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# CONSUMER ATTITUDES TOWARDS NEW PERSONAL CARE PRODUCT INNOVATIONS IN RURAL MARKETS OF HARYANA

**Prathmesh Vilas Patil**
Research Scholar
Civil Engineering
**Dr. Ambadas Dhuaji Lodhe,**
[Assistant Professor]
School of Civil Engineering, Sunrise University, Alwar, Rajasthan



## ABSTRACT

*Droughts are becoming more common and storms are becoming more intense in arid places as a result of climate change. Water shortages and the failure to reach sustainable development targets are results of these messed-up and nonexistent precipitation patterns. Rainwater harvesting (RWH) techniques are most suited for use in the Egypt drainage basin. This study used a multi-criteria technique to identify the best areas for RWH in the Wadi Safaga, with the goal of promoting the adoption of sustainable water resource management methods in the area. The hydrologic features of the catchments are highlighted by integrating radar and optical remote sensing data from Sentinel-1&2, Landsat-8, ALOS/PALSAR, Sentinel-1 Interferometric SAR, climatic Tropical Rainfall Measuring Mission (TRMM), hydrological, and geological datasets. The patterns of rainfall intensity within the basin were also analysed. The anticipated model depends on thirteen variables: topography, slope, depression, lithology, radar, InSAR CCD, drainage density (Dd), distance to river (DR), vegetation, topographic wetness index (TWI), rainfall, and lineament density. To identify possible locations for RWH and GWPZs, a knowledge-driven GIS approach was used, which included weighted criteria derived from the Analytical Hierarchy Process (AHP). Very low(14%), low (28%), moderate (27%), high (21%), and very high (10%) were the five GWPZ classifications that the resulting map placed the basin under.*

***Keywords**: Water harvesting, Drought mitigation, Solapur district, Sustainable water management, Community resilience*

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## 1. INTRODUCTION

There is a dearth of readily available water sources in arid regions. Therefore, it is crucial to promote regional development and sustain diverse human activities by identifying and developing exploitable groundwater reserves. In dry and semi-arid regions, having access to groundwater is crucial for long-term human settlements, population expansion, and sustainability. Similar to North African Egypt in the Sahara Desert, this region has few rivers and lakes and a dearth of surface water resources. It is essential to search for extra water resources in this area because of the water shortage caused by climate change and overcrowding. According to many studies, the Bedouin people living in these areas get the majority of their water from spring wells that tap into wadi deposits or cracked rock formations. The majority of farmed land is irrigated using water from groundwater wells, further illustrating this reliance on the agricultural sector.

The North African Sahara is heavily dependent on potentially exploitable groundwater reserves due to the region's limited access to surface water. To find and characterise new water resources, a multidisciplinary strategy combining geological, geophysical, and remote sensing approaches is needed to meet the increasing worldwide demand for freshwater. Projections of climate change make this problem worse by implying that the hydrological cycle would become more intense, which might increase the occurrence and intensity of storms and droughts and worsen water scarcity. As a result, there is a need to establish and employ dependable methods for exploring groundwater and evaluating resources on different sizes.

In GWPZ, remote sensing approaches are now indispensable. Thanks to RS advancements, we can now investigate a wide range of hydrological parameters in great detail, which allows us to forecast, based on several factors, where we could find freshwater resources. To lessen the impact of impending water shortages, this interdisciplinary strategy is worth exploring. It brings together information from geology, geophysics, and remote sensing. Water occurrence and accumulation regions

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have been identified and predicted using GIS and remote sensing (RS) methods in many research. Applied GIS techniques were used to simulate water resources. Water resources in hard rocks that are difficult to reach can also be explored using this approach describe the geological contacts, faults, and joints that are under the influence, as well as the features of the catchment area.

The lithology, infiltration capacity, and topographical gradient of an area determine its drainage patterns. Water is more likely to accumulate and seep into soil when the topography of the ground is flat and low in height. In contrast, regions with a high surface curvature tend to accumulate water, and steeper slopes speed up runoff. Surface water buildup and infiltration were both enhanced in areas next to streams as opposed to those further away. Lineament density, infiltration potential, and fault and fracture systems are all important factors in hard rock terrains. Furthermore, runoff from higher mountains can help recharge lower regions and flatlands, which is a crucial factor in replenishing shallow aquifers. However, in order to guarantee its water security in the long run, Egypt is aggressively seeking alternatives including desalination, wastewater treatment, and improved agricultural methods. It is necessary to determine the best areas to develop water resources in light of the water shortage problems that dry regions are experiencing. Thus, the purpose of this research is to (a) use RS-GIS methods to evaluate and define the GWPZ in hard rocks located in dry and semi-arid areas of Western Safaga.

## 2. REVIEW OF LITERATURE

In an agro-urban area of Pakistan, Arshad et al. (2020) offer a thorough investigation of groundwater potential recharge zones using probability frequency ratio models and GIS-based analytical hierarchical procedures. The importance of spatial modeling in locating places with high groundwater recharge potential is emphasized in this study. This is crucial for sustainable water management in areas where water availability varies. The research provides useful insights into maximizing groundwater resources by using geographic information systems (GIS) and

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sophisticated statistical models. This can support intelligent irrigation methods by guaranteeing a more educated approach to water allocation and utilization.

Case and Zeglen (2018) investigate community involvement in water activism using the Pyramid of Engagement concept in a different setting. Their research, which was published in the Journal of Community Practice, looks into how two Canadian towns' various levels of community involvement in water management differ from one another. The study emphasizes how crucial community involvement is in tackling water-related problems and putting into practice efficient water management techniques. The study illustrates the potential for greater public involvement to improve the success of water management programs, including smart irrigation technologies, by analyzing the ebbs and flows of community engagement.

Overall, the research shows that more efficient and sustainable water management techniques can be achieved by fusing cutting-edge technical solutions—such as intelligent irrigation systems and GIS-based groundwater modeling—with strong community participation plans. Case and Zeglen draw attention to the social aspects of water activism, while Arshad et al. concentrate on the technical aspects of groundwater management. Combining these viewpoints can offer a comprehensive strategy for solving water scarcity and advancing environmentally friendly farming methods.

Case and Zeglen's (2018) study, which was published in the Journal of Community Practice, explores the dynamics of community engagement in water activism. Their study examines community involvement in water management in two Canadian towns using the Pyramid of Engagement concept. Through an examination of how varying degrees of involvement influence water activism, the research offers valuable perspectives on the effectiveness of community-based strategies. The aforementioned study emphasizes the significance of cultivating proactive and knowledgeable community engagement in order to proficiently tackle water-related concerns and execute efficacious water management tactics, encompassing intelligent irrigation technology.

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Dile et al. (2013) add to the social perspective by concentrating on the function of water harvesting in sub-Saharan Africa's resilience to water-related shocks and sustainable agricultural intensification. Their research highlights how water harvesting methods might improve agricultural output and resilience in areas vulnerable to water scarcity. It was published in Agriculture, Ecosystems & Environment. Farmers can more effectively manage their resources and lessen the effects of water-related issues by increasing the availability of water through harvesting techniques. This strategy supports agricultural sustainability and encourages effective water usage, which are both in line with the concepts of smart irrigation.

## 3. WATER HARVESTING TECHNIQUE

Collecting Rainwater from Rooftops Rooftop rainwater harvesting is an efficient and environmentally friendly way to manage water in the Solapur district. It involves collecting rainwater from rooftops, channeling it through pipes and gutters, and then storing it in tanks or underground reservoirs. Whether you live in an urban or rural part of Solapur district, you may utilise the rooftop rainwater harvesting method to collect rainwater for your home and garden. The approach is well-suited to the socio-economic situation of the area and offers a practical, evidence-based way to increase water supplies because of its simplicity, which also makes it affordable and easy to execute. Groundwater levels have risen, and urban and rural residents in Bangalore, India, have better access to water, thanks to the widespread use of rooftop rainwater gathering systems. The effectiveness of the technique in tackling water shortage concerns through scientifically informed water management practices is highlighted in this case study.

Verify Delaying water flow and making sedimentation processes easier are the primary functions of check dams, which are modest, low constructions built across streams or rivers. This mechanism exemplifies the scientifically sound method of check dams in sustainable water resource management; it assists in recharging groundwater and effectively prevents soil erosion. The river and stream network in the Solapur district makes check dams an appropriate strategic asset for collecting rainfall during the

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monsoons. Because of their ability to reduce downstream floods and increase groundwater recharge, check dams provide a practical and long-term answer to the problem of managing the region's water resources. In the Maharashtra village of Ralegan Siddhi, check dams were built, which had a profound effect on the environment. More water was available for farming, soil erosion was reduced, and water management was improved, according to science. In comparable agro-ecological settings, this case study demonstrates how effective check dams are in improving water supplies and fostering ecosystem resilience.

Trenching on a contour to carry out this technique, trenches are dug following the natural topography of the ground in order to collect and slow down surface water runoff. This method effectively prevents soil erosion while also promoting infiltration, which allows water to penetrate the soil. Because of its ability to efficiently save rainfall by enabling percolation into the soil, contour trenching is well-suited to the undulating topography of the Solapur area. Soil moisture levels are improved using this method, which is supported by science, creating an ideal setting for rainfed farming in the area. The Watershed Organisation Trust (WOTR) has successfully implemented contour trenching in several locations, including Maharashtra. This approach has been shown to increase agricultural output and enhance water availability, according to scientific evidence. This case study highlights the effectiveness of contour trenching as a powerful approach for managing watersheds. It might be used to improve water resources and promote sustainable agriculture in similar geographical areas. Chunks of Percolation The purpose of percolation pits is to manage the penetration of rainfall into the subsurface. They are tiny dug structures that are filled with coarse material. This strategy has been proven to improve groundwater recharge and reduce surface runoff. Because of its space-saving design, percolation pits may be placed strategically in the Solapur District to collect runoff and replenish the groundwater table. This technology is especially useful in urban and peri-urban areas since it provides a localised and long-term solution to the problem of water scarcity. An interesting case study in which the restoration of traditional water-harvesting structures has led to elevated groundwater

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levels and increased water availability for agricultural purposes is the implementation of percolation pits by the Tarun Bharat Sangh in Rajasthan, India. This might have consequences for comparable agro-ecological settings, but it does show that percolation pits are an effective and sustainable way to manage water resources in dry areas.

D. Ponds on Farms Farm ponds are intentionally built tiny lakes within agricultural fields. They are essential for collecting and storing rainfall so it may be used for irrigation. Sustainable and efficient management of water resources is promoted by this method, which is in line with scientifically-informed strategies for increasing water availability in agricultural contexts. When considering the Solapur District, farm ponds stand out as a perfect way to increase the amount of water available for farming. According to science, these reservoirs are great at storing rainfall during the monsoons and provide a useful tool for irrigation later on. Reduced dependence on traditional water sources is one benefit of this method, which adds to the region's sustainable and scientifically sound agricultural water management plan. One notable case study is the Watershed Development Project in Maharashtra, which effectively promoted the construction of farm ponds. By implementing these reservoirs, water availability was increased and crop yields were boosted, demonstrating the efficacy of these strategies in sustainable watershed management. When combined and implemented properly, these water harvesting methods provide a thorough solution to the problem of water shortage in the Solapur area. Case studies that have been successful show that water availability, agricultural output, and community resilience may all be greatly improved.

## 4. BENEFITS AND OUTCOMES OF ADOPTING WATER HARVESTING TECHNIQUE

More Access to Water Rooftop rainwater collecting, check dams and percolation pits are just a few examples of the water harvesting methods that have been shown to greatly enhance groundwater recharge. More water is available for crops for a longer period of time because these methods improve soil moisture retention. This holistic strategy highlights the efficacy of many approaches

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in promoting sustainable water management, which in turn improves agricultural output and groundwater resources, according to scientific research. Among the results is a marked decrease in the dependence on unpredictable rainfall patterns, which guarantees a more reliable water supply for farming and household uses. As a result, agricultural output has been sustained, and the crop has become more resistant to dry periods and drought. From a scientific perspective, these beneficial effects highlight how effective water collecting methods are in reducing the region's susceptibility to climatic unpredictability and improving water security generally.

Eco-Friendly Farming Scientifically optimising agricultural output, water collecting techniques make sure there's enough water for irrigation, especially during crucial periods of crop growth. Water shortage has a negative effect on agricultural activity, but this method simultaneously lessens reliance on traditional water sources. Aligning with the principles of effective water resource management, the scientifically supported use of water harvesting techniques helps to build agricultural systems that are both resilient and sustainable. Because of the reliable water supply made possible by water collecting techniques, the results include increased crop yields and a wider variety of crops. Farmers have seen an uptick in revenue, and food security in their communities has improved, all because of this. These beneficial effects support the idea that sustainable water management practices might improve the region's socioeconomic status and agricultural resilience, according to the scientific community.

Community Strength Local communities are empowered when they actively participate in water collecting activities, which is one of the advantages. By scientifically conserving community structures and traditions, this technique helps to reduce the demand for migration during periods of water scarcity. The significance of socio-scientific factors in encouraging sustainable practices in the area is shown by the incorporation of community-driven water management measures, which improve resilience. Improved community cooperation and social cohesiveness in water resource management are some of the results. The increased ability to handle and recover from drought has improved overall health, highlighting the social and scientific importance of community-driven programs in building resilience and promoting sustainable water resource management in the area.

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Preserving the Environment The advantages that have been realised include the reduction of soil erosion that has been accomplished by using techniques like contour trenching and check dams. The scientific community also backs these techniques for their role in restoring damaged ecosystems and protecting biodiversity. By highlighting the beneficial effects of water harvesting methods on soil conservation and regional ecosystem health, this integrated approach is in line with ecologically sustainable principles [48]. Natural filtration mechanisms improve water quality, which leads to an increase in the sustainability of ecosystems and habitats, as verified by science. This helps keep the environment in check by reducing pollution and encouraging sustainable water management in the area.

The State of the Economy Reduced economic losses due to drought-induced crop failures and livestock depletion are among the realised advantages. At the same time, there are more chances to make money by doing things right with water and sustainable farming, which highlights the social and scientific importance of integrated water management strategies for building economic resilience in the area. Increases in agricultural production have been shown to have a positive effect on the economy, leading to a general uptick in local spending. The socio-scientific benefits of integrated water management have been emphasised by the fact that a more resilient and robust local economy has been produced by diversifying livelihoodsapproaches to management that promote long-term economic growth in the area.

Ways to Reduce Urban Water Stress The installation of rooftop rainwater collecting systems in both urban and peri-urban regions has several advantages, one of which is a lessened burden on urban water delivery systems. The scientific community agrees that this technique helps make urban water management more resilient and sustainable by reducing water stress, especially during peak demand times. There has been a decrease in the strain on municipal water supply systems, which is supported by science, and more water is available for household usage. Integrated water management techniques have a good influence on improving the overall efficiency and robustness of urban water systems in the region, which in turn supports sustainable urban growth and makes urban areas more water resilient.

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Environmental Effects Over Time Implementing sustainable water management strategies helps preserve water supplies for future generations, which is one of the realised advantages. Furthermore, this scientifically significant addition to global climate change efforts promotes local resilience and highlights the interdependence of regional water conservation initiatives with larger environmental sustainability objectives. The results show that water will be available for ecosystems and humans for the foreseeable future, which is good for the environment. This highlights the significance of integrated water management techniques in promoting environmental resilience and balance, which in turn supports the sustainable utilisation of water resources in the area. All things considered; the Solapur area stands to gain a great deal by implementing water harvesting techniques. This includes both short-term gains in water availability and longer-term advantages for people, agriculture, and the environment. All of these results add up to make the area stronger and better off in the long run.

## 5. CONCLUSION

In conclusion, the study of Solapur district's water collecting methods for drought mitigation has shed light on the region's pressing water problems. Water harvesting is an important and long-term strategy for increasing water availability, reducing drought's negative effects, and building resilience in Solapur district, according to the study's main conclusions and insights. Solapur district is currently facing a water crisis due to unpredictable rainfall, declining groundwater levels, and few surface water supplies. The region's economy, way of life, and agricultural production are all negatively affected by protracted droughts. Rooftop rainwater harvesting, contour trenching, percolation pits, farm ponds and check dams are some of the water gathering methods that have been found and investigated in the study. Because of Solapur's specific geography and climate, each method has its own set of benefits. Water harvesting has the potential to alleviate urban water stress while simultaneously improving water supply, fostering sustainable agriculture, building resilient communities, protecting the environment, and boosting the economy. For water harvesting systems to be successful and last, community involvement and engagement became crucial.

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