

Spatial Dimensions of Drinking Water in an Agriculturally Prosperous State

Haryana, India

Rinku

Assistant Professor in Geography

A.I.J.H.M. College, Rohtak (HR.)

Abstract: The supply of safe drinking water, one of the Millennium Development Goals and most important basic needs of life, is currently the major challenge before the governments in developing countries including India. Availability of drinking water directly or indirectly affects the health, education and earnings. Women and children bear the primary responsibility for drinking water collection in India. As per census 2011, in rural India 37.8 per cent households used tap water for drinking and 35.7 per cent used hand pumps, 7.6 per cent tubewells, 16.5 per cent wells and 2.4 per cent used other sources of drinking water.

Haryana, the study area, an agrarian prosperous state, lies in north western part of India. The research is based on primary (field survey) as well as secondary data (Census of India and Public Health and Engineering Department etc.). The present research paper attempts to answer the following questions: How is the question of equity in drinking water addressed in an agrarian state in India? What are the policy interventions, technological progress and programmes in vogue to ensure safe drinking water across different parts of the state?

In Haryana, 65 per cent population lives in 6841 Villages and more than one-fifth or 22 per cent population in village belongs to scheduled castes. Haryana is emerging as a modern state and has made tremendous progress in the availability of drinking water. While 63 per cent of rural households in rural Haryana using tap water as source of drinking water in 2011, and in 1981 it was only 20 per cent. Use of well water as a source of drinking water in rural Haryana has also been changed significantly. While it was 53 per cent in 1981 and it decreased at the level of 4.5 per cent in 2011. In common with physiography, there is a significant spatial disparity in sources of drinking water in rural Haryana. The 87 per cent households in Panchkula used tap water where as only 32 per cent households in Mewat district have access to tap water. In Mewat 18 per cent households used well water for drinking, top in Haryana and in Karnal it is only 0.1 per cent. While using the traditional sources of drinking water such as well, there is a deprivation and untouchability in various caste groups.

Keywords: Drinking Water, Rural Haryana, Spatial Disparity, Agriculture, Sources.

Introduction: In the 21st century the problem of availability of drinking water in rural areas is increasing continuously. Access to drinking water is an important measure of socio-economic status of household. Inadequate and poor quality of drinking water resulted in more sickness and deaths which effects low worker productivity and school enrolment (Haq, M., et. Al, 2007). The definition of safe or improved source of drinking water is different within countries and regions; Joint monitoring programme has defined a set of categories for them. An improved source of drinking water includes, in addition to water piped, water available from a public tap or standpost, a tubewell/borewell, a protected dug well, protected spring and rainwater. In India, tap, Handpump and tubewell sources of drinking water includes in safe sources of drinking water (Economic Survey, Govt. of India).

Disparity in drinking water can be classified in spatial disparity, social disparity, gender disparity and Inter generational disparity (Tiwari R and Nyak S, 2013). Generally drinking water problem is more acute in rural areas than urban areas (Kanmony, 2013). In India, tap water as a source of drinking water using in 70.63 per cent households, in urban areas whereas its only 30.82 per cent in rural areas (Census of India, 2011). Ramachandraiah (2001) discussed about the social biasness in water availability and said that the distribution of water in urban areas is extremely inequitable, unjust and biased against the poor. Majumder (2007) found that there are regional and social disparities in use of alternative sources of drinking water. Reddy & Rathore (1993) in their study on Rajasthan identified that due to distance factor of the water source private infrastructure is developing in the area. But the poor are not able to purchase the water so the females walk 6-9 Km every day to fetch water. Women and girls are disproportionately burdened by scarcity of drinking water and they sacrifice their time and education to collect drinking water. Inter-generational disparity of drinking water refers to equity in enjoyment of natural resources including drinking water. If the present pattern of demand and supply continue to next twenty year, the half of our water demand could remain unmet. Roy A (2012) in his study found that rich families use more safe sources of water for their domestic water use.

Right to potable drinking water has been interpreted in Constitution of India as a part of Right to Life, under Article 21 of the Constitution of India. Every individual has a right to minimum quantity of potable water for essential health and hygiene, and within the access of household and the minimum quantity of potable water shall not be less than 25 litres per capita per day (Draft National Water Framework Bill 2013).

Haryana is one of the foremost states in India to provide piped water supply for all of its villages till 31st March 1992. But in Haryana, due to inadequate and faulty water supply system, people

are mostly dependent on traditional drinking water source such as wells. In addition to this, there are separate wells for general and schedule castes people and women spent a lot of time in hatching pitchers of water (The Tribune 18/11/2013).

Drinking Water and World:

The problem of drinking water is not associated with one individual or group of individuals but it is universal. It differs from region to region. In developed countries, it is not the problem of water scarcity but they face the problem of water pollution. In 1972, the UN conference on environmental issues was held at Stockholm. It created awareness about the problems related to water scarcity. In 1976, the UN conference on human settlement was held in Vancouver, Canada. On the bases of the emphases and recommendation made by the conference the UN conference held at “Mar del Plata Conference, Argentina” in 1977 focused exclusively on drinking water and sanitation need of the poor and vulnerable. This resulted in the designation of the period from 1981 to 1990 as the International Drinking Water Supply and Sanitation Decade (IDWSSD). International conference on drinking water and environment (Dublin, 1993) noted that water has an economic value in all its competing users and should be recognised as an economic good. The general assembly of United Nation (1993) declared 22 March as the world water day. From 1997, every third year, World Water Council organises World Water Forum to raise the awareness, improving access to water supply, encourage greater media attention for water issues etc (Iyer, 2005). In the year 2000, the United Nations and the international water community announced explicit goals, the Millennium Development Goals (MDGs) for human development over the next several decades and goal seven focused on drinking water quantity, the supply of drinking water and increasing access to sanitation with commitment expressed through the World Summit of Sustainable Development (Gleick, P. H.). In 2003, the United Nations General Assembly paid special attention to water by issuing a separate resolution declaring the period 2005 to 2015 as the “International Decade for Action, Water for Life” (Salman, 2005). UN identified the Year 2003 as the International year for freshwater with one of its aim to restart the UN’s millennium development goals.

Study Area:

Haryana was administered as a part of the Punjab province of British India, and was carved out on linguistic lines as India's 17th state in 1966. The state of Haryana came into existence on November 1, 1966. It was carved out from the composite territories of Punjab. Haryana is located in the north western part of the India. The state extends from 27°39′ to 30°55′ North

latitude and 74°28' to 77°36' East longitude. It is bordered by Punjab and Himachal Pradesh to the north and by Rajasthan to the west and south. The entire State spans into 44212 km², which forms 1.35 per cent of the total area of the country, it is the 16th largest state of India. The state covered 2,53,51,462 persons as per 2011 census and lies 2.09 per cent of the India's total population, Haryana ranks 17th in India from size of population point of view. Out of total population 1,65,31,493 persons (65.21 per cent) lives in rural. Sex ratio of the state is 877 females per 1000 males lower than national average (940 females per 1000 males). The literacy rate of the state is 76.64 per cent and where the national average is 74.04 per cent. Density of population of Haryana is 573 persons per km² more than national average 382 persons per km².

Four divisions, twenty one districts, forty eight sub-division, seventy four tehsils, forty three sub-tehsil, 154 towns, 119 Community Development Blocks and 6841 villages comprise the state of Haryana (Census of India, 2011).

Geographically the state of Haryana can be divided into four physical divisions (a) Hilly area of Shivalik, this hilly area is the north-eastern part of the state and its height is from 900-2300 meters and river Ghagghar, Tangari, Markanda emerge from this hilly area, (b) Plain area covers largest area of the state from north to south and its very hot in summer and several cold in winter, (c) Sandy area lies in western part of the state adjacent to Rajasthan and here small sand dunes found part of Mahendragarh, Bhiwani, Sirsa and Hisar districts are sandy, (d) Dry plain area of Aravalli ranges are found in southern part of Haryana Aravalli ranges are situated in the Mewat area of Gurgaon districts. There is no single perennial river passing through Haryana. There is a large variation in the monthly weather regime from place to place depending on the distance from the mountains, and location with reference to the Thar Desert. Haryana has a climate of subtropical continental monsoon type. Annual rainfall in Haryana varies from 25 cms in western



Source: Census of India, 2011

part and 110 cms in north-eastern part (Ambala and Panchkula). The period of south monsoon, accounts for 80 per cent of the annual rainfall.

Research Methodology:

Based on the above facts of drinking water, the present research paper attempts to answer the following questions:

- How is the question of equity in drinking water addressed in an agrarian state in India?
- What are the policy interventions, technological progress and programmes in vogue to ensure safe drinking water across different parts of the state?

The paper is based on both primary and secondary data. With the help of secondary data of Census of India 2011, the spatial patterns in the availability of drinking water is analysed at block level.

Result and Discussion:

According to Entry 17 of State List in Constitution of India, drinking water is the responsibility of the State, where Union government is only responsible for setting water quality standards, but state government has to establish departments or special agencies for supply of domestic water to urban and rural areas. These state agencies are responsible for monitoring the quality of water supplied (Srikanth, R., 2009). The rural water supply programme in the state is implemented and managed by the Public Health and Engineering Department (PHED) under the Public Health Ministry. PHED is headed by Engineering in Chief and Haryana is divided into 15 circles. Superintending Engineer is the incharge of the circle. Circles are divided into divisions. There are 56 (PHED website) divisions in Haryana and divisions are headed by Executive Engineer (Ex. En) and divisions are further divided into sub divisions, there are 174 sub divisions in Haryana and Sub Divisional Engineer is the incharge of sub division. Then Subdivision is further divided into section and J.E. (Junior Engineer) handles the section (Ghosh et. al, 2012).

According to eleventh schedule of the Constitution of India (Article 243G, 73rd Embedment of Constitution of India), the power of management of drinking water has been given to Gram Panchayats on micro level. Within Gram Panchayat a Village Water Supply and Sanitation Committee shall be constituted to manage the drinking water and sanitation (Report of the Committee for Drafting of National Water Framework Law, 2013).

In Haryana, the chief sources of drinking water are tap, handpump, tubewell/Borehole, wells.

Haryana is one of the foremost state to provide piped water supply to all of its villages. There is a significance disparity between Haryana and India in regard to use of sources of drinking water. There is a significant disparity between Haryana and India in regard to use of sources of drinking

water in rural areas (Table 1). In Haryana 63.6 per cent rural households use tap water for drinking purpose whereas it's only 30.8 per cent in India. Other sources of drinking water using less by rural households in Haryana as compare to Indian average.

Table 1

Rural Households Covered by Different Sources of drinking water in India and Haryana, 2011

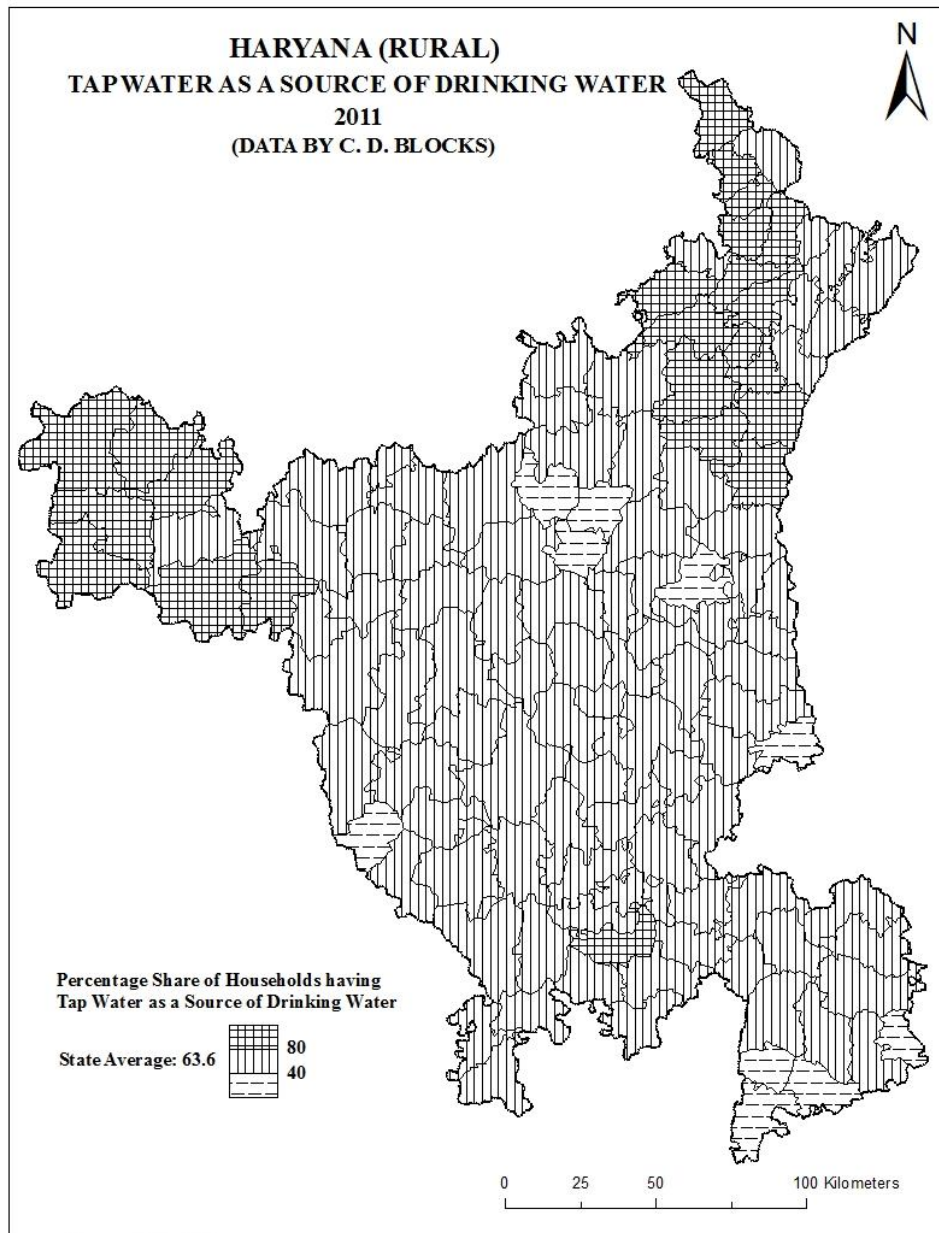
(Data in Per cent)

| Sources of Drinking Water | India | Haryana |
|------------------------------|-------|---------|
| Tap | 30.8 | 63.6 |
| Handpump/ Tubewell/ Borehole | 51.9 | 28.4 |
| Well | 13.3 | 4.5 |
| Other Sources | 4.0 | 3.5 |

Tap Water as a Source of Drinking Water:

Tap water is assumed as the safe source of drinking water. In Haryana, tap water is the major source of drinking water and 63.6 per cent households use tap water as a source of drinking water in rural Haryana. Haryana made significance growth in providing tap water facilities to rural peoples. In 1981, 20.6 per cent of rural households use tap water as a source of drinking water in Haryana whereas its 63.6 per cent in 2011. But there is a spatial disparity in different blocks by using tap water as a source of drinking water in rural areas (Map 2). After analyzing the map two cluster of blocks exist on map where more than 80 per cent households use tap water as a source of drinking water. Firstly in the north and eastern part of Haryana Raipur Rani, Babain, Pinjore, Barwala (Panchkula), Shahbad, Karnal, Naraingarh, Indri, Saha, Barara, Ladwa, Thanesar, Sahjadpur, Nilokheri and Ambala I; and in western part of Haryana Odhan, Dabwali, Rania, Nathusari, Chopta, Baragudha, Ellenabad and Bhattu Kallan; and Jatusana (southern Haryana) where more than 80 per cent households use tap water as a source of drinking water. In northern Haryana in Sivalik region due to hilly surface its not easy to install handpump, tube well, borehole and well etc. and Government also gave special assistance for development of drinking water sector in hilly areas. So, due to good availability of tap water majority of households use tap water as a source of drinking water. Secondly in western Haryana due to good availability of tap water people use its in priority. Whereas in Punhana, Nagina, Hasanpur, Ferozpur, Jirkha (southern Haryana), Behal (western Haryana), Kalayat, Rai, Rajaund, Madlauda and Alewa blocks less than 40 per cent households use tap water as a source of drinking water

Map



minimum in rural Haryana. It's due to lack of awareness about safe drinking water sources (Kumar et. Al, 2008), less availability of drinking water and good availability of ground water sources of drinking water.

Handpump/Tubewell/Borehole as a Source of Drinking Water:

Handpump/Tubewell/Borehole are the second major source of drinking water. As compare to national average (51.9 per cent) in Haryana 28.4 per cent households use handpump/tubewell/borehole as a source of drinking water. These sources also include in safe sources of drinking water by Government of India (Economic Survey 2013-14). Haryana make a significance progress in handpump/tubewell/borehole as a source of drinking water, from 1981 to 2001. In 1981, 22.25 households in rural Haryana, use handpump/tubewell/borehole as a

Map 3

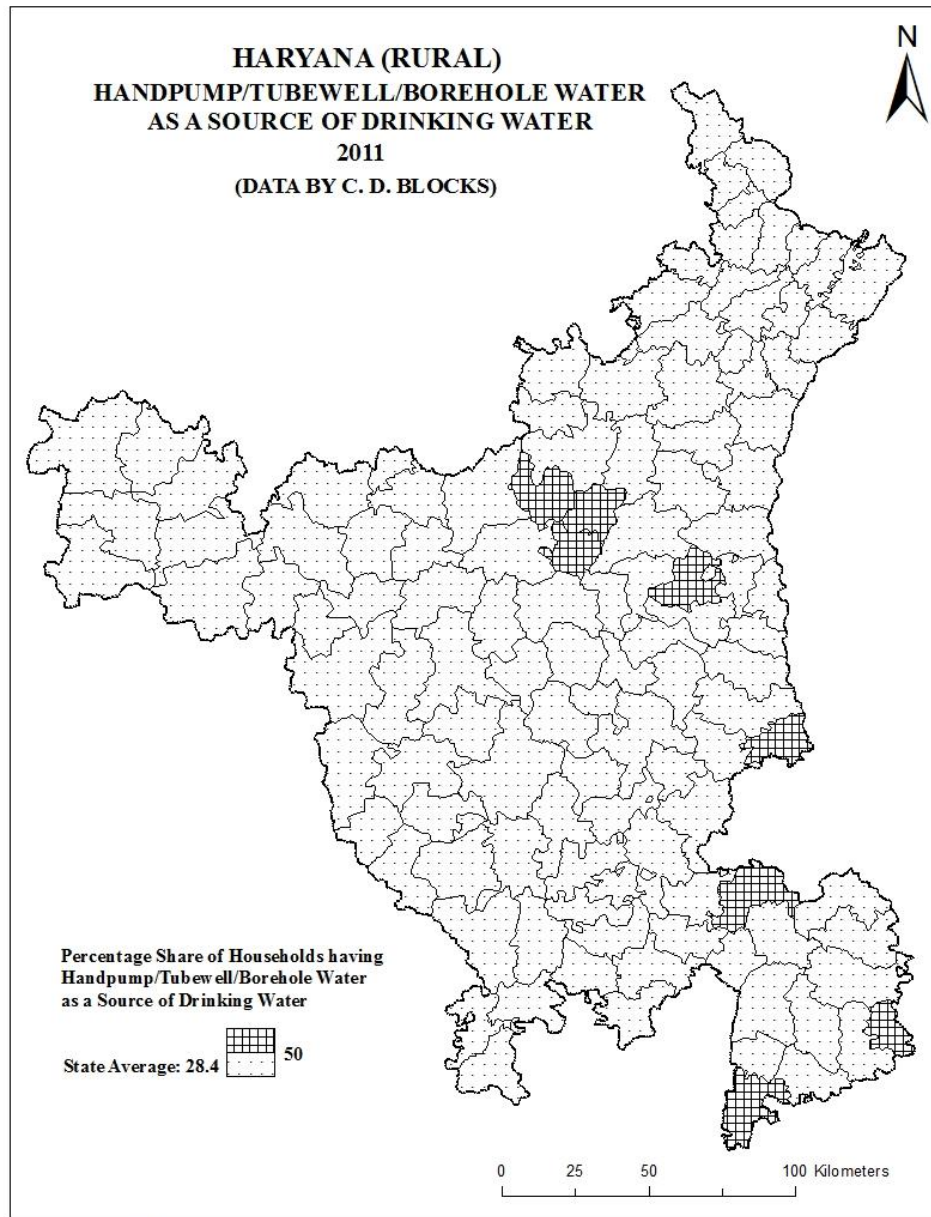


Table 2

Rural Households Covered by Different Sources of drinking water in Haryana, 2011

(Data in Per cent)

| Sr. No. | Name of C.D. Block | Tap | Well | Handpump/Tube-well/Bore-hole | Other Sources | Sr. No. | Name of C.D. Block | Tap | Well | Handpump/Tube-well/Bore-hole | Other Sources |
|---------|--------------------|------|------|------------------------------|---------------|---------|-------------------------|------|------|------------------------------|---------------|
| 1 | PUNAHANA | 21.1 | 22.7 | 40.2 | 16.0 | 31 | S O H N A | 52.5 | 0.4 | 43.2 | 3.8 |
| 2 | FEROZEPUR JHIRKA | 21.3 | 22.4 | 53.1 | 3.2 | 32 | G A N A U R | 52.8 | 1.4 | 42.6 | 3.2 |
| 3 | N A G I N A | 26.4 | 28.8 | 19.6 | 25.2 | 33 | P A L W A L | 52.9 | 1.2 | 43.1 | 2.8 |
| 4 | R A J A U N D | 28.5 | 3.1 | 65.5 | 3.0 | 34 | S A F I D O N | 55.6 | 2.0 | 39.8 | 2.7 |
| 5 | K A L A Y A T | 28.7 | 4.4 | 62.9 | 4.0 | 35 | U K L A N A | 56.2 | 8.5 | 34.4 | 0.9 |
| 6 | MADLAUDA | 28.9 | 1.6 | 66.9 | 2.6 | 36 | K A T H U R A | 57.0 | 6.8 | 32.1 | 4.0 |
| 7 | HASSANPUR | 36.6 | 1.4 | 55.9 | 6.1 | 37 | B A D H R A | 57.2 | 4.8 | 37.4 | 0.6 |
| 8 | A L E W A | 36.6 | 7.0 | 50.6 | 5.7 | 38 | M A H A M | 57.5 | 17.0 | 23.5 | 2.0 |
| 9 | R A I | 39.3 | 1.2 | 57.3 | 2.2 | 39 | K A I T H A L | 58.0 | 0.5 | 39.6 | 1.9 |
| 10 | B E H A L | 39.3 | 12.4 | 44.2 | 4.1 | 40 | M U N D L A N A | 58.0 | 7.8 | 30.7 | 3.4 |
| 11 | J I N D | 40.1 | 10.2 | 46.4 | 3.3 | 41 | H A N S I I | 61.2 | 7.5 | 30.0 | 1.4 |
| 12 | NARNAUND | 41.8 | 17.1 | 40.2 | 0.9 | 42 | H A T H I N | 61.3 | 12.7 | 21.1 | 4.9 |
| 13 | L O H A R U | 43.2 | 7.3 | 47.1 | 2.3 | 43 | A S S A N D H | 61.4 | 0.3 | 35.3 | 3.1 |
| 14 | N U H | 43.8 | 17.4 | 23.3 | 15.5 | 44 | S I W A N | 61.9 | 0.1 | 36.5 | 1.6 |
| 15 | PILLUKHERA | 44.3 | 12.5 | 40.0 | 3.2 | 45 | B A W A L | 62.4 | 3.5 | 29.6 | 4.6 |
| 16 | NARNAUL | 44.9 | 5.0 | 33.7 | 16.4 | 46 | G O H A N A | 62.6 | 3.9 | 29.8 | 3.7 |
| 17 | H A N S I I I | 45.6 | 7.1 | 43.9 | 3.4 | 47 | B A P O L I | 63.4 | 0.1 | 33.9 | 2.5 |
| 18 | NANGAL CHAUDHARY | 46.7 | 5.3 | 35.1 | 12.9 | 48 | S A M P L A | 63.5 | 5.3 | 27.1 | 4.1 |
| 19 | B H I W A N I | 47.1 | 18.2 | 32.5 | 2.3 | 49 | T O S H A M | 63.6 | 8.7 | 16.4 | 11.4 |
| 20 | GURGAON | 47.9 | 0.7 | 50.3 | 1.1 | 50 | H O D A L | 63.6 | 1.6 | 30.3 | 4.5 |
| 21 | S O N I P A T | 47.9 | 6.8 | 44.0 | 1.3 | 51 | P U N D R I | 63.9 | 0.3 | 34.3 | 1.6 |
| 22 | FARIDABAD | 48.1 | 0.4 | 47.3 | 4.1 | 52 | L A K H A N M A J R A | 64.0 | 5.8 | 26.0 | 4.2 |
| 23 | NARWANA | 49.0 | 8.3 | 40.6 | 2.0 | 53 | T O H A N A | 64.8 | 2.2 | 32.2 | 0.8 |
| 24 | T A O R U | 49.5 | 1.3 | 46.6 | 2.6 | 54 | P E H O W A | 65.1 | 0.3 | 33.8 | 0.8 |
| 25 | BALLAB-GARH | 50.0 | 0.4 | 47.4 | 2.2 | 55 | F A R U K H - N A G A R | 65.2 | 0.4 | 31.2 | 3.3 |
| 26 | SAMALKHA | 50.7 | 0.2 | 46.2 | 2.8 | 56 | K H O L A T R E W A R I | 65.4 | 1.6 | 27.6 | 5.5 |
| 27 | J U L A N A | 51.1 | 17.3 | 28.0 | 3.6 | 57 | B E R I | 65.5 | 7.7 | 24.0 | 2.9 |
| 28 | U C H A N A | 51.1 | 12.9 | 33.4 | 2.6 | 58 | R A T I A | 65.8 | 0.2 | 33.0 | 0.9 |
| 29 | G U H L A | 51.6 | 0.4 | 46.3 | 1.7 | 59 | P A N I P A T | 66.3 | 0.5 | 31.9 | 1.3 |
| 30 | I S R A N A | 51.8 | 1.9 | 44.2 | 2.1 | 60 | B A W A N I K H E R A | 66.8 | 15.9 | 14.7 | 2.6 |

Contd.

| Sr. No. | N A M E | Tap | Well | Handpump/Tube-well/Bore-hole | Other Sources | Sr. No. | N A M E | Tap | Well | Handpump/Tube-well/Bore-hole | Other Sources |
|---------|---------|-----|------|------------------------------|---------------|---------|---------|-----|------|------------------------------|---------------|
|---------|---------|-----|------|------------------------------|---------------|---------|---------|-----|------|------------------------------|---------------|

| | | | | | | | | | | | |
|----|---------------|------|------|------|------|-----|------------------|------|-----|------|-----|
| 61 | CHHACHH-RAULI | 67.0 | 0.2 | 30.8 | 1.9 | 91 | SAHLAWAS | 78.3 | 3.8 | 16.8 | 1.1 |
| 62 | ADAMPUR | 67.1 | 3.4 | 10.0 | 19.4 | 92 | HISAR II | 78.6 | 2.1 | 12.1 | 7.2 |
| 63 | KALANAUR | 67.2 | 7.8 | 24.0 | 1.1 | 93 | MUSTAFA-BAD | 78.8 | 0.3 | 19.9 | 1.0 |
| 64 | FATEHABAD | 67.3 | 1.1 | 26.2 | 5.3 | 94 | BOND KALAN | 79.0 | 6.7 | 11.3 | 3.0 |
| 65 | KANINA | 67.3 | 4.7 | 25.6 | 2.4 | 95 | JAKHAL | 79.1 | 0.1 | 19.0 | 1.8 |
| 66 | ROHTAK | 67.9 | 3.7 | 27.0 | 1.5 | 96 | SADARA | 79.9 | 0.6 | 19.1 | 0.4 |
| 67 | MAHENDRA-GARH | 67.9 | 4.0 | 24.3 | 3.8 | 97 | BHATTU KALAN | 80.2 | 1.4 | 10.2 | 8.3 |
| 68 | JAGADHRI | 67.9 | 0.2 | 31.3 | 0.6 | 98 | ELLENABAD | 80.2 | 0.4 | 16.5 | 2.9 |
| 69 | BAHADUR-GARH | 69.1 | 4.4 | 22.1 | 4.4 | 99 | AMBALA-I | 80.3 | 0.5 | 18.6 | 0.6 |
| 70 | BARWALA | 69.2 | 11.4 | 16.6 | 2.8 | 100 | NILOKHERI | 81.0 | 0.1 | 17.7 | 1.2 |
| 71 | KAIRU | 69.3 | 9.3 | 18.1 | 3.3 | 101 | SHAHZAD-PUR | 81.2 | 0.3 | 17.9 | 0.6 |
| 72 | BHUNA | 69.6 | 0.2 | 28.6 | 1.5 | 102 | THANESAR | 82.3 | 0.3 | 16.7 | 0.7 |
| 73 | SIWANI | 70.0 | 6.6 | 16.4 | 7.0 | 103 | LADWA | 82.7 | 0.1 | 16.6 | 0.6 |
| 74 | MATENHAIL | 71.4 | 7.7 | 15.6 | 5.3 | 104 | BARARA | 83.1 | 0.2 | 16.2 | 0.6 |
| 75 | PATAUDI | 71.9 | 0.2 | 26.5 | 1.5 | 105 | BARA-GUDHA | 83.7 | 1.2 | 9.4 | 5.7 |
| 76 | AMBALA-II | 72.1 | 0.2 | 27.3 | 0.5 | 106 | SAHA | 84.3 | 0.3 | 14.5 | 0.9 |
| 77 | BILASPUR | 72.5 | 1.3 | 25.6 | 0.6 | 107 | INDRI | 84.5 | 0.0 | 14.8 | 0.7 |
| 78 | HISAR I | 72.5 | 2.6 | 21.9 | 3.1 | 108 | JATU SANA | 84.9 | 1.0 | 12.3 | 1.8 |
| 79 | RADAU | 73.0 | 0.1 | 25.5 | 1.4 | 109 | NARAIN-GARH | 86.1 | 0.2 | 12.9 | 0.8 |
| 80 | KHARKHODA | 73.2 | 2.3 | 22.1 | 2.3 | 110 | NATHUSARI CHOPTA | 86.3 | 1.7 | 6.3 | 5.8 |
| 81 | REWARI | 73.5 | 3.0 | 20.0 | 3.5 | 111 | RANIA | 86.4 | 2.3 | 9.3 | 2.0 |
| 82 | GHARAUNDA | 73.8 | 0.1 | 24.6 | 1.5 | 112 | KARNAL | 86.8 | 0.1 | 12.2 | 0.9 |
| 83 | JHAJJAR | 74.4 | 2.1 | 20.6 | 2.8 | 113 | SHAHBAD | 87.1 | 0.2 | 12.0 | 0.7 |
| 84 | NAHAR | 74.7 | 2.6 | 20.3 | 2.4 | 114 | DABWALI | 87.4 | 1.0 | 5.8 | 5.9 |
| 85 | NISSING | 75.4 | 0.1 | 23.3 | 1.1 | 115 | BARWALA PKL | 88.0 | 0.1 | 11.5 | 0.5 |
| 86 | AGROHA | 75.6 | 2.6 | 15.5 | 6.3 | 116 | PINJORE | 88.5 | 1.2 | 7.6 | 2.8 |
| 87 | ATELINANGAL | 76.0 | 4.0 | 16.2 | 3.8 | 117 | BABAIN | 89.2 | 0.1 | 10.0 | 0.7 |
| 88 | MORNI | 76.1 | 4.7 | 0.2 | 18.9 | 118 | ODHAN | 90.0 | 1.4 | 4.6 | 4.0 |
| 89 | DADRI | 76.4 | 6.1 | 15.5 | 2.0 | 119 | RAIPUR RANI | 90.1 | 0.3 | 8.6 | 1.0 |
| 90 | SIRSA | 76.9 | 0.2 | 22.3 | 0.6 | | | | | | |

Source: Census of India 2011.

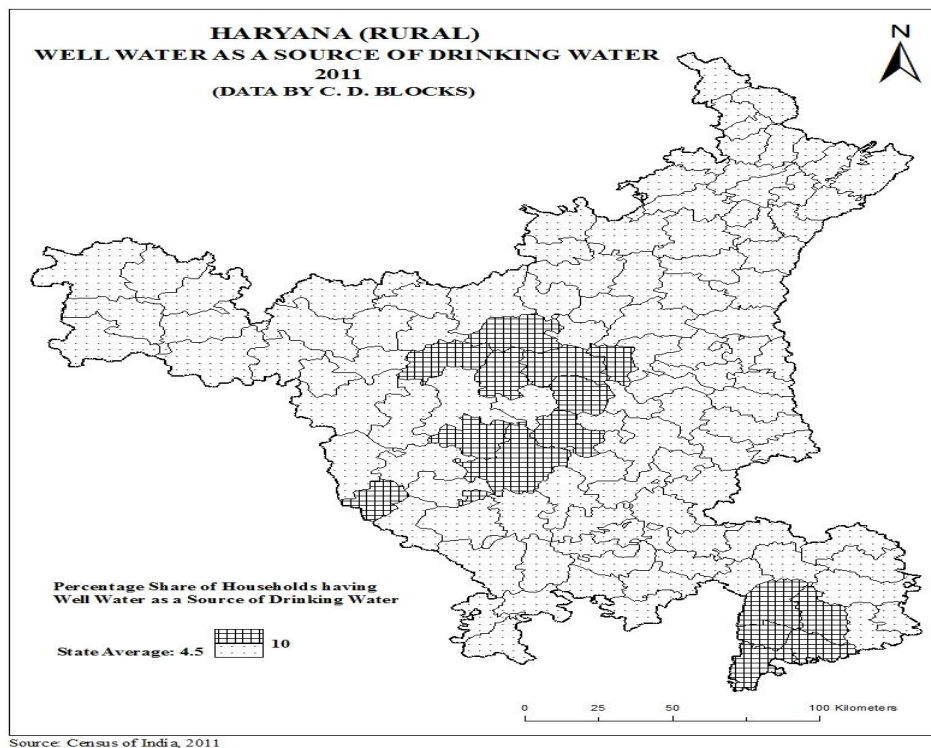
source of drinking water and it reached at 43.23 per cent in 2001 but due to decrease in ground water table in many areas and encouraging of tap water by Government Schemes and programmes, it decreased in 2011 (28.4 per cent). It is noticeable that the blocks Madlauda, Rajaund, Kalayat, Rai, Hassanpur, Ferozepur Jhirka, and Alewa where tap water use is minimum in Haryana, the use of handpump/tubewell/borehole is maximum in rural Haryana. In Gurgaon

block also more than half households use handpump/tubewell/borehole as a source of drinking water. The causes are reverse from tap here such as less develop tap water infrastructure, less awareness drinking water etc.

Well Water as a Source of Drinking Water.

Well water is the third major source of drinking water in rural Haryana. There is a gradual decrease in well water as a source of drinking water in rural Haryana. In 1981, 53.05 per cent households use well water for their drinking water needs and it reduced up to 4.5 percent in 2011 (Census of India). There are two major areas (Central and Southern Haryana) in Haryana where use well water by rural households is more than double of state average. In central Haryana, Julana, Narnaund, Maham, BawaniKhera, Uchana, PilluKhera, Barwala, Jind blocks and in southern Haryana Nagiana, Punahana, FerozpurJhirka, Bhiwani, Nuh and Hathin; and Behal use of well water is maximum in Haryana. By survey it is revealed that in some areas peoples are habitual to use well water for drinking purposes, although they have availability of tap water but they are using well water continuously. Peoples told that well water is sweeter than tap water and they use tap water or other domestic uses.

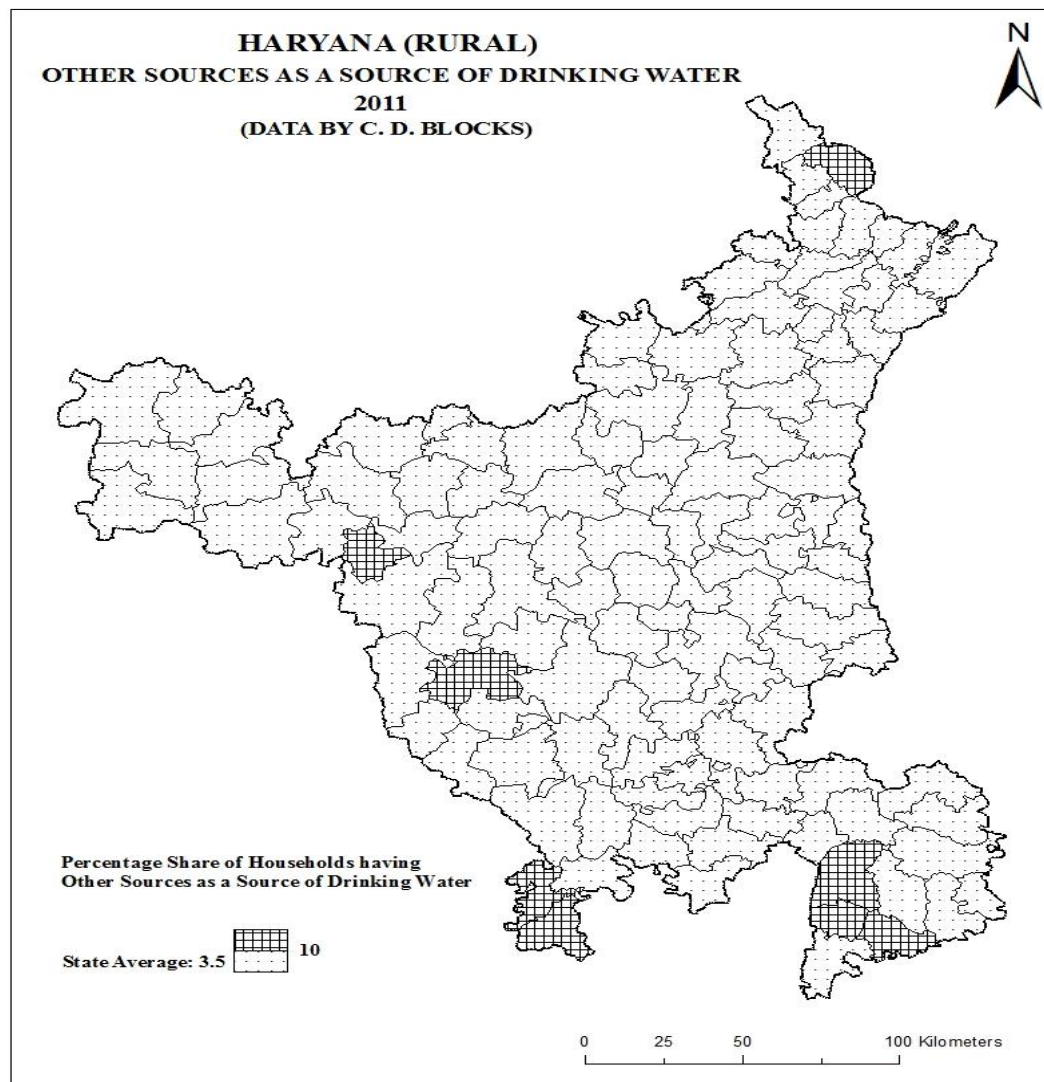
Map 4



Other Sources of Drinking Water:

In addition to tap, handpump/tubewell/borehole and well all other sources of drinking water such as spring, river/canal, tank/pond/lake and rest other sources includes in other sources of drinking water. These sources are taken unsafe sources of drinking water by Government of India reports. In Haryana there is no significance change in other sources of drinking water from 1981 (4.01 per cent) to 2011 (3.48 per cent). But spatial disparity is significant here. In Nagiana, Adampur,

Map-5



Morni, Narnaul, Punahana, Nuh, NangalChaudhary and Tosham blocks more than 10 per cent households use other sources of drinking water in rural areas. It is because in these areas ground water is not accessible due to decrease in water table, low water quality or hilly surface. These blocks are lies in southern and western Haryana and Sivalik region, geographically these areas have hilly and aeolian origin undulating surface.

Conclusion: After analyzing the all programmes of drinking water for rural areas, It is reviles that India make a significance progress in drinking water sector. Haryana has achieved the millennium development goal and 92 per cent rural household of Haryana use safe sources of drinking water. Haryana made a significance progress in supplied safe sources of drinking water. In Haryana, only 4.5 per cent households using well water and 3.5 per cent households using other sources. Although its not a big per cent, but in many blocks more than 20 per cent households using well and other sources of drinking water. There is a significant spatial disparity also in all sources of drinking water. In many blocks peoples are still facing drinking water scarcity. Peoples have to use unsafe sources of drinking water in absence of safe sources. Women are still bearing the burden of drinking water management and fetching water from away from premises. The villages are covered by safe drinking water sources. But the problem of sustainability of drinking water sources yet to solved. Due to many reasons the programmes not implemented very well at ground level and still we could not achieve the goal to provide safe drinking water to all and shifting the aim from many years.

References:

- A. Airon, et.al., (2017), “Productivity zoning of Indian mustard (brassica SPP.) in Haryana state by climatic and physical factors”, *International Journal of Pure & Applied Bioscience*, Vol. 5(5), pp. 1075-1079.
- A.K. Antonakos, et.al., (2014), “Site selection for drinking-water pumping boreholes using a fuzzy spatial decision support system in the Korinthia prefecture, SE Greece” *Hydrogeology Journal*, Vol. 22 (8), pp. 1763-1776.
- Chand, D, (2009), “Drinking water supply to villages”, in S. B. Verma, P. Sahu, and J. Lal, (ed.), *Water Resource Management*, New Delhi: Pentagon Press, pp. 204-215.
- G. Dickason, (2003), “Infrastructure amenities in villages on Delhi’s urban fringe”, *Population Geography*, Vol. 25(1-2), pp.73-82.
- Government of Haryana, (2013), *Statistical Abstract Haryana 2011-12*, Panchkula: Department of Economic and Statistical Analysis.
- H. D. Dwarakanath, (2013), “National rural drinking water emerging challenges and remedial measures”, *Kurukshetra: A Journal of Rural Development*, Vol. 61 (03), pp. 35-39.

- O. Singh, & R. Sharma, (2010), “Assessment and demand of water resource in Rewari District of Haryana”, *Punjab Geographer*, Vol. 6, pp. 16-28.
- P.C. Bansil, (2004), *Water Management in India*, New Delhi: Concept Publishing Company.
- R. Bhagat, & A. Parihar, (2007), “Access to basic amenities in urban India: Implications for health and wellbeing”, *Population Geography*, Vol. 29 (1-2), pp. 15-26.
- R.Gupta, & A.K. Mishra, (2018), “Drinking water quality problem in Haryana, India: prediction of human health risks, economic burden and assessment of possible intervention options”, *Environment, Development and Sustainability*, pp. 1-15. Accessed on March 11, 2018, from <https://doi.org/10.1007/s10668-018-0125-z>
- T. Akter, et.al., (2016), “Water quality index for measuring drinking water quality in rural Bangladesh: a cross-sectional study”, *Journal of Health, Population and Nutrition*, Vol. 35, Article 4, pp. 1-12.
- V. K.Garg, et.al., (2009), “Drinking water quality in villages of southwestern Haryana, India: assessing human health risks associated with hydrochemistry”, *Environmental Geology*, Vol. 58(6), pp. 1329–1340

