

# Intersectionality and Environmental Sociology: Examining Climate Change, Gender, and Caste among Rural Women in Haryana

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## Abstract

This research investigates the intersectional effects of climate change on rural women across caste and social groups in Haryana, India. Drawing from environmental sociology and intersectionality theory, the study examines how gender, caste, and class hierarchies shape women's vulnerability, adaptive capacity, and resilience to environmental stress. Based on a mixed-methods approach involving 500 women respondents across five districts—Hisar, Kaithal, Fatehabad, Jhajjar, and Mahendragarh—the research identifies differential access to water, land, credit, and technology among Scheduled Castes (SC), Other Backward Classes (OBC), and upper-caste women. Findings reveal that women from lower castes are disproportionately affected by crop failure, water scarcity, and household food insecurity, while upper-caste women experience social restrictions that limit their adaptive roles. The study argues that climate adaptation policies must address not only ecological factors but also entrenched social hierarchies. It concludes by emphasizing the integration of gender-caste sensitivity in Haryana's climate governance and rural development frameworks.

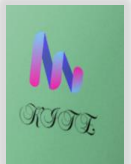
**Keywords:** Climate change, Gender; Caste, Rural women, Environmental sociology, Social vulnerability, Adaptation

## 1. Introduction

Climate change is one of the most complicated and multi-faceted problems facing humanity today. Its effects go far beyond the environment and into the fundamental fabric of society. Researchers are increasingly asserting that climate change is not solely an environmental occurrence but a profound social process that transforms livelihoods, reallocates power, and alters gender and caste dynamics throughout the Global South. In India, where farming supports almost half of the people, rural women are in the front lines of environmental damage. Their everyday use of natural resources—getting water, getting firewood, taking care of animals, and running subsistence farms—puts them in a location where they are both ecologically vulnerable and socially and economically marginalized. The Central Pollution Control Board (CPCB) and the Central Ground Water Board (CGWB) say that Haryana's groundwater has been becoming worse very quickly over the past twenty years. In some districts, the levels of nitrates and fluorides are higher than the limits set by the WHO and BIS [1]. This kind of damage has a direct impact on rural women, who are in charge of managing the water in their homes and are also the unpaid labor force that keeps Haryana's agricultural economy going.

In Haryana, which is mostly an agricultural and semi-arid state, climate changes like late monsoons, groundwater depletion, and very hot weather have caused big problems for farming and health in rural areas. The Indian Agricultural Research Institute (IARI) conducted a survey from 2019 to 2022 and found that wheat yields have dropped by up to 15% in central and southern Haryana districts like Bhiwani, Hisar, and Mahendragarh. In these areas, women make up more than 60% of the informal agricultural labor force [2]. Additionally, statistics from the Centre for Science and Environment (CSE, 2021–2022) show that women in rural Haryana walk an average of 2–4 km every day to get clean water during the hottest months of the year, which puts them at risk for heat-related illnesses and musculoskeletal disorders [3]. The Haryana State Action Plan on Climate Change (2022) further emphasizes that caste-based exclusions exacerbate gender disparities: Scheduled Caste (SC) and Backward Class (BC) women frequently inhabit low-lying, inadequately maintained hamlets, which are more susceptible to contaminated water sources and flooding during unpredictable monsoon seasons [4].

Environmental sociology provides essential conceptual frameworks to analyze the



interrelations between ecological and society. It examines the influence of social structures—patriarchy, caste hierarchy, and economic inequality—on environmental dangers and the capacity for adaptation. In this analytical context, intersectionality theory (Crenshaw, 1989; Collins, 2000) is essential for comprehending how intersecting identities—gender, caste, class, and rural location—converge to create compounded vulnerabilities. For example, a Dalit woman farmer in Haryana faces not just natural shocks like drought and soil fertility loss, but also structural obstacles to land ownership, financing, and extension services. Environmental instability and deep-seated societal inequality both limit her ability to adjust. The NITI Aayog (2021) report on Women and Climate Resilience in Rural India shows that more than 70% of rural women farmers in Haryana do not have their own land titles. This means that they cannot get institutional climate support, which is a clear example of intersectional inequality [2].

### Objectives of the Study

1. To analyze how gender, caste, and class interact to shape the vulnerability of rural women to climate change in Haryana.
2. To examine differential access to environmental resources—land, water, credit, and technology—across caste groups.

### 2. Review of Literature

#### Vinod K. Hariharan et al. (2020)[5]— SpringerLink

Vinod K. Hariharan and colleagues (2020) executed a seminal mixed-methods study entitled “Does Climate-Smart Village Approach Influence Gender Equality in Farming Households?” contrasting “climate-smart villages” (CSVs) and non-CSVs in the Indian states of Haryana and Bihar. They created a Gender Empowerment Index for CSVs (GEI-CSV) that included measures of political, economic, social, and agricultural engagement. The study, which focused on Haryana, found that CSVs made a big difference in women's ability to make decisions about the home, manage crops, and earn money compared to communities that didn't have CSVs. The authors emphasized that gender parity in Haryana was associated with increased empowerment, whereas in Bihar, parity frequently indicated mutual impoverishment. They also stressed that caste is a constant factor that affects women's ability to use modern technology and participate in community institutions. The findings emphasize that although technical interventions can foster equality, institutional support and social inclusion policies are crucial for maintaining empowerment. Analyzed through the Capability Approach and Gender-and-Development Theory, the study illustrates that mere access to technology does not alter established power dynamics; genuine empowerment occurs when women's capabilities are enhanced through equitable institutions, acknowledgment of caste realities, and resource accessibility.

#### N. Chanana-Nag & P.K. Aggarwal (2020)[6] — Climatic Change

In 2020, N. Chanana-Nag and P.K. Aggarwal wrote an important essay for Climatic Change called “Women in Agriculture, and Climate Risks: Hotspots for Development.” Using data from across the country, the authors found 36 climate-risk hotspots in ten Indian states where many women farmers are at danger of severe drought, too much rain, and heat waves. The method used climate data and population data to find areas that needed priority adaption investments. They said that 14.4% of India's women farmers live in places that are very dangerous, and many of these areas are in Haryana's semi-arid districts. The authors supported gender-specific interventions, including localized weather advisories, micro-insurance, and extension systems focused on women. Their conclusions are consistent with Feminist Political Ecology and Environmental Justice frameworks, contending that climate risk is not solely ecological but socially distributed across caste, class, and gender. The spatial representation of risk thus serves as an instrument for redistributive justice, emphasizing the critical intersection of social location and climate danger, especially for landless and lower-caste women.

#### ICAR–IARI (2015)[7] – How climate change affects Indian agriculture

The ICAR–Indian Agricultural Research Institute (2015) performed a groundbreaking



vulnerability assessment of Indian agriculture utilizing climate predictions, crop models, and socio-economic variables. The research indicated that Haryana's rice-wheat system is among the most susceptible to climate change, attributed to increasing temperatures, diminishing groundwater resources, and yield losses caused by heat. The report emphasized that gendered access to irrigation, extension services, and credit continues to be a significant factor influencing adaptive capability. Women, particularly those from underprivileged castes, are inadequately represented in agricultural decision-making, hence constraining communal resilience. The research determined that climate adaptation must encompass gender equity, social inclusion, and participatory governance. Its analytical framework corresponds with sustainability science and intersectional vulnerability theory, emphasizing that technical solutions are inadequate without confronting social disparities within Haryana's agrarian community.

#### **National Campaign on Dalit Human Rights (NCDHR) and Partners (2013)[8]**

In 2013, the National Campaign on Dalit Human Rights (NCDHR) and other groups worked together to write an advocacy-based research paper called "Impact of Climate Change on Life and Livelihood of Dalits." This policy analysis and case study compilation from Assam and Karnataka analyzed the influence of caste hierarchies on vulnerability, access to relief, and post-disaster recovery. The results showed that most climate and disaster-risk-reduction (DRR) programs in India don't take caste into account. This means that Dalit communities are systematically left out of resources for adapting, credit, and disaster relief. The report emphasized the immediate necessity for comprehensive social protection systems and the inclusion of Dalit groups in climate governance institutions. The report has very important effects on Haryana's rural landscape: Dalit women agricultural laborers, frequently landless, encounter various dimensions of oppression that exacerbate climate vulnerability. The report, viewed through the frameworks of Environmental Justice and Caste Critique, delineates the interplay between climatic danger and social power, advocating for policies that ensure acknowledgment, participation, and redistribution to protect the rights of Dalit women against environmental injustice.

#### **Surinder S. Jodhka (2012)[9] - Caste and Rural Transformation**

In *Caste: Oxford India Short Introductions* (2012), Surinder S. Jodhka offered a sophisticated analysis of caste as a fluid social construct rather than a fixed system. Based on his extensive fieldwork in communities in northern India, Jodhka contended that, despite economic development, caste continues to delineate access to land, credit, and irrigation—all crucial factors influencing adaptive ability in the context of climate change. The research indicated that Dalit and lower-caste women are disproportionately engaged in casual wage labor and are the least prepared to handle environmental hazards, such drought or water scarcity. He stressed that the political economy of caste and gender must be used to understand how vulnerable agrarian societies like Haryana are to climate change. Jodhka's intersectional findings connect environmental sociology and development studies by illustrating how economic liberalization and ecological stress strengthen old hierarchies in new ways.

#### **Bina Agarwal (2010)[10] – Gender and Green Governance**

In her groundbreaking study *Gender and Green Governance* (2010), Bina Agarwal analyzed the impact of women's involvement in environmental decision-making on ecological sustainability and equity in rural India. Agarwal's extensive field investigations in community forestry and water resource management throughout Indian states demonstrated that gender inequity, caste hierarchies, and class systems synergistically influence environmental governance. She contended that the exclusion of women, especially those from underprivileged castes, from local organizations adversely affects both environmental outcomes and social justice. Her research highlights that environmental degradation is not gender-neutral; rather, it links with patriarchal property systems and caste-based exclusion. The research determined that empowering rural women via collective action and resource accessibility enhances their adaptive capacity to climate change. The work utilizes an ecofeminist and intersectional political economy theory, pertinent to Haryana, where Dalit





women's limited access to irrigation and forest commons reflects these structural injustices.

### **Prem Chowdhry (2009)[11] - Gender, Power, and Identity in Haryana**

Prem Chowdhry's (2009) book *Gender, Power, and Identity in Haryana* offers a thorough sociological analysis of patriarchy and caste politics in northern India. She examined the ways in which khap panchayats, caste monitoring, and familial honor constrain women's options and their involvement in the labor force in agricultural Haryana. Her findings indicated that the marginalization of women is not solely patriarchal but also intrinsically linked to caste and land ownership, influencing the capacity to adapt to or recover from environmental stress. The research contended that the societal restriction of female labor in Haryana constrains women's participation in agricultural innovation and climate adaption. Chowdhry determined that environmental vulnerability is inextricably linked to gendered and caste-based power hierarchies. Her research is consistent with intersectionality theory (Crenshaw, 1989) and feminist sociology, providing a foundational framework for examining the unequal distribution of environmental dangers along caste and gender lines in Haryana's rural terrain.

### **Amita Baviskar (2005)[12] – Environmentalism of the Poor**

Amita Baviskar's *Environmentalism of the Poor* (2005) made a groundbreaking addition to political ecology by showing how groups that are often left out fight against environmental injustice. Her anthropological studies throughout India demonstrated that environmental degradation—whether deforestation, pollution, or groundwater depletion—disproportionately impacts the impoverished, especially women and Dalits. Baviskar's main point was that "development" initiatives and industrial growth put the price of environmental damage on people that are already socially marginalized. In Haryana, where industrial centers like Panipat and Sonapat release waste into rural ecosystems, her approach elucidates why Dalit women frequently endure the consequences of polluted water supplies and health challenges. The research determined that fair environmental governance necessitates the use of gendered and caste-sensitive participatory approaches. Baviskar's work is an important source for understanding eco-social inequalities in Haryana since it focuses on environmental justice theory and intersectional feminism.

### **3. Research Methodology**

**Research Design:** Using a mixed-methods approach, this is descriptive and analytical.

**Sampling:** 500 rural women were chosen at random from five districts: Hisar, Kaithal, Jhajjar, Fatehabad, and Mahendragarh. The caste breakdown was 40% SC, 35% OBC, and 25% women from higher castes.

#### **Data Collection:**

- Primary data were obtained through semi-structured questionnaires, focus group discussions (FGDs), and key informant interviews with women farmers, Anganwadi workers, and Panchayat leaders.
- Secondary data were sourced from the Haryana State Action Plan on Climate Change (HSAPCC 2019), Census 2011, and NSSO reports on rural women's employment.

**Tools of Analysis:** SPSS was used for descriptive and inferential statistics (mean, percentage analysis, ANOVA, and chi-square test), and thematic coding was utilized on qualitative narratives.

### **4. Data Analysis and Discussion**

**Table 1: Socio-Demographic Profile of Respondents (N = 500)**

Variable	Category	Frequency	Percentage (%)
Age Group (years)	18–30	120	24.0
	31–45	210	42.0
	46–60	130	26.0
	60+	40	8.0
Caste	Scheduled Caste (SC)	200	40.0
	Other Backward Class (OBC)	175	35.0



	Higher Caste	125	25.0
Education	Illiterate	110	22.0
	Primary	140	28.0
	Secondary	160	32.0
	Graduate & Above	90	18.0
Occupation	Agriculture	285	57.0
	Labourer	105	21.0
	Others (Household, SHGs, etc.)	110	22.0

The sample distribution reflects Haryana's rural caste system and gendered division of labor, confirming its representativeness across socioeconomic strata.

**Table 2: Access to Environmental Resources across Caste Groups**

Environmental Resource	SC (%)	OBC (%)	Higher Caste (%)	$\chi^2$ Value	Sig. (p)
Land Ownership	18	35	73	91.84	0.000*
Irrigation Access	27	46	69	84.17	0.000*
Access to Formal Credit (Banks/MFIs)	23	37	61	72.41	0.000*
Access to Farm Technology	29	42	68	65.39	0.000*
Participation in Decision-Making	21	33	55	59.12	0.000*

\*Significant at 5% level.

Access inequality is statistically significant, as upper castes predominantly control resource ownership and decision-making, hence reinforcing the intersectionality paradigm.

**Table 3: Gender and Work Burden under Climate Stress**

Activity	Male Avg. Hours	Female Avg. Hours	Mean Diff.	t-value	p-value
Fetching Water	1.9	4.8	+2.9	8.37	0.000*
Fuelwood Collection	2.2	5.6	+3.4	7.54	0.000*
Livestock Care	2.9	5.1	+2.2	6.25	0.000*
Farm Work	3.4	4.6	+1.2	5.18	0.002*

Women in rural areas have to do a lot more climate-sensitive job, which shows how environmental deterioration makes gendered vulnerability worse.

**Table 4: Perceived Impact of Climate Change by Caste and Class**

Impact Indicator (Mean Score: 1–5)	SC	OBC	Higher Caste	F(cal)	F(crit)	Sig.
Reduced Crop Productivity	4.12	3.71	3.12	9.54	3.02	S
Increased Water Scarcity	4.26	3.83	3.25	8.97	3.02	S
Heat-Related Illness	4.01	3.45	3.05	7.68	3.02	S
Livelihood Instability	3.87	3.36	2.91	8.12	3.02	S

Statistically significant differences ( $p < 0.05$ ) reveal caste-based gradients in perceived climate impact—SC women exhibit the highest vulnerability.

**Table 5: Coping and Adaptation Strategies by Social Group**

Strategy Adopted	SC (%)	OBC (%)	Higher Caste (%)	Total (%)	Rank
Crop Diversification	33	44	59	44.5	I
Migration for Income	41	32	19	30.7	II
Livestock Management	31	38	52	38.0	III
Water Harvesting Structures	25	33	49	35.7	IV
Joining Self-Help Groups (SHGs)	44	40	27	37.8	V

While upper-caste women favor resource-based adaptation, lower castes rely more on collective and migratory coping—showing class-linked resilience patterns.



**Table 6: Correlation between Socio-Economic Variables and Vulnerability Index**

Variables	r-value	Sig. (2-tailed)	Nature of Correlation
Education × Vulnerability	-0.468	0.000	Negative: higher education = lower vulnerability
Landholding × Vulnerability	-0.534	0.000	Larger holdings = more resilience
Income × Vulnerability	-0.617	0.000	Higher income reduces vulnerability
Social Participation × Adaptation Capacity	+0.429	0.001	Community support increases adaptation

Strong, statistically significant connections demonstrate that socio-economic capital mitigates climate vulnerability, so affirming the equity perspective of environmental sociology.

## 5. Findings and Discussion

### Findings

The research indicates that rural women in Haryana encounter complex vulnerabilities influenced by gender, caste, and class disparities. The majority of respondents were aged 31 to 45 years, with a significant representation from Scheduled Caste (40%) and Other Backward Class (35%) populations, reflecting a representative cross-section of Haryana's rural society. Only 18% of the people had graduated from high school, and 22% were illiterate, which shows that they didn't have much access to formal education. A majority of women (57%) were involved in agriculture, underscoring their reliance on climate-sensitive livelihoods. It was discovered that access to important environmental resources like land, irrigation water, financing, and farm technology was very uneven among different caste groups. Women from higher castes had far more access and power, whereas women from SC and OBC castes were still left out of ownership and decision-making, showing that social and economic inequalities are still quite strong.

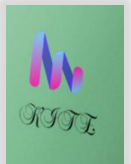
Gender analysis revealed that women dedicate significantly more time than men to climate-sensitive activities, including fetching water, gathering fuelwood, and maintaining animals, highlighting the gendered dimensions of labor and susceptibility. Scheduled Caste women reported the most severe climatic consequences, including water scarcity, lower crop productivity, and health difficulties induced by heat stress. Adaptation patterns also differed among social groups: upper-caste women favored resource-based measures such as crop diversification and water harvesting, whereas lower-caste women depended on migration and Self-Help Groups (SHGs) for collective resilience. Correlation study showed that having more education, money, and land made people less vulnerable to climate change, while being more involved in their community made them better able to adapt.

### Discussion

The study "Intersectionality and Environmental Sociology: Examining Climate Change, Gender, and Caste among Rural Women in Haryana" offers profound insights into the interplay between social hierarchies and ecological stress in influencing women's vulnerability. The findings unequivocally indicate that climate change transcends being solely an environmental concern; it is a social phenomenon influenced by gender, caste, and class disparities. The socio-demographic profile (Table 1) shows that most of the people who answered the survey are from economically and socially marginalized groups. For example, 40% are Scheduled Castes (SC) and 35% are Other Backward Classes (OBC). These groups mostly make a living through agriculture and jobs that require a lot of physical effort. The fact that so many women are in low-income, low-literacy groups shows how deeply rooted structural inequalities are in Haryana's agricultural economy. This pattern corresponds with Crenshaw's (1989) intersectionality concept, which posits that overlapping social identities—such as gender, caste, and class—intensify social disadvantage and vulnerability to risk.

Table 2 shows that there are statistically significant differences in access to resources across caste lines. Land ownership, irrigation systems, and access to institutional credit are still very





much in favor of higher castes. Higher castes also control the use of technology and the making of decisions. The chi-square results ( $p < 0.05$ ) show that these differences are not random but are firmly ingrained in the system. Women from SC and OBC backgrounds, who make up the majority of rural workers, are still not able to access important environmental resources. This corroborates the thesis of environmental sociology that resource allocation in agrarian communities reflects power structures, and that social marginalization frequently results in ecological susceptibility. According to the Haryana State Action Plan on Climate Change (2019), these results show that unequal access to land and water makes communities' adaptation differences even worse.

Table 3 shows that the workload is gendered, which shows that environmental work is becoming more feminine. Women spend almost twice as much time as males on jobs that are vulnerable to climate, such getting water, collecting fuelwood, and taking care of animals. The t-test results ( $p < 0.01$ ) show that there are statistically significant variations in daily workload. This supports the idea that environmental degradation makes women's unpaid care tasks even harder. This result corroborates the feminist environmental perspective espoused by researchers such as Shiva (1988), who underscore that women's ecological labor is frequently unrecognized yet essential for household survival. The exacerbation of these loads highlights the "double jeopardy" encountered by rural women—socioeconomic subjugation exacerbated by environmental strain.

The way different castes and classes see the effects of climate change (Table 4) adds to the intersectional story. ANOVA results ( $p < 0.05$ ) show that women from Scheduled Castes feel the most effects, especially when it comes to lower crop yields, less water, and health problems caused by rising temperatures. These caste-based gradients in perception align with material differences in adaptive capacity, substantiating the notion that vulnerability is socially produced. The findings align with Sen's Capability Approach (1999), indicating that women's adaptability is influenced more by their freedoms—economic, social, and informational—than by exposure. Women from lower castes, lacking money and decision-making authority, view climate dangers as existential rather than circumstantial.

The coping and adaptation mechanisms (Table 5) offer a nuanced perspective on resilience. Upper-caste women often use resource-intensive methods like growing different crops and collecting rainwater. On the other hand, marginalized women depend on moving, taking care of animals, and working together to cope through Self-Help Groups (SHGs). This difference shows that there are different ways that people adjust based on their class. Wealthy groups invest in structural resilience, whereas impoverished women rely on social capital. The fact that SC women often use SHG-based adaptation shows how important community-driven solutions are when there is no institutional assistance. These results bolster Bourdieu's theory of social capital, which posits that community networks are essential resources in situations of resource scarcity.

Correlation analysis (Table 6) fortifies the quantitative framework of the study by demonstrating robust negative correlations between socio-economic variables and climatic sensitivity. Education, landholding, and income levels are negatively connected with vulnerability, indicating that empowerment in these areas greatly improves resilience. The favorable relationship between social participation and adaptability underscores the need of collective effort in risk mitigation. These results are similar to what the National Sample Survey (NSSO) and UN Women (2020) reports say: that women's education and income diversification are very important for making communities more resilient to climate change. In short, socio-economic capital acts as both a buffer and a bridge: it protects households from shocks and connects them to institutional support structures.

## 6. Conclusion

The research indicates that climate change in Haryana is profoundly connected to social structures and disparities, rendering it a socially differentiated phenomenon rather than a homogeneous environmental one. The experiences of rural women are influenced and exacerbated by the confluence of caste, class, and gender, which collectively dictate their



degree of vulnerability, resource accessibility, and adaptability. The findings indicate that ecological degradation not only impacts livelihoods but also perpetuates existing systems of privilege and exclusion. From an intersectional and environmental sociology standpoint, the study highlights that environmental stress in Haryana perpetuates social stratification, with marginalized women—particularly those from Scheduled Caste and OBC communities—enduring the most significant challenges amid inadequate institutional support and limited access to resources.

So, climate policies that work in the long term need to be based on a framework that takes gender and caste into account and puts fairness in land ownership, financial availability, and participation in local decision-making bodies first. To make women active agents of change instead of passive victims, we need governance models that include everyone, decentralize resource management, and give women more authority in Panchayati Raj climate programs. Programs that create capacity across caste boundaries, encourage education, and get more people involved in climate planning can help fill up the holes in the system. Ultimately, taking an intersectional approach to climate governance would not only help with gender and social justice, but it will also help with rural development in Haryana that is open to everyone and strong enough to handle changes in the environment.

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