International Journal of Education and Science Research Review

E-ISSN 2348-6457

Volume-7, Issue-3 June- 2020

P-ISSN 2349-1817

www.ijesrr.org

Email- editor@ijesrr.org

# LAND AND WATER RESOURCE MANAGEMENT FOR SUSTAINABLE DEVELOPMENT WITH A REFERENCE TO PURULIA, WEST BENGAL

**Rohit**

PG Scholar (Department of geography)

Kurukshetra University, kurukshetra

**ABSTRACT**

Water is widely used for a variety of reasons or purposes, ranging from household to agricultural. Drinking water scarcity is a major issue in many villages in the research area. During the hot months of March through May, there is a lack of water or restricted supply. The biggest issue with water is a lack of clean water and the spread of waterborne illnesses. Water that is unsafe and of low quality has negative consequences for human health as well as the health of domestic and wild animals. Water consumption is now growing at a greater rate than population increase. Drought has increased demand for water due to growing populations, expanded agriculture, industry, and a high quality of life. Overuse and pollution have all reduced supplies, causing major environmental harm.

To make up for the deficit, water is frequently taken from wells, tube wells, and projects. Due to geographical and geological conditions, rainfall variability, and poor recharge rates, the study region's groundwater table has dropped dramatically in the eastern section of the research region. It is estimated that this problem affects 26.79 percent of communities in Para Blocks. Balarampur comes next, with 16.17 percent of villages experiencing the same issue. The villages of Kashipur, Santuri, and Jhalda account for 14.29% of the total. The drinking water status in Hura Blocks is satisfactory. Drinking water shortages exist in part or all of the remaining Puncha, Joypur, and Arsha Blocks. The eastern section of the country suffers from a greater scarcity of drinking water than the western part.

**KEYWORDS:**

Water, Sustainable, Development

## INTRODUCTION

Trash creation, insufficient waste collection, transport, treatment, and disposal are key environmental concerns in the research region's sample villages, such as Malgaon, Balarampur, Kasabe-Digraj, Umadi,

International Journal of Education and Science Research Review
Volume-7, Issue-3 June- 2020 E-ISSN 2348-6457 P-ISSN 2349-1817
www.ijesrr.org Email- editor@ijesrr.org

and Arewadi. Gram panchayats or Municipal Corporations are in charge of waste collection. Waste dumps have negative environmental and public health consequences. On market days, all waste stuff is deposited in an open area on the settlement's outskirts. Methane is released from open landfills due to the breakdown of biodegradable garbage and anaerobic conditions. Discarded tyres at landfills allow mosquitos to grow, leading to an increase in illnesses including malaria, dengue fever, and West Nile fever. Methane is a key contributor to global warming and causes flames and explosions.

Purulia, now the western-most district of the state of West Bengal, has a border with the neighbouring states of Jharkhand and Bihar. Prior to independence, it was part of the Manbhum district under the state of undivided Bihar. Purulia was founded and amalgamated with West Bengal on November 1, 1956, by dividing regions under 16 police stations in then-Bihar, as recommended by the State Reorganization Commission, under the Bihar and West Bengal (Transfer of Territories) Act 1956. The district of Purulia has been chosen as the research region for this study. (See Fig. 3.1).

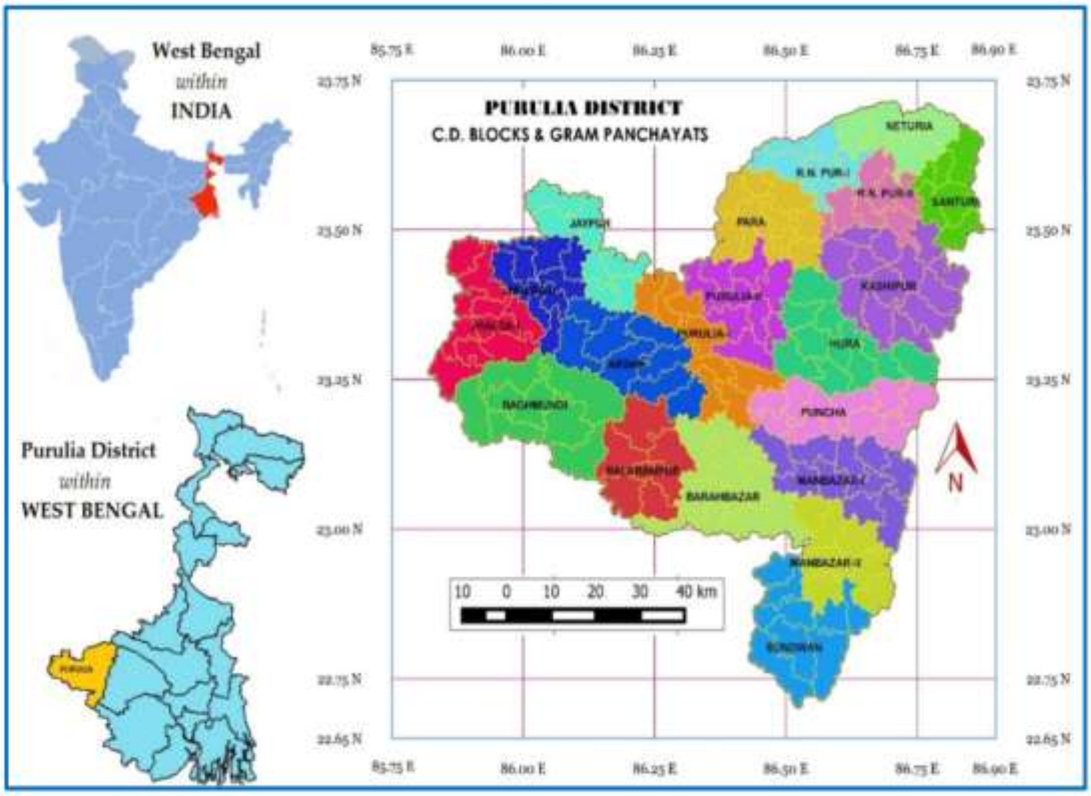


**Figure 3.1: Map of selected region**

The district covers a total area of 6259 km2 and is located between 22.702950 N and 23.713350 N latitude and 85.820070 E and 86.875080 E longitude. Except for around a hundred kilometres of the district-boundary marked by the Damodar river in the north and the Subarnarekha in the west, the district has few natural boundaries. The district is bordered on the east by the West Bengal districts of

Paschim Medinipur and Bankura; on the north by the West Bengal districts of Burdwan and Dhanbad; and on the north west and south west by the Jharkhand districts of Hazaribag, Ranchi, and Singhbhum.

## ANALYSIS OF WATER RESORCE MANAGEMENT IN PURULIA

- **Water Resources from Surface Runoff:**

Table 1 reveals that run-off water resources are not uniformly distributed in drought-prone Blocks. Because the Ajanta and Hatti ranges are nearby, there is more water available in the southern sections. Meanwhile, the northern and western sections of the country have less water. The reason for this is that the northern and western sides of the island are leeward. As a result, these localities face water shortages. After evaporation losses are taken into account, the total yearly water availability for the study region is projected to be 2,326 million m3. The region's average freshwater resources are 2,326 million m3 in total volume. This represents barely 0.12% of the Indian supply.

**Table 1: Surface Run- off water resources (MCM)**

| Blocks | 1990 | 2001 | 2010 | 2020 | 1990-2020 |
|---|---|---|---|---|---|
| Arsha | 415 | 643 | 197 | 425 | 409 |
| Hura | 61 | 87 | 32 | 66 | 66 |
| Kashipur | 248 | 248 | 248 | 248 | 208 |
| Santuri | 132 | 262 | 75 | 209 | 153 |
| Jhalda | 221 | 339 | 126 | 367 | 208 |
| Puncha | 209 | 285 | 122 | 263 | 240 |
| Balarampur | 211 | 194 | 83 | 83 | 159 |
| Para | 847 | 847 | 847 | 847 | 696 |
| Joypur | 172 | 201 | 96 | 240 | 187 |
| Region | 2416 | 3069 | 1115 | 2664 | 2326 |

**Table 2: Utilizable (Surface and ground) water resources (MCM)**

| Blocks | 1990 | | 2001 | | 2010 | | 2020 | | 1990-2020 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | Ground | Surface | Ground | Surface | Ground | Surface | Ground | Surface | Ground |
| Arsha | 153 | 96 | 237 | 149 | 72 | 46 | 157 | 99 | 169 | 106 |
| Hura | 78 | 14 | 110 | 20 | 40 | 7 | 83 | 15 | 84 | 15 |
| Kashipur | 91 | 57 | 120 | 75 | 48 | 30 | 107 | 68 | 95 | 60 |
| Santuri | 49 | 31 | 97 | 61 | 28 | 17 | 77 | 49 | 56 | 35 |
| Jhalda | 82 | 51 | 125 | 79 | 46 | 29 | 135 | 85 | 95 | 60 |
| Puncha | 77 | 48 | 105 | 66 | 45 | 28 | 97 | 61 | 88 | 56 |
| Balarampur | 72 | 45 | 71 | 45 | 31 | 19 | 31 | 19 | 59 | 37 |
| Para | 312 | 197 | 246 | 155 | 74 | 47 | 192 | 121 | 180 | 114 |
| Joypur | 63 | 40 | 74 | 47 | 35 | 22 | 89 | 56 | 69 | 43 |
| Region | 890 | 561 | 1130 | 712 | 411 | 259 | 981 | 618 | 857 | 540 |

Due to hydrological and topographical limits, the total amount of utilisable water is only 1,397 million m3, of which 857 million m3 comes from surface water and 540 million m3 comes from diminishing ground water. However, as with rainfall, there are significant regional and temporal changes in water availability.

According to Table 2, the average annual water availability in Para Blocks is more than 1005 million m3, followed by 840 million m3 in Arsha Blocks. Santuri Blocks has the lowest average annual water availability (314 million m3), while Balarampur Blocks has the highest (326 million m3). The other Blocks, on the other hand, have annual average water availability of 385 million m3 to 530 million m3. The quantity of water that can be withdrawn from its natural source is known as the usable water resource.

Within the restrictions of physiographic circumstances and the socio-political context, legal and constitutional restraints, and current development technology, the utilisable quantity of water from surface flow has been judged differently by various agencies. The region's yearly surface water supply is 1,396 million m3. Construction of storages at suitable sites in nearby regions has the potential to significantly increase water consumption in the Girna, Waghur, and Bori basins. The study region's yearly potential natural groundwater recharge from rainfall is approximately 540 million m3, or 11.31 percent of total annual rainfall. Annual groundwater recharge augmentation from canal irrigation systems is estimated to be around 35 million $m^3$.

As a result, the research region's total replenishable groundwater resource is estimated to be 431.89 percent. After reserving 15% of this volume for drinking and 5 million m3 for industrial use, the remainder can be used for irrigation. Thus, the available groundwater supply for irrigation is 361 million m3, of which 325 million m3 is utilizable (90 percent). The entire replenishable groundwater resource, provision for household, industrial, and irrigation needs, and utilizable groundwater resources for future use, as estimated by the Central Groundwater Board, Nagpur (CGWB).

- **Water Availability Per Capita**

Water availability per capita is decreasing year after year as the world's population grows. Limited water supplies are being strained by rising population, growing demand for water for both urban and agricultural use, and economic growth. In 1981, the study region's per capita water availability was at 1638 $m^3$. In 2011, this was down to roughly 1,096 $m^3$.

Due to significant population increase, the gap between demand and supply of water has recently widened. The study region's water consumption is rapidly growing. Water availability per capita was determined to be at a trace level between 1981 and 2011. In 2041, the anticipated per capita water availability will be 894 M3 only. This suggests that the population will face water scarcity over these decades. Water shortage has been noted in the Blocks of Hura, Jhalda, and Puncha.

## Scarcity Of Water

In the research area, demand-driven water shortage is the most common kind of water scarcity. In proportion to their population, most Blocks possessed adequate water supplies. Water scarcity resulted in either high water stress (WSI value) or both high WSI and low WCI values in locations that experienced some type of water scarcity

However, the few locations where population-driven water shortages and water stress occurred account for about half of the study area's total population (0.7099435 million). As a result, despite the seemingly abundant per capita water resources in the study location, there is a substantial water deficit. According to the findings, 85 percent of the people in the research region (1.629883 million) experienced some level of water scarcity. Approximately half of them resided in places where there was severe water scarcity, defined as both high water stress and chronic water scarcity. Water stress affected 60% of the population, with the bulk of them living in locations with less than 985 m3 of water per capita per year. Except in Para Blocks, water shortage was prevalent in all Blocks. Water shortage was particularly severe in Kashipur, Hura, and Balarampur, with 13 percent, 6%, and 8% of the population suffering from acute water scarcity, respectively. The population of Para Blocks did not face water shortages, although the population of the surrounding Blocks did, with a WCI value of less than 900 m3 per capita per year.

**Table 3: Blocks wise per capita water availability ($M^3$ / Year)**

| Blocks | Population & Water availability | 1981 | 1991 | 2001 | 2011 | 2021 | 2041 |
|---|---|---|---|---|---|---|---|
| | | | | | | Projected | |
| Arsha | p | 0.251044 | 0.329268 | 0.356808 | 0.394600 | 0.441952 | 0.500000 |
| | W | 382 | 382 | 382 | 382 | 382 | 382 |
| | A | 1522 | 1160 | 1071 | 968 | 864 | 764 |
| Hura | p | 0.11234 | 0.127723 | 0.142168 | 0.157226 | 0.172241 | 0.187312 |
| | W | 126 | 126 | 126 | 126 | 126 | 126 |
| | A | 1122 | 987 | 886 | 801 | 732 | 728 |
| Kashipur | p | 0.182855 | 0.227437 | 0.251907 | 0.278588 | 0.307617 | 0.339148 |
| | W | 208 | 208 | 208 | 208 | 208 | 208 |
| | A | 1138 | 915 | 826 | 747 | 676 | 613 |
| Para | p | 0.200976 | 0.244795 | 0.288804 | 0.319393 | 0.348138 | 0.375989 |
| | W | 696 | 696 | 696 | 696 | 696 | 696 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | 3463 | 2843 | 2410 | 2179 | 1999 | 1851 |
| Santuri | p | 0.116900 | 0.133488 | 0.148114 | 0.163802 | 0.180543 | 0.198597 |
| | W | 153 | 153 | 153 | 153 | 153 | 153 |
| | A | 1309 | 1146 | 1033 | 934 | 847 | 770 |
| Jhalda | p | 0.125102 | 0.154399 | 0.169919 | 0.187916 | 0.208587 | 0.231532 |
| | W | 175 | 175 | 175 | 175 | 175 | 175 |
| | A | 1399 | 1133 | 1030 | 1931 | 839 | 756 |
| Balarampur | p | 0.123113 | 0.146654 | 0.160692 | 0.177712 | 0.196567 | 0.217462 |
| | W | 159 | 159 | 159 | 159 | 159 | 159 |
| | A | 1291 | 1084 | 989 | 895 | 809 | 731 |
| Puncha | p | 0.214300 | 0.241332 | 0.262522 | 0.290328 | 0.326329 | 0.366794 |
| | W | 277 | 277 | 277 | 277 | 277 | 277 |
| | A | 1293 | 1148 | 1055 | 954 | 849 | 755 |
| Joypur | p | 0.093257 | 0.115323 | 0.137753 | 0.152267 | 0.166732 | 0.180904 |
| | W | 150 | 150 | 150 | 150 | 150 | 150 |
| | A | 1608 | 1301 | 1089 | 985 | 900 | 829 |
| Region | p | 1.419887 | 1.720419 | 1.918687 | 2.121832 | 2.348706 | 2.601563 |
| | W | 2326 | 2326 | 2326 | 2326 | 2326 | 2326 |
| | A | 1638 | 1352 | 1212 | 1096 | 990 | 894 |

Where: P= Population in million, A= Per capita water availability in $M^3$ /year, W= Run-off water resources

Water shortage, like climate change, is emerging as one of the most pressing global issues of our day. Demand-driven water scarcity was shown to be the most common kind of water shortage in the research area. The majority of the population (1.802439 million) resided in areas with demand-driven water stress, with around half of the population living in areas with population-driven water shortages.

Concerningly, 29% of the population experienced serious water shortage (over 70 percent of available water resources are consumed and per capita water availability is less than 895 m3 per year). Even though its water resources are plentiful, the study region is widely regarded as a water-scarce area. The findings support the assumption that the real issue in the region is a lack of water resources, as well as their uneven distribution and excessive consumption.

Currently, most places make excessive use of their given water resources. These are also the places with the greatest concentration of the region's population, and the demand on restricted water supplies is only likely to increase in the future as the population grows. As a result, actions to alleviate water shortage in the study region are urgently needed. Traditionally, such interventions have included lowering water usage intensity and enhancing water use efficiency. However, in today's globalised world, many water-intensive items are traded rather than consumed at the point of production, therefore the larger context of water management cannot be overlooked.

**Table 4: Population under different water scarcity categories, presented in Blocks scale population under water scarcity (Million) 2019-20**

| Blocks | Available water resources (MCM) | Population (Million) | WSI % | WCI (M3/C/yr) | Population not under water scarcity | High water stress | Moderate water shortage | Severe Water scarcity | Total under water scarcity |
|---|---|---|---|---|---|---|---|---|---|
| Arsha | 382 | 0.394600 | 103 | 968 | | | 0.3946 | | 0.3946 |
| Hura | 696 | 0.319393 | 29 | 2179 | 0.319393 | | | | |
| Kashipur | 208 | 0.278588 | 140 | 747 | | | | 0.278588 | 0.2786 |
| Jhalda | 126 | 0.157226 | 191 | 801 | | | | 0.157226 | 0.1572 |
| Santuri | 153 | 0.163802 | 122 | 934 | | | 0.163802 | | 0.1638 |
| Puncha | 175 | 0.187916 | 97 | 931 | | | 0.187916 | | 0.1879 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Balarampur | 277 | 0.290328 | 85 | 954 | | | 0.290328 | | 0.2903 |
| Para | 159 | 0.177712 | 259 | 895 | | | | 0.177712 | 0.1777 |
| Joypur | 150 | 0.152267 | 100 | 985 | | | 0.152267 | | 0.1523 |
| Region | 2326 | 2.121832 | 125 | 1096 | 0.319393 | | 1.188913 | 0.613526 | 1.8024 |
| | | | | | 15% | | 56% | 29% | 85% |

Water shortage is a severe and developing issue in several of the study region's tahsils. Altering agricultural patterns, changing home usage (appliances, household size and behaviour), tourism, and industrial activities have all contributed to the rise in over abstraction. As a result, water scarcity has risen to the top of the semi-arid, drought-prone region's policy agenda. Climate change will increase water scarcity issues, increasing the vulnerability of socio-ecological systems. Due to high surface temperatures, aridity, and irregular monsoons, the availability of water resources varies from year to year.

**Table 5: Blocks wise Population, available water resources and water consumption 2019-20**

| **Blocks** | **Population** | **Available water** | **Water consumption ($M^3$/yr)** | | | | |
|---|---|---|---|---|---|---|---|
| | **(Million)** | **resources (MCM)** | **Irrigation** | **Domestic** | **Livestock** | **Industry** | **Total** |
| Arsha | 0.329268 | 386 | 265 | 8 | 20 | 18 | 311 |
| Hura | 0.127723 | 158 | 124 | 3 | 10 | 7 | 144 |
| Kashipur | 0.227437 | 195 | 160 | 6 | 18 | 14 | 198 |
| Jhalda | 0.154399 | 171 | 119 | 4 | 12 | 6 | 141 |
| Santuri | 0.133488 | 204 | 90 | 4 | 7 | 5 | 106 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Puncha | 0.241332 | 116 | 113 | 6 | 18 | 8 | 145 |
| Balarampur | 0.146654 | 130 | 129 | 6 | 12 | 14 | 161 |
| Para | 0.244795 | 502 | 213 | 8 | 50 | 18 | 289 |
| Joypur | 0.115323 | 120 | 126 | 3 | 17 | 5 | 151 |
| Region | 1.720419 | 1983 | 1339 | 48 | 164 | 95 | 1646 |

## CONCLUSION

The majority of the water is used to grow cash crops like bananas and sugarcane. In general, if existing trends in population growth and agricultural policies continue, and the problem of shared water resources is not resolved, the shortage and stress of fresh water resources in the study region is projected to worsen in the future. Water shortage will be mitigated in some tahsils due to their increased use, even if it is still anticipated to rise.

## REFERENCES: -

[1] Ahmed, Shaik & Joshi, Aparna. (2018). WATER MANAGEMENT IN INDIA ISSUES AND CHALLENGES.

[2] Alam, Khorshed. (2015). Farmers' adaptation to water scarcity in drought-prone environments: A case study of Rajshahi District, Bangladesh. Agricultural Water Management. 148. 10.1016/j.agwat.2014.10.011.

[3] Alam, N.M. & Ranjan, Rajeev & Jana, C. & Singh, Raman & Patra, Sridhar & Ghosh, B. & Sharma, N.K.. (2014). Drought Classification for Policy Planning and Sustainable Agricultural Production in India. Popular Kheti. 2. 53-59.

[4] Alcamo J., Flörke M. and Märker M. (2007): Future long term changes in global water resources.

[5] Anonymous 2006: Water– A shared responsibility, United Nations World Water Development Report.

[6] Ausder Beek T.V.F. and Flörke M. (2011): Modeling the impact of Glob Change on the hydrological system of the Aral Sea basin, Physics and Chemistry of the Earth, Parts A/B/C. 21.

[7] Bandyopadhyay N, Saha AK. Analysing meteorological and vegetative drought in Guja-rat. In: Singh M, Singh RB, Hassan I, editors. Climate change and biodiversity: Proceed-ings of IGU Rohtak conference. Japan: Springer; 2014. p. 61–71

[8] Bandyopadhyay, N., Bhuiyan, C., Saha, A.K., (2015) Temperature extremes, moisturedeficiency and their impacts on dryland agriculture in West Bengal, India. In: Andreu J,Solera A, Paredes-Arquiola J, Haro-Monteagudo D, van Lanen H (eds.) Drought: Re-search and Science-Policy Interfacing, CRC Press, UK

[9] Bandyopadhyay, N., Bhuiyan, C., Saha, A.K., (2016). Heat waves, temperature extremesand their impacts on monsoon rainfall and meteorological droughts in West Bengal, IndiaNat Hazards 82, 367–388. http:// doi.org/https://doi.org/10.1007/s11069-016-2205-4

[10] Bandyopadhyay, Nairwita & Bhuiyan, Chandrashekhar & Saha, Ashis. (2019). Drought mitigation: Critical analysis and proposal for a new drought policy with special reference to West Bengal (India). Progress in Disaster Science. 5. 100049. 10.1016/j.pdisas.2019.100049.

[11] Bandyopadhyay, Nairwita & Saha, Ashis. (2016). A comparative analysis of four drought indices using geospatial data in West Bengal, India. Arabian Journal of Geosciences. 9. 10.1007/s12517-016-2378-x.

[12] Bandyopadhyay, Sunando & Kar, Nabendu Sekhar & Das, Sayantan & Sen, Jayanta. (2014). River systems and water resources of West Bengal: A review. 10.17491/cgsi/0/v0i0/62893.

[13] Barakade, Ankush. (2014). Rainfall Trend in Drought Prone Region in Eastern Part of Satara District of Maharashtra, India. European Educational Research Journal. II. 329-340.

[14] Bauri, Kailash & Gorai, Partha & Modak, Biplob. (2020). INDIGENOUS KNOWLEDGE AND PRACTICES ON WATER CONSERVATION AND MANAGEMENT IN PURULIA DISTRICT, WEST BENGAL. 17. 89-98.

[15] Bera, Amit & Das, Shubhamita. (2021). Water Resource Management in Semi-arid Purulia District of West Bengal, in the Context of Sustainable Development Goals. 10.1007/978-3-030-64136-8_23.