

LEGAL METHODS TO ADDRESS DROUGHT IN THE UNITED STATES

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Abstract

Drought, or an extended shortage of rainfall, is a regular and recurring climatic feature in all climate zones [1]. The socio-economic issue caused by drought accumulates gradually and spreads across a given geographical region. Many responses to drought and its effects focus on immediate needs, which can often be costly and must balance competing interests [2]. Appropriate, proactive approaches would help make these decisions easier and more effective. Good drought management includes preparedness, mitigation, reduction, and early warning strategies. The research paper addresses legal methods for drought management in the United States [3]. Different combinations of socio-economic and environmental factors play a huge role in influencing drought and its implications. To develop effective drought management policies, it is necessary to understand drought's acute effects and their underlying causes [4]. The US government needs to develop and adopt effective federal policies as long-term response mechanisms to mitigate the impact of drought. Drought can cause food insecurity, death of livestock, and malnutrition, which makes it important to increase public awareness and enhance coordination between various stakeholders [5].

keywords: *Climate Change, Drought, Legal, California*

1. INTRODUCTION

Drought is a major challenge facing societies around the globe. It is not just a problem in developing countries or places that are hard to live in. It is different from aridity, a permanent state of low rainfall. Global warming and climate change have caused droughts to increase in frequency and severity, and they are closely linked to desertification because of a prolonged lack of precipitation [6]. Insufficient rainfall endangers the lives of animals, plants, and human beings. Drought has also pronounced a significant reduction in gross primary productivity, resulting in shortages in food production and high global prices [7]. It is estimated that drought causes annual damage of \$7 billion globally and is associated with a great impact on energy consumption, hydropower production, and transportation by the river. Severe drought has spread worldwide, including in Africa, Asia, Latin America, and developed countries. It is a major factor in lowering crop yields, killing livestock, and destroying the resource base of many agricultural enterprises. Prolonged droughts have adversely affected productivity and national economies worldwide [8]. In the United States, much of the country faces drought conditions, particularly in the West. In 2014, over 57 percent of the entire continental US experienced one of the harshest droughts recorded in the country. Over 40 percent of the US has experienced drought in the previous nine decades [9]. The Western region has experienced the worst wildfires of the last five decades, and California has been among the hardest hit by drought in the United States. Its available water supply has fallen by over 25 percent. By the end of summer 2021, the United States drought monitor reported an extreme drought in the western part of the country and found that reservoir.

Most of the states had experienced poor conditions in their rangelands and pastures. Drought also affected the larger parts of northern Mexico, extending to western Canada and from the Pacific Ocean to the plains [10]. The recent consequences of drought and climate change projections have necessitated a systematic approach to documenting and comprehending drought in a useful way for public land and resource managers. As a result, local differences in specific management targets, decisions, and timing within the local socio-ecological natural resource framework are important in comprehending drought impacts, responses, and vulnerabilities [11].



Even though the effects of drought can be severe, there is no comprehensive national drought policy in place. Developing a national strategy would be difficult due to the division of federal and nonfederal duties, the current patchwork of federal programs, and regional variances in circumstances, dangers, and possible remedies. Given the current circumstances, Congress may examine the effectiveness and sufficiency of existing federal actions and initiatives.

Furthermore, while many water allocation and other water management responsibilities are primarily at the state or municipal level, towns and people frequently resort to the federal government for assistance when calamities strike [12]. Apart from relief to the agricultural sector, the overall costs to the federal government and the nation due to significant drought are difficult to calculate, partly due to the wide breadth of the effects of the drought. Congress may also investigate how the two primary federal water management agencies, the Corps and Reclamation, prepare for, respond to, and account for severe drought.

Figure 3 presents the annual evolution of the published papers on Drought-Induced Forest Die-Off Alters Microclimate. It is to be mentioned that although the number is still limited, there has been notable growth over the past five years.

Fig. 1 Number of research articles published per year in the last 10 years, obtained from a search in the Scopus database using the keywords (Drought; Forest; Microclimate) in

1.1 Thesis Statement

The United States has developed methods for the management of droughts. These policies are tied to the country's legal and constitutional framework.

Background of the Problem

The United States, especially the Western region, has experienced prolonged droughts and acute water shortages in the past few years [13]. Water is not necessarily found where needed or in a non-reusable form. Drought conditions produce major socio-economic challenges requiring political and legal solutions. Water shortages caused by prolonged drought have created strained relationships between different states [14]. At least 35 states have had conflicts resulting from competition over water resources.

These states, especially those that depend on agriculture, face significant effects from ongoing water shortages. In 2014, the prolonged drought was estimated to have cost slightly over 17,000 seasonal and part-time jobs. The governor declared a state of emergency because of the severe drought [15]. During this period, the state-supported 17 water systems are expected to experience severe water shortages. For the first time in recorded history, the state began pumping underground water for agriculture and domestic use. Beyond agriculture and domestic use, water is a vital component in the transport, IT, retail, energy, and retail sectors. The drought crisis is, therefore, not just an economic but also an environmental issue that requires a national [15].

The water supply, including rivers, streams, lakes, reservoirs, and underground water, continues to depend on climatic patterns [16]. Innovative solutions, such as reclamation methods and desalination, have mitigated water shortages. Because the water supply is influenced by climate change and global warming, human activities must also be controlled to lessen the impact of the ongoing drought.

The demand for water in the United States is high. The country has the world's largest per capita water consumption rate, more than twice the UK's water demand. New measures to conserve water have reduced this demand substantially [17]. However, water reallocation could be used to address water crises, long-standing legal doctrines, and institutional.

Reallocation could address water crises, but long-standing legal doctrines and institutional rigidities have severely hindered various water trading schemes. Even so, the efficient use of natural resources is important for sustainable economic development. Implementing pragmatic regulations governing natural resources such as water can better position the economy of the United States to handle the



increasing imbalance between the water supply and its demand [18].

2. **Methods Used to Address Drought in the United States**

In 2013, California was among the states hardest hit by drought; seventeen communities faced the prospect of running out of water. Droughts like these involve more than just weather conditions. How water is used also influences the consequences of drought. The following are some critical legal methods and procedures employed in the United States to mitigate drought [18].

Drip irrigation is one of the methods employed to conserve water. In California, the agricultural sector uses over 80 percent of the state's water supply. Without this irrigation, the fertile lands in California's Central Valley (accounting for about 8 percent of the US's total farm production) could become barren. Most water is not used effectively if distributed via Sprinkling methods or flooding fields [19]. Instead, drip irrigation can be used. This method started in Israel and is more effective in saving water than conventional irrigation methods [19]. Although drip irrigation is more expensive than traditional methods, it is necessary given California's increasing water scarcity.

Xeriscaping is employed in drier areas of the United States, such as California. Its grass is unlikely to survive without water in dry regions such as California. This method is increasingly being adopted as a strategy to mitigate drought [16]. Desalination can also help in drought management. Coastal states such as California cannot run short of water since they are near oceans, but they can run short of fresh water.

Desalination technology allows seawater to be made drinkable. Many developed countries like Singapore have also embraced this technology [13]. Dozens of desalinization plants are being set up, including those in Huntington Beach and Carlsbad. However, desalinization has several shortcomings. The technology is extremely expensive and comes with environmental costs since plants often use petroleum-based fuel. Greener options can be embraced to remove salt from water, particularly by using renewable energy sources for plants [5].

Water recycling can help get more use out of limited water resources. Water can be treated for reuse, and wastewater can be used directly for some purposes [11]. In DATE, California developed GRS technology to clean over 70 gallons of sewage daily. This purification system can produce enough safe water for human consumption.

Water conservation is also very important for drought management. Each family in California uses roughly 200 liters of water daily. Simple water-saving behavior, like turning off faucets, can help reduce the water demand [6]. Water utilities also offer rebates for replacing inefficient appliances with new and more efficient ones. In California, the demand for irrigation and urban water has leveled even as the state's economy and population continue to skyrocket [3]. Therefore, California is unlikely to experience long dry spells in other countries. Their statutory government ensures that no drop of water is lost.

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3. **Wrongs with the Previous Research**

According to research done by Adler on Drought, sustainability, and the law, researchers and different agencies have in the recent past made various efforts to respond to drought, and some of these changes have started to change from purely reactive relief-based interventions to programs established to thwart the impacts of drought [19]. Adequate attention has been drawn to laws that may affect practices and policies that could increase or decrease the vulnerability of a drought. In the past, climate scientists have faced difficulty putting together a system-wide view of how climate change impacts people globally due to limited data in formation. Climate change has outperformed the efforts of many scientists to estimate the huge costs. Data availability significantly differs across nations, so local expertise should be invested in it [11]. There has been a misrepresentation of climate change science, a big concern that many scientists have called for the voice of rational scientists.

Additionally, attempts have been made by scientific literature to correct some misconceptions, like an allegation of a slowdown in global warming [13]. Furthermore, some scientists have been confused



about the correct methods used to measure heat waves. This has led to misconceptions and doubt about some research publications, thus derailing the efforts to understand climate change. Most publications have also fallen into an analytical setup, a typical logical failure where they write their findings with false assumptions. Furthermore, climate change researchers have neglected contextual information, such as relevant literature or some other information at variance with their conclusions. Furthermore, much past research has ignored the physical consistencies and interdependencies [15]. It has been found that they lack adequate model evaluation where they did not compare models against independent values not employed for model development. A false dichotomy is a common theme in some research works; for example, they claim that the sun causes global warming without considering GHGs because the two forcings coexist [29]. Furthermore, celestial research papers on climate change have reported fundamentally incomplete physics, and some research claims celestial influences, but they lack elaborate physical reasoning. Some information from attribution studies has falsely claimed that astronomical forcings influence climate change [1-2]. Other instances of erroneous analysis found in this research included irrelevant hypothesis testing and inaccurate statistics.

4. Legal Mechanisms Used to Address Drought in the United States

Over the years, droughts have triggered different federal responses. When local authorities officially declare a drought, a governor, the President, or the Secretary of Agriculture triggers changes, policies, recommendations, activities, and restrictions at the local, regional, federal, and state levels. These responses vary according to the length and severity of the drought [17].

State and local authorities may take different actions before the severity of a drought attracts a federal response. In 2008, the governor of Alabama declared a drought emergency in 10 northern counties per the state's drought management plan [18]. According to this plan, saying the drought as an emergency does not invoke different sets of water users.

NIDIS focuses on early warning of drought and works with other federal and state government agencies to manage drought in the US. It uses the global drought information system and partners with different organizations nationwide. The System Reauthorization Act of 2013 reauthorized, and a similar bill, the Drought Information Act, was passed that same year [34]. In 2006, the Western governors met, after which the form NIDIS Act became law in the same year. This law also led to the birth of the Drought Portal. At the time of the development of this law, the US was experiencing severe drought, which had serious socio-economic consequences in the USA: agricultural production dropped significantly, industries such as hydroelectric power were affected negatively, and industrial output declined overall. The 2013 NIDIS Act amended and revised the NIDIS Act of 2006. The law was meant to give early warnings on drought conditions to allow effective decision-making and to adopt response mechanisms to handle drought conditions throughout the country.

DEWS (Drought Early Warning System) uses various systems to make atmospheric science accessible and useful to stakeholders. It works to improve the capacity to monitor, forecast, and cope with the negative impacts of the drought effectively [13]. This allows for assessing the potential consequences of droughts and helps decision-makers prepare for them [5]. DEWS also offers a legal framework to improve public awareness and education about drought and its causes. Setting up national DEWS is challenging because droughts in different parts of the US are different. Regional DEWS and national DEWS must be an important part of any drought management program. Setting up national DEWS is challenging because droughts in different parts of the US are different. Regional DEWS and national DEWS must be an important part of any drought management program.

Federal aid is another method used by the federal government in drought management. According to the Stafford Act, the President has the power to declare a state of emergency that results in the affected area receiving federal aid. Although the President declared it a national disaster, he declined to issue an emergency drought declaration in response to the governor's request. The last drought declaration issued by a US President was in 1980 for New Jersey. Since drought declarations by the President are so rare, it is uncertain which circumstances might result in such a declaration.



In most cases, the governor requests assistance for drought disaster management and control from the US Secretary of Agriculture. The governor can declare a drought a disaster, requiring federal intervention. In 2012, the Agriculture Secretary announced that 40 Texas counties were affected by drought. Excessive heat, lack of precipitation, high winds, and wildfires caused this. In the same year, the Secretary of Agriculture designated over 1400 counties in 33 states as disaster counties to seek federal assistance from the federal government [16]. Despite the agricultural losses from droughts, Congress's interests in the federal drought assistance programs are not intertwined with the USDA. For instance, the 2012 drought conditions in the USA raised interest in the extent of the drought and whether other federal agencies have legal powers to assist in drought management [11]. For instance, besides operations of the fedwater facilities, the Army Corps of Engineers and the American Bureau of Reclamation possess limited plans for drought management. However, the Corps is exempted from assisting with well construction or shipment of water to drought-distressed farmers and ranchers.

In 2016, President Obama signed a memorandum that directed federal agencies to build capabilities for long-term drought resilience. The NDRP (National Drought Resilience Partnership) was to operate collaboratively to deliver a federal action plan to deal with the country's drought and water issues. The NDRP includes six goals and 27 associated actions. Drought is a major disaster affecting all life aspects [3- 8]. This results in decreased food production, a reduction in the quality of services, and increased prices of basic consumer goods such as food and water. Businesses are also threatened because of increased production costs [13]. Between 1980 and 2000, the US experienced several major droughts and heat waves. Almost 66% of the USA's continent experienced a severe drought in 2012, and this trend is expected to continue. Critical strategies must be developed to mitigate such conditions [14].

NDRP also engages with local and statutory authorities to identify the tools and actions needed to support community drought planning and water resource management. For example, they can support specific elements of a state's drought strategy, such as the protection of forest cover and the improvement of the efficiency of the use of water resources [14]. California has developed water rationing strategies to ensure water is used effectively. There are several federal components of collaborative engagement. One component is preparedness, mitigation, and risk management in regional, statutory, and local areas. Another component comprises actionable, science-based data for informed decision-making [18]. Yet another component involves sustainable water infrastructure [7]. Federal and state agencies cooperate in managing lands and water so that resilient farms and other natural resources such as *Id.* as forests enhance healthy watersheds.

Engagement with the key stakeholders is also integral to drought management and control. In 2015, NDRP hosted top-notch drought management experts. In this summit, the experts discussed the country's water issues in all sectors: government, agriculture, ecological conservation, and the private sector [9]. All involved parties participated in the strategy discussion to help build long-term drought resilience strategies. Federal facilities can also be used to mitigate drought. Sustained hydrological drought is a factor that affects the federal operations of the water reservoirs and other storage facilities such as dams and hydroelectric facilities [9]. For instance, various Corps dams and reservoirs have management plans and strategies for the drought that may result in a trade-off situation. A trade-off occurs where some benefits are foregone to obtain the other benefits.

The drought conditions experienced in California between 2007 and 2009 required response mechanisms such as modification of the reclamation facilities. This included reducing water deliveries to the project contractors of the Central Valley. The reclamation decision made in 2001 aimed to withhold water to support human activities such as fish rearing, agriculture, and household [6]. The negative implications of droughts in California have contributed to such problems as the outbreak of water-borne diseases such as cholera and the migration of birds. Drought forecasts are also used to manage water consumption and water shortage. Drought analysts predict a drought's severity and duration by studying weather and climate patterns [9-10]. Forecasting local, regional, or national droughts can be daunting [10]. It is, therefore, important for water managers at various levels of the



government to study the potential changes in the long-term climatic trends.

5. Conclusion

Drought is a major global challenge that requires policy responses to address. Drought conditions result from natural and human-created conditions, but human activities have been the major cause of prolonged droughts and desertification in the past two centuries. The harmful effects of drought cannot be ignored; it causes food insecurity, water shortages, and economic stagnation. Since 1900, the United States has faced many droughts, especially in the Western regions. Over two-thirds of the continental US has experienced drought in the past few years. Different drought cases require various legal methods to be resolved. These methods are entailed in the discussion. These legal methods aim to create awareness, increase preparedness, and mitigate regional, local, community, and national drought conditions.

Drought is always associated with rainfall. Drought negatively affects the social and economic health of a state. Drought is not a one-day occurrence; it invades gradually and, with time, spreads across the country. A country should always be prepared to prevent the occurrence of drought as prevention is better than cure. A country can avoid and manage drought by preparing in good time and warning its citizens about the likelihood of drought. Drought is not manufactured, and all disciplines must be incorporated into fighting drought. Science and arts should indulge in fighting drought. The US government has harmonized social, political, economic, and environmental factors to manage drought. There is a great need to develop the best methods and, where possible, create them.

7.1 Implications

Drought is a national disaster and should possibly be prevented. A drought-stricken country can never be productive; Drought leads to loss of lives, lack of food, and malnutrition. In the US, the supreme source is the constitution, and any other that contradicts the constitution becomes null and void. Drought has been enshrined in this constitution. The legal department and, specifically, the judiciary have always interpreted these Laws. Drought management must be approached from all perspectives, including Law, Science, and politics. Citizens need to be educated on the importance of conserving the environment and the risks associated with environmental degradation. They need to be taught the best practices which are environmentally friendly. Companies must be warned against harmful emissions of chemicals that are likely to affect the environment.

Water can be recycled to make good use of our few water sources. This includes treating that water for reuse. California has tried this, and it is indeed working; they have more than seventy gallons of water treated daily and released for the public. Conserving water plays a very key role in drought management. The government and Law enforcement agencies need to work tirelessly. The regulations on water conservation and prevention of the environment must be adhered to; perpetrators should be subjected to severe punishment. National Disaster Management authorities must emphasize Drought; Drought can weaken a state completely within a few years. Drought does not occur like an Emergency; its occurrence can be seen, and there is, therefore, the need to protect drought from occurring. Its side effects are not friendly to both the people and the environment.

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