yari Hesar et al., 2012: 1439).

Effects of industrial estates on rural areas

Many studies have focused on industrial areas and their effects and consequences on geographical spaces. In Iran, several studies have been conducted in this respect, including the research by Taherkhani (2001), Najafi Kani and Moti'ei Langroudi (2007), Taqdisi (2007) and Faraji Sabokbar (2002), whose results indicate an improvement in the living conditions of villagers after the establishment of industrial estates in villages. In these studies, shortage and unequal distribution of agricultural lands are considered among the most important barriers to rural development and as the main cause of rural-urban migration. Establishment of industries in rural areas can create more job and income opportunities and is thus an appropriate platform for rural development (Hajinezhad et al., 2006: 20). Further, establishment of industry and industrial areas in villages can lead to the exploitation of local resources and skills by strengthening economic foundations, creating jobs, absorbing excess work force and mobilizing little capital and prevent the migration of villagers to cities by breaking the vicious circle of poverty (Sahra Bayan, 2001: 43). Development of industrial areas is regarded as a source of supplementary income for low-income and vulnerable households in addition to creating sustainable employment through seasonal recruitment in cold months of the year when agricultural activity is minimized.

Establishment of industry in rural areas, in addition to increased income, is accompanied by income stability, change in the consumption pattern and reduced income differences between townspeople and villagers (United Nations, 1987: 1).

Considering the studies conducted and the results obtained regarding the effect of industrial estates (economic, social, physical and environmental) on rural areas and economic indicators of the sustainability of rural settlements, the following common indicators (Table 2) have been selected to determine the impacts of industrial estates on the sustainability of rural settlements, which are proportional to the area under study.

Table 2. Indicators of rural sustainability with regard to the impact of industrial estates

Dimensions	Components	Items	Sources	Common items	Variables under study
Economic	Employment	1) The working population of the village (industry, agriculture, services); 2) the ratio of workers in workshop jobs to	Bouzarjomehri et al. (2014); Riyahi & Pashazadeh (2014); Kalantari et l. (2001)	1) Job satisfaction; 2) unemployment rate; 3) working population rate	Effect of Binaloud Industrial Estate on increased employment of villagers/ effect of Binaloud Industrial Estate

		total village jobs; 3) job satisfaction; 4) unemployment rate			on the creation of new jobs in villages/ Binaloud Industrial Estate on increased job satisfaction of villagers
	Income	1) Average annual household income; 2) inverse dependency ratio; 3) income satisfaction; 4) percentage of newly-built housing	Afrakhteh et al. (2016); Yari Hesar et al. (2013); Ejtemaei et al. (2011); Tavakkoli (2014); Qadiri Ma'soum et al. (2011)	1) Income satisfaction	Effect of Binaloud Industrial Estate on the income of villagers/ effect of Binaloud Industrial Estate on increased income satisfaction of villagers
	Investment	1) Investment tendency in the village of residence; 2) the amount of savings; 3) increased land value (price)	Annabestani et al. (2011); Shayan et al. (2011); Hajinezhad et al. (2010)	1) The amount of savings; 2) investment tendency in the village	Effect of Binaloud Industrial Estate on the amount of villagers' savings/ effect of Binaloud Industrial Estate on encouraging villagers to invest in the village
Social	Population	1) Population size; 2) population growth rate; 3) inverse immigrant population; 4) percentage of permanent residents	'Ameri Siyahkouei et al. (2011); Qasemi et al. (2011); Hedayati Moqaddam et al. (2015)	1) Inverse immigrant population; 2) population growth rate	Effect of Binaloud Industrial Estate on reduced migration of villagers to the city/ effect of Binaloud Industrial Estate on increased population
	Educational	1) Percentage of literacy; 2) percentage of female literacy; 3) percentage of male literacy; 4) satisfaction with educational quality	Hamzeei et al. (2014); Ejtemaei et al. (2014); Tavakkoli & Rostami (2013)	1) Percentage of literacy; 2) educational quality	Effect of Binaloud Industrial Estate on increased literacy level of villagers/ effect of Binaloud Industrial Estate on enhanced educational quality of villagers
	Welfare	1) Households covered by insurance (percentage); 2) reverse percentage of households covered by supportive institutions (Welfare Organization, Relief Committee); 3) percentage of members of various cooperatives and	Bouzarjomehri et al. (2014); Annabestani et al. (2011); Tavakkoli (2014); Shayan et al. (2011); Rukn al-Din Eftekhari et al. (2010)	1) Satisfaction with the quality of life; 2) the amount of motivation to stay in the village; 3) the household covered by insurance; 4) the rate of people's participation in rural affairs	Effect of Binaloud Industrial Estate on raised welfare level of villagers/ effect of Binaloud Industrial Estate on increased interest of villagers in ruralization/ effect of Binaloud Industrial Estate on the number of individuals covered by insurance/ effect of Binaloud

		organizations; 4) the rate of people's satisfaction with councils; 5) satisfaction with the quality of life; 6) the amount of motivation to stay in the village; 7) the rate of people's participation in rural affairs			Industrial Estate on increased people's participation in rural affairs
	Service	1) The rate of enjoying communication services; 2) the rate of enjoying health and treatment services; 3) the rate of satisfaction with cultural facilities	Hajinezhad et al. (2010); 'Ameri Siyahkouei et al. (2011); Hedayati Moqaddam et al. (2015)	The rate of enjoying communication services	Effect of Binaloud Industrial Estate on directing infrastructure services and facilities towards villagers
Environmental	Water resources	1) The quantity of sufficient agricultural water; 2) satisfaction with the quality of drinking water	Sajasi Qeidari et al. (2014); Kalantari et al. (2009); Ejtemaei et al. (2015)	1) Satisfaction with water quality; 2) change in the cultivation type	Effect of Binaloud Industrial Estate on villagers' drinking water quality/ effect of Binaloud Industrial Estate on the change in the cultivation type of villagers
	Health	1) Satisfaction with the manner of landfill; 2) satisfaction with sewage disposal health network	Tavakkoli & Rostami (2013); Pour Taheri et al. (2012); Annabestani et al. (2011)	1) Satisfaction with sewage disposal health network; 2) satisfaction with the manner of landfill	Effect of Binaloud Industrial Estate on the manner of landfill of villagers/ effect of Binaloud Industrial Estate on the development of sewage disposal health network of villagers
	Physical	1) Quality of buildings; 2) percentage of the increase in construction; 3) change in use; 4) satisfaction from the natural perspective; 5) natural disasters such as flood, earthquake and drought	Shayan et al. (2011); 'Ameri Siyahkouei et al. (2011); Hedayati Moqaddam et al. (2015)	1) Percentage of the increase in construction; 2) quality of buildings	Effect of Binaloud Industrial Estate on increased construction in villages; 2) effect of Binaloud Industrial Estate on land use change in villages

Source: Author's research findings, 2017

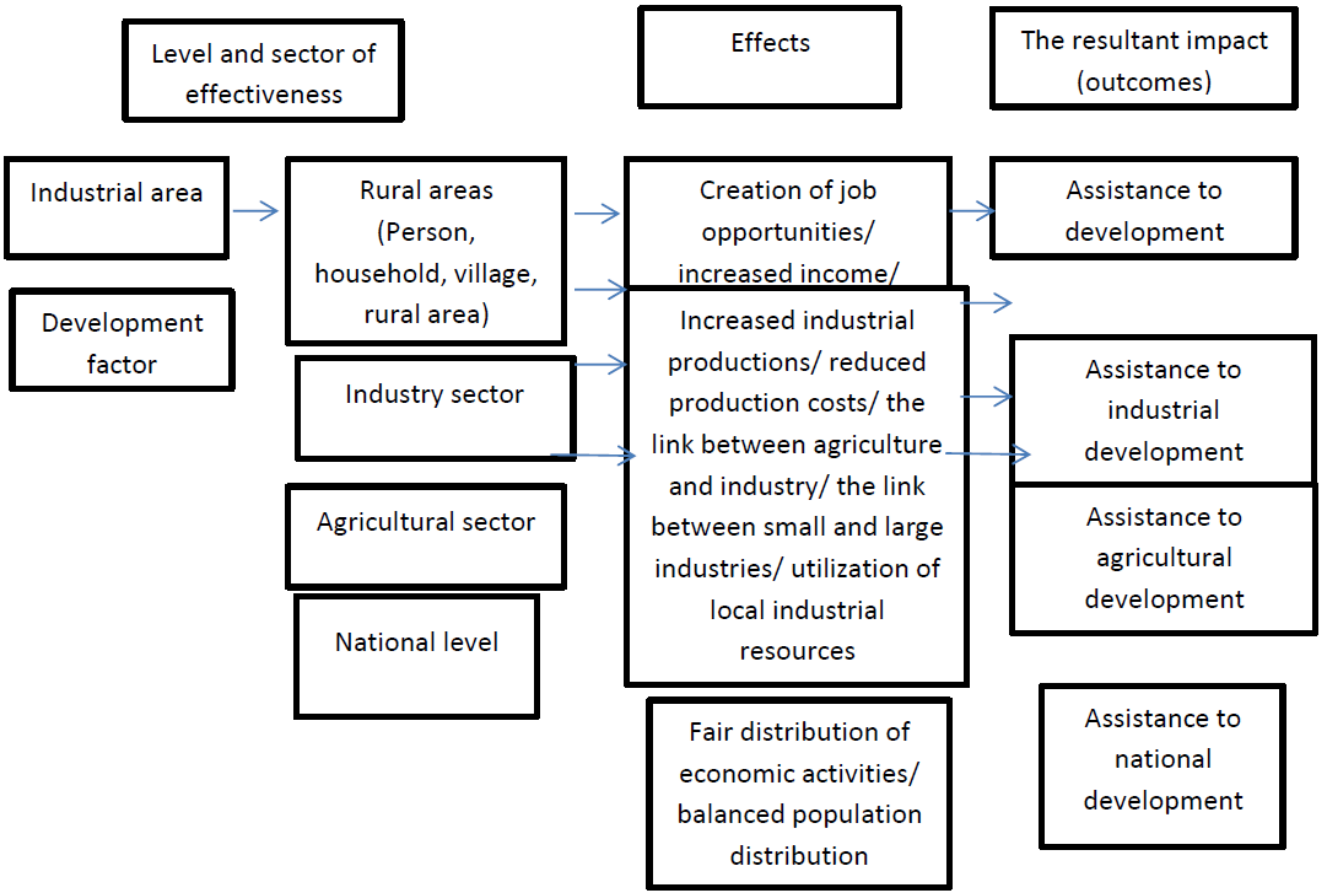

Fig 1. The impact of establishing industrial areas on the development of rural areas. Source: Taherkhani, 2000: 99 (with amendments and additions)

Research findings

In this section, the three dimensions considered in this study and the effect of the industrial estate on these three dimensions are investigated generally and also for each village and then, the villages are compared with each other.

General investigation of the research dimensions

Given that each of the studied dimensions includes more than one component (and naturally more than one item), they have a quantitative scale. With regard to the sample size which is greater than 30, the average data has normal distribution according to the central limit theorem and t-test can be employed to compare the average dimension with number 3. Results of this test have been provided in the following table:

Table 3. Results of the comparison of the research average dimension with number 3 by t-test

Dimension	Mean	SD	T statistic	Degree of freedom	P-value	Result
Economic dimension	3.420	0.553	14.169	347	0.000	More than average
Social dimension	3.708	0.541	24.402	347	0.000	More than average
Environmental dimension	3.048	0.514	1.744	347	0.082	More than average
Sustainability of settlements	3.392	0.437	16.732	347	0.000	More than average

Based on the obtained results, it is considered that the impact of the industrial estate on each of the three dimensions under investigation is more than average (p-value divided by 2 is less than 0.05 and t-statistic is positive).
Moreover, 95% confidence interval has been obtained for average difference of each dimension with number 3, which has been presented in the table below. In this table, if the confidence interval contains only positive numbers, it shows that the studied difference is only positive and thus, the average is significantly more than 3 (medium). The confidence interval including the

zero number indicates that the difference can be zero; that is, there is no difference or the average is medium and the confidence interval containing only negative numbers suggests that the average is significantly lower than medium (3).

Table 4. Results of the comparison of the research average dimensions

Dimension	Mean	Average difference and 3	The lower limit of confidence interval	The upper limit of confidence interval	Result
Economic dimension	3.420	0.420	0.361	0.478	More than average
Social dimension	3.708	0.708	0.651	0.765	More than average
Environmental dimension	3.048	0.048	0.006	0.102	More than average
Sustainability of settlements	3.392	0.392	0.346	0.438	More than average

As can be observed in the above table, the confidence interval obtained for all three dimensions and the main variable contains only positive numbers, which demonstrates that the effect of the industrial estate on all three dimensions and the main variable is more than average.

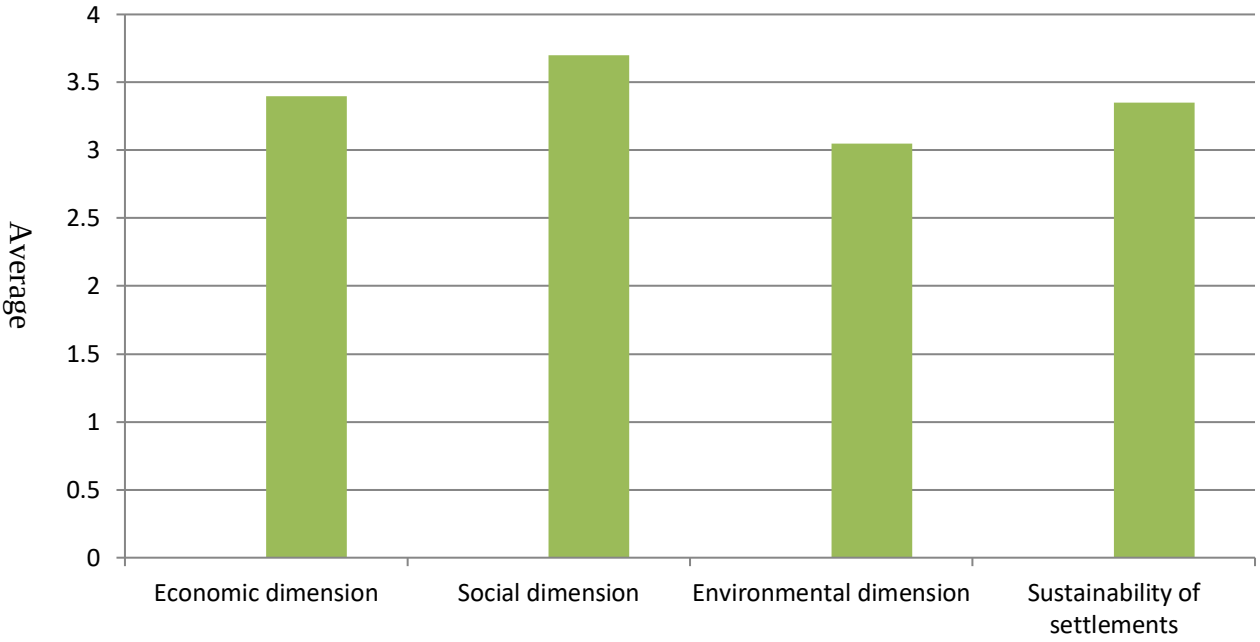

Fig. 2. Comparison of the research average dimension

Investigating the research dimensions for each of the villages under study

To examine the average dimension for each of the studied villages, the following table displays the average of these components for each village.

Table 5. Average dimension of each village under study

Village	Economic dimension	Social dimension	Environmental dimension	Sustainability of settlements
Avareshk	3.958	4.122	3.672	3.917
Pivehzhan	2.452	3.128	2.765	2.782
Jamal Deh	3.348	3.214	2.811	3.124
Hoseinabad	3.354	3.450	2.843	3.216
Derakht-e Sefidar	2.852	3.225	2.578	2.885
Dizbad-e Sofla	3.481	3.919	2.893	3.431
Soltanabad	3.430	3.905	2.820	3.385
Seidabad	3.530	3.774	3.248	3.517
Fakhr Davoud	3.783	3.822	3.311	3.639
Qasemabad	3.012	3.098	2.784	2.965

By considering the table, it is observed that Avareshk village is generally in the best situation in three dimensions and the industrial estate has generally been effective in all three dimensions in this village. In the economic dimension, the lowest effect of the industrial estate is in Pivehzhan village and in the social dimension, the lowest effect of the industrial estate is related to Qasemabad village and in the environmental dimension, the lowest impact is in Derakht-e Sefidar.
In general, it can be mentioned that the industrial estate has made the least impact on Pivehzhan village in the sustainability of settlements.

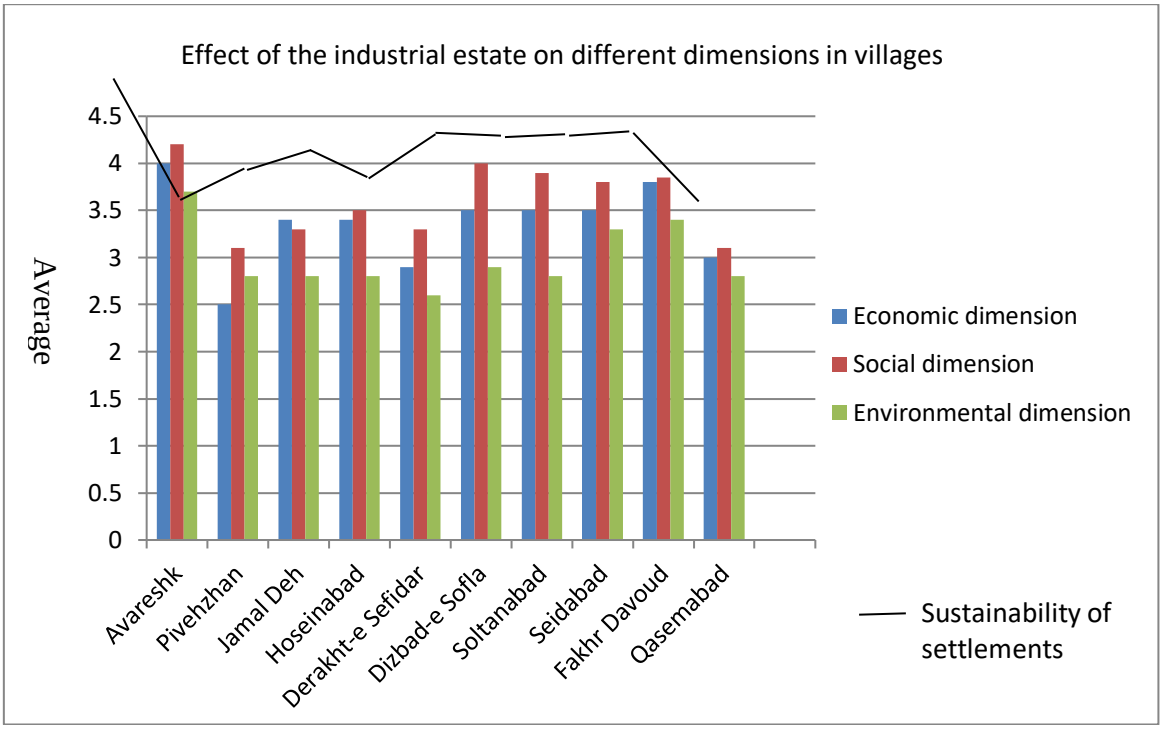

Fig. 3. Comparing the studied villages based on the research average dimension

Considering the above chart, it can be seen that Avareshk village has the best status in terms of the effect of the industrial estate on the dimensions and Pivehzhan, Qasemabad and Derakht-e Sefidar have the most unfavorable situation in terms of the effect of the industrial estate on the research dimensions.
In the following, the status of the effect of the industrial estate on the studied villages from the most impact to the least impact is provided for each dimension in the form of a chart.
Based on the average economic dimension, the highest impact of the industrial estate in this dimension is in Avareshk village and the lowest impact is in Pivehzhan village.
According to the average social dimension, the highest impact of the industrial estate in this dimension is in Avareshk village and the lowest impact is in Qasemabad village.
With regard to the average environmental dimension in villages, the highest impact of the industrial estate in this dimension is in Avareshk village and the lowest impact is in Derakht-e Sefidar village.

Investigating the effect of the industrial estate on each village for each dimension

To examine the effect of the industrial estate on each village, with respect to the quantitative scale of dimensions, if the sample size in each village is greater than 30 or data distribution is normal, then t-test can be used to compare the average of every dimension with number 3 in each village. Therefore, the normality of these dimensions is initially evaluated by Kolmogorov-Smirnov test in villages with less than 30 samples and if the dimension examined in the village is normal, t-test is applied.

Table 6. P-value of Kolmogorov-Smirnov test in examining the normality of dimensions for each village

Village	Sample size	Economic dimension	Social dimension	Environmental dimension	Sustainability of settlements
Jamal Deh	15	0.200	0.200	0.000	0.200
Hoseinabad	22	0.057	0.083	0.000	0.001
Derakht-e Sefidar	15	0.198	0.200	0.200	0.200
Qasemabad	27	0.012	0.200	0.011	0.200

Since the normality of data distribution in some of the villages (with the sample size of less than 30) was confirmed (obtained p-value is higher than 0.05), parametric t-test can be used for these villages. In other villages that are marked in color and for which normal distribution was not approved, Wilcoxon test is used.
Results of studying t-test or Wilcoxon test in villages are as follows:

Table 7. Results of examining the effect of the industrial estate on the research dimensions in the studied villages

Village	Under study	Economic dimension	Social dimension	Environmental dimension	Sustainability of settlements
Avareshk	Mean	3.958	4.122	3.672	3.917
	Test	t-test	t-test	t-test	t-test
	P-value	0.000	0.000	0.000	0.000
	Result	More than average	More than average	More than average	More than average
Pivehzhan	Mean	2.452	3.128	2.765	2.782
	Test	t-test	t-test	t-test	t-test
	P-value	0.000	0.019	0.001	0.000
	Result	Less than average	More than average	Less than average	Less than average
Jamal Deh	Mean	3.348	3.214	2.811	3.124
	Test	t-test	t-test	Wilcoxon test	t-test
	P-value	0.009	0.001	0.005	0.027
	Result	More than average	More than average	Less than average	More than average
Hoseinabad	Mean	3.354	3.450	2.843	3.216
	Test	t-test	t-test	Wilcoxon test	Wilcoxon test
	P-value	0.000	0.000	0.646	0.009
	Result	More than average	More than average	Average	More than average
Derakht-e Sefidar	Mean	2.852	3.225	2.578	2.885
	Test	t-test	t-test	t-test	t-test
	P-value	0.045	0.012	0.000	0.031
	Result	Less than average	More than average	Less than average	Less than average
Dizbad-e Sofla	Mean	3.481	3.919	2.893	3.431
	Test	t-test	t-test	t-test	t-test
	P-value	0.000	0.000	0.005	0.000
	Result	More than average	More than average	Less than average	More than average
Soltanabad	Mean	3.430	3.905	2.820	3.385
	Test	t-test	t-test	t-test	t-test
	P-value	0.000	0.000	0.004	0.000
	Result	More than average	More than average	Less than average	More than average
Seidabad	Mean	3.530	3.774	3.248	3.517
	Test	t-test	t-test	t-test	t-test
	P-value	0.000	0.000	0.001	0.000
	Result	More than average	More than average	More than average	More than average
Fakhr Davoud	Mean	3.783	3.822	3.311	3.639
	Test	t-test	t-test	t-test	t-test
	P-value	0.000	0.000	0.001	0.000
	Result	More than average	More than average	More than average	More than average
Qasemabad	Mean	3.012	3.098	2.784	2.965
	Test	Wilcoxon test	t-test	Wilcoxon test	t-test
	P-value	0.876	0.115	0.000	0.466
	Result	Average	Average	Less than average	Average

According to the results obtained from t-test and Wilcoxon test, it is observed that the status of villages is as follows:
The impact of the industrial estate on the studied villages is greater in the social and economic dimensions and in the environmental dimension, the industrial estate has had a significant effect on only three villages (Avareshk, Seidabad and Fakhr Davoud).

Conclusion

To compare the average opinions of respondents regarding the effect of the industrial estate on the sustainability of rural settlements, comparison of the average of this variable (including economic, social and environmental dimensions) was made with the help of t-test with number 3 (medium), whose results are also shown in the table below.

Table 8. Results of comparing the average effect of the industrial estate on the environmental dimension with number 3 by t-test

Examination	Mean	SD	T statistic	Degree of freedom	P-value	Hypothesis result
Average effect of the industrial estate on the sustainability of settlements	3.392	0.437	16.732	347	0.000	Approved

It can be observed that P-value divided by 2 of this test is less than 0.05 and t-statistic is positive (16.732). Thus, it can be stated that the null hypothesis indicating that the establishment of industrial estates is not effective in the sustainability of rural settlements is rejected. In other words, the average effect of the industrial estate on the sustainability of settlements is more than medium. Hence, it can be concluded that the establishment of industrial estates is effective in the sustainability of settlements. That is, the hypothesis is confirmed with 95% confidence.

The confidence interval method for the difference of 3 from the mean:

One method to test the hypothesis of comparing the average with number 3 is to obtain the confidence interval for the difference of 3 from the mean. If this confidence interval contains only positive numbers, it can be concluded that the desired average is significantly greater than 3. If the confidence interval contains only negative numbers, it is concluded that the mean of the target population is significantly less than 3. And finally, if the confidence interval contains zero number, it is concluded that the mean of the population has no significant difference with number 3. Confidence interval for the difference of 3 has been obtained from the average impact of the industrial estate on the sustainability of settlements, which has been displayed in the following table:

Table 9. 95% confidence interval for the difference of 3 from the average impact of the industrial estate on the sustainability of settlements

Upper limit	Lower limit	Confidence interval including	Confidence interval result
0.4381	0.3459	Only positive numbers	The mean under study is significantly greater than 3

According to the above table, it can be seen that the confidence interval only contains positive numbers. Thus, the average impact of the industrial estate on the sustainability of settlements is significantly more than 3 (medium). Therefore, it can be concluded that the establishment of industrial estates is effective in the sustainability of settlements in villages; that is, the hypothesis is approved.

By the same token, results of the present study reveal that Binaloud Industrial Estate has made positive impacts on the sustainability of its surrounding rural settlements and accordingly, the following points are raised:

- Although the construction of the industrial estate has paved the way for reducing immigration, it is suggested that the ground be prepared for accepting immigrants in villages through increased number of industrial units and activities and consequently greater use of local labor force.
- Creation of physical conditions like easy access to industrial estates through appropriate ways and facilities of the estate, which can have an important role in the sustainability of rural settlements.
- Creation of technical and vocational schools and knowledge work in rural areas or industrial estates and attraction of rural students in proportion to the type of industrial activities in the region and their attraction in line with social sustainability of rural settlements.
- Establishment of Binaloud Industrial Estate in the surrounding villages, especially in the villages under study, lacks agricultural orientation and has not created a link between industry and agriculture of the area (inconformity of the type of industries existing in the estate with the activities of the agricultural sector). Hence, it seems necessary to create agricultural processing and conversion industries for durable sustainability of rural settlements.
- Construction of small industrial units in Binaloud Industrial Estate, which requires less capital and specialized force; thus, rural residents of the region who are less skilled can easily start working in these units.
- For direct effectiveness and prevention of the transfer of capital from industrial enterprises located in rural areas to urban areas, creating more facilities for the villagers in the form of long-term credits and granting privileges and attracting villagers' little capital in the form of cooperative formation are among the long-term goals for establishing these types of estates in rural areas.

- Creation of sewage and industrial waste disposal depot to reduce pollution, protect the environment and prevent the disruption of environmental equilibrium, spread of pollution and destruction of natural resources for the environmental sustainability of rural settlements.

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Citation:

Majid Najib Davandeh, Mahdi Jahani Sani, Abolfazl Behniafar (2017). Explaining the Effects of Industrial Estates on the Sustainability of Rural Settlements: A case study of Binaloud Industrial Estate in Mashhad. *Ukrainian Journal of Ecology, 7*(4), 304–315.

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