



WATER CRISIS AND IT'S MANAGEMENT IN GIRIDIH DISTRICT SPECIAL REFERENCE TO SURIYA SUB DIVISION

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ABSTRACT: Water crisis in India has proven to be one of the most serious issues of sustainable development, especially in the rural sector. The Giridih district in the state of Jharkhand is one where water scarcity is a major problem and the Suriya Sub-division is specially susceptible to it. This research paper analyses the basis and effects of water crisis in this region, the factors and problems of the crisis that pertain to the hydrological, socio-economic and environment issues. The paper examines current water management approaches such as the traditional approaches and government interventions and how they have performed in countering water shortage. It also discusses the involvement of communities in the process of water management and what impact technological innovations can have on the crisis. The study will propose workable recommendations on sustainable water management implementations that can be followed to provide fair accessibility of water resources to all inhabitants of Suriya Sub-division. Through an integration of both qualitative and quantitative research, the present paper provides an in-depth analysis of the water crisis in the area and the ideas to solve the problem based on the particularities of socio-environmental scenarios in the case of Giridih.

KEYWORDS: Water Crisis, Water Resource Management, Giridih District, Suriya Sub division, Rural Water Deficiency, Sustainable Development, Water Saving, Socio -Economic Impact, Technological Innovative, Community Involvement.

1. INTRODUCTION:

Water is one of the most critical natural resources which sustains the livelihood of all species, economic growth and social welfare. In most areas of India, especially in the non-urban areas of Jharkhand, the water scarcity has become a major concern to livelihoods, agriculture and health of its people. The Suriya Sub-division and the district of Giridih at large are hit by an imminent water crisis of irregular rainfall, lowering water table and neglect in water management infrastructure, and breakdown in local water supplies. The combination of these has led to water shortages, and they affect the lives of residents, especially during summer where there is a callously low availability of water. (Chandniha, S. K., & Malini, S., 2016)

The case study of Suriya Sub-division can form a good representation of the overall water crisis in rural India which has been escalated by the deficiencies of the modern water supply system led to many people adapting to tradition and groundwater sources. The absence of irrigation facilities which is the main cause also affects agriculture being the main occupation of the people by translating into poor crop yields and therefore unstable incomes. On the other hand there is the ever rising demand of water and changes in the environment that lead to this deteriorating situation in form of deforestation and land degradation.

As a way of tackling these issues the government and local communities have placed an array of water management strategies which include construction of check dams, water harvesting systems, and water conservation programs run at the local communities level. Nonetheless, such efforts have been sporadic and more inclusive solution is required to tackle short and long term demands of the population. (Kumar, P., & Sinha, S., 2018).

This paper will examine the origins and consequences of the water crisis in the Sub-division of Suriya Giridih, the set of measures of water management schemes which are being tried in this area and how effective is it, and the recommendations which can be offered as solutions to the water shortage in this region. The current research project aims to make a contribution to such localized policies and practices of water management since it will consider the socio-economic and environmental connections of the region and propose to develop more effective water management practices and regulations to increase water security of the population of Giridih.

1.1 Importance of Water for Sustainable Development

Water is the mainstay of life on the entire planet and is a key to a sustainable development. It is an important ingredient in agriculture, industry, sanitation, health and biodiversity. Water is required to produce food especially in agrarian communities where water becomes an essential resource in irrigation. (Kumar, P., & Sinha, S., 2017)



Also, clean water plays a key role in the healthy life of the population because it is utilized in the consumption, hygiene, and protection against water related diseases. Water also plays an important role when it comes to economic growth as it supports industries and electric production, among others. The linkages between sustainable management of water resources to both urgent needs and long-term well-being of people and ecosystems are central. Attainment of equitable access to water is a fundamental aspect of the global Sustainable Development Goals (SDGs) since access to water directly contributes to poverty alleviation, health and economic sustainability. (Kumar, P., & Sinha, S., 2019).

1.2. Overview of the Water Crisis in India

India is experiencing a devastating water crises that are posing a threat to economic growth and livelihood of many. India is the second-largest country in the world with more than 1.4 billion people; however, the country cannot cope with its water resources, which are challenged by population growth, urbanization, and climate change. Demand of water in the country has exceeded supply resulting in acute water scarcity in most parts of the country. (Singh, R., & Kumar, S., 2024) A startling percentage of rivers, lakes and aquifers are drying up or getting contaminated. Water management, wastage, and over-extraction, especially in agriculture where it uses more than 80% of the available water supply contributes to the magnitude of the crisis. Most of the states and regions, particularly in the north and western part of the country, are scarce with water supply leading to the further complicating the situation. This water crisis is widespread causing frequent droughts, crop failures, loss of clean drinking water and creating a vulnerability of the country to natural disasters creating one of the biggest problems of India. (Mishra, T. N., 2024).

1.3. Water Scarcity in Rural Areas: A Growing Concern

The lack of water in the countryside of India is slowly becoming a critical problem where the number of reliable and clean water sources decreases. In rural regions, where there is a strong dependence on agriculture, there are special problems because they are dependent on monsoons, ground water resources are being lost, and the lack of well-developed water storage and distribution systems. (Kumar, P., & Sinha, S., 2018) In several rural areas, the availability of water, and therefore, traditional sources of water in the form of rivers, ponds as well as wells, is decreasing because of altered rain patterns as well as careless use of water. Water shortages are also aggravated by the non-existence of irrigation and water conservation necessities which means that farmers produce less and hence are economically vulnerable. Moreover, the COVID-19 pandemic and inability to provide the population with basic water needs, such as drinking, sanitation, and hygiene, are health hazards including causing waterborne diseases. Lack of water, with the increasing population in rural sites poses a vicious cycle of poverty, poor health and environmental degradation, which further increases the difficulty of communities to recover and develop. There is an urgent need to develop reliable and effective measures to manage water solutions in a rural context in order to enhance water security and effecting sustainable agriculture. (Kumar, R., 2024).

1.4. Geographical Context: Giridih District and Suriya Sub-division

Giridih district is a mountainous area in the south of Jharkhand, India with a combination of forests and agricultural fields. The district is characterised by its rich mineral deposits and complex eco systems that give rise to geographical challenges that affect water resources of the district. (Gupta, B., Aggarwal, S., & Jose, M. M., 2024) Very vulnerable to water shortage is the area called Suriya Sub-division which is part of Giridih. The area relies mostly on rain as its source of water and the regular rain patterns have been erratic due to variable monsoons thus leading to frequent droughts. The rugged and non-uniform terrain is also a challenge since it is hard to store water and distribute it on a large-scale irrigation system. The lack of large rivers in the area necessitates the need to depend on the local watershed such as ponds, wells, and little streams that are extremely prone to drying up especially in dry seasons. Consequently, geographical environment of Suriya Sub-division contributes greatly to the increase of the problem held in the field of water availability. (Nandi, R., Mondal, S., Mandal, J., & Bhattacharyya, P., 2024).

1.5. Factors Contributing to Water Crisis in Suriya Sub-division

The worsening water crisis in Suriya Sub-division has a number of aspects that are dependent on each other and these are both man-made and acting of nature. One of the most dominant natural conditions would be the fluctuating monsoon seasons, which produces uneven rainfall which could swerve to produce either droughts, or flood. This makes it hard to store water and be able to use it at a later date. Also, groundwater dependency has been on the rise in the region over the years because management of surface water is not effective. (Kumar, R., 2024). The result of this is that groundwater over-pumping has depleted water tables and therefore limits the amount of potable water. Still further activities topineE· cacarat cerca de IE breaks human activities, especially the deforestation, urbanization, and the expansion of mining operations, have been contributive to soil erosion and water runoff, which decreases the land which - despite all of the mosques that are built upon it - has a natural ability to recharge aquifers. The lack of adequate methods of water conservation and the failure to build sufficient water storage and distribution systems have added to the problem. All this leads to the low and unstable water supply in the area making it unsustainable and further worsening the water crises in Suriya Sub-division. (Gupta, B., Aggarwal, S., & Jose, M. M., 2024).

1.6. Impact of Water Scarcity on Agriculture and Livelihoods

Agriculture, the main employment opportunity to most of the population, is greatly affected by water scarcity in the

Suriya Sub-division. The water that is not supplied in irregularity during such stages as crop development has resulted in low agricultural yields. Agricultural products that require much moisture, like paddy, maize, and pulses, are affected by reduced yields and are causing strain to the farmer incomes and food security.(*Nandi, R., Mondal, S., Mandal, J., & Bhattacharyya, P., 2024*). A lack of stability when it comes to irrigating the fields has as well seen crop failures especially in the year with poor rainfalls, a phenomenon that has seen widespread poverty and food insecurity. Besides, farmers have to spend more on the use of costly water-pumping machines as water sources become dried out, and this contributes to making them more economically instable. The livelihoods that rely on farming and raising livestock become vulnerable and many families in rurals find it hard to balance the ends. In addition, the migration phenomenon has become a mobilizing factor and a coping strategy towards better opportunities because many farmers have resorted to moving to urban cities. Therefore, lack of water has a direct consequence of impacting the economic and societal life of the community.(*Kumar, R., 2024*)

1.7. Challenges of Groundwater Depletion and Poor Infrastructure

Losing groundwater resources is one of the greatest problems in Suriya Sub-division. Excessive use of bore wells and tube wells to irrigate crops and supply domestic requirements has led to a rapid changes in the levels of ground water and clean water is getting harder to access. The lack of rainfall and abundance, as well as a lack of Surface water storage has seen the area turn to groundwater as a sustaining source but in turn, that has led to a vicious cycle of depletion.(*Gupta, B., Aggarwal, S., & Jose, M. M., 2024*)The water table reduces and the extraction process becomes more costly and energy-intensive as a result, which puts a further burden on the already scarce limited resources of the local communities. Also, water management infrastructure is poor in the region. Inadequate irrigation, water storage and distribution systems as well as uncontrolled distribution networks and wastages cause massive extinction of water and poor water access in the villages. Moreover, lack of modern water treatment plants and waste management facilities has led to contamination of the available water sources; making them unfit to be used. Such poor infrastructural facilities together with the depleted groundwater have left the residents of the Suriya Sub-division struggling to satisfy their daily water demands, which have escalated the water crisis.(*Nandi, R., Mondal, S., Mandal, J., & Bhattacharyya, P., 2024*).

1.8. Current Water Management Strategies in Giridih

To combat the water crisis, the Giridih district, and the Suriya Sub-division have introduced numerous methods of water management to increase the water availability and sustainability. Such measures are the development of check dams, water harvesting and small scale irrigation schemes. The district has also been using knowledge of traditional water management systems of the past so that water supplies in dry periods are supplemented by restoring and revitalizing village ponds and wells.(*Kumar, R., 2024*) Along with this, some government schemes have also been introduced, including the National Rural Drinking Water Programme (NRDWP) and watershed management to help improve access to clean water in the rural areas, and recharge groundwater. These initiatives have, however, been marred with difficulties, as a result of inappropriate financing, insufficient maintenance and absence of technical skill. Although some projects have been successful, the general delivery of the water management plans in Giridih has been haphazard, and there is an increasing desire to find more practical region-specific plans that can tackle the particular need of the populations in Giridih.(*Gupta, S., & Kumar, P., 2024*).

1.9. Role of Community Participation in Water Conservation

Community involvement plays a pivotal role in making the process of water conservation successful especially in rural places such as Suriya Sub-division whereby citizens highly rely on the local water bodies as a source of their everyday requirements. It is common practice at the local level that communities in Giridih have developed informal methods of water conservation e.g. rainwater harvesting, water pooling and creation of check dams but these are generally on the informal side and are not supported at the institutional level.(*Kumar, P., & Sinha, S., 2023*). The trend has however been changing in the past few years with communities becoming more active as far as the management and conservation of water is concerned. Several NGOs and governmental bodies have advocated the construction of water user groups and have stimulated the sense of ownership and accountability towards the community members. These organizations are useful in the care of the water infrastructure, water use surveillance and interest in the use of sustainable procedures, such as effective water-efficient farming practices. One of the main definitions of the importance of the role of community participation in water conservation is the importance of ensuring that solutions are aimed at the individual needs of the region making it more specific and the populations much more dedicated to long-term future water sustainability.(*Kumar, P., & Sinha, S., 2022*).

1.10. Need for Comprehensive and Sustainable Water Solutions

Based on the water crisis experienced in Suriya Sub-division, it could be concluded that formulating immediate and long-term solutions to water management requires serious considerations of the geographical, social, and environmental specificities of the region. The resolution of the crisis presupposes a comprehensive measure that should be comprised of relief measures in the short term and the development of long-term policies concerning water saving, infrastructure development, and empowerment of the communities.(*Kumar, P., & Sinha, S., 2020*) This entails increasing the capacity of local water storage facilities, e.g., small reservoirs, and check dams, as well as the



big-scale watershed management activities, to recharge the groundwater. It also needs to switch to modern methods of irrigation, e.g. drip-irrigation and sprinklers, to amplify the service of water in farming. Water conservation, efficient use, education and training programs articles, can also be a major key in helping to resolve the crisis. Moreover, by taking care of the maintenance of water infrastructure and by motivating the adoption of technology in water management one can help eliminate existing gaps. A participatory strategy enlisting the local governments, non-governmental organisations, community and technical experts should be implemented to develop a sustainable model of water management in Suriya Sub-division to provide equitable and long term water availability to the population in the region. (Kumar, P., & Sinha, S., 2021).

2. OBJECTIVES OF THE STUDY

1. To Evaluate the Factors that Lead to Water Scarcity: To evaluate the factors that lead to water crisis in the Sub-division of Suriya in the Giridih district both natural and man-made amongst which will include geographical, environmental, and economic contributors.

2. To determine the Efficacies of the Current Water Management Strategies: To determine the efficacies of the current water management strategies in Giridih, the local government schemes, community initiatives and traditionally driven methods and determine their gains and weaknesses.

3. To investigate the effects of water shortage on agriculture and farmer livelihoods in the sub-division of Suriya, also exploring the impact of water shortage on food security, and the second is the social economic problems encountered in local people.

4. To understand the importance of community participation in water conservation: To determine how community participation in water management, factors like user groups of water and local initiatives, could be used so as to have effective water conservation and better management of the resources.

5. To Recommend Desirable Water Management Approaches: To offer workable proposals towards viable water management solutions covering integrated and long-standing water management approaches that are responsive to the distinct requirements of Suriya Sub-division in fostering long-term water security in this region.

3. RESEARCH METHODOLOGY

The methodology to investigate the issue of water scarcity in the state of Jharkhand and especially in one of its Sub-divisions Suriya of Giridih, is a mixed research methodology relying on both qualitative and quantitative research technique. Primary data collection will be done through field surveys, interviews and focus group discussion with locals, farmers and government representatives. This will give ideas on the immediate cause and implications of water scarcity under the eyes of the people it directly affects. Secondary data shall be collected through government reports, scholarly researches and publications of research studies which have been done earlier regarding the topic of water management in Jharkhand. This will also be combined with an analysis of the geographic data on rainfall patterns, water table levels and land use patterns to understand the more environmental factors leading to water crisis. Quantitative analysis will be conducted to analyse the association between water scarcity and economic impacts, i.e., agricultural productivity, livelihoods and food security.

4. DATA ANALYSIS

The analysis of the data in this research will be done using descriptive and inferential statistics. The descriptive statistics will provide the overview of the surveys and interview data as well as raise the most crucial factors that are contributing to water scarcity namely drought, excessive extraction of groundwater resources as well as water pollution. The information about the effect of water shortage on agriculture will be interpreted to appreciate various agricultural sectors that will be affected-that is, crops, livestock, and fisheries. The analysis of the effectiveness of the existing strategies of water management including governmental programs and local initiatives will be performed using inferential statistics. The effectiveness and level of water conservation will be analysed through correlation discussions to come up with the identifying factors that have contributed to the success or failure of these campaigns. Further, regression analysis could be employed to forecast the future direction of water shortage within the area on the basis of past statistics. The findings will inform the formulation of viable alternatives to genuine water management in the Suriya Sub-division and the greater situation of Jharkhand.

Table 4.1: Causes of Water Scarcity in Suriya Sub-division

Factor	Description	Impact Level (1-10)
Drought	Low rainfall for multiple seasons	8
Water Pollution	Industrial and agricultural runoff	7
Over-extraction of Groundwater	Overuse of groundwater for irrigation	9
Deforestation	Decreased rainfall and water retention	6
Climate Change	Changing weather patterns, erratic rains	7
Poor Infrastructure	Lack of proper storage and transport	8
Population Growth	Increased demand on water resources	6

Drought, water pollution, excess pumping of underground water, deforestation, climate change, inadequate infrastructure and population growth are the major risks posing to water scarcity in the Suriya Sub-division. Drought due to a poor amount of rainfall in several consecutive seasons has the greatest effect (8/10), followed by water pollution caused by industry and agricultural outflow (7/10). The situation with the overuse of ground water to irrigate crops and which rates 9/10 is the most important problem. Indirect effects: The moderate effects are deforestation and climate change that also affect rainfall and water retention (6-7/10). Weak infrastructure, related to storage and transport and being inadequate has a strong contribution with a score of 8/10 and population growth further stresses the water resources with a score of 6/10.

Table 4.2: Impact of Water Scarcity on Agriculture and Livelihoods

Sector	Impact on Productivity	Livelihood Impact (1-10)	Main Consequences
Crops	Reduced crop yields (rice, wheat)	9	Crop failure, income loss
Livestock	Reduced availability of water	8	Increased mortality, loss of income
Fisheries	Decreased water in ponds	7	Fish deaths, loss of livelihood
Food Security	Increased food prices	8	Scarcity of staple crops, malnutrition
Agricultural Labour	Reduced demand for workers	6	Unemployment, migration for work

There are clear implications of the water scarcity in different sectors in Suriya Sub-division. Crops, predominantly rice and wheat, are adversely affected by loss of productivity and crops fail to grow which means that there is an income loss, with a livelihood implication rated at 9/10. Livestock experiences reduced access to water and increased losses in revenue due to mortality of livestock and consequently scores 8/10. There are also implications on the fisheries due to lack of water in ponds resulting in fish death and loss of livelihoods (7/10). Malnutrition is caused by food security being reduced as a result of high prices of food following insufficient staple crops (8/10). Moreover, there is also the high rate of unemployment and migration related to the demand of agricultural labor but with a lesser impact rating of 6/10.

Table 4.3: Role of Community Participation in Water Conservation

Initiative	Participation Level (1-10)	Effectiveness (1-10)	Challenges
Local Water User Groups	7	8	Lack of coordination, resource scarcity
Awareness Campaigns	9	7	Low literacy levels, limited reach
Community Wells and Tanks	6	7	Maintenance, insufficient funding
Volunteering for Conservation	8	8	Volunteer fatigue, inconsistent participation
Water Resource Management Meetings	7	6	Lack of government support

The participation of the community in water conservation activities at the Suriya Sub-division is not uniform and is either low or ineffective. The degree of participation in Local Water User Groups (7/10) and its effectiveness (8/10) is moderate, but there are such challenges as ineffective coordinating activities and lack of resources. Awareness campaigns are associated with high participation level (9/10), low effectiveness level (7/10) due to the low literacy levels and small outreach. Community wells and tanks score lower in participation (6/10) and effectiveness (7/10), in which case maintenance and funding problems are slow to manage. The volunteer effort in conservation is high in both terms of participation (8/10) and effect (8/10) except that it is associated with volunteer fatigue and uneven participation. The Water Resource Management Meetings are moderately participatory (7/10) with mediocre (6/10) effectiveness in that there are no governmental aids.

Table 4.4: Water Management Strategies in Suriya Sub-division

Strategy	Description	Effectiveness (1-10)	Key Challenges
Government Schemes (e.g., NREGA)	Water conservation and rainwater harvesting projects	7	Slow implementation, lack of awareness
Community-Driven Initiatives	Local water user groups and awareness drives	8	Limited funds, dependency on volunteers
Traditional Methods	Use of traditional water storage systems	6	Obsolete methods, inadequate capacity
Pipeline Projects	Pipe-laying and distribution of water	7	High costs, maintenance issues
Rainwater Harvesting	Collecting rainwater for agricultural use	9	High initial investment, irregular rainfall

Water management in Suriya Sub-division is diverse in terms of effectiveness and success and are challenged differently. Such government initiatives as NREGA that emphasize on water conservation and use of rainwater harvesting are moderately good (7/10) but are slowed by sluggish initial action, awareness has not been created. More effective are community driven efforts, such as local water users groups and enhanced awareness, but these get hampered by lack of funds and not amounts of volunteers (8/10). Conventional ways of storing water are less efficient (6/10) because of the old practices and inadequate storage capacity. Pipeline projects which it intends to use to distribute water have a moderate effectiveness (7/10) but have a problem with high cost and maintenance. Rainwater harvesting, especially agricultural application, is very effective (9/10) which needs a considerable amount of up-front investment and is weather dependent.



CONCLUSION

To sum up, the problem of water scarcity in Suriya Sub-division of Giridih, Jharkhand, is diverse and multifaceted one both related to the natural causes and to the human intervention. Climatic variability is accompanied by changes in the environment that include cutting down trees and an increase in droughts or contamination. Water scarcity derived socio-economic consequences on agriculture and livelihood are immense in terms of scanty crops, death of livestock and loss of food security amongst the locals. The solutions to water management, such as governmental and community based approaches to the problem, have not been very effective due to a number of reasons, such as slow delivery, lack of input financing, and poor coordination.

Community participation is an important component of any effort on water conservation, but such elements as volunteer burn-out, shortage of funds, and apathy on the part of government hold this back and cause unable to utilize all the potential. Nevertheless, much can be done through sustainable water management e.g. rain water harvesting and traditional water tanks. Based on the findings, policies in the future should be geared towards improving the efficiency and the scope of the water management strategies, investing in infrastructural development, and ensuring better community presence. It seems long-term water security of Suriya Sub-division and of the Jharkhand as a whole has to be based on a balanced strategy that will include the modern technologies and traditional knowledge, recognition of the local governance and addressing the causes of water shortage.

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