IMPACT OF PRADHAN MANTRI GRAMIN SADAK YOJNA ON RURAL DEVELOPMENT IN CHURAH TEHSIL, DISTRICT CHAMBA, HIMACHAL PRADESH, INDIA

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Abstract

Construction of rural roads inevitably leads to an increase in agricultural production and productivity by bringing in new areas under cultivation or by intensifying existing land use. The present study seeks to investigate the impact of Pradhan Mantri Gramin Sadak Yojana (PMGSY) on the socio-economic upliftment of rural people of Churah tehsil. This study has utilized both primary and secondary sources of data. In total, 343 households randomly selected from 14 sample villages have been surveyed. To understand the impact of PMGSY on the life of inhabitants, 8 domains namely income, wealth, employment, health, education, agriculture, gender empowerment, social order and disorganization, general and political awareness and living environment have been taken into account. The study validates the basic premise that construction of PMGSY roads has played a significant impact on development of education, health facilities and economic activities leading to overall rural development in the study area.

Keywords: PMGSY, Rural roads, Infrastructure, Principal Components Analysis, Chamba district.

Introduction

Availability of rural roads enhances mobility of humans, goods and services, thus in turn facilitates economic growth. Rural roads provide good connectivity to schools, health and market centers (Sannalingappa et al., 2016). Improved roads stimulate socio-economic growth and poverty reduction through a range of mechanisms. Roads reduce costs of transportation, consumption and production of goods and services. With easier access to markets and technology, improved roads expand farm and non-farm production through increased availability of inputs and lower input costs (Binswanger, 1993). Good road connectivity contributes to higher productivity and demand for labour and improved education and health facilities (Bryceson and Howe, 1993). Poor road infrastructure limits access to markets and public services of developing countries. It is estimated that 15 per cent of crop produce is lost between the farm gate and the consumer because of poor roads and inappropriate storage facilities alone, adversely influencing the income of farmers (World Bank, 2009). Construction of rural roads inevitably leads to an increase in agricultural production and

productivity by bringing in new areas under cultivation or by intensifying existing land use to take the advantage of expanded market opportunities. In addition to facilitating agricultural commercialization and diversification, the rural roads have also consolidated the links between agricultural and non-agricultural activities within rural areas and between rural and urban areas (Samanta, 2015).

The Indian economy has been agrarian by nature, so it is necessary to have a good rural road network which is instrumental in increasing the manifold returns from agriculture as well as minimizing the post-harvest losses (Sharma, 2017). Against this backdrop, the Government of India appointed Jaykar Committee to advise suitable road policy for India. The Government of India and the State Governments have drawn several policies, programmes and conceived various schemes for the development of rural roads in India. Efforts have been made to develop rural roads under various programmes. During 1943-61, the Nagpur plan has been the India's first major attempt towards planning of road system. The Bombay plan (1961-81) thereafter owed to the changing nature of road transport in India. The Lucknow plan (1981-2001) has been drawn up to feature all aspects of road development and its management. The roads have been classified into national highways, state highways, and district and village roads (MoRD, 2006). In order to create durable and permanent assets, an adequate provision for drainage and protection works as well as quality control during construction and maintenance of assets, the Government of India launched the PMGSY scheme on 25th December, 2000 as a Centrally Sponsored Scheme to assist the states. The primary objective of PMGSY is to provide connectivity by way of an all-weather road to the eligible unconnected habitations with populations exceeding 500 persons (250 in hilly and desert areas) by 2015 (Samanta, 2015). After the launch of PMGSY, activities have spread to all parts of the country and satisfactory road connectivity has been witnessed in the last decade. Today, India with 4.7 million kilometers of roads has the second largest road network in the world. Rural roads account for 60 per cent of the total road length in India (Thakur, 2021).

However, the state of Himachal Pradesh still has a large proportion of habitations unconnected to the roads. Out of total 17,882 inhabited villages 68 per cent have bus connectivity and only 53 per cent have pucca road facility (Census of India, 2011). It is a matter of great concern that a large part of the state is still inaccessible, which retards good and easy accessibility to educational institutions, health institutions and market centers. The agro-climatic conditions of the state are congenial for the production of cash crops like seed potato, off-season vegetables and ginger, flowers, mushroom, honey, hops and apples (Economic and Statistics, 2022). For the improvement of economic and social conditions of rural people the roads have a very rich development potential in the state. The problems relating to easy access to schools, hospitals and markets may be solved to a great extent by providing good road connectivity in the rural areas of Chamba district where about 90 per cent of people reside in rural areas. With this background, the present study has been taken-up to explore the impact of PMGSY on the rural development of Churah tehsil, district Chamba.

Objectives

Major objective of the study is:

- to study the impact of PMGSY on rural development of Churah tehsil, district Chamba.

Research Hypothesis

The present study seeks to investigate the following hypothesis:

- There is no significant impact of road connectivity on (i) economic activity, (ii) agriculture, (iii) health conditions, (iv) education, (v) gender empowerment and vi) overall rural development.

Study Area

Churah tehsil of Chamba district of Himachal Pradesh is located between 77° 55' 21" to 76° 26´ 43" east longitudes and 32° 35' 47" to 33° 01' 27" north latitudes (Fig. 1). Chamba is one of the 115 backward districts identified by the National Institute for Transforming India (NITI) Aayog, (NITI Aayog, 2022). Churah is one of the backward tehsils (sub-district) of this 'aspirational district' chosen for development. Tissa is the tehsil headquarter of the Churah tehsil which is about 69 km away from district headquarter of Chamba. There are 181 inhabited villages spreading over an area of about 1069 km^2, inhabiting 78,988 persons as per 2011 census. The tehsil accounts for about 16 per cent of the total geographical area and about 15 per cent of total population of Chamba district. The forest cover is the dominant land use category followed by permanent pastures and open spaces. A sizable share of land is under snow cover. Given the mountainous nature of topography, only 7 per cent of area is under cultivation and 3 per cent under built-up. A small proportion of land under agriculture and built-up use signifies that construction of physical infrastructure including roads is a challenging task and costly business in Churah tehsil.

Database and Methodology

The present study is based on both primary and secondary sources of data. The complete information of the roads constructed under PMGSY in Churah tehsil has been procured from Public Works Department (PWD) office, Chamba. Only the roads of 5 km or above in length have been considered for the study because the roads constructed under PMGSY are minimum of 5 km or above in length. In order to study the regional variations, the study area has been divided into 3 spatial zones of 1 km physical distance (Fig.1; Table 1). This criterion has been decided arbitrarily but in a logical manner considering the mountainous terrain of the area.

In order to collect primary data, the habitations having population of at least 100 persons and more have been considered from each buffer zone. Primary data based on 48 variables relating to the impact of PMGSY roads on rural development have been collected at the household level. Both direct and proxy indicators related to the impacts of PMGSY on the lives of people have been taken into account. The overall rural development has been assessed through the schedules of questions on the role of PMGSY, containing 8 dimensions (Table 2). It has been evaluated by the respondents as per their experiences and expectations.

There are 14072 households (as per 2011 Census) distributed all across three spatial zones identified. Out of these, 343 households from 14 sample villages have been randomly selected for household survey. The villages have been selected using purposive stratified random sampling technique.

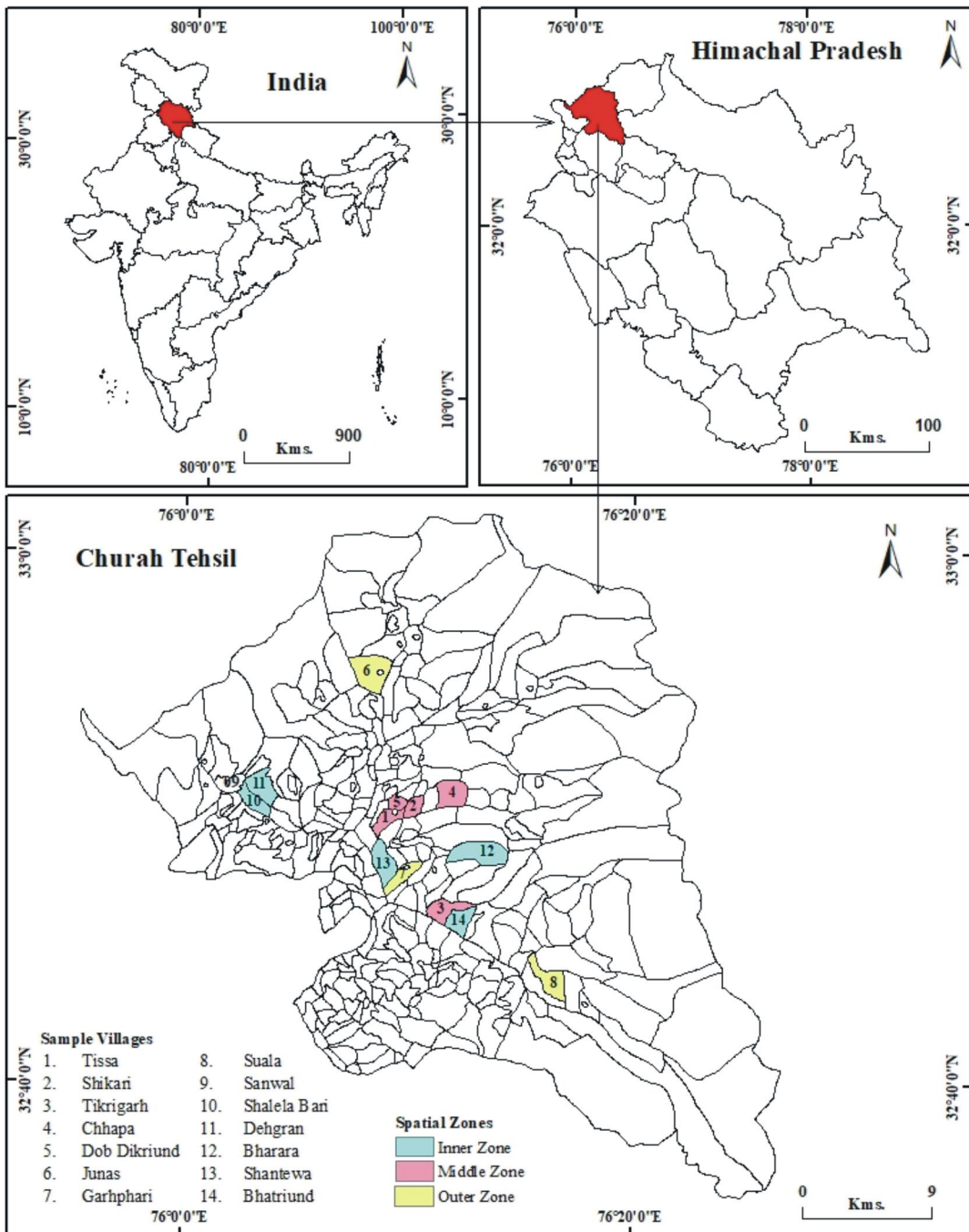Principal components method of factor

Fig. 1

Table 1
Churah Tehsil: Spatial Zonation of Sample Villages and Sample Households

Spatial Zone	Sample Village	Sample Households
Inner Zone	Tikrigarh	31
	Tissa	22
	Shikari	32
	Bharara	29
	Dob Dikriund	17
Sub-Total	**05**	**131**
Middle Zone	Junas	26
	Garhphari	23
	Swala	30
Sub-Total	**03**	**79**
Outer Zone	Sanwal	26
	Shalela Bari	19
	Dehgran	22
	Chhappa	27
	Shantewa	19
	Batrundi	20
Sub-Total	**06**	**133**
Total	**14**	**343**

Source: Compiled by Authors

analysis has been used to summarize the variables into smaller groups of factors with minimum loss of information. In all, 48 variables (objective and subjective) relating to 8 domains namely income, wealth, employment, health, education, agriculture, gender empowerment, social order and disorganisation, general and political awareness and living environment have been used to understand the impact of PMGSY on the life of inhabitants of the study area. Subjective variables have been evaluated on Likert scale of classification (Likert, 1932; Edwards and Kenney, 1946; Kothari, 2004). The variables have been transformed into scores ranging from 1 to 5. Score 1 has been given to the lowest contributor and 5 to the highest contributor (Mazziotta and Pareto, 2013; Saitluanga, 2014; Greyling and Tregenna, 2017). Instead of enumerating and considering every occupation, only five key occupations of the sample population have been considered. The household economic activity score has been assigned to individuals engaged in activities as: 0.5 to primary, 1 to secondary, 1.5 to tertiary, 2 to quaternary and 2.5 to quinary activities. Accordingly, the economic activity score has been summed up and computed for each household.

The suitability of the Principal Components Analysis (PCA) technique developed by Hotelling (1933) has been assessed by standardization of variables, visual analysis of correlation matrix for all the variables and Kasier-Meyer-Olkin (KMO), a measure of data adequacy. The KMO measure has been 0.757 which is above the criteria of 0.5. This indicates

Table 2
Churah Tehsil: List of Dimensions and Indicators Used

Dimensions	Indicators
Income, Wealth and Employment	• Households average annual income • Households average annual per capita expenditure • Households perceiving improvement in income • Households perceiving increase in land value • Households perceiving change from kutcha house to pucca house • Households perceiving increase in employment opportunities • Households perceiving increase in on farm opportunities • Distribution of economic activities among sample households • Households economic activity score • Households perceiving change in occupational structure
Health	• Households perceiving improvement in availability of medicines • Households perceiving improvement in availability of health emergency services • Households perceiving improvement in health environment (overall health care) • Households perceiving increase in level of child immunisation • Households perceiving increase in availability of beds in hospital • Households perceiving increase in availability of basic medicine in the hospital • Households perceiving improvement in mobile health facilities • Households perceiving improvement in access to health services • Households perceiving improvement in the doctors/medical staff in the institution
Education	• Households perceiving increase in universalisation of primary education • Households perceiving increase in number of girls attending schools • Households perceiving increase in availability of teachers • Households perceiving increase in regularity of students attending schools/ colleges • Households perceiving increase in private educational institutions in the area • Households perceiving increase in educational facilities • Households perceiving positive change in quality of education • Educational attainment at household level
Agriculture	• Households perceiving improvement in buying agricultural products • Households perceiving increase in profit from agriculture • Households perceiving better transport of produce to the market • Households perceiving positive change in agricultural infrastructure such as improved plough, threshing machines etc. • Households perceiving improvement in accessing market to sell products
Gender Employment	• Households perceiving positive change in gender equality • Households perceiving increase in female employment opportunities • Number of females in economic gainful activity in the household
General and Political Awareness	• Households perceiving increase in government official visits regarding various awareness programmes • Households perceiving improvement in general awareness • Households perceiving better politically informed
Living Environment	• Households perceiving improvement in quality of life • Households perceiving improvement in living environment • Households perceiving improvement in electricity supply • Households perceiving improvement in drinking water supply • Households perceiving improvement in availability public toilets • Households perceiving increase in official visits regarding local governance • Households perceiving PMGSY as a good scheme • Households perceiving overall rural development
Social Order and Disorganization	• Households perceiving change in consumption of alcohol and other drugs • Households perceiving increase in crime

Source: Compiled by Authors

the aptness of the use of PCA in the present study. Based on (i) eigen values 1.00 and above, (ii) scree plot information (Table 3), (iii) visual analysis of correlation matrix for all variables (0.5 and above) and (iv) rotated component matrix only 27 out of 48 variables have been retained. Overall, 8 factors have been extracted explaining 65.81 per cent of the total variance in the data set. The first principal component extracted at the household level has been used to understand the zonal variation in overall impact of PMGSY. The household factor score has been classified into three categories to understand the zonal variation in overall impacts of PMGSY.

The study used simple regression analysis based on economic, health, education, gender empowerment, agriculture infrastructure and overall rural development aspects of dependent variables and one independent variable i.e., road connectivity to test the null hypotheses having a significance level of 95 per cent.

Results and Discussion

Table 3 reveals that out of 48 variables, 27 variables have been retained through factor analysis to know the impact of PMGSY. These variables are further divided into distinct groups to determine the most important factors affecting development of rural households. The higher loadings show higher correlation among variables and thus more important in impacting the factor and vice-versa. The derived factors are named and interpreted as under:

Education and Health Services

The first component is the most important which explains 20 per cent of the total variance of impact of PMGSY. It reveals that education and health services have been highly positively affected due to PMGSY connectivity in comparison to the other factors. Among these, girls attending schools' figure at the top (with 0.782 loadings) and improvement in emergency health service remains at the bottom (with 0.514 loadings). The component includes seven variables namely increase in girls attending schools, universalization of primary education, regularity of students attending schools, increase in boy to girl's ratio attending school, increase in immunization of children, positive change in quality of education and improvement in emergency health services. All these variables are significantly correlated with the first component, therefore named as education and health services. This is indicative of the fact that inhabitant's life has been positively impacted with respect to educational pursuits and delivery of medical facilities after the implementation of PMGSY in the area.

Health Infrastructure

This factor explains 10.08 per cent of the total variance. The factor loadings range from 0.63 to 0.87. The variables that have been heavily loaded on the factor are positive change in the availability of doctors, the number of beds in the hospitals, availability of basic medicines and mobile health facilities. Thus, health infrastructure has emerged the second most positively impacted aspect due to the implementation of PMGSY.

Basic Public Facility

This factor consists of three variables namely, improvement in water supply, electricity supply and availability of public toilet facility. This factor explained 8.089 per cent of the total variance in the data set. The highest loadings with 0.924 have been

Table 3

Churah Tehsil: Factor Loading Matrix for Impact of PMGSY

Factors	Variables	Factors							
		1	2	3	4	5	6	7	8
Education and Health Services	Increase in girls attending school	0.782							
	Positive impact on universalisation of primary education	0.736							
	Regularity of students attending school	0.676							
	Increase in boy-girls ratio in educational institution	0.648							
	Increase in immunisation	0.583							
	Positive change in quality of education	0.574							
	Improvement in health emergency services	0.514							
Health Infrastructure	Positive change in the availability of doctors		0.870						
	Positive change in the number of beds in hospital		0.821						
	Positive change in stock of medicine		0.820						
	Positive change in mobile health facilities		0.638						
Basic Public Facility	Improvement in water supply			0.924					
	Improvement in electricity supply			0.876					
	Improvement in public toilet facility			0.638					
Educational Infrastructure	Increase in private institutions				0.769				
	Improvement in educational facilities				0.697				
	Increase in availability of teachers				0.674				
Agricultural Infrastructure	Positive change in agricultural machinery such as threshing machine etc.					0.777			
	Increase of female in economic gainful activities					0.776			
	Positive change in overall agriculture infrastructure					0.570			
Increased Agricultural Output	Increase in agricultural profit						0.784		
	Better transport of produce						0.643		
	Increase in on farm opportunities						0.640		
Change in Drug Consumption	Change in alcohol consumption							0.850	
	Change in consumption of drugs							0.829	
Increase in General and Political Awareness Level	Improvement in general awareness								0.842
	People making politically informed decisions								0.826
	Eigen value	5.587	2.722	2.184	1.891	1.750	1.328	1.185	1.123
	% of variance explained	20.694	10.080	8.089	7.005	6.481	4.918	4.389	4.160

Source: Compiled by Authors

observed for improvement in water supply. This factor has explained 6.41 per cent of the total variance of the data set. It indicates that the availability of basic public facilities has increased after the implementation of PMGSY, facilitating the improvement in the standard of living of the people.

Educational Infrastructure

This factor including three variables i.e., increase in private educational institutions, improvement in educational facilities and increase in availability of teachers has been loaded heavily on educational infrastructure. This factor explains 7 per cent of the total variance in overall impact of the implementation of PMGSY. Thus, the study suggests that the PMGSY has played a significant role in development of educational facilities in the study area.

Agricultural Infrastructure

The next factor that has been heavily loaded is improvement in agricultural infrastructure. This factor has two variables of threshing machines and improved plough. Thus, PMGSY has been proved to be helpful for the farmers by facilitating their access to improved agricultural machinery.

Increased Agricultural Output

This factor explains 4.91 per cent of the total variance of the data set regarding impact of PMGSY on agriculture in the area. This factor includes three variables such as, an increase in agricultural profit (with 0.784 loading), better transport facility to carry agricultural produce to the market (with 0.643 loading) and increase in on farm opportunities with 0.640 loadings (Table 3). Thus, due to the implementation of PMGSY total agricultural profit has increased in the study area.

Change in Drug Consumption

This factor includes two variables namely change in consumption of alcohol and drugs (Table 3). This factor has explained 4.38 per cent of the total variance of the data set. Thus, with the implementation of PMGSY, the consumption of drugs has also changed.

Increase in General and Political Awareness Level

This factor consists of two variables namely improvement in general awareness level of the inhabitants and people being informed about political decisions. This factor explained 4.16 per cent of the total variance of the data set. The implementation of PMGSY has been instrumental in making people politically informed as transportation has brought connectivity to remotest of the villages of tehsil. This has increased the general awareness level of the inhabitants.

Spatial Pattern of Education and Health Services

Considering the variations emanating from the implementation of PMGSY roads, the study area has been divided into three zones (Table 4). The zonal distribution of the education and health services has been discussed as under:

Inner Zone

In this zone, about 61 per cent of the total households fall in high category of factor score indicating good impact on educational and health services. About 28 per cent of the total households in this zone have been observed in the medium factor score category. However, about 11 per cent of the total

Table 4
Churah Tehsil: Education and Health Service

Factor Score		Spatial Zones			Total
		Inner	Middle	Outer	
High	0.357 - 1.620	80 (61.10)	15 (19.00)	54 (40.60)	149 (43.40)
Medium	-0.810 - 0.356	36 (27.50)	34 (43.00)	43 (32.30)	113 (32.90)
Low	-3.93 - -0.809	15 (11.50)	30 (38.00)	36 (27.10)	81 (23.60)
Total Sample Households		131 (100.00)	79 (100.00)	133 (100.00)	343 (100.00)

Source: Compiled by Authors. The figures in parentheses show the per cent to the total.

households have been observed in the low factor score category implying low impact with the implementation of PMGSY.

Middle Zone

It is evident from Table 4 that this zone reported the lowest 19 per cent share of households in the high factor score category of education and health services. Similarly, 43 per cent households have reported moderate impact and 38 per cent households have witnessed low impact on quality of education and health services. In this way, this zone reports the moderate impact of PMGSY on the education and health services.

Outer Zone

Table 4 further reveals that about 41 per cent of the total households in this zone fall in high factor score category implying positive impact of PMGSY on education and health services. About 1/3 of the total households of this zone fall in the category of medium factor score. However, more than one fourth of the total households have been observed in the low factor score category indicating less impact of PMGSY on the education and health services.

Overall, it emerges that there has been a more diffusional impact of road connectivity all across the spatial zones. However, the people inhabiting the outer zone or farthest places have experienced relatively more positive impact than the people inhabiting places near to the roads.

Testing of Hypothesis

The dependent variables of health and educational facilities, agriculture, overall rural development and gender empowerment have been regressed with road connectivity (independent variable) to test the hypothesis. The outcomes of the six simple linear regression models have been presented in Table 5. The p-value is less than 0.05. Thus, null hypothesis is rejected. It means that road connectivity has played a significant role in shaping overall rural development ($b = -1.100$, $p < 0.05$). Moreover, the R square = 0.059 depicts that the model explains 5.9 per cent of the variance in overall rural development.

The hypothesis validation results derived from simple linear regression equation reveal that the construction of PMGSY roads has played a significant role in shaping economic activity measured in terms of annual income, per capita expenditure, increase in land value etc. The road connectivity has also positively impacted agricultural environment, particularly purchase of agro-products, agricultural inputs, agriculture induced benefits. The construction of PMGSY roads has also played a significant role in shaping the educational development in terms of increasing girls' enrolments, universalization of primary

Table 5
Churah Tehsil: Simple Linear Regression

Null Hypothesis(H_0)	Regression Weight	R	R^2	Constant	b	F	P-Value*	Hypothesis Supported
H_0 – A	RC ⟶ Economic Activity	0.152	0.023	26.534	0.625	08.100	0.005	No
H_0 – B	RC ⟶ Agriculture	0.116	0.013	19.926	0.303	04.654	0.032	No
H_0 – C	RC ⟶ Health Conditions	0.024	0.001	29.094	-0.188	00.197	0.657	Yes
H_0 – D	RC ⟶ Education	0.222	0.049	36.427	1.365	17.625	0.000	No
H_0 – E	RC ⟶ Gender Empowerment	0.078	0.006	11.145	0.151	02.062	0.152	Yes
H_0 – F	RC ⟶ Overall Rural Development	0.242	0.059	37.445	-1.100	21.213	0.000	No

Source: Compiled by Authors, *$p < 0.05$ (95 % significance level), RC - Road Connectivity (Independent Variable).

education, availability of teaching staff, regularity of students, change in quality of education and improving educational attainments. The highest impact of road connectivity has been observed on overall rural development assessed in terms of electricity and water supplies, increase in local governance and general awareness and improvement in quality of life of the inhabitants.

Major Problems and Suggestions for Effective Implementation of PMGSY

Following suggestions have emerged from the interaction with the local representatives:

- Getting forest clearance from the Ministry of Environment, Forest and Climate Change, is a big hurdle in timely implementation of PMGSY. To make the process simple and fast, the issue of forest clearance should be given to the forest department of the state.

- The shortage of staff in the Public Works Department (PWD) affects the timely preparation of detailed project reports and building synergy with other line departments and concerned stakeholders. PWD must have its own revenue official i.e., Patwari for speedy implementation of such works.

- There is a provision of a flat rate of Rs. 66 lakhs for the construction of one km of new road. In areas of hard and uneven topography the construction cost increases, therefore construction rate needs to be increased for hilly areas having hard strata.

- There is always reluctance among landowners about transfer of their private land through *gift deed* (transfer-

ring land rights) which delays the execution work. A local PMGSY committee involving elected representatives, social activists, NGOs, PWD officials and intellectuals should be constituted to earn full cooperation of locals and convince concerned stakeholders for getting a gift deed and commencement of execution work on time. The farmers donating the land should be compensated either with land or job or cash.

- Sometimes, political activism also results into the change of road alignment resulting delay in execution of work. There should be no political interference in the execution of PMGSY.

- Having 250 persons in single habitation for application of PMGSY is a major constraint in sparsely populated and scattered settlement areas. The population criterion needs to be further relaxed for hilly areas.

- In order to ensure the quality construction, the contract should include general maintenance and repair of roads for about 10 years by the concerned contractors. However, in case of natural calamities some relaxation may be provided.

- The study reveals that still 49 eligible habitations/villages are yet to be connected with roads. For such villages, for augmentation of rural connectivity under PMGSY, a proposed plan with levels of priority has been suggested (Fig. 2).

Conclusions

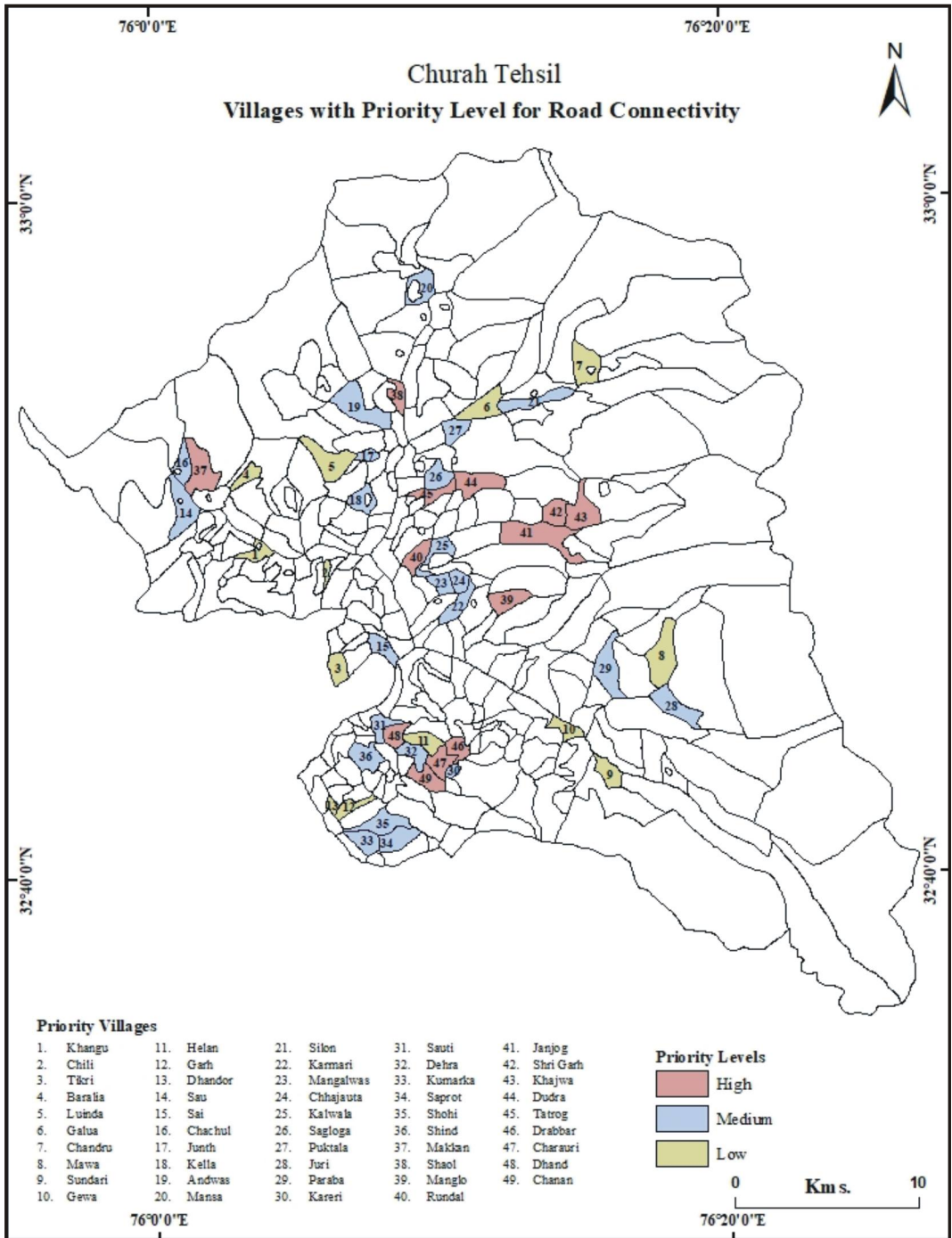The study reveals that education and

Fig. 2

health services have been positively impacted in the study area after the introduction of PMGSY. Apart from these, health infrastructure, basic public facilities, education infrastructure, agricultural infrastructure, agricultural output, drug consumption and general and political awareness level have also improved. The spatial distribution of the levels of impact indicates that 61 per cent of the households of inner zone perceived very high impact followed by outer zone (41 per cent). The medium level of impact has been reported by 43 per cent of the households of middle zone followed by outer zone (32 percent). Similarly, low level of impact of PMGSY has been perceived by 38 per cent of the households of middle zone again followed by outer zone (27 per cent). On the whole, out of the total, 43 per cent, 33 per cent and 24 per cent of the households perceive high, medium and low level of impact of the PMGSY on the educational and health services of the study area.

The construction of PMGSY roads has also played a significant role in shaping economic activity measured in terms of annual income, per capita expenditure, increase in land value etc. The road connectivity has also positively impacted the agricultural environment, particularly the purchase of agro-products, agricultural inputs, agriculture induced benefits. The construction of PMGSY roads have also played a significant role in shaping the educational development in terms of increasing girls' enrolment, universalization of primary education, availability of teaching staff, regularity of students and change in quality of education and improving educational attainments. The highest impact of road connectivity has been observed on overall rural development in terms of electricity and water supplies, improvement in living environment,

increase in local governance and general awareness and improvement in quality-of-life of inhabitants. On the whole, the highest impact of PMGSY has been observed on overall rural development followed by educational development and economic activity.

Acknowledgements

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