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**Majid Majeed Khanday**  
Research Scholar, Department  
of Geography, CMJ University  
Jorabat, Meghalaya, India

## Exploring impact of global warming on Jammu and Kashmir

**Majid Majeed Khanday**

### Abstract

Greenhouse gas emission is directly related to fossil fuel use, industrialization, deforestation, air pollution and other environmental unfriendly activities across the globe. The mountainous regions like Jammu, Kashmir and Ladakh are the least industrialized; unfortunately, they are bearing the brunt of the climate change as the phenomena have global dimensions. It would lead to loss of hydropower generation, ecosystem services, and impacts on other key economic sectors in the region. Other impacts are an increase in the frequency of climate extremes, changes in stream flows, in the faunal and floral biodiversity, plant invasions and changes in agriculture and horticulture productivity. Effects of climate change are already being felt on the ground. Erratic snowfall and rainfall pattern, and unusually warm winters are some of the characteristics of the climate change in Jammu and Kashmir. The average temperature of Jammu and Kashmir has increased by 1.2 degree Celsius over the last century, higher than the global average of 0.8 to 0.9 degree Celsius. The increase in temperatures in Jammu and Kashmir has to do with the topography and high altitude. We have seen that warming is higher in the Himalayas and other mountainous regions of the globe. Temperature varies from place to place and it is basically a function of location, longitude, latitude and altitude.

**Keywords:** fossil fuels, climate extremes, stream flow's, productivity, erratic

### Introduction

Falling in the Himalayan region, Jammu and Kashmir has a geographic area of 2,22,236 sq. km. Around 20,230 sq. km, which comprises 19.95 per cent of the total geographical area of Jammu and Kashmir, is under the forest cover. The state is divided into three geographic regions-Ladakh, Kashmir Valley and Jammu. The higher regions of the state are covered by Pir-Panjal, Karakoram and inner Himalayan ranges of mountains. The state of J&K also forms a part of this complex Himalayan Mountain system and is located in the northern part of the Indian sub-continent and sharing international border with Pakistan, Tibet and China and has the most strategic location among the states in the country. It falls in the great north-western complex of the Himalayan Ranges with marked relief variation, snow-capped summits, antecedent drainage and complex geological structure. Climate change refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer. Global warming refers to the recent and on-going rise in global average temperature near Earth's surface. It is caused mostly by increasing concentrations of greenhouse gases in the atmosphere. Global warming is causing climate patterns to change. Global warming is showing an impact world over, from a small place like Kashmir in India to the Death Valley in the United States where the temperatures of 54.4 degrees Celsius were reported. World Meteorological Organization says the high temperatures are part of a global trend. Last year, Jammu and Kashmir surpassed the world in average temperature rise recorded in the last 100 years. Experts are also blaming human-induced activities for the rise in the overall temperature in Jammu and Kashmir. The experts say untimely rain and snowfall are indicators of the change. The early snowfall previous year, the effects of climate change is already being felt in the Kashmir valley. Climate change has made it clear that this change is happening largely because of human activity. The average temperature rise in the northern India state of Jammu and Kashmir has far surpassed the world average, which has got experts extremely worried. As against a global increase of 0.8 to 0.9 degrees Celsius over the last 100 years, temperatures in

**Correspondence**  
**Majid Majeed Khanday**  
Research Scholar, Department  
of Geography, CMJ University  
Jorabat, Meghalaya, India

Jammu and Kashmir have risen by an average of 1.2 degrees Celsius. The summer capital of Jammu and Kashmir, Srinagar, has recorded the highest ever day temperature recorded in August in the last 39 years. The city of Srinagar recorded 35.7 degrees Celsius temperature, which is more than 6 degrees above the normal in the month. It has set alarm bells ringing among the experts tracking climate change in the region. Similar temperatures were recorded back in 1981. People of Kashmir were not expecting such heat wave here because Kashmir is cooler as compared to Jammu but the heat wave here is intense this year. People from outside think the weather in Srinagar will be cooler like Shimla but it is hot here as well. J&K is a mountainous area, which is very susceptible to global warming and climate change. Our state is at a typical geographical location and if there is any human interference, like continuous infrastructure building, it becomes problematic", says Sonam Lotus, Director Meteorological department Kashmir, adding that five small floods declared after 2014 are the indicators. We have received less rainfall and western disturbances haven't impacted, due to which J&K & Ladakh have witnessed deficient rainfall. There has been a sharp increase in the day temperature", Sonam Lotus, Director meteorological department. We have received less rainfall and western disturbances haven't impacted, due to which J&K & Ladakh have witnessed deficient rainfall. There has been a sharp increase in the day temperature", Sonam Lotus, Director meteorological department. In 2014, Jammu and Kashmir witnessed a massive flood caused due to cloud bursting. According to a report prepared by the State Disaster Management Authority, since 2010, many flash floods and cloudbursts which have hit J&K resulted in the killing of 300 people. It reads that property worth crores of rupees was also damaged. Flash floods and cloudbursts have also proved disastrous for the agriculture and horticulture sector of the valley which is the backbone of the rural economy. Experts believe that given the geographical location, Jammu, Kashmir and Ladakh are prone to such calamities with continues deforestation adding to it. This has worried the farmers as there has been a deficient rainfall of 54 per cent below normal, according to India Meteorological Department data. Similar weather changes have also been noticed in other districts of the valley. Water bodies have dried up which has also caused the scarcity of drinking water.

When compared the satellite images of important glaciers from the last 30 years and the results were astonishing, surprising to many. What I found was that there was a visible receding of Ice cover over the mountains. We looked at Shafat Glacier, which is the source of water for Indus River, and we found that the ice has receded. From images, it seems between 10 to 12 Kilometers, A study conducted by Union Ministry of Earth Sciences has already warned about an increase in temperatures in Jammu & Kashmir and Ladakh due to the melting of glaciers which is a direct impact of climate change. Satellite images have shown a significant impact of climate change on the glaciers in the valley, among them is Shafat Glacier which contributes to the Indus River. This has resulted in the melting of glaciers and greater precipitation which, the experts say, could lead to disaster in the state. Experts say that although warming is

a global phenomenon, it will have a significant impact on the Kashmir valley since its glaciers are now melting at a fast pace. (Shafat glacier, which contributes to the Indus River, being among them).



Fig 1: Showing Picture: Showing melting of glaciers

**Research gap:** While surveying the review of the reacted lecture the researcher found that limited researcher studies has been conducted on the global warming. However among these studies maximum are carried at national and international level. Least researcher studies have been carried out in context of Jammu and Kashmir. So the researcher selected the below mentioned research problem.

**Problem in hand:** The statement of the research problem is given as under:

**“Exploring the impact of global warming on Jammu and Kashmir”**

**Methodology and procedure:** The methodology and the procedure of the study is based on below mentioned parameters:

- **Study design:** The study has been carried in context of descriptive research method.
- **Data collection:** The researcher has collected the data by using the primary and secondary data.

**Analysis and Interpretation:** The average annual carbon dioxide emissions per person, in India is 1.6 tons On Earth, human activities are changing the natural greenhouse. Over the last century the burning of fossil fuels like coal and oil has increased the concentration of atmospheric carbon dioxide (CO<sub>2</sub>). The clearing of land for agriculture, industry, and other human activities have increased concentrations of greenhouse gases.

Table 1: Showing the gases that contribute to the greenhouse effect

Gas	PRE-1750 Concentration	Current Concentration	Lifetime (Years)
Carbon-Dioxide (ppm)	280	400.16	100-300
Methane (ppb)	722	1842	12
Nitrous Oxide (ppb)	270	327	121
Ozone (dn)	237	337	Hours-days
CFC-11 (ppt)	Zero	236	45
CFC-12 (ppt)	Zero	527	100

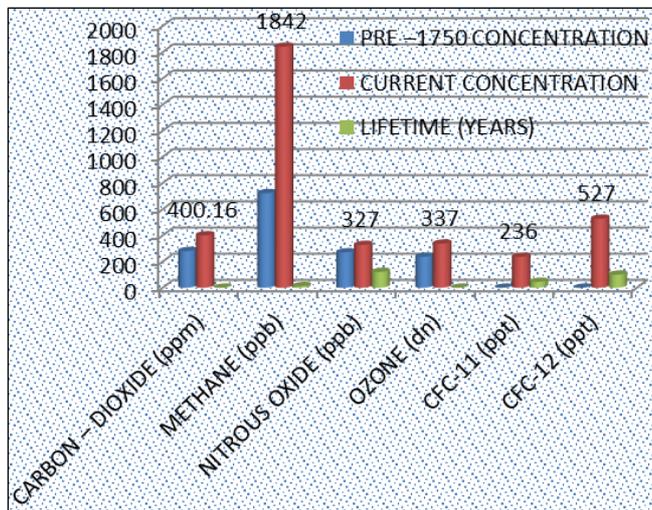


Fig 2: Showing the gases that contribute to the greenhouse effect

The results reported in the above table indicate that changing climate will create havoc in future if the same trend continues. With increasing water crisis, population explosion and climate change, the import of grains is going

to be an uphill task in future and will further widen the already stressed fiscal deficit. Dozens of colonies are coming up on agricultural land in different parts of the state. The law enforcement agencies, climate change groups need to curb the menace before the problem assumes horrendous proportions. It is concluded from the foregoing facts that the future climate and its impact could well trigger bloody wars fought over access to basic necessities like drinking water and food grains. Certain measures are required to be taken to overcome this problem which include creation of laws; growing of pulses, millets and adoption of agroforestry.

**Climate change & agriculture:** Agriculture is highly dependent on weather and changes in weather cycle have a major effect on crop yield and food supply. Mountain agriculture is mostly rain fed and driven by biomass energy of surrounding forests and confined to terraces carved out of hill slopes. Looking at the present situation in Jammu and Kashmir, the figures in terms of production, area and yield rate are not satisfactory as the gap between deficit and requirement is increasing at an increasing rate which has gone up to 81 per cent against the current population growth.

Table 2: Details of production and yield of main food crops in Jammu and Kashmir

S. No.	Crop	Production (in 000 quintals) 2013-14	Production (in 000 quintals) 2014-15	Yield (quintals/ha) 2013-14	Yield (quintals/ha) 2014-15
1.	Rice	5567.38	4548	20.51	17.11
2.	Maize	5305.3	2735	17.76	8.86
3.	Wheat	6018.81	5819.5	20.16	20.00
4.	Barley	71.6	71.6	5.67	5.67
5.	Pulses	84.1	84.1	5.37	3.17
6.	Oil-Seeds	583.36	583.8	8.95	8.85
	Total	17689.25	13842	18.22	14.26

Source: Directorate of Economics and statistics government of Jammu and Kashmir annual publication 2013-14.

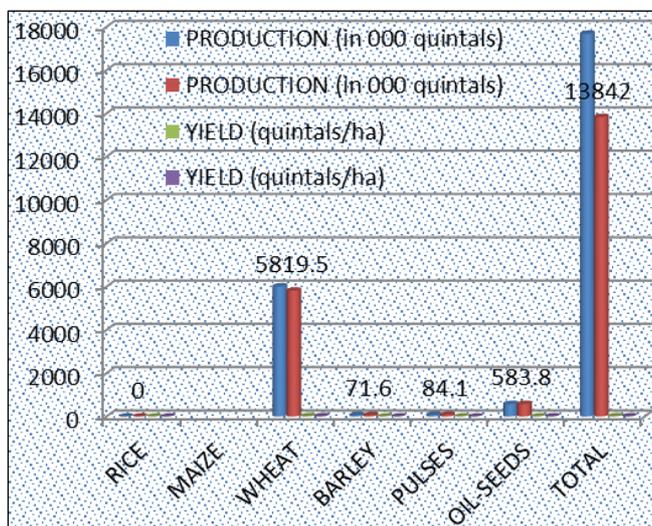


Fig 3: Details of production and yield of main food crops in Jammu and Kashmir

It is very evident from the above table that effects of climate change are clearly visible on the production and yield of agriculture. There is a drastic change in the total production from 2013-15 in the main crops of the Jammu and Kashmir. The reasons behind this severe change are Land use Changes, global warming, climatic change/variability, Reduced availability of water for irrigation affected by erratic rainfall, Loss of Soil Moisture, Degraded Soil Health,

Extreme drought events and shifts in the rainfall regime resulting into failure of crop germination and fruit set. We need to take this climate change on a serious note and find some adaptive measures in order to live happily on this planet.

**Recommendations of the study:** The recommendations of the study are given as under:

1. Access to early warning equipment (e.g. radios) for tourism operators.
2. Adoption of organic farming.
3. Certain measures are required to be taken to overcome this problem which include creation of laws; desalting, growing of pulses, millets and adoption of agroforestry.
4. Emphasis should be given on cultivation of wild edible plants/fruits.
5. Farmers must be given knowledge about the best practices for water conservation like sprinkle irrigation etc.
6. Improvement in weather-forecasting and awareness among farmers about the latest agricultural techniques.
7. Increased evaporation from the soil and accelerated transpiration in the plants themselves will cause moisture stress; as a result, there will be a need to develop crop varieties with greater drought tolerance.
8. Introduction of drought and pest-resistant crops.
9. Preserve and restore structural complexity and biodiversity of vegetation.

10. Protect ecologically “critical” areas such as nursery grounds, spawning grounds and areas of high species diversity.
11. Reintroduction of non-polluting traditional methods
12. Shifting of dependence on artificial fertilizers towards organic fertilizers like green manure, bio-manure etc.
13. Training of tour guides as first responders, and/or building a fleet of emergency responder.
14. Upgraded and climate resilient critical infrastructure (roads).
15. Weather forecasting and early warning systems.

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