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LIVELIHOOD STATUS AND SUSTAINABILITY IN RURAL INDIA: A GEOGRAPHICAL ANALYSIS

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Abstract

India is predominantly a rural country. It is witnessing transformations in all its major domains. The rural settlements and their livelihoods are also no exception and witnessing changes in new economic order. The trends suggest that there is declining share of agriculture in the national economy whereas urban population is increasing at a faster rate, which threatens agricultural environs. It also adds complications to rural livelihood sustainability. This study, primarily based on the secondary sources of data, attempts to evaluate transforming status of rural livelihood sustainability in India. United Nations Development Programme's normalization method has been incorporated to standardise indicators and a modified form of Intergovernmental Panel on Climate Change's Vulnerability Index has been used to develop 'Sustainable Livelihood Index' (SLI). This index is taken as a base for formulating 'Livelihood Ladder', adapted from the Oxfam Report. Main findings of this paper reveal that there are large scale inter-state disparities for different assets. Central and eastern states of India are found to be poor on livelihood sustainability due to their lower human, social and financial assets index and thus more economically vulnerable to present day shocks and stresses, while southern and northern states are better placed in terms of livelihood sustainability.

Keywords: Livelihood, Sustainability, Agriculture, Assets, Economic vulnerability, India.

Introduction

India is a country of villages. As per Census 2011, 68.84 per cent population is rural with 893 million people, making it the largest rural country of the world. Majority of this population depend directly or indirectly on agriculture for their livelihoods. It is a source of living for an estimated 86 per cent of rural people across the globe (World Bank, 2008). The global rural population is now close to 3.4 billion and Africa and Asia are home to nearly 90 per cent of the world's rural population (United Nations, 2018). However, the recent trends suggest a decline in rural population of the world from 60 per cent in 1980 to 45 per cent in 2017 (World Bank, 2018). While urban areas are experiencing a constant and steady growth of population (WHO, 2018). The similar patterns are also observed in India, where urban population is increasing continuously. However, the magnitude of change for both rural and urban population does not match to the same pace as it is still inclined and dominated by rural population (Sudhira and Gururaja, 2012). Despite the rise of urbanization, more than half of India's population is

projected to be rural by 2050 (United Nations, 2012; NITI Ayog, 2017). Moreover, the absolute size of rural population is still too critical and enormous as it is two and half times bigger than the total population of USA (Sekhar and Padmaja, 2013). The rural areas in India are experiencing social, economic, political, demographic, cultural and ecological transformations mainly due to increasing influence from urban areas, bringing features of urban environment into rural settings, shifts in rural ecology and changes to systems and processes that affect rural people's way of living and livelihoods encompassing agricultural as well as non-agricultural sectors (Patil, 2012; Ohlan, 2016).

However, in the process of economic transformation, agriculture sector loses its importance due to its eroding contribution in national income (Webb and Block, 2012). Economic policy reforms of 1991 and the formation of World Trade Organization (WTO) in 1995 have brought structural transformations in the Indian agricultural sector (Ferroni and Zhou, 2017). The Central Statistical Organization (CSO, 2016) reveals that in 1950-51, the share of agriculture in Gross Domestic Product (GDP) was around 55 per cent, which has declined to less than 17 per cent in 2016-17. But still, a very high proportion of labour force (nearly 60 per cent) continues to depend on agricultural sector (Dev, 2018). This negative trend has major repercussions from the viewpoints of rural poverty and inequality (Ramchandani and Karmarkar, 2014; Dutta and Mahajan 2016).

Since last few years, it has been observed that these transformations in rural areas are exacerbating the sustainability of rural livelihoods (Gupta, 2016). One of the key challenges in this regard owes to increasing urbanisation process which results in the rapid conversion of fertile agricultural land to urban land use (Fazal, 2013). As a result, land-based livelihoods of small and marginal farmers are increasingly becoming unsustainable. As their land has failed to support their families' requirements, they are forced to look at alternative means for supplementing their livelihood (Banu and Fazal, 2017). It is increasingly the case with rural workers, who are more foot loose than before and there is considerable seasonal migration from rural to urban areas for short and medium-term employment under a variety of arrangements (Agrawal, 2008). This distress migration badly affects different aspects of their lives. It clearly reflects the poorly productive rural livelihood in India.

Since rural livelihood is in a state of crisis therefore, sustainability of rural livelihood is increasingly attaining central position to the debate about rural development, poverty reduction and environmental management (Scoones, 2009). It has been embraced by a number of development agencies with United Nations Development Programme (UNDP) and the Department for International Development (DFID). Keeping all these aspects in view, this study attempts to evaluate the present status of rural livelihood and its sustainability status in India.

Objectives

Major objectives of the study are:

- to assess the status of livelihood sustainability in rural areas of India;
- to examine the association of assets, economic vulnerability and livelihood sensitivity index with livelihood sustainability in the study area and
- to explore reasons for emerging

different states into different ladders of sustainability.

Study Area

India is the seventh largest country, marked by physical and economic diversity with an area of 3.288 million km^2. Geographically, the study area is located between 8° 4' to 37° 6' north latitudes and 68° 7' to 97° 25' east longitudes. This study is focused on 28 states of India. About 69 per cent of its population resides in rural areas against 31 per cent living in urban areas, whereas 74 per cent of its population is literate. However, there are significant disparities among male and female literacy rate, which is about 82 per cent for males and 65 per cent for females. The sex ratio is 940. Religious composition of the study area reveals that 79.80 per cent of its population is of Hindus followed by Muslims 14.23 per cent, Christians 2.30 per cent, Sikhs 1.72 per cent and others 1.95 per cent as per Census of India, 2011. India is the second most populous country of the world with a population of 1.27 billion. Agriculture, with its allied sectors, is the largest source of livelihood in India. About 70 per cent of its rural households still depend primarily on agriculture for their livelihood, with 82 per cent of farmers being small and marginal. Of the total area under agriculture, 64.7 million hectares is under irrigation. Agricultural sector is not merely a source of livelihood but a way of life. It is the main source of food, fodder and fuel and is the basic foundation of economic development.

Database and Methodology

This study employs secondary data of rural areas taken from different sources like Census of India, Office of Registrar of India, 2011; Rural Development Statistics, Government of India (GOI), 2011-12; All India Survey on Higher Education, MHRD, Department of Higher Education, GOI, 2012-13; Bulletin of Rural Health Statistics, India, 2014; District Level Household and Facility Survey, 2012, Ministry of Health and Family Welfare, GOI; Sample Registration System, Office of Registrar of India, 2013; National Sample Survey Organisation (66th Round, 2009-10 and 68th Round, 2012), Ministry of Labour and Employment, GOI, 2011-12; Economic Survey, GOI, 2014-15; Sample Registration System (SRS) Bulletin, Ministry of Home Affairs, 2013; Ministry of Road Transport and Highways, 2012; Reserve Bank of India, 2013; Open Government Data (OGD) Platform; Department of Statistics and Information Management, RBI, 2013; India State of Forest Report, 2017-18; Central Water Commission, 2011; Planning Commission, GOI, 2012; Directorate of Economics and Statistics, 2013-14, Department of Agriculture, Cooperation and Family Welfare, 2015-16.

Selection of Components and Indicators

An effort has been made to identify appropriate indicators at state level for assessing livelihood sustainability in India. The Sustainable Livelihood Index (SLI) used in this research is composed of three interacting major components, i.e. Assets Index, Economic Vulnerability Index and Livelihood Sensitivity Index. At the next level, these three major components are classified into nine minor components, which are further sub divided into 44 indicators as proxies to calculate the SLI. The indicators taken up in this study are listed in (Table 1).

Formulation of Sustainable Livelihood Index (SLI)

The Sustainable Livelihood Index (SLI)

Table 1
India: Indicators taken for Development of Sustainable Livelihood Index (SLI)

Major Components	Minor Components	Indicators
Assets	Human assets	• Percentage of working population in the age group 15–64 • Percentage of population able to read and write above 7 years of age • Percentage of female population able to read and write above 7 years of age • Number of females per thousand males
	Physical assets	• Gross enrolment ratio up to 17 years of age • Gross enrolment ratio in higher education • Gender parity in higher education • Number of health centres including sub centres, PHCs and CHCs per 10000 population • Percentage of institutional deliveries to total deliveries • Percentage of children received full vaccination aged 12–23 months • Number of surviving infants per 1000 live births in a year • Calorie intake per day • Per capita monthly consumer expenditure for goods & services • Road density, km per hundred km² of area • Metalled roads connectivity, km per hundred km² of area • State road length, km per hundred square km² of area
	Social assets	• Percentage of kisan credit cards • Number of commercial banks per 100000 persons • Women employment rate • Percentage of female headed households
	Natural assets	• Percentage of forest area to total area • Percentage of soil testing laboratories • Ratio of net sown area to total cropped area • Availability of ground water resource in billion cubic meters (BCM)
	Financial assets	• Monthly per capita expenditure in the states • Percentage of population above poverty line • Percentage of main workers to total workers • Percentage of cultivators to total workers • Percentage of other workers to total workers
Economic Vulnerability	Population exposed to unsustainable situation	• Unemployment rate • Percentage of population below poverty line • Percentage of agricultural labourers to total workers • Percentage of marginal workers to total workers
Livelihood Sensitivity	Housing condition	• Percentage of households having good condition houses • Percentage of households having 2 or more rooms • Percentage of households having electricity
	Sanitation facility	• Percentage of households having tap water from treated sources • Percentage of households having water within premises • Percentage of households having access to safe drinking

Source: Compiled by Authors.

is used to assess variety of livelihood elements of rural population. This index is calculated by the method of equalizing the contribution of each indicator through an average weighted approach. The method used to standardize each indicator is adapted from the method used in calculating Human Develop-ment Indices (UNDP, 2015). As the indicators selected under major and minor components for calculating sustainable livelihood index differ in their nature and scale so each indicator has been standardized by formula (1) and thus indices for minor components are formed. Eventually, these indices are averaged to develop three major indices, i.e., assets index, economic vulnerability index and livelihood sensitivity index.

$$Index\,A_i = \frac{A_i - A_{min}}{A_{max} - A_{min}} \qquad (1)$$

where A_i is the actual value of an indicator of the component and A_{max} and A_{min} are the maximum and minimum values of the indicator from the entire data set. After standardization, the value of indices ranges from 0 to 1 to represent extreme unsustainability to high sustainability respectively and these indices are free from any measurement units. When each of these indicators are standardized, the value for the components having more than one indicator is derived by averaging the sub-component values using the following formula (2)

$$C_i = \frac{\sum_i^n = 1\ Index\ A_i}{n} \qquad (2)$$

where, C_i is one of the three major components, i.e., assets, economic vulnerability and livelihood sensitivity. Index A_i is the minor component (s) that make up the major component and n is the number of minor components in each major component. Here, each index ranges between 0 and 1.

In this study, an alternative method of measuring SLI is also calculated to understand the influence of economic vulnerability on overall livelihood sustainability. It is adapted and modified from the Intergovernmental Panel on Climate Change's vulnerability index (IPCC, 2001). The modified formula is (assets index+sensitivity index)/economic vulnerability index. The degree of sustainability is measured using these three calculated indices of assets, economic vulnerability and livelihood sensitivity. It is a well-recognized fact that the areas having higher assets index and livelihood sensitivity index but lower economic vulnerability index are more sustainable and immune to cope up with varying stresses and shocking events. Thus, this Sustainable Livelihood Index (SLI) is formulated by adding up the assets index and livelihood sensitivity index and then, it is divided by the economic vulnerability index. Finally, LSI is formulated and divided into four categories called “Livelihood Ladder”. This concept is originally taken from the “Oxfam Report, 2005” and is modified according to the suitability of the present study. The main idea to utilize this ladder is to identify the appropriate benchmarks that help in determining transitions between different rungs on the ladder and thus make it easier to categorize states of India depending on their levels of livelihood sustainability. Mean and standard deviation method are used to classify the data in to five categories to get representative status of livelihood sustainability among Indian states.

After calculating the modified equation of IPCC vulnerability index, the scale for this ladder is derived, which ranges between 0 and 10. The quartile method is used to classify the ladder into accumulating, adapting, coping and

Table 2
India: Details about the Transitional Stages of Livelihood Sustainability Ladder

Livelihood Ladder	Characteristics	Sustainable Livelihood Index (SLI)	Ladder Features
Surviving	Life is a constant battle. States are extremely vulnerable to both minor and major external shocks with poor social and human assets, e.g., debt from the banks, illiteracy etc.	Less than 3.00	- Livelihood - Sustainability
Coping	Life is just getting by. States can cope with minor shocks but cannot endure major ones. Decreasing range of assets and poor sensitivity make them economically vulnerable.	3.00 - 4.59	- Livelihood + Sustainability
Adapting	Life is tolerable. States own and control some assets, especially financial. However, it is not accumulating and has potential vulnerability to shocks, e.g., increasing rate of unemployment.	4.60 - 7.00	+ Livelihood - Sustainability
Accumulating	Life is going well. States own and control an increasing range of assets and can cope with a range of stress and shocks.	More than 7.00	+ Livelihood + Sustainability

Source: Compiled by Authors. + denotes positive feature, while – denote negative feature of livelihood ladder. Adapted from, "Oxfam Report", 2005.

surviving categories (Table 2). Here, the lowest ladder of sustainability is named as surviving while the most sustainable one is designated as accumulating.

Results and Discussion

Status of Assets in Rural India

Assets are defined as the composite of people, their activities and accessibility to tangible and intangible resources to develop their livelihood. Greater access to assets is positively associated with sustainable livelihood. The sustainable livelihood framework identifies five types of assets upon which livelihood is built. In this study, assets index is a compendium of human, physical, social, natural and financial assets. Assets index approaching to 1 indicate sustainable condition.

Status of Human Assets

Human assets represent persons' ability to pursue different activities. Here emphasis is given to individual's skills, knowledge, ability and opportunity to work. It enables a person to orient activities and achieve their livelihood objectives (Ali, 2020). Human assets index has been calculated on the basis of work participation rate, total literacy rate, female literacy rate and sex ratio and the results are presented in (Table 3).

Results reveal that the status of human assets among states of India is not very satisfactory. The human assets index for India as a whole is (0.32). Nineteen states have their index higher than the national average. Prominent among them are Kerala (0.79) Himachal Pradesh (0.70) and Goa (0.63). The reason is that these states have performed better for all the above mentioned four indicators taken to measure status of human assets than other states in the country. While nine states have their human assets index lower

Table 3
India: Assets Indices and Composite Assets Index

States	Human Assets Index	Physical Assets Index	Social Assets Index	Natural Assets Index	Financial Assets Index	Composite Assets Index
Andhra Pradesh	0.40	0.48	0.40	0.39	0.52	0.44
Arunachal Pradesh	0.26	0.35	0.29	0.47	0.51	0.37
Assam	0.33	0.29	0.18	0.40	0.38	0.32
Bihar	0.08	0.24	0.16	0.44	0.20	0.22
Chhattisgarh	0.47	0.26	0.31	0.49	0.18	0.34
Goa	0.63	0.66	0.81	0.34	0.72	0.63
Gujarat	0.40	0.35	0.31	0.47	0.45	0.40
Haryana	0.20	0.56	0.17	0.48	0.62	0.41
Himachal Pradesh	0.70	0.63	0.60	0.72	0.58	0.65
Jammu & Kashmir	0.10	0.43	0.22	0.55	0.49	0.36
Jharkhand	0.25	0.22	0.33	0.23	0.13	0.23
Karnataka	0.46	0.47	0.37	0.31	0.47	0.42
Kerala	0.79	0.81	0.34	0.39	0.73	0.61
Madhya Pradesh	0.30	0.29	0.24	0.52	0.26	0.32
Maharashtra	0.54	0.50	0.32	0.32	0.49	0.44
Manipur	0.49	0.39	0.34	0.24	0.43	0.38
Meghalaya	0.43	0.26	0.38	0.39	0.55	0.40
Mizoram	0.64	0.46	0.32	0.29	0.54	0.45
Nagaland	0.58	0.32	0.35	0.33	0.61	0.44
Odisha	0.42	0.33	0.20	0.40	0.19	0.31
Punjab	0.26	0.64	0.26	0.60	0.70	0.49
Rajasthan	0.25	0.41	0.32	0.34	0.50	0.37
Sikkim	0.53	0.53	0.43	0.94	0.58	0.60
Tamil Nadu	0.56	0.62	0.39	0.41	0.51	0.50
Tripura	0.56	0.42	0.22	0.44	0.45	0.42
Uttar Pradesh	0.13	0.26	0.19	0.43	0.30	0.26
Uttarakhand	0.48	0.47	0.44	0.67	0.57	0.53
West Bengal	0.36	0.38	0.18	0.44	0.38	0.34
India	0.32	0.34	0.27	0.44	0.38	0.35

Source: Compiled by Authors.

than the national average like Bihar (0.08), Jammu and Kashmir (0.10) and Uttar Pradesh (0.13). Most of the populous states, e.g., West Bengal (0.36), Assam (0.33) and Andhra Pradesh (0.40) have reported their human assets index near the national average. These variations in the status of human assets are the result of varying performance mainly for literate population and work participation in the states. India has significant regional

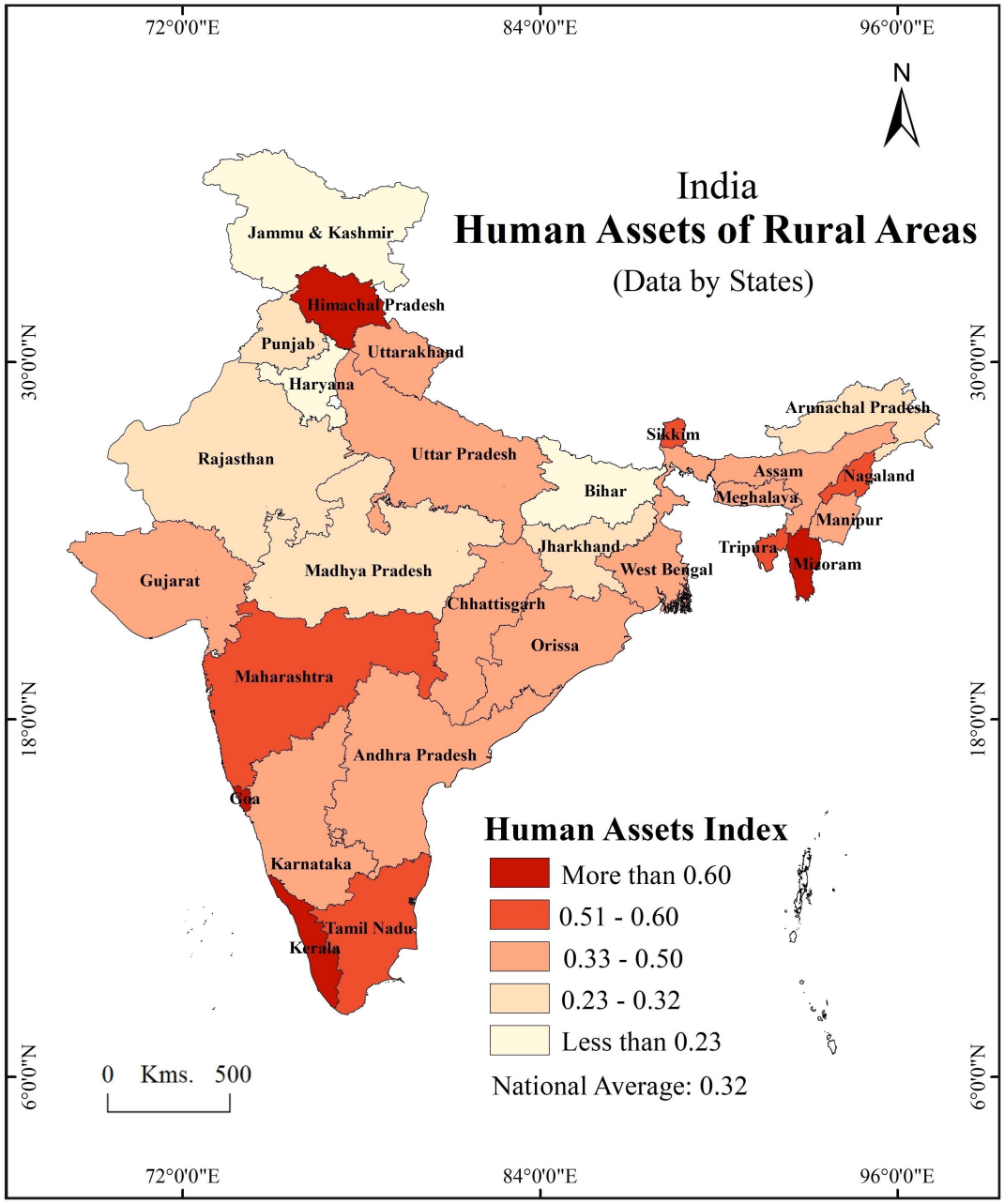
variations in terms of literate population. Southern states like Kerala (0.92), Goa (0.86) and Tamil Nadu (0.73) have high literacy indices but central Indian populous states have shown poor literacy indices like Bihar (0.59), Jharkhand (0.61) and Uttar Pradesh (0.65). Similarly, for female literacy index, Kerala (0.90) again occupies the first rank. On the contrary, Rajasthan (0.45) remains at the bottom. Similarly, work participation index for India is (0.39) whereas, it is (0.41) for rural areas. Nagaland (0.54), Tamil Nadu (0.50), Maharashtra (0.49) and Kerala (0.36) have recorded higher work participation indices, while Uttar Pradesh (0.33) and Bihar (0.34) have reported lower work participation indices. Sex ratio is critical for the society and its economic performance. Sex ratio index for India is (0.36). However, Haryana (0.14), Jammu and Kashmir (0.23) and Uttar Pradesh (0.28) have registered poor sex ratio indices, while Kerala (0.96) and Goa (0.71) have recorded favorable sex ratio indices (Fig.1).

Status of Physical Assets

Physical assets reflect the basic strength and ability of people to make a living. This includes individual's capacity as well as available resources and also access to basic infrastructure required (Devi and Rajeshwari, 2016). Physical assets index has been calculated on the basis of 12 indicators further subgrouped in to health, education, food security and transport and communication (Table 1).

The physical assets index reveals that Kerala (0.81) is first ranking state among all the states followed by Goa (0.66), Punjab (0.64) and Tamil Nadu (0.62). The national average for physical assets index in rural India is (0.34; Table 3). Analysis indicates that states like Madhya Pradesh (0.29), Uttar Pradesh (0.26), Chhattisgarh (0.26), Bihar (0.24) and Jharkhand (0.22) fall under very low category due to their lower index value for all the selected indicators, i.e., health, education, food security and, transport and communication facilities. There is one common thread among these states except Odisha and Madhya Pradesh that they all are densely populated owing to large agriculturally fertile plains. Apart from Punjab, other northern states like Haryana and Himachal Pradesh are also better placed in physical assets.

Further, there are 19 states with their physical assets index greater than the national average (0.34). The analysis also reveals that education index is found highest in Kerala (0.80) followed by Tamil Nadu (0.71) and Goa (0.65), while Bihar (0.07), Nagaland (0.14) and Arunachal Pradesh (0.22) show poor status on account of education. There are nine states that have recorded physical assets index lesser than the national average. Majority of them are from central parts of India. The national average index for health is (0.22) and only four states like Goa (0.84), Kerala (0.78), Sikkim (0.74) and Mizoram (0.68) are placed in very high category, while eleven states belong to low and very low category of health facility with the lowest recorded by Meghalaya (0.16) followed by Uttar Pradesh (0.17). The food security index reveals that more than nine states lie below the national average (0.36) with Jharkhand (0.08) being at the bottom. Most of these states are located in central and north-eastern parts of India. However, Kerala and Punjab enjoy the topmost position (0.83) in terms of food security index. On account of transport and communication facility index, Himachal Pradesh remains at the top (0.98), followed by Punjab (0.80) and Kerala (0.75), while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Uttar Pradesh
Bihar
Sikkim
Arunachal Pradesh
Assam
Nagaland
Meghalaya
Manipur
Tripura
Mizoram
Jharkhand
West Bengal
Gujarat
Madhya Pradesh
Chhattisgarh
Orissa
Maharashtra
Andhra Pradesh
Goa
Karnataka
Tamil Nadu
Kerala
Human Assets Index
More than 0.60
0.51 - 0.60
0.33 - 0.50
0.23 - 0.32
Less than 0.23
National Average: 0.32
0 Kms. 500

Fig. 1

Chhattisgarh and Arunachal Pradesh (0.12) lie at the lowest (Fig. 2).

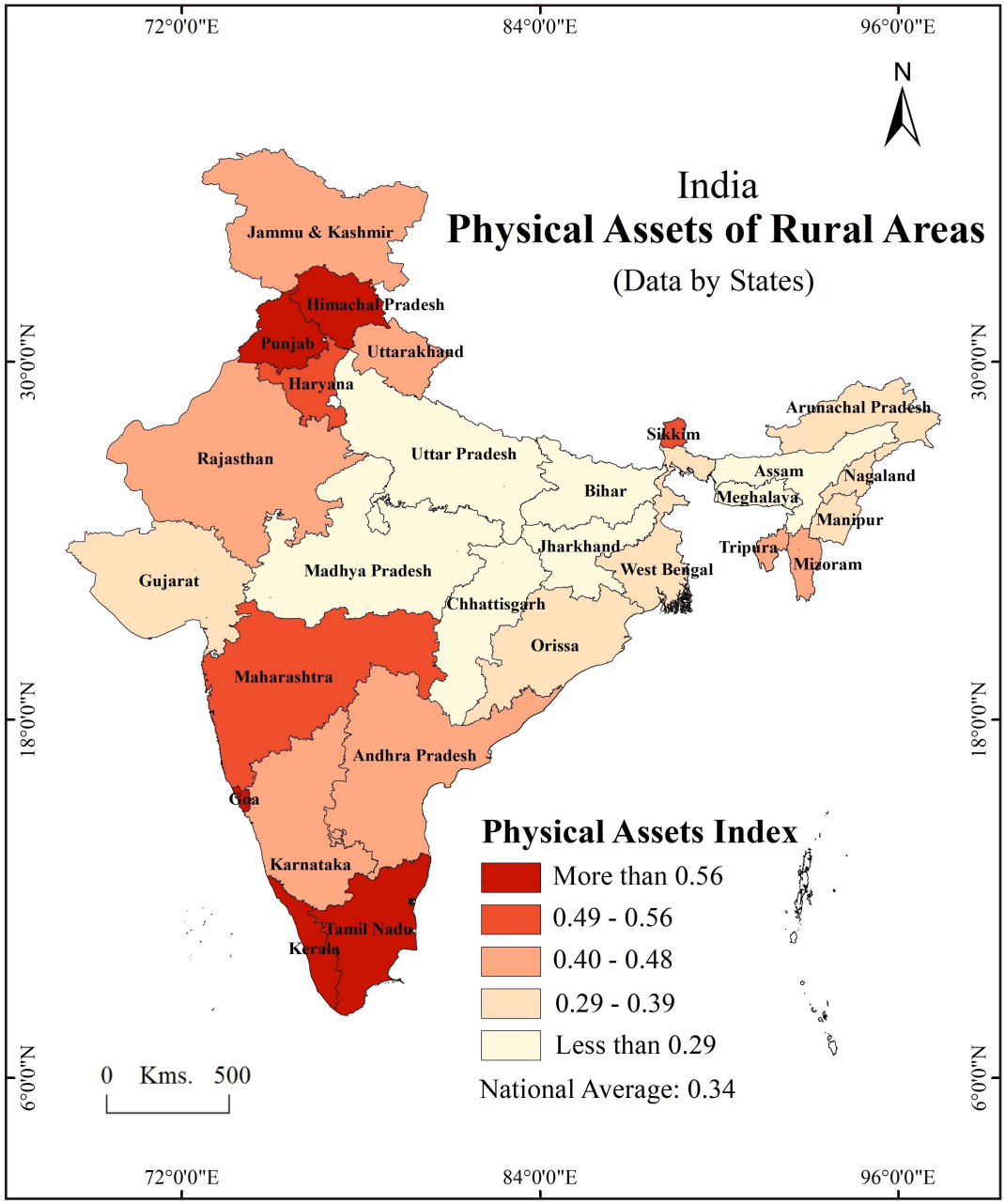
Status of Social Assets

Social assets refer to the network of relationships between individuals who live and work in a particular society, allowing them to function effectively to achieve their common goals. Social assets index has been calculated on the basis of four indicators. These are Kisan Credit Cards (KCC), existence of commercial banks in rural areas, women employment rate and female headed households. The results of social assets index show that Goa (0.81) holds the topmost position. More than one third of the total states are still struggling to achieve the national average (0.27). Nine states are found to be in very low and low category with lowest being Bihar (0.16). Haryana falls in very low category, largely on account of its gender disparity in terms of low women employment and very low female headed households in the state. Southern states except Goa and Kerala belong to high category of social assets.

The state with very low kisan credit cards is Odisha (0.02) followed by Chhattisgarh (0.03), Rajasthan (0.12) and Madhya Pradesh (0.15). On the contrary, Goa occupies first rank with (0.98), followed by Punjab (0.47) and Gujarat (0.46) recording higher percentage of Kisan Credit Cards. The results also reveal that majority of the central and the north-eastern states report commercial banks less than the national average (0.12) with Bihar (0.04) at the bottom, followed by Manipur (0.06), Madhya Pradesh (0.09) and Uttar Pradesh (0.11). However, there are wide gaps existing in rural India regarding these banks as Goa with (0.98) occupies the first position followed by Himachal Pradesh (0.33) and Punjab (0.25). Women employment rate (WER) has marginally decreased from 25.70 per cent in 2001 to 25.51 per cent in 2011 in India. Eleven states have their index value lower than the national average (0.41), where Uttar Pradesh (0.10), West Bengal (0.13) and Bihar (0.15) have reported poor women employment indices. However, Himachal Pradesh (0.87), Andhra Pradesh (0.80) and Sikkim (0.79) have shown higher women employment indices (Fig. 3).

Status of Natural Assets

Natural assets indicate the natural resource stocks useful for livelihood. India is endowed with great natural resources such as forest wealth, fertile agricultural land, water resources, etc. helping in the economic development of the country (Sandhu, 2007). Natural assets index has been calculated with the four indicators. These include percentage of forest area, soil testing laboratories, ground water resource and net sown area to total cropped area. The results of natural assets index reveal gloomy picture as more than fifteen states recorded natural assets index below the national average (0.44). The analysis shows that Rajasthan (0.34), Nagaland (0.33), Maharashtra (0.32), Karnataka (0.31), Mizoram (0.29), Jharkhand (0.23) and Manipur (0.24) have reported very low natural assets index. While, Uttar Pradesh (0.43), Tamil Nadu (0.41), Odisha (0.40), Assam (0.40), Meghalaya (0.39), Kerala (0.39) and Andhra Pradesh (0.39) fall in the low category of natural assets index. However, the index of Jammu and Kashmir (0.55), Madhya Pradesh (0.52), Chhattisgarh (0.49), Haryana (0.48), Gujarat (0.47), Arunachal Pradesh (0.47), Bihar (0.44), West Bengal (0.44), and Tripura (0.44) belong to medium category. Whereas the natural assets index for Himachal Pradesh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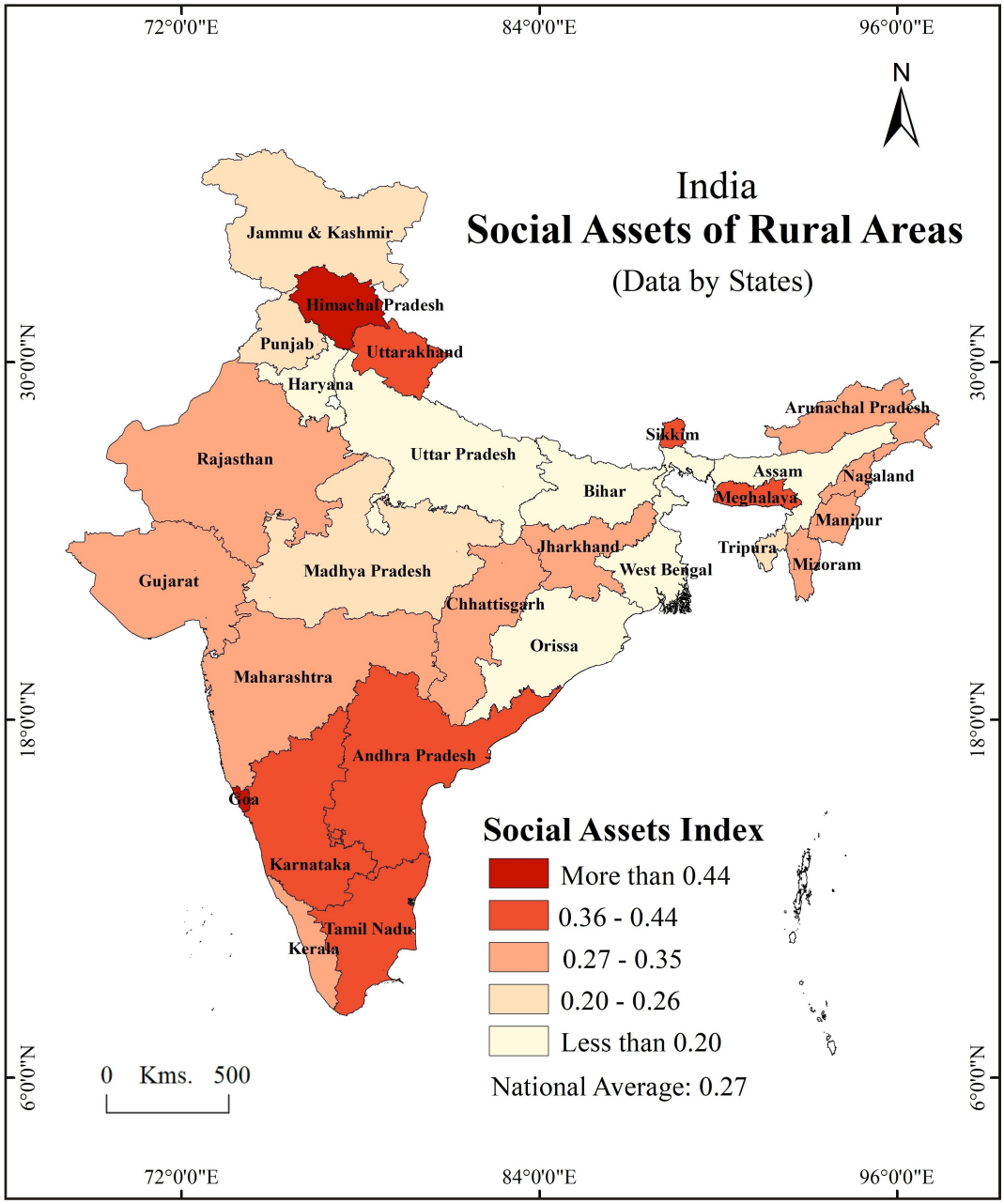
Arunachal Pradesh
Assam
Nagaland
Meghalaya
Manipur
Tripura
Mizoram
Jharkhand
West Bengal
Gujarat
Madhya Pradesh
Chhattisgarh
Orissa
Maharashtra
Andhra Pradesh
Goa
Karnataka
Tamil Nadu
Kerala
Physical Assets Index
More than 0.56
0.49 - 0.56
0.40 - 0.48
0.29 - 0.39
Less than 0.29
National Average: 0.34
0 Kms. 500

Fig. 2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Bihar
Sikkim
Arunachal Pradesh
Assam
Nagaland
Meghalaya
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Jharkhand
West Bengal
Gujarat
Madhya Pradesh
Chhattisgarh
Orissa
Maharashtra
Andhra Pradesh
Goa
Karnataka
Tamil Nadu
Kerala
Social Assets Index
More than 0.44
0.36 - 0.44
0.27 - 0.35
0.20 - 0.26
Less than 0.20
National Average: 0.27
0 Kms. 500

Fig. 3

(0.72), Uttarakhand (0.67) and Punjab (0.60) fall under high category. Sikkim (0.94) shows the highest score for this index and remains at the top.

Findings about forest area index depict that Mizoram (0.95) tops the list followed by Manipur (0.89), Goa (0.68) and Kerala (0.59). While, Haryana (0.13) reported the lowest forest area index. Thus, it is very clear that there are large scale inter-state variations in areas under forest. On account of soil testing laboratories, which is the base for decisions about fertilizer requirements, fifteen states have recorded their index more than the national average (0.67). Among them, Sikkim (0.97), Himachal Pradesh (0.89) and Mizoram (0.83) are worth mentioning. The states with lower ground water resources fall in the north-eastern region of India. The findings of ground water resource index depict that Arunachal Pradesh lies at the bottom with (0.10) while Assam with (0.28) at the top among these eight north-eastern states. This is largely due to steep slopes and high runoff. Cropping intensity refers to the ratio of net sown area to total cropped area. It is also considered as an important indicator of natural assets. Cropping intensity index reveals that Odisha (0.16) and Jharkhand and Chhattisgarh (0.23) show poor cropping intensity. While, Punjab (0.98), Haryana (0.93) and Uttar Pradesh (0.62) have reported high level of cropping intensity index (Fig. 4).

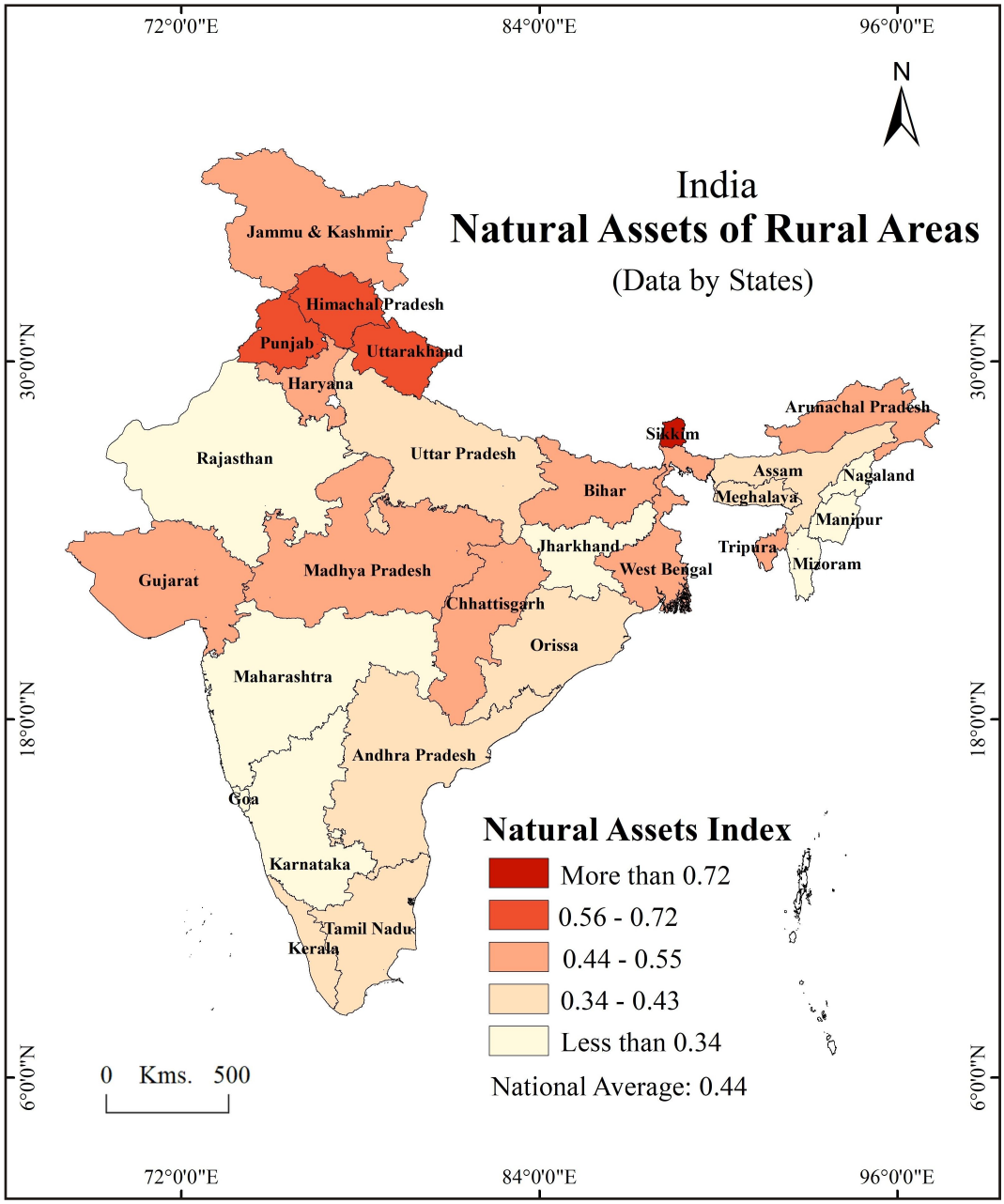
Status of Financial Assets

Financial assets are the assets base which is essential for the pursuit of any livelihood strategy. Financial assets index has been calculated with five indicators including monthly per capita expenditure, population above poverty line, main workers, cultivators and other workers. The national average for financial assets index is (0.38). 20 states have recorded their index value less than the national average. Findings of financial assets index reveal that Jharkhand (0.13), Chhattisgarh (0.18), Odisha (0.19), Bihar (0.20), Madhya Pradesh (0.26) and Uttar Pradesh (0.30) fall in very low category due to declining other workers, cultivators and persons above poverty line. Highest financial assets index is recorded by Kerala (0.73) followed by Goa (0.72), while all other southern states fall in the medium category.

Monthly per capita expenditure is closely linked to individual's per capita monthly income. Analysis shows that Odisha (0.14), Jharkhand (0.15), Bihar (0.17), Madhya Pradesh (0.19) and Uttar Pradesh (0.20) have their monthly per capita expenditure index less than the national average (0.35). Only three states i.e., Kerala (0.86), Punjab (0.79) and Haryana (0.77) report their monthly per capita expenditure index in high category.

Population above poverty line index reveals that Goa (0.96), Kerala (0.95), Sikkim (0.93), Himachal Pradesh (0.92) and Punjab (0.91) belong to high category while Chhattisgarh (0.55), Jharkhand (0.59), Arunachal Pradesh (0.61) and Madhya Pradesh (0.64) report lower indices of population above poverty line. However, there are ten states which have recorded their index less than the national average (0.74) in terms of population above the poverty line.

Main workers are those who work for 183 days or more days. Main workers index shows that Maharashtra (0.86) has the highest index of main workers, followed by Mizoram (0.85) and Punjab (0.82), while Jharkhand (0.45), Jammu and Kashmir (0.53) and Odisha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Meghalaya
Manipur
Tripura
Mizoram
Jharkhand
West Bengal
Gujarat
Madhya Pradesh
Chhattisgarh
Orissa
Maharashtra
Andhra Pradesh
Goa
Karnataka
Tamil Nadu
Kerala
Natural Assets Index
More than 0.72
0.56 - 0.72
0.44 - 0.55
0.34 - 0.43
Less than 0.34
National Average: 0.44
0 Kms. 500

Fig. 4

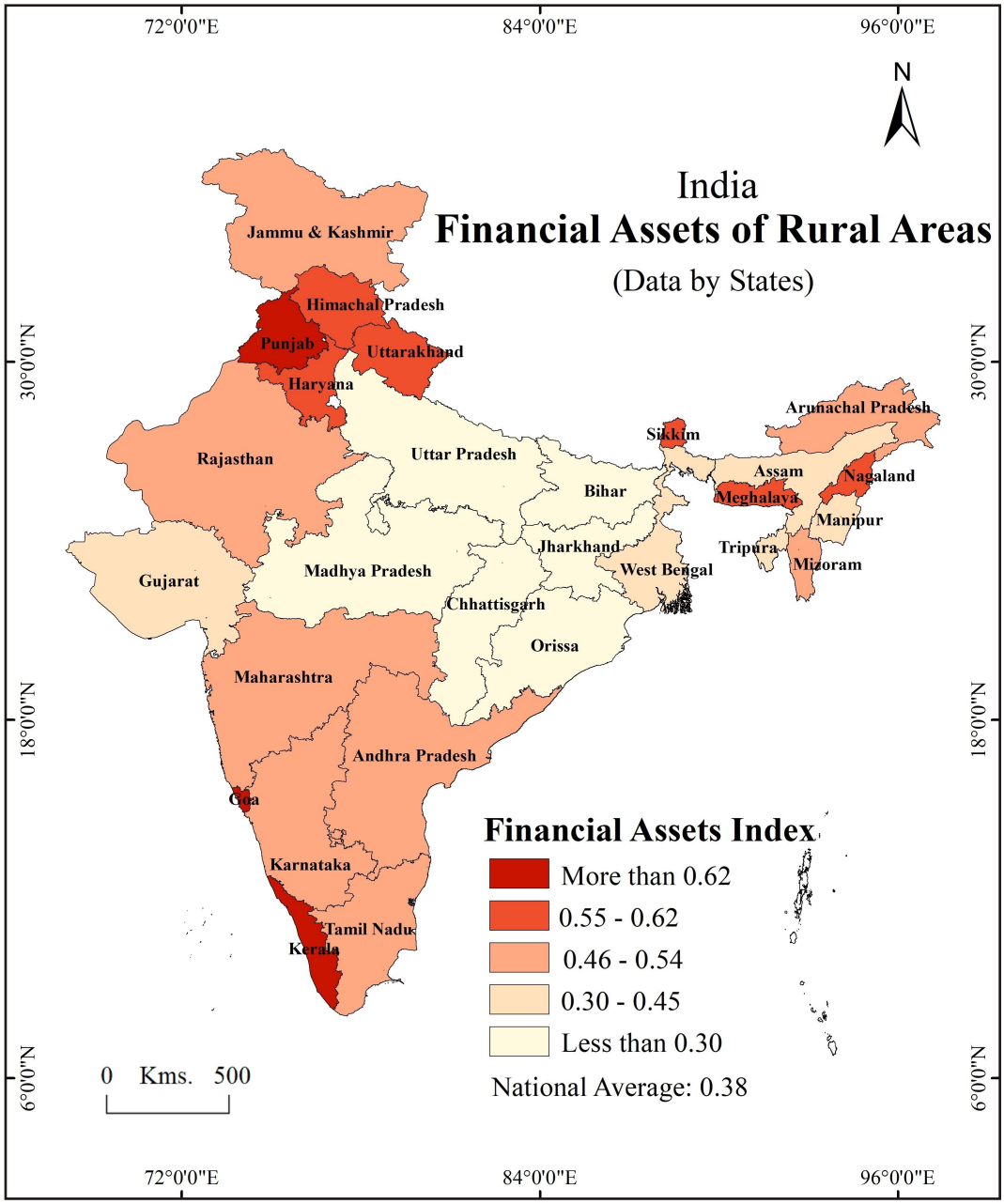
(0.57) have recorded lower indices of main workers. Cultivators are those who own any piece of land. Cultivators' index shows that Mizoram occupies the first position with (0.98). Other significant states are Himachal Pradesh (0.79) and Rajasthan (0.68). While, there are nine states which have their index for cultivators less than the national average (0.35). The lowest index of cultivators is reported by West Bengal (0.16) followed by Odisha (0.19) and Bihar (0.26). As per census, other workers are those who are engaged in economic activities except primary economic activities. The states which have high index of other workers are Goa (0.75), Kerala (0.71) and Punjab (0.42) (Fig. 5).

Status of Economic Vulnerability in Rural India

The term economic vulnerability is used to highlight the magnitude to which a state is susceptible to varying levels of stresses and shocks. Vulnerability has two aspects; external and internal. External aspects include various risks and hurdles associated with livelihood sustainability while internal aspects refer to the ability of a system to recover. It mainly depends on the availability of various assets and access of people to them. Higher the economic vulnerability index, greater would be the hindrances in the way of achieving sustainable livelihood. It also reflects the external environment that the poor people live in. It is calculated on the basis of indicators, like unemployment rate, percentage of population below poverty line, percentage of agricultural labourers to total workers and percentage of marginal workers to total workers (Table 1). There are seven states having their economic vulnerability index higher than the national average of (0.24). Among these are the states of central and eastern region like Jharkhand (0.34), Bihar (0.33), Odisha (0.31), Madhya Pradesh (0.29), Uttar Pradesh (0.26) and West Bengal (0.24). It is largely because of higher unemployment and increasing number of agricultural labourers, recorded by these states (Table 4).

An annual report on employment and unemployment survey is published by Ministry of Labour and Employment. Analysis for unemployment index reveals that the lowest unemployment is recorded from Gujarat (0.01) followed by Maharashtra (0.01) and Karnataka (0.02). Contrary to it, highest unemployment index is reported from Nagaland (0.97) followed by Tripura (0.48).

According to the Planning Commission (2012), 25.70 per cent of the total population of rural India live below poverty line (BPL). Goa (6.81 per cent), Punjab (7.66 per cent) and Kerala (9.14 per cent) belong to the category of those states where population living BPL is less than 10 per cent. However, there are states like Jharkhand (40.84 per cent), Chhattisgarh (44.61 per cent) and Madhya Pradesh (35.74 per cent) that have a large share of population living in BPL. Agricultural workers constitute the largest working class in Indian rural structure. The rise of agricultural laborers is closely associated with the increment in economic vulnerability. Census data reveals that the number of agricultural labourers has increased from 106.8 million in 2001 to 144.3 million in 2011. For the first time after independence, agricultural labourers have outnumbered cultivators. Bihar (56.86 per cent) has the highest percentage of agricultural labourers, while Himachal Pradesh (5.18 per cent) occupies the topmost rank among the states having lower share of agricultural labourers. Census data also shows that during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Assam
Nagaland
Meghalaya
Manipur
Tripura
Mizoram
Jharkhand
West Bengal
Gujarat
Madhya Pradesh
Chhattisgarh
Orissa
Maharashtra
Andhra Pradesh
Goa
Karnataka
Tamil Nadu
Kerala
Financial Assets Index
More than 0.62
0.55 - 0.62
0.46 - 0.54
0.30 - 0.45
Less than 0.30
National Average: 0.38
0 Kms. 500

Fig. 5

Table 4
India: Major Component Indices and Sustainable Livelihood Index

States	Assets Index	Economic Vulnerability Index	Livelihood Sensitivity Index	Sustainable Livelihood Index
Andhra Pradesh	0.44	0.21	0.55	4.66
Arunachal Pradesh	0.37	0.17	0.39	4.62
Assam	0.32	0.22	0.32	3.65
Bihar	0.22	0.33	0.31	1.58
Chhattisgarh	0.34	0.33	0.34	2.09
Goa	0.63	0.11	0.86	9.95
Gujarat	0.40	0.22	0.51	4.13
Haryana	0.41	0.16	0.72	7.07
Himachal Pradesh	0.65	0.15	0.82	9.73
Jammu & Kashmir	0.36	0.20	0.50	4.38
Jharkhand	0.23	0.34	0.28	1.48
Karnataka	0.42	0.20	0.52	4.63
Kerala	0.61	0.15	0.75	9.43
Madhya Pradesh	0.32	0.29	0.32	2.21
Maharashtra	0.44	0.20	0.52	4.79
Manipur	0.38	0.19	0.44	4.18
Meghalaya	0.40	0.14	0.29	4.77
Mizoram	0.45	0.15	0.40	5.72
Nagaland	0.44	0.19	0.38	4.23
Odisha	0.31	0.31	0.26	1.82
Punjab	0.49	0.13	0.79	8.62
Rajasthan	0.37	0.18	0.42	4.48
Sikkim	0.60	0.13	0.57	9.78
Tamil Nadu	0.50	0.21	0.60	5.33
Tripura	0.42	0.22	0.38	3.56
Uttar Pradesh	0.26	0.26	0.49	2.85
Uttarakhand	0.53	0.14	0.68	8.82
West Bengal	0.34	0.24	0.31	2.66
India	0.35	0.24	0.47	3.50

Source: Compiled by Authors.

the last two decades (1991-2011), the rate of growth in marginal workers has been higher than that of main workers. Maharashtra (13.51 per cent) has the lowest share of marginal workers followed by Andhra Pradesh (16.90 per cent) and Punjab (17.35 per cent). However, Jharkhand (54.66 per cent), Jammu and Kashmir (46.36 per cent) and Odisha (42.90 per cent) have reported marginal workers more than the national average (29.50 per cent) (Census of India, 2011) (Fig. 6).

Status of Livelihood Sensitivity in Rural India

Livelihood sensitivity refers to the degree to which a system is affected either adversely or beneficially. In this study, livelihood sensitivity index is considered as complementary to assets index. Both help in understanding the levels of assets of the state and has to combat economic vulnerability. The basic difference between these two indices lies in the fact that the assets index assesses the status of livelihood sustainability at macro level while livelihood sensitivity index emphasizes on micro level, i.e., household level. The index of livelihood sensitivity is positively associated with livelihood sustain-ability. Higher livelihood sensitivity index, i.e., close to 1 reveals sustainable situation. The livelihood sensitivity index is calculated using 10 indicators reflecting housing condition, sanitation facility and household assets (Table 1).

(i) Status of Housing Condition

Everyone has the right to a standard of living adequate for the health and well-being of himself and his family. Nearly 53 per cent rural population is reported to live in 'good condition houses' (Census of India, 2011). However, there is great inequality among states as Odisha with 25.42 per cent of good condition houses is ranked at the lowest level, while Goa has 75 per cent rural houses in the category of good condition houses. In India, about 56 per cent of the total rural households have access to more than two dwelling rooms and electricity (Census of India, 2011).

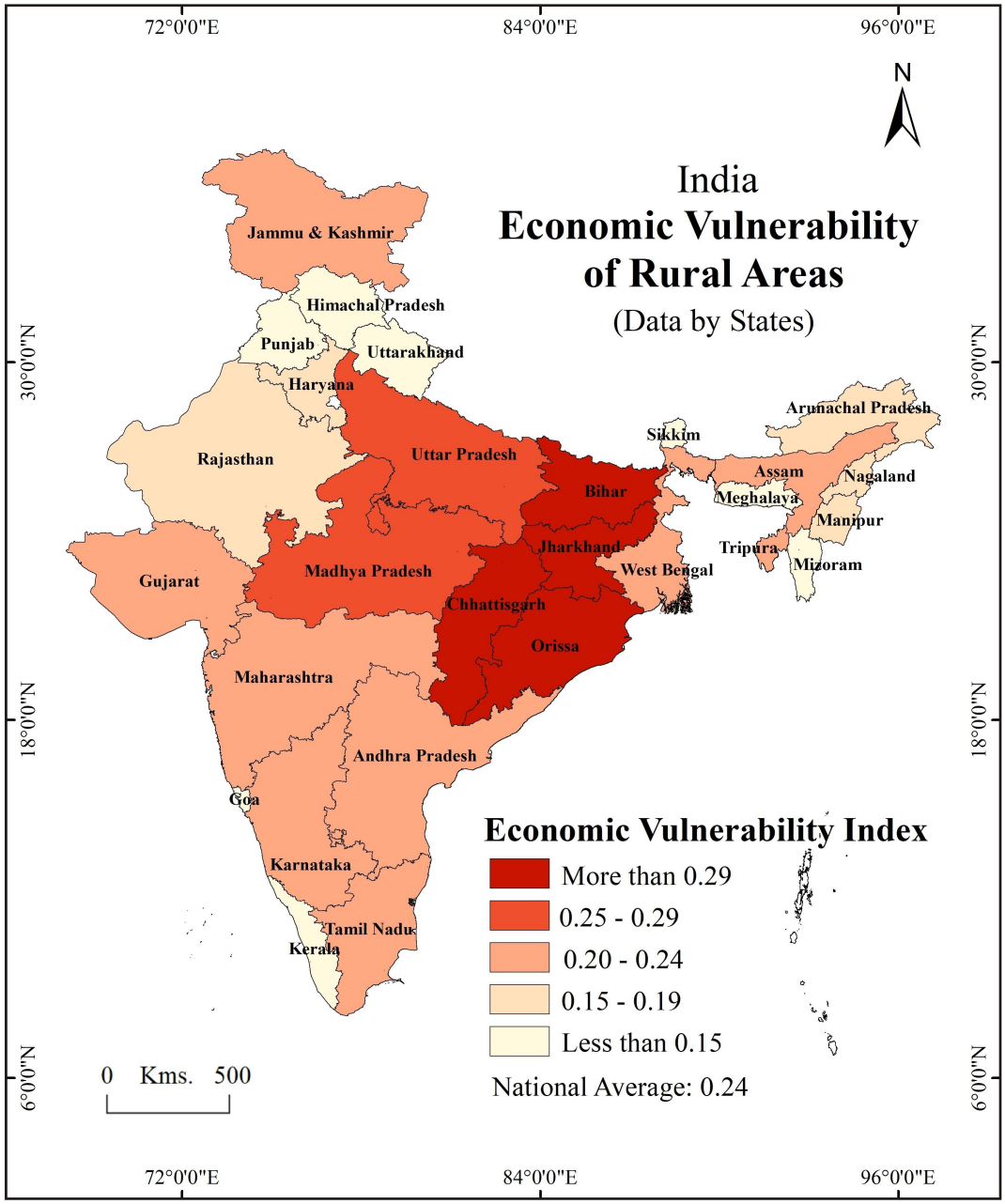
(ii) Status of Sanitation Facility

Sanitation encompasses formidable part of ensuring human dignity. It is not only an absence of garbage and waste materials strewn around but also access to toilet facility, safe drinking water and connectivity to a drainage system. Only 31 per cent rural households are having any toilet facility in their households (Census of India, 2011). In nine states of India, percentage in access to toilet facility is even below than the national average. Similarly, sixteen states are lagging behind the national average (82.7 per cent) for safe drinking water. Mostly north eastern states like Meghalaya (35.1 per cent) followed by Manipur (37.5 per cent) and Mizoram (43.4 per cent) are found to be greatly deprived of this resource. Forty-two per cent Indian rural households have well-connected waste-water outlet, while only 38 per cent of rural households have source of water within the premises. However, 28 per cent of rural households get access to tap water from treated source (Census of India, 2011).

(iii) Status of Household Assets

Those households which have lesser access to household assets are more vulnerable to livelihood sensitivity. For measuring it, two indicators, i.e., banking facilities and access to specific household assets, have been taken into account. Fifty-eight per cent of the rural households in India are availing banking facilities (Census of India, 2011). In household assets, like access to bike, bicycle, mobile phones, television, and banking facility are considered. Household assets index show that Punjab (0.93) has the highest index followed by Goa (0.87), while Meghalaya (0.15) has the lowest index after Nagaland (0.18) and Arunachal Pradesh (0.25).

The study, on the whole, reveals that fourteen states of India lie below the national average in livelihood sensitivity index (0.47). Central and eastern states like Chhattisgarh (0.34), Madhya Pradesh (0.32), West Bengal (0.31), Bihar (0.31), Jharkhand (0.28) and Odisha (0.26) belong to very low category. However, Goa (0.86), Himachal Pradesh (0.82)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Sikkim
Arunachal Pradesh
Assam
Nagaland
Meghalaya
Manipur
Tripura
Mizoram
Jharkhand
West Bengal
Gujarat
Madhya Pradesh
Chhattisgarh
Orissa
Maharashtra
Andhra Pradesh
Goa
Karnataka
Tamil Nadu
Kerala
Economic Vulnerability Index
More than 0.29
0.25 - 0.29
0.20 - 0.24
0.15 - 0.19
Less than 0.15
National Average: 0.24
0 Kms. 500

Fig. 6

and Punjab (0.79) belong to very high category of livelihood sensitivity index due to their better indices for housing condition, sanitation facilities and household assets (Fig. 7).

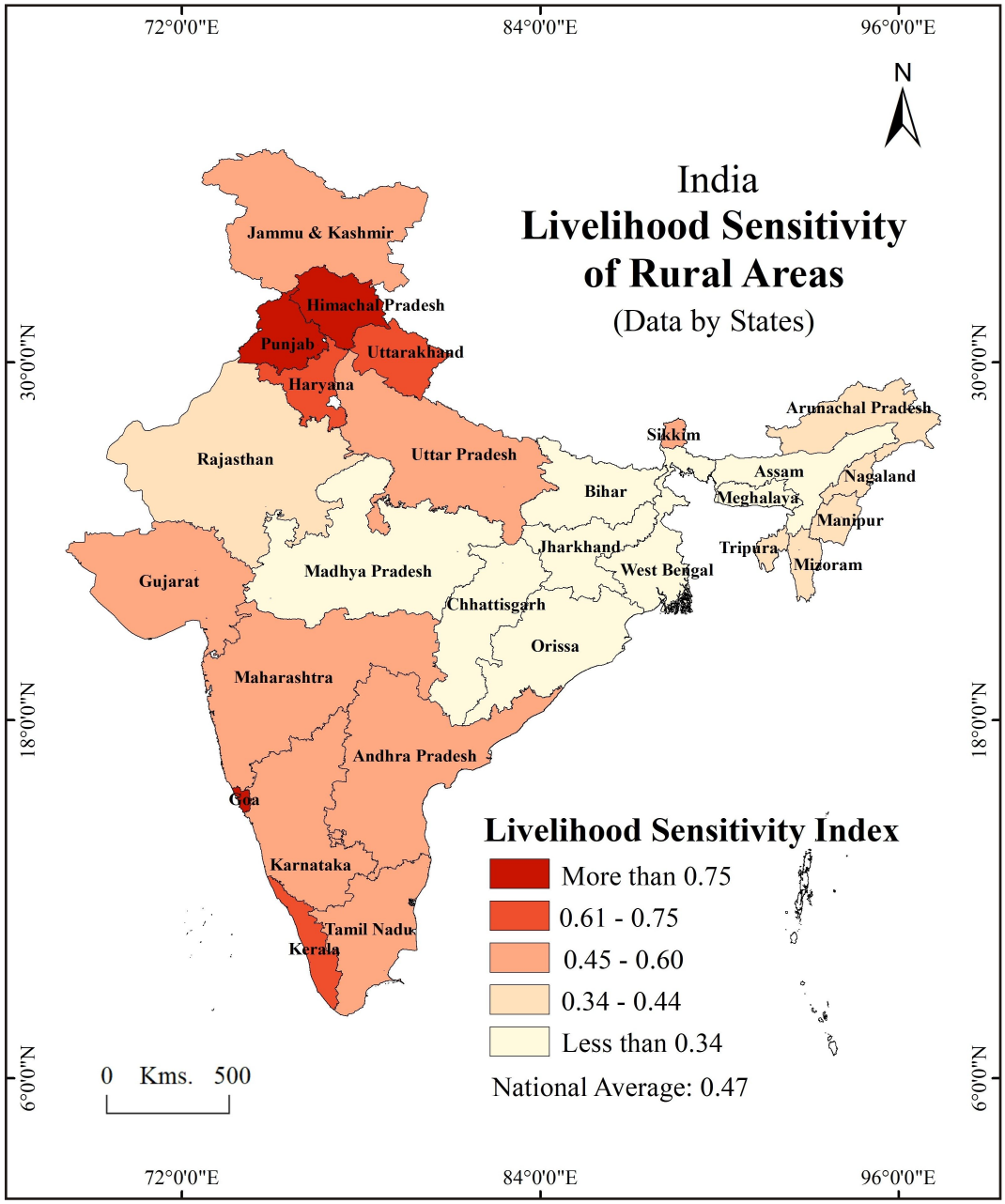
Livelihood Sustainability Ladder

This ladder has been computed using 44 indicators from various domains of major and minor components. For this purpose, modified IPCC vulnerability index is applied to get SLI. This index is categorized into four sustainability transitional stages namely surviving, coping, adapting, and accumulating, proceeding from poor livelihood status to better livelihood status. The analysis shows that there are nine states with livelihood sustainability index less than the national average (3.50). States like Uttar Pradesh (2.85), West Bengal (2.66), Madhya Pradesh (2.21), Chhattisgarh (2.09), Odisha (1.82), Bihar (1.58) and Jharkhand (1.48) are grouped into 'surviving' category mainly due to poor social, human and financial assets' indices. These states have lower assets base, particularly associated with female literacy, work participation, kisan credit cards and monthly consumer expenditure. Therefore, these states are economically vulnerable to varying stresses, shocks, trends and seasonality, hindering their way to livelihood sustainability. Except West Bengal, all these six states have more than 35 per cent of their rural population living below the poverty line.

Second livelihood transitional stage is 'coping'. It means that these states are also poor in assets and therefore, are economically vulnerable. Majority of these states have lower index for physical and social assets. Access to education, health facilities, rural banks and gender disparity are the core concerns for these states. However, this stage is different from the 'surviving' on account of its lesser severity for economic vulnerability. The SLI recorded by these states is above the national average (3.50). States falling in this category are Rajasthan (4.48), Jammu and Kashmir (4.38), Nagaland (4.23), Manipur (4.18), Gujarat (4.13), Assam (3.65) and Tripura (3.56). Lower assets and increasing agricultural labourers are mainly responsible for placing these states into this category.

The third transitional stage of rural livelihood sustainability is termed as 'adapting', which is characterized by better index for assets, especially for human, physical and financial. This category includes seven states namely Mizoram (5.72), Tamil Nadu (5.33), Maharashtra (4.79), Meghalaya (4.77), Andhra Pradesh (4.66), Karnataka (4.63) and Arunachal Pradesh (4.62) located in southern and north-eastern parts of India. Although, these states have reported to have easy and efficient access to various assets and household amenities, yet, these are placed in adapting category because of recording constant increase in the percentage of agricultural labourers and marginal workers since last few decades, affecting their sustainability index. This has neutralized the impact of higher assets and livelihood sensitivity and kept these states out of the stage of accumulating.

The fourth and most sustainable transitional stage is termed as 'accumulating'. The states falling in this category have enough assets base to cope any stress and shocks. This category includes seven states and most of them have recorded high index for most of the major and minor components. Goa has recorded the highest SLI (9.95), followed by Sikkim (9.78). Apart from these two states, other states in accumulating category are Himachal Pradesh (9.73), Kerala (9.43),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Bihar
Sikkim
Arunachal Pradesh
Assam
Nagaland
Meghalaya
Manipur
Tripura
Mizoram
Jharkhand
West Bengal
Gujarat
Madhya Pradesh
Chhattisgarh
Orissa
Maharashtra
Andhra Pradesh
Goa
Karnataka
Tamil Nadu
Kerala
Livelihood Sensitivity Index
More than 0.75
0.61 - 0.75
0.45 - 0.60
0.34 - 0.44
Less than 0.34
National Average: 0.47
0 Kms. 500

Fig. 7

Uttarakhand (8.82), Punjab (8.62) and Haryana (7.07) (Table 4). All these states could make their place in this category, owing to their higher index for human, physical and financial assets. Their economic vulnerability index is also low which makes them more sustainable (Fig. 8).

Impact of Major Components on Livelihood Sustainability

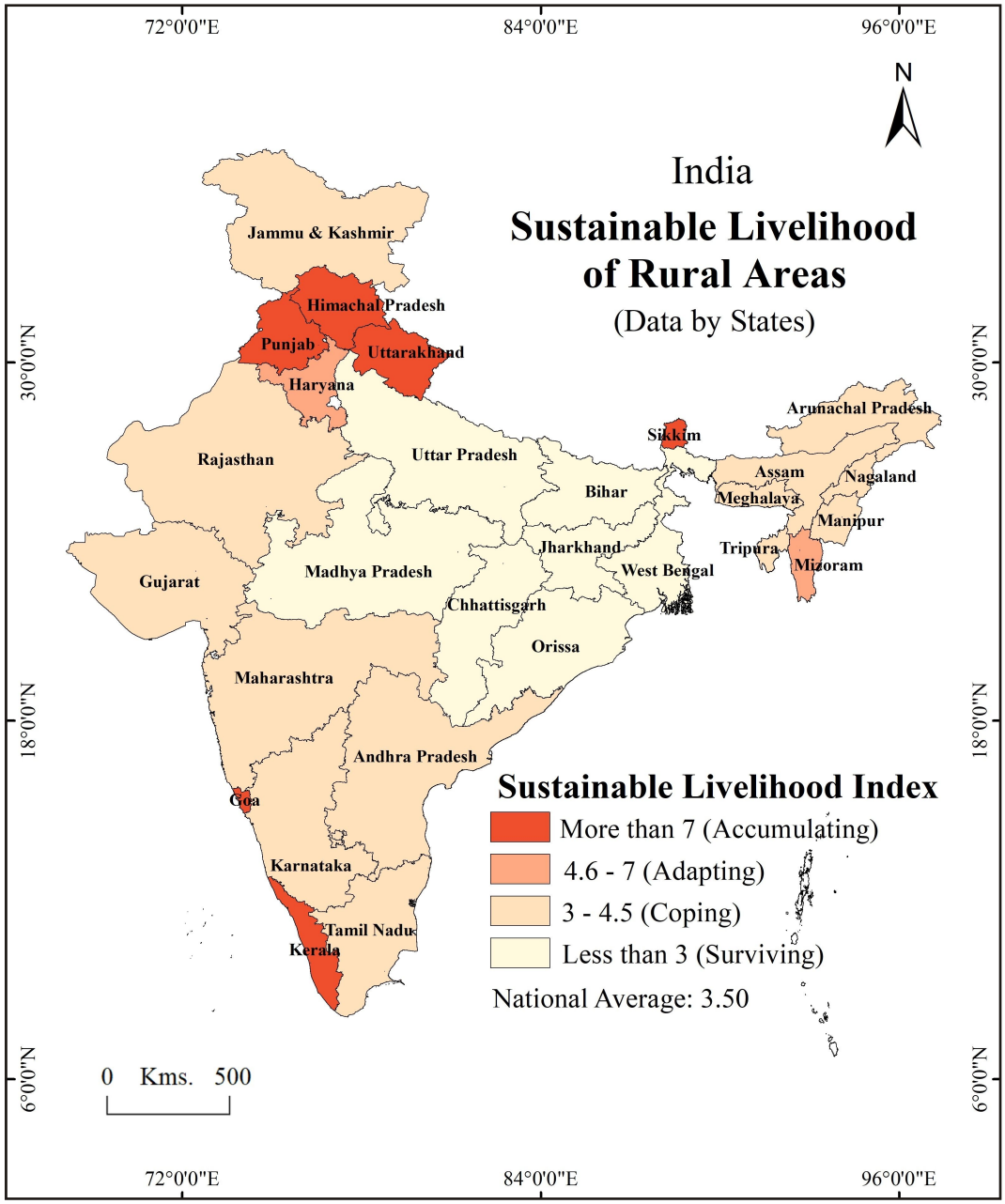
Livelihood sustainability is the outcome of major components, i.e., assets, economic vulnerability and livelihood sensitivity and their interaction with one another. Therefore, Pearson product-moment correlation coefficient is computed to assess the relationship and direction of relationship among these components. The findings reveal that there is a positive and significant relationship between assets index and livelihood sensitivity index, $r = 0.80$, $n = 28$ and $p = 0.00$. However, economic vulnerability index shows an inverse relationship with both assets index and livelihood sensitivity index. Its r value being -0.79 and -0.67 respectively, $n = 28$ and $p = 0.00$. Nevertheless, p value of economic vulnerability index makes it statistically significant.

Secondly, multiple regression is carried out for measuring and predicting the influence of different major components on livelihood sustainability index. The results of the regression indicate that the model explains over 90 per cent of the variation on the predicted variable: livelihood sustainability index ($R^2 = 0.92$, Adjusted $R^2 = 0.92$, $p < 0.05$). Analysis of variance shows that each of the predictor has a significant effect on livelihood sustainability index and in the development of full model. On the basis of indices, it is found that assets index holds the topmost position impacting rural livelihood sustainability with 7.46 units ($p < 0.05$). It is followed by livelihood sensitivity index. Both the indices contribute positively to overall livelihood sustainability. However, analysis of economic vulnerability index depicts that it creates hindrances in the way to achieve rural livelihood sustainability with -11.60 units.

Thirdly, Exploratory Factor Analysis (EFA) has been utilised as it lays the foundation and tries to uncover complex patterns by exploring the dataset and testing predictions (Child, 2006). After running the EFA in SPSS, the first output is the descriptive statistics for all the variables explaining mean, standard deviation and other significant statistics followed by the correlation co-efficient. It provides information between a single variable and every other variable in the investigation. The correlation coefficient varies between +1 and -1.

Another important test is Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity. It measures the sampling adequacy which should be greater than 0.5 for carrying out a satisfactory EFA. For the present study, KMO value is 0.68, which is close to 0.70. It reflects that Bartlett's test is significant. Results of EFA depict that out of total 44 variables, seven variables form the first two components of EFA. These seven variables explain cumulative 86.75 per cent of the total variation.

Eventually, rotated component (factor) matrix is derived. The main idea behind the rotation is to reduce the number of factors on which the variables under investigation have high loadings. Two factors are extracted. On the basis of their properties and common thread and characteristics among the variables, first factor has been named as “Housing Infra-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Assam
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Manipur
Tripura
Mizoram
Jharkhand
West Bengal
Gujarat
Madhya Pradesh
Chhattisgarh
Orissa
Maharashtra
Andhra Pradesh
Goa
Karnataka
Tamil Nadu
Kerala
Sustainable Livelihood Index
More than 7 (Accumulating)
4.6 - 7 (Adapting)
3 - 4.5 (Coping)
Less than 3 (Surviving)
National Average: 3.50
0 Kms. 500

Fig. 8

structure" and second as "Economic". Thus, this exploratory factor analysis makes it very clear that sustainability of rural livelihood is largely influenced by the combination of these factors.

Conclusions

This study has assessed the status of livelihood sustainability in rural areas of India and also examined the association of assets index, economic vulnerability index and livelihood sensitivity index in influencing SLI. The findings of this paper reveal that for all the five indices of assets, i.e., human, physical, social, natural and financial - Goa, Kerala, Himachal Pradesh, Punjab and Sikkim have recorded high index values. However, social and natural assets are the matter of concern even among these states also. Analysis for economic vulnerability index shows that Goa, Sikkim, Himachal Pradesh, Uttarakhand, Kerala, Punjab, Meghalaya and Mizoram belong to very low economic vulnerability and have higher assets. While, Jharkhand, Bihar, Chhattisgarh and Odisha are found to be having very high economic vulnerability index values. These states also have reported lower assets, making them economically vulnerable. Another significant finding depicts that the north-eastern states are better placed in terms of economic vulnerability. Surprisingly, Gujarat and Maharashtra are respectively placed on twentieth and fifteenth position in the ladder of livelihood sustainability. The results for livelihood sensitivity index depict that Odisha lies at the bottom for livelihood sensitivity index followed by Jharkhand, Meghalaya, Assam, West Bengal, Madhya Pradesh, Chhattisgarh and Bihar.

The findings of SLI reveal that Goa, Punjab, Himachal Pradesh, Kerala, Sikkim, Uttarakhand and Haryana belong to the highest ladder of livelihood sustainability, named 'accumulating'. These are the states which have higher index values for both assets and livelihood sensitivity, while economic vulnerability is comparatively low here. On the other hand, Jharkhand, Bihar, Odisha, Chhattisgarh, Madhya Pradesh, West Bengal and Uttar Pradesh lie at the bottom of this ladder, named as 'surviving'. They are poorly sustainable states and also reported poor household assets. Assam, Tripura, Gujarat, Rajasthan, Jammu and Kashmir, Nagaland and Manipur fall in coping category, however, Karnataka, Maharashtra, Tamil Nadu, Andhra Pradesh, Arunachal Pradesh, Meghalaya and Mizoram belong to adapting category. States like Karnataka, Maharashtra and Tamil Nadu have recorded high index values for all the assets except natural assets. However, they are placed in adapting ladder due to their medium index values for economic vulnerability index and livelihood sensitivity index.

This study identifies poor performing states under various domains of livelihood and also in assessing varying needs for different states. Proper attention is required for identified poor assets among states to improve their position and thus they can also move upward in this ladder. Statistics presented and explained in this paper would help policy makers and planners to design, rejuvenate and strengthen the rural areas.

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