

# **ASSESSMENT OF THE WATER CRISIS IN A DROUGHT PRONE AREA THROUGH EXPERIMENTATION**

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## **Abstract**

This study is a regional investigation that focuses on the drought in Gujarat and the numerous ways in which it has had an effect on the state. Because the findings of this study are so specific, it is possible to steer clear of making sweeping generalisations about their implications. On the other hand, an evaluation of drought mitigation policy has been carried out with the support of a more comprehensive national policy framework as well as policies relevant to individual states. This evaluation was carried out in order to better understand how best to mitigate drought. The responses of farmers are dependent on ways of recollection and are highly subjective in nature; yet, the total response provides an insight that is rather accurate of the numerous ramifications that drought has had in dry regions of the state. Policy repercussions for drought and areas in Gujarat that are prone to drought may be applicable to conditions that are comparable to those found in other parts of India, notably in dry and semi-arid portions of the country.

**Keywords:** A Drought Prone Area , Water Crisis , regions in India

## **Introduction**

Drought is one of the most common natural disasters in India, occurring on a national scale more often than any other. It's become more widespread and more widespread in the last few years. As a result, around a third of the country is either in danger of drought or is deserted. These regions are lagging behind the rest of the country when it comes to agricultural productivity and overall economic growth. Their agricultural output and earnings can fluctuate dramatically from year to year, and they have a large percentage of people living below the poverty line. Agricultural output and revenue can vary greatly from year to year.. They are particularly exposed to a wide range of challenges because their incomes are low and vary, they have a huge debt load, and their human development is weak.. The need to aid the poor and vulnerable in overcoming their poverty and vulnerability, as well as the inclusion of drought-prone regions in mainstream development, are major challenges facing policymakers today. The current status of the world necessitates both of these conditions. Drought and famine have been a source of concern for Indian monarchs since the 13th and 14th centuries. It was under the reign of Muhammad Tughlakh, the first Sultan to take systematic steps to alleviate the consequences of drought, that he provided grains to the people of Delhi who were suffering from its effects. It is likely that Muhammad Tughlakh was the first Sultan to take attempts to mitigate the impact of droughts in a systematic manner (Loveday 1985). In addition to the Mughals, there were other more kings and rulers throughout history who used this strategy, which was later improved upon by successive generations of rulers. Efforts were also made to help those who had been affected by droughts or famines under the British rule of India. During the British rule of India, these programmes were implemented. There were relief operations and food distribution as well as the distribution of fodder and loans for farmers to start farming again the following season. Loans to farmers were also included in this category. Scarcity Guides issued by the British government in 1883 were followed by similar manuals compiled by provincial governments in subsequent decades (Hirway 2001). As a way to help communities still reeling from the effects of the Great Famine, the Royal Commission on Agriculture recommended in 1928 that dry land farming be encouraged as a viable option. In spite of this, little effort was made into it, and while the British were in power, there was a troubling rise in the number of occurrences (Bhatia 1967). Policymakers in the United States have paid much more attention to droughts since the country won its independence than they ever had before. Over the last few decades, the approach to drought management has evolved. Famines no longer exist, and

deaths caused by starvation are extremely rare. Famines are no longer an issue. As part of a three-pronged strategy to battle droughts, the government has implemented the following measures: (1) executing drought-related shortage relief programmes; (2) enhancing water conservation efforts; and (3) raising agricultural productivity. (3) the inclusion of dry farming as an agricultural policy component (2) the implementation of a drought-prone and desert-specific area development programme (abbreviated DPAP and DDP). ) This approach has not been very successful in any way, as seen by the increasing number of drought-prone regions around the country, as well as the relatively high levels of poverty and vulnerability among the people who live in these regions. It is becoming more and more likely that these regions will continue to be isolated in terms of economic progress. If the proper steps are not made to integrate these regions into the economy on a larger scale, the new opportunities brought about by globalisation may pass these regions by. Even while this situation is conceivable, it cannot be ruled out completely. For these reasons and others, it is imperative that researchers conduct research to answer the following questions: (1) whether the policy in India has adequately addressed the multiple dimensions of drought; (2) whether the policy needs to be reoriented or modified; (3) whether the policy implementation should change; and (4) what kind of measures are needed to enable drought-prone areas access the new opportunities afforded by globalisation. The examination will proceed as planned as part of the proposed study.

### **Related Work**

Because of the state's deserts and other drought-prone regions, the people of Gujarat has regressed to a more primitive state as a direct consequence of the state's periodic droughts. In these areas, residents have reported lower household incomes, increased vulnerability, and increased levels of poverty over both the short and long term. It has been decided that the human development status of the residents of these areas, when compared to the rest of the state, is similarly determined to be worrying. As a direct consequence of this, those who live in regions that are prone to drought are at an increased risk of experiencing both physical and socioeconomic suffering. The high incidence of poverty and the poor degree of human development are two indicators that the people who live in the parts of Gujarat that are prone to drought are particularly backward. The extremely low level of agricultural development that has occurred as a direct consequence of the repeated crop failures and droughts that have plagued the area has led to a significant decline in agricultural income. As a direct

consequence of this, a significant number of households in the drought-affected regions of the state are mired in debt. According to the findings of a recent study, the amount of debt in this region is extremely high. The parts of Gujarat that are prone to drought are characterised by a low level of human development, fragility, and difficulty in overcoming hardship. When compared to the rest of the country, these regions are far further behind in terms of overall economic development.

**(Nguyen, VanHieu, et al., 2020)** Droughts, more than any other natural disaster, have the greatest negative impact on people. Every part of the world is susceptible to a drought. When it comes to reducing the negative effects of drought, precise forecasts of future drought episodes are a crucial requirement. If an adaptive inference system (ANFIS) might be utilised for drought forecasting and to identify the quantitative value of drought indices, it was the goal of this research. Two specific indices were of interest: the Standardized Precipitation Index (SPI) and the Standardized Precipitation Evapotranspiration Index (SPEI). Three independent meteorological stations in Vietnam's Khanhhoa Province made it an ideal setting for the study. Sea surface temperature anomalies (SSTA) events in the NinoW zone and the Nino4 zone were selected as input variables for the drought forecast. We trained and tested fifteen ANFIS forecasting models for SPI/SPEI over a period of one, three, six, and twelve months.

**(Chaudhari, Sanjay U et al., 2018)** Nowadays There is a significant issue with water in the region of Shindkheda since the water table has dropped significantly in recent years. There are certain steps that need to be performed in order to overcome this problem. In the coming years, the agriculture industry will experience significant hardship if these significant problems are not resolved. This research investigated an alternative approach to elevating the water table in the Shindkheda region by utilising pipe canals to connect two rivers located at close proximity to one another. Following the completion of the preliminary survey utilising software, the next step is the design phase, and lastly, an analysis of the overall economics of the project is carried out. The entirety of the research effort can be broken down into these three stages.

**(Dr. V. V. Kulkarni et al, 2011)** Both different means of making a living and the variety of life on the earth are closely linked to one another. People who live in areas that are prone to drought face an ongoing threat to their means of subsistence posed by the natural environment in their immediate surroundings. According to the findings of a study that was

conducted in four villages that are situated in a region that is prone to drought, there is variety in cropping pattern, which helps to enhance the resources that people rely on for their means of subsistence. According to the findings of the study, the watershed development programme has a positive influence on the resources that are used for livelihoods (CDI= 0.57 to 0.87). This suggests that there is a good impact on the resources that are used for livelihoods. The traditional agricultural practises that have been used in the past are slowly being phased out and being replaced by newer, more efficient methods of agriculture that make use of high-yielding seed varieties.

**(Sultana, N et al.,2016)** People know that Bangladesh is a country that has a lot of natural disasters, and drought is one of the most common ones. This study looks at a number of different sets of data, including daily maximum temperature readings from drought-prone areas between 1964 and 2013 in the districts of Bogra, Dinajpur, Ishsurdi, Faridpur, and Rangpur. For modelling purposes, data on the highest temperature of each year are used. These data are then fit to generalise extreme value (GEV) distributions and the block maxima technique. The trend in the GEV model takes into account the fact that the daily temperature data also show a trend over time. The likelihood ratio statistics are a good way to compare models with and without trends side by side. The best-fitting GEV model's quantile, which is also called "return levels," is used to figure out drought risk. This quantile is based on what has happened in the past.

#### Proposed methodology

Prior to this, we discussed the factors that led us to choose a certain state and a particular subregion for the purpose of policy formulation. In terms of methodology, the study consisted of the following four steps:

The first step is to compile a database at the block level that includes socioeconomic and ecological information that are pertinent to the production systems. Both attribute and numeric data, as well as data based on maps or other spatial representations, need to be included in the database.

The results were found to be more accurate after the geographical data (landforms and watersheds) and the quantitative data for an administrative unit (such as a block or district) were merged with one another so that both sets of data could be assessed simultaneously.

We carried out a preliminary field study in a few different communities and residences in order to get a better understanding of the current situation and how the risk of drought manifests itself.

conducting research on relevant policy papers and academic material in order to develop a rebuttal case.

A meteorological anomaly known as a drought is a complex occurrence that happens frequently and widely in a particular location over a certain time period. It is possible for it to take place in regions that receive little rainfall as well as in regions that receive a lot of rainfall. It is possible to find it in both lowlands and mountainous regions of the world. It is a specific weather condition that can be defined by the total amount of precipitation that falls over a given period of time in a particular place. The absence of more than 25 percent of the annual average precipitation is what the India Meteorological Department (IMD) considers to be a drought. If this drought continues unabated for a significant amount of time without being addressed, natural disasters may take place. Droughts are notoriously difficult to predict, which is another another way of putting the same point across. In order to provide a profile of the regions of Gujarat that are prone to drought, it is necessary to first understand the fundamental principles associated with droughts. Concepts related to drought Even though droughts can be characterised in a variety of ways, there are a number of different measurements that can be used to identify drought conditions in a particular region and time period. It is a generally accepted principle that the duration of a dry period and the degree of its severity are the two most important factors to consider when determining whether or not a region is going through a meteorological drought. When annual precipitation is less than a quarter of what it generally is in a certain region, that region is regarded as being in a state of drought (Normal rainfall are calculated on the basis of average rainfall for more than a 30 years period i.e. climatological mean for a particular area, however, a longer period say 100 years average gives better result of normal rainfall). The meteorological definition of drought does not take into consideration the factors related to drought that are hydrological, ecological, or human-made. A hydrological drought is present when there is a considerable reduction in the amount of surface water that is available, and dry lakes, reservoirs, and rivers are indications of this condition. The presence of low reservoir storage, low stream flows, aggregate runoff that is less than the long-term normal runoff, and high-altitude rainfall are all indicators that a drought may be present. The SWSI is utilised to ascertain both the

occurrence and the frequency of it (surface water supply index). A severe crop stress brought on by a lack of soil moisture is the defining characteristic of an agricultural drought. The Crop Moisture Index is a metric that is used in agriculture to measure the severity of drought conditions (CMI). Droughts in ecosystems, whether natural or artificially managed, can be caused by sustained reductions in the amount of precipitation that falls. Socioeconomic droughts have an impact on human activities when there is a lack of precipitation that is sufficient to meet their requirements. The principal causes of drought are a lack of precipitation or a delay in the onset of the monsoon season. An estimated fifty million people are impacted by drought on a yearly basis across sixteen percent of the country's entire land area (National Centre for Disaster Management, NCDM). Conditions of drought, if left uncontrolled, can lead to the occurrence of natural disasters. In the year 2005, Bajpai and his fellow employees They have an impact not only on the region that is impacted, but also on the people that make their home in that region. A prolonged drop in agricultural production throughout an entire region will have repercussions for the economy of that area in the long run. It is more common in regions where agriculture is the predominant form of economic activity (Rao, et.al., 1988). Due to a decline in production of a food item, it has a negative impact on household income, employment, and nutrition in the short term. This is because the production of the food item has decreased. Households in regions that are afflicted by drought eventually fall victim to the vicious cycle of poverty (Hirway, 2001). The arid and semi-arid parts of India are prone to experiencing drought on a regular basis. The dry and semi-arid zone extends throughout a significant amount of the northwestern region of India, and the state of Gujarat can be found inside its confines. Every three to four years, a drought will strike the state of Gujarat, which is one of the states in India that is most susceptible to drought. However, data collected over the course of 35 years shows that Gujarat's rural areas have been experiencing drought on an almost annual basis, which has led to circumstances of scarcity and near-scarcity in many of these areas.

### **Need For Multi-Disciplinary Planning**

This shows that an approach that is only one-dimensional and compartmentalised to a limited extent is doomed to fail. They are extremely critical in their criticism of what they call the "anaemic tradition of multidisciplinary concerns," which is the inability of social scientists to bridge the lakshmana rekha that was built by the colonial tradition. 9 The majority of the published research on topics such as tribal development, environmental preservation, natural

resource management, and strategies to mitigate the effects of drought emphasises the importance of interdisciplinary approaches, even though they are insufficient. Geology enables us to gain a deeper understanding of the behaviour of aquifers and the potential for recharge that they offer, as demonstrated by the exercise that we just completed. The morphology of the soil is one of the factors that can be considered when calculating the percolation capacity of the soil. The cropping patterns and irrigation needs should take into account not only the depth and extent of the soil's moisture retention, but also the soil's capacity to retain water on a surface level. This will allow the biomass potential and output growth to be maximised. Both the treatment of wastewater and its recycling in industrial settings, as well as the implementation of technologies that require little to no water for their operation, call for the use of technology and engineering. That is to say, in order to achieve growth that is both equitable and sustainable over the long term, a significant amount of effort from a wide variety of sources is required.

### **Ecological Typologies**

In addition, as part of our work, we categorise blocks according to ecological typologies with the intention of identifying a universal matrix of treatment options that may be utilised across the board for all of these ecological typologies. This constitutes an extra significant turning point in the course of our investigation. A large majority of the efforts that have been devoted towards regionalization up to this point have been concentrated on agroclimatic zoning. In the context of this conversation, landform and terrain are considered to be the single most important factor that either defines or maintains the cohesion of a zone that is comprised of places that are located in close proximity to one another. This represents a substantial divergence from the technique that we have been utilising up until this point; as a result, we have categorised and organised geographically different sites into common typologies. As a result of this, it was required to perform an in-depth and careful investigation of biological factors (rain, soil, slope, cover, and geology), which, in the end, led to the design of a shared matrix of drought-proofing treatments that can be applied across all of the typologies. It has never been done before in the history of the world something of this magnitude, level of detail, or breadth. It is also vital for another reason, and that reason is that it demonstrates both the possibility of and the desire to carry out a similar exercise in other states in Central and Eastern Peninsular India that are comparable, such as Jharkhand and Orissa, for example. This is an important reason for why it is vital. Because of this, it is very important. A method



such as the one that was described above has the potential to provide an extraordinarily detailed database that can be utilised for planning. This database takes into account the specifics of the subregions and classifies the blocks according to their susceptibility to drought, their level of sensitivity to drought, the ecological kinds that they contain, and their level of suffering caused by drought. Each of the offered tactics and treatments is an improvement over the possibilities that are already at one's disposal. This is the case regardless of whatever strategy or therapy is chosen.

### Objective of the Study

In order to achieve the following through our research, we have outlined certain particular goals for ourselves:

Because Gujarat receives relatively little rainfall on average each year, it is vital to investigate the myriad ways in which droughts impact this important state. Short-term and long-term effects on (a) agriculture and the entire economy; (b) natural resources, such as ground and (surface water) land; and (c) poverty and human development, which encompasses variables such as poverty, health and nutrition, literacy and education, and other factors related to these areas.

to investigate the state's drought policy and weigh the merits of the plan against its potential drawbacks. The plan for dealing with the drought will incorporate each and every aspect of the policy.

The management of drought in its many guises, including forecasting, agricultural research in drought-prone areas, shortage relief, the influence of watershed development on agriculture, case studies of drought-proofing houses and businesses, etc., will be the focus of much of the attention that will be paid to this topic. It is important that areas prone to drought be included in the process of economic progress and that they be given the opportunity to benefit from the opportunities that globalisation offers.

### Hypotheses

- The Influence This Will Have On The Environment And Ecology Frequent droughts have a tendency to result in the depletion and deterioration of natural resources, which, in turn, have

a tendency to cause damage to the lives and livelihood of a significant number of people. The environment and the ecology are both impacted as a result of this.

- A negative influence on the general macroeconomic growth of the region as a result of low and uncertain incomes, sluggish economic growth, and coping measures such as migration
- Droughts are more likely to have a detrimental impact on some social groups, including households belonging to scheduled castes and scheduled tribes, as well as women, children, and other social groups such as women. This is because these groups are already in a precarious position, either within their own households or throughout society as a whole, and this circumstance does not improve their lot.

### **Conclusion**

Many issues have arisen as a direct consequence of Gujarat's persistent drought conditions and the recurrent occurrence of droughts across a considerable portion of the state's territory as a whole. It is clear that a significant portion of the state has been included in the area development programme in order to address the connected issues of desertification and drought susceptibility. On the other hand, these regions endure a great deal of hardship as a consequence of the recurrent droughts that cause a great deal of distress for their inhabitants. The profile of drought zones shows that these areas are generally backward and have low services. Although there are strong physical infrastructure facilities in the villages that are prone to drought and are located in remote areas, the people who live in these villages face significant challenges regarding the availability and quality of drinking water. The features of the households in these communities, which were shown, are not particularly hopeful in terms of the socioeconomic progress that has taken place. They have less economic diversity, are mostly involved in agricultural activities, and demonstrate unequal land distribution among the various caste groups. It was discovered that the distribution of landholding is skewed, and the majority of households do not own any land. One of the most remarkable features of drought-stricken regions is the massive outmigration of individuals in pursuit of jobs that will allow them to maintain their standard of living. In addition to this, it is one of the reasons for poor income, especially income from the agricultural sector. The level of literacy is quite low in comparison to the rest of rural Gujarat, and even within the villages that were examined, there is a significant amount of diversity in literacy levels. On the other hand, it has been found that places where there has been a diversification of economic

activity and villages that are close to towns and easily accessible fare better in comparison in terms of the aforementioned qualities. At this moment in time, there is a pressing need to gain a comprehensive understanding of both the frequency and the coverage of drought. In order to mitigate and control the effects of drought in afflicted areas, efficient solutions to ensure drinking water supply through the appropriate management of water resources, particularly in drought-stricken regions, are required. Works relating to scarcity are a short-term answer to this state's long-term challenge of persistent drought. This occurrence of chronic drought conditions in specific locations, particularly in the regions of Saurashtra and Kutch, has led to serious degradation and depletion of natural resources throughout the state.

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