Our Heritage

ISSN: 0474-9030

Vol-68-Issue-1-January-2020

Declining Ground Water Level in Haryana: A Challenge

[1]Seema Redhu, [2]Dr. Rekha Israni

[1]Research Scholar, [2]Supervisor

[1+2]Bhagwant University, Ajmer, Rajasthan, India

Email ID: redhuseema84@gmail.com

Abstract: Groundwater has emerged as the major water source and poverty reduction tool in India's rural areas. Ground water has made significant contributions to the growth of India's Economy and has been an important catalyst for its sustainable socio-economic development. Its importance as a precious natural resource in the Indian context can be gauged from the fact that more than 75 percent of India's rural domestic water requirements, 50 percent of its urban water requirements and more than 50 percent of its irrigation requirements are being met from ground water resources. But over the years there has been overexploitation of groundwater, which has been used to meet the increasing demand for water. This has resulted in declining water table in various parts of the country and become threat for sustainable development. In the present study an attempt has been made to address the issue of declining ground water level in Haryana. Further study also measured the impact of annual rainfall, number of tubewells and area under water hungry crops on depth of ground water level in the state. The study finds that declining ground water level is becoming challenge for the sustainability of the state. The study suggests the immediate attention of policy makers in this direction.

Keywords: Ground Water Level, Haryana.

Introduction: Groundwater is the water present beneath Earth's surface in soil pore spaces and in the fractures of rock formations. A unit of rock or an unconsolidated deposit is called an aquifer when it can yield a usable quantity of water. The depth at which soil pore spaces or fractures and voids in rock become completely saturated with water is called the water table.

ISSN: 0474-9030

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Groundwater is recharged from the surface; it may discharge from the surface naturally at springs and seeps, and can form oases or wetlands. Groundwater is also often withdrawn for agricultural, municipal, and industrial use by constructing and operating extraction wells. The study of the distribution and movement of groundwater is hydrogeology, also called groundwater hydrology.

Typically, groundwater is thought of as water flowing through shallow aquifers, but, in the technical sense, it can also contain soil moisture, permafrost (frozen soil), immobile water in very low permeability bedrock, and deep geothermal or oil formation water. Groundwater is hypothesized to provide lubrication that can possibly influence the movement of faults. It is likely that much of Earth's subsurface contains some water, which may be mixed with other fluids in some instances. Groundwater may not be confined only to Earth. The formation of some of the landforms observed on Mars may have been influenced by groundwater. There is also evidence that liquid water may also exist in the subsurface of Jupiter's moon Europa.

Groundwater is often cheaper, more convenient and less vulnerable to pollution than surface water. Therefore, it is commonly used for public water supplies. For example, groundwater provides the largest source of usable water storage in the United States, and California annually withdraws the largest amount of groundwater of all the states. Underground reservoirs contain far more water than the capacity of all surface reservoirs and lakes in the US, including the Great Lakes. Many municipal water supplies are derived solely from groundwater.

Polluted groundwater is less visible and more difficult to clean up than pollution in rivers and lakes. Groundwater pollution most often results from improper disposal of wastes on land. Major sources include industrial and household chemicals and garbage landfills, excessive fertilizers and pesticides used in agriculture, industrial waste lagoons, tailings and process wastewater from mines, industrial fracking, oil field brine pits, leaking underground oil storage tanks and pipelines, sewage sludge and septic systems.

ISSN: 0474-9030

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Research Methodology: The focus is on Haryana, where the depletion of groundwater resources could threaten the long- term sustainability of irrigated agriculture on which the state depends. The primary cause of decline in water table is said to be the introduction of water-hungry crops in Haryana. The present study is an attempt to access the impact of area under water hungry crops as well as number of tubewells and of annual rain fall on depth of ground water level in Haryana.

The main objectives of the study are as follow:

1. To study the recent trends in ground water level in Haryana

2. To find the impact of area under water hungry crops, number of tubewells and annual rainfall on the ground level water depth in Haryana over the time.

The study is analytical in nature and based on secondary source of information. Major sources of data are ground water year book (2019) published by central ground water board and ground water cell, agriculture department, government of Haryana and statistical abstract of Haryana. The study is carried out for the period of 23 years (1995-96 to 2018-19). The impact of area under water hungry crops, number of tubewells and annual rain fall on ground water level depth has been analyzed by applying the multiple regression analysis.

Findings: The state-wise status of groundwater resources as on March 2019 is given in table 1. The table depicts that the net draft of groundwater is either in excess of or close to the net available resource, implying that these states are facing a situation of dangerous overexploitation of their available groundwater resources. The crux of the groundwater challenge in India is that there is extreme overexploitation of the resource in some parts of the country coexisting with relatively low levels of extraction in others. Thus, the stage of groundwater development in Punjab (170%), Rajasthan (135%) and Haryana (127%) have reached unsustainable levels while Tamil Nadu (80%), Gujarat (75%) and UP (72%) are fast approaching that threshold.

ISSN: 0474-9030

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Table 2 shows that nearly all districts in Punjab, Rajasthan and Haryana are in the "unsafe" category. Seventy-two per cent of the districts in Tamil Nadu and nearly half the districts in Uttar Pradesh and Karnataka are also in unsafe category. While the traditional green revolution states of Punjab and Haryana continues to lead in terms of the proportion of area and population affected by groundwater overuse, what is perhaps more remarkable is that states like Rajasthan, Tamil Nadu and Uttar Pradesh are rapidly moving in the same direction of quantitative depletion of their groundwater resources. The message is thus clear: there is definite evidence on increased pressure on aquifers and the race to drill and pump.

S.No	States	Annual Replenishable Ground Water Resource	Net Availability	Net Draft	Stage of water level development*
1	Andhra Pradesh	33.83	30.76	14.15	46
2	Assam	30.35	27.81	6.026	22
3	Bihar	28.63	26.21	11.36	43
4	Chhattisgarh	12.22	11.58	3.6	31
5	Gujarat	18.43	17.35	12.99	75
6	Haryana	10.48	9.8	12.43	127
7	Jammu & Kashmir	3.7	3.33	0.73	22
8	Jharkhand	5.96	5.41	1.61	30
9	Karnataka	16.81	14.81	10.01	68
10	Kerala	6.62	6.03	2.81	47
11	Madhya Pradesh	33.95	32.25	17.99	56
12	Maharashtra	35.73	33.81	16.95	50
13	Orissa	17.78	16.69	4.36	26
14	Punjab	22.56	20.35	34.66	170
15	Rajasthan	11.86	10.79	14.52	135
16	Tamil Nadu	22.94	20.65	16.56	80
17	Uttar Pradesh	75.25	68.57	49.48	72
18	Uttarakhand	2.17	2.07	1.05	51
19	West Bengal	30.5	27.58	10.91	40

Table 1: State-wise Status of Groundwater Resources (2019) In Billion Cubic Metres (BCM)

ISSN: 0474-9030

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More districts and a larger proportion of population are going to get into the unsafe category unless the rate of groundwater extraction is regulated. It is, therefore, worthwhile to ask how safe are the so-called "safe" districts in terms of their groundwater usage. The quick change of situation between 1999 and 2019 should be taken as a warning of an impending catastrophe ready to strike in the near future. The problem needs urgent attention because groundwater is the major source of drinking water especially in rural areas.

According to the latest available data from the National Sample Survey, 56% of the rural households get drinking water from handpumps or tube wells, 14% from open wells and 25% from piped water systems based on groundwater (NSSO 2011). According to the department of drinking water supply (DDWS), GOI, nearly 90% of the rural water supply currently is sourced from groundwater. Though the share of drinking water in total water use is about 7% while irrigation accounts for over 80%, rapid expansion of groundwater irrigation can threaten drinking water security in the long run, since the resource for both uses is common. Indeed, there is mounting evidence that this could be happening in many parts of rural India, as revealed through the statistics of several habitations "slipping back" from full coverage to partial coverage.

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States	Districts in Unsafe Category		State Area Affected		State Population Affect	
	1999	2019	1999	2019	1999	2019
Andhra Pradesh	0	27	0	27	0	26
Gujarat	5	40	2	56	4	44
Haryana	63	89	46	93	55	97
Karnataka	5	50	4	52	5	61
Madhya Pradesh	0	23	0	16	0	22
Punjab	50	94	43	95	52	97
Rajasthan	35	97	7	97	15	97
Tamil Nadu	29	72	24	73	23	77
Uttar Pradesh	0	49	0	47	0	55
West Bengal	0	18	0	15	0	55
All India	9	30	5	33	7	35

Table 2: Proportion of 'Unsafe' Districts (GWD>70%) in Selected States

Estimates of groundwater depth in the state shows that the groundwater level is generally high in the southern parts and low in the north and north-east, which is a hilly tract. During the pre-monsoon period, it ranges from 5m to 21m below ground level (bgl). What is often not recognised is that the groundwater problem in Haryana has two dimensions. The first is that of rising groundwater table in the areas with low quality aquifers, leading to secondary Stalinisation and water logging. The second is that of declining water tables due to over-pumping of groundwater in fresh water quality aquifer zones. Districtwise average depth of water in Haryana has been shown in table 3.

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Sr No	District	1979	2019	Change
1	Ambala	5.79	9.31	-3.52
2	**Bhiwani**	**21.24**	**18.58**	**2,66**
3	Faridabad	5.94	10.61	-4.67
4	Fatehabad	10.48	15.94	-5.46
5	Gurgaon	6.64	22.62	-15.98
6	**Hisar**	**15.47**	**7.58**	**7.89**
7	**Jind**	**11.97**	**10.43**	**1.54**
8	**Jhajjar**	**6.32**	**5.27**	**1.05**
9	K.shetra	10.21	28.79	-18.58
10	Kaithal	6.28	18.34	-12.06
11	Karnal	5.72	15.19	-9.47
12	M.garh	16.11	41.08	-24.97
13	Mewat	5.5	10.31	-4.81
14	Panchkula	7.58	12.19	-4.61
15	Panipat	4.56	14.45	-9.89
16	Rewari	11.75	22.21	-10.46
17	**Rohtak**	**6.64**	**4.2**	**2.44**
18	Sonepat	4.68	7.56	-2.88
19	**Sirsa**	**17.88**	**14.14**	**3.74**
20	Yamuna Nagar	6.26	9.76	-3.5
	State Average	9.35	15.1	-5.75

Table 3: Districtwise Average Depth to Water During June 1979, June, 2019 (Metres)

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Table 3 reveals that average depth of water among the districts of Haryana is continuously increasing. The stable shows that situation of water level depth is very critical in the districts namely Gurgoan, Kurukshetra, Mahendergarh, Rewari and Kaithal.

The depth has nearly doubled in Gurgaon, Kurukshetra, Mahendergarh and Rewari. Interestingly, the water table has declined both in the regions where the water table was high as well as those where the water table was deep (such as Mahendargarh). In contrast, in the regions of Bhiwani, Jind, Hissar, Rohtak and Sirsa the water table has risen by nearly 2 to 8 metres over the time.

Sr No	District	Number of Blocks			
		Safe<70	Semi critical 70-90	Critical 90-100	Over exploited >100
1	Ambala	3	-	-	1
2	Bhiwani	4	-	-	5
3	Faridabad	3	-	2	-
4	Fatehabad	2	-	-	3
5	Gurgaon	-	-	-	4
6	Hisar	8	-	-	1
7	Jind	4	-	2	1
8	Jhajjar	2	-	1	2
9	K.shetra	-	-	-	5
10	Kaithal	-	-	-	5
11	Karnal	-	-	-	6
12	M.garh	-	-	3	2
13	Mewat	3	1	1	1
14	Panchkula	3	1	-	-
15	Panipat	-	-	-	5
16	Rewari	-	1	-	4
17	Rohtak	4	-	-	1
18	Sonepat	3	-	-	3
19	Sirsa	3	-	1	3
20	Yamuna Nagar	1	2	-	3
	Total	43	5	11	55

Table 4: Categorization of Blocks on the Basis of Groundwater Assessment as on April 1, 2019

ISSN: 0474-9030

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To capture the severity of depletion, it is common to categorise areas as being safe, semi critical, critical and over exploited (Table 4). A block is characterised as safe if the rate of groundwater exploitation is below 70 per cent, semi critical if the rate of exploitation happens to be in the range of 70 per cent to 90 per cent and overexploited if the groundwater use is above 100 per cent of its utilisable recharge. Of 114 hydro-geological blocks in Haryana, 48 per cent of them are categorised as over exploited blocks. In fact, in few cases the utilization ratio exceeds even 100 per cent of recharge – Kurukshetra (178 per cent), Karnal (132 per cent) and Mahendargarh (130 per cent). The situation is also dismal in the districts of Ambala, Panipat and Yamunanagar. 16 blocks out of total 114 blocks are in semi critical and critical category. This leaves only 37 per cent of the area categorised as safe zone. Districts namely Ambala, Hisar, Jind, Rohtak and Sirsa lies in this category.

Conclusion: The present study an attempt has been made to address the issue of declining ground water level in Haryana. The study also measured the impact of annual rainfall, number of tubewells and area under water hungry crops on depth of ground water level in the state. The water problem in Haryana is distinct as both water logging and water depletion is observed. The study has noted with serious concern the rapidly declining groundwater levels in various parts of Haryana. It is all the more disturbing to find that the cultivation of water-intensive crops is increasing in the regions where the water table is falling. The decline in water table is confined not only to those regions where cultivation of water intensive crops is more predominant. As seen in the study, Faridabad, Gurgaon and Mahendargarh are the regions where water table is receding but paddy cropping is not much (though increasing). This implies that the cause of declining water levels in parts of Haryana is explained by factors other than an increase in water-intensive crops. The study finds that declining ground water level is becoming challenge for the sustainability of the state.

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