

CLIMATE CHANGE AND THE TRIPLE THREAT; WATER SCARCITY, AGRICULTURAL DECLINE, AND FOOD INSECURITY IN INDIA

AUTHOR – POOJA.S.P, LL.M STUDENT AT CENTRAL UNIVERSITY OF KERALA

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Abstract

Climate change is an all-around threat to India, affecting water resources, agriculture productivity, and food security, commonly described as a "triple threat." Increased temperature globally, irregular rainfall, melting of glaciers, and more frequent occurrences of extreme climate events like floods and droughts have undermined ecosystem processes and human lives. Whereas previous research has studied these problems in silo, a gap in research exists to comprehend the interlinked legal, socio-economic, and environmental implications of climate change on the water-agriculture-food nexus in India.

Statement of problem:

India's agriculture sector, which sustains more than 40% of the population and contributes meaningfully to GDP, is very sensitive to climate variability. Water shortage caused by declining river flows, groundwater overdraft, and uneven rainfall impacts irrigation and access to drinking water. Productivity in crops decreases as heat stress, pest infestations, and uneven precipitation interfere with the production of staples like rice, wheat, pulses, and cotton. These interferences compromise food security through decreased availability, rising prices, and compromised nutritional quality. The highest socio-economic cost falls on vulnerable groups, i.e., smallholder farmers, landless agricultural laborers, and poor rural households. In spite of the given legal mechanism constitutional protection (Articles 21, 48A, 51A(g)), environmental law (Environment Protection Act, 1986; National Water Policy, 2012), and judicial activism (Subhash Kumar v. State of Bihar, 1991; Vellore Citizens Welfare Forum v. Union of India, 1996; M.C. Mehta v. Kamal Nath, 1997) gaps in implementation narrow down the effective protection.

Research Questions:

1. How do climate change impacts at the same time influence water resources, agriculture, and food security in India, and what are the socio-economic implications?
2. What are the ways legal institutions, judicial interventions, and policy actions can reduce these impacts?

Objectives

To explore the intertwined legal, socio-economic, and environmental aspects of climate-related risks; determine groups and areas most at risk; and suggest implementable strategies for resilience, adaptation, and enforcement.

Hypothesis

Climate change multiplies threats in water, agriculture, and food systems, and the interlinking of legal protection with socio-economic adaptation strategies can reduce exposure, enhance food security, and foster inclusive development.

Methodology

The research employs doctrinal legal analysis on constitutional provisions, statutory laws, and

court judgments supplemented by secondary data from government publications, agricultural surveys, climate analysis, and regional case studies on droughts, floods, and crop failure.

Major Findings

Climate change has resulted in decreased river flows, groundwater extraction, declining agricultural production, and food insecurity, directly impacting poor and vulnerable groups disproportionately. Environmental rights and inter-generational justice are recognized in law, but enforcement loopholes are widespread. Socio-economic effects comprise loss of income, rural indebtedness, migration, malnutrition, and price volatility of food. Examples include Maharashtra and Karnataka droughts, Bihar floods, and unreliable rainfall in Punjab and Haryana, negatively impacting staple foods.

Recommendations

The measures comprise climate-resilient varieties, water-saving irrigation, watershed management, diversification of crops, community adaptation, and social safety nets. Hardening legal enforcement together with socio-economic interventions is necessary to provide for sustainable water, agriculture, and food systems for both current and coming generations.

Keywords: Climate Change, Water Scarcity, Agriculture, Food Security, India, Legal Interventions, Socio-Economic Impacts, Adaptation

INTRODUCTION

India is amongst the most climate change-vulnerable countries, considering that it is agriculture-dependent, densely populated, and has unpredictable monsoon rain. Agriculture provides a job to more than 40% of its people and adds almost 17% to GDP, and therefore the sector is fundamental to economic stability, food security, and rural livelihoods. The rising incidence of severe weather events like droughts, floods, heatwaves, and cyclones has heightened threats to water supplies, crop

yields, and food supply chains. Warmings and glacial melt risk the perennial river basins, e.g., the Ganga, Brahmaputra, and Indus, critical for irrigation, hydropower, and potable water supplies.

The triple menace of climate change that is water scarcity, agricultural decline, and food insecurity is linked. Water scarcity due to overexploitation of groundwater and erratic rainfall reduces irrigation capacity, affecting crop yields. Agricultural decline leads to economic losses, particularly for smallholder farmers who rely on rain-fed farming. Reduced crop output destabilizes food supply, increases prices, and threatens nutritional security, disproportionately impacting low-income and marginalized communities. Social consequences include rural indebtedness, forced migration, and increased vulnerability of women, children, and indigenous populations.

Legally speaking, India's Constitution has a strong mechanism to tackle environmental and climate issues. Article 21 ensures the right to life and includes a healthy and clean environment. Article 48A instructs the state to preserve natural resources, forests, and environmental balance, and Article 51A(g) places a fundamental duty on the citizens to conserve the environment. Judicial decisions have strengthened these rights. In *Subhash Kumar v. State of Bihar*¹²⁴², the Supreme Court held groundwater depletion as a violation of Article 21. Then in *Vellore Citizens Welfare Forum v. Union of India*¹²⁴³, the Court highlighted intergenerational equity as an aspect of sustainable development and *M.C. Mehta v. Kamal Nath*¹²⁴⁴ enforced the Public Trust Doctrine over natural resources. These legal norms form the foundation of climate justice and resource conservation in India.

With the existence of legal protection, there are gaps in implementation, especially in water regulation, agricultural policy, and food

¹²⁴² *Subhash Kumar v. State of Bihar*, AIR 1991 SC 420.

¹²⁴³ *Vellore Citizens Welfare Forum v. Union of India*, AIR 1996 SC 2715

¹²⁴⁴ *M.C. Mehta v. Kamal Nath*, (1997) 1 SCC 388A

distribution channels. Socio-economic disparities compound climate change effects, and marginalized communities bear the brunt disproportionately. To craft effective resilience, sustainable development, and food security strategies, it is important to recognize these interconnected aspects such as environmental, socio-economic, and legal.

The contribution of climate change to water, agriculture, and food security in India is analyzed in this paper using legal, socio-economic, and environmental considerations. It integrates case law interventions, regional examples, and case studies to point out vulnerabilities, gaps, and suggested measures for avoiding risks and ensuring sustainable development for present as well as future generations.

IMPACT ON WATER RESOURCES

Water is a vital natural resource supporting agriculture, industry, and human use, but it is becoming increasingly vulnerable to climate change in India. Temperature rise, irregular rainfall, and glacial melt are modifying the hydrological cycle, leading to both droughts and floods. The Himalayan glaciers that supply India's key rivers such as the Ganga, Yamuna, Brahmaputra, and Indus are in retreat, resulting in decreased river flows during dry periods and unsteady discharge regimes during monsoons. These fluctuations impact irrigation-based agriculture, drinking water supply, and hydroelectric power generation directly. Overuse of groundwater has been a cause of serious concern. Areas like Punjab, Haryana, Maharashtra, and Karnataka have seen high groundwater depletion because of overwithdrawal for irrigation purposes and patchy rainfall. Rain shadow areas, like Marathwada and Vidarbha, experience severe water shortages, affecting agricultural production and domestic water availability. Alternatively, water rich states such as Bihar and Assam have an abundance of water in the short term but face repeated flooding that pollutes drinking water, ruins crops, and ruins

infrastructure, leading to long-term water insecurity. On a socio-economic level, water shortage has extremely serious impacts on rural communities. Subsistence crops irrigated by smallholder farmers are affected by crop loss, lower income, and higher exposure to debt and migration. Women and children are forced to bear the brunt of fetching water during shortage, resulting in lower educational attainment and increased gender inequality. Drought-hit communities regularly turn to informal labor or migration, upsetting social cohesion and economic stability.

Legally, water has been a fundamental resource covered under Article 21 of the Constitution, read to cover the right to clean water. In *Subhash Kumar v. State of Bihar*¹²⁴⁵, the Supreme Court underlined that the depletion or pollution of groundwater is against the right to life. The National Water Policy¹²⁴⁶ underlines sustainable use of water, fair distribution, and involvement of the people in management. Moreover, judicial decisions like *M.C. Mehta v. Kamal Nath*¹²⁴⁷ invoked the Public Trust Doctrine, reaffirming that water and other natural resources are held in trust by the State for public use, and overexploitation for private ends is not allowed.

In spite of these legal protections, implementation gaps remain. In many areas, there is poor water governance, poor monitoring of extraction, and absence of community-level management, exacerbating climate vulnerability. Adaptive strategies like rainwater harvesting, watershed development, conservation-friendly irrigation methods, and groundwater recharge schemes are central to providing long-term water security. The union of legal enforcement and socio-economic interventions can safeguard vulnerable groups, support agriculture, and preserve ecological balance, and hence address one of the most

¹²⁴⁵ *Supra note 1*

¹²⁴⁶ Government of India, Ministry of Water Resources. (2012). *National Water Policy, 2012*. Government of India. <http://moar.gov.in>

¹²⁴⁷ *Supra note 3*

significant facets of climate-induced risk in India.

IMPACT ON AGRICULTURE

Indian agriculture is extremely climate-sensitive and ranks among the most exposed sectors to global warming, irregular rainfall, and extreme weather conditions. Most of Indian agriculture relies on monsoon rains, and a change in rainfall patterns directly affects productivity of crops. Increased temperatures, out-of-season rainfall, and recurring droughts have already led to substantial yields declines of staple food crops like rice, wheat, pulses, and cotton. For example, the Maharashtra-Karnataka drought of 2015 led to large-scale crop failure, which had a disastrous impact on millions of smallholder farmers and contributed to an increase in rural indebtedness and migration. Likewise, the unseasonal rain in Punjab and Haryana has caused heavy losses in wheat and paddy production, influencing national food stocks. Outbreaks of pests and diseases have grown under warmer temperatures and humidity, lowering yields and quality even further. Warmer winters in central India, for instance, have enabled pest populations, e.g., the pink bollworm in cotton, to multiply, resulting in losses to farmers. Heat stress during flowering and grain-filling has resulted in lowered productivity in major cereal crops, while flooding in eastern India has ruined standing crops, derailing the agricultural calendar and supply chains.

From a socio-economic viewpoint, Marginal and small-scale farmers, who are the vast majority of rural families, are adversely affected disproportionately owing to restricted access to irrigation, credit, and technology. Crop losses cut family income, growing poverty, indebtedness, and food insecurity, and frequently push seasonal migration towards towns. Women, who are most engaged in farm work and post-harvest processing, experience more workload, less income, and greater exposure to social disparities. Malnutrition and stunting among children are prevalent in

drought-affected areas like Vidarbha and Marathwada, which shows the interconnectivity of climate, agriculture, and public health.

India legally has systems for safeguarding agricultural sustainability. Article 48A of the Constitution instructs the state to protect ecological balance and natural resources, including those nurturing agriculture. The Environment Protection Act¹²⁴⁸ and National Policy for Farmers¹²⁴⁹ and National Mission on Sustainable Agriculture offer arrangements for encouraging climate-resilient farm practices. Judicial rulings, like Vellore Citizens Welfare Forum v. Union of India¹²⁵⁰, promote the concept of intergenerational equity, which can be used to regulate sustainable farming practices and avoid future food shortages.

Adaptation measures cover crop varieties that can survive in drought conditions, precision irrigation systems, crop diversification, managed pest populations, and micro-insurance for small-scale farmers. Community action and farmer capacity-building programs are also critical to build resilience. Incorporating socio-economic factors, including fair access to technology and financial assistance, guarantees that climate adaptation not only preserves crop productivity but also rural livelihoods and vulnerability to cascading climatic impacts.

IMPACT ON FOOD SECURITY

There are four main dimensions of food security. They are availability, access, utilization, and stability. Climate change jeopardizes all four pillars by interfering with agricultural production, food supply chains, and household availability to nutritious food. Increased temperatures, unpredictable rainfall, floods, and droughts lower the yield of crops and influence the dates of sowing and harvesting, leading to shortages of staple grains like rice, wheat, and pulses. For example, the 2019 floods in Bihar

¹²⁴⁸ Government of India. (1986). *The Environment (Protection) Act, 1986*. Ministry of Environment, Forest and Climate Change. <http://moef.gov.in>

¹²⁴⁹ Government of India, Ministry of Agriculture. (2007). *National Policy for Farmers, 2007*. Government of India. <http://agricoop.nic.in>

¹²⁵⁰ *Supra note 3*

ravaged huge areas of rice and maize crops, lowering locally available food and pushing up prices at the market. In the same vein, drought in Maharashtra and Karnataka resulted in major crop loss, perpetrating severe food insecurity among smallholder farmers and landless laborers.

The socio-economic effect of food insecurity is immense. Rural communities living on subsistence farming experience loss of income, decreased purchasing power, and heightened exposure to malnutrition. Women and children suffer specifically as nutritional deficiencies can give rise to stunting, anemia, and impaired cognitive development. Rural-urban seasonal migration tends to lead to decentralized family structures, disruption of community care systems, and enhanced labor exploitation. Urban low-income households are also affected by food price volatility due to climate-driven crop failures, citing the interconnected nature of rural and urban food security.

Legally, the right to food in India has been defined under Article 21 (Right to Life) through judicial activism, making the state accountable towards food insecurity. The Right to Food Act¹²⁵¹ makes it obligatory to supply subsidized food grains to vulnerable sections. Additionally, judicial rulings like *M.C. Mehta v. Kamal Nath*¹²⁵² and *Vellore Citizens Welfare Forum v. Union of India*¹²⁵³ enshrine environmental protection as part of ensuring livelihoods and the rights of future generations. These paradigms give a legal basis for incorporating measures of climate adaptation into food security planning.

Some of the adaptation measures against climate-induced food insecurity are climate-resilient crops, enhanced storage facilities, food distribution networks, crop insurance, and early warning systems. Policy interventions like the National Food Security Mission and public distribution system reforms are intended to decrease vulnerability among marginalized

groups. Socio-economic interventions, such as community-based interventions, women's agricultural training, and targeted nutritional assistance, boost adaptive capacity. The connection of legal enforcement, policy planning, and socio-economic support ensures that food systems are kept stable and available in the face of climate shocks while ensuring the right to adequate food for present and future generations.

By confronting the legal, socio-economic, and environmental aspects of food security, India is able to counteract the effects of climate change among its people, minimize inequality, and ensure sustainable development based on the principles of intergenerational equity and climate justice.

LEGAL FRAMEWORK AND JUDICIAL INTERVENTIONS

India boasts a strong constitutional and legislative framework to deal with environmental protection, management of resources, and climate-related problems such as water shortages, agricultural losses, and food deficiency. The Constitution inculcates environmental responsibility both in the basic rights as well as in the duties. Article 21, namely the right to life, has been interpreted by the courts in a liberal manner to encompass the right to a healthy and clean environment, including access to water, air, and food. Article 48A obliges the State to preserve and promote the environment, forests, and ecological balance, and Article 51A(g) places a responsibility on each citizen to safeguard the environment for the welfare of the current and future generations.

The judiciary has also taken a key role in upholding these constitutional principles. In *Subhash Kumar v. State of Bihar*¹²⁵⁴, the Supreme Court ruled that groundwater contamination and excessive extraction harmed the right to life under Article 21, directly equating environmental protection with the well-being of people. In the

¹²⁵¹ Government of India. (2013). *The National Food Security Act, 2013*. Ministry of Law and Justice. <http://egazette.nic.in>

¹²⁵² *Supra* note 2

¹²⁵³ *Supra* note 3

¹²⁵⁴ *Supra* note 1

same vein, in *Vellore Citizens Welfare Forum v. Union of India*¹²⁵⁵, the Court identified intergenerational equity as a necessary element of sustainable development, holding that environmental degradation today creates legal and moral duties on both citizens and government to safeguard resources for posterity. In *M.C. Mehta v. Kamal Nath*¹²⁵⁶, Public Trust Doctrine was invoked, focusing on the point that natural resources such as water, air, and forests are held by the State in trust for public purposes, and exploitation for private benefit is violative of this principle.

Statutory provisions augment these constitutional requirements. The Environment Protection Act, enunciates exhaustive regulatory authorities to the government with a view to preventing pollution, conserving natural resources, and enforcing environmental norms. The National Water Policy¹²⁵⁷ focuses on equitable distribution, sustainable utilization, and participatory water resource management. Furthermore, the Food Security Act¹²⁵⁸ incorporates legal duties for providing access to proper food, taking cognizance of the link between environmental stability and socio-economic welfare.

Socio-economically, judicial and legal interventions provide safeguard to marginalized groups disproportionately impacted by climate change. Landless laborers, rural poor, and smallholder farmers gain from legally enforceable rights over water, land, and access to food, which lessens exposure to climate shocks. Community-based legal systems and tribunals, like the National Green Tribunal (NGT), have come into being to resolve environmental conflicts effectively, reconciling developmental requirements with green protection.

In spite of these strong mechanisms, there are still challenges such as weak enforcement, low citizen awareness, policy disintegration, and

poor integration of climate adaptation plans. Legal compliance and citizen participation must be strengthened to ensure that constitutional rights, statutory provisions, and judicial principles genuinely protect water, agriculture, and food security against the increased effects of climate change.

CHALLENGES AND ADAPTATION STRATEGIES

Climate change poses interconnected and challenging issues for India, impacting water resources, agriculture, and food security. Water scarcity is worsened by overexploitation of groundwater, poor irrigation, and unpredictable monsoons. For instance, states like Maharashtra, Karnataka, and Rajasthan regularly experience serious droughts, causing crop failures, income loss, and rural distress. In contrast, floods in Bihar, Assam, and Odisha displace people, pollute drinking water, and reduce standing crops, illustrating that the impacts of climate are location-specific but ubiquitous.

Agriculture is very susceptible, with smallholders suffering the worst from climate variability. Floods and droughts lower production of staples like rice, wheat, pulses, and cotton. Heatwaves in Haryana and Punjab interfere with wheat production, while warmer temperatures-enhanced pest infestations ruin cotton and vegetable crops. Socio-economically, this interference augment seasonal migration, rural indebtedness, and food insecurity, especially for marginalized groups like women, landless workers, and tribes.

Food security is jeopardized through reduced crop yields, supply chain dislocation, and price fluctuations. Rural livelihoods are confronted with decreased purchasing power, undernutrition, and restricted access to government welfare programmes. Urban communities also suffer vulnerability in the form of increasing food prices and dependency on climate-deteriorated rural production. Legal safeguards, including the Right to Food Act (2013) and judicial readings of Article 21, are essential but are hampered by enforcement

¹²⁵⁵ *Supra note 2*

¹²⁵⁶ *Supra note 3*

¹²⁵⁷ Government of India. (2012). *National Water Policy, 2012*. Ministry of Water Resources. <http://jalshakti-dowr.gov.in>

¹²⁵⁸ Government of India. (2013). *The National Food Security Act, 2013*. Ministry of Law and Justice. <http://legislative.gov.in>

challenges, especially in disaster-susceptible areas. Adaptation strategies need to be multi-dimensional. For water management, rainwater harvesting, watershed development, groundwater recharge, and efficient irrigation systems (drip and sprinklers) are crucial. For agriculture, climate-resilient crop varieties, crop diversification, integrated pest management, and insurance programs (e.g., Pradhan Mantri Fasal Bima Yojana) increase resilience. Food security can be made stronger through better storage infrastructure, public distribution systems, and community-based nutrition schemes. Legally, judges and regulatory agencies such as the National Green Tribunal (NGT) can enforce environmental standards, regulate sustainable use of water, and enforce compliance with environmental standards. Judicially imposed Public Trust Doctrine and precautionary principle offer tools for avoiding excessive use of natural resources. Combining these legal systems with socio-economic measures makes adaptation inclusive, equitable, and sustainable. Local participation is central. Capacity-building of local stakeholders, especially women and disadvantaged groups, in water management, crop planning, and food distribution improves resilience. Public awareness campaigns and capacity-building programs facilitate behavioral change to enable the effective use of climate adaptation measures.

In summary, climate change challenges are socio-economic and legal as well as environmental. Successful adaptation calls for the alignment of legal protection, technological measures, community engagement, and policy integration to make water, agriculture, and food security systems resilient and just.

WAY FORWARD AND CONCLUSION

Combating the triple threat of climate change like water scarcity, agriculture decline, and food insecurity calls for an integrated strategy which incorporates legal enforcement, policy transformation, technological development, and socio-economic interventions. The course

of action needs to accept that climate change is both a development and environmental issue, with consequences for livelihoods, public health, and national food security.

Policy interventions need to put climate-resilient agricultural and water systems first. Watershed management strengthening, encouraging improved irrigation methods, and rainwater harvesting at the farm and community levels are crucial for ensuring sustainable water utilization. For agriculture, using drought- and flood-tolerant crop varieties, crop diversification, and integrated pest management can increase productivity while lowering vulnerability. Food security policy interventions, including strengthening storage and distribution systems, making public distribution more resilient, and increasing the coverage of insurance for farmers, are essential for ensuring that socio-economic effects are mitigated.

Institutional and legal steps are key to enforcing environmental justice and defending natural resources. Judicial interventions like *Subhash Kumar v. State of Bihar*¹²⁵⁹ and *Vellore Citizens Welfare Forum v. Union of India*¹²⁶⁰ set strong precedents for linking environmental protection with fundamental rights and intergenerational equity. The Public Trust Doctrine, precautionary principle, and polluter-pays principle need to be implemented through enhanced regulation by regulatory bodies and the National Green Tribunal (NGT). Legal observance needs to be extended to groundwater management, sustainable land use, and anti-pollution measures, with a view to maintaining natural resources available for current as well as future generations.

Socio-economic measures are also crucial. Strengthening smallholder farmers, women, and the poor through capacity development, access to technology, and credit ensures inclusive adaptation. Community management of water resources, participatory agricultural planning,

¹²⁵⁹ *Supra note 1*

¹²⁶⁰ *Supra note 2*

and local food security programs enhance resilience and social equity. Public information campaigns on climate change, water conservation, and nutrition can induce behavior change and support sustainable practices.

Technological innovation can be supplemented by legal and socio-economic measures. Remote sensing, GIS-based irrigation planning, weather forecasting, and precision agriculture can enhance the use of resources and reduce losses. Incorporation of these technologies into policy and community plans can enhance decision-making and adaptive capacity.

Overall, climate change imperils India's water resources, agriculture, and food security, with disproportionate effects on the vulnerable. A multi-faceted strategy enforcement through law, strong policy frameworks, socio-economic integration, technological advancement, and people's participation is the key to addressing these impacts. If India incorporates environmental justice, intergenerational fairness, and sustainable processes into climate adaptation planning, it can secure livelihoods, guarantee food security, and enhance resilience to future climate events. This combined trajectory is pivotal to ensuring sustainable development, social justice, and environmental harmony so that India is able to address the needs of today's and tomorrow's generations in a climate change world.

BIBLIOGRAPHY

1. *Subhash Kumar v. State of Bihar*, AIR 1991 SC 420.
2. *Vellore Citizens Welfare Forum v. Union of India*, AIR 1996 SC 2715.
3. *M.C. Mehta v. Kamal Nath*, AIR 1997 SC 1125.
4. *Constitution of India*, Articles 21, 48A, 51A(g).
5. *Environment Protection Act, 1986*.
6. *National Water Policy, Ministry of Water Resources, 2012*.
7. *Right to Food Act, 2013*.
8. *Government of India, National Mission on Sustainable Agriculture, 2010*.
9. *Government of India, National Food Security Mission Reports, 2018–2023*.
10. *Intergovernmental Panel on Climate Change (IPCC), 2023*.