

## ACCESS TO SOURCES OF DRINKING WATER AMONG HOUSEHOLDS IN RURAL INDIA

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**Abstract:** *The district-wise census data of 2011 of different sources of drinking water among households in rural India has been used for the present research work. To understand regional variations in the access to sources of drinking water among households, percentage technique has been adopted at regional, state and district levels in rural India. The study highlights that more than two-fifth of the households in rural India has been dependent on hand pump, while nearly 18 percent households have used treated tap water. On the other hand, 13 percent of households used un-treated tap water and 12 percent un-covered wells. About eight percent households have still used the water by tube well/borehole in rural India in 2011. Similarly, it has been observed that the largest number of households, 41 percent within the premises; 46 percent near the premises; and 44 percent away the premises access to hand pump. It has been also observed that more than half of households used treated tap water in islands followed by north-western and southern regions of India. It has been noticed that more than two-third households in eastern, three-fifth households in northern and two-fifth households in north-eastern region have access to hand pumps for drinking water. Similarly, un-treated tap water has been accessible to more than one-fourth of households in southern and western regions of India. Finally, it is suggested that nearly 29 percent of total rural households in India which have to depend on un-treated tap water, un-covered well and all other sources of drinking water must be provided safe drinking water for better healthy living.*

**Key words:** Drinking Water, Hand Pump/Treated, Un-Treated Tap water, Borehole and Broad Regions

## **Introduction**

Safe drinking water supply has been one of the public health agenda for so long. It is essential for all human beings. Clean water forms the backbone of an effective public health system. However, providing the safe drinking water in a large and heterogeneous country can be a big challenge (Desai, et. al., 2010). Globally, the world is on track to meet the Millennium Development Goal (MDG) of safe drinking water. As per census 2011, India is also on the track with about 70 percent of rural households having sustainable access to safe drinking water. Census of India (2011) defined it as, "if a household has access to drinking water from a tap, tube well or hand pump situated within the premises or outside the premises, it is considered as having access to safe/improved drinking water". Further, Census of India also provides the data into following three categories: "within the premises, near the premises and away from the premises. 'Within the premises' refers to the availability of water located within the premises where the household lives. If the source is located within a range of 100 meters from the premises in urban areas and within a distance of 500 meters in case of rural areas, the category is considered as 'near the premises. If the source is located beyond 100 meters from the premises in urban areas and beyond 500 meters in rural areas, the category becomes 'away from the premises" (Census of India). Haq, M., et.al (2007) "described that safe drinking water in the household is one of the important indicators of the socio-economic development of any area, region or a country, but is also fundamental to the health of the people". Tiwari, and Nayak (2013) "studied that a large part of the Uttar Pradesh households depends on their own private tube wells and pumps for their daily water needs. The study also highlighted the wide inter-regional disparities in access to drinking water." Krishan (2017) "assessed the middle-class household by considering the trinity of daily living facilities, such as electricity, treated water supply and sanitation in the house".

Since, rural housing conditions are the true indicators of the living standard of the people. Therefore, the access to sources of drinking water among households in rural India where nearly 68 percent of people live in rural areas has been considered. A very few studies have been carried out to examine the access to drinking water at district and country levels. Therefore, to fill this gap, the present study has been made to analyze the district-wise access to various sources of drinking water among households in rural India.

## **Objective of the Study**

The main objective of the present study is:

To highlight the 'access to sources of drinking water among households at regional, state and district levels in rural India.'

## **Study Area**

India extends from 8° 4' north to 37° 6' north latitudes and 68° 7' east to 97° 25' east longitudes, covering 32,87,263 km<sup>2</sup> of area. India is a federal union comprising of 28 states and 7 union territories. As per census, 2011, it has 640 districts in India, out of which nine districts have without rural population. The total rural population is 833.75 million which resides in 168.61 million households. Out of the total population in the country, nearly 68.85 percent rural population lives in 68.04 percent of households in rural India.

## **Database and Research Methodology**

The district-wise census data of 2011 of different sources of drinking water among households in rural India has been used for the present research work. The data with respect to various sources of drinking water such as (i) tap water (treated), (ii) tap water (un-treated), (iii) covered well, (iv) un-covered well, (v) hand pump, (vi) tube well/borehole, (vii) spring, (viii) river/canal, (ix) tank/pond/lake, and (x) other sources have been calculated in percentages. Data have been

processed to discuss the spatial variations at broad regional levels such as northwestern, northern, eastern, northeastern, western, southern, and islands identified by Ahmed (1999). Further, data have also been processed to highlight the spatial variations at state level as well as at district levels. Finally, maps and tables have been prepared to interpret and analyze the results.

### **Results and Discussion**

As per Census 2011, it has been recorded that more than two-fifth (43.63 percent) of the total rural households have been dependent on hand pump, while nearly 18 percent of households have been dependent on treated tap water in rural India. Un-treated tap and un-covered well are other important sources of water for nearly 13 and 12 percent households respectively. About eight percent of households are still dependent on water by tube well/borehole. It has been found that about 5.51 percent of the total rural households have access to water from five different sources like covered well (1.54 percent), spring (0.71 percent), river/canal (0.84 percent), tank/pond/lake (1.06 percent), and other sources (1.36 percent) in India.

Similarly, it may be noted that access to maximum households, about 41 percent within the premises; 46 percent near the premises; and 44 percent away from the premises have been dependent on hand pump. On the other hand, only five percent households have access to water near the premises from the sources like covered well; spring; river, canal; tank, pond, lake; and other sources. It has been observed that about 12 percent of households have access to water away the premises by the same sources in rural India (Table 1). To highlight the spatial variations in the access to these sources of drinking water, analysis has been carried out among households at regional, state and district levels in rural India.

### **Spatial Variations at Regional Level**

Across the broad regions, the access to drinking water differs significantly in rural India. Among the regions, the eastern region of India has the highest access to hand pump as source of safe drinking water, where nearly 68 percent rural households are dependent on hand pump, followed by northern region with 61 percent households and north-eastern region with 41 percent households in 2011. While smallest proportion of households, access to hand pump has been recorded in islands region (0.03 percent), followed by southern region (10.50 percent) in rural India (Table 2). Treated tap water is a major source of safe drinking water among rural households in islands region (52.57 percent), followed by north-western region (40.34 percent) and southern region (33.94 percent) in India. On the other hand, it has been least used in eastern region (4.05 percent) and north-eastern region (7.75 percent) respectively. The access of un-treated tap water among rural households varies across different regions in India. The maximum access to un-treated tap water, among rural households has been observed in southern region (27.79 percent), followed by western region (25.27 percent), while minimum use is recorded in eastern region (2.52 percent).

Likewise, the highest use of un-covered wells, as source of drinking water has been found in north-eastern region (18.24 percent), while the lowest use has been observed in north-western region (2.48 percent). Similarly, north-western region is leading in the use of tube well/borehole (15.14 percent) as source of drinking water for rural households. The study also reveals that 18.47 percent of rural households in north-eastern are dependent on covered well; spring; river/canal; tank/pond/lake; and other sources of drinking water in India in 2011.

**Table 01: Households Based on Location and Source of Drinking Water in Rural India**

Source of Drinking Water	Total Households	Within the Premises	Near the Premises	Away the Premises
Tap Water (Treated)	17.86	25.51	16.45	08.45
Tap Water (Un-Treated)	12.96	14.53	14.66	07.14
Covered Well	01.54	01.90	01.16	01.72
Un-Covered Well	11.76	08.95	10.52	18.64
Hand Pump	43.63	40.95	45.73	43.79
Tube well/ Bore well	08.28	08.16	07.58	09.83
Spring	00.71	00.00	00.54	02.19
River/ Canal	00.84	00.00	00.73	02.40
Tank/Pond/Lake	01.06	00.00	01.44	02.00
Other Source	01.36	00.00	01.19	03.84
<b>Rural India</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

Source: Census of India, 2011. Compiled by Authors. Figures shows in percentage.

**Table 02: Region-wise, Households by Source of Drinking Water in Rural India**

Region	Sources of Drinking Water (Percent)					
	Hand pump	Tap Water (Treated)	Tap Water (Un-Treated)	Un-Covered Well	Tube well Borehole	Covered well/ Spring/River/Canal/ Tank/Pond/Lake/Others
North-western	19.65	40.34	15.16	02.48	15.14	07.27
Northern	60.67	12.27	07.23	10.55	04.68	04.59
Eastern	68.50	04.05	02.52	11.14	10.14	03.65
Northeastern	41.20	07.75	06.71	18.24	07.62	18.47
Western	16.48	27.04	25.27	16.66	08.44	06.12
Southern	10.50	33.94	27.79	12.57	09.55	05.65
Islands	00.03	52.57	22.81	11.65	00.72	12.01
<b>National Average</b>	<b>43.63</b>	<b>17.86</b>	<b>12.96</b>	<b>11.76</b>	<b>08.28</b>	<b>05.51</b>

Source: Census of India, 2011. Compiled by Authors.

### Spatial Variations at State Level

State-wise spatial variations in access to various sources of household drinking water have been discussed as under:

#### Access to Hand pump

Hand pump is the largest source of safe drinking water being used by nearly 73.25 million households in rural India. The access to hand pump as source of safe drinking water across the states varies from 0.02 percent households in Sikkim and Andaman & Nicobar Islands to 89.24 percent households in Bihar (Table 3). The high and very high level of access to safe drinking water (more than 60 percent) among households has been found in four states like Bihar, Uttar Pradesh, Chhattisgarh and West Bengal. On the other hand, the extremely very low access to hand pump (less than 05.01 percent) as a source of drinking water has been recorded in the states like Sikkim, Goa, Kerala, Mizoram, Nagaland, Meghalaya and Himachal Pradesh. Further, the very low access to water from hand pump (less than 20.01 percent) has been observed in the states such as Tamil Nadu, Manipur, Karnataka, Arunachal Pradesh, Jammu & Kashmir, Haryana, Maharashtra, Tripura, Andhra Pradesh and Gujarat. On the whole, about 29 percent of states have recorded access to hand pump as source of safe drinking water more than the national average, against 71 percent states having less than the national average of 43.63 percent. Among the Union Territories (UTs), leaving aside Dadra & Nagar Haveli (30.09 percent), all the UTs have less than 20 percent households having access to hand pump as source of safe drinking water.

### **Access to Treated tap water**

Treated tap water is the second largest source of safe drinking water being used by nearly 29.98 million households in rural India. In other words, nearly 18 percent of rural households are dependent on this source of drinking water. Among the states, the highest use of treated tap water has been observed by Himachal Pradesh (82.75 percent), followed by Goa, Haryana, Tamil Nadu, Uttarakhand, Andhra Pradesh, Maharashtra, Punjab, Karnataka, Jammu & Kashmir, Arunachal Pradesh and Rajasthan respectively, where use of treated tap water is more than the national average of 17.86 percent. On the other hand, the lowest proportion of access to treated tap water among households has been observed in the state of Bihar (1.64 percent), followed by Jharkhand, Chhattisgarh, Odisha and Madhya Pradesh. Except Arunachal Pradesh, all the states located in the north-eastern region of India, Uttar Pradesh and Kerala have also access to treated tap water as source of household safe drinking water less than the national average of 17.86 percent. Likewise, union territory of Chandigarh has recorded the highest use of treated tap water (88.80 percent) and the lowest by Lakshadweep (0.75 percent; Table 3).

### **Access to Un-treated Tap Water**

Un-treated tap water is another important source of drinking water, being used by nearly 21.75 million households, which constitute nearly 13 percent of the total households in rural India. The access to un-treated tap water as source of household drinking water among states varies from 0.91 percent households in Bihar to 69.26 percent households in Sikkim (Table 3). The states like Sikkim, Nagaland, Arunachal Pradesh, Gujarat, Karnataka, Jammu & Kashmir, Tamil Nadu, Andhra Pradesh and Mizoram have extremely high access, where more than 25 percent of households are dependent on un-treated tap water in rural India. Among the union territories, Lakshadweep recorded the highest use of un-treated tap water with 30.28 percent of households depending on it, followed by Dadra & Nagar Haveli (26.73 percent) and Andaman & Nicobar Islands (22.49 percent). On the whole, it has been observed that half of the states and UTs have access to un-treated tap water less than the national average.

### **Access to Un-covered well**

Un-covered well is also a significant source of drinking water used by about 19.75 million households which constitute about 12 percent of the total households in rural India. Among the states, the use of un-covered well varies from 0.22 percent households in Sikkim to 50.53 percent in Kerala (Table 3). It has been observed that states such as Kerala, Jharkhand, Tripura, Madhya Pradesh, Meghalaya and Maharashtra, which have more than 20 percent household's dependent on un-covered well. On the other hand, the proportion of households using un-covered well in two-third of the states and union territories is less than the national level.

### **Access to Tube well/Borehole**

Access to tube wells and boreholes as sources of drinking water in rural India across the states varies from 0.02 percent households in Sikkim to 27.97 percent households in Punjab with national average of 8.28 percent. The states such as Punjab, Odisha, Karnataka, West Bengal and Tripura are leading states for use of tube well and borehole as sources of drinking water as more than 15 percent of households have access to these sources of drinking water. It has been recorded that about 71 percent of the states, the percentage of households depending on these sources of drinking water is less than the national average. While, among all the UTs, NCT of Delhi and Dadra & Nagar Haveli have a proportion of households depending on these sources of drinking water more than the national average (Table 3).

### Access to Covered Well/Spring/River/Canal/Tank/Pond/Lake/and Other Sources

It has been noticed that covered well; spring; river, canal; tank, pond, lake; and other sources still have sources of drinking water in rural India. It is important to note that nearly 9.25 million households still have access to these sources, which constitutes 5.51 percent of the total households in rural India. Across the states, these sources vary from 1.43 percent households in Uttar Pradesh to 56.22 percent households in Manipur. Besides the state of Manipur, Mizoram (53.17 percent), Meghalaya (42.57 percent), Nagaland (25.86 percent), Jammu & Kashmir (23.82 percent), Kerala (21.14 percent), and Arunachal Pradesh (20.92 percent) are other leading states for use of above-mentioned sources of drinking water as more than 20 percent of the households have access to these sources of drinking water in rural India. It has been recorded that about 57 percent of the states also fall in the category, where percentage of households depending on these sources of drinking water is above the national average (Table 3). While among the UTs, NCT of Delhi, Lakshadweep and Andaman & Nicobar Islands have a proportion of households depending on these sources of drinking water more than the national average.

**Table 03: Percentage of Households by Sources of Drinking Water in Rural India**

States /Union Territories	Hand Pump	Tap Water (Treated)	Tap Water (Un-Treated)	Un Covered Well	Tube well/ Borehole	Covered Well/Spring/ River/Canal/Tank/ Pond/ Lake/Other Sources
Jammu & Kashmir	13.06	22.29	33.38	06.08	01.37	23.82
Himachal Pradesh	03.88	82.75	05.98	01.46	00.61	05.32
Punjab	33.80	25.32	09.58	00.29	27.97	03.04
Chandigarh (UT)	01.33	88.80	06.44	00.01	02.12	01.30
Uttarakhand	24.07	46.01	17.91	00.61	01.50	09.90
Haryana	14.17	47.39	16.26	03.55	14.20	04.43
NCT of Delhi (UT)	14.85	49.56	09.85	00.10	13.67	11.97
Rajasthan	31.49	17.92	08.99	12.43	14.39	14.78
Uttar Pradesh	73.18	13.06	07.11	04.24	00.98	01.43
Bihar	89.24	01.64	00.91	03.82	02.12	02.27
Sikkim	00.02	13.39	69.26	00.22	00.02	17.09
Arunachal Pradesh	12.33	19.67	39.61	04.76	02.71	20.92
Nagaland	01.43	06.10	45.68	19.54	01.39	25.86
Manipur	06.70	13.01	17.98	05.72	00.37	56.22
Mizoram	00.79	14.61	26.77	03.44	01.22	53.17
Tripura	16.79	11.35	13.80	31.92	16.17	09.97
Meghalaya	03.46	16.72	12.00	22.29	02.96	42.57
Assam	53.33	05.78	01.04	17.97	08.18	13.70
West Bengal	62.88	07.64	03.79	06.17	17.11	02.41
Jharkhand	49.09	02.10	01.62	40.33	01.48	05.38
Odisha	46.79	04.00	03.47	18.08	20.16	07.50
Chhattisgarh	69.82	03.26	05.58	12.36	05.48	03.50
Madhya Pradesh	58.29	04.66	05.28	24.03	04.91	02.83
Gujarat	18.23	16.68	39.10	08.36	10.88	06.75
Daman & Diu (UT)	05.77	76.46	08.31	00.50	07.26	01.70
D & N Haveli (UT)	30.09	15.78	26.73	11.38	11.72	04.30
Maharashtra	15.70	31.96	18.29	21.06	07.25	05.74
Andhra Pradesh	18.15	36.37	27.03	07.83	07.05	03.57
Karnataka	08.42	22.86	33.50	10.88	19.57	04.77
Goa	00.10	72.88	04.95	11.06	00.43	10.58
Lakshadweep (UT)	00.16	00.75	30.28	50.69	00.04	18.08
Kerala	00.38	17.18	07.28	50.53	03.49	21.14
Tamil Nadu	05.23	46.06	33.21	04.87	07.69	02.94
Puducherry (UT)	02.57	88.65	06.40	00.02	01.99	00.37
A & N Islands (UT)	00.02	54.99	22.49	09.98	00.75	11.77
<b>National Average</b>	<b>43.63</b>	<b>17.86</b>	<b>12.96</b>	<b>11.76</b>	<b>08.28</b>	<b>05.51</b>

Source: Census of India, 2011. Compiled by Authors.

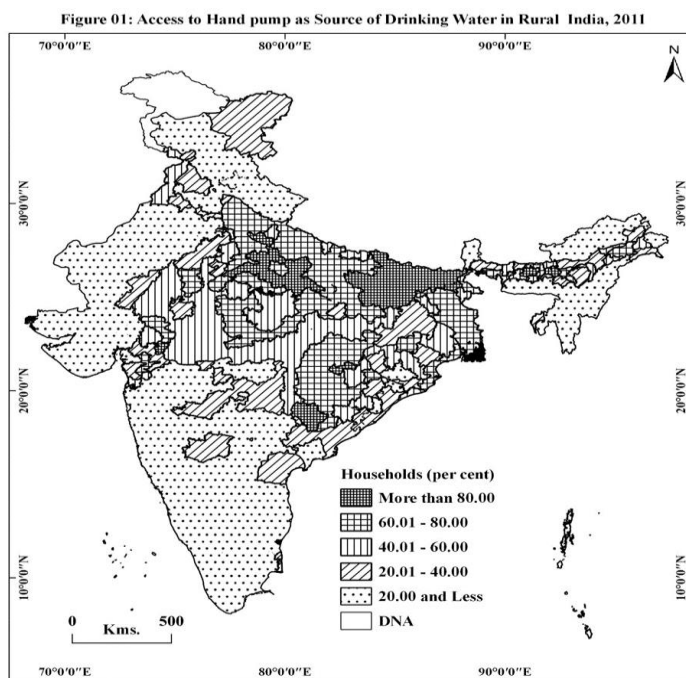
## Spatial Variations at District Level

District-wise variations in access to various sources of households' drinking water have also been discussed as under:

### Access to Hand Pump

The access to hand pump as a source of safe drinking water across the districts varies from 0.02 percent households in East Kameng district of Arunachal Pradesh; Mokokchung and Phek districts of Nagaland; Nicobar's and North & Middle Andaman districts of Andaman & Nicobar Islands to 97.23 percent in Sheohar district of Bihar. About 10 percent of the districts in India are having very high level of access (more than 80 percent of households) to hand pump as source of safe drinking water and more than four-fifth of the districts belong to the states of Uttar Pradesh and Bihar only, confined to large patches in northern and eastern parts of India (Figure 01). The access to high level of hand pump has been found in 126 districts accounting for one-fifth (19.87 percent) of the total districts of the country. More than three-fourth districts belong to the states of Uttar Pradesh, Madhya Pradesh, West Bengal, Odisha and Chhattisgarh fall in this category of areas and are mostly confined to northern and eastern parts of India. The moderate level of access (40.01 to 60.0 percent) to hand pump has been recorded by 14 percent of districts and more than half of the districts of this category are in the states of Rajasthan, Madhya Pradesh and Odisha.

The districts having less than 40.01 percent of households have been categorized as areas of low and very low levels of access to hand pump. About 10.62 million households found in 355 districts accounting for 56 percent of the total districts fall in this category (Table 4). Among the states, all the districts of Himachal Pradesh, Haryana, Sikkim, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Andhra Pradesh, Karnataka, Goa, Kerala, Tamil Nadu and except the districts of Jammu and Samba of Jammu & Kashmir; Hardwar and Udham Singh Nagar of Uttarakhand; Lohit of Arunachal Pradesh; Gadchiroli and Gondiya of Maharashtra also come under this category and mostly located in north-western, north-eastern, western and southern parts of India. Among the union territories, all the districts of Chandigarh, Daman & Diu, Dadra & Nagar Haveli, Lakshadweep, Puducherry and Andaman & Nicobar Islands also fall in this category (Figure 01).

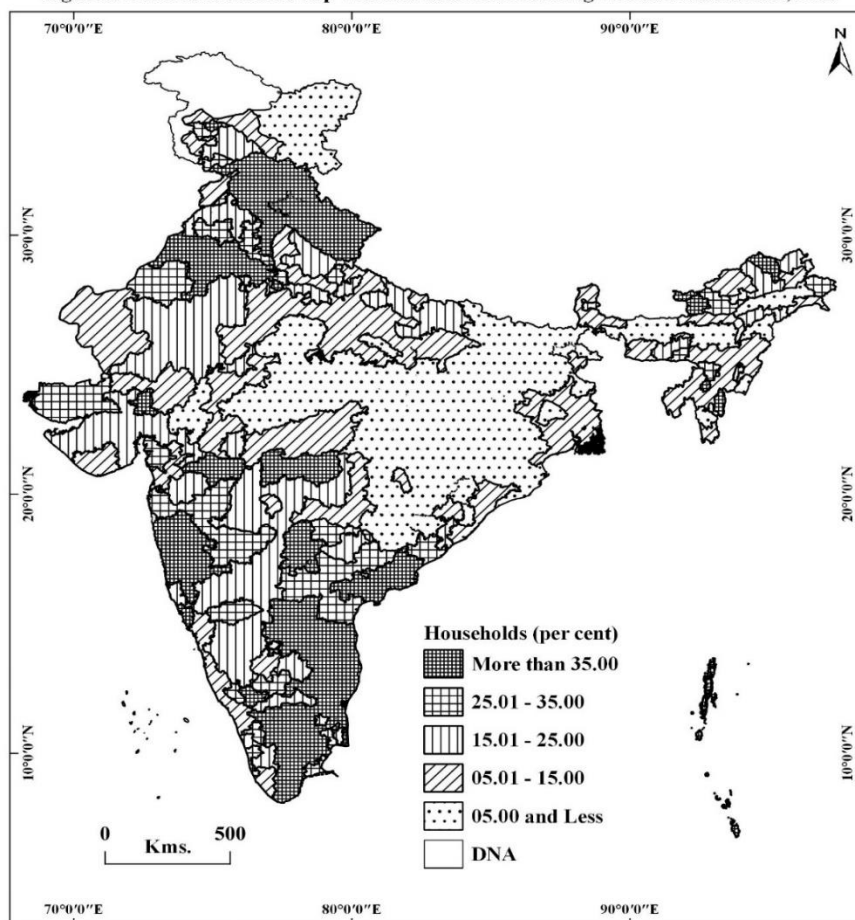


### Access to Treated Tap water

Use of treated tap water varies across the district from 0.47 percent in Jashpur district of Chhattisgarh to cent percent in East Delhi district of NCT of Delhi. Very high and high levels of access to treated tap water (more than 25 percent of households) have been recorded in 174 districts accounting about 28 percent of the total districts, and confined to north-western, western and southern parts of India in the form of large patches (Figure 02) About two-third districts of this category belong to only seven states such as Himachal Pradesh, Punjab, Uttarakhand, Haryana, Maharashtra, Andhra Pradesh and Tamil Nadu. The moderate level of access (15.01 to 25.00 percent) to treated tap water as source of safe drinking water has been found in 117 districts and more than three-fifth of the districts are in the states of Rajasthan, Uttar Pradesh, Gujarat, Maharashtra and Karnataka.

On the other hand, access to treated tap water at very low and low levels (less than 15.01 percent households) has been recorded in 340 districts comprising about 54 percent of the total districts (Table 5), mostly confined to northern, eastern, and north-eastern parts of India in the form of large patches (Figure 02). All the districts of Bihar, West Bengal, Jharkhand, Odisha, Chhattisgarh, Nagaland, and except the district of West Nimar of Madhya Pradesh; Cachar, Jorhat and Sivasagar districts of Assam and two-third districts of Uttar Pradesh and more than half of the districts of Rajasthan accounting for four-fifth of the districts of this category of less than 15.01 percent households in a district. It may also be noted that almost opposite relationship has been observed between the level of access of hand pump and treated tap water as source of safe drinking water, as the use of hand pump is larger in northern and eastern parts while use of treated tap water is very small in these areas in rural India (see Figure 01; and Figure 02).

Figure 02: Access to Treated Tap Water as Source of Drinking Water in Rural India, 2011



Source: Based on Table 5

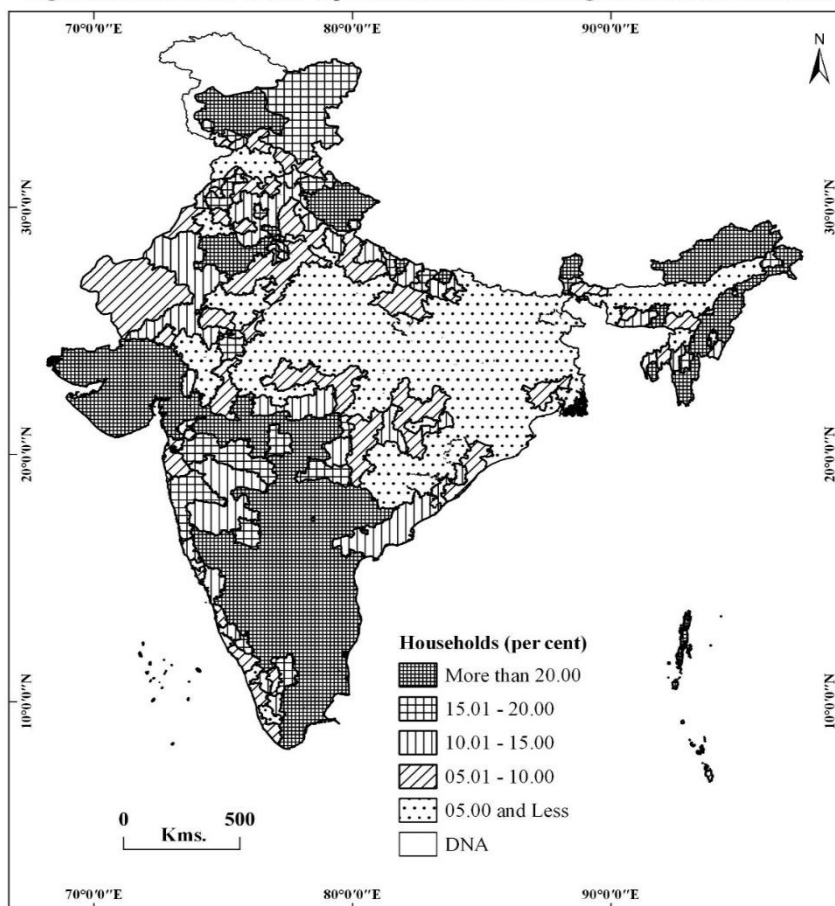


### Access to Un-Treated Tap water

The access to un-treated tap water has been recorded in about 13 percent of the total households (12.96 percent) of the study area. The access to un-treated tap water as a source of household drinking water across the district varies from 0.26 percent households in Dhubri of Assam to 76.25 percent households in Kiphire of Nagaland. The high to very high levels of use of un-treated tap water as source of household drinking water (more than 15 percent of households) has been recorded in 217 districts accounting about one-third of the total districts of rural India and confined to north-western, north-eastern, western and southern parts of India in the form of large patches (Figure 03). These districts are spreading in 24 states, but about 78 percent located in Jammu & Kashmir, Uttarakhand, Arunachal Pradesh, Nagaland, Gujarat, Maharashtra, Andhra Pradesh, Karnataka, and Tamil Nadu in the form of large scattered patches. The moderate use of un-treated tap water (10.01 to 15.0 percent households) has been found in nearly 11 percent of the districts in the form of small scattered patches, mostly located in the states of Haryana, Rajasthan, Uttar Pradesh, Maharashtra and Andhra Pradesh.

On the other hand, access to very low to low level of un-treated tap water (10.01 and less percent of households) has been observed in 55 percent districts in the rural India (Table 6). All the districts of Bihar, Assam, Jharkhand and except the district of Darjiling of West Bengal; Gajapati and Bargarh districts of Odisha; Dhamtari and Durg districts of Chhattisgarh; Idukki and Palakkad districts of Kerala, followed by districts of Madhya Pradesh (86 percent), Uttar Pradesh (80 percent) and Rajasthan (73 percent) come under this category. These districts cover more than four-fifth of the total districts of this category and located in northern and eastern parts in the form of very large patches in the study area (Figure 03).

Figure 03: Access to Un-Treated Tap Water as Source of Drinking Water in Rural India, 2011

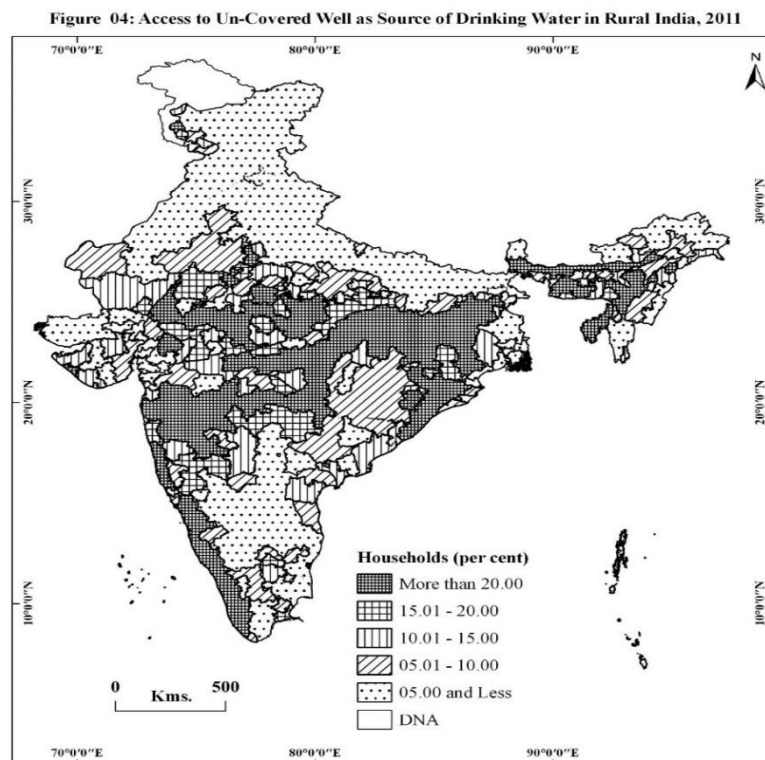


Source: Based on Table 6

### Access to Un-Covered Well

Likewise un-treated tap water as source of household drinking water, un-covered well is also a significant source of household drinking water in rural India. The use of un-covered well as source of household drinking water across the country varies from 72.41 percent households in Udipi district of Karnataka to Kargil district of Jammu & Kashmir where not even a single household is dependent on this source of drinking water. Apart from Udipi district of Karnataka, the highest percent of such households has been observed in Giridih, Hazaribagh, Gumla and Ramgarh districts of Jharkhand; Uttara Kannada district of Karnataka; Kannur, Malappuram, Kozhikode and Kasaragod districts of Kerala where more than 60 percent households used un-covered well for the purpose of household drinking water in rural India.

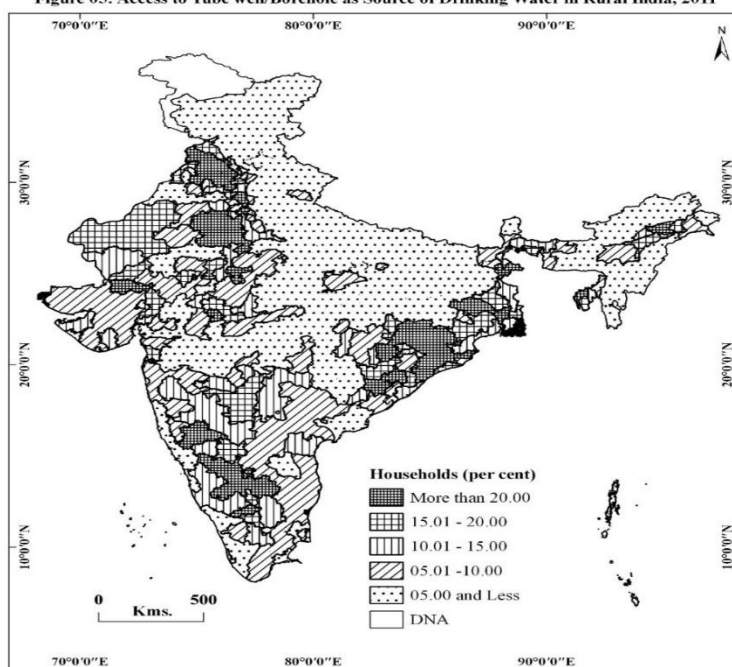
The high to very high levels of use of un-covered well as source of household drinking water (more than 15 percent of households) has been recorded in 188 districts, accounting about 30 percent of the total districts and mostly confined to northern, eastern, north-eastern in the form of large patches and linear form along the western and eastern coasts of India (Figure 04). About three-fourth of the districts are also spreading over various states of the country such as Rajasthan, Maharashtra, Madhya Pradesh, Odisha, Jharkhand, Kerala and Assam. The moderate level of use of drinking water by un-covered well (10.01-15.00 percent households in a district) has been recorded in 61 districts, accounting about 10 percent of the total districts and spreading over various states in the form of small scattered patches in India. On the other hand, low and very low levels (less than 10.01 percent) of access to drinking water from un-covered well has been found in 382 districts (Table 7). All the districts of the states of Himachal Pradesh, Punjab, Uttarakhand, Sikkim, Manipur; and union territories of Chandigarh, NCT of Delhi, Daman & Diu, Puducherry and except the district of Mewat of Haryana; Changlang and Papum Pare districts of Arunachal Pradesh; Saiha district of Mizoram; followed by districts of Bihar (87 percent), Tamil Nadu (87 percent), Uttar Pradesh (83 percent) and Jammu & Kashmir (82 percent) come under this category. Further, it has been found that more than half of the districts of this category is located in only seven states such as Jammu & Kashmir, Punjab, Haryana, Uttar Pradesh, Bihar, Karnataka and Tamil Nadu (Figure 04).



### Access to Tube well/Borehole

The access to tube well and borehole water as sources of drinking water across the country varies from nearly half of the (49.88 percent) households in Barnala district of Punjab to Lahul & Spiti district of Himachal Pradesh, East Delhi district of NCT of Delhi, Dibang Valley and Anjaw districts of Arunachal Pradesh, Kiphire district of Nagaland, Serchhip district of Mizoram and Diu district of Daman & Diu where not a single household is dependent on tube well and borehole for drinking water. The high to very high levels of use of tube well and borehole water as source of household drinking water (more than 15 percent of households) has been recorded in 110 districts accounting about 17 percent of the total districts of rural India and confined to north-western, eastern and southern parts of India in the form of large patches (Figure 05). It has also been found that about 62 percent of the districts having very high level of access (more than 20 percent households) to tube well and borehole water belong to the states of Punjab, Odisha and Karnataka only. The moderate to moderately high levels of use of tube well and borehole water (5.01 to 15.0 percent households) has been found in about 29 percent of the total districts in the form of scattered patches and mostly located in the states of Haryana, Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Andhra Pradesh and Tamil Nadu. On the other hand, low level of access to tube well and borehole water (less than 5.01 percent households) has been recorded in 341 districts comprising about 54 percent of the total districts (Table 8). Most of the districts are confined to north-western, eastern, north-eastern regions and some parts of southern India in the form of small patches. Further, all the districts of Jammu & Kashmir, Himachal Pradesh, Sikkim, Manipur, Mizoram, Goa, and except the district Nainital of Uttarakhand; Dimapur district of Nagaland; West Garo Hills district of Meghalaya; Purbi Singhbhum district of Jharkhand; Lohit and Changlang districts of Arunachal Pradesh; Kasaragod, Alappuzha and Palakkad districts of Kerala; Agra, Baghpat, Mathura and Varanasi districts of Uttar Pradesh; Araria, Kishanganj, Purnia and Katihar districts of Bihar; and all the districts of union territories of Chandigarh, Lakshadweep, Andaman & Nicobar Islands.

Figure 05: Access to Tube well/Borehole as Source of Drinking Water in Rural India, 2011



### Access to Covered Well/Spring/River/Canal/Tank/Pond/Lake/and Other Sources

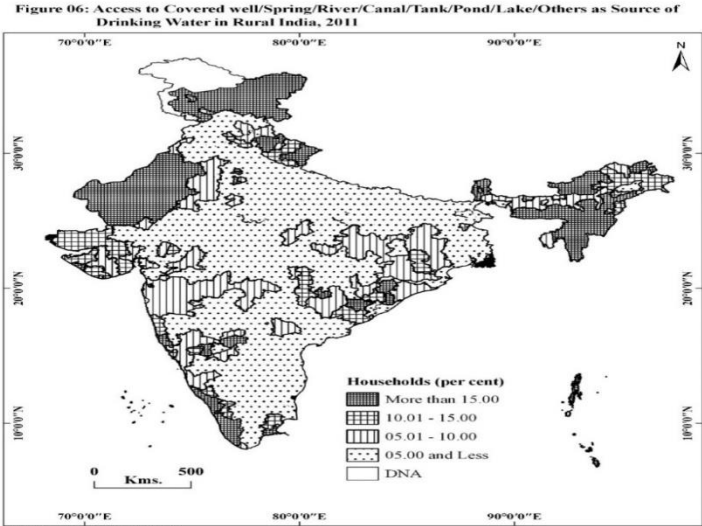
The access to covered well/spring/river/canal/tank/pond/lake/and other sources as sources of drinking water across the districts varies from nearly four-fifth of the households (79.30 percent) in Mamit district of Mizoram to East Delhi district of NCT of Delhi, where not a single household is dependent on these sources for drinking water. The areas of very high level of access to all

these sources for drinking water have been found in about 18 percent districts of the country where more than 15 percent households are using such types of sources (Table 9). However, wide inter-district variations are recorded ranging from an extremely high level of 79.30 percent households in Mamit district of Mizoram to 15.16 percent households in Ganderbal district of Jammu & Kashmir. The extremely high level of access that is more than 50 percent of households in a district are dependent on the above-mentioned sources has been observed in 22 districts. It is noted that nearly 70 percent districts of the category of very high level of access are located in the states of Jammu & Kashmir, Rajasthan, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Meghalaya and Kerala. The high level of use of all other sources as mentioned above for drinking water that is between 10.01 to 15.00 percent of households has been found in 46 districts accounting about seven percent of the total districts. The very high and high levels of access to above mentioned sources of drinking water are confined to north-western, northern, north-eastern regions and some parts of southern India in the form of very small scattered patches in rural India (Figure06). It has also been observed that the households located at higher altitude, densely forested areas, deserted areas, remote areas and border areas fall under these categories. Nearly 17 percent of total districts fall in the category of moderate level of use in which 5.01 to 10.00 percent households are dependent on other sources of drinking water. Out of these, more than half of the districts are located in the states of Assam, Jharkhand, Odisha, Maharashtra and Karnataka. While the access to all other sources mentioned in these categories of drinking water among households at low level (less than 5.01 percent) have been found in about 58 percent of the total districts. Taking districts into account it has been noticed that all the districts of the states of Uttar Pradesh, Bihar, and except the Firozpur district of Punjab; Visakhapatnam and Nalgonda districts of Andhra Pradesh; Darjiling, Jalpaiguri and Puruliya districts of West Bengal, followed by districts of Madhya Pradesh (86 percent), Tamil Nadu (84 percent), Haryana (71 percent) come under this category. Among the union territories, and all the districts Chandigarh, Daman & Diu; Dadra & Nagar Haveli; and Puducherry fall under this category of access to any other sources of drinking water.

**Table 04: Access to Hand pump for Households Drinking Water in Rural India**

Level of Access	Households ( percent)	No. of Districts	District ( percent)
Very High	More than 80.00	061	09.67
High	60.01-80.00	126	19.87
Moderate	40.01-60.00	089	14.10
Low	20.01-40.00	078	12.36
Very Low	20.00 and less	277	43.90
<b>Rural India</b>	<b>43.63</b>	<b>631</b>	<b>100.00</b>

Source: Census of India, 2011. Compiled by Authors.



**Table 05: Access to Treated Tap Water for households Drinking Water in Rural India**

Level of Access	Households (Percent)	No. of Districts	District (Percent)
Very High	More than 20.00	147	23.30
High	15.01-20.00	041	06.50
Moderate	10.01-15.00	061	09.67
Low	05.01-10.00	102	16.16
Very Low	05.00 and less	280	44.37
<b>Rural India</b>	<b>11.76</b>	<b>631</b>	<b>100.00</b>

Source: Census of India, 2011. Compiled by Authors.

**Table 06: Access to Un-Treated Tap Water for households Drinking Water in Rural India**

Level of Access	Households (Percent)	No. of Districts	District (Percent)
Very High	More than 35.00	122	19.33
High	25.01-35.00	052	08.24
Moderate	15.01-25.00	117	18.54
Low	05.01-15.00	159	25.20
Very Low	05.00 and less	181	28.69
<b>Rural India</b>	<b>17.86</b>	<b>631</b>	<b>100.00</b>

Source: Census of India, 2011. Compiled by Authors.

**Table 07: Access to Un-Covered well for households Drinking Water in Rural India**

Level of Access	Households (Percent)	No. of Districts	District (Percent)
Very High	More than 20.00	180	28.53
High	15.01-20.00	037	05.86
Moderate	10.01-15.00	070	11.09
Low	05.01-10.00	098	15.53
Very Low	05.00 and less	246	38.99
<b>Rural India</b>	<b>12.96</b>	<b>631</b>	<b>100.00</b>

Source: Census of India, 2011. Compiled by Authors.

**Table 08: Access to Tube well/ Borehole Water for households Drinking Water in Rural India**

Level of Access	Households (Percent)	No. of Districts	District (Percent)
Very High	More than 20.00	065	10.30
High	15.01-20.00	045	07.13
Moderate	10.01-15.00	068	10.78
Low	05.01-10.00	112	17.75
Very Low	Less than 05.01	341	54.04
<b>Rural India</b>	<b>08.28</b>	<b>631</b>	<b>100.00</b>

Source: Census of India, 2011. Compiled by Authors.

**Table 09: Access to Covered well/Spring/River/Canal/Tank/Pond/Lake/and Other Sources for households Drinking Water in Rural India**

Level of Access	Households (Percent)	No. of Districts	District (Percent)
Very High	More than 15.00	113	17.91
High	10.01-15.00	046	07.29
Moderate	05.01-10.00	108	17.12
Low	Less than 05.01	364	57.68
<b>Rural India</b>	<b>05.51</b>	<b>631</b>	<b>100.00</b>

Source: Census of India, 2011. Compiled by Authors.

## Conclusion

The condition of safe drinking water in the households is one of the important indicators of the socio-economic development of any area, region or a country. The study highlights that more than two-fifth of the households has access to hand pump as source of drinking water followed by treated tap water, un-treated tap water, un-covered well, and tube well/borehole in rural India. High to very high level of access to hand pump as source of drinking water has been recorded in states of Bihar, Uttar Pradesh, Chhattisgarh and West Bengal. The areas of very high level of access to treated tap water are in islands region and north-western region of India. It may also

be noted that an almost opposite relationship has been observed between the level of access of hand pump and treated tap water as source of safe drinking water, as the use of hand pump is larger in northern and eastern parts while use of treated tap water is very small in these areas in rural India. Finally, it has been observed that the use of treated tap water as source of household drinking water is an index of better socio-economic development, while use of un-treated tap water, un-covered well and other sources of drinking water reflect the degree of deprivation. Since safe drinking water in the household is one of the necessities for healthy living, therefore, it is suggested that 48.16 million households comprising nearly 29 percent of total rural households in India which have to depend on un-treated tap water, un-covered well and all other sources of drinking water must be provided safe drinking water for better healthy living.

### **References**

1. Ahmad, A. (1999) Social Geography. Rawat Publications, Jaipur: 255-258.
2. Census of India. (2011) Primary Census Abstract, New Delhi.
3. Census of India. (2011) Tables on Houses, Households Amenities and Assets, HH-Series, New Delhi.
4. Census of India. (2011) Instruction Manual for House listing and Housing Census, New Delhi.
5. Desai, S. B., Dubey, A., Joshi, B. L., Sen, M., Sharif, A. and Venneman, R. (2010) Human Development in India: Challenges for a Society in Transition, Oxford University Press, Delhi.
6. Haq, M. et.al. (2007) Households' willingness to pay for safe drinking water: a case study of Abbottabad district. *The Pakistan Development Review*, 46 (4): 1137-1153.
7. Krishan, Gopal. (2017) *The Vitality of India: A Regional Perspective*, Rawat Pub. Delhi.
8. Tiwari, R., and Nayak, S. (2013) Drinking water and sanitation in Uttar Pradesh: a regional analysis. *Journal of Rural Development*, 32 (1): 61–74.