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Ranking Rural Livelihood Capitals in the Central District of Dena County: The Application of Analytic Network Process (ANP)

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Abstract

Sustainable Livelihoods Approach emerged in the 1980s as a new analytical approach in the field of rural development in which the rural livelihood capitals form the basis of the villagers' empowerment and their ability to get involved in their own individual and social destiny. This study aimed to answer the question that how much the importance of each type of livelihood capitals is in the Central District of Dena County in an attempt to improve rural development interventions. The statistical population of the study consisted of local experts of Central District of Dena County that involved village managers and village council members out of which 15 individuals were purposefully selected based on their accessibility. Data were collected through a questionnaire which was developed to conduct pairwise comparisons of livelihood capitals according to the ANP method. Super Decisions software was used in order to rank livelihood capitals and their sub-indexes. The results showed that from among the five types of capital, physical capital was at the first priority. In addition, human, natural and social capitals were at the second, third and fourth priorities, respectively. Finally, financial capital was in the last priority. Therefore, in planning and investing to achieve sustainable livelihood in rural areas, physical and human capital should be taken into consideration more than any other capitals.

Keywords:

financial capital, human capital, natural capital, physical capital, social capital, sustainable rural livelihood

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INTRODUCTION

Sustainable livelihood approach emerged in the 1980s as a new analytical approach in the field of rural development which is taken into consideration in order to achieve rural development and poverty reduction (Jomehpour & Ahmadi, 2011; Nourozi & Hayati, 2015). Sustainable livelihood refers to a living which is adequate to fulfil the basic needs and secure against anticipated shocks and stresses (Chambers, 1995). The sustainable livelihoods concept provides the necessary tools for understanding situations in rural areas at the household level and from the local actors' perspective. This approach focuses on villagers' resources, and its aim is to develop their livelihoods with a more sustainable orientation (Huttunen, 2012).

A sustainable livelihood framework contains five key elements, namely: vulnerability, assets or capitals, transforming structures and processes, livelihood strategies, and livelihood outcomes. Vulnerability is an expression of insecurity about the well-being of individuals, families, and society under adverse environmental changes (Motiee Langroodi et al., 2012). Capitals or assets refer to the resources owned, controlled, claimed, or accessed by the household (Khayyati & Aazami, 2016). Furthermore, the available capitals constitute a stock of asset which can be stored, accumulated, exchanged, and put to work to generate a flow of income (Fang et al., 2014). Transforming structures and processes refer to institutions and organizations that affect how people use their asset portfolios to pursue livelihood strategies. These occur at multiple levels, from the individual to household and community levels (Tang et al., 2013). Livelihood strategies are a combination of activities that people choose to undertake in order to accomplish their livelihood goals. Livelihood outcomes are the achievements and outputs of livelihood strategies (Motiee Langroodi et al., 2012).

Many researchers have simplified the indicators of sustainable livelihoods into four or five livelihood assets to indicate livelihood sustainability (Wang et al., 2016). Therefore, in the livelihoods approach, rural development is achieved by promoting five livelihood assets. This approach

emphasizes the five capital assets, beyond the economic view on rural development (Salmani et al., 2011). In fact, based on the livelihood approach, rural livelihood assets form the basis of the villagers' empowerment and their ability to get involved in their own individual and social destiny, as the aforementioned capitals determine the perceptions, expectations, and activities of individuals and families living in rural areas (Barimani et al., 2016). Assets play a leading role in developing and understanding the livelihood strategies, which may help improve livelihood situation (Paul & Vogl, 2013). In other words, assets lie at the core of livelihood system (Roknedin Eftekhari et al., 2014).

Livelihood capitals include natural, physical, financial, human, and social capital. Natural capital refers to the natural resources that can be exploited by people to achieve their livelihood objectives. Examples are land, water, and forests (Ghadirimasoum et al., 2015). In other words, natural capital includes all natural resource stocks such as land, flora and fauna, water, air, and environmental services from which livelihoods are derived. In rural agrarian societies, farmland availability and its ownership are crucial for sustaining livelihoods (Bhandari, 2013). In another classification, natural capital includes both intangible public goods such as the atmosphere and biodiversity as well as assets used directly for production including trees, water, and land (Thulstrup, 2015). Physical capital refers to basic infrastructure such as roads, water channels, manufacturing tools, and capital goods (such as machinery including tractors) required to support livelihoods (Ghadirimasoum et al., 2015). The infrastructure consists of changes in the physical environment that helps people meet their basic needs (Su & Shang, 2012). Financial capital refers to funds (such as cash, bank accounts, current assets, pensions and annuities, as well as financial assistance and remittances) which are available to maintain or improve people's livelihoods (Ghadirimasoum et al., 2015). Income, savings, and loans are three main sources of financial capital (Liu & Xu, 2016). Financial capital facilitates economic production, referring rather to a system of ownership or control of

physical capital (Goodwin, 2003). These assets may be the most important and the most accessible asset for the poor. Human capital refers to individuals' demographic attributes, and levels of health, education, and skill development (Horsley et al., 2015). It also refers to appropriate health and ability to work, which makes it possible for individuals to follow livelihood strategies and activities as well as to achieve livelihood goals (Ghadirimasoum et al., 2015). It is formed by changing the behavior of individuals to gain skills and abilities and enables them to behave in a new way, and it is, therefore, less tangible and appears in skills and knowledge acquired by individuals (Sharbatiyan et al., 2015). Social capital is a controversial issue which has been defined in various ways. In the traditional view of management, the development of the economics, physical capitals, and human resources plays the most important role in development, but in the current era, social capital is perceived to be more important than the economic, physical, and human capital for development because the lack of this capital makes it impossible to use the other capitals optimally (Manzoor & Yadipoor, 2009). Indeed, it is almost inconceivable to access any source of livelihood without social capital (Mitra, 2008). Social capital is defined as social resources that people use to help them contribute to their livelihood. This type of support usually includes social networks, membership in groups, interaction, and a sense of trust (Ghadirimasoum et al., 2015).

Some studies have also investigated the types of capital. For example, Omrani and Farajzadeh (2016) studied the role of different types of capital including physical, human, and social capital in Iranian agriculture growth. Physical capital was found to have been more important in the agriculture than other types of capital. In addition, following physical capital, social capital had a relatively important role in agricultural production, while human capital had no important role to assist the agricultural sector. Furthermore, Ghafari and Paluj (2013) investigated the relation of social, human, and physical capital with the value of agricultural commodities in rural areas of Isfahan Province. Results revealed that physical capital had the

most substantial contribution and social capital and human capital had less contribution.

Some studies have also been conducted to measure the capitals. The results of ranking capitals in the research conducted by Sojasi Ghidari et al. (2016) showed that social capital was the first capital. Next, physical, natural, financial, and institutional capitals were placed in the second to fifth rank, respectively, and human capital was the last capital. Barimani et al. (2016) indicated that there was a weakness in livelihood capitals except for social capital. Abdollahzadeh et al. (2016) showed that all five forms of assets were below average in two groups of villages, one with tourism and the other without it, so that they were in an inappropriate status. Paul and Vogl (2013) reported that the adoption of organic shrimp farming increased farmers' assets. According to Udayakumara and Shrestha (2011), livelihood assets including physical, social, and human capital have been increased significantly in both upstream and downstream areas, while access to natural and financial capital has been decreased during the last two decades significantly and slightly, respectively. In general, based on literature review, rural livelihood capital consists of five dimensions including social, financial, human, physical, and natural capital. Each of these capitals is characterized by criteria included in the conceptual model of the study in Figure 1.

Studies show that different forms of capital are not completely independent of one another, but are mutually dependent and reinforcing each other (Mahmodi et al., 2016). As a result, five mentioned capitals should be coordinately balanced or improved in order to achieve the three goals of sustainable development including social, economic, and environmental development. In addition, activities need to be planned through an integrated approach to supply the five capitals which are the suppliers of goods and services and should be considered in any attempt to improve the quality of life and achieve development (Ghorbani et al., 2015). However, as long as the sources and effective factors on rural development are not known and their importance is not determined, appropriate and constructive actions cannot be taken for sus-

tainable rural development (Barimani et al., 2016). Therefore, given the importance of different capitals in sustainable rural development on the one hand and the low level of rural development in Dena County on the other hand (Karami & Abdshahi, 2012), the purpose of this study is to address the question as to the importance of each of these capitals (social, financial, human, physical, and natural). The prioritization of capitals provides the information for planners and policymakers as to how to allocate the resources, funds, and investments in order to accomplish sustainable rural development.

MATERIALS AND METHODS

This study is an applied research in terms of its objective, since its results could be useful for rural planners and policymakers. The statistical population consisted of local experts of Central District of Dena County including village managers and village council members, out of which 15 individuals were purposefully selected based on their accessibility. Data were collected through a questionnaire whose validity was confirmed using comments of rural development experts, and its reliability was confirmed by calculating inconsistency rate (IR). Geometric mean was used to integrate the data collected from different respondents.

Multi-criteria decision-making method is a well-known method in decision issues and options prioritization which addresses the society's

elite (Ghanbari & Roostaei, 2014). The present study employed the process of network analysis, which is one of multi-criteria decision-making method, to analyze the data. This process, first introduced by Saati in 1982, is a developed version of analytic hierarchy process. Analytic Hierarchy Process (AHP) is one of the basic techniques of multi-criteria decision-making that includes goal, a set of criteria, sub-criteria, and finally strategic options at the lowest level. The sum of these levels forms a hierarchy. The underlying assumption is the independence of the higher levels from the lower levels in AHP; however, many issues cannot be analyzed in a hierarchical structure because of the interaction between various factors. To address this limitation, Saati proposed an analytic network process method to solve the issues of the interdependency of the options. In other words, in analytic hierarchy process, the relations are linear and unidirectional, while in analytic network process, the factors of a group may affect the factors of the same group or a group at a higher level (Hayatgheibi & Karbassi, 2013). The steps of analytic network process in this study are as follows:

Step 1: Forming analytic network

Five dimensions of livelihood assets including human, social, natural, physical, and financial capitals form the main clusters in this study. To

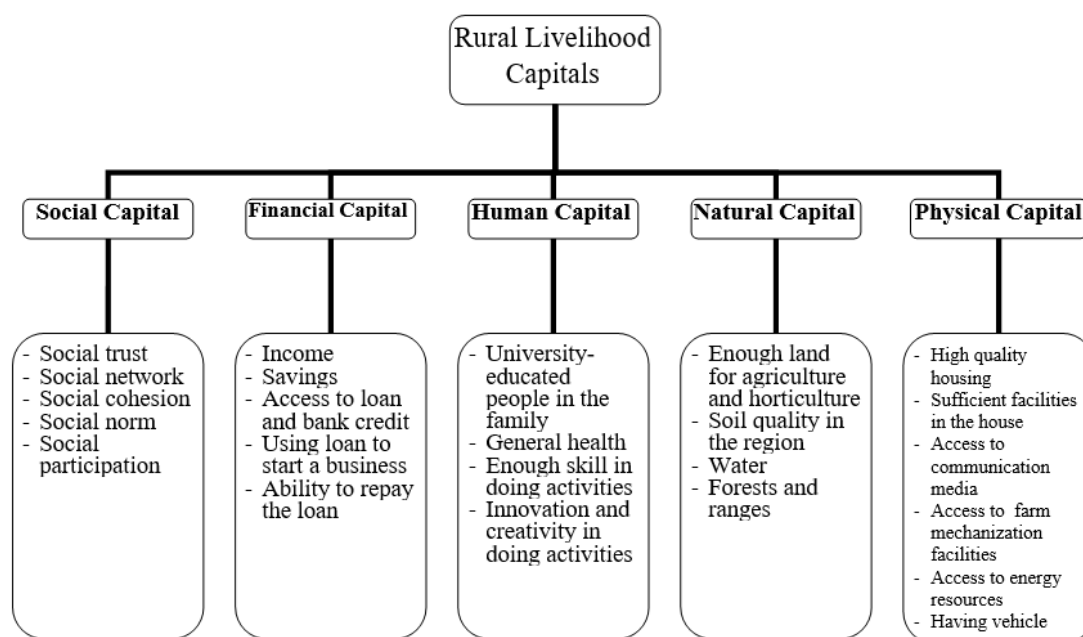


Figure 1. The conceptual and network model to prioritize rural livelihood capitals

Table 1
Pairwise Comparison Scale

Comparison expression	Same	Equally important to a little more	More important	Much more important	Absolutely important	Middle preferences
Value	1	3	5	7	9	2, 4, 6, 8

Source: Rangzan et al. (2015)

achieve each one of the supposed capitals, some criteria should be met; accordingly, within each cluster, there is a set of criteria that are characterized as network nodes. In this study, the following criteria were derived from the literature review and secondary data.

Step 2: Conducting a pairwise comparison and estimating the relative weights

At this stage, the pairwise comparison is done to use it in assigning the relative weights to the criteria and sub-criteria. Saati suggested a scale of 1 to 9 for the pairwise comparison of two components. In this scale, the score 1 indicates the equal importance of two components whereas the score 9 indicates the absolute importance of one component to the other component (Faraji Sabokbar et al., 2010).

In judgments and pairwise comparisons, it is important to monitor their compliance. The mechanism that this model aims to investigate inconsistencies in judgments is calculating the inconsistency rate (IR). Inconsistency rate is calculated by the software for each pairwise comparison matrix and if it exceeds 0.1, it is an inconsistent judgment and should be revised (Sadeghi Ravesh & Khosravi, 2015). In this study, inconsistency rate of pairwise comparisons were smaller than 0.1; therefore, the judgments were reliable.

Step 3: Forming the initial supermatrix

Based on the results of the pairwise comparison made in the previous step, some matrices are produced and the relative weight of each matrix is calculated based on the pairwise comparison. Then, the calculated weights are entered in supermatrix which shows the relationship between the elements of the system. The supermatrix generated at this stage is called the initial supermatrix.

Step 4: Forming weighted supermatrix

In fact, each column of the initial supermatrix consists of several Eigen vectors each of which sums to one. As a result, the sum of each column of the initial supermatrix could be greater than one. Each element in the column of the supermatrix is factored by its relative weight and the sum of each of its columns would be equal to one. Therefore, each initial supermatrices' column would be standardized. As can be seen in the matrix, the sum of each of its columns equals unity, and it is hence called a weighted matrix.

Step 5: Calculating general weighted vector of limited matrix

In the final step, the weighted supermatrix is raised to a sufficiently large power until convergence occurs to get the general weighted vectors. Limited matrix is obtained by raising weighted supermatrix to the power and its rows are equal. Super Decisions software was used to carry out the network analysis process. Some concepts are defined as below.

- Social trust is as an internalized model of values, norms, and obligations which is the core of modern theories of social capital as well as a vital element of the society.
- Social networks are the forms in which collective action emerges and they are expressed as a prerequisite for the formation of social capital (Ansari Arjmand et al., 2016).
- Social coherence refers to the amount and pattern of interaction between the actors, groups and differentiated subcultures (Naderi Mahdei et al., 2015).
- Social norms are often defined as rules that are enforced in a community, leaving the social concepts of a rule and rule-following unexplained (Detel, 2008).
- Social participation refers to voluntary ac-

tivities through which members of a community take part in neighborhood, town and village affairs and participate directly or indirectly in shaping their own social life (Nikkhah et al., 2014).

RESULTS

The final results of prioritization are presented in three forms including raw, normalized, and ideal scores in Tables (2)-(7). Raw scores are the scores of limited supermatrix. Normal scores represent the normalized results of capital priorities. Ideal scores are acquired from dividing either normal or raw scores to its largest score. Therefore, in this column, the first priority is given the score "one" and other capitals are given a score between zero and one.

The results of prioritizing different types of capitals in Table 2 show that from among the

five categories of capital, physical capital weighing 0.286 is the first priority. Human capital weighing 0.226 was placed in the second priority. Natural capital and social capital weighing 0.192 and 0.169 were regarded as third and fourth priority, respectively. Finally, the financial capital, weighing 0.125 was placed in the last priority. As Table 3 shows, from among the five social capital criteria, social participation with the weight of 0.259 was placed in the first priority, followed by social norms, social trust and social networks with the weights of 0.216, 0.211 and 0.171 were placed in the second to fourth priority, respectively, and social cohesion was the last priority with the weight of 0.141.

The results of Table 4 show that from among the five financial capital criteria, using loan to run a business was regarded as the first priority

Table 2
Priority of Types of Capital

Types of capitals	Raw	Normal	Ideals	Priority
Physical capital	0.023	0.286	1.000	1
Human capital	0.018	0.226	0.789	2
Natural capital	0.016	0.192	0.672	3
Social capital	0.014	0.169	0.593	4
Financial capital	0.010	0.125	0.437	5

Table 3
Priority of Social Capital Criteria

Criteria	Raw	Normal	Ideals	Priority
Social participation	0.021	0.259	1.000	1
Social norm	0.018	0.216	0.836	2
Social trust	0.017	0.211	0.817	3
Social network	0.014	0.171	0.659	4
Social cohesion	0.011	0.141	0.543	5

Table 4
Priority of Financial Capital Criteria

Criteria	Raw	Normal	Ideals	Priority
Using loan to start a business	0.021	0.257	1.000	1
Access to loan and bank credit	0.018	0.216	0.842	2
Savings	0.017	0.211	0.820	3
Income	0.016	0.195	0.759	4
Ability to repay the loan	0.009	0.118	0.460	5

Table 5
Priority of Human Capital Criteria

Criteria	Raw	Normal	Ideals	Priority
General health	0.029	0.350	1.000	1
Innovation and creativity in doing activities	0.019	0.230	0.656	2
Sufficient skill in doing activities	0.018	0.225	0.643	3
University-educated people in the family	0.016	0.193	0.550	4

Table 6
Priority of Natural Capital Criteria

Criteria	Raw	Normal	Ideals	Priority
Water	0.031	0.372	1.000	1
Enough land for agronomy and horticulture	0.020	0.249	0.668	2
Soil quality in the region	0.017	0.207	0.556	3
Forests and ranges	0.014	0.171	0.459	4

Table 7
Priority of Physical Capital Criteria

Criteria	Raw	Normal	Ideals	Priority
Adequate facilities in the house	0.015	0.187	1.000	1
Access to means of communication	0.015	0.186	0.994	2
Access to farm mechanization facilities	0.015	0.186	0.992	3
High quality housing	0.015	0.180	0.959	4
Access to energy resources	0.014	0.174	0.931	5
Having vehicle	0.007	0.084	0.451	6

with the weight of 0.257. Furthermore, access to loan and bank credit, savings, and income with the weights of 0.216, 0.211, and 0.195 were placed in the second to fourth priority, respectively, as well as ability to repay the loan that was placed in the last priority with the weight of 0.118.

According to Table 5, from among the four criteria of human capital, the first priority was assigned to having general health with the weight of 0.350. Then, innovation and creativity in doing activities was assigned to the second priority with the weight of 0.230. Having sufficient skill in doing activities was regarded as the third priority with the weight of 0.225 and having university-educated people in the family was assigned to the last priority with the weight of 0.193.

The results of prioritizing natural capital criteria in Table 6 show that water was placed

in the first priority with the weight of 0.372. Having land for agriculture and horticulture, weighted 0.249, was assigned to the second priority, soil quality in the region, weighed 0.207, was determined as the third priority, and forests and ranges with the weight of 0.171 was regarded as the last priority.

Table 7 presents the prioritization of the physical capital criteria. Accordingly, three criteria including having adequate facilities in the house such as heating and cooling system, and so on, access to means of communication such as landline phone, mobile, and the Internet, and access to farm mechanization facilities, such as tractors, and so on with the weights of 0.187, 0.186, and 0.186 were placed in the first to third priorities, respectively, with a very slight difference. Having high quality housing and access to energy resources such as oil, gas, gasoline, etc. weighted 0.180 and 0.174 were

the fourth and fifth priorities, respectively. Having a vehicle such as bicycle, car, etc. with the weight of 0.084 was placed in the last priority.

DISCUSSION AND CONCLUSION

This study aimed to determine the importance of different types of livelihood capitals in order to achieve rural development. The results of prioritizing capitals showed that among the five categories of capital, physical capital was given the first priority. Human capital was placed in the second priority. Natural capital and social capital were placed in the third and fourth priorities, respectively. Finally, the financial capital was given the last priority. These findings are consistent with [Omrani and Farajzadeh \(2016\)](#) as well as [Ghafari and Paluj \(2013\)](#). [Omrani and Farajzadeh \(2016\)](#) evaluated the role of physical capital to be more important than other capitals. Furthermore, in [Ghafari and Paluj's \(2013\)](#) experiment, physical capital was found to play the first role. Therefore, physical capital plays a key role in comparison with other capitals in achieving sustainable livelihoods as well as rural development. On the other hand, the financial capital was given the last priority which indicates that according to local experts physical, human, natural and social capitals are more important than financial capital in paving the way to achieve sustainable rural development.

The results of prioritizing social capital criteria showed that from among the five social capital criteria, social participation is the first priority, followed by social norms, social trust and social networks in the second to fourth priority, respectively, and social cohesion was placed in the last priority. Social participation underpins any action to achieve rural development. Therefore, it was placed as the first priority. On the other hand, social cohesion, which reflects the solidarity and emotional commitment of community members towards each other, is the last priority. In fact, in order to achieve rural development, other criteria of social capital were more important than social cohesion.

Among the five financial capital criteria, using loan to start a business was regarded as the first priority. Furthermore, access to loan and bank

credit, savings, and income were placed in the second to fourth priorities, respectively, and ability to repay the loan was placed in the last priority. This result may be due to the fact that everyone may not be able to have enough savings or income, but the majority of people can use the loans to start a business. Nevertheless, according to local experts, the ability to repay the loan was found to be less important than the other financial capital criteria.

Among four criteria of human capital, having general health was placed in the first priority. Furthermore, having innovation and creativity in doing activities was prioritized the second, having sufficient skill in doing activities was assigned to the third priority, and having university-educated people in the family was prioritized the last. This result seems quite logical because having general health is a prerequisite for any activity of the villagers in order to achieve rural development. On the other hand, having university-educated people in the family as the last priority may indicate the fact that in order to achieve sustainable rural development, having university-educated people in the family is not sufficient and having innovative and skilful people is of higher importance.

The results of prioritizing natural capital criteria showed that water is the first priority. Having land for agronomy and horticulture was prioritized the second, soil quality in the region was determined to be the third priority, and forests and ranges were placed as the last priority. Since water is the origin of life, its priority over the other natural capital criteria can be expected and justified. The categorization of the forests and ranges as the last priority could be due to the fact that it is not possible to have forests and ranges everywhere.

The results of prioritizing physical capital criteria showed that three criteria including having adequate facilities in the house, access to means of communication such as landline phone, mobile, the Internet, and access to farm mechanization facilities, such as tractors, etc. were regarded as the first to third priorities with a very slight difference, respectively. Having high quality housing and access to energy resources

such as oil, gas, gasoline, etc. were assigned to the fourth and fifth priorities, respectively. Having a vehicle was prioritized the last.

Having adequate facilities in the house was prioritized the first which can be attributed to the fact that having adequate facilities in the house is one of the basic needs of rural families. On the other hand, having a vehicle is less important than the other physical criteria which could be because of the fact that it is possible to use public transportation in the absence of the vehicle.

RECOMMENDATIONS

Based on the results of the present study, the following recommendations can be given.

Since from among the five social capital criteria, social participation was prioritized the first, in order to boost villagers' social capital, it is suggested that rural participation should be considered in conducting rural affairs including planning, implementation, and evaluation of various projects in rural areas.

Among the five financial capital criteria, according to local experts, using loan to start a business as well as access to loan and bank credit were prioritized the first and second, respectively. Therefore, in order to increase the level of financial capital and subsequently make improvements in rural livelihoods, low-interest loans and bank credit with long-term installments and without the need for collateral or guarantors should be provided conveniently for villagers to start a new business.

Since among human capital criteria, having general health was prioritized the first, raising awareness of villagers about health and disease prevention as well as providing free or reduced-cost health care services should be taken into consideration by rural health centers and rural home health in order to promote the villagers' health.

Among natural capital criteria, water was found to be the first priority. Therefore, planning for conservation and optimal utilization of water resources, preventing unauthorized use of the well, and promoting the proper use of water should be taken into account by the relevant authorities in order to improve rural livelihood.

Since three physical capital criteria including

having adequate facilities in the house, access to means of communication such as landline phone, mobile, the Internet and access to farm mechanization facilities, such as tractors, etc. were prioritized the first to third, respectively, it should be tried by officials to supply low-interest loans in order to assist villagers to provide adequate facilities in the house, provide access to means of communication as well as farm mechanization facilities.

In general, among the different types of capitals, physical capital and human capital were found to be the first and second priority, respectively. Hence, it seems essential to provide physical infrastructure as well as consider villagers' health status.

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