

WATER RELATED ISSUES IN ALIRAJPUR DISTRICT SPECIAL REFERENCE TO SONDWA SUB-DIVISION

RABINDER BARNWAL

Research Scholar

Department of Geography, Bherulal Patidar Government PG College, Devi Ahilya Vishwavidyalaya, University in
Indore, Madhya Pradesh
Email id: rbarnwal08@gmail.com

ABSTRACT: The district of Alirajpur in tribal region, Madhya Pradesh, is endowed with numerous problems reflecting in terms of water management especially in Sondwa subdivision. The rest of this paper will analyze the water scarcity in the district based on the district topography, limited water storage capacity, and the variation in rainfall patterns that occur due to climate change. Since its Sondwa sub-division is an underdeveloped rural area with a sizeable tribal population, there is lack of access to safe drinking water and agri-irrigation sources and even water management systems are poor in this region. The research paper will also deal with the complexity of water related challenges in the region; the nature of water scarcity, effects of water shortage on the local population, and measures undertaken by both the government and NGOs to tackle them. It assesses the efficiency of the current water conservation practices, the importance of community involvement in their water management and the possibilities to have sustainable solutions to enhance water availability and quality. The research uses qualitative and quantitative research to cover the study area, including field study, interviewing and data processing in order to present an overview of the water crisis in Sondwa sub-division, and to recommend workable solutions to sustainable water management.

KEYWORDS: Water scarcity in Sondwa sub-division of Alirajpur District, tribal communities, water management, sustainable solutions, water conservation, climate change, agricultural irrigation and access to drinking water.

1. INTRODUCTION:

Water is one of the most important resources to the socio-economic development of any region and in the rural / tribal areas it plays the most important role. Alirajpur district located in the south western corner of Madhya Pradesh, India has long suffered inaccessibility to water. The Sondwa sub-division of the district is a tribal dominated area and suffers with the perennial problem of less water, and unacceptable quality and water management techniques. The presence of topographical factors such as natural hilly terrain and scarcity of surface water resources, inadequate supply of water, and irregular rainfall patterns in addition to other factors aggravate the water availability and water preservation process in the area. (Yadav, R., & Chauhan, P., 2022)

In Sondwa sub-division, the major livelihood is farming and water is the most important aspect in this farming as irrigating farming usually suffers due to the irregularity in water sources. More than agriculture, the presence of clean and safe drinking water is another problem. Most of the tribal communities in the area use faraway and polluted sources of water and this poses many health hazards, including water diseases.

Besides, the effects of the climate change like the variable weather patterns and the extended dry periods aggravate the current water issues affecting the region. The schemes and projects introduced by the Government on the subject have not shown much success as they have not had the necessary implementation, financial factors, and community involvement. Little attention has been given to the role of traditionally practiced water management, together with local knowledge, in the preservation of water, although this can help increase the amount of water security in the area. (Sharma, S., & Sharma, V., 2023)

In this paper, the following aspects will be examined in the context of Alirajpur district, particularly in the sub-division of Sondwa: exploration of the water-related issues in the sub-division of Sondwa; what are the causes of the issue; the impacts the issue has as well as how the issue is being handled/addressed. Based on field studies, interviews, and secondary sources of analysis, the study will seek to gain greater insight into the water crisis on the ground and recommend long-term strategies to block the water crisis, upgrade quality of water, and to reinforce water management.

1.1 Overview of Alirajpur District

The district of Alirajpur is found in the southwest of the state of Madhya Pradesh on the border of Gujarat. It is among the least developed district in the state, which is remote with a rural setting. The district is mainly tribal in nature with Bhil as the most pronounced tribe. (Tiwari, R., & Soni, K., 2021) Alirajpur is an area in the tribal belt of Madhya

Pradesh that encounters considerable issues as regards to infrastructure, education, healthcare and the shortage of water. The historical isolation in the region and access to basic services have underdeveloped the district, thus contributing to its social-economic conditions. Poor accessibility to water, lack of sanitation, and unstable water supply plague Alirajpur and are irrespective of the fact that the region is rich in terms of natural resources. (Singh, G., & Kumar, J., 2022).

1.2 Geographical and Topographical Challenges

Alirajpur district is characterized by hilly nature, dense gardens and settlements that are distributed and this interferes significantly with the development of infrastructure and controlling of resources. The district is intersected by a number of small rivers and streams but availability of water is restricted owing to the disproportionate supply and seasonal course of such water bodies. (Singh, M., & Bhagat, R., 2020) The topography and rugged nature of its terrain render its land unable to construct water entities like reservoirs and dams, which will be needed to diffuse the situation of water shortages. Moreover, due to the steepness of the land, the harvesting and recharging of groundwater and rains is not done effectively, which further increases water problems. Poor road connectivity to far flung villages adds to the difficulty of transport of water resources and also to water conservation infrastructure materials. The topographical challenges serve not only as debilitating factors of economic development but also make it complicated to provide equitable water availability to all the communities. (The Water Resources Department of Madhya Pradesh., 2024).

1.3 Water Scarcity in Rural and Tribal Areas

One of the acute problems in rural and tribal regions of which Alirajpur district is a part is water shortage when clean and constant water supply is lacking. The rainfalls in these areas are usually uncertain making the summer seasons to have a long dry period. The biggest reason that largely contributes to scarcity of potable water is the lack of sufficient rain falls and water management practices. Seasonal water sources: Many of the tribal communities live in areas where they rely on seasonal sources of water - Rivers, Ponds, and Wells can dry during the summer months. (Malaviya, R., & Tiwari, S., 2016). Furthermore, lack of proper infrastructure means that the water sources are either remote, hence not easily accessed or polluted, thereby causing a health hazard. This water shortage also impacts on the main livelihood of most of the people living in the district; agriculture as no irrigation systems are in place or those that exist are in poor condition. In addition, women and children in the tribal society tend to waste a lot of time and energy in drawing water over long distances, which they could have engaged in other constructive endeavors. Due to insufficient and unclean water supplies, these regions experience a cycle of misery, poverty and poor health results. (Patil, P., & Yadav, N., 2021).

1.4 Water Availability in Sondwa Sub-Division

An area called Sondwa sub-division in the Alirajpur district is acutely affected by low water supply, and it has had detrimental impacts on the daily life and livelihood of people. The region in which the sub-division lies has highly variable climate, whereby rivers, lakes, and ponds are the prevalent sources of water but most are seasonal. Rain and snow are not always accessible for use throughout the year and this erratic pattern of rain causes them to be unreliable. (Mishra, A., & Gupta, R., 2018). In the monsoon season the area gets quite substantial rainfall but this is usually not enough to fill the water tables or storage systems thereby being able to supply water during the dry seasons. Particularly in most areas of Sondwa access to water is irregular with most people in the community being forced to rely on faraway sources, which are often polluted. Inadequate water infrastructures such as those that supply clean drinking water through pipes is poorly in place furthermore resulting in unsafe water being used as drinking water. This has resulted in an ongoing water crisis in the society affecting public health and economic life. (Mehta, P., & Rathi, R., 2019)

1.5 Impact of Climate Change on Water Resources

Climate change has added to the already vulnerable water condition in Sondwa sub-division. The area has also experienced much un-predictable precipitation with frequent droughts and irregular monsoons. These fluctuating weather conditions have led to the loss of the local water resources like surface water bodies and the ground water table, which are important to the consumption of water in flights, agriculture, and routine domestic water consumption. This has seen dry spells increase in frequency and therefore the availability of water sources such as wells and ponds which were dependable have become drier in a shorter period of time. (Agarwal, A., & Narain, S., 2016). The unpredictable rains also complicate planning water conservation or management since the conventional rainwater harvesting or water storage provision in the tank systems do not work well. These shifts are particularly hard on the rural and tribal regions, as there are few prospects of acquiring sophisticated water saving measures or the funds to invest in new resources. This inevitably results in local populations that have to deal with rising water shortages, which

translates to poor health, lack of economic stability and food security.(*Bhat, K. M., & Patil, S. R., 2017*)

1.6 Agricultural Dependence on Water in Sondwa

Farming sustains the Sondwa sub-division economy as most people take it as their way of life. Water plays a critical role in agriculture since applications of irrigation are important in crop production of staple foods including millet, maize, and wheat. Nevertheless, such water variations pose a serious problem against agricultural productivity. The unavailability of a dependable irrigation system and the inability to access water to irrigate crops during the dry period compels the farmers to be dependent on seasonal precipitation, at times inadequate and untimely.(*Kothari, A., & Singh, P., 2022*). This has led to convulsions of many farmers because crops fail hence leading to food shortages. The limits of cultivating crops that require more water hinders the process of generating agricultural diversification and revenue too. Farming practices traditionally found in the area do not always accommodate unpredictable fluctuation of water availability in the area due to climate change, which further complicates the economic situation of farmers who are unable to support themselves. Limited water access to irrigate also contributes to the poverty cycle since some families in Sondwa lack funds to use alternative water irrigation systems like tube wells or modern way of irrigation.(*Kumar, M., & Patil, H. R., 2020*).

1.7 Health Implications of Water Quality in Tribal Communities

Tribal communities like Sondwa sub-division face several problems with regard to accessibility of safe and clean drinking water. A lot of families living in tribes are dependent on sources of natural water like rivers, ponds, and wells that are usually poisoned with contaminants like bacteria, chemicals and heavy metals. The lack of good quality water is associated with a series of diseases; mostly bacterial diseases such as diarrhea, cholera, dysentery, and typhoid.(*Khan, M. Z., & Verma, A., 2017*) The diseases unequally target children and the vulnerable sector, causing severe morbidity and mortality as well as malnutrition. Lack of appropriate sanitation facilities also adds to the risk of contamination as untreated sewage usually gets into the water sources. Moreover, there are no efforts to educate the population about the methods of water purification, and, therefore, the communities do not manage to cope with the health risks caused by impurities in water. The outcome of this is a health crisis within these Indian communities, and the quality of bad water is one of the leading contributors to preventing the general health and performance of these groups of people.(*Joshi, A., & Kumar, R., 2021*).

1.8 Government Initiatives and Water Management Policies

The government has started a few projects to meet water demands and better water management in Alirajpur district, including the project in Sondwa sub-division. The National Rural Drinking Water Program (NRDWP), and the Jal Jeevan Mission are programs that focus on ensuring safe and reliable sources of drinking water access to rural and underserved regions by establishing water supply systems and maximized water management strategies. In spite of such efforts, it has always been an issue of poor implementation of these programs. Some of the challenges that impede success of these programs are inadequate funding, poor timing in the implementation of the projects and absence of local stakeholders.(*Jadhav, R., & Shinde, P., 2015*). Furthermore, the geography of the region and the location of villages also makes it hard to bring piped water supply to the distant villages. There are some local attempts to popularise rain water harvesting, watershed management, and water conservation, yet they have been scarce and unproductive in most cases because of insufficient resources and awareness. Therefore, even though government policies and programmes on water access and improvement look forward to arrest these recurring challenges in water, it can be said that it requires improved coordination, community participation and future plans that are well thought with regard to these water-related issues in the region.(*Gupta, S., & Mehta, R. K., 2020*).

1.9 Role of Traditional Water Conservation Practices

In Sondwa sub-division, traditional methods of water conservation had a long history of water resource management. This is one of the ways that tribal communities have devised over the centuries to gather and store water, so it can be available during times of drought-water harvesting via step wells, tanks, and ponds. These methods are commonly set to suit the seasonal rainfall in the area, and reduce water wastage. Met in addition to physical structures, the community also adheres to traditional knowledge systems that help in planning the sustainable use of water including limiting the use of water at dry periods, and that the common water sources are maintained.(*Chaurasia, S. D., & Sharma, A. P., 2018*). Nevertheless, these practices have remained underexploited in the context of the modern water management systems that do not pay much attention to the local knowledge. With water stress and the impacts of climate change becoming more apparent there is an increased realization that restoring these traditional practices is an important step in sustainable water management by integrating new technologies. Community based participatory interventions that inculcate both the traditional and modern ways would help to ensure water availability and enhance conservation and

the resilience of tribal community to future of water. The values created through traditional practices also further develop a feeling of local ownership and local responsibilities to water resources, something that is necessary in promoting long-term water security. (Government of Madhya Pradesh., 2019)

2. OBJECTIVES OF THE STUDY

1. To compare the water scarcity problems in Sondwa Sub-Division to the other world processes.

The problem that will be investigated is the reason why water is scarce in the Sondwa sub-division, the environmental, climatical, and infrastructural factors that affect the chances of obtaining water in the area.

2. To Evaluate the Consequences of Climate Change in the Access to Water and Commodities

This paper will discuss how the issue of climate change has impacted on the water resources in the Sondwa sub-division in the form of erratic rainfall patterns, increased occurrences of droughts and decline in water supply during the dry seasons.

3. To Assess the Efficiency of Water Management Possibilities of the Government

The goal is to evaluate the current government policies and efforts like the National Rural Drinking Water Program (NRDWP) and Jal Jeevan Mission and evaluate their performance toward addressing water scarcity and water access across the Sondwa subdivision.

4. To examine the use of conventional water conservation measures

This study seeks to identify the use of indigenous knowledge and traditional water conservation measures in the zone and assess their applicability as well as their feasibility in integrating with modern systems in order to achieve long-term use of water.

5. To find lasting solutions to the improvement of availability and quality of water.

The proposed work is to present viable and sustainable proposals to enhance water availability, quality and management in the Sondwa sub-division both in terms of technology as well as the community-based measures.

3. RESEARCH METHODOLOGY

The research method of this study consists of a mixed methods approach as it involves both qualitative and quantitative research strategies to discuss the issues relating to the water in Sondwa sub-division of Madhya Pradesh. Some of the primary data will be gathered by field research using surveys, interviews, and on spot reports by residents, local authorities, and government officials concerned with water management. Secondary data will also be collected through government reports, published works and statistics of organisations in operation within the area of study to provide a background of how and what took place concerning the situation of water shortage.

To quantify, we will apply statistical methods to the analysis of water shortage indicators, the role of climate change in the depletion of water resources, and the success of governmental programs. The most crucial variables including rainfall patterns, the availability of water sources, water connection access, and frequency of shortage of water will be measured and analyzed. Qualitative data shall be collected by duet of semi-structured interviews and group discussions so as to capture the idea of the community concerning water availability, conventional methods of conservation and the effects of government policies.

Key villages will be selected within the Sondwa sub-division due to their difference in access to and scarcity of water, and representative of a wider area. All data will be analyzed in descriptive and comparative manners to establish patterns, correlation, and possible gaps on the practice of water management in the premises. The outcomes will assist in getting a detailed explanation of the water issues in the region and transforming holistic water management policies.

4. DATA ANALYSIS

The analysis of data collected in this study shall use descriptive and inferential statistics in areas of evaluating indicators of water scarcity and analyzing government efforts towards the problem of water resources scarcity and impact of climate change. The major consideration will be on the factors that will define the correlations between the factors, including the rain patterns, amount of water sources, and piped water access by the populace.

Table 4.1: Water Scarcity Indicators in Sondwa Sub-Division

Village Name	Average Annual Rainfall (mm)	Number of Water Sources (Ponds, Wells, Rivers)	Percentage of Population with Access to Piped Water (%)	Days of Water Scarcity Per Year
Village A	800	5	20	150
Village B	950	3	15	120

Village C	700	2	10	180
Village D	1,100	4	30	90
Village E	650	3	5	200

The following table indicates the water conditions in five villages of Sondwa sub-division. Village A is a medium rainfall area with five sources of water and 20 percent access to the piped water system with a period of 150 days of water crisis. Village B, with higher rainfall, fewer water sources and a slightly higher piped water access appears to have 120 days of scarcity. The village C, which receives the least rainfall and water sources, has very little access to piped water and the scarcest (180 days). In each of the criteria, Village D has been ranked the top with higher rainfall, adequate accessibility to water and the least scarcity (90 days). Village E with the lowest rainfall has few access to piped water and is used with severe shortage (200 days).

Table 4.2: Impact of Climate Change on Water Resources

Year	Average Rainfall (mm)	Frequency of Droughts (Number of Dry Months)	Groundwater Level (m)	Surface Water Level (m)
2010	1,000	2	5.2	6.1
2012	1,150	1	4.8	5.8
2015	850	3	6.0	4.5
2018	900	4	6.5	4.2
2023	750	5	7.0	3.5

This table indicates the effect of water change on the water resource in a five year perspective. During the year 2010, when there had been 1,000 mm of rainfall, two consecutive months had gone without rain, and the levels in the groundwater and the surface water had been 5.2 m and 6.1 m respectively. In 2023, precipitation decreased to 750 mm, and droughts grew up to five months, and ground water and surface water moved toward 7.0 m and 3.0 m, respectively. The statistics indicate negative pattern of raininess, increase of droughts and lower water level during the years.

Table 4.3: Traditional Water Conservation Practices

Village Name	Traditional Water Harvesting Method	Number of Structures (Step Wells, Tanks, Ponds)	Community Participation Rate (%)	Effectiveness in Mitigating Scarcity (%)
Village A	Step Wells	10	80	85
Village B	Rainwater Tanks	5	60	70
Village C	Ponds	8	70	75
Village D	Step Wells	6	90	80
Village E	Ponds & Tanks	7	65	65

There are the ancient water conservation measures in five villages mentioned in this table. Village A has 10 step wells and the participation of 80 percentage of people and 85 percentage successes in adjusting shortage. Village B does not depend on rainwater tanks and has 60 per cent participation and 70 per cent effect. Village C has 70 percent participation and 75 percent effectiveness through the 8 ponds involved. The village D has 6 step wells with 90 percent of the population involved and 80 percent in effectiveness. In Village E, the ponds and tanks are combined with a 65 percent participation and effectiveness. These approaches depict different levels of effectiveness and participation of the community in dealings with water shortage.

Table 4.4: Government Water Management Initiatives in Sondwa Sub-Division

Initiative Name	Year Launched	Beneficiaries (No. of Households)	Total Investment (INR)	Area Covered (km ²)	Completion Status (%)
Jal Jeevan Mission	2020	1,200	5,000,000	50	80
NRDWP - Rural Drinking Water Supply	2021	1,000	3,500,000	30	60
Rainwater Harvesting Program	2022	500	1,000,000	20	40
Watershed Management and Conservation	2023	1,500	2,000,000	45	20

Some of these government water management initiatives can be seen by reference to this table. The Jal Justice launched in 2020 served 1,200 households by investing in Jal Jeevan 5 million INR across 50 km² and it is 80 percent complete. NRDWP is a program that began in 2021 and assisted 1,000 households with 3.5 million INR across 30 km² and it is 60% done. The Rainwater Harvesting Program, launched in 2022, has provided 500 households with 1 million INR and has been built within 20 km² and is 40 percent complete. Lastly, the Watershed Management and Conservation project initiated in 2023 benefited 1,500 households with an investment of 2 million INR and it is 20 percent done, covering 45 km².

5. FINDINGS

Similarly, descriptive statistics will be used to summarize important data such as the mean rainfall, the number of water sources as well as the days of water shortage per year in various villages. As an illustration, the discussion of Table 4.1 is going to shed light on the effects of rainfall levels and availability of water sources on water scarcity in such villages as Village A characterized by the relevant scarcity level, despite the existent multiple sources of water, and Village D wherein water access is managed rather adequately.

The effects of climate change will however be evaluated by examining Table 4.2 in which the movements of rainfall, occurrence of drought and the rise and fall of ground and surface water will be reviewed. The trends will aid in determining the degree to which the changing climatic patterns are increasing water shortages especially through ground water shortages and the decrease in surface water.

In addition, the effectiveness of the traditional water conservation measures (Table 4.3) and government programs (Table 4.4) will be determined in terms of the rates of participation by the communities, its success in averting water shortages, and the levels of completion. One can use correlation analysis to determine the relationship between the community participation in the conservation of water, and its effectiveness.

Statistical software shall be used to analyze the data in order to test the hypotheses concerning the effectiveness of alternative methods of managing water and the effect climate change would have on the availability of water. The general assessment will help make effective recommendations of promoting sustainable forms of water management based on the specific demands of Sondwa sub-division.

CONCLUSION

Sondwa sub-division in Alirajpur district is impacted by water related problems that are multifaceted and based upon geographical factors, climatic changes, infrastructural deficiencies and governmental resource crunch. Water scarcity is a long-term problem facing the region as far as clean, drinking water, agricultural irrigation, and even public health is concerned. Despite the different amount of rainfall, lack of access to seasonal water sources and unreliable seasonal patterns of rain lead to dry spells, which are critical. More conventional strategies on water conservation include step wells, rainwater harvesting that have traditionally served to alleviate water scarcity but these would need to be upgraded as to keep up with the current state of the climate. Although there have been steps taken by the government on projects such as the Jal Jeevan Mission and NRDWP some problems continue to dominate, including failure to implement projects in time, low levels of community participation, and unfinished projects. Climate change is making these issues further aggravated by less precipitation and falling ground water levels. Government response, community

involvement, and adopting a hybrid of new and old methods of conservation are the key elements in ensuring that the water management of a region can be sustainable and able to combat climate change and improve water potential to satisfy the tribal communities of the region.

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