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The implication of 'Smart Village' in Nepal: Sustainable rural development perspective

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Abstract
The main objective of the study is to discuss the importance of 'smart villages' in Nepal considering it would enhance rural and local development. The analytical review literature of both theoretical and empirical data and documents and observation as methods are adopted for the study. The majority of the population in Nepal resides in rural areas. Similarly, rural-urban migration is common. There is a wide gap between rural and urban in terms of infrastructure development and poverty. The rural population stands for 27 % of poverty, which is higher than the urban (15%). Many parts of the local levels face a lack of infrastructure, poor public services, and technologies. The exodus of youth from villages has resulted in decreasing agriculture production. Considering topography, population, limitation of land, and migration trends; the concept of smart villages is rational and it will have evident implications for rural development. The concept of smart villages will sustainably enhance the rural economy, minimizing the rural-urban economies gap.

Keywords: Migration, smart villages, sustainable development, technology, and youth

Introduction
The major objective of the paper is to explore the implication of the concept of smart villages in Nepal. Nepal is a rural country as 79.85 percent of the population resides in rural areas (WB, 2019). However, rural definitions vary from country to country as it depends upon the country's policies regarding the villages and cities. But there is no dispute that agriculture is the main characteristic of rural areas. Chamber (1983) defines rural as a small area and groups, agriculture-based livelihood, small-scale farmers, and tenants dominant. Agriculture is the major sector

of the Nepalese rural economy; it provides employment opportunities to around 65 % of the total population (MoALD, 2020). Similarly, the agricultural sector contributes 27.85 % to the national GDP (NRB, 2018) but the rural economy is not able to generate a good income for rural people. In fact, agriculture represents the subsistence form in Nepal. Likewise, there have been gaps between urban and rural sectors in terms of infrastructural development, technology usage, opportunities, and production, and rural-urban migration is intrinsic.

The urbanization process has increased rapidly with a growth rate of up to 7 %. Internal migration in Nepal is generally expected with the increasing level of urbanization (Suwal, 2014). The nature of internal migration in Nepal is characterized by mountainous/hill to Tarai/Madhesh (southern plain terrain) and rural to urban in particular and resulting in the numbers of new urban centers in arable and forest lands. In the absence of proper planning and strategies, urban centers have been facing problems and complexity. Most of the urban centers could not manage to provide services or facilities effectively. The haphazard and unplanned urban have been the attention of policymakers and experts. The government has initiated some policies to manage and develop the urban area in a sustainable way, but there has always been a question about poor implementation. At the same time, increasing trends of rural-urban gaps lead to the concept of smart villages in terms of sustainable rural development.

The concept of smart villages is mainly understood based on economic sustainability; it is often related to the well-being of society (Arrow et al. 2004). The well-being includes economic production (income), market and services, households and environmental services, and other non-market outputs. Cork Declaration (in the EU context) has put the principles of rural area development as an "A Living Countryside", defining the integrated development of rural areas as unique social, economic, and cultural infrastructures and emphasizing innovative, integrated, and inclusive rural and agricultural policy. The present society has been undergoing a technological and cultural shift, which appeals to redefining the relationships among people, the environment, and the economy. Technologies and innovations are delivering better public service delivery

and better quality of life in developed and some developing countries. Aziza & Susanto (2020) views that the concept of village development could provide solutions by utilizing technology and innovation, and it makes services effective and efficient and could make a balance of rural-urban gaps.

Some literature suggests that the concept of smart villages would support the rural economy and poverty alleviation and minimize the rural-urban gap. The post-Covid19 has also emphasized the development of a micro-economy to avert the food crisis. Since Nepal characterizes the dispersed rural settlements, particularly in hilly areas, and, the per capita costs of construction, operation, and maintenance of basic infrastructure and other essential services are very high coupled with low economic returns (NPC & UN-Habitat, 2013, p.9). Therefore, rural development in part of smart villages is imperative to fill gaps between rural and urban to some extent.

This paper discusses the advantages of the smart village concept analytically through a review of the literature's comparison and available research articles, case studies, and data regarding rural gaps in terms of rural-urban migration and sustainable rural development. The observational notes are also considered.

Nepalese rural setting and challenges

The rural is the main characteristic of Nepalese society in terms of socioeconomics. Around two-thirds of people reside in rural areas. Geographically, the country is mainly characterized by mountains/hills and Tarai/Madhesh (plain terrain). Plain terrain comprises only 23 % of the total land and 77 % of hills and mountains. Tarai region is dense in population. Two third of major cities are located in the Tarai plain region.

The hill and mountains have thin and scattered settlements. Natural hazards have been a problem in many hill areas; landslides and soil erosion are common during the rainy season. Flooding is a major problem for Tarai settlements. The western hilly areas have long been facing food scarcity. Many villages have lacked good types of infrastructure i.e., roads, irrigation, and the internet. The large rural hill population in Nepal living in scattered settlements does not reach the minimum population thresholds to

be effectively provided with basic infrastructure, and social and economic services. However, hilly villages are rich in natural resources like water and forestry, but these are less used for economic upliftment. Some villages are unique in terms of cultural characteristics and natures, and the concept of smart villages would enhance localism.

According to a new political structure, Nepal is divided into 77 districts and 753 local levels (including 6 metropolises, 11 sub-metropolitan cities, 276 municipalities, and 460 rural municipalities). Rural municipalities are the local government and under these, the wards are the smallest administrative units that need to be developed as smart villages.

Rural-urban gaps

Literature suggests that there is a wide gap in terms of the human development index between rural and urban. Table 1 illustrates that score of the urban area in terms of HDI (Human Development Index) is 0.647 which surpasses rural areas as it stands at 0.561 only. It indicates that rural areas possess poor per capita and less access to education and health than urban.

Table 1 : Rural-urban gaps in terms of HDI & population

	Human Development Index	Population, %
Rural	0.561	82.9
Urban	0.647	17.1
	Total	100.00
Tarai/Plain	0.563	50.27
Hill	0.623	43
Mountain	0.564	6.73
	Total	100.00

Source: NPC & UNDP, 2020

The majority of rural areas have been lacking quality basic amenities. Twenty-two percent of Nepali lack electricity in Nepal (PPEO, 2018). Many villages of Nepal are still not connected by a good type of road. The rural and remote hilly areas had less road network in comparison to urban; there is a total of 29157-kilometer road lengths in 2016/17 in Nepal (Bhagat, 2017). The internet service is expensive and has poor connectivity in remote areas. Nepal was ranked 130 out of 145 countries in mobile internet speed by the latest Speed test Global Index by Ookla (The Kathmandu Post, 2019). Life expectancy is lower in rural than that in urban. Poverty in rural is found at 27 %, which is double that in urban.

Basic health and education, public transportation, and reliable internet services are the major lacking in villages. Similarly, the development of the market plays important role in exchanging commodities. The e-administration enhances public service deliveries smoothly. The gaps between rural and urban can be seen in the following fields of amenities, which are essential for rural sustainable development:

- Demography imbalance
- Basic health & education
- Public transportation
- Internet
- E-administration
- Rule and law
- Market

Rural-Urban Migration pattern in Nepal

Internal migration in Nepal can be understood in two dimensions such as hill to plain Tarai and rural-urban. The migration from hills/mountains to plain areas has significantly increased since 1950; the main reason was the economy (Regmi, 1 999). Figure 1 reveals that the population of plain Tarai was 35.2 % in 1952/54 and it drastically increased in 2021 as it reached 53.66 %; whereas, the hill/mountain population has largely been decreasing over the same periods. Similarly, 96.4 % of the population

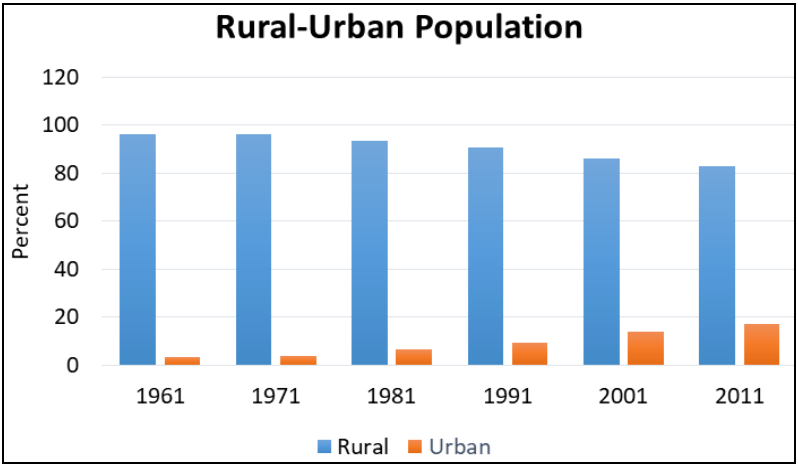
resided in rural areas in 1961 and it decreased as it stands for 46.34% in 2021(CBS, 2050-2021). In due course, the urban population has steadily increased it reached from 3.6% in 1961 to 17.1 % in 2011 and the number of urban centers also increased fourfold. This type of internal migration resulted in massive urbanization in Tarai and the Chure valley. The emergence of most urban centers after 1950 has largely been the result of rural migration from rural areas. The nature of the topography, lack of infrastructure, and communication were the push factors for internal migration. The pull-push factor has long dominated internal migration; unfavorable conditions pushed people towards a favorable environment. In the case of internal migration, Kathmandu district represents the fastest decadal population growth rate as it is 4.78% and the lowest one is Manang (-3.83%); twenty-seven hilly and mountainous districts, including Manang, Khotang, Mustang, Terhathum, Bhojpur, have recorded negative population growth rates during the last decade due to internal migration (Pathak & Lamichhane, 2014).

Table 2: Distribution of population-based on ecology (%)

	***Hill/ Mountains**	***Tarai/ Madhesh**	**Rural scenario**	**Urban Scenario**	**Urban Centers**
1952/ 54	64.8	35.2			
1961	63.6	36.4	96.4	3.6	16
1971	62.4	37.6	96	4	16
1981	56.4	43.6	93.6	6.4	23
1991	53.3	46.7	90.8	9.2	33
2001	51.6	48.4	86.1	13.9	58
2011	49.7	50.3	82.9	17.1	58

*Source: CBS, 1995; 2003 & 2012 national Report (Adapted from Pathak & Lamichhane, 2014) *denotes ecological zone*

Figure 1 : Rural-urban population scenario over five decades



Review of Literature on Global concept and practices of Smart Villages

Literature suggests that the concept of smart villages may differ from country to country; it depends upon the country's socio-economic development. For instance, developed countries like Europe would link it with sustainability and clean energy basically, whereas the developing countries' concern has been towards modernization in terms of technology, innovation, and sustainability because many villages are still lacking infrastructures and modern amenities and facing rural-urban gaps and migration. There is no one rigid or clear definition because the concept of a smart city or village largely depends on the purposes and targeted objectives. The Smart village concept relates to communities that are not a thing; technological development and digitization concepts are more concerned to address challenges facing communities (Zavratnik, 2018). Similarly, Somwanshi (2016) defines a smart village as a bundle of services, which are delivered to its residents and businesses effectively and efficiently. The linkage between rural productivity and its distribution is concerned with the smart village concept.

The concept of smart villages can well be understood through a sustainable development approach through modern technologies and tools. The economy, society, and environment are major components of sustainability. The concept of a smart village mirrors a linkage among communities, production, consumption methods, culture, and environment. Presently the concept of sustainability has been linked with development. The UN has also adopted it as a policy like the concept of Sustainable Development Goals (SDGs) and most of the country including Nepal endorsed it. The "Sustainable Development Agenda for 2030" suggests the establishment of smart villages (United Nations, 2015) and sets out 17 sustainable development goals with 169 associated targets. The SDGs aim to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity by 2030. The 17 goals set by the UN to achieve by 2030 for sustainability (#Envision, 2030). These goals are expected to achieve by adopting smart development concepts.

The movement of the Smart Village in the European Union (EU) and other countries address rural communities by undertaking an innovative approach to unlocking the potential of rural development (White Paper, 2017). Therefore, the main aspect of smart development either city or village is related to both sustainability and social prosperity through technology

The European Union initiated the concept of 'smart' in 2010 for a new ten-year growth strategy stating that Europe should become a smart, sustainable, and inclusive economy. The concept of Smart Villages proposed by the European Union was to build on their existing strengths and assets as well as on developing new opportunities to refer to rural areas and communities (Naldi, 2015). In 2017, the European Commission published a Smart Villages document; Smart Village has initiated a sub-theme within the European Network for Rural Development (ENRD). ENRD explored ideas around revitalizing rural services through digital and social innovation. It aims to improve and make sustainable rural services such as health, social services, education, energy, and transport through the deployment of Information and Communication Technology tools. Similarly, Hungary also initiated the smart rural village concept in

'Turistvandi'- a small village, in the agricultural field that emphasizes self-sufficient food production (Orban, 2017). Jones (2017) wrote about the smart village in Africa and found that the basic concept of "smartness" includes access to services such as high-quality education, healthcare, clean water and sanitation, and improved livelihoods, including entrepreneurial endeavors and value-addition by the villagers themselves. Similarly, Atkočiūnienė & Vaznonienė (2019) found the following driving forces characterizing the most advanced level of rural development: precise farming (agriculture); digital and other open platforms for innovation; sharing economy; a bio-based (renewable) economy; renewable energy; rural tourism, including ecological, healthy food and recreation, recreational tourism; social innovation in rural services and entrepreneurship; development and implementation of an inclusive social infrastructure and partnership organizational mechanism.

India is also implementing a smart village concept to make minimize rural migration and the rural-urban gap. Around 65.53% of the population (WB, 2019) still lives in rural areas in India and agriculture is the main livelihood. To control rural-urban migration, the concept of Smart Villages was initiated to provide a basic framework for local people to enhance their participation on a local level and improve their economic, social, and living conditions and thus make their community stronger (Srivasta, 2015).

Similarly, Ranade, Londhe, and Mishra (2015) identify the following aspects of smart villages in India- smart infrastructure, smart service delivery, smart institutions, and smart technology, and innovations. Shukra (2016) would link the smart village concept with integrated rural planning by means of digital technologies aimed at developers, and local businesses, and improving education, health, and welfare. In the campaign of smart villages, India launched 'Digital India' in 2019 assuming that millions of people will have access to the internet and telecommunication. Within the "Digital India" plans, the Indian government envisages that, by the year 2019, 250,000 Indian villages will have access to the internet and telecommunications networks (Boda, 2018).

Sustainable development and Smart village policy and practices in Nepal

The concept of smart villages has largely arisen after the concept of the smart city in Nepal after 2000. The smart city can be heard among educated people for a half-decade in Nepal. The Millennium Development Goals (MDGs) by the United Nations have set the foundation for Sustainable Development Goals (SDGs) to be achieved by 2030. The 2030 Sustainable Development Agenda emphasizes devoting resources to developing rural areas and sustainable agriculture and fisheries, supporting smallholder farmers, especially women farmers, herders, and fishers in developing countries, particularly least developed countries." SDG 2 targets to end hunger is the primary SDG that is associated with the rural economy. The 11th goal in SDGs mentions the mobilization of Sustainable Cities and Communities making cities and human settlements inclusive, safe, resilient, and sustainable by 2030. It includes access for all to adequate, safe housing and basic services, safe, accessible, and sustainable transport systems for all by expanding public transport, safeguarding the world's cultural and natural heritage, etc.

The UN declares the 7th goal, 169th quantitative target, and 232nd indicators of sustainable development to be targeted by 2030. The end of poverty and hunger, and providing health and education to all are the basic goals. Nepal targets to be a middle-income country by 2030, though, absolute poverty is at 21.6 percent which is the highest in South Asia. The Constitution of Nepal assures basic education and health as human rights (NPC, 2017). Nepal targets that the citizens should improve their lives in a modern, comfortable, comfortable way. Prosperous Nepal Happy Nepal' is the Nepal government's main motto highlighting modern, sustainable, and systematic rehabilitation, housing, and settlement development (NPC, 2020).

Nepal's government itself declared to develop ten smart cities across the country in the Fiscal year 2015-16 and it was the first policy and program relating to the smart city. However, the progress of smart cities is not satisfactory. In 2016 August National Planning omission (NPC) published the 'Smart City' (*Swofurta Sahar* in Nepali) Concept as policy (Concept of Smart City, 2073). However, the concept of the smart village is completely new to Nepal.

Recently, the Nepal government announced to development of some villages as smart villages along the lines of climate change. The government is planning to identify 150 climate-smart villages across the country in this fiscal year of 2019-20, where the local communities will be equipped with the capacity, technologies, and knowledge to adapt to the increasing impacts of climate change on various sectors linked with livelihood (*The Kathmandu Post, 2020*). The proposal is in the beginning phase initiated by the Ministry of Forests and Environment. The major objective of the climate-smart village approach is to identify and develop climate-smart adaptation practices and the use of technologies to build resilience to the impacts of climate change on agriculture.

The ICIMOD (2016) also has initiated the climate-smart village concept which encompasses a participatory and integrated approach to adapting to change and fosters a sustainable development approach. Similarly, Smart Village (2015) made a workshop and its main aim was to make energy access for lighting by fully supporting the establishment of local enterprises considering the sustainability of off-grid energy schemes and realizing smart villages. Sometimes, the concept of the tourist-centric smart village is also heard that emphasizes the quality of tourism and its sustainability.

Discussion and Analysis

The concept of the smart village in developing countries has been introduced to enhance the quality of life for villagers through technology and innovation. The global initiatives for smart villages are primarily focused to boost the areas with a lack of basic infrastructure such as

electricity, water supply, internet access (Doloi, Green & Donovan, 2018), public services (basic education, health, food security, banking, e-governance, etc). Without these amenities and facilities, the economy of villages could not be sustained. The sustainability in terms of the economy of villages can also balance rural-urban migration. In Nepal, the notion of the smart village seems to be relevant for those areas which are potential in terms of economy as well as vulnerability by nature. Nepal's many rural areas are rich in natural and cultural resources, though they have been lacking good infrastructures and public service delivery. Natural calamities like soil erosion and landslide in many hilly areas are common.

Nepal's main economy is largely dependent on remittances, agriculture, and tourism; the volume of manufacturing exports is very minimal. Agriculture sectors still contribute employment to 65 % of the total population, though mostly the subsistence form and the most informal employees are involved in this sector. However, the contribution of agriculture to the national GDP is about 32% only. and two-thirds of the labor force is employed in agriculture. Poverty is a common problem in rural areas, and agriculture is the chief economic resource.

According to CBS (2011), 60 percent of farmers are unable to produce enough agricultural production to cope with their livelihood. The growth rate of the agricultural sector is only 2.8 percent, which indicates a low rate. Many western hill districts of the country have been facing a food deficit; poor rural people mostly used to go to India in search of work during the off-farming season and youths are reluctant to stay in villages in Nepal (Chaudhary, 2018). The national household food security is only 48.2%, whereas in rural areas the percentage is only about 38.8% (NDHS, 2016). Therefore, food security can be achieved through rural economic development. Similarly, the new adaptation to overcome the climate issue is critical for rural livelihood and production.

Nepal's trade deficit is largely associated with agricultural imports as it has nearly Rs200 billion. In the same way, there is the limitation of agricultural land, the time has now come to revive agriculture and the rural economy

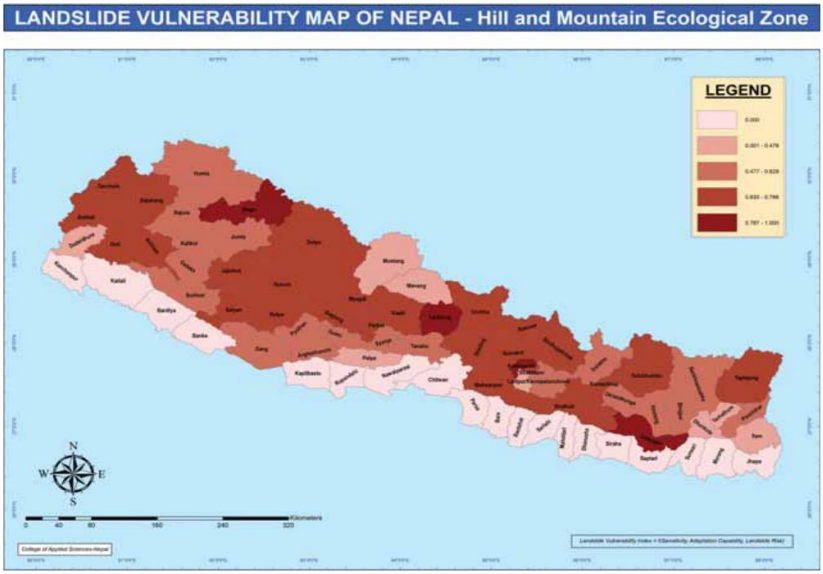
through technology and innovation. Recently, the post-Covid19 highlighted the importance of a micro-economy and food security as many parts of Nepal face insufficiency of food production and resulting in malnutrition. Therefore, the rationality of the smart villages to achieve a micro-economy in a sustainable way has become obvious. It also helps address the informal sector's problems.

The concept of smart villages can be viewed in two ways in Nepal. One aspect is to develop the existing villages in the framework of smart which is more potential in terms of economy, particularly agriculture. Cultural potentiality is also the basis for smart villages. Another aspect is to develop completely new settlements. Many places on the hill that have been threatened by natural hazards (figure 2) may need to relocate to the periphery of their old settlements. In this case, new smart villages are intrinsic.

There is a need for an integrity approach to developing the rural economy through technology and the concept of a smart village to support the idea of an integrity approach and boosts the rural economy. Because rural development in Nepal should be considered diversification and inclusive and environment-friendly.

A master plan identifying potential villages/settlements or locations with economic and cultural importance should be chosen first. The availability of agricultural products, tourism potential, population, transit routes, etc. may be the selection criteria for such villages. Both top-down and down-top smart village construction models will be required in Nepal.

Figure 2: Landslide vulnerability map of Nepal(dark color represents more vulnerability)



Source: NAPA, 2010

The province or local level has not now been capable in terms of budget, resources, and social capital to implement the concept of the smart village alone, so federal initiation is essential in the beginning phase. Schedule 8 of the Constitution has a provision for the authority of a local government for local development plans and projects itself. The present Constitution has a provision for local government based on the devolution of power and the notion of decentralization is strong. For instance, the basic health and education sectors are under the jurisdiction of the local government. Likewise, the public service delivery at the grass-root level is part of the local level in Nepal and has been questioned in terms of effectiveness and e-governance is essential that will help in boosting transparency as well. The internet has now become an important part of human life and it has played a key role in social changes, while a majority of rural areas are

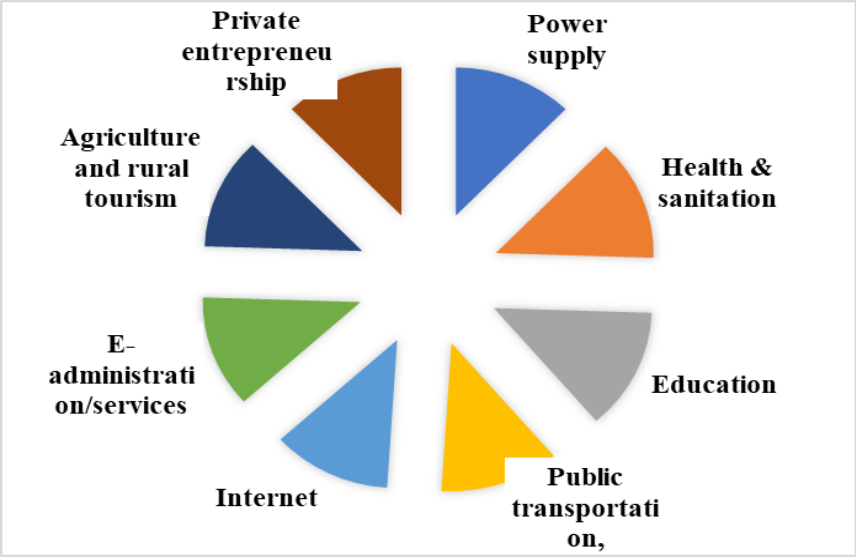
lacking reliable internet services. In many cases, the staff at the local level seems to have been reluctant to stay in village offices due to a lack of quality internet and infrastructure in Nepal. Therefore, basic amenities need to be set up in the villages. Equally, the province can also develop some potential villages within the respective province. Correspondingly, the rural municipality can develop such small villages within respective rural municipalities on a small scale with its resources.

The concept of smart villages may have a great chance that can vibrate the rural economy in villages and result in reducing unnecessary rural-urban migration. The impact of Covid-19 forced us to rethink agricultural development (Chaudhary, 2021) and the concept of a smart city could only make sustain the agrarian economy in Nepal. For sustainable rural development, the role of the public and private sectors is important. In Poland, the smart growth potential was determined by means of 24 variables in management life quality, economy, society, natural environment, and mobility; and the finding was that the smart village concept could be useful in facilitating sustainable development of rural areas (Adamowicz & Zwolińska-Ligaj, 2020). Literature suggests that rural people are facing numerous challenges in terms of climate change, land degradation, biodiversity loss, poverty and geographical isolation (Mihai & Latu, 2020) and these challenges are the same for Nepal as it has also been discussed.

Based on the above discussion, the sparse and thin settlements in some hill/mountainous parts as challenges that need to be integrated to develop so that services could be provided easily. In Tarai, the market and reliable transportation, and cheap internet are essential.

In essence, the rural areas of Nepal need intervention in both public and private sectors in the following fields:

Figure 3: Areas to be intervened in the light of smart villages



The role of the private sector as an investor cannot also be ignored. For instance, Mahabir Pun awarded by Magsaysay Award has been involved in Wireless Networking Project since 2002 to build a local communication network using wireless technology to connect people in the Himalayan communities particularly in the Gandaki Province through National Innovation Center. Such programs can be implemented through a public-private partnership scheme.

Conclusion

The concept of smart villages is related to the policy and programs that improve the rural economy and community through innovation and technology that results in balancing rural-urban gaps to some extent. It would address the problems faced by scattered settlements. The unplanned

rural-urban migration has created a risk in the light of diversity in terms of social cultures. Also, the limitation of agricultural land (14.7 % of the total land area) and the domination of the agricultural economy (though subsistence form) in Nepal suggest the urgent need for balancing development between rural and urban areas. The success of the smart village will help in reducing poverty and hunger. Local governance and leadership effectiveness are crucial in order to implement the concept of smart villages. However, the concept of smart villages in Nepal is completely new.; it may also be a vibrant field of research in the changing context of the village, urbanization, and migration.

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