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STATUS OF SANITATION FACILITIES IN HIMACHAL PRADESH: A TEHSIL LEVEL ANALYSIS

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Abstract

Sanitation refers to any process whereby people create and sustain a hygienic and healthy environment for them by erecting barriers to prevent the transmission of disease causing agents. In this study an attempt has been made to assess the status of sanitation in Himachal Pradesh in terms of availability of some selected sanitary facilities. The study is based on secondary data on 'Household Amenities and Assets' collected from the Census of India, 2011. Statistical techniques like z-score and composite index have been used to assess the status of sanitation. The study brings out that barring a few exceptions, tehsils having higher value of sanitation index are found in the western part of the study area.

Introduction

Sanitation literally means measures necessary for improving and protecting health and well-being of the people. The significance of sanitation can be estimated from the fact that it is considered as the fourth most important necessity of mankind after food, clothing and shelter (Hussain and Mangla, 2014). It is a way of separating human waste from water, food and general human contact, especially when carried out at household level (WHO and UNICEF, 2006). Sanitation is a broad term which means more than just having access to a toilet facility. It is not only concerned with disposal of human excreta rather it is a total concept of personal hygiene, safe water supply, housing condition, solid waste and waste water disposal to maintain public health and quality of life (Kumar and Singh, 1999; Rajeshwari, 2008). The same approach is reflected in various programmes and policies of various

governmental and non-governmental agencies. Water supply and sanitation were added to the national agenda of public health during the country's first five year plan (1951-56). In 1954, sanitation was formed as a sub-part of the first national water supply programme. It was only during mid-eighties that India's first nationwide programme for sanitation was acknowledged by the Government of India as Central Rural Sanitation Programme (CRSP) in the year 1986. Subsequently, the ambit of this program was amplified with the launch of a demand-driven and people-centred approach called as Total Sanitation Campaign (TSC) in 1999 (Ministry of Planning Commission, 2013). It broadened the concept of sanitation to cover 'personal hygiene, home sanitation, safe water, garbage disposal, excreta disposal and waste water disposal'. To give a fillip to the TSC Government of India launched the Nirmal Gram Puraskar (NGP) in 2003 to reward the

fully sanitized and open defecation free gram panchayats (GPs), blocks, districts and states. Encouraged by the success, TSC was renamed as "Nirmal Bharat Abhiyan" (NBA) in 2012 to attain the vision of Nirmal Bharat by 2022 (Ministry of Drinking Water and Sanitation, 2012) and renamed again on 2nd October, 2014 as 'Swachh Bharat Abhiyan' or Clean India campaign to achieve its goals by 2nd October, 2019 (Banerjee et al., 2016).

Government of India under Central Rural Sanitation Programme of 1986 provided for the construction of village sanitary complexes with bathing facilities, hand pumps and drainage facilities along with toilets. Toilet is an excreta disposal facility in which human waste is channeled through pipes into sewerage systems which enable people to maintain personal hygiene. On the other hand, taps provide safe drinking water and also ensure that drinking water is separated from the pathogens carried in faecal matter. In areas where drainage and toilet facilities are poor, water runs over the ground during rainstorms, picks up faeces, in turn contaminates soil and water sources which contributes to the spread of diseases such as typhoid, cholera, and worm infections (Kolsky, 1998). It has been established through findings of various research studies that availability of safe drinking water, drainage system for disposal of waste water, bathing facilities along with toilet for disposal of human excreta are most important and mutually associated elements of sanitation. In addition to these the use of a sanitary facility is also closely linked to varied and complex factors, namely appropriate hygiene behaviour, socio-cultural and economic background (Lawrence et al., 2002; Rotowa et al., 2015) and institutional, structural, environmental and educational level of people or society (Hussain and Mangla, 2014).

Currently, at least 780 million people in the world live without clean drinking water and 2.5 billion without access to improved sanitation, two-thirds of whom live in Asia and sub-Saharan Africa and about 60 per cent of people worldwide who defecate in the open live in India (UNICEF and WHO, 2012). About 70 per cent households do not own a toilet in rural India (Census of India, 2011) which makes it the world's largest "open air toilet". Hundreds of thousands of children die each year from diseases related to open defecation and those who survive are left stunted, both physically and cognitively (Spears, 2013). Lack of access to these facilities is major cause of diarrheal disease, which annually kills nearly 760,000 children under the age of five years in world (Johansson and Wardlaw, 2009). Likewise, it accounts for one-fourth deaths in India out of 25 lakh deaths globally (Rajeshwari, 2008).

It is now an established fact that quality of human life depends upon accessibility to better sanitation facilities. Studies show that improvements in the quality of water alone can reduce the morbidity due to diarrheal diseases by 17 per cent and combinations of water and sanitation projects can reduce the morbidity by about 30 per cent (Esrey et al., 1991). In this study therefore, efforts have been made to access the availability of sanitary facilities in Himachal Pradesh.

Objectives of the Study

To assess the status of sanitation in Himachal Pradesh by highlighting spatial patterns of sanitary facilities at tehsil level.

Hypothesis

Status of sanitation is directly proportional to the rate of literacy and degree of urbanization.

Study Area

Himachal Pradesh, one of the northern states of India is located in the western Himalaya between 30° 22' 44" to 33° 12' 40" north latitudes and 75° 47' 55" to 79° 04' 20" east longitudes (Fig. 1). It is one of the land locked states and is bordered by states of Jammu & Kashmir in the north, Haryana and Uttar Pradesh in the south, Uttarakhand in the south-east and Punjab in the west and south-west. It also shares international border with Tibet (China) in the east. The territory of Himachal Pradesh is mountainous with altitude varying from 350 m to 7000 m above the mean sea level and has general increase in elevation from west to east and from south to north (Singh, 1971). The state came into existence as Chief Commissioner's Province on 15th April, 1948. In 1952, it became the Part-C state and remained as a union territory from 1956 to 1971. On January 25, 1971 it achieved the full statehood and became 18th state of Union of India. Presently, the state has total geographical area of 55,673 km² and is divided into 12 districts and 117 tehsils/sub-tehsils (2011) for administrative purposes. State has a total population of 68,56,509 persons and it is the only state in India whose 89.96 per cent of population lives in rural areas. Therefore, economy of state is dependent upon agriculture and horticulture which provides direct employment to about 62 per cent of total workers of the state. Despite of rural and agricultural economy the state has relatively notable achievements in some social indicators like literacy, as 83.78 per cent of population is literate and sex ratio which is 974 women per 1000 male.

Data Base and Methodology

The present paper is based on secondary data pertaining to household amenities

collected from census of India, 2011. The tehsil has been taken as a unit for data collection and data analysis. Statistical techniques like z-score and composite index have been applied to assess the tehsil-wise levels of sanitation facilities. The z-score quantifies the departure of individual observations, expressed in a comparable form. It may be expressed as:

$$Z_{ij} = X_{ij} - \bar{x}/s.d.$$

where, Z_{ij} = Standard value of the indicator i in tehsil/sub-tehsil j .

X_{ij} = Actual value of indicator i in tehsil/sub-tehsil j .

\bar{x} = Mean value of indicator i in all tehsils and sub-tehsils.

s.d = Standard deviation of indicator i in all tehsils and sub-tehsils.

Further, the tehsil wise z-scores of all indicators of sanitation have been added separately and the average has been taken out for these indicators which may be called as composite score (C.S.) for each tehsil and may be algebraically expressed as:

$$C.S. = \sum Z_{ij}/N$$

where, $\sum Z_{ij}$ = Z scores of all indicators in district j .

N = Number of Indicators.

The higher value of composite index indicates higher level in respect of sanitation and lower value shows low level. Along with advanced statistical techniques, quantitative data have been analysed in Arc GIS and Microsoft Excel spreadsheet.

Results and Discussion

Status of Sanitation Facilities

Four variables viz. tap water from treated source, separate bathroom facility, drainage connectivity and improved toilet facility have been taken to highlight the spatial variations in sanitary facility of Himachal Pradesh.

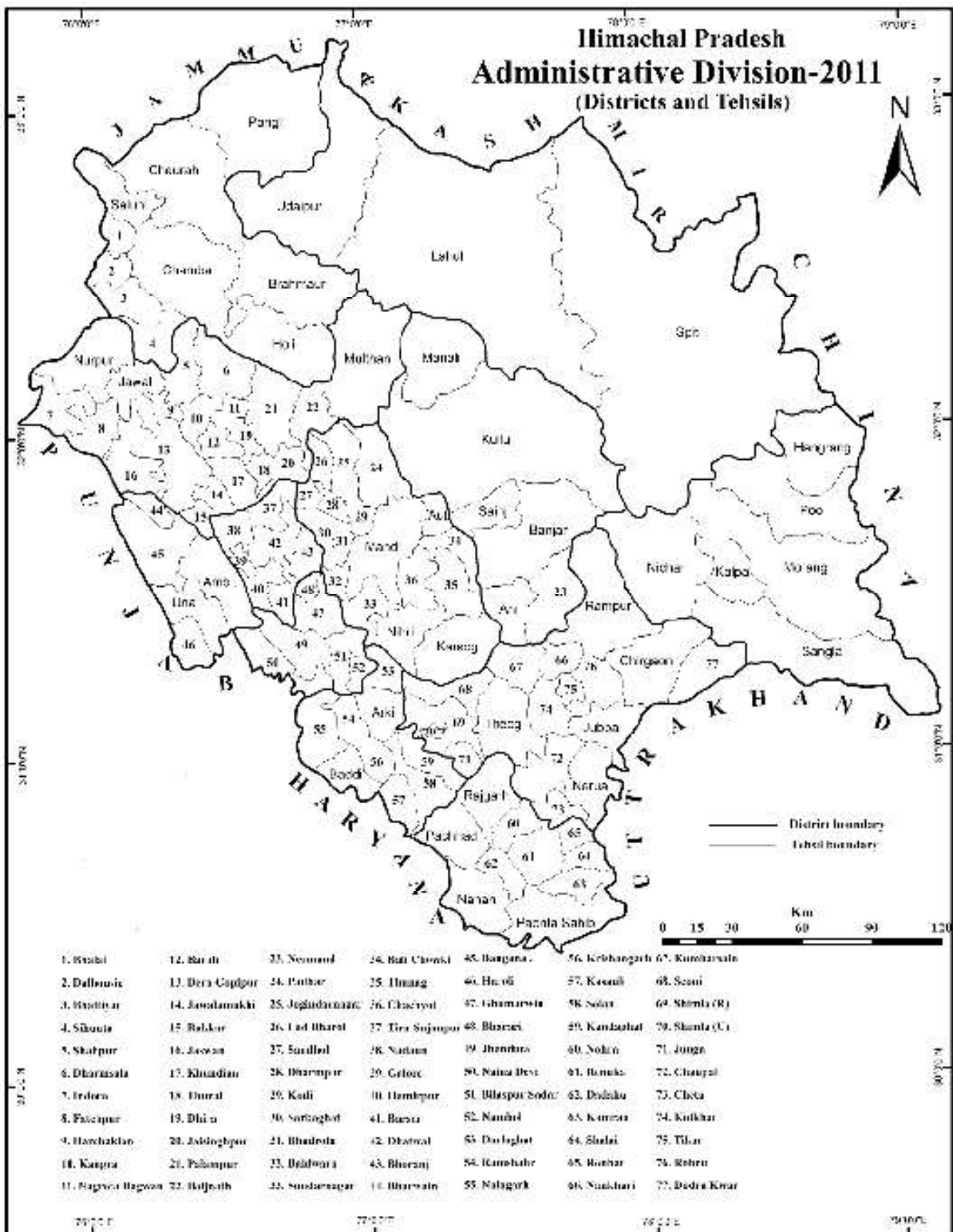


Fig. 1

Table 1
Himachal Pradesh: Tehsil-wise Status of Sanitation Facilities

Sanitation Facility	Very High	High	Moderate	Low	Very Low
	Percentage of Tehsils				
Treated Tap Water	04	43	31	13	09
Separate Bathroom	04	30	37	15	14
Drainage Connectivity	03	32	32	26	07
Improved Toilet	11	27	28	22	12
Status of Sanitation	01	26	50	21	02

Source: Compiled by Authors

(i) Tap Water from Treated Source

Majority of households (83.9 per cent) in Himachal Pradesh have access to tap water supply from treated source against the all India average of 32 per cent. Inter-tehsil differentiations, range from as high as of 97.4 per cent recorded by Sandhol tehsil of Mandi district to as low as of 52.6 per cent, witnessed by Indora tehsil of Kangra district. Little less than 50 per cent of tehsils of state are falling in very high and high categories (Table 1) and barring a few exceptions, majority of them constitute a contiguous large region in western part of state running from north-west to south-east direction (Fig. 2). Medium category comprises of 1/3rd (31 per cent) of total tehsils (Table 1) and form a region in northern part of the state (Fig. 2). Whereas, low and very low categories jointly constitute 1/5th (22 per cent) of tehsils (Table 1) and roughly form one cluster comprising tehsils of Paonta Sahib, Kamrau, Shalai, Dadahu, Renuka, Nohra, Pachhad, Rajgarh, Chaupal and Theog located in the southern part of the study area (Fig. 2).

(ii) Separate Bathroom Facility

Separate room for taking bath is available in about 75 per cent of households in the study area. This is very well placed if compared to national average of 58.43 per cent. Inter-tehsil comparison reveals that availability of separate bathroom in households ranges

from a minimum of 18.2 per cent in Chaurah tehsil of Chamba district to a maximum of 95.8 per cent in tehsil Shimla (urban). Very high and high categories together include 1/3rd (34 per cent) of tehsils (Table 1) and all are clustered in western and south-western parts of the state. Of them there are only 5 tehsils i.e. Shimla (Urban), Shimla (Rural), Seoni, Kumharsain and Solan in which separate bathroom facility is available in more than 90 per cent of the households. Medium category includes 37 per cent tehsils (Table 1) and constitutes two extended and identifiable regions located in north-eastern and central parts of the state (Fig. 3). The first one includes the tribal tehsils of Udaipur, Lahul and Spiti of district Lahul & Spiti, Hangrang and Poo of Kinnaur district (Fig.3). Second cluster includes about 2/3rd of total tehsils comprising of almost all the tehsils of Una, Hamirpur, Mandi, Bilaspur, Solan and Shimla districts apart from tehsils of Sirmour, southern Kullu and eastern, southern and western Kangra districts (Fig. 3). Areas of low concentration i.e. low and very low categories jointly constitute 29 per cent of tehsils which forms a narrow and elongated region running in north-west to south-east direction. These regions include the tehsils of Chirgaon and Dodra Kwar of Shimla district, Nichar of Kinnaur district, Kullu of Kullu district, Padhar of Mandi district, Multhan of Kangra district and tehsils of Bharmaur, Holi, Chaurah, Saluni,

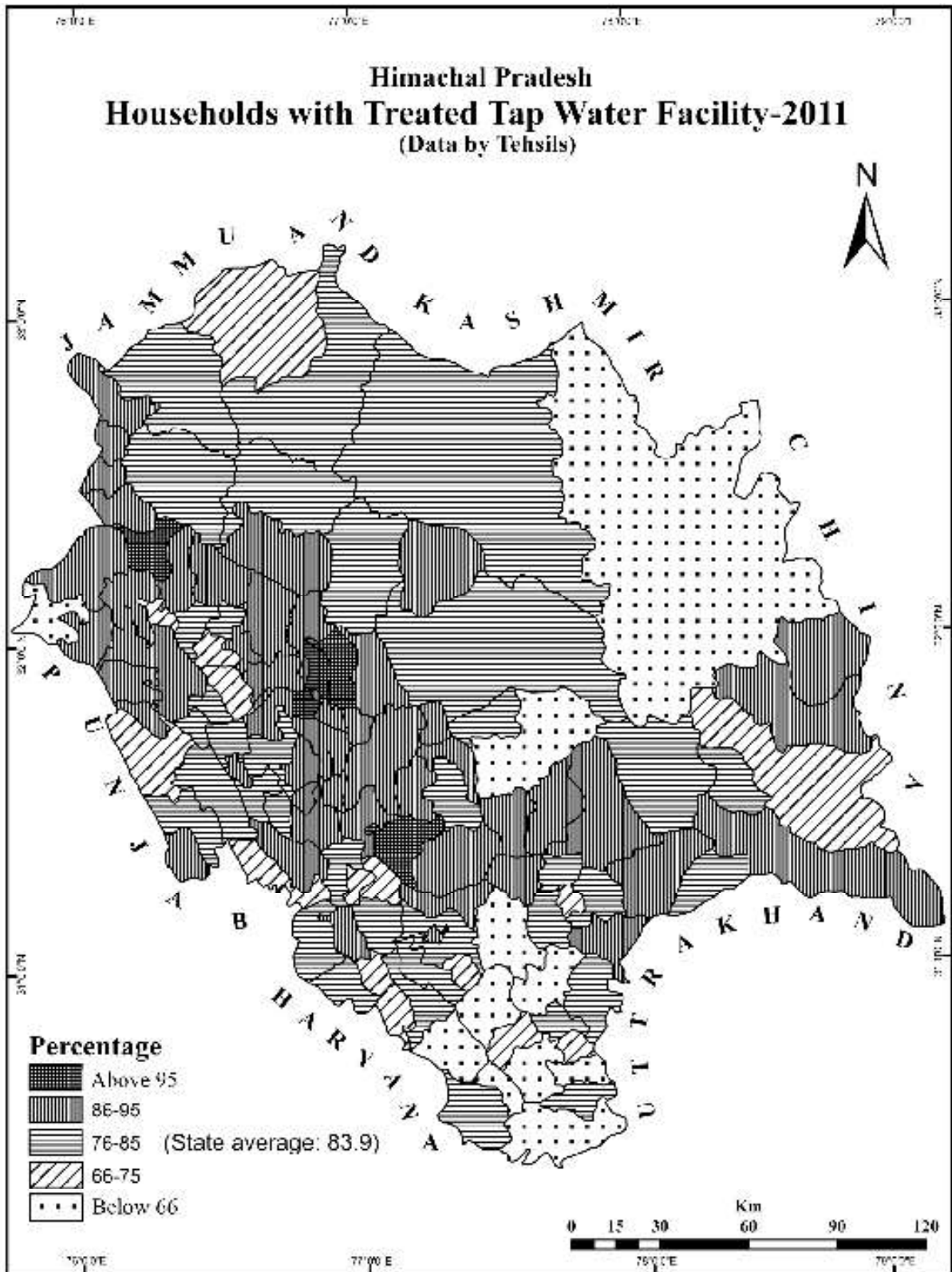


Fig. 2

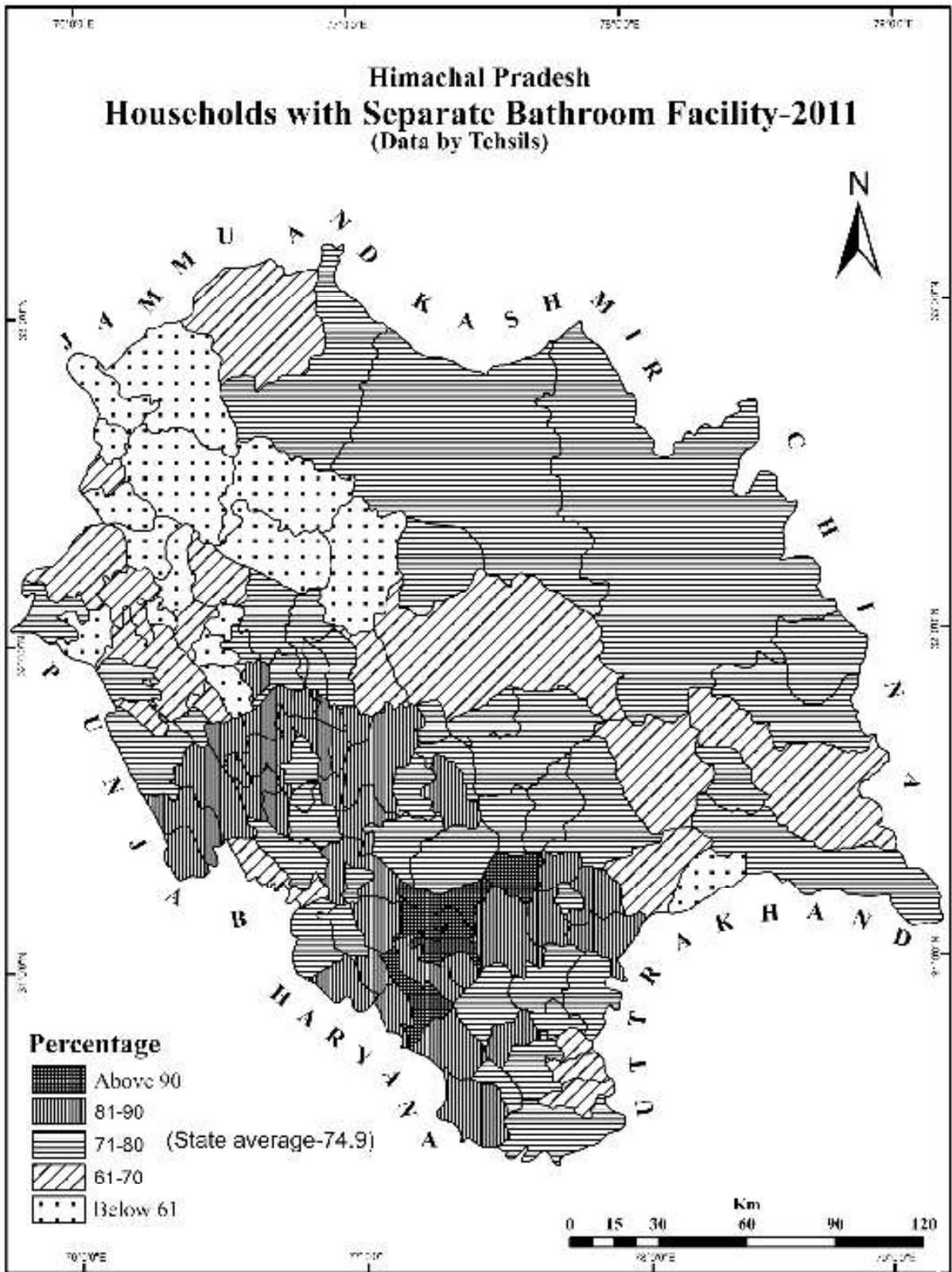


Fig. 3

Bhalai, Bhattiyat, Dalhousie, Sihunta and Chamba of district Chamba. However, majority of the tehsils with very low level of separate bathroom facility are clustered in central-north-west part of state (Fig. 3).

(iii) Drainage Connectivity

In Himachal Pradesh 65.2 per cent of households have the facility of drainage connectivity. Although the state has performed above the national average (52.14 per cent) yet, about 1/3rd households in state are still without drainage facility. Inter-tehsil variations range from the lowest of 18.4 per cent households in tehsil Dodra Kwar to the highest of 97.4 per cent households in tehsil Shimla (urban). Interestingly, both the tehsils fall in Shimla district. Only 3 tehsils i.e. Shimla (Urban), Solan and Palampur in which more than 85 per cent of their households have drainage connectivity fall in the category of very high drainage connectivity (Table 1). High category comprises of about 1/3rd (32 per cent) of tehsils (Table 1) and form many clusters that spread over the entire state. Low category constitutes 1/4th of tehsils (Table 1) and mainly forms clusters in north-western and south-eastern parts of state. On the other hand 7 per cent of tehsils (Table 1) namely Cheta, Naina Devi, Bangana, Saluni, Shalai, Chaurah, Bhalai and Dodra Kwar in which drainage facility is available in less than 40 per cent of their households falls in very low category (Fig. 4).

(iv) Improved Toilet Facility

Improved toilet facility in state is available only in 66.1 per cent of households suggesting that about 1/3rd of the total households are either defecating in open or have access to unimproved toilet facility. Inter-tehsil variation ranges from highest of 94.3 per cent households in Sandhol tehsil (Mandi

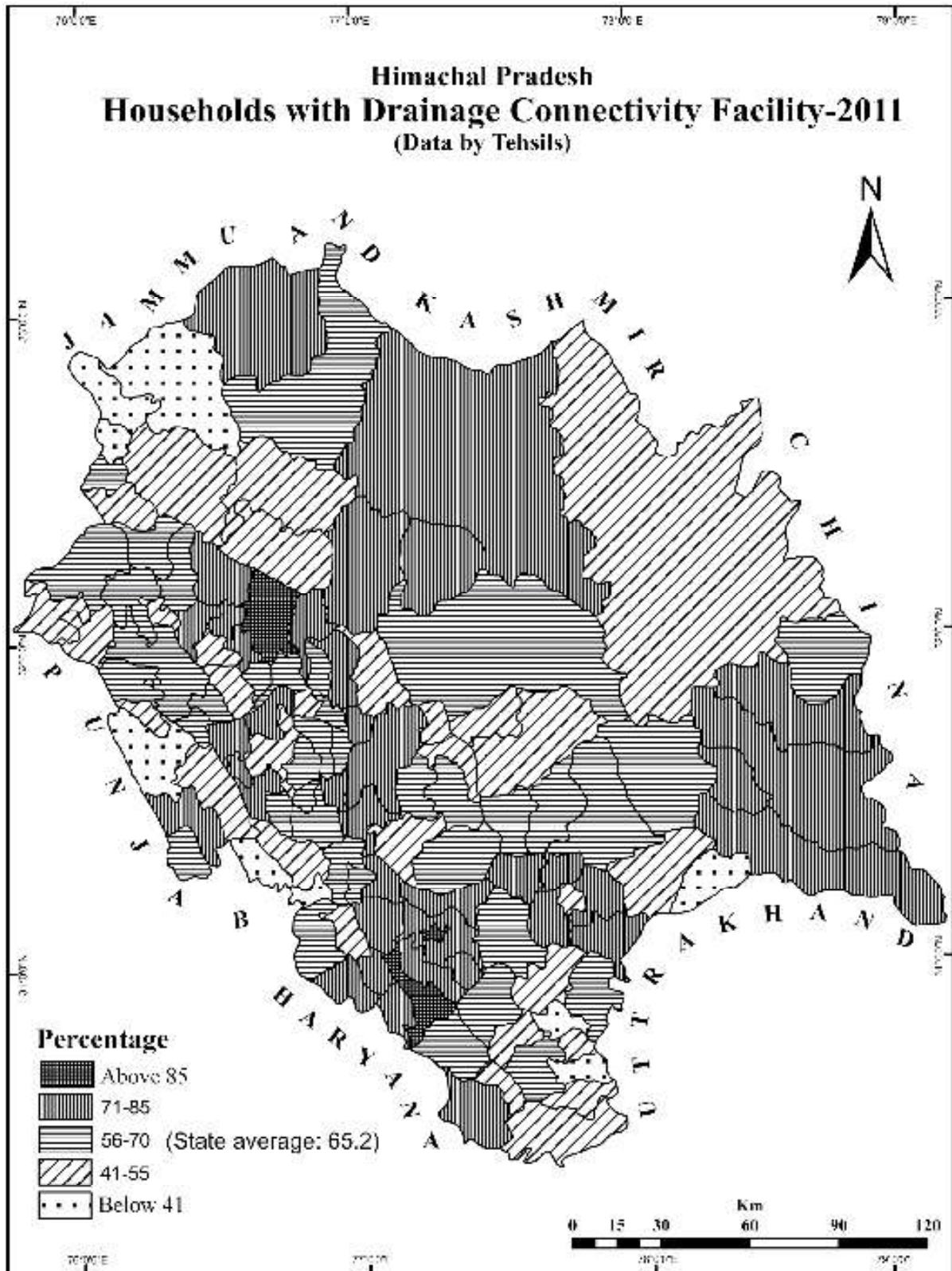
district) to lowest of 12.4 per cent households in Spiti tehsil. It has been found that not even a single tehsil has the distinction of achieving 100 per cent level of access to toilet facility at household level in the state. Areas of very high and high categories together constitute 37 per cent of the total tehsils of the state (Table 1). Barring few exceptions, majority of these tehsils make a remarkable region in western part of state, comprising parts of Kangra, Hamirpur, Una, Bilaspur and Mandi districts. The region also includes the tehsils of western part of district Shimla and adjoining parts of Solan district and extends up to southern part of Sirmaur district. Medium category comprises of 28 per cent of tehsils (Table 1) and majority of these are clustered near or around the region formed by tehsils of very high and high categories. On the other hand, remaining 1/3rd (33 per cent) of tehsils fall in areas of low and very low categories in which less than 40 per cent households have toilet facilities (Table 1). Such tehsils are mostly clustered in northern, eastern and south-eastern parts of state (Fig. 5).

Composite Scores of sanitary facilities

The composite scores of sanitary facilities for 117 tehsils of Himachal Pradesh have been computed and presented in Table 2. The Table reveals a wide range of variations in composite scores of sanitary facilities. It varies from highest of 1.65 score in Shimla (urban) tehsil to minimum of (-2.18 score) in Dodra Kwar tehsil. Interestingly, both of these tehsils fall in Shimla district. The entire array of variation in composite scores of sanitary facilities has been grouped in five categories, mapped and discussed as under:

(i) Areas of Very High Level of Sanitary Facilities

By recording 1.65 composite scores,



Source: Computed by authors.

Fig. 4

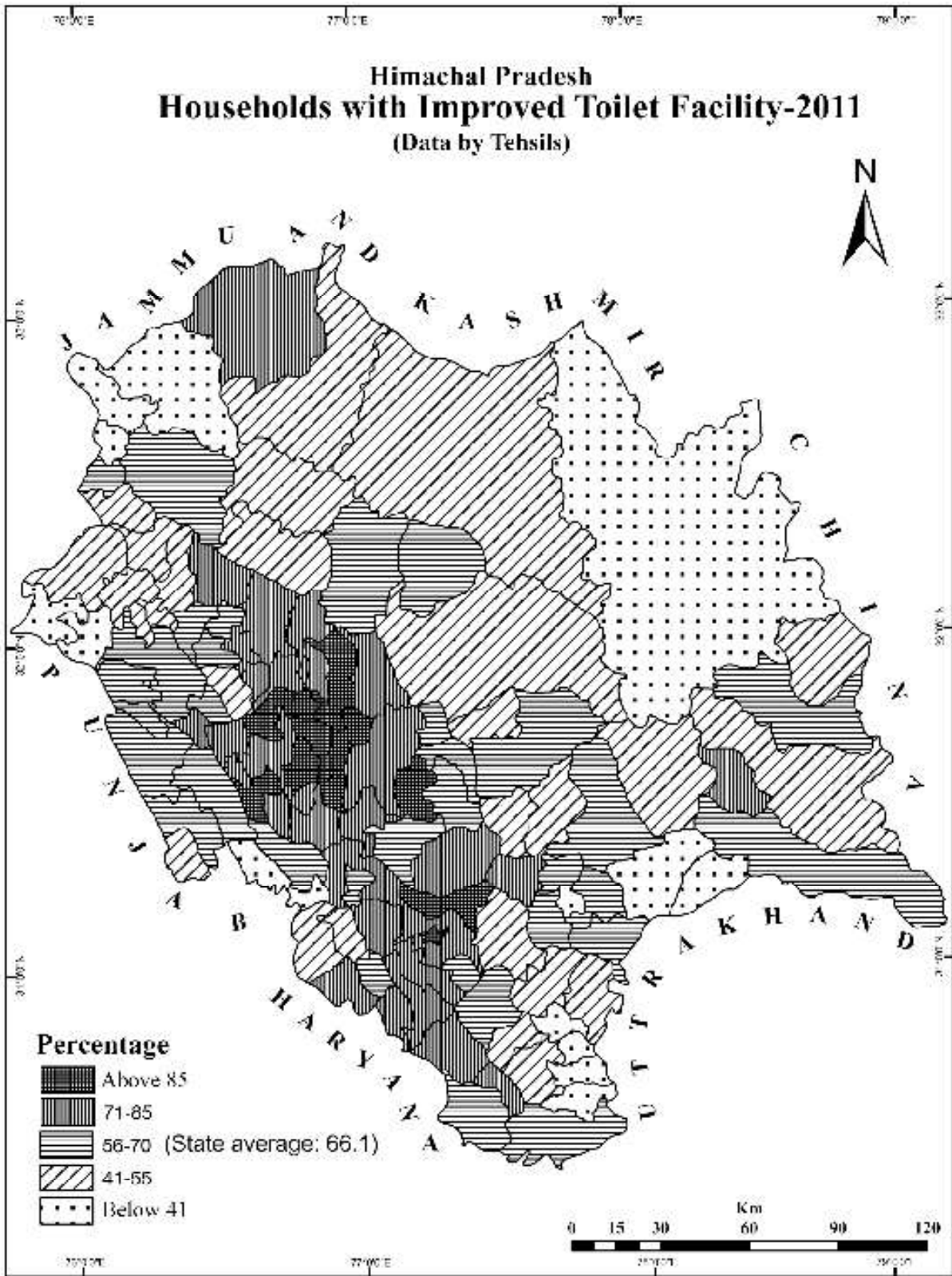


Fig. 5

Table 2
Himachal Pradesh: Tehsil-wise, Composite Score of Sanitation Facilities, 2011

Tehsils	Composite Score	Tehsils	Composite Score	Tehsils	Composite Score
Shimla (urban)	1.65	Manali	0.43	Ramshahr	-0.25
Palampur	1.10	Rampur	0.42	Jhanduta	-0.27
Seoni	1.09	Jubbal	0.40	Nerua	-0.30
Kumharsain	1.08	Bharari	0.37	Udaipur	-0.33
Jogindarnagar	1.06	Rakkar	0.36	Nohra	-0.36
Solan	1.05	Ghumarwin	0.33	Morang	-0.39
Kotli	1.04	Krishangarh	0.30	Sainj	-0.41
Galore	1.04	Rohru	0.27	Namhol	-0.44
Shimla (Rural)	1.02	Dhatwal	0.26	Sihunta	-0.46
Sarkaghat	1.00	Una	0.24	Rajgarh	-0.48
Baldwara	0.96	Dalhousie	0.23	Shahpur	-0.51
Tira Sujanpur	0.96	Haroli	0.22	Chamba	-0.52
Hamirpur	0.90	Nankhari	0.22	Baroh	-0.58
Sundarnagar	0.82	Jaswan	0.20	Theog	-0.61
Bajjnath	0.80	Kotkhai	0.15	Brahmaur	-0.65
Sandhol	0.78	Nihri	0.13	Paonta Sahib	-0.65
Arki	0.77	Lahul	0.11	Chirgaon	-0.65
Bhoranj	0.75	Thunag	0.10	Dadahu	-0.66
Dhira	0.71	Nermand	0.09	Bangana	-0.70
Chachyot	0.70	Ani	0.08	Kamrau	-0.75
Mandi	0.69	Hangrang	0.08	Tikar	-0.76
Thural	0.68	Jawalamukhi	0.07	Renuka	-0.78
Lad Bharol	0.66	Padhar	0.07	Chaupal	-0.82
Dharmpur	0.65	Multhan	0.03	Banjar	-0.83
Nadaun	0.65	Nagrota Bagwan	0.01	Fatehpur	-0.92
Darlaghat	0.63	Dera Gopipur	0.00	Bhattiyat	-0.96
Kandaghat	0.63	Junga	-0.02	Cheta	-1.01
Baddi	0.59	Aut	-0.06	Holi	-1.01
Nahan	0.59	Amb	-0.06	Ronhat	-1.01
Bhadrota	0.58	Nalagarh	-0.09	Khundian	-1.17
Barsar	0.55	Kangra	-0.13	Indora	-1.21
Bilaspur Sadar	0.52	Pachhad	-0.17	Harchakian	-1.21
Kasauli	0.51	Pangi	-0.18	Bhalai	-1.29
Jaisinghpur	0.49	Jawali	-0.18	Naina Devi	-1.39
Kalpa	0.49	Bharwain	-0.18	Spiti	-1.43
Dharmsala	0.48	Nichar	-0.21	Saluni	-1.48
Karsog	0.48	Bali Chowki	-0.21	Shalai	-1.60
Sangla	0.48	Nurpur	-0.22	Chaurah	-2.06
Poo	0.45	Kullu	-0.22	Dodra Kwar	-2.18

Source: Compiled by Authors

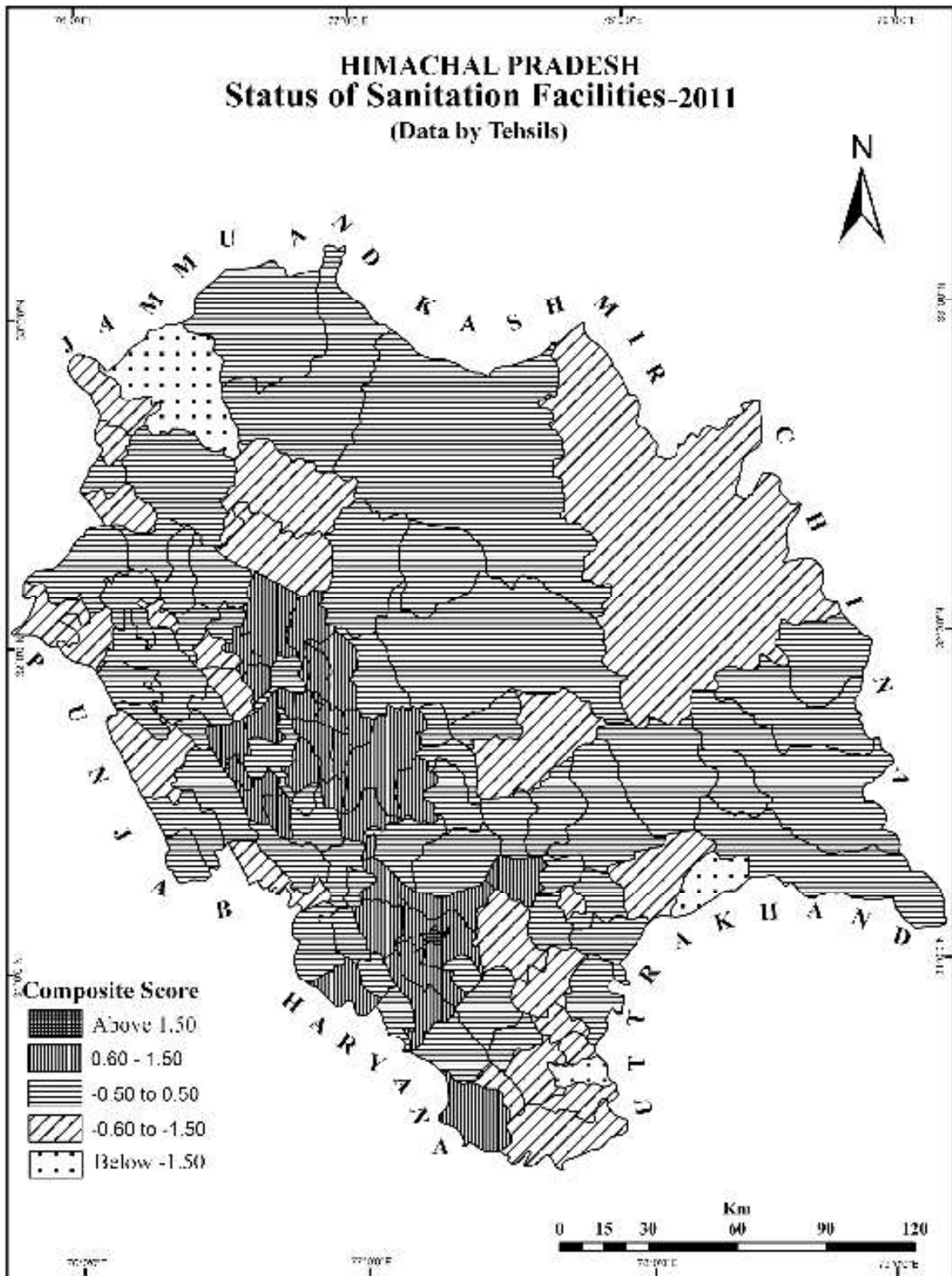


Fig. 6

Shimla (urban) tehsil of district Shimla is the leading and the only tehsil which falls under very high level of sanitation facilities in Himachal Pradesh (Table 2; Fig. 6). Being an urban tehsil, sanitary facilities like tap water from treated source, separate bathroom facility, drainage connectivity and improved toilet facility, all are available in more than 90 per cent of households. Therefore, the tehsil has witnessed highest level of sanitary facilities in the state.

(ii) Areas of High Level of Sanitary Facilities

High levels of sanitary facilities have been found in 26 per cent tehsils of the state (Table 2). Most of the tehsils of this category are located in central parts of state (Fig. 6). A compact and contiguous region comprising tehsils of Baijnath, Palampur, Dhira, Thural, Jogindernagar, Lad Bharol, Sandhol, Dharpur, Kotli, Sarkaghat, Bhadrola, Baldwara, Sundarnagar, Mandi, Chachyot, Tira-Sujanpur, Nadaun, Galore, Hamirpur, Barsar, Bhoranj, Darlaghat, Kumharsain, Seoni, Arki, Shimla (Rural), Solan, Kandaghat, Baddi and Nahan is well marked in the central parts of the state. Better level of sanitation status in these tehsils may be attributed to combination of factors like relatively better accessibility and connectivity, high socio-economic status, high literacy rate and awareness among households about significance of sanitary facility.

(iii) Areas of Medium Level of Sanitary Facilities

About 50 per cent tehsils of the state fall under medium category and roughly make a region adjacent to the contiguous cluster formed by tehsils of high category (Table 2; Fig.6). It further forms two clusters in northern and eastern parts of state (Fig. 6). Northern

cluster includes tehsils of Pangi, Udaipur, Lahul, Multhan, Manali and Kullu and eastern cluster includes tehsils Hangrang, Poo, Morang, Kalpa, Sangla, Nichar and Rampur. It is interesting to note that all the tehsils falling in this category are tribal.

(iv) Areas of Low Level of Sanitary Facilities

This category comprises of 21 per cent tehsils of the state (Table 2), which mostly are border tehsils and forms two identifiable clusters located in north-western and southern parts of the state. North-western cluster, comprises the tehsil of Bhalai, Saluni, Bhattiyat, Brahmour, and Holi of district Chamba. While, tehsil like Paonta Sahib, Kamrau, Renuka, Dadahu and Ronhat of district Sirmour and tehsil like Chaupal, Cheta and Theog of district Shimla in southern part of state constitute second cluster. Other border tehsils like Indora and Fatehpur of district Kangra, Amb tehsil of district Una, Jhanduta and Naina Devi tehsils of district Bilaspur, Chirgaon and Dodra Kwar thesils of district Shimla and Spiti tehsil of district Lahul & Spiti also recorded low level of sanitary facilities.

(v) Areas of Very Low Level of Sanitary Facilities

The poor level of sanitation facilities has been found in three tehsils of the state (Fig.6). This can be visualized from Table 2, that the worst situation in terms of sanitation facilities is in the tehsil Dodra Kwar (-2.18) of district Shimla, Chaurah (-2.06) of district Chamba, and Shalai (-1.60) of district Sirmaur. Dodra Kwar and Chaurah, tehsils fall in this category, because, except tap water facility, remaining three facilities i.e. bathroom, drainage and improved toilet are not found to be in more than 70 per cent of households of these tehsils. In case of tehsil Shalai more than 1/3rd of

Table 3
Himachal Pradesh: Correlation Matrix between Various Parameters

Parameters	Tap water	Separate Bathroom	Drainage Connectivity	Improved Toilet	Sanitation Status	Literacy Rate	Rate of Urbanization
Tap water	1						
Separate Bathroom	0.001*	1					
Drainage Connectivity	0.188**	0.676*	1				
Improved Toilet	0.371*	0.643*	0.606*	1			
Sanitation Status	0.521*	0.774*	0.825*	0.875*	1		
Literacy Rate	0.108*	0.702*	0.522*	0.640*	0.659*	1	
Rate of Urbanization	0.101*	0.257**	0.400*	0.250*	0.337**	0.355*	1
** Significant at 0.1 percent level							
* Significant at 0.5 percent level							

Source: Compiled by Authors

households are without tap and bathroom facilities while 2/3rd of households have absence of drainage and toilet facilities. Hence, status of sanitation is very poor in these tehsils. On the whole, low level of sanitation status in the above mentioned tehsils falling in areas of low and very low level of sanitary facilities is the outcome of factors like socio-economic backwardness, poor accessibility and connectivity, traditional attitude and awareness of the people about the associated health hazards and level of literacy.

Testing of Hypothesis

To understand the relationship between various indicators and their association with rate of literacy and degree of urbanization, Pearson's correlation has been calculated. Table 3 reveals that all the indicators taken to assess the levels of sanitation facilities in Himachal Pradesh are positively as well as significantly related with each other and with the sanitation status of the tehsils as a whole, suggesting that, all the sanitary facilities are mutually supportive. However, it must be mentioned that availability of tap water is the basic input to encourage the growth of other facilities.

Similarly, study also brings out that literacy rate is positively related with status of sanitation (0.659) at 0.5 per cent level of confidence and degree of urbanization is also positively related with level of sanitation status (0.337) at 0.1 per cent level of confidence. Thus, the hypothesis 'status of sanitation is directly proportional to the rate of literacy and degree of urbanization' stands proved.

Conclusions

Sanitation is critical not only for health but also for sustainable socio-economic development. It is not only a development issue, but also an empowerment tool for the betterment of society as quality of human life rests upon accessibility to better sanitation. Study reveals wide inter-tehsil variations in terms of availability of sanitary facilities within the state. However, striking observations of the study are:

- About 84 per cent of households in Himachal Pradesh have access to treated tap water against the national average of 32 per cent.
- About 50 per cent of the total tehsils in the state have recorded high to very high

level of access to treated tap water facility, while less than 40 per cent tehsils have access to other sanitary facilities.

- Not even a single tehsil in state has the distinction of achieving 100 per cent level of access to toilet facility at households level. About 1/3rd of the households are either defecating in open or have access to unimproved toilet facilities.
- It has been found that tehsils of Shimla (urban) and Dodra Kwar by recording composite scores, of 1.65 and -2.18 respectively have attained highest and lowest positions in status of sanitation in the state. Both the tehsils fall in Shimla district.
- Barring few exceptions, tehsils with high level of sanitation facilities are concentrated in the western part of the state, which generally decreases as one move from western part of state to eastern, northern and southern parts.
- The study reveals that tehsils having high rates of literacy and urbanization enjoy higher status of sanitation in the state.

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