Journal of Research and Rural Planning
Volume 13, No. 1, Winter 2024, Serial No. 44, Pp. 1-23
eISSN: 2783-2007 **ISSN: 2783-2791**
http://jrrp.um.ac.ir

Original Article

Modeling the Impacts and Consequences of Climate Change on Sustainable Livelihood of Rural Communities (Case study: Rural Households in Mashhad County)

Mehri Jahansoozi[1], Hossein Farahani[2*], Behrooz Mohammadi Yeganeh[3], Jamshid Einali[4]

1- Ph.D. Candidate in Geography & Rural Planning, University of Zanjan, Zanjan, Iran.
2- Associate Professor in Geography & Rural Planning, University of Zanjan, Zanjan, Iran.
3- Associate Professor in Geography & Rural Planning, University of Zanjan, Zanjan, Iran.
4- Associate Professor in Geography & Rural Planning, University of Zanjan, Zanjan, Iran.

Abstract

Purpose- Climate change has negative effects on the economic, social, and environmental aspects of rural households. Given the importance of the impact of climate change on the livelihoods of rural people, this study was conducted with the aim of reducing vulnerability and increasing resilience and adaptation to these conditions in Mashhad Township.

Design/methodology/approach- The statistical population of the study is 11,706 rural households in Mashhad Township, out of which 372 households were selected proportionally by multistage stratified random sampling based on Cochran's formula. The main tool of the research was a questionnaire whose validity was examined through content validity, structural validity, and reliability by composite reliability and Cronbach's alpha (a= 0.9). The data were analyzed using SPSS and LISREL software. To examine the fit of the measurement model of the effects of climate change on sustainable livelihoods, the collected data were analyzed using second-order confirmatory factor analysis with LISREL software.

Findings- The results of the study showed that the greatest impact of climate change was on financial capital, including income reduction, increased costs and increased product prices, reduced productivity and employment. In addition, the greatest effects of climate change on social capital include were on reduced sense of belonging and increased dependence on government support; on human capital include a were on reduced health levels and quality of life; and on natural capital include a were on reduced land resources and pressure and occurrence of hazards; and on physical capital were on reduced services and facilities for people. The research findings also showed that the goodness-of-fit indices (AGFI=0.91, GFI=0.91), (NNFI=0.91, CFI= 0.92), and (RMSEA= 0.073, X2/df= 2.97) confirmed an excellent fit of the measurement model of the effects of climate change on sustainable livelihoods with observed data. In addition, the results of structural equation modeling showed that the greatest impacts of climate change among livelihood capitals were respectively related to physical, financial, natural, social and human capitals.

Keyword: Vulnerability, Sustainable Livelihood, Sustainable Development, Structural Equation Modeling (SEM), Mashhad Township

Use your device to scan and read the article online

How to cite this article:
Jahansoozi, M., Farahani, H., Mohammadi Yeganeh, B. & Einali, J. (2024). Modeling the impacts and consequences of climate change on sustainable livelihood of rural communities (Case study: Rural households in Mashhad County). *Journal of Research & Rural Planning*, *13*(1), 1-23.
http://dx.doi.org/10.22067/jrrp.v13i1.2307-1084

Date:
Received: 26-08-2023
Revised: 23-09-2023
Accepted: 30-11- 2023
Available Online: 01-12-2023

Corresponding Author:
Farahani, Hossein, Ph.D.
Address: Department of Geography & Rural Planning, Faculty of Humanities Sciences, University of Zanjan, Zanjan, Iran.
Tel: +989186200623
E-mail: hfarahani@znu.ac.ir

1. Introduction

During the past few years, the world has witnessed significant climate changes such as changes in rainfall patterns, temperature changes, and rising sea levels. The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) predicted that these changes will become more severe and serious soon (Khan et al., 2021). Climate change is considered one of the biggest challenges facing human societies (Mekuriaw et al., 2019), posing a potential threat to natural ecosystems and sustainable human development (Zhao et al., 2019). This phenomenon has significant social-economic and environmental impacts (Mekuriaw et al., 2019). Climate change has a great impact on local or global natural resources and causes floods, droughts, and conflicts among resource users (Ikhuoso et al., 2020). also reduces water resources and access to drinking water (Nyiwul, 2021) and unstable weather and rapid melting of glaciers increase the risk of extinction of many plant and animal species (Shaffril et al., 2018). In addition, climate change reduces agricultural productivity and increases water consumption in this sector (Zareian & Eslamian, 2019). Climate change and associated stressors influence human development through their support or destabilization of the livelihood systems of the poorest and most vulnerable people (Chitongo, 2019). Although various factors affect rural livelihoods, recent studies show that climate change can double the vulnerability of rural communities (Shahraki et al., 2022). The impact of climate change is extensive and has negative effects on various aspects of rural livelihoods. Those impacts can be observed through increased and uncertain hydrological functioning, depletion of water sources, decrease in soil productivity, ecological degradation, and increased disaster risk, resulting in the reduction of land productivity and economic performance. Agriculture-based communities in rural areas are most affected by the effects of climate change (Aryal et al., 2019); Why do rural households have a high dependence on agriculture, natural resources, and animal husbandry (Poudel et al., 2020; Priyadarshi et al., 2019). while having less ability to cope with and adapt to natural hazards (De Silva & Kawasaki, 2018). Therefore, the agricultural sector has the highest sensitivity to changes in weather conditions (Menike & Arachchi, 2016). Climate change can lead to reduced economic growth and the creation or expansion of poverty (Bauer et al., 2022). Some believe that climate change can not only bring new inequalities and challenges but also the shock and stress it causes will have a significant impact on the vulnerability of rural livelihoods (Shahraki et al., 2022). Livelihood vulnerability is concentrated on exposure, sensitivity as well as the adaptive capacity of an individual's livelihood or a community's livelihood in the face of natural disasters (Sarker et al., 2019). In addition to affecting the agricultural production of farmers, climate change also endangers their household welfare and food security (Jamshidi et al., 2019). Vulnerable livelihoods will certainly lead to food insecurity. Since livelihoods are obtained in various sectors, climate change cannot be considered as the only effective factor in food insecurity (Gautam, 2017). Climate change with increasing natural hazards not only affects the livelihood capital of local communities but also has long-term effects on their income and occupation (Aggarwal & Singh, 2010; Wei et al., 2014). In this way, climate change is a major threat to rural livelihoods (Mashizha et al., 2017). Therefore climate change exacerbates some of the challenges for rural livelihoods arising from urban expansion, population growth, land degradation, and unsustainable agricultural systems. This reduces the resilience of rural livelihood strategies that are difficult to use for protection against shocks and stresses in the face of harsh weather conditions (Chitongo, 2019).

Livelihood should be sustainable in the rural livable environment; meaning that it can adapt to stresses and shocks and improve its capabilities and assets now and in the future without weakening the natural resource base. This interpretation of livelihood sustainability, with an emphasis on coping with stresses and shocks, is strongly related to resilience (Carr, 2020). This happens when in addition to the desirability of livelihood assets, the institutions, structures, environmental conditions, and livelihood strategies that provide rural livelihoods are also mutually satisfactory in interaction and mutual relationship. Also, household livelihoods should be resilient so that they can be sustainable; because increasing the resilience of livelihoods

improves the level of adaptability and coping power and consequently reduces vulnerability among local communities. One of the efforts to implement sustainability is to focus on livelihoods and enhance their resilience as a means of achieving quality of life and well-being and ensuring it against external shocks. Livelihood is not just a means of survival but a process through which resources are provided so that people can improve their lives (Morse & McNamara, 2013). Livelihood is sustainable or flexible when it can cope with stresses and shocks, recover from them, and maintain its capabilities and assets (Gong et al., 2021). Livelihood resilience refers to households' ability to maintain and improve their livelihoods so that they can cope with environmental, economic, social, and political imbalances and improve them (Wang et al., 2021). Resilience is a key component of sustainable livelihoods and vice versa (Awazi & Quandt, 2021). Ensuring rural livelihoods and more importantly, sustaining livelihood systems as a fundamental principle in the dominant approach to rural development planning in the present era has been accepted (Babae et al., 2021). Understanding what creates and improves livelihood resilience against climate change is essential because livelihood systems must be compatible with global and local changes (Quandt et al., 2019). Therefore, livelihood resilience emphasizes empowering communities to maintain these assets against the effects of hazards and recover and restore them to normal after risk-taking (Sadeghlo & Khirabadi, 2020). Understanding how affected people response to life-threatening disasters, especially a thorough describing how they adapt to a new natural phenomenon, would help them to shape appropriate strategies. Such an understanding would provide a better picture of the key elements including resilience characteristics which enable individuals to establish resilience to relevant organizations in addressing the individual perquisites to cope with disasters, even prior to occurrence of those events (Nasrnia & Ashktorab, 2021).

In Iran, climate change events have become more frequent and severe in recent decades. Mashhad is an example of regions where climate change, especially reduced precipitation, changes in precipitation patterns, consecutive droughts, and warming temperatures, are well observable (Regional Water Company of Khorasan Razavi, 2023). Given that Khorasan Razavi province has little rainfall and vast desert areas that are struggling with water scarcity, it is more affected by the effects of climate change. The livelihood of most rural households in this area is based on income from agriculture, handicrafts, and small-scale conversion industries, whose inputs are provided by agricultural, horticultural, and animal husbandry activities. The dependence of the livelihoods of rural communities in the township on agriculture and natural resources has led to less flexibility in the face of short-term weather fluctuations, destruction of environmental resources, the vulnerability of rural economies and instability of income sources, changes in occupation, weakening of rural economies, rural migration and marginalization and increase Problems have become urban. The main issue of this research is how climate change has affected the sustainability of rural livelihoods in Mashhad Township and what effects and consequences it has had. Understanding these effects and consequences will be necessary for developing practical programs and effective strategies for managing climate change. Therefore, given the importance of the impact of climate change on local rural livelihoods, this study was conducted to reduce vulnerability and increase resilience and adaptation to these conditions in Mashhad Township. Awareness of the consequences of climate change and how to deal with it can lead to sustainable livelihoods and increased local community resilience against the consequences of climate change in these areas. In this regard, this study seeks to answer the question of what impact climate change and its consequences (such as prolonged droughts, severe reduction of surface and groundwater resources, reduced crop yields, etc.) have had on the sustainability of rural livelihoods in the study area.

2. Research Theoretical Literature

Livelihood is a way of life that people individually or collectively adopt to meet their economic needs or respond to new economic opportunities (Sina et al., 2019). This method includes individuals and capacities, assets, and activities that are necessary for life (Chen et al.,

2020; Saxena et al., 2016; Shekari et al., 2022) and focuses on the relationship between people's assets and livelihood decisions other than income (Li & Shi, 2022). The livelihood sustainability of individuals or households refers to optimized livelihood capital, increased capacity, improved stakeholder rights, and increased social stability (Zhang & Fang, 2020). According to studies conducted in many parts of the world, rural livelihoods mainly consist of family farms that are involved in agricultural activities such as aquaculture, social forestry, agriculture, and fish farming. Rural livelihoods rely heavily on natural resources and ecosystem services and are vulnerable to shocks and stressors (Pelletier et al., 2016). In rural areas, their livelihood is an interface between social and natural systems through resource use management (Wang et al., 2021). Livelihood characteristics such as production activities and assets are important factors that determine how resilient or adaptable livelihoods are too extreme weather events (Bauer et al., 2022). Essentially, sustainable rural livelihoods address how the poor in rural areas can overcome stress shocks (such as severe weather conditions) to improve their lives (Amoah & Simatele, 2021). Based on the sustainable livelihood approach, livelihood tools should be based on people's access to capital assets so that people can earn a living by combining and growing these assets through interaction with actors and institutions (Nasrnia & Ashktorab, 2021). Within the framework of sustainable livelihoods with a people-centered approach, five components of sustainable livelihoods including human capital, social capital, financial capital, natural capital, and physical capital have been emphasized. These five components are interdependent and each can complement other assets (Nasrnia & Ashktorab, 2021; Pandey et al., 2017; Quandt et al., 2017; Shakoori & Bahrami, 2014). In the following, the interpretation of each component of sustainable livelihoods is discussed below:

A) Human capital: is an inherent and acquired asset of an individual that includes a person's skills, abilities, and capabilities (Quandt, 2018). This capital refers to the population characteristics of individuals such as education, skills, knowledge, work ability, health status, good nutrition, work capacity, and people's adaptability that enable individuals to pursue various livelihood strategies to achieve their livelihood goals (Mkuna et al., 2020; Sahneh & Sadin, 2022). Therefore, this capital refers to the human capacity to understand risk and adopt adaptive strategies against climate change (Pagnani et al., 2021). B) Physical capital: includes basic infrastructure (transportation, shelter, water, energy, and communications) and production equipment that enables people to pursue their livelihoods (Mkuna et al., 2020). C) Social capital: is focused on social networks and communications between members of society, norms, social laws, and institutions. In addition, dependence or membership in groups, associations, and official organizations creates mutual trust and people can use them to solve common problems that ultimately increase knowledge, information, skills, and access to resources for better livelihoods. These are resources and assets that individuals and communities can access through special communication with each other (Sahneh & Sadin, 2022). D) Financial capital: includes financial resources available to people (including savings, credit or installment payments and retirement benefits, remittances, and wages) in addition to providing different livelihood options for them (Mkuna et al., 2020). Natural capital represents the resources that can be used at any time to provide a livelihood. Natural capital includes access to environmental services and resources (Nasrnia & Ashktorab, 2021). E) Natural capital: is especially important for those who derive all or part of their livelihoods from natural resource-based activities. It includes resources such as land, water, minerals, livestock, and other natural resources. Natural capital and vulnerability have close relationships with each other because many destructive shocks to livelihoods such as fires, floods, earthquakes, etc., are natural processes that reduce natural capital (Sharafi et al., 2018).

The mentioned framework is based on 5 key components including the concept of vulnerability, livelihood assets, transformative structures and processes, livelihood strategies, and livelihood outcomes and impacts (Wang et al., 2016). Transformative structures and processes refer to institutions, organizations, policies, and laws that shape livelihoods. Livelihood strategies are a combination of activities chosen by people to achieve their livelihood goals and ultimately livelihood

outcomes, achievements, and outputs of livelihood interventions. Also, according to the sustainable livelihood framework, vulnerability is one of the fundamental concepts that takes shape based on the existence of deleterious fields (Seyed Akhlaghi Shal, 2019). The vulnerability context may have a direct or indirect effect on the five dimensions of livelihood assets (Liu & Xu, 2016). In the field of climate stressors, vulnerability arises due to the lack of coping power and incompatibility capacity and consequently low resilience (Bhattacharjee & Behera, 2018). Therefore, vulnerability is one of the most important determinants of the sustainable livelihood framework that is mainly based on livelihood assets and directly affects institutional processes, livelihood strategies, and their impacts to enhance local community resilience (Jacquet et al., 2018; Sarker, Wu, Alam, & Shouse, 2020). A resilient community and environment confront threats as soon as possible and adapt to them so that they return to their previous desirable state with minimal changes and negative consequences. The compatibility of livelihood systems is the key to their resilience (Kien, 2011) and depends on how local people and the livelihood system respond to stressors and damages (Mohammadi & Manoochehri, 2019).

2.1 Review of Literature

Many studies have been conducted on climate change Karim & Thiel (2017), the vulnerability and resilience of livelihoods to climate change Sarker et al., (2019), and adaptation to climate change Chen, et al., (2018); Masud et al., (2017). In their study, Nagasha, Mugisha, Kaase-Bwanga, Onyuth, & Ocaido (2019) found that river erosion and destruction due to floods caused by climate change have caused residents to migrate and have had a significant impact on employment status, access to food and health services. The results of the study by Kuang et al., (2019) in rural households in Wushen Banner, China indicate that the amount of agricultural livelihood capital plays an important role in adopting adaptation strategies for climate change. Specifically, natural capital and social capital have a positive impact on farmers' decisions regarding adaptation and resilience strategies to climate change, while human capital and physical capital are placed in the next stage. Harvey et al., (2018) Found in their research in Central America that more than 90% of farmers in Central America have experienced climate change and most of them believed that although the impact of temperature and precipitation increase is unpredictable, it has had a significant impact on crop yield, pest and disease outbreaks, and people's income. The results of the study in Rajasthan, India Chand & Kumar (2018) showed that reduced household income, reduced water for irrigation, and reduced crop yields were among the most important livelihood impacts of climate change. In addition, increased livestock mortality, increased weed growth, and new pest and disease outbreaks are among other negative impacts of climate change on local communities' livelihoods. In their research, Hua et al., (2017) examined the role of livelihood assets in appropriate livelihood strategies. Their findings showed that human, natural, and financial assets have a significant impact on livelihood strategies and that the choice of livelihood strategy varies depending on livelihood assets. Fang et al., (2014) Conducted a study to measure the sensitivity of livelihood strategies to livelihood capital in the upper reaches of the Minjiang River in China's mountainous areas. Their results showed that natural and human capital had a positive correlation with farm livelihood strategies, while financial and social capital accelerated activities outside the farm. Shah et al., (2013) Studied the development and testing of the livelihood vulnerability index for agriculture and resource-dependent communities in developing countries. The results showed that Nariva community was more vulnerable than other communities, especially in relation to social population, health and water security, natural disaster and climate change. On the other hand, Caroni was more vulnerable than other livelihood vulnerability indices except for food security. Motsholapheko et al., (2011) Studied rural livelihoods and household resilience to floods in Botswana's Okavango Delta. Their findings showed that people generally had high access to natural capital but low access to four types of capital: financial, physical, human, and social. Shahraki et al., (2021) Examined rural people's awareness of climate change indicators and their relationship with sustainable livelihoods in Oghan watershed area of Golestan province. They found that there

was a direct relationship between people's awareness of climate change indicators and their livelihood changes. Sharafi et al., (2018) Examined the status of livelihood assets and their sustainability and found that among the five livelihood assets, social, human, and physical capital were moderately sustainable while financial and natural capital were potentially unstable (weak).

3. Research Methodology

3.1 Geographical Scope of the Recsearch

Mashhad Township is one of the counties of Khorasan Razavi Province in northeastern Iran, with its center in Mashhad. This Township is located at the longitude of 59° 03′ to 60° 35′ and latitude of 35° 42′ to 36°59′ and in between the Binalud and Hezar Masjed mountain ranges in the Kashaf Rud basin (Figure 1). According to the 2016 census, it has three districts, 11 rural districts, and 379 villages with a population of 360,498 people and 103,657 households. Due to its location in the Binalud and Hezar Masjed mountains, Mashhad Township has a Mediterranean climate that is hot and dry. This Township has an annual evaporation rate of between 1300 and 2800 millimeters. The total annual rainfall in Mashhad Township is 249.42 millimeters and the average monthly rainfall is 20.78 millimeters. The maximum rainfall during the period (1951-2017) was related to June with 54.83 millimeters and the minimum rainfall was also related to November with 0.74 millimeters (Regional Water Company of Khorasan Razavi, 2018).

In this Township, agriculture is considered the main livelihood activity of rural households. The livelihood of most rural households in this area is based on income from agriculture and small-scale handicrafts and processing, the inputs of which are provided by agricultural activities such as farming, horticulture, and animal husbandry. Agriculture in this area depends on the amount and distribution of rainfall. The sudden decrease in rainfall in recent years in the villages of this Township has led to successive droughts in this area. According to the Standardized Precipitation Evapotranspiration Index (SPEI), during the ten years until the end of January 2021, the study area has been in a state of moderate to severe drought, and 89.8% of the area of the Township has been affected by drought (General Meteorological Department of Khorasan Razavi, 2022).

Drought and water scarcity are one of the most important climate changes that Mashhad Township has been dealing with for several years, which in addition to destructive changes on the ecosystem of Khorasan Razavi province and Mashhad Township, has caused significant damage to agriculture, rangelands, and water resources of the Township and as a result agricultural production, livestock, and rural income have decreased. The livelihoods of residents of rural areas of the Township have been threatened by droughts over the past two decades due to a decrease in surface and groundwater resources and the drying up of canals. Water resource constraints and droughts in recent decades and as a result drying up of canals and declining water tables have led to an increase in unauthorized well digging in some villages and as a result severe depletion of groundwater reserves. On the other hand, a lack of precise control and supervision over the desirable use of water resources has created conditions for any exploitative behavior and competitive use of scarce resources especially water in some villages (Ghasemi et al., 2021). Therefore, natural hazards and climate change have increased its vulnerability to disasters in rural areas of Mashhad Township.

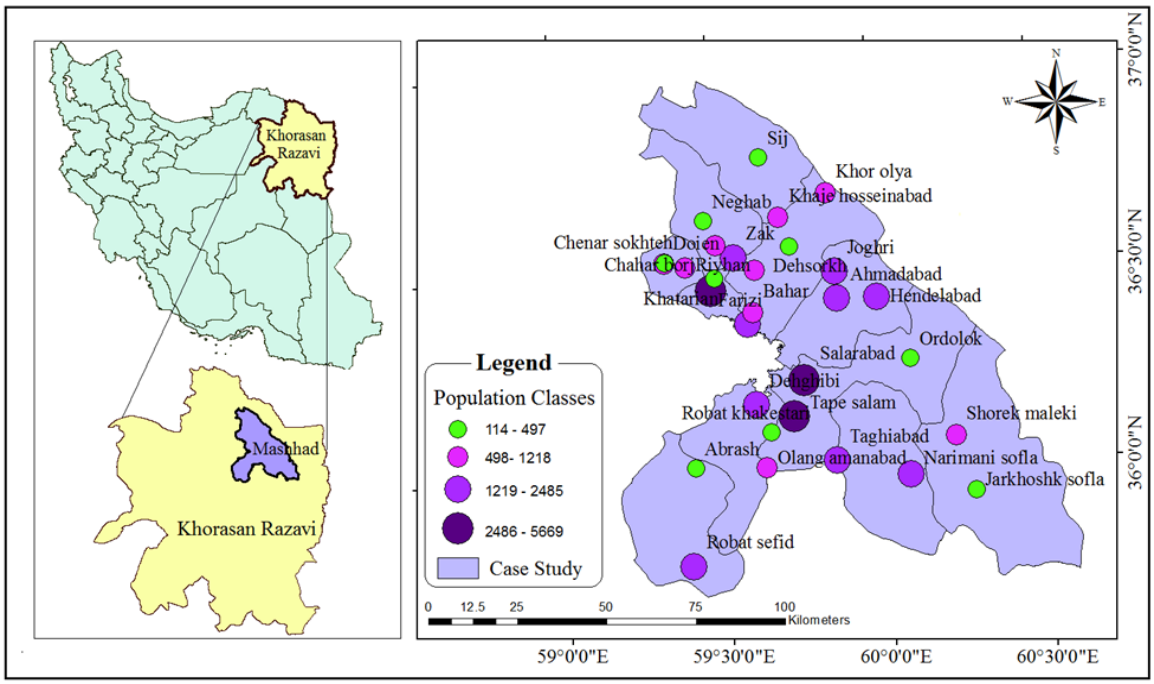

Figure 1. The geographical location of sample villages in the study area

3.2 Research Method

Since the main objective of this research was to reduce the vulnerability and increase the resilience and adaptability of rural households in Mashhad Township against climate change, an attempt has been made to achieve this goal using a descriptive-analytical method and using quantitative methods. In this study, the document method (books, articles, and reports) and field survey (questionnaire and observation) were used to collect information and data. In the library method, with the help of available documents, the theoretical issue was explained. Finally, after extracting a list of research indices and variables (Table 1), in the field study phase, using a questionnaire at the household level in the studied villages within the framework of Likert and in a five-spectrum [very low (1), low (2), medium (3), high (4), very high (5)] was operationalized. The statistical population of this study consists of 11,706 rural households residing in Mashhad Township, which according to the 1395 census of Iran's Statistical Center has a population of 360498 people and 103657 households in rural points and 379 villages with a population, of which 359 villages have more than 3 households and 20 villages have less than 3 households (Statistical Center of Iran, 2016). Due to the vastness and abundance of the number of villages under study, as well as the high costs, 8% or 30 villages were selected for distribution and completion of the questionnaire; and finally, using Cochran's formula, 372 households were selected as the sample size. Sampling from the desired population was done in a multi-stage method. Given that the study area is divided into two groups (plain and mountainous) in terms of location and topography, for this purpose, the frequency of villages in these two groups has been determined through stratified random sampling. Then, using simple random sampling, 15 villages were selected from among plain villages, and 15 villages were selected from among mountainous villages. In the next step, the selected villages from both groups are classified into four small, medium, large, and very large categories, and their share is allocated to them according to the percentage of each share. This means that each of the villages was placed in a class based on population distribution and based on this method, the sample size within each of these classes (villages) was selected. The validity (formal and content) of the questionnaire has been confirmed by a group of specialists in geography and rural planning who had previous experience in similar studies. Also, structural validity and Average Variance Extracted (AVE) index calculation were used. This index shares the average variance between each structure and its

own indices. In simpler terms, the extracted average variance index indicates the correlation between a structure and its own indices, which means that the higher this correlation is, the better the fit is. A pilot study was conducted in the statistical community with 30 questionnaires and using Cronbach's alpha formula, the overall reliability of the questionnaire was obtained as 0.975. Also, composite reliability has been used which according to both reliability statistics had an acceptable value (Table 5). SPSS software and Lisrel (structural equation modeling) were used for data analysis.

Table 1. The indicators of measuring rural livelihood assets

Dimension	Component	Index	Refrence
Financial Capacity	Income	Decrease in income from agriculture, decrease in agricultural income, decrease in income satisfaction, increase in poverty, decrease in income and purchasing power	Alam et al., 2017; Azhdarpoor, 2016; Davoodpur, 2017; Ghayeni Sabegh, 2017
	Employment	Reduced youth employment and job creation, seasonal and permanent unemployment, changing jobs to other jobs or losing jobs, turning to non-traditional jobs (false)	Azhdarpoor, 2016; Davoodpur, 2017; Ghayeni Sabegh, 2017
	Increasing costs and prices of products	decreasing productivity, decreasing the area under cultivation of products, decreasing the performance of agricultural products, decreasing efficiency and production efficiency, declining agricultural farm performance, increasing the price of agricultural production inputs (seeds, fertilizers, etc.), increasing agricultural production costs (buying water, etc.), increasing the price of livestock and agricultural products, increasing animal feed costs, increasing land prices, cost of machinery in production, increasing the price of food production	Azhdarpoor, 2016; Davoodpur, 2017; Ghayeni Sabegh, 2017; Hajian, 2017
	Savings	Reduction of personal savings and reduced satisfaction with savings	Davoodpur, 2017
	Financial resources	Reduced financial capacity to repay loans, delay in repayment of bank loans, reduction in the value of farmers' assets, increase in debt (agricultural loans of farmers) to banks	Davoodpur, 2017; Ghayeni Sabegh, 2017; Hajian, 2017
	Supply, demand, and welfare	Reduced demand for (farmer, livestock or orchardist) daily needs, reduced supply of intermediaries for rural daily needs, impact on rural welfare, increased demand for (farmer, livestock or orchardist) loans and bank facilities from the government	Moradi, 2014
	Investment	Reduced investment in the agriculture sector, reduced investment in the livestock sector, investment in non-agricultural sectors, reduced motivation and tendency of private sector investment in rural areas	Davoodpur, 2017; Ghayeni Sabegh, 2017; Hajian, 2017
Social Capacity	Locality	Reduction of the rural population, evacuation of villages, escape of young people, temporary job migration, seasonal migration for work, permanent migration to the city	khatibi, 2017;Shahraki et al., 2021
	Social participation	Participation and cooperation of people in rural affairs, cohesion and interaction between villages, and solidarity among villagers to protect basic resources such as water and soil	khatibi, 2017; Venot et al., 2010; Davoodpur, 2017
	Social trust	Creating pessimism and dissatisfaction with government organizations	Shahraki et al., 2021
	Social security	Increase in crime due to climate change (floods, droughts, etc.), increase in conflict and differences between local people, conflict and dispute with rural people, crime and insecurity among families	Shahraki et al., 2021; Davoodpur, 2017
	Mental health	Occurrence of mental stress (anxiety, despair) affected by climate change, despair from agricultural activities	Azhdarpoor, 2016; Davoodpur, 2017
	Dependency	Increased dependence of farmers on government support, increase in the population covered by the Relief Committee	Shahraki et al., 2021
Human	Knowledge and	The knowledge and awareness of rural people about the causes of	Davoodpur, 2017

Dimension	Component	Index	Refrence
Capacity	awareness	climate change, knowledge about measures to reduce the effects of climate change, knowledge and awareness of rural people about organizations related to climate change management, awareness of aid agencies and assistance to people in the occurrence of climate change	
	Skill	The skill of rural people in preparing for climate change and its damages, the skill of rural people in managing and behaving properly to cope with climate change and its damages	Davoodpur, 2017
	Education	Dropout and leaving the school of children	Azhdarpoor, 2016
	Health issues and quality of life	Increase and prevalence of various diseases, decrease in quality of life and its impact on health, decrease in health and nutrition level, increase in mortality	Azhdarpoor, 2016; Davoodpur, 2017
Natural Capacity	Land resources	Reduction of farmers' lands, land use change and orchards, lowering groundwater levels, reduction of rangeland and forest vegetation cover, reduction of plant and wildlife biodiversity due to temperature increase, reduction of water flow, the disappearance of the natural beauty of the environment (wetlands), soil quality reduction, the disappearance of wells, reduction in quantity and quality of water	Alam et al., 2017; Stoutenborough & Vedlitz, 2014; Azhdarpoor, 2016; Davoodpur, 2017
	Natural hazards	Flooding in the region, landslides, erosion due to rainfall, drought due to extreme heat, increase in flowing sands	Shahraki et al., 2021; Ghayeni Sabegh, 2017;
	Environmental pollution	Water pollution and salinization of groundwater, soil pollution, and salinization, increase in dust and air pollution	Shahraki et al., 2021
Physical Capacity	Services and facilities	Status of rural roads, electricity lines, telephone, healthy drinking water, public institutions, transportation facilities, access to the market, health facilities	Shahraki et al., 2021
	Housing	Family housing quality, destruction of infrastructure and housing	Shahraki et al., 2021

4. Research Findings

4.1. Demographic Characteristics

Descriptive characteristics of the study sample indicate that out of 372 respondents, 81.7% were men and 18.3% were women. The highest frequency (28.5%) is in the age group of 41 to 50 years. In terms of education level, the highest frequency (29%) of education level was related to respondents with guidance school education. 7.5% of respondents are illiterate, 26.9% are elementary school graduates, 19.9% are diploma holders, and 16.7% have higher education degrees or above. The examination of economic characteristics shows that most of the households under study (50.8%) are simultaneously farmers, gardeners, and livestock breeders as their main occupation. Also, out of all respondents, 69.6% have one to four agricultural land plots. 65.3% of the agricultural lands of the respondents are owned by them. The examination of social characteristics indicates that the average number of household members in the studied rural areas is between five and six people (40.9%).

4.2. Prioritizing the effects of climate change on sustainable livelihood components

To prioritize the effects of climate change on sustainable livelihoods in financial, social, human, natural, and financial livelihoods, the coefficient of changes has been used as a statistic. The results of this section are presented in (Table 2). As the results of the table show, the most significant impact on income and cost increase, product price increase, reduced productivity (production efficiency), and employment has been in financial capital. In social capital, climate change has had an impact on reducing local attachment and increasing dependence on government support; in human capital, it has affected health issues; in natural capital, it has had an impact on reducing and putting pressure on land resources and the occurrence of hazards (floods, landslides, droughts, etc.), and in physical capital, it has had an impact on reducing people's services and facilities.

Table 2. Prioritization of the effects and consequences of climate change on sustainable livelihood indicators
Source: Research findings, 2022

Dimension	Component	Mean	Standard deviation	Coefficient of Variation
Financial Capacity	Income	3.98	0.185	0.74
	Employment	3.90	0.192	0.75
	Increasing costs and Increasing prices of products	3.86	0.189	0.73
	Savings	3.82	0.259	0.99
	Financial resources	3.76	0.244	0.92
	Supply, demand, and welfare	3.75	0.258	0.97
	Investment	3.93	0.226	0.89
Social Capacity	Locality	3.96	0.246	0.97
	Social participation	3.39	0.262	0.89
	Social trust	3.28	0.289	0.95
	Social security	3.49	0.252	0.88
	Mental health	3.88	0.247	0.96
	Dependency	3.73	0.284	1.06
Human Capacity	Knowledge and awareness	3.28	0.289	0.95
	Skill	3.26	0.296	0.72
	Education	2.08	0.346	0.72
	Health issues and quality of life	3.27	0.360	1.18
Natural Capacity	Land resources	4.02	0.174	0.70
	Natural hazards	3.19	0.241	0.77
	Environmental pollution	3.50	0.308	1.08
Physical Capacity	Services and facilities	3.98	0.183	0.73
	Housing	2.96	0.253	0.75

4.3. Analysis of factors affecting the sustainability of rural livelihoods

To examine the validity of the questionnaire structure and the fit of the measurement model related to the structure "The effects of climate change on sustainable livelihoods of rural communities in Mashhad Township", the data collected using Lisrel software were analyzed by confirmatory factor analysis. This method aims to determine whether the number of measured factors is consistent with what was expected based on theoretical and theoretical models. In other words, it tests the degree of conformity and harmony between the variables that make up the empirical research structure and factors. In this stage, second-order factor analysis was used to evaluate the effects of climate change on the sustainable livelihoods of rural communities. Based on the results obtained in (Table 3), the t-values obtained for all variables studied were greater than 1.96, and as a result, the relationships between these variables and their corresponding factors became significant. In other words, the findings of this section show that all selected indicators for measuring the effects of climate change on sustainable livelihoods of rural communities in Mashhad Township have sufficient and necessary accuracy; therefore, it can be said that the indices used to show acceptable conformity with the theoretical basis of research.

Table 3. Factor Loadings of indicators and structural effects of climate change on sustainable rural livelihoods in the form of a measurement model
Source: Research findings, 2022

Dimension	Component	Mean	Factor Loadings	t-value	R^2
Financial Capacity	Income	F1	0.77	-	0.59
	Employment	F2	0.77	15.84	0.60
	Increasing costs and increasing prices of products	F3	0.87	18.22	0.75
	Savings	F4	0.76	15.64	0.58
	Financial resources	F5	0.77	15.73	0.59
	Supply, demand, and welfare	F6	0.76	15.46	0.57

Dimension	Component	Mean	Factor Loadings	t-value	R^2
	Investment	F7	0.72	14.63	0.52
Social Capacity	Locality	SO1	0.98	-	0.96
	Social participation	SO2	0.40	8.21	0.16
	Social trust	SO3	0.40	8.36	0.16
	Social security	SO4	0.57	13.01	0.32
	Mental health	SO5	0.98	15.09	0.96
	Dependency	SO6	0.51	11.19	0.26
Human Capacity	Knowledge and awareness	H1	0.44	-	0.19
	Skill	H2	0.34	3.29	0.18
	Education	H3	0.44	3.79	0.59
	Health issues and quality of life	H4	0.43	5.76	0.19
Natural Capacity	Land resources	N1	0.85	-	0.72
	Natural hazards	N2	0.76	15.82	0.58
	Environmental pollution	N3	0.74	15.28	0.55
Physical Capacity	Services and facilities	P1	0.78	-	0.61
	Housing	P2	0.41	7.88	0.17

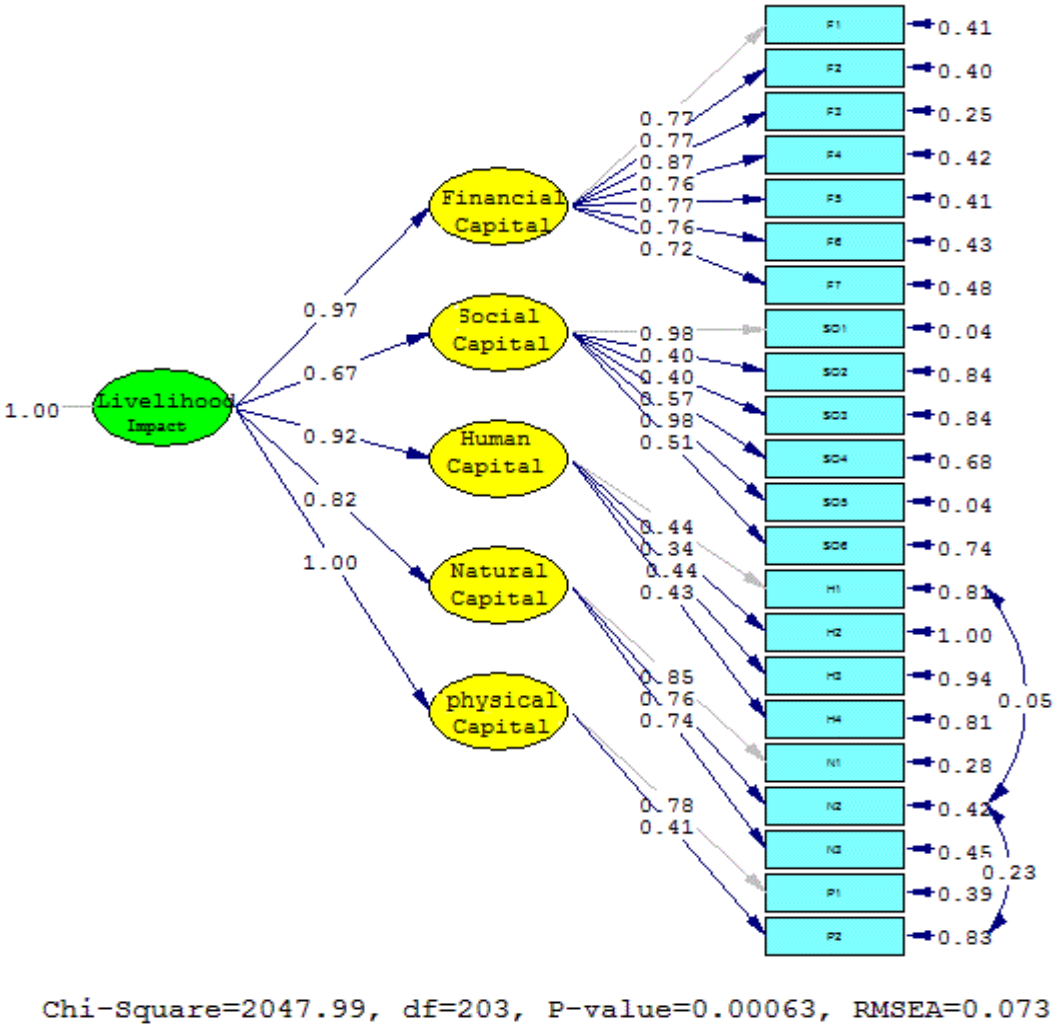

Figure 2. Standardized coefficients of the measurement model components of the effects of climate change on sustainable livelihoods in the standard state

Source: Research findings, 2022

Also, according to the fitness indices shown in the (table 4), it can be stated that the measurement model of the effects of climate change on sustainable livelihoods of rural communities in Mashhad city (Figure 2) is valid and acceptable for fitting the relationships between the indices and their related indicators.

Table 4. Fitness indices of the measurement model of the effects of climate change on sustainable livelihoods of rural communities

Source: Research findings, 2022

Index	X^2/df	RMR	NFI	NNFI	CFI	IFI	GFI	AGFI	RMSEA
Proposed criterion	≤3	≤5	≤0.90	≤0.90	≤0.90	≤0.90	≤0.90	≤0.90	0.08≤
Reported criterion	2.79	0.048	0.91	0.91	0.92	0.92	0.91	0.91	0.073

According to the results obtained from (Table 4), one of the model fitting indices is the Root Mean Square Error of Approximation (RMSEA). The proposed criterion for this index is less than or equal to 0.08. In the present model, this index is equal to 0.073, which indicates a good fit of the study model with the observed data. Another index is Goodness-of-Fit Index (GFI) and the Adjusted Goodness-of-Fit Index (AGFI). The closer these indices are to one, the better the fit of the model is, which in this case is 0.91. Also, the ratio of chi-square to degrees of freedom (X2/df= 2.79) is less than 3, indicating an excellent fit of the measurement model with the observed data. Other fitting indices also indicate a good and excellent fit of the model. Therefore, according to the results obtained, it can be said that the overall fit of the measurement model is desirable and compatible with the data used. In other words, the quality of the overall fit of the measurement model is desirable. As shown in (Figure 3) and (Table 5), the significant part of the coefficients and parameters obtained shows the measurement model of climate change effects on sustainable livelihoods of rural communities in Mashhad city. If a significant number is greater than 1.96 or less than -1.96, then there will be a significant relationship in the research model. Figure 4 shows that all relationships are significant and all hypotheses are confirmed. Therefore, it can be said that climate change components explain a significant part of the structure of sustainable rural livelihoods studied and prioritize first to fifth in explaining this structure.

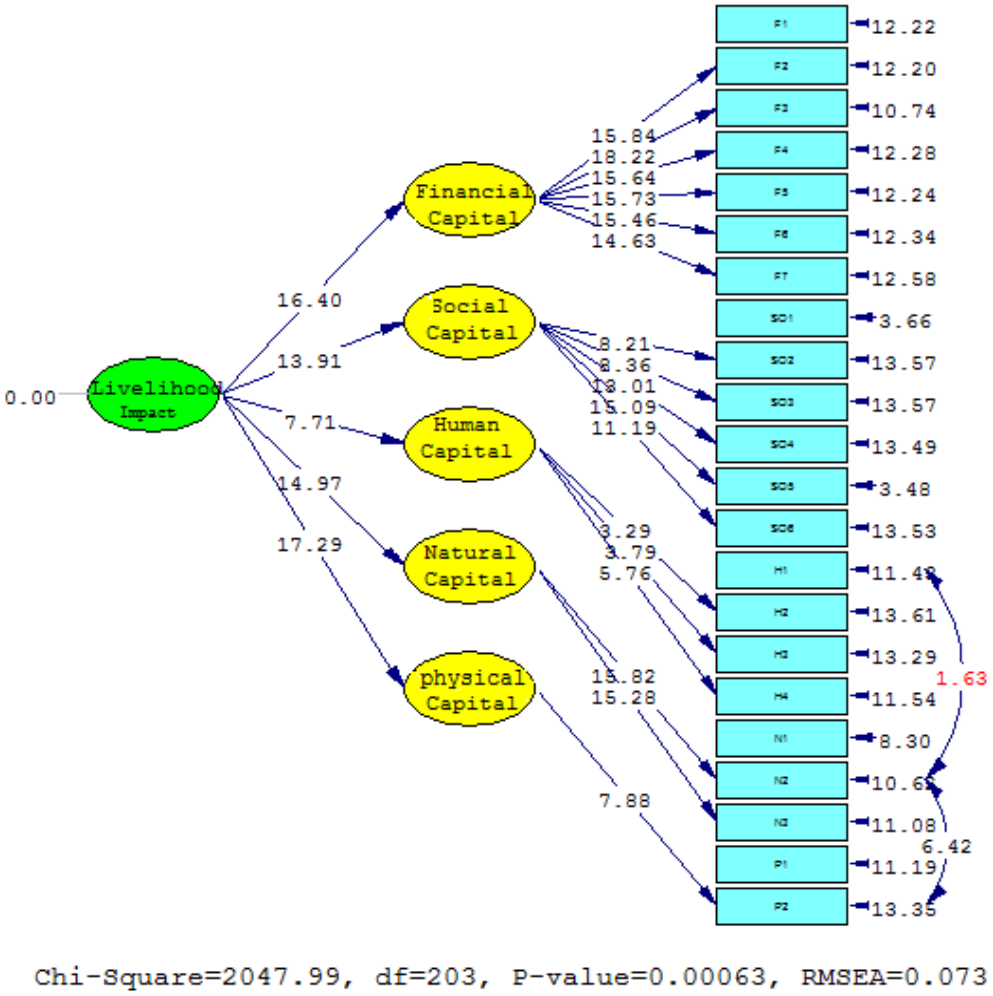

Figure 3. Measurement model of the components of the effects of climate change on sustainable livelihoods of rural communities in a significant state
Source: Research findings, 2022

In (Table 5), the standardized loading value of the effect indicators and their significance level are shown based on the t-value in the second-order confirmatory factor analysis. According to the results presented in (Table 5), it can be seen that all indicators (indices) have a t-value higher than 1.96. Also, the results of this table show that for the structure of effects, indices a, CR, and AVE have an appropriate and acceptable values. Therefore, it can be stated that all selected indices for measuring the effects of climate change on sustainable livelihoods are accurate enough and have sufficient validity and reliability.

Table 5. Standardized factor loading values and significance level of effect indicators.
Source: Research findings, 2022

Structure	Index	Standard coefficient	T	R^2	A	CR	AVE
Effects	Financial Capital	0.97	**16.40	0.94	0.95	0.98	0.71
	Social Capital	0.67	**13.91	0.46	0.92	0.95	0.61
	Human Capital	0.92	**7.71	0.84	0.71	0.74	0.56
	Natural Capital	0.82	**14.97	0.67	0.92	0.96	0.66
	Physical Capital	1.00	**17.29	1.00	0.74	0.78	0.70

5. Discussion and conclusion

Sustainable livelihoods is a new approach to rural development that examines the factors and relationships that affect rural livelihoods. This approach helps individuals cope with the stresses, shocks, and damages caused by climate change, which vary in different regions. Climate change as a background for damaging the sustainability of regional livelihoods weakens an asset or capital such as financial assets and provides the conditions for weakening other capital and assets of rural households in the region as well. This research was conducted with the main objective of explaining the effects and consequences of climate change on rural households' livelihoods and in addition to achieving this important goal, expanding theoretical knowledge and using it to analyze the level of sustainability of rural residents' livelihoods in Mashhad Township in the face of climate change, it achieved the following results.

The occurrence of climate change has affected the livelihood assets of rural people as the main core of livelihood sustainability. The results of this study indicate that climate change has had effects on the financial, social, human, natural, and physical capital of local communities. According to the statistics of the coefficient of climate change in financial capital, it has had the greatest impact on income and cost increases and product prices, reduced productivity, and employment. Climate change harms social capital by reducing spatial attachment and increasing dependence on government support, on human capital by health issues, on natural capital by reducing and putting pressure on land resources and the occurrence of hazards (floods, landslides, droughts, etc.), and on physical capital by reducing services and facilities for people. Climate change has led to a shortage of water resources for rural people in the region whose livelihoods depend on agriculture and animal husbandry; therefore, the reduction of water resources in this area has had a significant negative impact on agricultural production. With the reduction in agricultural production due to various reasons such as (changes in precipitation patterns, cold patterns, etc., water scarcity and droughts, and prevalence and spread of various pests and diseases), household income and savings, as well as an investment, have also decreased. In addition, it has led to an increase in demand for receiving credits and loans. In this process, households that receive loans are unable to pay monthly installments and become indebted households. This has led many rural households to face food insecurity and household heads are forced to engage in false activities and employment to meet their livelihoods and living expenses. These cases lead to greater dissatisfaction and harder living conditions for rural people and as a result, their temporary and permanent migration to cities increases which itself causes more problems in cities such as marginalization. Therefore, with the reduction of income and power, and production capacity in rural areas, the motivation for permanent migration to other areas or seasonal migration has increased more and some villages are practically dormitories and others are not producers. Because villages have been transformed from places of production to places of dormitory or consumption. On the other hand, due to various problems that threaten the production, life, income, and economy of rural people, each individual is looking for a solution to their problem and pays less attention to group work and solving rural problems cooperatively, and individualism has prevailed over group work.

In the field of natural capital, the occurrence of hazards such as floods and successive droughts in this area has led to a decrease in soil quality, soil erosion, and consequently, the destruction of pastures and a decrease in plant and animal diversity. Therefore, the reduction of vegetation cover leads to an increase in fine particles (which harms agricultural production), soil erosion, and a decrease in rainfall retention and its conversion into floods and the destruction of agricultural lands, production, and income. In addition, cultivated lands are now left uncultivated due to climate change (drought, water scarcity, etc.) without use, and the area under cultivation has decreased. These factors and the above factors have disrupted the education of children and the decline and cessation of students' education, the prevalence of child labor, and disruption of access to health and educational services, etc. in rural areas of this region; These factors have in turn led to a decrease in the quality of life in the studied villages. In other words, with the reduction of income, healthy nutrition, and health care are also seriously threatened by various diseases that

reduce human productivity. Riahi & Pashazadeh (2014) have stated that the economic damages caused by reduced income and savings, changes in rural employment structure, increased tendency to migrate, and reduced livestock and agricultural production are among the economic damages caused by reduced rainfall and drought.

According to the results obtained, it can be said that the overall fit of the model for measuring the effects and consequences of climate change on the livelihoods of rural people was desirable and compatible with the data used; In other words, the overall fit of the research measurement model is desirable. As observed, the results of the study showed that based on the values of factor analysis indices obtained from field data among the indices examined, although climate change has had an impact on all five dimensions of rural livelihoods; but among them, physical capital and then financial and natural capital were the most affected. Natural capital is the main source for creating livelihoods in rural societies, which can maintain their livelihoods. This finding is consistent with part of the results of the study Ahmadi & Manoochehri (2020)**.** The results Timalsina (2007) showed that physical capital enables households to have quick access to markets and makes it possible to improve their livelihoods. Educational and health services reduce rural costs and eliminate the need to go to urban areas. Sojasi Ghidari et al., (2016) Also, believe that physical capital is one of the most important resources for creating community capacity for sustainable livelihood development. Physical infrastructure such as roads, bridges, dams, and anchors along with communication and transportation systems are necessary to create proper structures in society, especially in facilitating the process of using capacities and other assets available in rural environments. The lack of physical infrastructure or vital facilities may negatively affect the capacity to use other livelihood assets. Financial capital enables people to continue their livelihoods. Usually, tangible financial assets are considered the most tangible assets of local communities, and any damage to them should be considered important. Accordingly, one of the most important aspects affecting the sustainability of rural livelihoods is their access to financial capital, which has affected their livelihoods in various dimensions and its absence can lead to instability in rural livelihoods, which results in increased vulnerability and poverty in rural communities. Shahraki et al., (2021) In their research, they found that the greatest change in sustainable livelihoods was related to financial and physical capital, and the least change was related to social and natural capital Badko et al., (2020) They also found that due to vulnerability in various fields in recent years, physical, financial and natural assets have decreased and human and social assets have increased.

In addition, Zacarias (2018) found in his research that the impact of local community livelihoods of climate change is more related to financial, physical, and social capital. Economic and physical assets have a greater impact on the sustainable livelihoods of rural residents. This is while according to the findings, natural and social capital have also been affected by climate. The recent finding is that research Ghorbani et al., (2019) and Sojasi Ghidari et al., (2016) have shown that social capital has the greatest impact on the livelihood adaptation of watershed residents compared to other assets. Because a significant portion of rural livelihoods are affected by social dependencies, social unity, social cohesion, social security, social participation, etc., which directly and indirectly affect rural livelihoods; And a rural area that lacks social capital does not have a conceptual financial asset or adequate security for operation and use. In addition, Mitra (2008) believes that social capital is the most important livelihood capital and without it, access to other resources is almost impossible. The findings of this study also indicate that climate change had the least impact on the human capital of the households studied. In rural areas, human resources give identity and vitality to rural environments and provide their livelihoods in rural areas through methods of land use that are commensurate with the integration of indigenous and modern knowledge. The method, type, and intensity of human exploitation of other assets and their combination are indicative of the sustainability or unsustainability of livelihoods in rural environments. This finding is consistent with the results of Shahraki et al., (2022) and Sojasi Ghidari et al., (2016)**.** According to the findings of this study, it is recommended that planners and policymakers pay special attention to the relationship between the economic situation of rural households and meteorological parameters to

improve, upgrade, and sustain the livelihoods of rural communities. To improve and restore the livelihoods of rural households and make their livelihoods compatible with climate change, priority should be given to those livelihood assets that have been most affected by climate change. Climate change has led to a decrease in the physical, financial, and natural capital of rural residents in the region, which has lowered their level of livelihood sustainability. Therefore, measures should be taken to provide the necessary financial resources for rural residents and protect the environment. Additionally, to enhance the economic capacity and increase the financial power of rural residents, production cooperatives such as carpet weaving workshops and handicraft industries should be established in the region.

Acknowledgments

The current paper is extracted from the doctoral dissertation of the first author (Mehri Jahansoozi) in geography and rural planning, University of Zanjan, Zanjan, Iran.

Authors' contributions

The authors equally contributed to the preparation of this article.

Conflict of interest

The authors declare no conflict of interest.

References

1. Aggarwal, P., & Singh, A. (2010). *Implications of global climatic change on water and food security*. https://link.springer.com/chapter/10.1007/978-3-642-04615-5_3
2. Ahmadi, a., & Manoochehri, s. (2020). An Analysis of the Impact of Environmental Risks (Drought) on Rural Sustainability (Case Study: Villages of Qaenat County). *Geography and Development, 18*(58), 175-202. [In Persian] doi:10.22111/gdij.2020.5367
3. Alam, G. M., Alam, K., & Mushtaq, S. (2017). Climate change perceptions and local adaptation strategies of hazard-prone rural households in Bangladesh. *Climate Risk Management, 17*, 52-63. https://doi.org/10.1016/j.crm.2017.06.006
4. Amoah, L. N. A., & Simatele, M. D. (2021). Food security and coping strategies of rural household livelihoods to climate change in the eastern cape of South Africa. *Frontiers in Sustainable Food Systems, 5*, 692185. https://doi.org/10.3389/fsufs.2021.692185
5. Aryal, K., Thapa, P. S., & Lamichhane, D. (2019). Revisiting agroforestry for building climate resilient communities: a case of package-based integrated agroforestry practices in Nepal. *Emerging science journal*, *3*(5), 303-311. http://dx.doi.org/10.28991/esj-2019-01193
6. Awazi, N. P., & Quandt, A. (2021). Livelihood resilience to environmental changes in areas of Kenya and Cameroon: a comparative analysis. *Climatic Change, 165*(1-2), 33. https://link.springer.com/ article/ 10.1007/ s10584-021-03073-5
7. Azhdarpoor, A. (2016). *Investigating rural people's perceptions of climate changes and adaptation strategies in Zabol county.* (degree of M.Sc.), Gorgan University of Agricultural Sciences and Natural Resources. [In Persian]
8. Babae, M., Jalalian, H., & Afrakhtehh, H. (2021). Rural livelihood resilience (a case study of villages around Lake Urmia within the city of Urmia). *Geography and Planning, 25*(77), 1-15. [In Persian] doi:10.22034/gp.2021.41837.2708
9. Badko, B., Ghasemi Siani, M., Ranjbaraki, A., Shambiati, M. H., & Shakiba, A. (2020). Assessing the Livelihood Capital of Mountainous Villages with a Sustainable Livelihood Approach (Case study: Kouhshah Rural District, Ahmadi District -Hormozgan). *Geographical Studies of Mountainous Areas, 1*(3), 53-65. [In Persian] doi:10.29252/gsma.1.3.53
10. Bauer, T., de Jong, W., Ingram, V., Arts, B., & Pacheco, P. (2022). Thriving in turbulent times: Livelihood resilience and vulnerability assessment of Bolivian Indigenous forest households. *Land Use Policy, 119*, 106146. https://doi.org/10.1016/j.landusepol.2022.10614
11. Bhattacharjee, K., & Behera, B. (2018). Determinants of household vulnerability and adaptation to floods: Empirical evidence from the Indian State of West Bengal. *International Journal of Disaster Risk Reduction, 31*, 758-769. https://doi.org/10.1016/j.ijdrr.2018.07.017

12. Carr, E. R. (2020). Resilient livelihoods in an era of a global transformation. *Global Environmental Change, 64*, 102155. https://doi.org/10.1016/j.gloenvcha.2020.102155
13. Chand, S., & Kumar, D. (2018). Farmers Perception on Climate Change and Its Management Strategies: A Micro Analysis of Rajasthan. *Indian research journal of extension education, 18*(3), 49-56. https://www.cabidigitallibrary.org/doi/full/10.5555/20183229996
14. Chen, F., Xu, H., & Lew, A. A. (2020). Livelihood resilience in tourism communities: The role of human agency. *Journal of Sustainable Tourism, 28*(4), 606-624. https://doi.org/10.1080/09669582.2019.1694029
15. Chen, J., Yin, S., Gebhardt, H., & Yang, X. (2018). Farmers' livelihood adaptation to environmental change in an arid region: A case study of the Minqin Oasis, northwestern China. *Ecological Indicators, 93*, 411-423. https://doi.org/10.1016/j.ecolind.2018.05.017
16. Chitongo, L. (2019). Rural livelihood resilience strategies in the face of harsh climatic conditions. The case of ward 11 Gwanda, South, Zimbabwe. *Cogent Social Sciences, 5*(1), 1617090. https://doi.org/10.1080/23311886.2019.1617090
17. Davoodpur, M. (2017). *Analysis of capacity, resiliency and Social _ Economic Resilience and Vulnerability of Farmers to Confronting Drought, Case Study: Bijar township, Najafabad district.* (Master's Thesis), University of Zanjan. [In Persian]
18. De Silva, M., & Kawasaki, A. (2018). Socioeconomic vulnerability to disaster risk: a case study of flood and drought impact in a rural Sri Lankan community. *Ecological Economics, 152*, 131-140. https://doi.org/10.1016/j.ecolecon.2018.05.010
19. Fang, Y.-p., Fan, J., Shen, M.-y., & Song, M.-q. (2014). Sensitivity of livelihood strategy to livelihood capital in mountain areas: Empirical analysis based on different settlements in the upper reaches of the Minjiang River, China. *Ecological Indicators, 38*, 225-235. https://doi.org/10.1016/j.ecolind.2013.11.007
20. Gautam, Y. (2017). Seasonal migration and livelihood resilience in the face of climate change in Nepal. *Mountain Research and Development, 37*(4), 436-445. https://doi.org/10.1659/MRD-JOURNAL-D-17-00035.1
21. General Meteorological Department of Khorasan Razavi, S. S. o. t. M. O. a. R. S. M. o. E. (2022). Retrieved from. [In Persian] https://razavimet.ir/fa/node/35.
22. Ghasemi, M., Alizade, l., & Soheili far, H. (2021). Identifying the optimal strategies for managing agricultural water resources for small-scale farmers (a case study of Darzab village, Mashhad County). *Agricultural Economics Research, 13*(2), 81-108. [In Persian] Jae.marvdasht.iau.ir
23. Ghayeni Sabegh, H. (2017). *investigating farmers' awareness of climate change and applying its adaptation option adaptability to it(case study: farmers of south Khorasan province, Nnehbandan county).* (BU-Ali Sina University), BU-Ali Sina University. (Graduate Studies Thesis\Dissertation Information) [In Persian]
24. Ghorbani, M., Taghipour, S. M., Khalighi Sigaroodi, S., & Alambaigi, A. (2019). Measuring and Prioritizing the Dimensions of Stakeholder's Adaptive Capacity Against Climate Change – Case Study: East of Gonabad Township, Khorasan Razavi Province. *Journal of Range and Watershed Management, 72*(2), 543-556. [In Persian] doi:10.22059/jrwm.2018.246184.1192
25. Gong, Y., Yao, K., Zhang, R., Liu, B., & Wang, F. (2021). Rethinking livelihood resilience after development-induced displacement and resettlement: a case study of Qianping Reservoir. *International Journal of Water Resources Development, 37*(5), 841-864. https://doi.org/10.1080/ 07900627.2020. 1790340
26. Hajian, N. (2017). *The role of diversity of economic activities (agronomic and non-agricultural) in vulnerability and resilience of rural households in the face of drought (Case study area: Chenaran County).* (Master's Thesis), Ferdowsi University of Mashhad. [In Persian]
27. Harvey, C. A., Saborio-Rodríguez, M., Martinez-Rodríguez, M. R., Viguera, B., Chain-Guadarrama, A., Vignola, R., & Alpizar, F. (2018). Climate change impacts and adaptation among smallholder farmers in Central America. *Agriculture & Food Security, 7*(1), 1-20. https://doi.org/10.1186/s40066-018-0209-x
28. Hua, X., Yan, J., & Zhang, Y. (2017). Evaluating the role of livelihood assets in suitable livelihood strategies: Protocol for anti-poverty policy in the Eastern Tibetan Plateau, China. *Ecological Indicators, 78*, 62-74. https://doi.org/10.1016/j.ecolind.2017.03.009

29. Ikhuoso, O. A., Adegbeye, M., Elghandour, M., Mellado, M., Al-Dobaib, S., & Salem, A. (2020). Climate change and Agriculture: The competition for limited resources amidst crop farmers-livestock herding conflict in Nigeria-A review. *Journal of cleaner production, 272*, 123104. https://doi.org/10.1016/j.jclepro.2020.123104
30. Jacquet, P. O., Wyart, V., Desantis, A., Hsu, Y.-F., Granjon, L., Sergent, C., & Waszak, F. (2018). Human susceptibility to social influence and its neural correlates are related to perceived vulnerability to extrinsic morbidity risks. *Scientific reports, 8*(1), 13347. https://doi.org/10.1038/s41598-018-31619-8
31. Jamshidi, O., Asadi, A., Kalantari, K., Azadi, H., & Scheffran, J. (2019). Vulnerability to climate change of smallholder farmers in the Hamadan province, Iran. *Climate Risk Management, 23*, 146-159. https://doi.org/10.1016/j.crm.2018.06.002
32. Karim, M. R., & Thiel, A. (2017). Role of community-based local institution for climate change adaptation in the Teesta riverine area of Bangladesh. *Climate Risk Management, 17*, 92-103. https://doi.org/10.1016/j.crm.2017.06.002
33. Khan, N. A., Qiao, J., Abid, M., & Gao, Q. (2021). Understanding farm-level cognition of and autonomous adaptation to climate variability and associated factors: Evidence from the rice-growing zone of Pakistan. *Land Use Policy, 105*, 105427. https://doi.org/10.1016/j.landusepol.2021.105427
34. khatibi, S. A. (2017). *Assessment Of Watershed Management Projects And Villagers' Resilience To Drought.* (MSc Thesis), Ferdowsi University of Mashhad. [In Persian]
35. Kien, N. V. (2011). Social capital, livelihood diversification and household resilience to annual flood events in the Vietnamese Mekong River Delta. *EEPSEA research report series/IDRC. Regional Office for Southeast and East Asia, Economy and Environment Program for Southeast Asia; no. 2011-RR10.* http://hdl.handle.net/10625/48825
36. Kuang, F., Jin, J., He, R., Wan, X., & Ning, J. (2019). Influence of livelihood capital on adaptation strategies: Evidence from rural households in Wushen Banner, China. *Land Use Policy, 89*, 104228. https://doi.org/10.1016/j.landusepol.2019.104228
37. Li, X., & Shi, X. (2022). Smallholders' Livelihood Resilience in the Dryland Area of the Yellow River Basin in China from the Perspective of the Family Life Cycle: Based on GeoDetector and LMG Metric Model. *Land, 11*(9), 1427. https://doi.org/10.3390/land11091427
38. Liu, Y., & Xu, Y. (2016). Geographic identification of multidimensional poverty in rural China under the framework of sustainable livelihoods analysis. *Applied Geography, 73*, 62-76. https://doi.org/10.1016/j.apgeog.2016.06.004
39. Mashizha, T. M., Ncube, C., Dzvimbo, M. A., & Monga, M. (2017). EXAMINING THE IMPACT OF CLIMATE CHANGE ON RURAL LIVELIHOODS AND FOOD SECURITY: EVIDENCE FROM SANYATI DISTRICT IN MASHONALAND WEST, ZIMBABWE. *Journal of Asian and African Social Science and Humanities, 3*(2), 56-68. http://wwww.researchgate.net
40. Masud, M. M., Azam, M. N., Mohiuddin, M., Banna, H., Akhtar, R., Alam, A. F., & Begum, H. (2017). Adaptation barriers and strategies towards climate change: Challenges in the agricultural sector. *Journal of cleaner production, 156*, 698-706. https://doi.org/10.1016/j.jclepro.2017.04.060
41. Mekuriaw, S., Mengistu, A., & Tegegne, F. (2019). Livestock technologies and grazing land management Options for climate change adaption and mitigation as a contribution for food security in Ethiopia: A brief overview. *Climate Change-Resilient Agriculture and Agroforestry: Ecosystem Services and Sustainability*, 383-396. https://link.springer.com/chapter/10.1007/978-3-319-75004-0_22
42. Menike, L., & Arachchi, K. K. (2016). Adaptation to climate change by smallholder farmers in rural communities: Evidence from Sri Lanka. *Procedia food science, 6*, 288-292. https://doi.org/10.1016/j.profoo.2016.02.057
43. Mitra, A. (2008). Social capital, livelihood, and upward mobility. *Habitat International, 32*(2), 261-269. https://doi.org/10.1016/j.habitatint.2007.08.006
44. Mkuna, E., Baiyegunhi, L., & Adamus, W. (2020). Sustainable livelihood alternatives among Nile perch (Lates niloticus) fishers in Lake Victoria Tanzania: analytical hierarchy process (AHP) approach. *Journal of Economic Structures, 9*(1), 1-18. https://journalofeconomicstructures.springeropen.com/ articles/ 10.1186/ s40008-020-00206-4

45. Mohammadi, S., & Manoochehri, S. (2019). An analysis of the relationship between Livability and Resilience of rural communities (Case Study: Rural villages of Marivan County). *Spatial Planning, 8*(4), 89-110. [In Persian] doi:10.22108/sppl.2018.110922.1207
46. Moradi, O. (2014). *Climate Change Impacts on Social and economical condition at the watershed scale (A Case Study: Sanandaj city)*. (Degree of Master of Sciences (MSc)), University of Kashan. [In Persian]
47. Morse, S., & McNamara, N. (2013). *Sustainable livelihood approach: A critique of theory and practice*: Springer Science & Business Media.
48. Motsholapheko, M., Kgathi, D., & Vanderpost, C. (2011). Rural livelihoods and household adaptation to extreme flooding in the Okavango Delta, Botswana. *Physics and Chemistry of the Earth, Parts A/B/C, 36*(14-15), 984-995. https://doi.org/10.1016/j.pce.2011.08.004
49. Nagasha, J. I., Mugisha, L., Kaase-Bwanga, E., Onyuth, H., & Ocaido, M. (2019). Effect of climate variability on gender roles among communities surrounding Lake Mburo National Park, Uganda. *Emerald Open Research, 1*, 7. https://doi.org/10.12688/emeraldopenres.12953.2
50. Nasrnia, F., & Ashktorab, N. (2021). Sustainable livelihood framework-based assessment of drought resilience patterns of rural households of Bakhtegan basin, Iran. *Ecological Indicators, 128*, 107817. https://doi.org/10.1016/j.ecolind.2021.107817
51. Nyiwul, L. (2021). Climate change adaptation and inequality in Africa: Case of water, energy and food insecurity. *Journal of cleaner production, 278*, 123393. https://doi.org/10.1016/j.jclepro.2020.123393
52. Pagnani, T., Gotor, E., & Caracciolo, F. (2021). Adaptive strategies enhance smallholders' livelihood resilience in Bihar, India. *Food Security, 13*, 419-437. https://link.springer.com/article/10.1007/s12571-020-01110-2
53. Pandey, R., Jha, S. K., Alatalo, J. M., Archie, K. M., & Gupta, A. K. (2017). Sustainable livelihood framework-based indicators for assessing climate change vulnerability and adaptation for Himalayan communities. *Ecological Indicators, 79*, 338-346. https://doi.org/10.1016/j.ecolind.2017.03.047
54. Pelletier, B., Hickey, G. M., Bothi, K. L., & Mude, A. (2016). Linking rural livelihood resilience and food security: an international challenge. *Food Security, 8*, 469-476. https://link.springer.com/ article/10.1007/ s12571-016-0576-8
55. Poudel, S., Funakawa, S., Shinjo, H., & Mishra, B. (2020). Understanding households' livelihood vulnerability to climate change in the Lamjung district of Nepal. *Environment, Development and Sustainability, 22*, 8159-8182. https://link.springer.com/article/10.1007/s10668-019-00566-3
56. Priyadarshi, S., Ojha, S., & Sharma, A. (2019). An Assessment of Vulnerability of Fishers' Livelihood to Climate Change in Coastal Odisha, India. *Current World Environment, 14*(1), 60. http://dx.doi.org/10.12944/CWE.14.1.08
57. Quandt, A. (2018). Measuring livelihood resilience: The household livelihood resilience approach (HLRA). *World Development, 107*, 253-263. https://doi.org/10.1016/j.worlddev.2018.02.024
58. Quandt, A., Neufeldt, H., & McCabe, J. T. (2017). The role of agroforestry in building livelihood resilience to floods and drought in semiarid Kenya. *Ecology and Society, 22*(3). https://www.jstor.org/ stable/26270151
59. Quandt, A., Neufeldt, H., & McCabe, J. T. (2019). Building livelihood resilience: what role does agroforestry play? *Climate and Development, 11*(6), 485-500. https://doi.org/10.1080/ 17565529.2018. 1447903
60. Regional Water Company of Khorasan Razavi. (2018) [In Persian]
61. Regional Water Company of Khorasan Razavi. (2023) [In Persian]
62. Riahi, V., & Pashazadeh, A. (2014). Economic and social impacts of drought on rural areas in Germi (Case study: Rural district of Azadlu). *Journal of Studies of Human Settlements Planning, 8*(25), 17-37. [In Persian] https://sanad.iau.ir/journal/jshsp/Article/513799?jid=513799
63. Sadeghlo, T., & Khirabadi, H. (2020). Analysis of the effects of drought on the resilience of rural livelihoods (Study Area: Barakouh, Mazhan, and Khosf rural districts of Khosf County). *Journal of Great Khorasan, 10*(37), 104-187. [In Persian] https://jgk.imamreza.ac.ir/article_137951.html

64. Sahneh, B., & Sadin, H. (2022). Mining Businesses' Role in Improving Sustainable Livelihoods of Rural Households in Azadshahr County. *Geography, 19*(71), 89-107. [In Persian] https://mag.iga.ir/article_248859.html
65. Sarker, M. N. I., Cao, Q., Wu, M., Hossin, M., Alam, G. M., & Shouse, R. C. (2019). Vulnerability and livelihood resilience in the face of natural disaster: a critical conceptual. *Appl. Ecol. Environ. Res, 17*, 12769-12785. http://dx.doi.org/10.15666/aeer/1706_1276912785
66. Sarker, M. N. I., Wu, M., Alam, G. M., & Shouse, R. C. (2020). Livelihood resilience of riverine island dwellers in the face of natural disasters: Empirical evidence from Bangladesh: Elsevier. https://doi.org/10.1016/j.landusepol.2020.104599
67. Saxena, A., Guneralp, B., Bailis, R., Yohe, G., & Oliver, C. (2016). Evaluating the resilience of forest-dependent communities in Central India by combining the sustainable livelihoods framework and the cross-scale resilience analysis. *Current Science*, 1195-1207. https://www.jstor.org/stable/24908009
68. Seyed Akhlaghi Shal, S. J. (2019). *Rural Resilience Assessment in Hablehrood Basin With an emphasis on drought.* (Degree of Ph.D.), Payame Noor University. [In Persian]
69. Shaffril, H. A. M., Krauss, S. E., & Samsuddin, S. F. (2018). A systematic review on Asian farmers' adaptation practices towards climate change. *Science of the total Environment, 644*, 683-695. https://doi.org/10.1016/j.scitotenv.2018.06.349
70. Shah, K. U., Dulal, H. B., Johnson, C., & Baptiste, A. (2013). Understanding livelihood vulnerability to climate change: Applying the livelihood vulnerability index in Trinidad and Tobago. Geoforum, 47, 125-137.https://doi.org/10.1016/j.geoforum.2013.04.004
71. Shahraki, M. R., Abedi Sarvestani, A., & Lotfi, A. (2021). Awareness of villagers about the occurrence of signs of climate change and its relationship with sustainable livelihoods of local communities (Case study: Oghan Watershed in Golestan province). *Iranian Journal of Range and Desert Research, 28*(1), 138-150. [In Persian] doi:10.22092/ijrdr.2021.123883
72. Shahraki, M. R., Abedi Sarvestani, A., & Lotfi, A. (2022). Livelihood vulnerability of villagers to climate change: the case of Oghan Watershed in Golestan Province. *Watershed Engineering and Management, 14*(1), 89-101. [In Persian] doi:10.22092/ijwmse.2021.354072.1889
73. Shakoori, A., & Bahrami, S. (2014). A Study of the Rural Tourism Impact on Poverty Reduction Using a Sustainable Livelihood Perspective (Villages of Glaehnou and Galin in Rey County). *Community Development (Rural and Urban Communities), 6*(1), 1-24. [In Persian] doi:10.22059/jrd.2014.52069
74. Sharafi, Z., Nooripour, M., & Karamidehkordi, E. (2018). Assessing Livelihood Capitals and their Sustainability in Rural Households (the Case of the Central District of Dena County). *Iranian Agricultural Extension and Education Journal, 13*(2), 51-70. [In Persian] https://www.cabdirect.org/cabdirect/abstract/20193131734
75. Shekari, F., Ziaee, M., Faghihi, A., & Jomehpour, M. (2022). Nomadic livelihood resilience through tourism. *Annals of Tourism Research Empirical Insights, 3*(1), 100034. https://doi.org/10.1016/j.annale.2022.100034
76. Sina, D., Chang-Richards, A. Y., Wilkinson, S., & Potangaroa, R. (2019). A conceptual framework for measuring livelihood resilience: Relocation experience from Aceh, Indonesia. *World Development, 117*, 253-265. https://doi.org/10.1016/j.worlddev.2019.01.003
77. Sojasi Ghidari, H., Sadeqlu, T., & Shakourifard, E. (2016). Measuring the Livelihood Properties in Rural Areas Using a Sustainable Livelihood Approach (Case Study: Rural Areas of Taybad County). *Journal of Research and Rural Planning, 5*(1), 197-215. [In Persian] doi:10.22067/jrrp.v5i1.48257
78. Statistical Center of Iran. (2016), *Statistical yearbook, Khorasan Razavi Province*, Tehran. [In Persian] https://www.amar.org.ir
79. Stoutenborough, J. W., & Vedlitz, A. (2014). The effect of perceived and assessed knowledge of climate change on public policy concerns: An empirical comparison. *Environmental Science & Policy, 37*, 23-33. https://doi.org/10.1016/j.envsci.2013.08.002
80. Timalsina, K. P. (2007). Rural-Urban Migration and Livelihood in the informal sector. *Master of Philosophy Thesis in Development Studies, Faculty of Social Science and technology management. Norwegian University of Science and Technology.* Website: www. divaportal. org/diva/getDocument.

81. Venot, J.-P., Reddy, V. R., & Umapathy, D. (2010). Coping with drought in irrigated South India: Farmers' adjustments in Nagarjuna Sagar. *Agricultural Water Management, 97*(10), 1434-1442. https://doi.org/10.1016/j.agwat.2010.04.009
82. Wang, N., Gao, Y., Wang, Y., & Li, X. (2016). Adoption of eco-friendly soil-management practices by smallholder farmers in Shandong Province of China. *Soil Science and Plant Nutrition, 62*(2), 185-193. https://doi.org/10.1080/00380768.2016.1149779
83. Wang, Y., Zhang, Q., Li, Q., Wang, J., Sannigrahi, S., Bilsborrow, R., . . . Song, C. (2021). Role of social networks in building household livelihood resilience under Payments for ecosystem services programs in a poor rural community in China. *Journal of Rural Studies, 86*, 208-225. https://doi.org/10.1016/j.jrurstud.2021.05.017
84. Wei, J., Hansen, A., Zhang, Y., Li, H., Liu, Q., Sun, Y., & Bi, P. (2014). Perception, attitude, and behavior in relation to climate change: a survey among CDC health professionals in Shanxi province, China. *Environmental Research, 134*, 301-308. https://doi.org/10.1016/j.envres.2014.08.006
85. Zacarias, D. A. (2018). Understanding community vulnerability to climate change and variability at a coastal municipality in southern Mozambique. *International Journal of Climate Change Strategies and Management*. https://doi.org/10.1108/IJCCSM-07-2017-0145
86. Zareian, M. J., & Eslamian, S. (2019). Using of optimization strategy for reducing water scarcity in the face of climate change. *Climate Change-Resilient Agriculture and Agroforestry: Ecosystem Services and Sustainability*, 317-331. https://link.springer.com/chapter/10.1007/978-3-319-75004-0_18
87. Zhang, C., & Fang, Y. (2020). Application of capital-based approach in the measurement of livelihood sustainability: A case study from the Koshi River basin community in Nepal. *Ecological Indicators, 116*, 106474. https://doi.org/10.1016/j.ecolind.2020.106474
88. Zhao, Z., Wang, G., Chen, J., Wang, J., & Zhang, Y. (2019). Assessment of climate change adaptation measures on the income of herders in a pastoral region. *Journal of cleaner production, 208*, 728-735. https://doi.org/10.1016/j.jclepro.2018.10.088

Journal of Research and Rural Planning
Volume 13, No. 1, Winter 2024, Serial No. 44, Pp. 1-23
eISSN: 2783-2007 **ISSN: 2783-2791**
http://jrrp.um.ac.ir
Original Article

مدل‌سازی اثرات و پیامدهای تغییر اقلیم بر معیشت پایدار جوامع روستایی (مطالعه موردی: خانوارهای روستایی شهرستان مشهد)

مهری جهانسوزی[۱]- حسین فراهانی [۲]، بهروز محمدی یگانه[۳]، جمشید عینالی[۴]

۱- دانشجوی دکترای جغرافیا و برنامه‌ریزی روستایی، دانشگاه زنجان، زنجان، ایران
۲- دانشیار جغرافیا و برنامه‌ریزی روستایی، دانشگاه زنجان، زنجان، ایران
۳- دانشیار جغرافیا و برنامه‌ریزی روستایی، دانشگاه زنجان، زنجان، ایران
۴- دانشیار جغرافیا و برنامه‌ریزی روستایی، دانشگاه زنجان، زنجان، ایران

چکیده مبسوط

۱. مقدمه

طی چند سال گذشته، جهان شاهد یک سری تغییرات مهم آب و هوایی مانند تغییر الگوهای بارندگی، تغییرات دما و افزایش سطح آب دریاها بوده است. تغییرات اقلیمی به عنوان یکی از بزرگترین چالش‌های جوامع بشری قادر است آسیب‌پذیری معیشت روستاییان را دو چندان کند. تأثیر تغییرات اقلیمی گسترده است و تأثیرات منفی بر جنبه‌های مختلف از معیشت روستایی دارد. این تأثیرات را می‌توان از طریق افزایش و عدم قطعیت بر عملکرد هیدرولوژیکی، کاهش منابع آب، کاهش حاصلخیزی خاک، تخریب اکولوژیکی، افزایش خطر ریسک و در نتیجه کاهش بهره‌وری زمین و عملکرد اقتصادی مشاهده کرد. جوامع مبتنی بر کشاورزی در مناطق روستایی بیشترین آسیب را از اثرات تغییرات اقلیم دیده‌اند؛ چرا که خانوارهای روستایی به کشاورزی، منابع‌طبیعی و دامداری وابستگی زیادی دارند و در عین حال توانایی کمتری برای مقابله و سازگاری در برابر مخاطرات طبیعی دارند. اخیراً روستاهای شهرستان مشهد نیز شاهد مخاطرات ناشی از تغییرات اقلیمی بوده است. در این شهرستان کشاورزی به عنوان فعالیت اصلی معیشت خانوارهای روستایی محسوب می‌شود. تأمین معیشت اکثر خانواراهای روستایی این منطقه برپایه درآمد حاصل از کشاورزی و صنایع دستی و تبدیلی کوچک مقیاس می‌باشد که نهاده‌های آن‌ها از فعالیت‌های زراعی، باغداری و دامداری تأمین می‌شوند. مسئله‌ی اصلی پژوهش حاضر این مطلب است که تغییرات اقلیمی بر روی پایداری معیشت روستاییان شهرستان مشهد چه تأثیرات و پیامدهایی داشته است، شناخت این تأثیرات و پیامدها، لازمه تدوین برنامه های کاربردی و راهبردهای مؤثر در جهت مدیریت تغییرات اقلیمی خواهد بود. آگاهی از پیامدهای تغییرات اقلیمی و چگونگی مواجه با آن می‌تواند منجر به پایداری معیشت و افزایش تاب‌آوری جوامع محلی در برابر پیامدهای تغییر اقلیم در این نواحی گردد.

۲. مبانی نظری

معیشت روشی است که مردم برای تأمین نیازها و فرصت‌های اقتصادی خود انتخاب می‌کنند. معیشت شامل افراد، دارایی‌ها و فعالیت‌هایی است که برای زندگی لازم هستند. معیشت روستایی بیشتر به کشاورزی و منابع طبیعی وابسته است و در برابر شوک‌ها و استرس‌ها آسیب‌پذیر است. معیشت پایدار بهبود زندگی مردم در برابر شوک‌ها را هدف قرار می‌دهد. معیشت پایدار از پنج سرمایه انسانی، اجتماعی، مالی، طبیعی و فیزیکی تشکیل شده است که با یکدیگر در ارتباط هستند. چارچوب معیشت پایدار بر پنج عنصر اصلی شامل آسیب‌پذیری، سرمایه‌های معیشتی، تغییرات نهادی، راهبردهای معیشتی و نتایج معیشتی بنا شده است. تغییر ساختارها و فرآیندها دلالت بر نهادها، سازمان‌ها، سیاست‌ها و قوانین شکل دهنده به معیشت هستند. راهبردهای معیشتی ترکیبی از فعالیت

*. نویسندهٔ مسئول:
دکتر حسین فراهانی
آدرس: گروه جغرافیا و برنامه ریزی روستایی، دانشکده علوم انسانی، دانشگاه زنجان، ایران.
پست الکترونیکی: E-mail: hfarahani@znu.ac.ir

های انتخاب شده توسط مردم برای دستیابی به هدف امرار معاش می‌باشند و در نهایت پیامدهای معیشتی، دستاوردها و خروجی‌های اقدامات معیشتی است. در زمینه تنش‌های آب و هوایی آسیب پذیری به دلیل فقدان قدرت مقابله و ظرفیت ناسازگاری و در نتیجه تاب‌آوری اندک حاصل می‌آید. آسیب‌پذیری، یکی از مهم‌ترین عوامل تعیین‌کنندهٔ چارچوب معیشت پایدار است که عمدتاً مبتنی بر سرمایه‌های معیشتی بوده و مستقیما بر فرایندهای نهادی، استراتژی‌های معیشتی و پیامدهای آن با هدف ارتقای تاب‌آوری جوامع محلی تأثیر می‌گذارد. برخورداری از سرمایه‌های معیشتی با دخالت نقش واسط نهادها و فرایندهای موجود در نظام معیشت روستایی منجر به اتخاذ راهبرد یا راهبردهای معیشتی مشخص از سوی خانوار در مواجهه با شرایط شوک یا بحران می‌شود.

۳. روش تحقیق

روش مورد استفاده در پژوهش حاضر از نوع توصیفی-تحلیلی می باشد. جهت گردآوری اطاعات و داده‌ها از روش اسنادی و پیمایش میدانی استفاده شده است. در شیوه کتابخانه‌ای به کمک اسناد موجود به بسط و تبیین نظری مسئله پرداخته شد. در نهایت پس از استخراج فهرستی از شاخص‌ها و متغیرهای پژوهش، در مرحله‌ی مطالعه‌ی میدانی به کمک پرسشنامه در سطح خانوار روستاهای مورد مطالعه در چارچوب لیکرت و به صورت پنج طیفی عملیاتی شد. بررسی روایی پرسشنامه توسط گروهی از متخصصین که سابقه مطالعات مشابه داشتند مورد تأیید قرارگرفته است. همچنین از روایی سازه و محاسبه شاخص متوسط واریانس استخراج شده بهره گرفته شده است. مطالعه آزمایشی در منطقه جامعه آماری با تعداد ۳۰ پرسشنامه صورت گرفت و با استفاده از فرمول آلفای کرونباخ، پایایی کل پرسشنامه ۰/۹۷۵ به دست آمد. همچنین از پایایی ترکیبی نیز استفاده گردیده است که بر اساس هر دو آماره پایایی متغیرها از مقدار قابل قبولی برخوردار بوده است. جهت تجزیه و تحلیل داده‌ها از نرم افزار Spss و Lisrel استفاده شده است.

۴. یافته‌های تحقیق

نتایج به دست آمده در این پژوهش بیانگر آن است که تغییرات اقلیمی اثراتی را در سرمایه‌های مالی، اجتماعی، انسانی، طبیعی و فیزیکی جوامع محلی داشته‌اند. نتایج پژوهش نشان‌دهنده بیشترین تأثیر تغییر اقلیم بر سرمایه مالی شامل کاهش درآمد، افزایش هزینه‌ها، افزایش قیمت محصولات، کاهش بهره‌وری و اشتغال بوده است. به علاوه بیشترین اثرهای تغییر اقلیم بر سرمایه اجتماعی شامل کاهش تعلق مکانی و افزایش وابستگی به حمایت‌های دولتی، بر سرمایه انسانی شامل کاهش سطح بهداشت و کیفیت زندگی، و بر سرمایه طبیعی ،کاهش و فشار بر منابع سرزمین و وقوع مخاطرات و بیشترین تاثیر تغییر اقلیم برسرمایه فیزیکی ،کاهش خدمات و امکانات مردم تأثیر گذار بوده است. همچنین نتایج پژوهش نشان داد که براساس مقادیر شاخص‌های تحلیل عاملی تاییدی به دست آمده از داده‌های میدانی در میان شاخص‌های بررسی شده، هر چند که تغییرات اقلیمی بر تمامی ابعاد پنج‌گانه‌ی سرمایه‌های معیشتی روستاییان شهرستان مشهد تأثیر گذار بوده است؛ اما در میان آن‌ها سرمایه‌های فیزیکی و سپس سرمایه‌های مالی و طبیعی دارای بیشترین اثرپذیری بودند. مسلم است کاهش سرمایه‌های فیزیکی، مالی و طبیعی که بسترساز و تأمین کننده سایر سرمایه‌ها در روستاها هستند، می‌تواند ضربه‌ای جبران ناپذیر بر حیات روستاها و سایر سرمایه‌ها مانند سرمایه‌های انسانی و اجتماعی وارد کند.

۵. نتیجه‌گیری

براساس یافته‌های پژوهش حاضر به منظور بهبود و ارتقا و پایدار نمودن معیشت جامعه روستایی به برنامه‌ریزان و سیاست‌گذاران پیشنهاد می‌شود در بررسی وضعیت معیشتی خانوارهای روستایی به ارتباط آن با پارامترهای آب و هوایی اهمیت ویژه داده شود. در بهبود و ترمیم معیشت خانوارهای روستایی و سازگار کردن معیشت آنان با تغییرات اقلیمی، اولویت به آن دسته از سرمایه‌های معیشتی داده شود که بیشترین آسیب را از تغییر اقلیم دیده‌اند. جهت توانمندی اقتصادی و افزایش توان مالی روستاییان کارگاه‌ها و واحدهای تعاونی تولیدی مانند کارگاه‌های قالی بافی، صنایع دستی و ... در منطقه ایجاد گردد.

کلیدواژه‌ها: آسیب‌پذیری، معیشت پایدار، توسعه پایدار، مدلسازی معادلات ساختاری، شهرستان مشهد

تشکر و قدردانی

پژوهش حاضر برگرفته از رساله دکتری نویسنده اول (مهری جهانسوزی)، گروه جغرافیا و برنامه‌ریزی روستایی دانشگاه زنجان، زنجان، ایران است

Use your device to scan and read the article online

How to cite this article:
Jahansoozi, M., Farahani, H., Mohammadi Yeganeh, B. & Einali, J. (2024). Modeling the impacts and consequences of climate change on sustainable livelihood of rural communities (Case study: Rural households in Mashhad County). *Journal of Research & Rural Planning*, *13*(1), 1-23.
http://dx.doi.org/10.22067/jrrp.v13i1.2307-1084

Date:
Received: 26-08-2023
Revised: 23-09-2023
Accepted: 30-11- 2023
Available Online: 01-12-2023