Journal of Rural Development, Vol. 37 No. (1) pp. 71-94
NIRD&PR, Hyderabad.

FACTORS AFFECTING THE FORMATION OF SMART RURAL DEVELOPMENT IN IRAN

Aliakbar Anabestani
and
*Mahdi Javanshiri**

ABSTRACT

Physical-spatial expansion of human settlements, especially over the last few decades, thanks to technological advances, has been increasing in a higher speed; therefore, developing an optimum and sustainable model for physical-spatial expansion of human settlements (particularly in the developing world) has created an enormous challenge. To the extent that it has affected not only the policies of physical planning but also socio-economic, and environmental issues of many rural and urban areas. Efforts have been made to counter the negative effects of urban dispersion; the most significant one was "smart growth strategy". Present study aims to investigate the smart development in rural areas of Iran to present a framework for this strategy, including the principles and factors affecting its development using Fuzzy Analytic Hierarchy Process (FAHP), Accordingly, the relationships between objectives, indicators and sub-indicators and the process of determining the weights of indicators and sub-indicators, and the final score of indicators was examined using fuzzy hierarchical analysis model and experts' opinions. Results showed the indicator of 'creative rural economy' with a weight of 0.534 was the most significant indicator in smart rural development. The indicators of environmental factors and human capital weighting 0.214 and 0.148, respectively, were in the next order.

Keywords: Smart Rural Development, Creative Rural Economy, Human Capital, FAHP.

Introduction

Smart growth by no means is a new notion. In the policies of the European Union it includes policies of innovation, research and education, while in the United States it mainly deals with planning policies to counter the urban dispersion. This is probably due to reflections of different interpretations of the challenges created in Europe and the United States. The overall objective of the smart growth in the United States is about urban planning and construction policy, especially to prevent urban dispersion. However, in Europe, smart growth mainly deals with policies of innovation, research and

*Associate Professor and Ph.D Candidates, Respectively, Geography and Rural Planning, Ferdowsi University of Mashhad, Mushhad, Iran.

education rather than planning (Naldi, et al. 2015). 'Smart growth' and 'smart development', make up the main part of the ten-year growth strategy of the Europe 2020, in which concepts such as "acting based on local capacities and capabilities in future policies" and emphasis on regional advantages, knowledge and innovation make up its basics (European Commission, 2010a; Barca et al., 2012; Combes and Overman, 2004). If the guidelines of smart growth are appropriately adopted, it can bring about diverse social, economic, and environmental benefits. Smart growth usually supports economic development through increasing economic products and decreasing the costs. Some studies have proved that taking the recommendations of the smart growth reduces the costs of public services such as water, schools, roads and transportation (Qorbani and Naushad, 2008). To adopt approaches of smart development has clear environmental benefits which include, improved air and water quality, protection of special settlements and open spaces, rapid development, protection of ecologically sensitive areas, combined uses, higher access and encouraging people to prefer walking to driving (Litman, 2005).

It should be noted that taking into account the principles of regional planning and local conditions of the study area is among the main pre-conditions of smart development.That is, all areas (both developed and underdeveloped ones), considering their various potentials (and economic conditions, knowledge and capacity of innovation), can move on in the path of smart development (McCann and Ortega-Argiles, 2013).This highly depends on business culture, skills of the workforce, education and training of education institutes, support services, ICT (Information and Computer Technology) and the infrastructure (Thissen et al., 2013; Asheim et al., 2011). However, one should not mix up the strategies of regional development with specialised imposed process of using top-down policies or government planning processes; rather they are entrepreneurial discovery process, as entrepreneurs basically are the ones who identify the potential special strategies relevant to each area, and act using a bottom-up planning process (Naldi et al. 2015). As it was argued, policies of smart growth are introduced based on knowledge, innovation and local differences. The proposed theory is more suitable for urban areas which have access to resources, local and regional knowledge, and also more opportunities to access resources of world knowledge (Vanthillo and Verhetsel, 2012). However, this study seeks to find out how the policies of smart growth are related to various rural areas.

It is worth mentioning, although the rural sprawl in rural areas is much less than that in urban areas and suburbs, rural sprawl has imposed more costs on rural communities which include: degradation of agricultural lands and gardens because of the changes in land-use (Lopez and Hynes, 2003), difficult access of people and inefficiency of sustainable modes of transportation such as walking and cycling due to long distances, increased use of private vehicles and the higher tendency of people to buy cars, higher fuel consumption, decreased social interactions (Fornoff and Cadillac News,

2007) , increased costs for development of the infrastructure and services (Jones et al. 2002, Coupal and Seidl 2003), destruction of the environment and ecosystems (Hansen et al. 2002; Stillwell, 1987; Theobald et al. 1997), decline of watershed and underground waters (Edwards and Abivardi 1998), increased number of floods and their higher intensity in rural areas (Leith and Whitfield, 2000), greater hazards for ecological sustainability and decreased ecosystem services, decreased biodiversity, decreased quality of water and soil, increased pollution and decline in public health (Bourhill, 2005; Tom Daniels, 1999). Accordingly, we may conclude that it is essential to adopt the policies of smart growth in rural areas, and considering the principles of sustainable development, smart development in rural areas is essential.

Smart development requires higher expenses on research and development (R & D), innovation, knowledge and learning. To encourage others to adopt the policies of rural smart growth, we should follow the policies which facilitate innovation, and learning about rural matters. However, to use the concept of smart development for rural areas might seem a little bit tricky. McCann and Ortega-Argiles (2013) argued that smart development is a broad concept, and its application on rural matters requires to design different models in each of the rural matters; besides, it is not yet clear whether smart expertise, is an appropriate policy for all rural areas (McCann and Ortega-Argiles, 2013).

Therefore, due to high degree of dispersion in rural areas, even in one area, we need to conduct more analysis and research on potential indicators, development measures and the factors affecting smart development, so that one can use the potentials of this policy for growth in various rural areas. For the same reason, the present study seeks to review the indicators of smart rural development to analyse the conceptual aspects, indicators, measures of smart development and factors affecting these points, so that we can identify the main indicators in smart rural development and benefit the capabilities of smart development policies in many rural areas. Therefore, this study seeks to answer this question: What are the factors affecting the formation of smart rural development in Iran?

Review of Literature

The term 'smart growth', was first introduced by Paris Anglenderning, the mayor of Maryland (from 1994 to 2002). Initially, the theory was developed in Canada and the United States and it was proposed in reaction to developments started since the early 1960s. Over 1970s and 1980s, in response to the wide dispersion of cities in these two countries, the smart urban growth theory was gradually developed based on the principles of sustainable development and the compact city, and it was eventually advanced in the form of a theory to sustain the urban spatial form (Feiock et al, 2008; Smartgrowth.org, 2012). After a brief review of the concept of smart growth as the basis for the concept of smart rural development, it is necessary to review several relevant studies in this field.

Smart growth draws on some principles of development and planning operations, which has created the pattern of land use and effective transportation. This approach includes innumerous strategies whose results include more accessibility, more efficient land use patterns and manifold transportation systems. Various groups support smart growth, Environmental Protection Agency of the US (EPA) and the American Planning Association (APA) are among its main advocates. APA defines smart growth as a combination of planning experiences, regulations and development that make way for optimum use of land through aggregated construction forms, development between the spaces and moderation in parking standards and streets. Its objectives include, reducing uncontrolled development, land reclamation, environmental protection, and creating a desirable neighbourhood (Zarrabi et al., 2011).

Today, many statements of the United Nations and guidelines of non-governmental organisations involved in urban planning seek to promote environmental factors through increasing the movement of pedestrians, reducing air pollution, increasing high-rise buildings, proximity and availability of urban services, removing the need for surface development of the infrastructure and urban services, preventing the destruction of green spaces and belts around cities through applying the ten principles of smart growth and ultimately reaching the ideal of a perfect city (Cooke and De Proprise, 2011). Clark et al., (2006) believe that smart growth is a collection of planning, regulation and development methods in which compact form of the buildings, endogenous development and moderation in standards of streets and parking in which land is used more effectively (Heydari, 2012). Alexander and Tomalty (2002) in an article titled "smart growth and sustainable development" using 13 indicators, investigated the relation between densities and urban development in 26 municipal regions of British Columbia,Canada.They pointed out the relationship between density and the efficiency of the infrastructure and reduced private vehicles' use along with the economic and ecological efficiency (Alexander and Tomalty, 2002: 397).The following are some examples of researches conducted in the field of smart growth, which are summarised in the following Table. However, according to the survey conducted in relation to smart rural development, no such research has been conducted in Iran, and the only research about this subject was conducted by Naldi et al. (2015) in a paper titled "What is rural smart development?". In this paper, they have analysed the conceptual aspects, indicators, smart development practices and its affecting factors, and they have finally identified factors effective in smart rural development.

Table 1 : Researches in the Field of Smart Growth and Urban Dispersion

Authors	Title of the papers	Results and findings
Rahnama et al. (2014)	Principles and strategies of urban smart growth in urban areas of Bukan County using the VICOR model	The results of the analysis showed that in the three areas of Buchanan County (Shahrak, Farhangian and Saman) according to 21 indicators of smart urban growth, the town was in the first place.
Rahnama and Hayati (2013)	Analysis of urban smart growth indicators in Mashhad	The indicators of smart urban growth in the city of Mashhad were reviewed in different municipal regions on the basis of three criteria of compactness, environmental factors and access. It was found that the region 8 had the best structure of smart urban growth.
Larijani Firooz (2010)	Spatial development using sustainable urban development approach	Smart growth principles and theory were discussed and the theory was introduced as a way to prevent urban dispersion.
Ghorbani and Naushad (2008)	Smart growth strategy in urban development (principles and practices)	The authors discussed the advantages and disadvantages of smart growth. In their paper, the disadvantages included increased density, air pollution, etc. The advantage of this theory included improved chances of transportation, reduced cost of services, etc.
Saeedi Rezvani and Khastoo (2007)	The phenomenon of urban dispersion and smart growth theory	This paper introduces the theory of smart growth and suggests the following guidelines to deal with urban dispersion: intensive development, the use of public transportation and the use of lands which already have the infrastructure
The United States Environmental Protection Agency (EPA) (2015)	Evaluation of rural smart growth in Madison County	This study sought to assess the smart growth strategies in 11 areas in small towns and rural communities. For this purpose, a questionnaire was constructed to enable the users to examine the smart growth and identify the gaps in policies and plans.
Xi et al (2012)	The potential effects of urban sprawl in Northeastern China: a new strategic assessment framework for rural physical development	Researchers in this study sought to evaluate the potential effects of urban sprawl on agricultural land, and presented three scenarios to provide scientific recommendations to guide the development and reduce the negative consequences.

(Contd.....)

Table 1 (Contd.....)

Authors	Title of the papers	Results and findings
Engle (2011)	Understanding rural sprawl: A look at Osceola County, Michigan	In this research, the author analyses the destructive consequences of rural sprawl in Osceola County over the past three decades.
Stephen Mann (2009)	Institutional causes of urban and rural sprawl in Switzerland	This paper outlined the institutional system of spatial planning in Switzerland. Case studies show that there are currently hardly any instruments available with which to steer land use beyond the local level. It is concluded that incentives for local administrations should be introduced in order to limit urban and rural sprawl.
Fei Yang (2009)	If 'Smart' is sustainable? An analysis of smart growth policies and its successful practices	This study aims to use an indicator-based assessment model to evaluate smart growth policies and successful practices. The findings suggest that smart growth policies do not fully encompass the values of sustainability.
Volker, et al. (2003)	Rural and sub-urban sprawl in the US Midwest from 1940 to 2000 and its relation to forest fragmentation	Volker, et al used the statistical data on housing density to examine the patterns of housing growth, sprawl and its environmental impacts across the US, Midwest, particularly fragmentation of forests. The results show rural and sub-urban sprawl had significant negative effects; however, the type and intensity of these effects were different in rural and sub-urban areas.

Source: The Author's studies, 2016

Theoretical Foundations

Rural Sprawl and its Features : Urban and sub-urban sprawl are new terms introduced in the past half century in literature of planning, urban planning and policy-making (Engle, 2011). However, it is only a decade that the term "rural sprawl" is used in world literature. Rural sprawl is also known as exurban development (Daniels 1999) and rural residential development (Hansen et al., 2002). There is not a universally accepted definition for sprawl, and it has been increasingly complex, ambiguous and evolving. However, the physical features of this type of spatial expansion of settlements include low-density development together with single and large residential areas (usually between one to five acres) which lead to the destruction of open spaces, agricultural land and forests (Lopez and Hynes, 2003).

Although many researchers have focused on urban sprawl (Waldie, 2000), rural sprawl has many larger effects (Weiler and Theobald, 2003; Daniels, 1999). Density of sprawl in rural areas is much lower than urban and sub-urban areas. Rural

sprawl is mainly determined by one to five acres' parts. Experts of planning and zoning believe that five acres' parts due to changes in land use and cover, quickly degrade the agricultural lands. Although a small fraction of the rural population (owners of such lands) profit from the sale of their lands, it imposes exorbitant costs on the entire community. Sustainable means of transportation such as using pedestrian and bicycle are now inefficient and difficult to access because of the long distances. Thus, the use of private vehicles and car ownership have become a necessity, more energy is consumed, ecological sustainability is endangered, public health has declined, fertile lands are degraded, and such villages have to pay higher costs to develop their infrastructure and roads (Lopez and Hynes, 2003, Fornoff and Cadillac News, 2007). In addition, rural sprawl has reduced ecosystem services, destroyed the biodiversity, and the quantity and quality of water and soil are degraded which result in increased pollution (Bourhill, 2005; Tom Daniels, 1999).

Smart Growth and Rural Settlements: In the mid-1990s, the term 'smart growth' appeared in planning and soon became a key term. Whether the term is inherently different from growth management, or the management of growth is debatable (Levey, 2008); however, it has originated from Movement Management (Roberts and Juergensmeyer, 2013; Nelson, 2000).

In fact, smart growth is one of the strategies of regional planning which aims to create regional balance and prevent the destruction of resources in line with the objectives of sustainable development. In other words, 'smart growth' is planning, designing, development and revitalisation of cities, towns, suburbs and rural areas which seek to generate and promote social equality, sense of belonging to a place and community, and conservation of natural resources along with cultural ones. The strategies of smart growth can have substantial benefits for rural communities as it can maintain their history and identity, build more sustainable rural settlements, make way for sustainable economic development, create more affordable housing options and maintain ecological sustainability (Michaud, 2013).

The most important principles of smart growth include:

1. To limit external expansion of new development on a regular basis to create more compact settlements and preserve open spaces. It could be beneficial by urban growth boundaries of the areas.
2. To increase population density in areas of new development and existing neighbourhoods;
3. To provide more mixed land use and suitable pedestrian output to minimise the use of cars for short trips;
4. To finance new development with its consumers through effective fees rather than jointly paying the costs through community;
5. To put more emphasis on public transportation to reduce the use of private vehicles;
6. To revitalise older neighbourhoods;
7. To provide affordable housing;

8. To reduce barriers to encourage developers;
9. To adopt different rules with regard to aesthetics, street outputs and designs;

Accordingly, the rural settlements are part of a local-spatial system, which have experienced uncontrolled growth in recent decades because of changes of internal and external forces and factors. This has posed considerable challenges for rural communities in preserving rural features, and supporting rural economic growth and opportunities. They need a set of tools that can be adjusted to show the diversity of rural communities. Table 2 shows the objectives and strategies of rural smart growth provided by ICMA.

Table 2 : Objectives and Strategies of Rural Smart Growth

Objective 1	Objective 2	Objective 3
To contribute to rural landscape	To contribute to the boom of existing places	To create new attractive places
Through creating an economic atmosphere that strengthens the livability of the lands being used and help to better preserve the environment.	Through maintenance of capital and assets including business centre of towns, main streets, existing infrastructures and sites that have social value.	Through constructing vibrant buildings, sustainable neighbourhoods, and communities that people, especially young ones do not wish to leave.
1.a. To guarantee livability of economic resources in the region	2.a. To invest the public and private capital in existing places	3.a. To update political and strategic documents to conform with new growth through continuous and intensive development
1.b. Strategies for development of the agricultural economy which puts emphasis on the traditional rural landscape of the rural areas	2.b. To encourage the private sector investments	3.b. To modify the policies to make it easier for developers to build compact places suitable for walking and other mixed uses.
1.c. To promote rural production in urban areas and in favour of all other rural-urban relations	2.c. Regeneration of past capital of the community	3.c. To identify and encourage the constructors who create appropriate locations using smart growth practices and green housing.
1.d. To link the strategies of rural land protection to adjacent areas	2.d. To promote economic development in existing trade centres	

Source : Mishkovsky, N. et al, 2018 8.

Methodology

This research is an applied one conducted in a descriptive-analytical method. In this study, data were collected using documentary methods and fieldworks. In documentary methods, we drew on statistical records, similar studies conducted in the universities, institutions, scientific journals, various scientific databases on the Internet. The required data about smart development were gathered, and factors affecting the rural smart development were defined in a hierarchal manner. In the fieldworks, the data were collected through questionnaires, interviews and observation. At this stage, in order to make paired comparisons, hierarchies and weighting were conducted based on Fuzzy Analytic Hierarchy Process (FAHP). For weighting of the criteria and sub-criteria, fuzzy pair-wise comparisons were employed which were applied by 46 people of experts and university professors in Iran. They were randomly selected from among experts in the country.

The research data were mainly gathered through fieldworks, questionnaires and interviews. In this study, two types of questionnaires were used. As the initial questionnaire was designed, we consulted with some experts and accordingly made some modifications in several stages. The final questionnaires were finally provided to the participants. The experts were also asked to score the indicators and sub-indicators of rural smart development from 1 (low importance) to 9 (vital importance). The participants were also provided with a sheet of instructions for completing the questionnaires. While the participant was filling out the questionnaires, the researchers were also present in order to remove any probable ambiguities. The data were provided by a total of 16 experts (professors); 92 per cent of the sample were male, 83 per cent were over thirty years' age, 92 per cent had a bachelor degree and 59 per cent had more than ten years of relevant experience. FAHP which was used in the analysis of the research data would be described in next parts. Table 3 shows the indicators and sub-indicators of the study.

Table 3 : Factors (Indicators and Sub-indicators) Effective in the Formation of Smart Rural Development

Main indicators	Sub-indicators	Source
Environmental	Rise in per capita green space	Saeedi Rezvani and Khastoo, 2007; Ghorbani and Naushad, 2008.
	Protection of agricultural lands	Zarrabi et al., 2011; Arbury, 2008.
	Access to open space and various natural landscapes	Cho et al., 2008; M cGranahan et al., 2011.
	To save fuel by improving the conditions of non-motorised trips	Jones et al., 2002; Coupal and Seidl, 2003.
	To reduce environmental waste by increasing the use of public transportation	Bourhill, 2005.
Economic	To reduce the cost of service	Rubin, et al., 2007
	To reduce the costs of making infrastructure services	Dovlati, 2007.
	To reduce the burden on rural communities	Zarrabi et al., 2011
	To increase the percentage of the employed population aged ten and more	
	To create better and more job opportunities	Nastran et al. 2013.
	To move towards creating self-sufficient communities	Saeedi Rezvani and Khastoo, 2009
Creative rural economy	Investment in research and development	Naldi, L., et al. (2015)
	Increased number of highly educated and creative people	(Isserman et al. 2009)
	To encourage innovation in economic activities (new marketing,...)	Marcouiller and Dissart, 2012
	To establish companies and NGOs	(McGranahan, 2008)
	To enhance entrepreneurial spirit	
	To launch and promote new local businesses	United States Environmental Protection Agency., 2015
	Access to local markets (e.g. local festivals)	Anwar McHenry, 2011; Bell and Jayne, 2010
	The presence of relevant industrial activities	
	Empirical knowledge (personal skills)	McGranahan et al., 2011 McGranahan and Wojan, 2007; Naldi, L., et al. (2015)
Physical	To encourage the endogenous development (compactness)	Saeedi Rezvani and Khastoo, 2009; Tiford, 2009.
	The revival of the old districts and primary centres	Arbury, 2008 .
	To improve the quality of access roads (footways and streets)	Victoria Transport Policy Institute, 2005; Pakzad, 2005.
	To increase per capita and the share of public thoroughfares	
	Share and per capita of residential use	Arbury, 2008; Zarrabi et al, 2011.
	Gradation of plots of land	
	Share and the per capita of service applications	
Socio-cultural	Population density	Jicobz, 1969.
	Change in percentage of literate villagers(male and female)	Zarrabi et al, 2011
	To improve the quality of life and social security	Nastran et al. 2013.
	Conservation of unique cultural, historical, traditional resources	Ghorbani and Naushad, 2008.
	To increase participationof villagers (male and female)	Zarrabi et al, 2011.
	A balance between public and private sector participation	Wiley, 2007 .
Human Capital	The percentage of students in various grades	Zarrabi et al, 2011.
	Access to higher education institutions	Frenken et al. 2007; Johansson et al., 2015
	The number of people with higher education	
	To develop mutual relations between rural areas and other areas	Bathelt, 2003; Torre and Rallet, 2005
	To develop the infrastructure for information and	European Commission, 2010a

Source: Research findings, 2016.

Fuzzy Analytical Hierarchy Process: Common AHP needs accurate judgements. However, due to the complexity and uncertainty involved in real-world issues, sometimes it is unrealistic or even impossible to make precise comparisons (Khorshid and Qaneh, 2009). Therefore, a good decision-making model must have tolerance for ambiguity, because the fuzziness and ambiguity are the common characteristics of decision-making problems. As decision-makers often give uncertain answers rather than methods and precise figures (Haq-shenas, et al., 2007), it was advised to use fuzzy data for decision-making and desirability evaluation rather than classic methods and conclusive data. Membership functions of fuzzy data are described with triangular, trapezoidal numbers, etc. Fuzzy AHP using Saaty AHP combined with fuzzy set theory was developed (Khosrovanjam et al., 2013). In these methods, the fuzzy and hierarchy concepts are used in a combined manner. And to select an option and confirm the problems through integration of concepts, fuzzy sets and analytical hierarchical process were designed (Perçin, 2008). Considering the disadvantages of the Chang extended techniques, in this study the improved algorithm technique is used. Improved AHP Fuzzy algorithm follows the basics of AHP technique, and operates in a fuzzy approach and includes the following steps:

1) Draw a hierarchical graph;

2) Define fuzzy numbers for pair-wise comparisons (Table 3);

Table 4 : Nine-point fuzzy scale in the FAHP

Linguistic variables	Positive triangular fuzzy numbers	Reciprocal triangular fuzzy numbers
Extremely strong	9,9,9	1/9,1/9,1/9
Extremely strong to very strong	7,8,9	1/7,1/8,1/9
Very strong	6,7,8	1/6,1/7,1/8
Strong to very strong	5,6,7	1/5,1/6,1/7
Strong	4,5,6	1/4,1/5,1/6
Moderately strong to strong	3,4,5	1/3,1/4,1/5
Moderately strong	2,3,4	1/2,1/3,1/4
Equally strong to moderately strong	1,2,3	1,1/2,1/3
Equally strong	1,1,1	1,1,1

Source: Lee and others, 2008.

3) By selecting the desired fuzzy scale, the gathered data are put in a pair-wise comparison matrix. If there is more than one expert, the geometric mean is used for integration of expert opinions.

4) In the pair-wise comparison matrix obtained from the integration of experts' opinions, calculate the geometric mean of each row.

5) Calculate the total fuzzy preferences of the elements:

6) Reverse the total calculated preferences:

7) By multiplying the geometric mean of each row by reciprocal of total column preferences, the final fuzzy weight will be obtained.

8) $x^i max$ method is used for defuzzification:

9) Normalise the obtained weights based on linear normalisation method.

Results and Discussion

According to exploratory studies, six categories of factors in environmental, economic, creative rural economy, physical, socio-cultural and human capital fields in rural areas affect smart development. To determine the weight of the indicators and based on the statements of experts, the following steps were taken. First, the comments of the participants about indicators and sub-indicators of the study collected based on a nine-point scale, were converted to triangular fuzzy numbers. Verbal scale for determining the weight of relevant indicators are shown in Table 5.

Table 5 : Matrix of Integration of Expert Opinions about the Main Indicators of the Study

Main indicators	Environmental	Economic	Creative rural economy	Physical	Socio-cultural	Human Capital
Environmental	1,1,1	0.166,0.2,0.25	0.111,0.111,0.111	0.166,0.2,0.25	0.111,0.111,0.111	0.142,0.166,0.2
Economic		1,1,1	0.142,0.166,0.2	4,5,6	3,4,5	0.25,0.333,0.5
Creative rural economy			1,1,1	6,7,8	9,9,9	5,6,7
Physical				1,1,1	1,2,3	1,1,1
Socio-cultural					1,1,1	0.25,0.333,0.5
Human Capital						1,1,1

Source: Research findings, 2016.

In the next stage, in the pair-wise comparison matrix of the integration of expert opinions, the geometric mean of each row is calculated. Then the sum of fuzzy preferences of elements are calculated. The following Table shows the results of this stage on the main indicators of the study.

Table 6 : Total Estimated Geometric Mean of Expert Opinions and Sum of Element Preferences

Main indicators	L	M	U
Environmental	0.23	0.21	0.19
Economic	1.62	1.33	1.09
Creative rural economy	5.63	5.23	4.8
Physical	0.95	0.81	0.66
Socio-cultural	0.74	0.59	0.95
Human Capital	1.68	1.44	1.19
Total	10.86	9.61	8.88

Source: Research findings, 2016.

Then, the sum of preferences should be reversed, and the reciprocal of sum value of preferences' column should be multiplied by geometric mean of each row (Table 7). The following Table shows the value of multiplication of the geometric mean by reciprocal of sum of each row.

Table 7 : The Value of Multiplication of the Geometric Mean by Reciprocal of Sum of Each Row

Main indicators	L	M	U
Environmental	0.026	0.022	0.018
Economic	0.182	0.138	0.101
Creative rural economy	0.634	0.544	0.442
Physical	0.107	0.084	0.061
Socio-cultural	0.084	0.061	0.088
Human Capital	0.189	0.150	0.110

Source: Research findings, 2016.

At the end, based on the following relationships, defuzzification process is performed and the final matrix is obtained. Then, the weight of each indicator is determined, which measures the maximum amount in each indicator (row). Weights are normalised using linear normalisation method.

$X^1max = L + M + U \div 3 = (0.026 + 0.022 + 0.018) \div 3 = 0.02176$

$X^2max = L + 2M + U \div 4 = (0.026 + (2 \times 0.022) + 0.018) \div 4 = 0.02174$

$X^3max = L + 4M + U \div 6 = (0.026 + (4 \times 0.022) + 0.018) \div 6 = 0.02172$

Table 8 : Values of Defuzzification of Elements and Normalised Weight of Indicators

Main indicators	X^1max	X^2max	X^3max	Deffuzy	Normalised weight
Environmental	0.02176	0.02174	0.02172	0.02176	0.0214
Economic	0.14042	0.13989	0.13936	0.14042	0.1382
Creative rural economy	0.53994	0.54100	0.54207	0.54207	0.5335
Physical	0.08420	0.08421	0.08431	0.08431	0.0830
Socio-cultural	0.07751	0.07344	0.06938	0.07751	0.0763
Human Capital	0.14966	0.14979	0.14991	0.14991	0.1476

Source: Research findings, 2016.

According to the results (Table 8), the indicators of rural creative economy weighing 0.534, human capital with a weight of 0.148 and economic indicators with a weight of 0.138 had the greatest impact on the formation of smart rural development. However, the environmental indicators weighing 0.0214 had the least impact on smart rural development. In order to determine the priorities of the sub-indicators for each of the indicators, the above procedure was also employed for them. For the sake of brevity, only results and values relevant to final weight of the sub-indicators are presented:

Environmental Factors: Among the environmental factors effective in the formation of smart rural development, the following indicators were identified:'rise in per capita green space, protection of agricultural lands, access to open space and various natural landscapes, to save fuel by improving the conditions of non-motorised trips, and to reduce environmental waste by increasing the use of public transportation'.The indicator of'rise in per capita green space' with the coefficient of 49.7 per cent, had the greatest effect, and the indicator of 'to reduce environmental waste by increasing the use of public transportation' with the coefficient of 3.2 per cent had the least impact on the formation of smart rural development.

Table 9 : The Impact of Environmental Factors on the Formation of Smart Rural Development

Explain	Normalised weight	Per cent	Rank
Rise in per capita green space	0.4926	49.3	1
Protection of agricultural lands	0.2728	27.3	2
Access to open space and various natural landscapes	0.1140	11.4	3
To save fuel by improving the conditions of non-motorised trips	0.0828	8.3	4
To reduce environmental waste by increasing the use of public transportation	0.0319	3.2	5
Total	1	100	-

Source: Research findings, 2016.

Economic Factors: Among the economic factors effective in the formation of smart rural development, the following indicators were identified:'to reduce the cost of service, to reduce the costs of making infrastructure services, to reduce the burden on rural communities, to increase the percentage of the employed population aged ten and more, to create better and more job opportunities, to move towards creating self-sufficient communities'. The indicator of 'to move towards creating self-sufficient communities' with the coefficient of 35.2 per cent, had the greatest effect, and the indicator of 'to reduce the costs of making infrastructure services' with the coefficient of 4.85 per cent, had the least impact on the formation of smart rural development.

Table 10 : The Impact of Economic Factors on the Formation of Smart Rural Development

Explain	Normalised weight	Per cent	Rank
To reduce the cost of service	0.1725	17.2	3
To reduce the costs of making infrastructure services	0.0485	4.9	6
To reduce the burden on rural communities	0.0803	8	5
To increase the percentage of the employed population aged ten and more	0.1886	18.7	2
To create better and more job opportunities	0.1577	15.8	4
To move towards creating self-sufficient communities	0.3523	35.2	1
Total	1	100	-

Source: Research findings, 2016.

Factors Related to Creative Rural Economy: Among the factors related to creative rural economy which are effective in the formation of smart rural development, the following indicators were identified: 'investment in research and development, increased number of highly educated and creative people, to encourage innovation in economic activities, to establish companies and NGOs, to enhance entrepreneurial spirit, to launch and promote new local businesses, access to local markets, presence of relevant industrial activities, and empirical knowledge' (Table 11). The indicator of 'investment in research and development' with the coefficient of 25.6 per cent, had the greatest effect, and the indicator of 'access to local markets' with the coefficient of 2.41 per cent, had the least impact on the formation of smart rural development.

Table 11: The Impact of Creative Rural Economy Factors on the Formation of Smart Rural Development

Explain	Normalised weight	Per cent	Rank
Investment in research and development	0.2556	25.5	1
Increased number of highly educated and creative people	0.1777	17.8	2
To encourage innovation in economic activities (new marketing, ...)	0.1644	16.4	3
To establish companies and NGOs	0.0916	9.2	5
To enhance entrepreneurial spirit	0.1560	15.6	4
To launch and promote new local businesses	0.0690	6.9	6
Access to local markets (e.g. local festivals)	0.0241	2.4	9
The presence of relevant industrial activities	0.0342	3.4	7
Empirical knowledge (personal skills)	0.0274	2.7	8
Total	1	100	--

Source: Research findings, 2016.

Physical Factors: Among the physical factors effective in the formation of smart rural development, the indicators shown in Table 12 were identified. The indicator of 'to encourage the endogenous development (compactness)' with the coefficient of 35.2 per cent, had the greatest effect, and the indicator of 'gradation of plots of land' with the coefficient of 4.58 per cent, had the least impact on the formation of smart rural development.

Table 12 : The Impact of Physical Factors on the Formation of Smart Rural Development

Explain	Normalised weight	Per cent	Rank
To encourage the endogenous development (compactness)	0.3815	38.1	1
The revival of the old districts and primary centres	0.0984	9.8	4
To improve the quality of access to roads (footways and streets)	0.2548	25.5	2
To increase per capita and the share of public thoroughfares	0.1072	10.7	3
Share and per capita of residential use	0.0608	6.1	6
Gradation of plots of land	0.0215	2.1	7
Share and the per capita of service applications	0.0759	7.6	5
Total	1	100	--

Source: Research findings, 2016.

Socio-Cultural Factors: Among the socio-cultural factors effective in the formation of smart rural development, the indicators shown in Table 13 were identified. The indicator of 'to improve the quality of life and social security' with the coefficient of 35.9 per cent, had the greatest effect, and the indicator of 'population density' with the coefficient of 8.22 per cent, had the least impact on the formation of smart rural development.

Table 13 : The Impact of Socio-Cultural Factors on the Formation of Smart Rural Development

Explain	Normalised weight	Per cent	Rank
Population density	0.0822	8.2	6
Change in percentage of literate villagers (male and female)	0.1500	15	3
To improve the quality of life and social security	0.3589	35.9	1
Conservation of unique cultural, historical, traditional resources	0.1388	13.9	4
To increase participation of villagers (male and female)	0.1541	15.4	2
A balance between public and private sector participation	0.1160	11.6	5
Total	1	100	-

Source: Research findings, 2016.

Human Capital: Among the human capital factors effective in the formation of smart rural development, the following indicators were identified:'the percentage of students in various grades, access to higher education institutions, the number of people with higher education, to develop mutual relations between rural areas and other areas, and to develop the infrastructure for ICT'. The indicator of 'the number of people with higher education' with the coefficient of 35.4 per cent, had the greatest effect, and the indicator of 'to develop mutual relations between rural areas and other areas' with the coefficient of 5.17 per cent, had the least impact on the formation of smart rural development.

Table 14 : The Impact of Human Capital Factors on the Formation of Smart Rural Development

Explain	Normalised weight	Per cent	Rank
The percentage of students in various grades	0.1018	10.2	4
Access to higher education institutions	0.3111	31.1	2
The number of people with higher education	0.3537	35.4	1
To develop mutual relations between rural areas and other areas	0.0517	5.2	5
To develop the infrastructure for information and communication technology (ICT)	0.1817	18.2	3
Total	1	100	-

Source: Research findings, 2016.

In the end, as the relative weight of indicators and sub-indicators is obtained, the final or normalised weight of sub-indicators are calculated relative to each other. For this purpose, the weight of main indicators is multiplied by relative weight of indicators related to that indicator. The normalised weight of sub-indicators and priority of their significance in formation of the rural smart development is provided in the Table below.

Table 15 : Priority of Sub-indicator of Rural Smart Growth Using FAHP Method

Main indicators	Indicator weight	Sub-indicators	Relative weight of sub-indicator	Normalised weight of sub-indicator	Rank
Environmental	**0.214**	Rise in per capita green space	0.493	0.1054	2
		Protection of agricultural lands	0.279	0.0596	6
		Access to open space and various natural landscapes	0.114	0.0244	16
		To save fuel by improving the conditions of non-motorised trips	0.083	0.0177	21
		To reduce environmental waste by increasing the use of public transportation	0.032	0.0068	33
Economic	**0.138**	To reduce the cost of service	0.173	0.0238	17
		To reduce the costs of making infrastructure services	0.049	0.0067	34
		To reduce the burden on rural communities	0.080	0.0111	27
		To increase the percentage of the employed population aged ten and more	0.189	0.0260	15
		To create better and more job opportunities	0.158	0.0218	18
		To move towards creating self- sufficient communities	0.352	0.0486	9
Creative rural economy	**0.534**	Investment in research and development	0.256	0.1365	1
		Increased number of highly educated and creative people	0.178	0.0949	3
		To encourage innovation in economic activities (new marketing,...)	0.164	0.0878	4
		To establish companies and NGOs	0.092	0.0489	8
		To enhance entrepreneurial spirit	0.156	0.0833	5
		To launch and promote new local businesses	0.069	0.0368	11
		Access to local markets (e.g. local festivals)	0.024	0.0129	24
		The presence of relevant industrial activities	0.034	0.0183	20
		Empirical knowledge(personal skills)	0.027	0.0146	23
Physical	**0.083**	To encourage the endogenous development (compactness)	0.382	0.0317	12
		The revival of the old districts and primary centres	0.098	0.0082	31
		To improve the quality of access to roads (footways and streets)	0.255	0.0211	19
		To increase per capita and the share of public thoroughfares	0.107	0.0089	29
		Share and per capita of residential use	0.061	0.0050	37
		Gradation of plots of land	0.022	0.0018	38
		Share and the per capita of service applications	0.076	0.0063	35
Socio-cultural	**0.076**	Population density	0.082	0.0062	36
		Change in percentage of literate villagers (male and female)	0.150	0.0114	26
		To improve the quality of life and social security	0.359	0.0273	13
		Conservation of unique cultural, historical, traditional resources	0.139	0.0105	28
		To increase participation of villagers (male and female)	0.154	0.0117	25
		A balance between public and private sector participation	0.116	0.0088	30
Human Capital	**0.148**	The percentage of students in various grades	0.102	0.0151	22
		Access to higher education institutions	0.311	0.0460	10
		The number of people with higher education	0.354	0.0523	7
		To develop mutual relations between rural areas and other areas	0.052	0.0077	32
		To develop the infrastructure for information and communication technology (ICT)	0.182	0.0269	14

Conclusions

Local-spatial systems are resultant of some forces, and internal and external factors. In fact, the phenomenon of smart growth in rural areas is the result of some factors and forces of environmental, economic, creative rural economy, socio-cultural, physical and human capital factors. These factors and forces operate

in a dialectical manner. In fact, we will not be able to analyse the phenomenon of dispersion, unless all these factors and forces are simultaneously taken into account.

Results of this study showed, according to the experts, the indicator of creative rural economy with a weight of 0.534 is the most significant indicator in rural smart development. The indicators of environmental and human capital, respectively, with a weight of 0.214 and 0.148 are the second and third effective factors. The analysis of sub-indicators effective in smart rural development revealed that the sub-indicator of 'Investment in research and development' with a weight of 0.1365 had the highest priority in shaping the smart rural development. The following are the top 10 sub-indicators effective in smart rural development:

1. Investment in research and development (0.1365),
2. Rise in per capita green space (0.1054),
3. Increased number of highly educated and creative people (0.0949),
4. To encourage innovation in economic activities (new marketing, ...) (0.0878),
5. To enhance entrepreneurial spirit (0.0833),
6. The protection of agricultural lands (0.0596),
7. The number of people with higher education (0.0523),
8. To establish companies and NGOs (0.0489),
9. To move towards creating self-sufficient communities (0.0486),
10. Access to higher education institutions (0.0460).

All geographical phenomena are rule-governed the same as systems, as a result they also act systematically. Therefore, the science of geography which focuses on the study of these phenomena, in practice deals with 'geographical systems' or 'spatial systems'. Modern geography, emphasising on the identification of new spatial systems, acts as an applied and resourceful science, and claims to have been organising spatial fields, with the aim of promoting development and well-being of human communities in various scales.

What we did in this study, was to present a number of potential indicators and measures of smart growth and its effective factors. The availability of these indicators and measures at various areas is quite different. Some studies should be conducted about the prerequisites and potentials necessary for the smart rural development, so that they can theoretically and experimentally reveal more details about the rural smart growth and its effective factors. No appropriate approach is adopted, unless components of this system are fully known. Smart growth presented in the form of spatial and regional planning to achieve sustainable development has recently received attention in planning circles. Smart growth somehow seeks to create livable communities based on its own principles, strategies and policy-making. It is advisable to draw on these principles and various outlooks to formulate strategies for efficiently developing human settlements.

References

Haq-shenas, A., Ketabi, S. and Dalvi, M. R. (2007), Performance Evaluation Using the Balanced Score by FAHP. *Journal of Knowledge Management,* 20 (77), 21-46. [In Persian]

Heydari, A. (2012), Spatial- physical Analysis of Future Development of Saqqez City with Point on Smart Urban Growth Indicators by Entropy Shannon Model, *Journal of Geography and Urban Space Development*, 1(2), 67-94. [In Persian]

Khosrovanjam, D., Anvari Rostami, A. A., Chavshini, R. and Ahmadzadeh, M. (2013), Fuzzy AHP Development of Models to Assess the Impact of IT Capability and Quality of Data, *Journal of Industrial Management*, 8(25), 105-116). [In Persian]

Khorshid, S. and Qaneh, H. (2009), Ranking the Challenges of Electronic Banking Using Fuzzy AHP, *Journal of Industrial Management*, 4(9), 89-106). [In Persian]

Rahnama, M. R., Shahmoradi, L. and Heydari, A. (2014), Urban Smart Growth Principles and Strategies in Urban Areas of Bukan Using VICOR, Proceeding of the 6th National Conference of Urban Management and Planning with Emphasize of Islamic City Factors, Ferdowsi University of Mashhad, Mashhad, Iran. [In Persian]

Rahnama, M. R. and Hayati, S. (2013), Analysis of Smart Urban Growth in Mashhad, *Journal of Urban Planning Studies*, 1(4), 71-98. [In Persian]

Saeedi Rezvani, N. and Khastoo, M. (2007), The Phenomenon of Urban Sprawl and Smart Growth Theory, *Shams Monthly*, 4(38), 9-18. [In Persian]

Zarrabi, A., Saberi, H., Mohammadi, J. and Vareshi, H. R. (2012), Spatial Analysis of Smart Growth Index (Case Study: Isfahan), *Journal of Human Geographical Researches,* 43(77), 1-17. [In Persian]

Ghorbani, R. and Novshad, S. (2008), Smart Growth Strategy in Urban Development, Principles and Practices. *Journal of Geography and Development*, 6(12)163-180. [In Persian]

Larijani Firooz, M. (2010), *Spatial Development Planning Approach to Sustainable Urban Development (Case Study: Babolsar City).* (Unpublished Master Thesis), Art University of Isfahan, Isfahan, Iran. [In Persian]

Alexander, D., and Tomalty, R. (2002), Smart Growth and Sustainable Development: Challenges, Solutions and Policy Directions, *Local Environment*, *7*(4), 397-409.

Asheim, B. T., Boschma, R., and Cooke, P. (2011), Constructing Regional Advantage: Platform Policies Based on Related Variety and Differentiated Knowledge Bases, *Regional Studies*, *45* (7), 893-904.

Barca, F., McCann, P., and Rodríguez Pose, A. (2012), The Case for Regional Development Intervention: Place-based Versus Place neutral Approaches, *Journal of Regional Science*, *52*(1), 134-152.

Bourhill, I. (2005), The Rural Chimera: An Investigation of Rural Sprawl and perspectives on land-use in Metchonsin, British Columbia [Electronic version], Retrieved on February 13, 2014 from http://www.unbc.ca/calendar/undergraduate/planning

Combes, P. P., and Overman, H. G. (2004), The Spatial Distribution of Economic Activities in the European Union, *Handbook of Regional and Urban Economics*, *4*, 2845-2909.

Cooke, P., and De Propris, L. (2011), A Policy Agenda for EU Smart Growth: The Role of Creative and Cultural Industries, *Policy Studies*, *32*(4), 365-375.

Coupal, R. and Seidl, A. (2003), Rural Land Use and Your Taxes: The Fiscal Impact of Rural Residential Development in Colorado, Agricultural and Resource Policy Report 03-03. Colorado State University: Fort Collins, CO.

Daniels, T. (1999), What to do About Rural Sprawl? The American Planning Association Conference, Seattle, WA. Retrieved on February 15, 2009 from http://www.mrsc.org/subjects/planning/rural/daniels.aspx

Daniels, T. (1999), When City and Country Collide: Managing Growth in the Metropolitan Fringe, Island Press, Washington, D.C.

Edwards, P. J., and Abivardi, C. (1998), The Value of Biodiversity: Where Ecology and Economy Blend, *Biological Conservation*, *83*(3), 239-246.

Engle, Nate (2011), Understanding Rural Sprawl: A Look at Osceola County, Michigan. *SPNHA Review*, 6(1), 1-14. Retrieved on February 15, 2016 from http://scholarworks.gvsu.edu/spnhareview/vol6/iss1/2

European Commission, (2010a), Europe 2020: A European Strategy for Smart, Sustainable and Inclusive Growth, European Commission, Brussels.

European Commission, (2010b), Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Regional Policy Contributing to Smart Growth in Europe 2020, European Commission, Brussels.

Feiock, R. C., Tavares, A. F., and Lubell, M. (2008), Policy Instrument Choices for Growth Management and Land Use Regulation, *Policy Studies Journal*, 36(3), 461-480.

Fornoff, R. (2007), *Several Concerns Regarding Osceola County Road Commission in 2005 Audit*, [Electronic version]. Retrieved on February 25, 2016 from http://www.cadillacnews.com/story/?contId=20394

Hansen, A. J., Rasker, R., Maxwell, B., Rotella, J. J., Johnson, J. D., Parmenter, A. W., ... and Kraska, M. P. (2002), Ecological Causes and Consequences of Demographic Change in the New West as natural amenities attract people and commerce to the rural west, the resulting land-use changes threaten biodiversity, even in protected areas, and challenge efforts to sustain local communities and ecosystems, *BioScience,* 52(2), 151-162.

Jones, J., D.M. Theobald, and Sullins, M. (2002), The Lay of the Land. In R.L. Knight, W. Gilgert, and E. Marston (eds.), Culture, Economics, and Ecology of Ranching West of the 100th Meridian, pp. 25-34. Island Press: Washington, D.C.

Juergensmeyer, J., and Roberts, T. (2013), Land Use Planning and Development Regulation Law 3d (Hornbook Series). West Academic.

Lee, A. H., Chen, W. C., and Chang, C. J. (2008), A Fuzzy AHP and BSC Approach for Evaluating Performance of IT Department in the Manufacturing Industry in Taiwan, *Expert Systems with Applications,* 34(1), 96-107.

Leith, R. M., and Whitfield, P. H. (2000), Some Effects of Urbanization on Streamflow Records in a Small Watershed in the Lower Fraser Valley, BC. *Northwest Science*, 74(1), 69-75.

Litman, T. (2003), *Evaluating Criticism of Smart Growth. Victoria, BC: Victoria Transport Policy Institute.* Retrieved on February 10, 2016 from www.vtpi.org

Lopez, R. and Hynes, P. (2003), Sprawl in the 1990s [Electronic version]. *Urban Affairs Review*, 38(3), 325-355. Retrieved on February 2, 2014 from http://uar.sagepub.com/cgi/content/abstract/38/3/325

Mann, S. (2009), Institutional Causes of Urban and Rural Sprawl in Switzerland, *Land Use Policy*, 26(4), 919-924.

McCann, B. (2000), Driven to Spend; The Impact of Sprawl on Household Transportation Expenses, Surface Transportation Policy Project and the Center for Neighborhood Technology, Chapter Three. See also "The Costs of Sprawl—Revisited, 6-7.

McCann, P., and Ortega-Argilés, R. (2015), Smart Specialisation, Regional Growth and Applications to European Union Cohesion Policy, *Regional Studies*, 49(8), 1291-1302. Retrieved on February 10, 2015 from http://www.tandfonline.com/doi/abs/10.1080/00343404.2013.799769

Michaud, W. (2013), Financing Strategies to Overcome Barriers to Smart Growth in Rural Communities, Smart Growth Network: National Conversation on the Future of Our Communities.

Mishkovsky, N., Dalbey, M., Bertaina, S., Read, A., and McGalliard, T. (2010), Putting Smart Growth to Work in Rural Communities, Washington, DC: International City/County Management Association (ICMA).

Naldi, L., Nilsson, P., Westlund, H., and Wixe, S. (2015), What is Smart Rural Development?, *Journal of Rural Studies*, *40*, 90-101.

Nelson, A. (2000), Growth Management. In The Practice of Local Government Planning. 375-400. Edited by Hoch, C. Washington, D.C.: International City/County Management Association.

Perçin. S. (2008), Use of Fuzzy AHP for Evaluating the Benefits of Information-sharing Decisions in Supply Chain, *Journal of Enterprise Information Management* 21(3), 263-284.

Stillwell, H.D., (1987), Environmental Impacts and Site Constraints of Mountain Resort Development, *Papers and Proceedings of Applied Geography*, 10(1), 297-305.

Theobald, D. M., Miller, J. R., and Hobbs, N. T. (1997), Estimating the Cumulative Effects of Development on Wildlife Habitat, *Landscape and Urban Planning*, 39(1), 25-36.

Thissen, M., van Oort, F., Diodato, D., and Ruijs, A., (2013), Regional Competitiveness and Smart Specialisation in Europe: Place-based Development in International Economic Networks, Edward Elgar, Cheltenham.

United States Environmental Protection Agency. Office of Sustainable Communities Smart Growth Program, (2015), Smart Growth Self-Assessment for Rural Communities: Madison County, New York, Retrieved on February 12, 2015 from *www.epa.gov/smartgrowth*

Vanthillo, T., and Verhetsel, A., (2012), Paradigm Change in Regional Policy: Towards Smart Specialisation? Lessons from Flanders (Belgium). Belgeo 1e2 [online]. Retrieved on February 10, 2015 from http://belgeo.revues.org/7083. accessed 2014-09-03.

Waldie, D.J., (2000), "Do the Voters Really Hate Sprawl?", New York Times. March 3rd.

Weiler, S., and Theobald, D. (2003), Pioneers of Rural Sprawl in the Rocky Mountain West, *The Review of Regional Studies*, 33(3), 264-283.

Xi, F., He, H. S., Clarke, K. C., Hu, Y., Wu, X., Liu, M., ... and Gao, C. (2012), The Potential Impacts of Sprawl on Farmland in Northeast China—Evaluating a New Strategy for Rural Development, *Landscape and Urban Planning*, 104(1), 34-46.

Yang, F., (2009), If 'Smart' is 'Sustainable'? An Analysis of Smart Growth Policies and Its Successful Practices, (Unpublished master thesis), Iowa State University, Ames.