



# An Analysis of India's Achievement in Access to Improved Drinking Water under the Millennium Development Goals: Before and After Policy Intervention

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**Abstract:** Since the launch of the Millennium Development Goals at the Millennium Summit in New York September 2000, the MDGs have become the most widely accepted yardstick of development efforts by government. The main objective of present study is appraising the Millennium Developmental Goal 7 indicator 30, halving the percentage of the population without access the improved source of drinking water between 1990 and 2015. The study is divided into two periods. First period dates back from 1990-2001. The second period covers decade of 2005-2015. During the first period, there was no strategy in place to achieve these goals. But in the second period, state put the designed strategy in place to attain these goals in the time bound framework. The analysis outline that the Historical Rate of Change in India is much higher 2.26 percent in the period between 1991 and 2001 in comparison to the 0.23 percent in MDGs period in spite of the Government of India starting a number of programmes according to the United Nations direction. The Required Annual Rate of Progress (RARP) to meet the MDGs target for this indicator between 1990 and 2015 is 1.26 percent per year. The study revealed that India recorded 1.85 percent of Actual Annual Rate of Progress (AARP) from 1991 to 2015 and achieved the goal well ahead of schedule.

**Keywords:** Millennium Development Goals, Improved Source of Drinking Water, India.

## 1. INTRODUCTION:

Every individual has the right to sufficient, acceptable, accessible, safe and affordable water and sanitation for personal use without discrimination under the human right to water and sanitation. The world is yet a long way from achieving this universal right. An estimated 768 million people lack access to safe drinking water. The right to water has now been widely recognised internationally, including through a 2010 Human Rights Council decision and UN General Assembly resolution the same year.<sup>1</sup> Safe drinking water and sanitary sanitation are prerequisites for good health and success in the battle against poverty, hunger, child mortality and gender inequality. It is also essential to every man, woman and child on the earth for maintaining their human rights and personal dignity.<sup>2</sup> Millennium Development Goal-7, target 10 focuses on access to safe drinking water and adequate sanitation. Access to water and sanitation are essential for enhancing quality of life and achieving other MDGs, such as lowering poverty and infant mortality, improving maternal health, gender equality and educational opportunities.<sup>3</sup>

In the present situation, the water and sanitation crises are more about access than scarcity. It is primarily caused by poverty and inequality, rather than by a lack of physical resources. In 2010 over 11 percent of the world's population lacked access to improved drinking water and had to rely on unprotected wells or springs, canals, lakes, or rivers to meet their needs. Sub-Saharan Africa with 333 million people (40%), Southern Asia with 170 million (20%) and Eastern Asia with 128 million (16%) make up the majority of this population.<sup>4</sup> Most of the development was accomplished in Eastern Asia (35%) and South-eastern Asia (23%) between 1990 and 2010. Therefore, the global goal may have been achieved. But, there will remain considerable regional differences. Improvements made in large populous countries have a significant impact on the overall progress. China and India accounted for nearly half of people who gained increased access to improved drinking water sources between 1990 and 2010.<sup>5</sup>

## 2. Research Methodology:

The data collected from secondary sources have been systematically arranged and tabulated in a suitable form for analysis and interpretations. The statistical analysis based on the data was collected from various sources and



documented systematically. Throughout the analysis, a comprehensive framework of pre and post programme period applied to assess the progress in achieving each goal. The following are the statistical tools used in the present study.

- i) Estimate Historical Rate of Change
- ii) Computation of Actual Annual Rate of Progress (AARP) and Required Annual Rate of Progress (RARP)

**Estimate Historical Rate of Change<sup>6</sup>**

$X_t = ae^{bt}$  where  $X_t$  is indicator value for year  $t$ , which gives for  $t=0$ ,

$X_0 = a$

Again,

$\ln X_t = \ln a + bt$

Taking natural logarithm of both sides of equation above

$= \ln X_0 + bt \dots\dots (1)$

i.e.  $(b^\wedge) = (\ln X_t - \ln X_0)/t \dots\dots (2)$

In terms of historical rate of change,  $r$

$X_t = X_0 (1+r)^t$

i.e.  $\ln X_t - \ln X_0 = t \ln(1+r)$

or,  $(\ln X_t - \ln X_0)/t = \ln(1+r)$

or,  $(1+r) = \exp[(\ln X_t - \ln X_0)/t]$

or,  $r = \exp[(\ln X_t - \ln X_0)/t] - 1 \dots\dots (3)$

Using relation (2) in (3) we get

$r = \exp(b^\wedge) - 1$  where  $r$  is historical rate of change

State-wise and national estimates of the indicators at observation time points have been subjected to the relationship (1) to arrive at their logarithmic values. These values being linear in time series provide the logarithmic values of the measure corresponding to future points of time, from which the estimates at the given point of future time may be derived by anti-log calculation.

**Calculate required rate of change<sup>7</sup>:**

**The Actual Annual Rate of Progress (AARP)**

Some of the selected indicators are positively linked to development while others are negatively related. The indicators which are negatively related to development, the desirable value is close to 0, while it is 100 for others. The indicators for which the desirable value is close to 0 are poverty, hunger and under five year mortality while for school education, gender equality in education, sanitation and drinking water, it is 100.

The methodology to be used for computing the AARP for those variables where the desirable value is 0 is:

$$\frac{(X_{t_1} - X_{t_0} / X_{t_0})}{t_1 - t_0}$$

Where,

$t_0$  is the year 1990 (or year closest to 1990 for which data are available)

$t_1$  is the most recent year for which data are available, and

$X_{t_0}$  and  $X_{t_1}$  are the values of the indicator for base year and end year respectively.

For the net primary enrolment ratio gender equality in education and the proportion of population with access to safe water and sanitation, for which the most desirable value is 100%, progress is expressed as Shortfall reduction according to the following formula.

$$\text{Actual Annual Rate of Progress} = \frac{(x_{t_1} - x_{t_0}) / (100 - x_{t_0})}{t_1 - t_0}$$

**Required Annual Rate of Progress (RARP)**

The required annual rate of progress is the rate which is necessary to reach the MDG. It is calculated as:

$$\frac{\alpha}{t_{\text{mdg}} - t_0}$$

Where  $\alpha$  is -1/2 for poverty and hunger, 12 for safe water and sanitation, -2/3 for under five mortality and 1 for primary enrolment and gender equality in education.

$t_{\text{mdg}}$  is the year by which the target is to be met, and  $t_0$  is the year closest to 1990 for which data are available.



### 3. Results and Discussion:

The majority of the Indians population lives in villages. According to the Census 2011, 83.3 crore people (69.84%) still live in villages. It also reveals that 70 percent of India's rural population is still vulnerable to water-borne and vector-borne diseases due to a lack of basic sanitation, unsafe water and unsanitary circumstances. Every year 1.4 million children die due to Diarrhea, which equates to one child every 20 seconds.<sup>8</sup> Attaining this goal will go a long way toward saving the lives of children. Dr. Margaret Chan, WHO Director-General, stated, "Providing sustainable access to improved drinking water sources is one of the most essential things we can do to prevent disease".<sup>9</sup> The present study is in reference to India's progress on MDG-7, target 10. The study has analysed the proportion of population with sustainable access to improved water sources in two periods. The table 3.1 is shown the status and trends of India's progress to access the improved source of drinking water from 1991 to 2001.

**Table3.1: Percentage of Household with Access to Improved Source of Drinking Water from 1991 to 2001**

S. No.	State	1991			2001			HRC <sup>1</sup>
		Rural	Urban	Total	Rural	Urban	Total	
1	Andhra Pradesh	49	73.8	55.1	76.9	90.2	80.1	3.81
2	Arunachal Pradesh	66.9	88.2	70	73.7	90.7	77.5	-0.69
3	Assam	43.3	64.1	45.9	56.8	70.4	58.8	2.51
4	Bihar	56.5	73.4	58.8	86.1	91.2	86.6	3.95
5	Chhattisgarh	N.A.	N.A.	N.A.	66.2	88.8	70.5	N.A.
7	Goa	30.5	61.7	43.4	58.3	82.1	70.1	4.91
8	Gujarat	60	87.2	69.8	76.9	95.4	84.1	1.88
9	Haryana	67.1	93.2	74.3	81.1	97.3	86.1	1.48
10	Himachal Pradesh	75.5	91.9	77.3	87.5	97	88.6	1.37
11	Jammu & Kashmir	N.A.	N.A.	N.A.	54.9	95.7	65.2	N.A.
12	Jharkhand	N.A.	N.A.	N.A.	35.5	68.2	42.6	N.A.
13	Karnataka	67.3	81.4	71.7	80.5	92.1	84.6	1.67
14	Kerala	12.2	38.7	18.9	16.9	42.8	23.4	2.16
15	Madhya Pradesh	45.6	79.4	53.4	61.5	88.6	68.4	2.51
16	Maharashtra	54	90.5	68.5	68.4	95.4	79.8	1.54
17	Manipur	33.7	52.	38.7	29.3	59.4	37	-0.45
18	Meghalaya	26.8	75.4	36.2	29.5	73.5	39	0.75
19	Mizoram	12.9	19.9	16.2	23.8	47.8	36	8.31
20	Nagaland	55.6	45.5	53.4	47.5	42.3	46.5	-1.37
21	Odisha	35.5	62.8	39.1	62.9	72.3	64.2	5.08
22	Punjab	92.1	94.2	92.7	96.9	98.9	97.6	0.52
23	Rajasthan	50.6	86.5	59	60.4	93.5	68.2	1.46
24	Sikkim	70.8	92.8	73.1	67	97.1	70.7	-0.33
25	Tamil Nadu	64.3	74.2	67.4	85.3	85.9	85.6	2.42
26	Tripura	30.6	71.1	37.2	45	85.8	52.5	3.51
28	Uttar Pradesh	56.6	85.8	62.2	85.5	97.2	87.8	3.51
29	Uttarakhand	N.A.	N.A.	N.A.	83	97.8	86.7	N.A.
30	West Bengal	80.3	86.2	82	87	92.3	88.5	0.77
	<b>India</b>	<b>55.5</b>	<b>81.4</b>	<b>62.3</b>	<b>73.2</b>	<b>90</b>	<b>77.9</b>	<b>2.26</b>

**Source:** Census of India 1991 series 1 Part VII tables on Houses and household Assets & Amenities, Census 2001 household amenities and Assets

The table 3.1 reveals that in 2001, 73.2 percent households in rural areas and 90 percent in urban India had adequate drinking water in comparison to 1991 only 55.5 percent households in rural areas and 81.4 percent in urban areas in India. While the overall access to improved sources of drinking water has risen from 62.3 percent in 1991 to 77.3 percent in 2001. In this period the Historical Rate of Change of 2.26 percent indicates India's fabulous performance to access the improved source of drinking water. In states of Punjab 97.6 percent followed by Himachal Pradesh (88.8%) and West Bengal (88.5%) has registered the highest household's access to drinking water. Kerala 23.4 percent followed



by particularly north eastern states Mizoram (36%), Manipur (37%) and Meghalaya (39%) reported lowest household access of sufficient drinking water in 2001. It has indicated that Government policies concentrated to close the gap between rural and urban areas in India before the Millennium Declaration. Rural drinking water supply is a state subject in India and it is listed in the Eleventh Schedule of the Constitution as one of the subjects that may be delegated to Panchayats by the states. However, the central government is assisting state governments considering the magnitude of the problem. The Government of India's major intervention in the water sector started in 1972-73 with the Accelerated Rural Water Supply Programme (ARWSP), which aimed to assist States/UTs in expanding access to drinking water. The National Drinking Water Mission (NDWM) was launched as one of the five Societal Missions in 1986. The objective of the programme is to provide adequate safe water for drinking, cooking and other basic needs of the entire rural population. The Sector Reform Project was established in 1999-2000 to involve the community in the planning, implementation and management of drinking water-related projects. It has expanded as the Swajaldhara programme in 2002.<sup>10</sup> The table 3.2 is shown the status and trends of India's progress to access the improved source of drinking water from 2005 to 2015

**Table3.2: Percentage of Household with Access to Improved Source of Drinking Water from 2005 to 2015**

S. No.	State	2005-06	2008-09		2015			HRC <sup>2</sup>
		Total	Rural	Urban	Rural	Urban	Total	
1	Andhra Pradesh	94.0	91.9	97.5	73.6	70.7	72.7	-2.54
2	Arunachal Pradesh	85.0	96.2	98.4	85	94.7	87.5	0.29
3	Assam	72.4	85.1	92.8	82.9	89.1	83.8	1.47
4	Bihar	96.1	97.6	99.7	98.2	97.8	98.2	0.22
5	Chhattisgarh	77.9	94.8	93.6	89.2	97.3	91.1	1.58
6	Goa	80.1	83.9	99.6	93.7	97.8	96.3	1.86
7	Gujarat	89.8	89.2	95.6	89.4	92.7	90.9	0.12
8	Haryana	95.6	92.6	92.3	94.3	88	91.7	-0.42
9	Himachal Pradesh	88.4	95.8	100	94.9	94.4	94.9	0.71
10	Jammu & Kashmir	80.8	80.6	97.9	85	97.9	89.2	0.99
11	Jharkhand	57.0	64.4	88.3	74	88.6	77.8	3.16
12	Karnataka	86.2	95.1	96	88.9	89.8	89.3	0.35
13	Kerala	69.1	29.5	56.8	93	95.7	94.3	3.16
14	Madhya Pradesh	74.2	83.2	97.1	79.5	96.8	84.7	1.33
15	Maharashtra	92.7	85.5	98.7	85.6	97.7	91.5	-0.13
16	Manipur	52.1	57	69.8	38	47.1	41.6	-2.23
17	Meghalaya	63.1	70.4	94.5	62.9	85.2	63.1	0.00
18	Mizoram	85.0	86.8	99.1	87.8	94.1	91.5	0.74
19	Nagaland	82.9	91.9	90.6	80.9	79.9	80.6	-0.28
20	Odisha	78.4	82.4	95.5	87.5	95.3	88.8	1.25
21	Punjab	99.5	99.5	99.7	99	99.3	99.1	-0.04
22	Rajasthan	81.8	79.1	92.3	83.3	91.7	85.5	0.44
23	Sikkim	77.6	85.2	98.8	96.8	99.3	97.6	2.32
24	Tamil Nadu	93.5	94	95	94.5	86.9	90.6	-0.31
25	Tripura	68.8	87.3	99.7	82.8	97.7	87.3	2.41
26	Uttar Pradesh	93.7	92.8	99.2	97.8	92.6	96.4	0.28
27	Uttarakhand	87.4	96.6	99.9	89.5	98.9	92.9	0.61
28	West Bengal	93.7	95	94.7	95.1	93.5	94.6	0.10
	<b>India</b>	87.9	88.5	95.3	89.3	91.1	89.9	0.23

**Source:** National Sample Survey 2008-09, National Family Health Surveys -3 (2005-06) & 4 (2015-16)

The table 3.2 points out that India has improved availability to safe drinking water in the home from 87.9 percent in 2005 to 89.9 percent in 2015. In terms of the rural-urban disparity in access to safe drinking water in Indian families, 55.5 percent of rural households and 81.4 percent of urban households had access to safe drinking water in 1991, indicating a gap of near about 26 percent in access to safe drinking water. However, this disparity has narrowed with



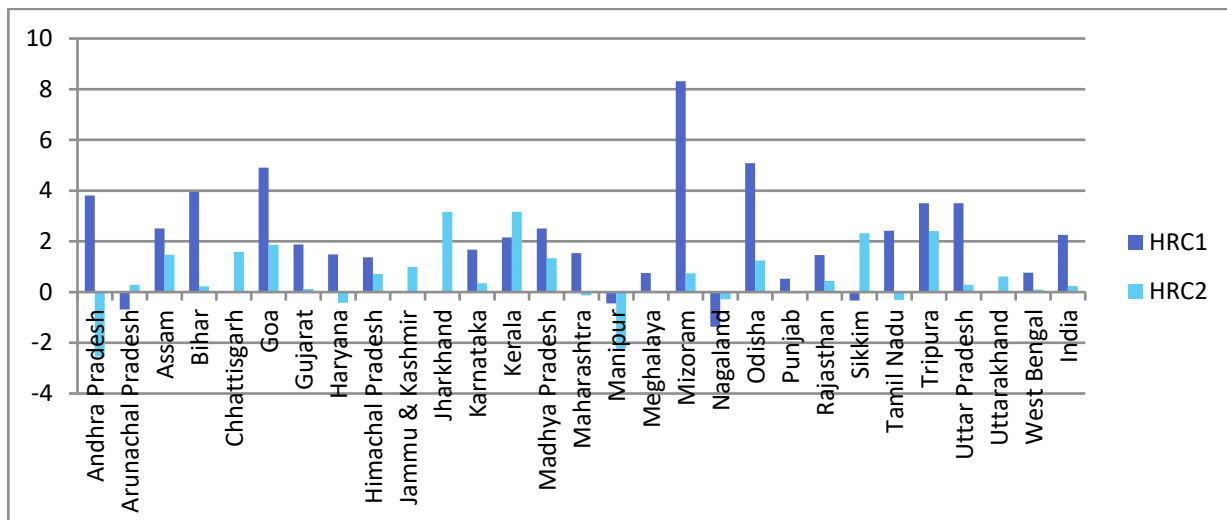
time, from 17 percent in 2001 to only 2 percent in 2015. Furthermore Jammu and Kashmir, Jharkhand, Tripura, Meghalaya and Madhya Pradesh are some of the key states with a considerable difference in access to safe drinking water between rural and urban areas in 2015. While the bigger states like Uttar Pradesh and Bihar have shown significant improvement to reduce the rural and urban gap in access to safe drinking water. In terms of access to safe drinking water in households, Punjab ranks first with 99.1 percent followed by Bihar (98.2 percent), Sikkim (97.6 percent) and Uttar Pradesh (96.4 percent). However 58.4 percent of families without access to safe drinking water in Manipur followed by Meghalaya (36.9%), Andhra Pradesh (27.3%) and Jharkhand (22.2%) in 2015. The target for access to improved sources of drinking water has already been attained at the national level, with 89.9% of households having access to improved sources of drinking water in 2015, compared to the target of 81.2 percent.

The table 3.2 also shows that 15 states have recorded a higher percentage of households with improved drinking water than the national average at the end of MDGs period. Punjab and Bihar had nearly 100% coverage of households with improved drinking water in 2015. The Government of India has recognised the importance of providing adequate and clean drinking water to a country's inhabitants. The National Rural Drinking Water Programme (NRDWP) was launched in 2009 in order to assure water availability in terms of portability, convenience, adequacy, affordability and equity. The Ministry of Drinking Water and Sanitation is currently concentrating on tightening central-level monitoring of the implementation of program's. The approach of the 12th Five Year Plan emphasises on piped water supply, boosting household tap connections and increasing drinking water supply norms from 40 to 55 lpcd (lpcd-litre per capita per day).<sup>11</sup>

**Table: 3.3. Appraisal of Progress on Access to Improved Source of Drinking Water in Pre and Post Strategy Intervention Period**

S.No.	State	HRC <sup>1</sup>	HRC <sup>2</sup>
1	Andhra Pradesh	3.81	-2.54
2	Arunachal Pradesh	-0.69	0.29
3	Assam	2.51	1.47
4	Bihar	3.95	0.22
5	Chhattisgarh	N.A	1.58
6	Goa	4.91	1.86
7	Gujarat	1.88	0.12
8	Haryana	1.48	-0.42
9	Himachal Pradesh	1.37	0.71
10	Jammu & Kashmir	N.A	0.99
11	Jharkhand	N.A	3.16
12	Karnataka	1.67	0.35
13	Kerala	2.16	3.16
14	Madhya Pradesh	2.51	1.33
15	Maharashtra	1.54	-0.13
16	Manipur	-0.45	-2.23
17	Meghalaya	0.75	0.00
18	Mizoram	8.31	0.74
19	Nagaland	-1.37	-0.28
20	Odisha	5.08	1.25
21	Punjab	0.52	-0.04
22	Rajasthan	1.46	0.44
23	Sikkim	-0.33	2.32
24	Tamil Nadu	2.42	-0.31
25	Tripura	3.51	2.41
26	Uttar Pradesh	3.51	0.28
27	Uttarakhand	N.A	0.61
28	West Bengal	0.77	0.10
29	<b>India</b>	2.26	0.23

Source: Computed from the table 3.1 and 3.2



**Figure: 3.1. The Progress of India and States on household with access to improved source of drinking water in Pre and Post Strategy Intervention Period**

The figure 3.1 shows that the Historical Rate of Change in India is much higher 2.26 percent in the period between 1991 and 2001 in comparison to the 0.23 percent in MDGs period in spite of the Government of India starting a number of programmes according to the United Nations direction. The better performance in the first period indicates that Governments were conscious of the need for sufficient water to its households before the Millennium Declaration. The Historical Rate of Change in two different periods differs widely across the state. The states Mizoram, Odisha, Goa, Bihar, Andhra Pradesh, Tripura and Uttar Pradesh are able to improve the access to sufficient amounts of water with a higher rate of change of more than 3.5 percent in the first period. Since water supply is a state subject and these states were more concerned to provide a sufficient amount of improved water to their population in the period of 1991 to 2001. However, after the Millennium Declaration by the United Nations in 2000, all the nations of world including India were committed toward human development. In spite of that only Kerala, Sikkim and Arunachal Pradesh have recorded a higher HRC in MDGs period in comparison to the period between 1991 and 2001. The states like Sikkim, Nagaland, Manipur and Arunachal Pradesh in Pre MDGs period and Andhra Pradesh, Haryana, Maharashtra, Manipur, Nagaland, Punjab and Tamil Nadu have registered negative HRC in the period 2005 to 2015.

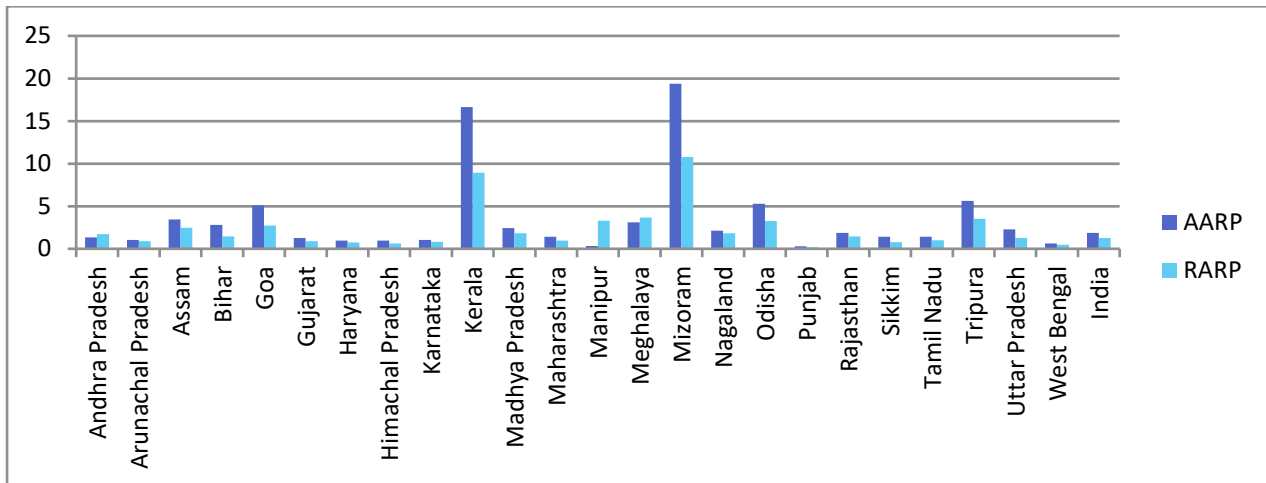
**Table:3.4 Evaluation of Progress of States toward the Millennium Development Goal -7**

S. No.	State	1991	2015	MDG Target	AARP	RARP	Progress Remarks
1	Andhra Pradesh	55.1	72.7	77.55	1.33	1.70	Achieved
2	Arunachal Pradesh	70	87.5	85	1.04	0.89	Achieved
3	Assam	45.9	83.8	72.95	3.44	2.46	Achieved
4	Bihar	58.8	98.2	79.4	2.79	1.46	Achieved
5	Goa	43.4	96.3	71.7	5.08	2.72	Achieved
6	Gujarat	69.8	90.9	84.9	1.26	0.90	Achieved
7	Haryana	74.3	91.7	87.15	0.98	0.72	Achieved
8	Himachal Pradesh	77.3	94.6	88.65	0.95	0.61	Achieved
9	Karnataka	71.7	89.3	85.85	1.02	0.82	Achieved
10	Kerala	18.9	94.3	59.45	16.62	8.94	Achieved
11	Madhya Pradesh	53.4	84.7	76.7	2.44	1.82	Achieved
12	Maharashtra	68.5	91.5	84.25	1.40	0.96	Achieved
13	Manipur	38.7	41.6	69.35	0.31	3.30	Insufficient
14	Meghalaya	36.2	63.1	68.1	3.10	3.67	Insufficient
15	Mizoram	16.2	91.5	58.1	19.37	10.78	Achieved
16	Nagaland	53.4	80.6	76.7	2.12	1.82	Achieved
17	Odisha	39.1	88.8	69.55	5.30	3.24	Achieved
18	Punjab	92.7	99.1	96.35	0.29	0.16	Achieved



19	Rajasthan	59	85.5	79.5	1.87	1.45	Achieved
20	Sikkim	73.1	97.6	86.55	1.40	0.77	Achieved
21	Tamil Nadu	67.4	90.6	83.7	1.43	1.01	Achieved
22	Tripura	37.2	87.3	68.6	5.61	3.52	Achieved
23	Uttar Pradesh	62.2	96.4	81.1	2.29	1.27	Achieved
24	West Bengal	82	94.6	91	0.64	0.46	Achieved
	<b>India</b>	62.3	89.9	81.15	1.85	1.26	Achieved

**Source:** Table 3.4 computed from the table 3.1 and 3.2



**Figure: 3.2 The Actual Annual Rate of Progress and Required Annual Rate of Progress of India and States on household with access to improved source of drinking water**

According to the census of 1991, 62.3 percent of India's population has access to improved drinking water on a long-term basis. In order to achieve the MDGs target, India would need to provide 81.2 percent of households with sufficient amounts of clean drinking water by 2015. Therefore, the Required Annual Rate of Progress (RARP) to meet the MDGs target for this indicator between 1990 and 2015 is 1.26 percent per year. The table 3.4 shows that India recorded 1.85 percent of Actual Annual Rate of Progress (AARP) from 1991 to 2015. It has indicated that India achieved the goal well ahead of schedule. Majority of Indian states achieved their respective targets easily due to their better performance in Pre and Post strategy intervention period. Only Manipur and Meghalaya were lagging behind to achieve their MDG target by half the proportion of people without sustainable access to safe drinking water by 2015.

**4. Conclusion:**

It is inferred from above analysis and discussion on Millennium Development Goal-7 that India has accessed the improved source of drinking water with much higher HRC of 2.26 percent in the period between 1991 and 2001 in comparison to the MDGs period of 0.23 percent. The performance of states in two periods indicates that Indian states were much concerned about the need for sufficient improved drinking water before the Millennium declaration by the United Nation in 2000 and progress also continued in the MDGs period. Therefore, 90 percent of Indian households were able to access improved sources of drinking water by the end of 2015 The remarkable performance in the pre MDGs period may facilitate the registered 1.85 percent of Actual Annual Rate of Progress from 1991 to 2015 in comparison to Required Annual Rate of progress of 1.26 percent to meet the MDGs target for this indicator. It has indicated that India achieved the goal well ahead of schedule. Majority of Indian states except Manipur and Meghalaya had achieved their respective targets easily due to their better performance in Pre and Post strategy intervention period.

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