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CLIMATE CHANGE AND IT'S EFFECT ON HEALTH AND LIVELIHOOD OF TRIBAL COMMUNITY PEOPLE IN ODISHA

Firoz Biswas
Research Scholar, P.G. Department of Geography, Utkal University, Vanivihar, Bhubaneswar, India

Abstract : Indigenous peoples get much of their living from farming and sustainable agriculture, which are vulnerable to climate change. Tribal groups are especially vulnerable to climate change because they rely on natural resources. This research provided adaptive solutions for coping with climate change's consequences on tribal cultures' resource bases, human suffering, and migration. Two hundred tribal families in four districts of western Odisha were interviewed and divided into focus groups. They depend on land, water, and forests. The correlation and importance of the Climate Change Index (σ), Livelihood Resource Base Index (η), Human Suffering Index (λ), and Migration Index (β) have been established. The study found that climate change has a greater impact on household resources, human distress, and migration than on community stress. Results indicate climate change has significantly impacted indigenous groups' livelihoods, suffering, and migration ($p<0.01$). The paper advises government, parliamentarians, and program implementers, including civil society organisations, to prioritise livelihood resource management. We must increase tribal groups' adaptive skills to cope with climate change, foster livelihood diversification, and establish climate-sensitive livelihood options. The study also suggests that government agencies, lawmakers, program implementers, and community organisations collaborate to preserve livelihood resources. The effort includes home-level adaptation, livelihood diversification, and climate-responsive livelihoods. Such efforts should reduce climate change's detrimental consequences on indigenous populations.

Keywords: Tribal Community, Climate Change, Livelihood, Migration, Adaptation.

INTRODUCTION

During the 21st century, one of the most significant challenges that the world is now confronted with is climate change. There is an effect that it is having on ecosystems, economies, as well as the health and happiness of individuals. Changes in temperature, unpredictable patterns of rainfall, frequent droughts, floods, and other extreme weather events have had a significant impact on the health and way of life of vulnerable populations all over the world. People who live in tribal groups are considered to be among the most vulnerable due to the fact that their way of existence is dependent on natural resources such as land, water, forests, and animals. There is a clear correlation between any alteration to the natural environment and the individuals' capacity to get food, earn money, and generally have a happy and fulfilling life.

Tribal people of India make up a significant portion of the country's population, and their means of subsistence include farming, the utilisation of forest resources, and the production of non-timber forest products. In particular, the western regions of Odisha are home to a sizable population of tribal people. Traditional agricultural practices, foraging for food in the wild, and activities on a smaller scale that make use of natural resources are the primary means of subsistence for these communities. Changes in the weather may have a significant impact on these methods of generating a livelihood. It is becoming more difficult for plants and trees to flourish as a result of a number of factors, including shifting patterns of rainfall, rising temperatures, soil deterioration, and a shortage of water. This has the potential to put the ability of tribal families to earn a livelihood in jeopardy [1].

The impacts of climate change are not limited to altering the materials that people use to earn a livelihood; it also has significant implications for the health and social well-being of individuals. As a result of fewer trees and fewer farms, it may become difficult for families living in tribal communities to get food, which may lead to malnutrition and instability in their financial situation. In addition, the anxiety that is brought on by climate change often causes individuals to suffer greater harm by putting their health in jeopardy, increasing mental stress, and making them more susceptible to social vulnerability. Because of these pressures, persons who live in tribal houses are often compelled to relocate, either temporarily or permanently, in order to obtain better employment opportunities. There are occasions when migration is considered a solution to a problem; nevertheless, it may also make life more difficult for tribal communities in terms of both their social and economic circumstances [2].

Climate Change and Tribal Livelihoods

There are a significant number of individuals who belong to the tribal community in India who live in rural and forested regions. Their primary means of subsistence include farming and activities that take place in the woods. sustenance farming, the collection of forest products, and other activities that make use of natural resources are the primary means of sustenance for tribal communities in the Indian state of Odisha, particularly in the western regions of the state. However, changes in the climate, such as unpredictability in the weather, extended droughts, and harm to the ecology, have made it very challenging for these traditional methods of generating a livelihood. The foundation of resources that tribal groups utilise to earn a living has grown more unstable as a consequence of this, which has led to a decrease in agricultural production, a diminishing supply of forest resources, and a reduction in the number of methods to make a living [3].

Climate Change, Human Suffering, and Migration

The repercussions of climate change on tribal families extend beyond the loss of those families' employment and have direct implications for the families' social and economic circumstances. individuals who have less access to natural resources are more likely to experience hunger, poverty, health issues, and feelings of stress, which in turn leads to an increase in the number of

individuals who are suffering within the community. The majority of tribal families are forced to relocate to adjacent towns and cities in order to obtain employment, either temporarily or permanently. This is due to the fact that there are not always reliable means for tribal families to earn a livelihood. Therefore, migration is a crucial method for addressing issues; but, it may also render tribal families more susceptible to social and economic issues via the process of migration [4-7].

Need for Adaptation and Policy Support

According to the findings of the research, it is critical for indigenous communities to develop strategies that are both efficient and prompt in order to address the issue of climate change. A primary priority for the government, lawmakers, individuals who are in charge of programs, and organisations that are part of civil society should be the long-term control of resources that are necessary for earning a livelihood. To do this, it is necessary to engage in a variety of occupations, to promote methods of earning a livelihood that are sensitive to the effects of climate change, and to facilitate the adaptation process for families belonging to tribes. When it comes to the utilisation of natural resources and the implementation of home-based strategies for climate change, everyone is required to collaborate in order to save the planet. These sorts of initiatives have the potential to significantly alleviate the suffering of individuals, prevent them from being compelled to relocate, and strengthen communities in their defences against the worst consequences of climate change [8-13].

OBJECTIIVE

1.To investigate how Odisha's indigenous peoples have fared in the face of climate change.

2.Evaluate the methods through which indigenous groups have dealt with the negative effects of climate change on their health and way of life.

DATA SOURCES AND METHOD

Study Area

Bargarh, Balangir, Kalahandi, and Nuapada are the four districts in western Odisha that were the sites of the research. The landscape consists of rolling hills, extended ridges, and isolated hilltops covered with forest cover. It covers 24,187 square kilometres, or about 16% of the state's total land area. The state average is 37% forest cover, whereas the regions only have 31%. The source cited is GoO in 2019. Extremely hot summers (averaging 40 degrees Celsius) and mild winters (averaging 27 degrees Celsius) characterise the tropical climate of the Bargarh, Balangir, Kalahandi, and Nuapada districts. Compared to the rest of the state, this area receives less precipitation each year, with an average of 1318 millimetres. This region is classified as a Very High Drought Risk Zone in part because of the rainfall differential. As stated by OSDMA in 2019. This area is one of the most migratory in the state, and it housed over half of the state's vulnerable population while only accounting for 12% of the total population (Meher, 1999). Agricultural production, net area irrigated, and population structure are among the other socioeconomic metrics that are lower than the state norms. Across 477 gram panchayats and across 3,327 villages, these districts are home to a sizable scheduled tribal population, making up 25.58 percent of the total. Despite making up 13.39% of the state's indigenous population, these districts have less connectivity than the rest of the state when it comes to connecting villages to growth centers or service hubs. Due to drought-like circumstances every other year, western Odisha—specifically Balangir, Bargarh, Kalahandi, and Nuapada—is regarded as one of the most susceptible regions to the effects of climate change [14-16].

Data Sources and Sample Size

Researchers in Western Odisha used secondary and primary sources to compile their findings. Data from the Odisha Economic Survey, the Census, and publications from the Intergovernmental Panel on Climate Change (IPCC) are among the secondary sources used in the research. The internet, as well as books, newspapers, articles, journals, and magazines, are also used. Two hundred tribal families from four-gram panchayats in the districts of Bargarh, Balangir, Nuapada, and Kalahandi were surveyed utilising structured and semi-structured interview schedules. This fieldwork provided the main data [17-19].

Analytical Tools

To address the aims and evaluate the hypotheses, a concurrent triangulation mixed approach was used. Community perception was recorded under each indicator based on their experience, and focus groups were held with different stakeholders to finalise the indicators under each dimension (stress from climate change, stress from livelihood resources, stress from human suffering, and stress from migration in its first phase). The next step was to use a three-point Likert Scale, where 1 meant "Not significant," 2 meant "Significant," and 3 meant "Highly significant." Various levels of importance connected with the evaluated factors or criteria were measured using this scale. The pooled mean (m) was obtained by calculating the mean values for both the community level (m1) and household level (m2). The overall dimension's contribution percentage (Ω) was further computed for each indicator. In addition, the ratio of the mean score to the maximum scale value for both the community level and household level was used to translate the mean values to the severity of the indicators. Last but not least, the index was determined by taking the square root of symptoms scores.

Climate Change Stress Index (σ= has five indications that stand for temperature and rainfall.

Livelihood Resource Index (η = was derived in light of nine indicators pertaining to the natural resources (land, water, and forests) that indigenous groups rely on for their livelihoods.

Human Suffering Index (λ = consisting of six indicators pertaining to food, water for drinking, health, income, and so forth.

Migration Index (β = included six indicators related to food, drinking water, health, income, etc.

RESULTS

The next four parts detail the four major aspects that emerged from our examination of the responders. We consider the following climate change-related indices: migration, human suffering, livelihood resource, climate change stress, and the kind and extent of the relationships between the two [20-22].

Impact of Climate Change Stress Indicators

A one-degree Celsius rise in temperature has real-world consequences, and India has been feeling them. The nation's average temperature has increased by 0.62°C in the last hundred years, according to recent statistics. (Indian government, 2021). Devastating heat, torrential rain, floods, violent storms, and rising sea levels are wreaking havoc on homes, businesses, and companies throughout the country. Heat waves tragically killed between 1,500 and 2,000 people throughout the nation in 2013 and 2015.

The cumulative effect of long-term temperature and precipitation fluctuations is climate change. According to Table 1, the most important indicators of climate change stress include rising atmospheric temperature and hot winds deviation (23.7%), rainfall deviation (21.9%), a delay in the onset of the monsoon (18.5%), irregular rainfall (18.4%), and a shortening of rainy days (17.5%).

Extend of Severity

According to the aggregated perception ratings from all samples, the Climate Change Stress Index was 0.79, with a community level severity score of 0.80 and a home level score of.078, respectively. According to weather records, the number of rainy days in Western Odisha has dropped dramatically over the last 30 years, going from 75 to 60. The monsoon also takes an extra month to arrive, from about the middle of June until sometime around the middle of July, and then again towards the end of July. Due to a combination of climatic and developmental conditions, more than one billion people in India face severe water shortages every summer. More than that, 180 million people face severe water shortage every year (Mekonnen & Hoekstra, 2016). There is a persistent lack of water for drinking and sanitation needs, and many people are already struggling to meet basic needs.

Table 1. Climate Change Stress

Climate Change Stress Indicators	σm1	σm2	σm	Ω (%)	(σ1)	(σ2)	$\sqrt{\sigma 1 + \sigma 2}$
Rising atmospheric temperature and hot winds	3.00	2.61	2.81	23.7	1.00	0.87	0.93
Deviation in monsoon rainfall	3.00	2.19	2.59	21.9	1.00	0.73	0.85
Shorten days of rainy season	2.00	2.16	2.08	17.5	0.67	0.72	0.69
Irregularity in rainfall	2.00	2.36	2.18	18.4	0.67	0.79	0.72
Delay in onset of monsoon	2.00	2.38	2.19	18.5	0.67	0.79	0.73
Total	12.00	11.69	11.84	100.0	0.80	0.78	0.79

Source: Primary Survey, 2021.

Losses of Livelihood Resource Base

The study shows that Western Odisha's water resource bases have been affected by major climate change. Specifically, there has been a 13.5% decrease in rainfall, a 13.4% loss of natural water reservoirs due to sediments and silts, and a 13.2% decline in groundwater due to the inability to recharge rainwater. Another important and noteworthy effect of climate change in Western Odisha, as noted in the paper, is the 13.3% extinction of pollination agents as a result of high summer temperatures. Soil erosion and decreased soil moisture content as a result of drought are the second major effect of climate change on land resources. Due to rootstock drying up and frequent forest fires caused by longer summer dryness, limited regeneration of forests is a consequence of climate change. Levels of severity at the community and household levels were 0.73 and.085, respectively, according to the aggregated perception ratings of all groups; the Climate Change Stress Index was 0.79. Loss of livelihood resources due to climate change is more severe for individuals than for communities [23].

Table 2. Livelihood resource stress

Livelihood Resource Stress	ηm1	ηm2	ηm	Ω (%)	(η1)	(η2)	$(\sqrt{\eta_1 + \eta_2})$
Soil erosion due to prolong dry spell followed by runoff	2.00	2.11	2.06	9.8	0.67	0.70	0.68
Decrease in nutrient content of the soil due to soil erosion	2.00	2.19	2.10	10.0	0.67	0.73	0.70
Decrease in soil moisture content due to the action of drought	2.00	2.13	2.06	9.9	0.67	0.71	0.69
Extinction of natural water reservoirs due to silts and sediments	3.00	2.61	2.81	13.4	1.00	0.87	0.93
Drying of streams and their extinction due to poor rainfall	3.00	2.65	2.83	13.5	1.00	0.88	0.94
Groundwater recession due to failure recharge of rainwater	3.00	2.54	2.77	13.2	1.00	0.85	0.92
Low regeneration of forest due to drying of rootstock	1.00	2.51	1.76	8.4	0.33	0.84	0.53
Forest fires due to prolonged dryness during summer	1.00	2.49	1.75	8.4	0.33	0.83	0.53
Forest fires due to prolonged dryness during summer	1.00	2.49	1.75	8.4	0.33	0.83	0.53

Extinction of pollinating agent due to high summer temperature	3.00	2.57	2.78	13.3	1.00	0.86	0.92
Total	20.00	21.79	20.89	100.0	0.73	0.85	0.79

Source: Primary Survey, 2021.

Human Suffering

As shown in Table 3, the loss of livelihood resource bases (land, water, and forest) has led to a decline in food from local resources (22.4 percent) and income from local resources (22.1 percent). Additional findings from the survey include a scarcity of potable water (17.4% of the population) and food (17.3% of the population) as a result of poor agricultural production and the negative impact of climate change on the development of health problems (11.0%). It is also important to note that many thought that, because of migration, increased human misery, and the loss of livelihood resources, climate change was reducing the life expectancy of indigenous people. Community and household levels of severity were 0.60 and 0.67, respectively, according to the aggregate evaluation of perception of all samples, while the Climate Change Stress Index was 0.63. A person's level of suffering is more directly affected by climate change than a community's level of suffering.

Table 3. Human Suffering

Human Suffering Indicators	λm1	λm2	λ m	λ(%)	(λ 1)	(λ 2)	($\sqrt{\lambda_1 + \lambda_2}$)
Diminishing food from local resources	3.00	2.50	2.75	22.4	1.00	0.83	0.91
Shortage of food due to low productivity of the land	2.00	2.25	2.12	17.3	0.67	0.75	0.71
Scarcity of clean drinking water	2.00	2.27	2.14	17.4	0.67	0.76	0.71
Decreased income from local resource	3.00	2.43	2.72	22.1	1.00	0.81	0.90
Increased health-related issues	1.00	1.69	1.35	11.0	0.33	0.56	0.43
Decreased life expectancy of local people	1.00	1.38	1.19	9.7	0.33	0.46	0.39
Total	12.00	12.52	12.26	100.0	0.60	0.67	0.63

Source: Primary Survey, 2021.

Migration Stress

The survey found that there has been an increase in the number of persons living in migrant families (33.8%) and migrants themselves (28.5%). Additionally, as a result of climate change's impacts on livelihood resources and human suffering, tribal groups saw a significant rise in the migration of women and children, amounting to 24.7%, in tribal territories over a period of time. The impact of climate change on debt bondage has been a noticeable 13% rise among tribal societies, while the increase in debt bondage itself has not been very substantial. The degree of severity at the home level is.71 and at the community level is 0.67, according to the aggregate assessment of perception of all samples. An overall migration index of 0.69 has been found. Impacts of climate change on migration are more severe at the person level than at the community level.

Table 4. Migration Stress

Migration Stress Indicators	βm1	βm2	Bm	Ω (%)	(β1)	(β2)	$\sqrt{\beta_1 + \beta_2}$
Increased in HH migrating	2.00	2.71	2.353	28.5	0.67	0.90	0.78
Increased in numbers of migrated labour	3.00	2.58	2.790	33.8	1.00	0.86	0.93
Increased in number of women/children migration	2.00	2.08	2.040	24.7	0.67	0.69	0.68
Increased in number of debt bondage	1.00	1.15	1.075	13.0	0.33	0.38	0.36
Total	8.00	8.52	8.258	100.0	0.67	0.71	0.69

Source: Primary Survey, 2021.

Relationship of Climate Change with Livelihood Base, Human Suffering and Migration

In this part, we looked at the kind and level of the interaction between climate change and other aspects, including migration, human misery, and livelihood resource base. A relationship's kind and strength may be inferred from the correlation coefficient. The coefficient value of 0.95 is positive and has a high degree, which indicates that climate change has a considerable influence on the livelihood resource base. The livelihood stress index and the climate stress index both exhibit proportional variations. The foundational resources for people's livelihoods have been hit the most by the shifting signs of climate change. The climatic stress index rises and falls in direct correlation with the amount of human suffering. An rise in a base of natural resources affected by climate change, leading to increased human misery, is highly supported by a high coefficient of correlation (0.87). The Climate Stress Index and the migration index both have a high degree of correlation (0.83). It suggests that water, land, and forest regeneration have been negatively affected by increasing air warmth and unpredictable rainfall. The loss of natural resources and the productivity they provided has had a devastating impact on communities that relied on them for their daily needs. A greater degree of livelihood stress and migration has resulted from the deterioration of the natural resource base caused by variations in air temperature and rainfall.[24]

In addition, the strong correlation coefficient suggests that human suffering has directly contributed to or caused a greater migration rate, and the negative coefficient value of -0.93 suggests that reduced livelihood resources have added to human suffering. Human misery has clearly contributed to or caused a greater migration rate, as seen by a significant correlation coefficient. There is a strong relationship between the human suffering index and the migration rate, as seen by the high coefficient of correlation.

Table 5. Relation among Climate Change, Livelihood Stress, Human Suffering, and Migration Stress

Relationship	Climate Change Stress Index (Σ)	Livelihood Stress Index (H)	Human Suffering Index (Λ)	Migration Index (B)
Climate Change Stress Index (Σ)	**1.00**	**0.95**	**0.87**	**0.83**
Livelihood Stress Index (H)	**0.95**	**1.00**	**-0.93**	**-0.91**
Human Suffering Index (Λ)	**0.87**	**-0.93**	**1.00**	**-0.78**
Migration Index (B)	**0.83**	**-0.91**	**-0.78**	**1.00**

Source: Primary Survey, 2021.

DISCUSSIONS

Climate change is already affecting the planet. All of these variables are making weather less dependable. Climate change, droughts, and floods hinder growth. People with money and interpersonal issues are most affected by climate change. Tribal tribes see climate change in terms of losing livelihoods, getting injured, and having to migrate. Climate change stresses are clearly shown in the 2021 IPCC assessment. The findings reveal that rainfall patterns will alter significantly, and spring rainfall will vary by region. Madhya Pradesh (Sushant, 2013), Karnataka (Udayashankara et al., 2016), Odisha (Mishra, 2017), and Jharkhand (Ahmad, 2018) research support this notion. The findings are also compared to others (Blunden, 2020). Climate change may dry up streams due to insufficient rainfall, reduce natural water reservoirs due to silts and sediments, and lower groundwater due to improper rainwater recharge.

The study found that increasing temperatures affect water supplies, which might harm natural resources. They also discussed how farms, woods, tourism, fishing, water, and energy influence rural communities socially. Climate change influences silt movement, and research shows that areas with higher flow have more erosion. Similar to food, health, and water issues (Ravindranath et al., 2006), human pain study is related to loss of life, income, property, and other fundamental services. Other climate change migration research supports this finding. Due to climate change, people moved more inside and across nations in Africa (Marchiori et al., 2011), Pakistan (Mueller et al., 2014), and Europe (Anderson, 2013). However, climate change evidence suggests that migration boosts income (Borjas, 2014). GOs and NGOs must collaborate to achieve sustainable development objectives and enhance environmental performance in Odisha, particularly Western Odisha. [25]

CONCLUSION

Climate change affects human lives and livelihoods, according to the research. Climate change causes droughts, floods, forest fires, seasonal cyclones, water shortages, and health issues throughout the state. Climate change worsens poverty and displacement by affecting livelihoods, economies, and well-being. Climate change impacts tribes, even if it affects everyone. Poverty and natural resource reliance make them climate change vulnerable. Land, water, and life damage from climate change may disrupt traditional lives. Temperature and rainfall dramatically affect crop output. The study demonstrates that climate adversely affects livelihood resources, human distress, and migration. The following methods may reduce climate change's harmful effects on indigenous communities. Communities need a comprehensive Climate Resilient Framework to combat climate change. Community responses and adaption methods must be recorded to further science. SFC, CFC, Mahatma Gandhi NREGS, and Mission Amrut Sarovar will comprehensively repair and revitalise ancient reservoirs and streams. To address climate change, the state may deploy water-efficient technologies, micro watersheds, irrigation system efficiency, rooftop rainwater collecting, and drainage system enhancements. Activities decrease climate change's detrimental effects. Increased solar and community/household biogas use may mitigate climate change in the state. Age and gender should be used to study tribal aspirational and distress migration to develop mitigating strategies. Strong seeds, agronomic packages and procedures, organic farming, and climate-smart agriculture should be supported by landscape design. To restore lost income, cattle, mushroom cultivation, cottage industry, and biofloc fisheries should be encouraged. Tribal areas struggle with clean drinking water due to groundwater depletion. For household and institutional needs and groundwater replenishment, PMAY, AWCs, schools & colleges, and government offices must collect rooftop rainwater.

Change must be comprehensive. After natural disasters, government aid—input assistance, crop insurance, and water and energy market regulations—is essential.

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