

IMPACTS ON CLIMATE CHANGE ON TRIBAL ECONOMY: A STUDY OF JHARKHAND STATE OF INDIA

Marcus Barla

Department of Economics at St. Xavier's College, Ranchi, India

Abstract

Climate change has become a major issue of concern during recent years. It has affected the life, livelihood and economy of the tribal people and threatened their survival. There are about 700 different tribes in India as per the Article 342 of the Constitution of India. According to the census 2011, tribal population consisted 8.6 per cent in India. In Jharkhand tribal population represented 24.80 per cent as per census 2011. The huge emission of Green House Gases and decline in forest coverage has resulted into the climate change. The excess emission of the Green House Gases increases the earth's surface temperature and causes global warming. It has caused discomfort for the tribal people, increased their cost of living and threat for survival, decline in crop production, increase in the incidence of crop diseases, livestock, human beings, social stress and conflict on sharing resources. It is believed that present state of climate change is human induced. In recent years the evidence of climate change is visible in Jharkhand State also. The incidence of drought has increased in entire state. The tribals are mainly dependent on natural resources and rain-fed agriculture. Therefore, they have been adversely affected due to changes in the climatic condition. In this study and attempt is made to find out the changes in climatic condition, assess its negative effects on the tribal economy and livelihood insecurity, evaluate the existing coping mechanism and practices including indigenous methods adopted by the tribals for dealing with the adverse consequences of the changing climate and find out the deficiencies in their traditional coping mechanism and practices in contrast to contemporary scientific approaches and recommend policy to set action plans for the adaptation by tribals of Jharkhand for their sustainable development.

Keywords: climate; tribal; Jharkhand; sustainable; development

INTRODUCTION

Jharkhand is a land of forest, hills, rivers, natural resources, mining, and industries in India. State of Jharkhand has come into being on November 2000. Each region of Jharkhand State faces erratic rainfall, wide variations in temperatures, humid to tropical and sub-tropical climate. Normal rainfall varies from a minimum of 800 mm in Saraikela, Palamu, Garhwa and Koderma to a maximum of over 1,320 mm in Pakur district of the state with huge year to year variability.

There are 32 tribal groups in Jharkhand, which include eight minor tribes, known as Primitive Tribal Groups (PTGs). This area was the home land of aboriginal races, such as the Santhals, Mundas, Oraons, Hos, Kharia, Bhumij, Birhors, known as

adivasis literally meaning 'original settlers' or the earliest settlers.

Climate change has become a major issue of concern during recent years. It has affected the life, livelihood and economy of the tribal people and threatened their survival. The tribal population consisted 8.6 per cent in India and Jharkhand State represented 24.80 percent as per census 2011. The huge emission of Green House Gases and decline in forest coverage has resulted into the climate change. It has caused discomfort for the tribal people, increased their cost of living and threat for survival, decline in crop production, increase in the incidence of crop diseases, livestock, human beings, and conflict on sharing resources.

In recent years, the evidence of climate change is visible in Jharkhand State also. The tribals are

mainly dependent on a natural resources and rain-fed agriculture. They have been adversely affected due to changes in the climatic condition.

OBJECTIVES OF THE STUDY

In this study an attempt is made:-

To find out the causes of changes in climatic condition

To assess its negative effects on the tribal economy and livelihood

To evaluate the existing coping mechanism and practices adopted by them and

To recommend policy to set action plans for the adoption by tribals of Jharkhand for their sustainable development.

METHODOLOGY

The issues are being assessed by review of literatures, analysis of secondary data and annual reports of various years. The relevant data and information have been examined in support of Key Informants' Interview (KII), Focus Group Discussion (FGD) methods and case studies. The study is also based on the data and information available in Jharkhand State and various web sites.

CONCEPTS

Climate is the general cumulative pattern of regional or global weather patterns. The most apparent aspects of climate are trends in air, temperature and humidity, wind and precipitation. Although the climate remains fairly stable on the human time scale of decades or centuries, it fluctuates continuously over thousands or millions of years. A great number of variables simultaneously act and react to create stability or fluctuation in this very complex system. Some of these variables are atmospheric composition, rates of solar energy input and terrestrial geography.

RELEVANCE OF THE STUDY

Climate Change has become a major issue of concern in recent years. It has affected the

existence of the living beings of the world and threatened their survival in future. During the recent years the excessive emissions of Green House Gases and massive deforestation have caused the rapid climate change and its adverse impacts on the ecosystem and the economy. The impacts of climate change have detrimental effect on the economic and social life of the human being. It has caused the discomfort for the people, increased their cost of living and production. It has also caused the uncertainty in the productivity and production, incidence of crop diseases, livestock and human beings. It has increased the social stress and conflict on sharing of resources especially among the tribals and other weaker sections of the society. The recent climate change has increased the frequency of natural disaster, loss of life, assets and resources.

The climate change has most adversely affected the tribals, deprived and weaker sections of the society. Tribal people and the deprived communities depend largely on natural ecosystem and environment for their existence. These communities have long been exposed to many kinds of environmental changes and magnitude of such changes and consequent hazards exceed their adaptive capacity. Therefore it has a major cause of concern and urgent needs of serious efforts for mitigating as well as adaptation.

LITERATURE SURVEY

The fourth assessment report of Inter-governmental Panel on Climate Change (IPCC, 2007) recognized that the tribals and deprived communities have been pushed to the most fragile lands due to the social, political and economic exclusion and hence their livelihoods are highly dependent on natural resources. The recent climate change has increased their vulnerability to work load, diseases and disaster. Since climate is going to aggravate in future, the incidence and severity of such changes are going to rise and it will surely cause adverse effect on the condition of human being, especially tribals and marginalized communities.

Most of the observed increase in the globally averaged temperature since the mid-20th century is very likely due to the observed increase in

anthropogenic greenhouse gas concentrations. Human activities have resulted in excess emission of greenhouse gases like carbon dioxide (CO₂), Methane, nitrous oxide and fluorinated gases.

CO₂ is the greenhouse gas most commonly produced by human activities and according to an estimate of European Union it is responsible for 64 percent of man-made global warming. Its concentration in the atmosphere is currently 40 percent higher than it was when industrialization began. Other greenhouse gases are emitted in smaller quantities, but they trap heat far more effectively than CO₂, and in some cases are thousands of times stronger. Methane is responsible for 17 percent of man-made global warming, nitrous oxide for 6 percent. Fluorinated gases produce a very strong warming effect up to 23000 times greater than CO₂, but its emission is very low.

Carbon dioxide and nitrous oxide has been released through burning of fossil fuel like coal, oil and gas. Trees help to regulate the climate by absorbing CO₂ from the atmosphere. But because they have been cut down in large number and forest coverage has shrunk its beneficial effect is being eroded and the carbon stored in the trees is released into the atmosphere adding further to the greenhouse effect.

Agriculture also generates greenhouse gases. Paddy cultivation causes emission of methane. In 2000 it was responsible for 65 percent of total greenhouse gas emissions mainly as a result of methane emitted in rice fields. Evidence of increase in temperature and erratic changes in rainfall pattern is experienced all over the world. It is reported that during the past 100 years, global mean surface air temperature have risen by 0.740C (Wadood and Kumari, P., 2008). Annual rainfall is also expected to increase in several parts of Asia while arid and semi-arid areas would become drier. Rising sea level will affect a significant number of countries in the region.

JUSTIFICATION OF THE STUDY

The evidence of climate change is visible in Jharkhand State also. The incidence of drought, which has been experienced by all the 24 districts

of the State, has increased in the last two and half decades. Frequent flash floods have been experienced by three of its districts viz., Ranchi, Jamshedpur and Saraikela. Nine districts are having a regular incidence of forest fire and lighting. Severe heat wave conditions were noticed in the year 2004, 2005 and 2010. The maximum and minimum temperatures have increased in the State.

Irregular Rainfall and increased incidence of drought has been observed in recent years. Increase in average rainfall, increase in variability of rainfall, high intensity rainfall, uncertainty of monsoon onset and withdrawal, increase in incidence of drought and rise in temperature has become the regular feature of the State.

Table 1 Important facts and figures of Jharkhand State of India

Geographical Area (Sq.km)	79.714
Population (Nos.-2011)	3,29,66,238
Males Population (Nos.-2011)	1,69,31,688
Females Population (Nos.-2011)	1,60,34,550
Density of Population (per sq.km)	414
Sex Ratio (per 1000 males)	947
Average Annual Growth Rate of Pop. (2001-11 (%))	2.23
Urban Population (%), 2011	22.4
Rural Population (%), 2011	77.6
S.T. Population (%), 2011	24.80
S.C. Population (%), 2011	15.00
Average Annual Rainfall	1100-1400 mm
Water Resource	28,081 mcm
Surface water	23,789 mcm (84.72%)
Ground water	04,292 mcm (15.28%)

Source: Census, 2011

Table 2 Administrative Units of Jharkhand

Divisions	05
Districts	24
Sub-divisions	41
Towns	152
Blocks	260
Gram Panchayats	4,423
Villages	32,620
Assembly Seats	81
Lok Sabha Seats	14
Rajya Sabha Seats	06

Source: Census, 2011

Table 3 A brief analytical descriptions of agro-climatic conditions of three zones in Jharkhand

Parameters	Central & North Eastern Plateau No. IV	Western Plateau No.V	South Eastern Plateau No.VI	Jharkhand State
Districts	Hazaribagh, Chatra, Giridih, Dhanbad, Godda, Pakur, Deoghar, Sahebganj, Jamtara, Dumka, Bokaro, Koderma & Ramgarh	Palamau, Garhwa, Latehar, Gumla, Simdega, Ranchi, Khunti & Lohardaga	East Singhbhum, West Singhbhum, Saraikela	
Rainfall (mm) South-West	1093 (85%)	1101 (86%)	1053(81%)	1093 (85%)
Total rainfall(mm)	1273	1293	1249	1272
Maximum temperature (0C)	44.2	43.6	44.0	44.0
Minimum temperature (0C)	4.8	5.3	6.6	5.6
Average temperature (0C)	25.2	25.8	27.2	26.0
Relative humidity (%) maximum (7.00 A.M).	62.5	56.5	63.0	60.7
Relative humidity (%) minimum (2.00 P.M.)	47.5	42.0	45.0	44.8
Cropping intensity (%)	110	110	118	116
Major crops	rice, wheat, maize	rice, maize, arhar	rice, maize, niger	

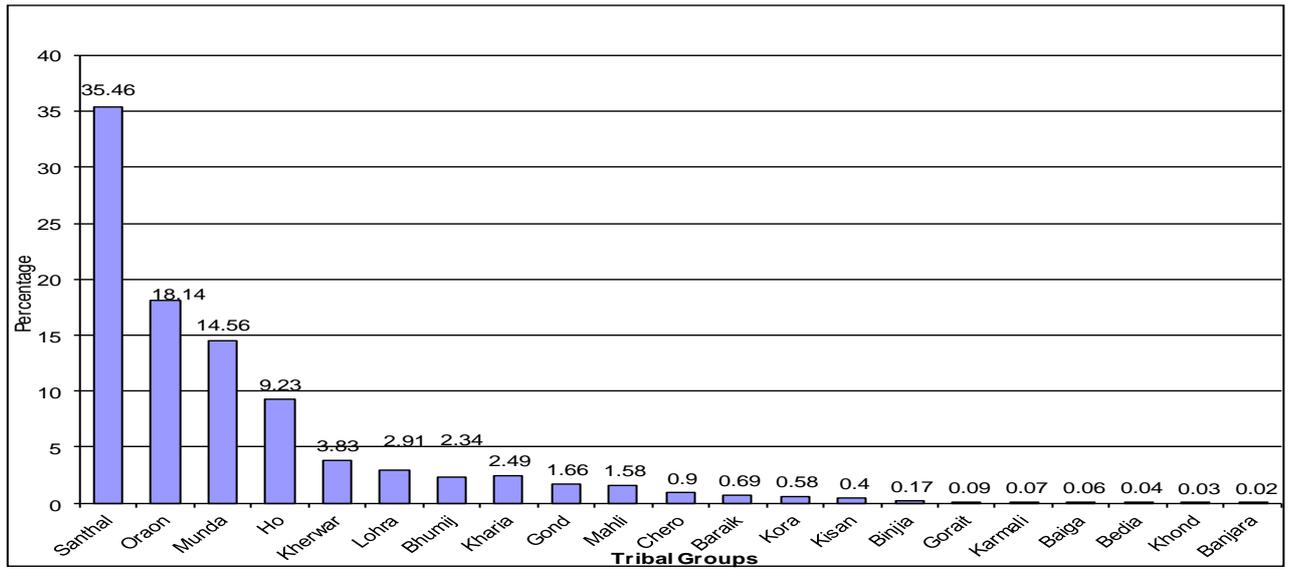


Figure1 Main tribal groups in Jharkhand (in percentage)

Source: Census, 1991

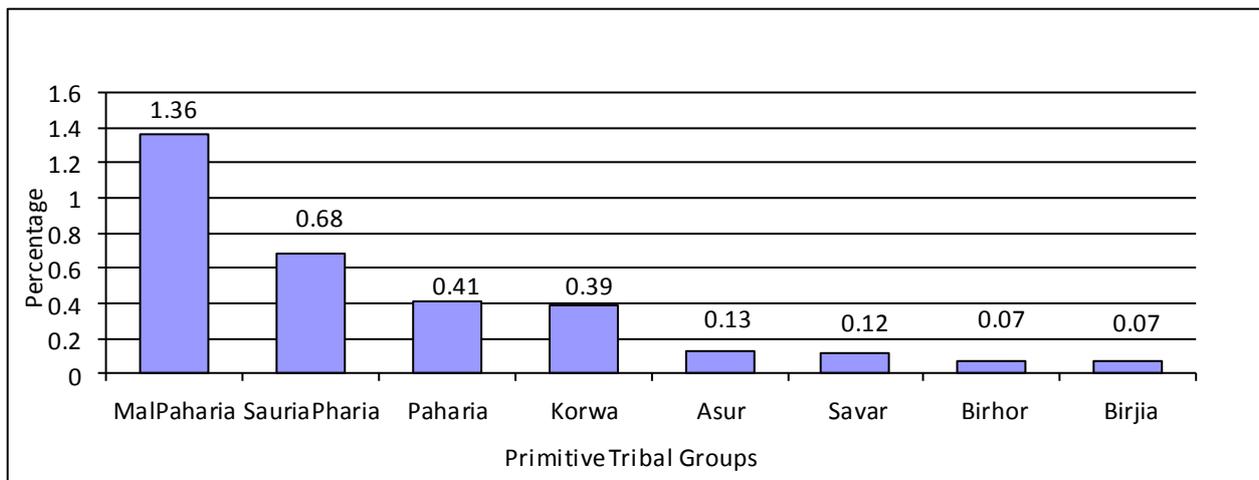


Figure 2 Primitive tribal groups (in percentage of total tribal population)

Source: Census, 1991

Impact of climate change on agriculture

Agriculture which is the main occupation of the tribals of Jharkhand has been adversely affected because of irregular rainfall and increase in temperature. Increase in maximum temperature which has been observed in Jharkhand has been found to have adverse effect on rice yield when it coincides with the flowering stages. A yield reduction of about 10 quintal per hectare has been observed on a 10C increase in maximum temperature at such stage. Similarly a decrease in minimum temperature at grain filling stages has a negative effect on rice yield.

Both the increasing trend of maximum temperature and decreasing trend of minimum temperature have caused reduction in the rice yield in particular and yield of most of the other kharif (main) crops in general. Above normal high maximum temperature coinciding with the flowering stage has been found to have detrimental effect on its yield. High rainfall at flowering stage also causes chaffy grain of rice causing a further loss of livelihood of the farmers, especially the resource poor tribal farmers. Similarly irregular rainfall affects the rain-fed paddy crop which is the main source of livelihood for most of the tribal farmers.

Because of irregular time of onset of monsoon the farmers fail to select right crops and varieties and finally end up getting less than the optimal output. Late arrival of rains many a times causes destruction of seedlings. The amount of precipitation, the duration of rainfall and the deviation in the time of withdrawal also results in the reduction of agricultural output. Failure of rainfall also causes a very heavy reduction in agricultural output. Drought which has become a recurrent phenomenon in Jharkhand affects the livelihood of the tribals severely. The worst affected are primitive tribal groups which historically are late entrants to settle cultivate and own land on hilly slopes with very low fertility and low water retention capacity.

High intensity rainfall which has also been evidenced in the state causes soil erosion. The state has an undulated terrain and the soil is light textured. The light textured soils of this region having shallow depths are prone to erosion in case of high intensity

rainfall. It is apprehended that such increase in number of erosive events may worsen the situation by leaving the top fertile soil barren and unproductive.

Bristle Beetle in Arhar, Sheeth Blight and Rust in Kharif maize, powdery mildew in lentil, Alternaria Blight in Rapeseed-Mustard, Swarming caterpillar in Rice, root Knot Nematode in Rice 19 have been observed in Jharkhand. Climate change has also resulted in appearance of new strains of disease and pests.

Impact on livestock

Climate change-driven alterations in rainfall have direct impacts on livestock productivity through water and pasture availability and significant indirect impacts.

Impact on milk production

The decline in minimum temperature during winter and increase (>40C) in summers have negatively impact on milk production by up to 30 percent (Upadhaya et al., 2012).

Impact on poultry output

A temperature of greater than 340C causes increase in mortality among chickens due to heat stress. The egg production also decreases both in broiler and layer breeders because of increase in atmospheric temperature. Heat stress also causes livestock loss affecting the livelihood of those tribals who wholly or partially are dependent on livestock.

Honey collection and climate change

The untimely rain reduces honey output also jeopardizing the livelihood of those tribal people who supplement their living by collecting honey. Climate change has brought down the number of honey hives. The flowering and frutescent stage of trees is important in the production of honey. Climatic change has adversely affected frutescent stage and lead to decline in honey production.

Impact of climate change on forest products

Climate change has adversely affected production of minor forest products on which the livelihood of a large proportion of tribals depend. Climate change has also caused fall in output of other types of minor forest products. The production of lac has decreased either because of problem in host trees.

The challenge of climate change on the livelihood of tribals

The effect of climate change is going to become more severe and the resultant situation is going to become worse in coming years. By the end of this century the precipitation is expected to increase and duration of rainfall is going to change in Jharkhand. It has been projected that by the end of this century the number of rainy days will go up by at least 10 days and the average rainfall in the state will rise by about 20 percent. The summer temperature will go up by a maximum of 2-30C during 2020-2025 whereas average winter temperature will go up by 4.78-5.20C by 2080.

The change in precipitation and temperature will worsen the livelihood condition of the tribals of this State and will cause deterioration in their economic condition. The productivity of their agriculture will decrease with the increase in temperature. Also the incidence of pests and other crop diseases will be on rise. Climate change will constrain the availability of clean air, drinking water, sufficient and safe quality food and also cause increase in natural disaster. They will affect the productivity of the poor tribal workers increase absenteeism because of disease and thus affect their livelihood adversely.

Climate Change in Jharkhand and tribal livelihood

Tribal population dominates the state of Jharkhand and is heavily dependent on rain-fed agriculture and to some extent on forest as means of subsistence. However climate variability and its unpredictability have had telling impact over the last few decades. Inability to withstand the extremes of climate, food insecurity, unstable and deteriorating income, rising health problems and such associated spillover effects have led most of these tribes to despair.

Climate change impact on livelihood vulnerability

The field crops are the main source of food for the tribal farmers. Bad crop impacts household food provision apart from source of income. Local people resort to deforestation activities to make both ends meet in drought and famine like situations.

Coping Mechanisms and adaptive risk

There is urgent need to intervene and reduce the climate change stress faced by the tribal communities in the region.

As a starting point they need to be made aware of alternative farming techniques and ways to conserve water and optimize its usage. Their primary source of sustenance is agriculture. However there are ways to circumvent the climatic adversities surrounding this means of livelihood and they need to be educated and trained in this respect.

Finding alternative edible products to satisfy hunger for example tubers, roots and wild fruits and plants. Finding alternate means of livelihood sustenance like selling minor forest produce and migration to nearby places to earn money.

Adaptive risk mitigation strategies can be introduced as:-

1. New farming techniques should be introduced to the tribal farmers.
2. Capacity building to sustain productivity should be promoted and
3. Water conservation mechanisms should be developed in every tribal village.

Some tribal farmers of the region have now adopted the system of rice/root intensification (SRI) for paddy cultivation. They are also using many different varieties of hybrid seeds like pioneer and advanta. Now apart from paddy, pulses and coarse crops tribal farmers are growing different types of vegetables and engaging their up lands for horticulture for marketing and self-consumption.

Inferences for policy focus through the risk mitigation:-

The first factor emerging from the study is to galvanize the Meteorological Department to timely communicate weather advisory information to the tribal farmers. Secondly to educate the tribal farmers on optimum soil, water and nutrient management. Thirdly, to concentrate on capacity building for water conservation, organic waste usage and composting, and finding alternate ways to make the agricultural tribes less vulnerable to climate change and more prepared to combat the climate induced livelihood stress. Fourthly, incentives should be rendered for research on alternate gainful means of employment in the regions to stop migration. Fifthly, there should be promotion of technology on innovative ways for watershed management and irrigations systems.

SUMMARY AND CONCLUSION

Thus, climate change has become a major issue of concern during recent years. It has affected the life, livelihood and economy of the tribal people and threatened their survival. In recent years the evidence of climate change is visible in Jharkhand State also. The incidence of drought has increased in entire state and tribal regions. The tribals are mainly dependent on natural resources and rain-fed agriculture. They have been adversely affected due to changes in the climatic condition. It is a major cause of concern and urgent need of serious efforts for mitigating as well as adaptation.

Therefore, there is an urgent need to intervene and reduce the climate change stress faced by the tribal communities in the region. The important factor emerging from the study is to galvanize the Meteorological Department to timely communicate weather advisory information to the tribal farmers. As mitigation strategy steps should be taken to reduce generation of Greenhouse Gases. This can be done through promotion of clean energy and adoption of climate-smart cultivation methods. As a starting point they need to be made aware of alternative farming techniques and ways to conserve water and optimize its usage. Tribal cultivators should be induced to switch over to rice varieties that require relatively lesser amount of water. Research on innovative ways for watershed management and irrigations systems

should be encouraged. System of rice/root intensification method of cultivation, reduction in fertilizer and pesticides use and adoption of climate friendly post-harvest measures can reduce GHG emission.

Tribal communities possess some traditional knowledge which helps them in not only reducing the impact of climate change but adapting themselves in case of climate change. There is a need of research on alternate gainful means of employment in the region to stop migration and promote sustainable development. Plantation of trees on the bunds and on other piece of land can also result into controlling climate change. Tree products provide farmers with a number of income options and increase their resilience to climate stress. The state government can develop a network of institutions within state that can provide necessary research and development support to all the sectors in the state in the context of climate change. Micro and mini water harvesting programs can be developed for the rural areas which are less costly yet result in effective water conservation.

Hence, there is an urgent need to develop a mechanism for effective dissemination and implementation of research findings in the tribal regions of the State. There should be ways to attract public-private partnership to address the tribal vulnerability in Jharkhand. Finally, larger tribal participation should be encouraged in policy framing and decision making.

REFERENCES

- IPCC, 2007, Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Geneva, Switzerland, available at:<http://www.ipcc.ch/publications...>
- Tebtebba, 2008, Guide on Climate Change and Indigenous Peoples, Tebtebba, Tebtebba foundation.
- Wadood and Kumari, P., 2008, Impact of Climate Change on Agriculture, ISPRS, Archives XXXVIII-8/W3
- Chakrabarti, P.G., 2015, Climate Change and Sustainable Development, Global Sustainable Development Report, Oxford, University Press.
- Christian, W., 2010, Climate Change and Security, a Gathering Storm of Global Challenges, PRAEGER.

Mishra, R.K., and Choudhary, J.S., 2012, Agricultural Resource Database of Jharkhand, 2011-12, Govt. of Jharkhand, SAMETI.

Data Source, 2016, India Meteorological Centre, Airport Road, Hinoo –Ranchi, Jharkhand.

Mishra, R.K., 2015, Growth and Development of Jharkhand Agriculture & Allied Sector, BAU, Ranchi.