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A C.D. BLOCK LEVEL STUDY ON GROUNDWATER IN MURSHIDABAD DISTRICT, WEST BENGAL

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Abstract:

Murshidabad district in West Bengal, India, relies heavily on groundwater for agricultural, domestic, and other needs. The region, characterized by its alluvial plains, has a complex hydrogeological setting influenced by the River Bhagirathi and its tributaries. Groundwater in Murshidabad is typically found in unconfined to semi-confined aquifers, with depths varying from shallow to deep zones. Quality assessments reveal that while the groundwater is generally suitable for most uses, concerns over arsenic contamination in certain areas pose significant health risks. Seasonal variations and over-extraction have led to declining water tables in many parts of the district. Sustainable management practices and regular monitoring are essential to ensure the long-term availability and safety of this vital resource. This abstract provides an overview of the groundwater conditions and challenges in Murshidabad district.

Key Words: Groundwater, Hydrology, Sustainability.

Introduction:

The most important natural resource in the earth is groundwater. Not only it supported almost all types of life forms to evolve, but also helped in the growth of human civilization. The inappropriate and disproportionate use of groundwater has led to questions regarding its sustainability. To what extent can groundwater be exploited without unduly compromising the principle of sustainable development? Groundwater utilization must be assessed from an interdisciplinary perspective, where hydrology, ecology, geomorphology, and climatology play an important role to assure its sustainability. Shallow groundwater flow systems should be distinguished from deep groundwater flow systems; the former interact with surface water, while the later do not. Generally, groundwater does not recycle as fast as the surface water, with rates of groundwater turnover varying from years to millennia, depending on aquifer location, type, depth, properties, and connectivity. Excessive pumping in the field of irrigation can lead to groundwater depletion, where groundwater is extracted at a rate faster that it can be replenished. To assure sustainability, studies must show that the hydrological, ecological, and other impacts of groundwater utilization are minimal. In addition to water quantity, sustainability must imply the preservation of water quality. "However, focus on development activities must be balanced by management mechanisms to achieve a sustainable utilization of groundwater resources as it constitutes the most important source of irrigation water in the Gangetic plains..." (Jha, B.M. 2009).

Study Area:

Murshidabad District, lying almost in the middle part of West Bengal, extends from 23°45'30" N to 24° 52' 30" N Latitudes and 87°57'30" E to 88° 46' 15" E Longitudes. The District, with an area of 5324 sq.km, is bounded by Malda District on the north and Barddhaman and Nadia Districts on the south and Birbhum District and Jharkhand State on the west [Fig. no. 1]. Murshidabad District shares the International Border with Bangladesh from north to south.

Murshidabad District is divided into five Sub-Divisions i.e. Jangipur, Lalbagh, Sadar, Domkal and Kandi (Census of India, 2011). There are seven Municipalities in this District i.e. Dhuliyan, Jangipur, Murshidabad, Jiaganj-Azimganj, Kandi, Berhampore and Beldanga. According to Census of India (2011), the District comprises 26 Community Development Blocks covering 2166 Villages and 65 Census Towns.

LOCATION MAP OF MURSHIDABAD DISTRICT

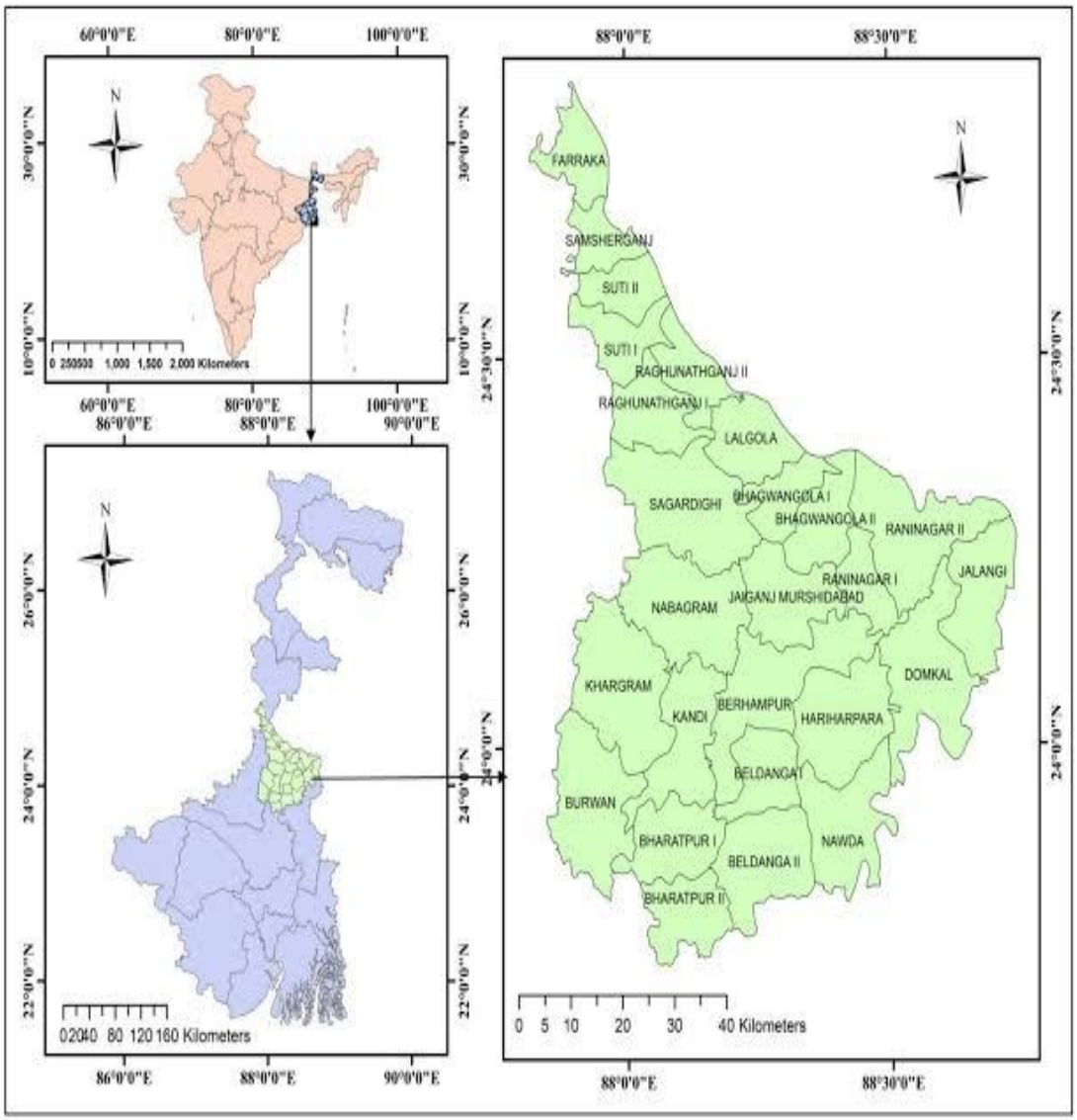


Fig no. 1

Objectives:

1. To show the C.D. Block-wise level of groundwater in pre-monsoon and post-monsoon periods in 2001.
2. To show the C.D. Block-wise level of groundwater in pre-monsoon and post-monsoon periods in 2011.
3. To analyse the changes in the level of groundwater in pre-monsoon and post-monsoon periods from 2001 to 2011.

Methodology:

This article is based on secondary data collected from Agri. Mech. Department, Berhampore, Govt. of West Bengal, Murshidabad District, West Bengal and Principal Agricultural Office, Berhampore, Govt. of West Bengal, Murshidabad District, West Bengal, India.
The secondary data of C.D Block-Wise level of groundwater in pre-monsoon and post-monsoon periods of 2001 and 2011 are cartographically presented with ARC-GIS software.

Findings and discussion:

1. In 2001, the uppermost level of groundwater was in Suti-II C.D. Block (2.76 mbgl), whereas deepest was in the Nabagram C.D. Block (15.69 mbgl) in pre-monsoon period. The uppermost level of groundwater was in Lalgola C.D. Block (1.35 mbgl) and deepest was in Nabagram C.D. Block (14.31 mbgl) in the post-monsoon period of 2001. (Table 1 and Figure no. 2 & 3).

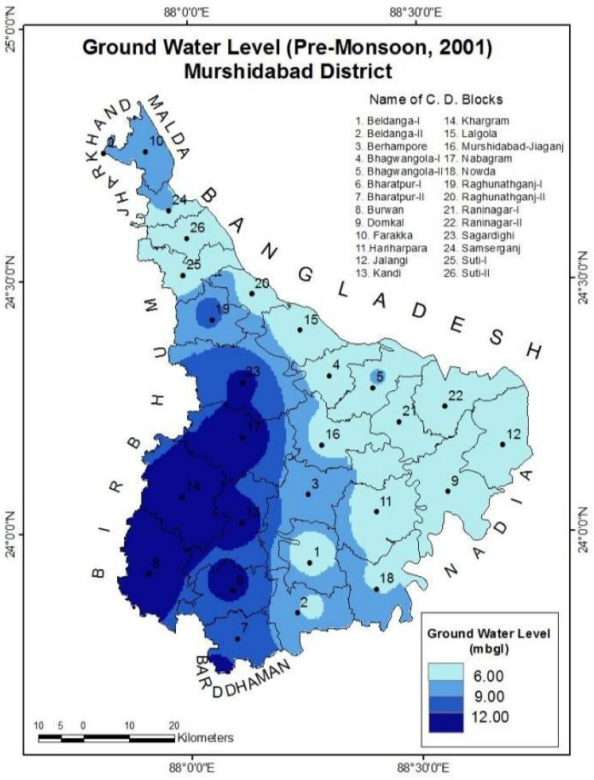
2. In 2011, the uppermost level of groundwater was found in Bhagwangola I C.D. Block (4.98 mbgl) where the deepest was in the Nabagram C.D. Block (20.44 mbgl) in the pre-monsoon period. In the post-monsoon period of 2011, the uppermost level of groundwater was found in Raninagar II C.D Block (2.85 mbgl) where the deepest level was found in Nabagram C.D. Block (20.09 mbgl). (Table 1 and Figure no. 4 & 5).

Table No. 1: C.D Block Wise Ground Water Level in Murshidabad District, Pre-monsoon and Post-monsoon Periods (2001 and 2011)

Sl. Nos.	C.D. Blocks	Ground Water Level [Meters below ground level (mbgl)]			
		2001		2011	
		Pre-Monsoon	Post-Monsoon	Pre-Monsoon	Post-Monsoon
1	Beldanga-I	4.32	2.06	6.68	3.60
2	Beldanga-II	5.68	2.95	5.17	4.07
3	Berhampore	7.38	5.23	8.20	3.94
4	Bhagwangola-I	4.12	2.86	4.98	3.38
5	Bhagwangola-II	6.07	2.22	6.36	3.52
6	Bharatpur-I	12.83	7.95	18.99	13.65
7	Bharatpur-II	12.35	8.56	16.90	15.18
8	Burwan	13.71	6.26	18.61	16.05
9	Domkal	4.44	3.23	6.87	3.43
10	Farakka	7.85	2.27	7.78	6.31
11	Hariharpara	5.07	2.51	6.36	4.90
12	Jalangi	5.43	3.06	6.50	4.14
13	Kandi	13.75	10.01	18.08	15.54
14	Khargram	12.71	7.36	17.56	14.01
15	Lalgola	3.89	1.35	5.36	3.39
16	Msd-Jiaganj	4.65	2.86	5.31	3.23
17	Nabagram	15.69	14.31	20.44	20.9
18	Nowda	5.90	3.11	6.45	4.08
19	Raghunathganj-I	10.12	5.29	11.81	8.60
20	Raghunathganj-II	5.01	1.48	5.78	4.45
21	Raninagar-I	5.52	3.28	6.40	5.24
22	Raninagar-II	4.49	1.97	5.40	2.85
23	Sagardighi	12.90	10.00	16.61	17.03
24	Samserganj	6.15	1.57	8.16	4.89
25	Suti-I	4.16	2.56	5.70	3.60
26	Suti-II	2.76	2.79	6.05	4.48

Source: Agri. Mech. Department, Berhampore, Government of West Bengal, Murshidabad District, West Bengal

Fig. no. 2



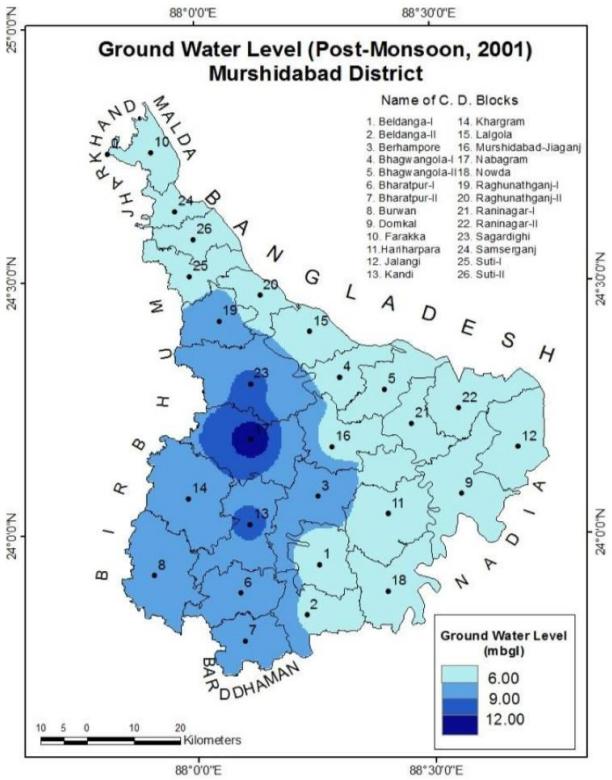
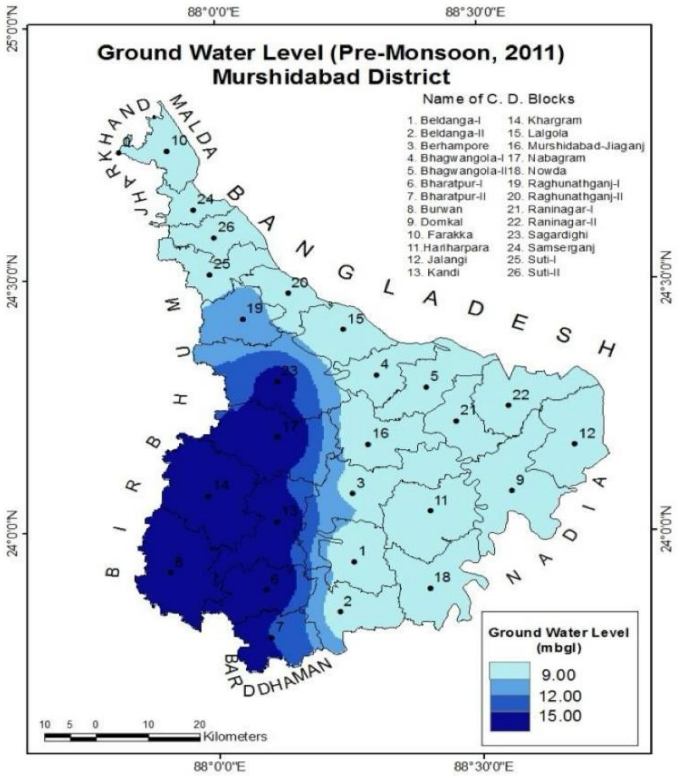


Fig no. 3

Fig. no. 4



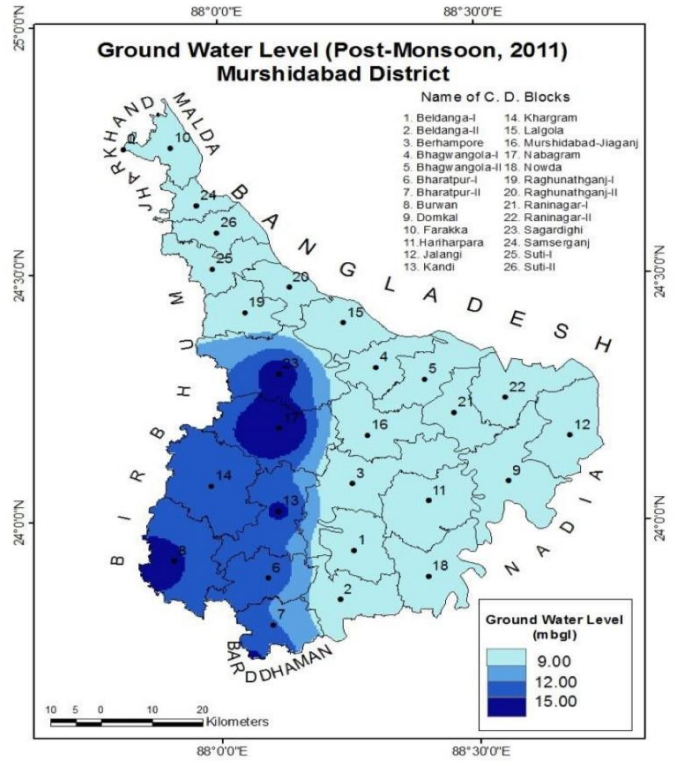


Fig. no. 5

3. In 2001, the level of groundwater increased the highest in Farakka C.D. Block (5.58 mbgl) whereas the lowest increase was found in Domkal C.D. Block (1.21 mbgl) from pre-monsoon to post-monsoon period. However, the level of groundwater decreased in Suti-II C.D. Block (-0.03 mbgl) during this period. (Table no. 1, Fig no. 2 & 3). In 2011, the level of groundwater increased highest in Bharatpur-I C.D. Block (5.34 mbgl) and lowest in Bhagwangola I C.D. Block (1.1 mbgl) from pre-monsoon to post-monsoon period. However, the level of groundwater decreased in Nabagram C.D. Block (-0.46 mbgl) and Sagardighi C.D. Block (-0.42 mbgl) during this period. (Table no. 1, Fig no. 4 & 5)

3. All the C.D. Blocks of Murshidabad district have experienced lowering in the level of groundwater in both pre-monsoon and post-monsoon periods from 2001 to 2011, except Beldanga II and Farakka C.D. Blocks where groundwater level has increased 0.51 mbgl and 0.07 mbgl respectively in the pre-monsoon period and in Berhampore C.D. Block with 1.29 mbgl in the post-monsoon period from 2001 to 2011. (Table no. 1, Fig no. 2, 3, 4 & 5).

4. During the period from 2001 to 2011 the highest decrease in the level of groundwater was recorded in Bharatpur- I C.D. Block (-6.16 mbgl) and the lowest decrease in the level of groundwater was recorded in Bhagwangola II C.D. Block (-0.29 mbgl) in pre-monsoon period. (Table no. 1, Fig no. 2 & 4). In the post-monsoon period from 2001 to 2011 the highest decrease in the level of groundwater was observed in Burwan C.D. Block (-9.79 mbgl) whereas the lowest decrease was observed in Domkal C.D Block (-0.2 mbgl). (Table no. 1, Fig. No. 3 & 5).

5. A clear variation in the groundwater level has also been observed between the Rarh Tract and Baghri Tract. In 2001, the groundwater level in the pre-monsoon period was more than 9 mbgl in most of the areas of the western part of the River Bhagirathi and less than 6 mbgl in the eastern part of this river. In this period, the level of groundwater has been recorded to be more than 12 mbgl in Sagardighi, Nabagram, Kandi, Khargram, Burwan, Bharatpur-1 and Bharatpur-II C.D. Blocks of the Rarh Tract. (Fig. No. 2) The ground water level in the post-monsoon period is more than 6 mbgl in the Rarh tract and less than 6 mbgl in the Baghri Tract in 2001. (Fig. No. 3)

6. In 2011, the groundwater level in the pre-monsoon period was more than 12 mbgl in the western part of the study area and less than 9 mbgl in the northern and eastern portions of the District. During this period, the level of groundwater has been recorded to be more than 15 mbgl in Sagardighi, Nabagram, Kandi, Khargram, Burwan, Bharatpur-1 and Bharatpur-Il C.D. Blocks of the Rarh Tract. (Fig. No. 4) The ground water level in the post-monsoon period is more than 9 mbgl in the Rarh Tract and less than 9 mbgl in the Baghri Tract. (Fig. No. 5)

Conclusion:

To conclude, it is evident from the findings and discussions that the groundwater level fluctuated largely from the pre-monsoon to post-monsoon periods in all 26 C.D. Blocks of Murshidabad district and the groundwater level are also lowering rapidly in the study area during the period from 2001 and 2011. Excessive use of groundwater in the irrigation sector, the groundwater abstraction has become very high resulting in groundwater depletion and unavailability of groundwater in Murshidabad District. "For the last 10 years the groundwater level has been declining. The rate of decline is 0.01 to 0.4 meters/

year and rising trend is 0.01 to 0.18 m/year "(Ghosh, 2007). The risk of toxic metal contamination has also been increased. "22 out of 26 C.D. Blocks have arsenic concentration" (Samadder and Subbarao, 2007) which make the district "one of the worst affected areas in the world by arsenicosis'. In agriculture, groundwater is considered as the most productive source of irrigation. "Due to its reliability of supply and availability on demand." (Mukherjee, 2007). But the volume of water used for specific crops varies considerably depending on the climatic as well as soil conditions. The water demand of rice which is the main crop cultivated in Murshidabad district is particularly high. Another aspect is economic groundwater scarcity which is the limited access to groundwater due to the high cost of water extraction. This scarcity ultimately reduces the farmers profit in an agricultural economic state. So, to cope with the rapid population growth the agriculture should be developed adopting the ways like - more emphasis on irrigation through surface water use, construction of more water reservoirs, conservation of the existing wetlands and water bodies, impeding surface run-oft, rainwater harvesting and also multi-crop farming, The effective management of available ground water resources requires an integrated approach, combining both supply side and demand measures.

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