Interpretation of Ground Water Crises in India.

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Abstract: *The contribution of groundwater for urban and rural both the area in India is indefinable. As a consequence of exceptionally population growth, improper water management, and environmental degradation, India is heading towards a freshwater crisis. The largest groundwater depletion in the world is happening in the northern part of India and Delhi is the prime concern of this fast-developing crisis. The situation of groundwater crises in India is getting worse by the day. According to the various report the water table declining at the rate of 1-2 m/year in most of the parts of the country. The government of India has taken various steps to overcome the groundwater management related issues but because of the lack of awareness, administrative activity and the political will, not achieved significant impact. This paper explains the condition of the groundwater crises in India to get the attention of engineers and scientific society to minimize the research demand in this field for any future drastically conditions.*

Keywords: Ground water, Ground Water Depletion, Sustainability, Hydrology, water Crisis

1. INTRODUCTION

Groundwater is the precious constituent for world community but Two-thirds of the total amount of groundwater is abstracted in Asia only with India, China, Pakistan, Iran, and Bangladesh as major consumers. For a developing country like India, groundwater is an essential natural resource. The United Nations Educational, Scientific and Cultural Organization (UNESCO) World Water Development Report states that India is the largest extractor of groundwater in the world. Groundwater has played a major role in increasing food production and achieving food security in India. It is an important source of water for agricultural, domestic and industrial needs. About more than 50% of theIndian agricultural area depends on the ground water[1] as well as about 60 % production of irrigated food is depending on the groundwater resources [2]. Table 1 shows that the there is still available considerable groundwater resources for use throughout the nation but when, observed at the micro- level, some regions, where intensive development and unbalanced climatic condition has created a critical situation like north Gujarat, southern Rajasthan, Saurashtra, Coimbatore and Madurai districts of Tamil Nadu, the Kolar district of Karnataka, the whole Rayalaseema region of Andhra Pradesh and parts of Punjab, Haryana and Uttar Pradesh declining, here groundwater depletion levels are in the order of 1–2 m/year. It has been reported that declining water levels could reduce India's harvest by 25% or more [3]. Due to a lack of data, the research tendency of this field was not appropriate. This paper mainly explains the groundwater situation in India.

Table 1: Share of groundwater in irrigation potential of India [1.]

Source	Irrigation potential (Million hectares)		
	Utility	Created up to 1997-1998	Utilized up-to 1997-1998
Major and medium (surface water)	58.5	33.6	29.0
Minor irrigation (surface water)	17.4	12.6	11.0
Minor irrigation (groundwater)	64.0	46.5	42.7
Total (surface water and groundwater)	81.4	59.1	53.7
Total (major, medium and groundwater)	139.9	92.7	82.7
Percentage of groundwater in total irrigation potential	46	50	51.6

1.1 Ground water

Groundwater contains under the surface of the earth in the cracks and spaces in the soil, sand, and rack. The level of water under the ground depends on various factors such as the physical characteristics of the region, the meteorological conditions, and the recharge and exploitation rates. It may be at shallow depth or, deep. Groundwater is recharged by a natural and artificial recharge system both. Naturally,

Groundwater is recharged by rainwater, snowmelt or from water that leaks through the bottom of some lakes and rivers. Groundwater also can be recharged when water supply systems leak and when crops are irrigated with more water than required.

1.2 Ground water availability and accessibility

In India, groundwater development and use are restricted to the shallow zone within a 50 m depth that includes dug wells, dug cum bore wells, shallow tubewells, and filter points and are mostly financed through institutional sources and private efforts although the second is the development of a deeper zone within the height is below the 50-300 meter from ground level which includes heavy-duty tubewells and bore wells, usually observe in the public sector for community irrigation. Table two represents the State-wise distribution of these structures. The data is given up to 1994. Groundwater utilization statistics reveal that the irrigation potential created from groundwater up to 1993 was 35.38 million ha. The stage of groundwater development worked out to be 55.23%. The actual stage of development worked out on a volumetric basis was about 32%. Central Water Commission (CWC 1993) report revealed that the average annual water resources potential in the country was 1869 billion cubic meters (BCM). Due to topographic, hydrological, and other constraints, the utilizable water is estimated at 1123 BCM which comprises 690 BCM of surface water and 433 BCM of replenishing able groundwater resources.[4]

India is the water-stressed country because any country is considering under water-stressed if the annual per capita availability of water is less than 1700 m3 and water-scarce if the same is less than 1000 m3 but the table three revealed that the condition of water scarcity as per its population projections that is facing the country.

According to the various report the ultimate irrigation potential (UIP) of India is calculated to be 139.89 million hectares (Mha), out of this 58.47 Mha means 42percent is from major and medium irrigation (MMI) and the 81.43 Mha is from minor irrigation [5].

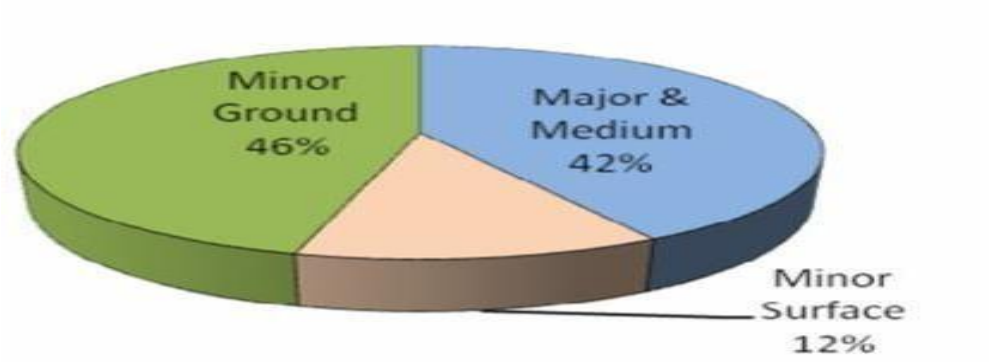

Fig 1: Share of Major, Medium and Minor Irrigation in Ultimate Irrigation Potential [6]

Table 2: Number of groundwater withdrawal structures (up to March 1994) [1]

State/union territories	Dug wells	Shallow tubewells	Public tubewells
Andhra Pradesh	1 309 860	113 160	8 109
Arunachal Pradesh	-	-	-
Assam	-	49 597	2 702
Bihar	509 770	755 142	6 625
Goa	102	-	105

Gujrat	709 070	8 300	5 588
Haryan	42 420	463 037	1 799
Himachal Pradesh	3 570	374	289
Jammu and Kashmir	2 779	2 087	172
Karnataka	545 156	37 837	-
Kerala	212 814	4 103	64
Madhya Pradesh	1 307 070	23 886	1 940
Maharashtra	1 350 020	254	-
Manipur	-	10	5
Meghalaya	-	780	3
Mizoram	-	-	-
Nagaland	450	-	4
Orissa	593 413	20 205	5 768
Punjab	93 470	622 600	2 002
Rajasthan	853 263	21 686	75
Sikkim	-	-	-
Tamil Nadu	1 470 807	171 305	-
Tripura	-	2 432	164
Uttar Pradesh	1 149 930	2 420 593	28 446
West Bengal	54 330	296 539	4 766
Total states	10 208 294	5 013 927	68 626
Union territories	16 857	26 083	797
Total	10 225 151	5 040 010	69 423

Table 3: The average annual per capita availabilities of water [6]

Year	2001	2011	2025	2050
Population Projection	1816 m^3	1545 m^3	1340 m^3	1140 m^3

There are also some other water resources for irrigation purposes like surface water but the use of groundwater is generally higher than the surface water because of conveyance. The past study revealed that the crop yield in India is three times higher as compared to the crop yield for irrigation by the canal system along.[8,9].

Table 4: Average grain yields, in tonnes per unirrigated hectare and per irrigated hectare by irrigated source in four Indian states [8]

State	Yield (t/ha)				
	Years	Unirrigated	Groundwater	Canal	Tank
Punjab	1977–79	1.08	5.46	3.24	_
	1963–65	0.75	3.06	1.18	_
	1950–51	0.37	1.75	0.94	_
Haryana	1978–79	0.38	5.74	2.36	_
	1976–77	_	_	_	_
Andhra Pradesh	1977–79	0.42	5.69	3.43	1.96
	1957–59	0.47	3.11	2.27	1.35
Tamil Nadu	1977–79	0.49	6.53	2.60	2.33
	1964–66	0.61	4.00	2.14	2.08
	1956–58	0.66	3.37	1.69	1.86

The depletion of groundwater resources is increasing very rapidly but not uniform throughout the country because the some part of the country having a high depletion rate of groundwater but some parts of the country are considerable manner. The previous study revealed that the groundwater withdrawal structures increased rapidly in which 10.50 million dug well, 6.75 million shallow tubewells and 0.09 million public tubewells withdrawal up to march 1997 [4]. Moench et. al (2000) [10] explained that the number of shallow tubewells roughly doubled every 3.7years between 1951 to 1991. There are many states and union territories are facing tremendous problem due to fresh water availability and water level declination which is mentioned in the above paragraphs, in which some parts of the nation is at the dangerous level like Delhi and Tamilnadu. Saksena et. al (2000)[11] revealed that the groundwater depleted by 10-15m in some districts of the Tamilnadu in the last 40-50 years. The future demand of water in India going to be increasing for various requirement like irrigation, domestic and industrial uses, that will create unbearable water crises in future because already the per capita water availability in the country has dropped from 5000m3 to 2200m3 [4] and the problem is India sharing 16%, 2.45%, and 4% world population, world's land area, and water resources respectively. The present time in India the annual demand for water is 634 billion cubic meters (BCM), but it will increase by 1092 BCM by 2025 and 1447 BCM by 2050 [1]. Jha et. al (2001) [12] explained that the groundwater reservoir will dry up completely in more than 15 states of India by 2025. According to the global water quality index, India is at 120th position among 122nd other world's countries that are the cause of 200000 peoples die every year due to polluted water and this figure is increasing day by day.

2. CONCLUSION

Ground Water is environmental resources and it should be a considerable concern for developing countries like India but the proper development and management of groundwater is complex but not impossible. The government should be focus on the key behind the depletion of groundwater. In India, the generally various issues are present like as consequences of increasing population, the domestic , agricultural and industrial needs increases, subsidies on electricity for water-intensive crops for farmers , Water contamination as in the case of pollution by landfills, septic tanks, leaky underground gas tanks, and from overuse of fertilizers and pesticides lead to damage and depletion of groundwater resources and also a prime cause is pollution because of deforestation, unscientific methods of agriculture, chemical effluents from industries and lack of sanitation. Indian government should be analyzing the future environmental

problem and research and scientific evaluation should be given the essential center of attention before forming any important policy.

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