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Regional Climate Changes its Consequences and Adaptation Strategies in India

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Abstract

Indian climate is experiencing serious change indicated by geophysical impacts on floods and drought natural climates both the condition is very serious as concern about human. The major factor of regional climate change is attributed to continuous mining and deforestation since colonial time period in industrialization policy frame work. This paper investigated the impact of climate change on geothermal condition in Arabian and Indian peninsula an impact of climate change on monsoon and rainfall variation in India. The paper also has made assessment of impacts of climate change as result of flood in northern India due to increases melting of glacier and increased flood in Perineal River originating from Himalaya, northern plain and sea basin in northern India. The climate change resulting low rainfall in southern India and arid zone resulting in water scarcity due to low carry capacity of rivers. Adaptation of farmers intensive cropping system in coastal regions have caused serious water conflicts in Cauvery river water sharing between two state Karnataka and Tamil Nadu. The paper also examine the Paris submit Recommendations and polices and mitigation of effect of climate change, environmental conservation and sustainable development polices at global and regional levels. In view of prolonged floods and drought in India since the colonial period. The paper identity the strategic planning and polices for restoration of environmental balance and sustainable development polices both for flood prone and drought prone regions in India. The climate change adaptation need in water, agriculture, infrastructure, human health transport energy and ecosystem in these sector. The imbalance of climate changes its effect in physical, Biological and Space.

Keywords: Geo-Thermal Condition in Arabian and Indian Peninsula; Impact of Climate Change on Monsoon; Floods and Drought; Long Term and Short Term Adaptation Strategic; Global and Indian Policy Response

Introduction

India is facing serious flood problems in Gangetic basin and coastal regions of India, drought problem in arid plateau regions. Both drought and floods problems have resulted due to changes in climate indicated by increases in temperature and reducing rainfall [1].The hypothesis of increasing temperature in India has caused reduced rainfall and melting of glaciers in Himalayan region causing floods in Gangetic basin region along with coastal areas and drought condition in arid plateau regions [1]. The hypothesis that continued mining and deforestation has led to the climate change problem in India since colonial period. This may be identified in mining and adjoining regions in geographical landscape the environmental degradation including land, water, air, temperature and space. The ecological and environmental degradation caused by the centralized developmental activities in India is of serious nature and questions the efforts of environmental conservation and developmental program for sustainability [2]. Indian culture has continued to be based on cultural values of preservation of life and has resisted to the modernization principles of economic growth through mineral based industrialization in dominance and succession process. It is now recognized that the unlimited growth possibility by maximization of exploitation of natural resources has resulted to unsustainability of environment and life on earth [3]. The climate change phenomena are closely related to deforestation and use fossil fuel in development process. Consequence of climate change and policy response of climate change has divided into adaptation and mitigation [4]. The recognition of shared global responsibility to reduced climate change by reducing global temperature by 2 °Cwould require adoption non-conventional energy sources but also adopting principles of environmental and life sustaining economic growth process at region scale [5].

Industrialization and Climate change

The industrial civilization using mineral resources and fossil energy resources with modernization principle led to unlimited growth of economies of the western regions in colonial dominance and succession process. The growing socialistic regionalism

and centralized planning for industrialization resulted in global rush for maximization of economic growth. The industrialization process led to serious social and environmental problems of the traditional agrarian regions dependent on bio production cycle and systems. Recognition of unsustainability of mineral based industrialization since 1970s has force to environmental conservations and sustainable development program at global and regional levels. Nevertheless, the programs have serious institutional conflicts and have not led to sustainability of development indicated by global climate change, large scale human migration as environmental refugees and terrorism.

The sustainability of global economies would require integrated growth of agrarian and industrial production cycle in regional and global systems in cultural cooperation between cultural geographic continuums. The increasing cultural regionalism for social stakes and access to the political economic systems has resulted due to dominance and succession process resulting in conflicts in geophysical, biotic and human life in adaptive social and cultural communities in mountain, animal husbandry and agricultural ecosystems [6].

Following the bio regenerative cycle and production complex systems in basin regions would require planning of the river basins for restoration of environmental quality and sustainable growth of regional economies following ecological and marketing principle in globalization. The balancing of climate change effects would require restoring balance between environmental systems and elements and also planning and integrated development process of bio-production cycle and the physical cycles and complexesfor restoring the ecologic economic systems and environment economic systems [7]. The physical, biotic, human, and economic monitoring and evaluation criteria indicate to the system balance in dynamics equilibrium [8].

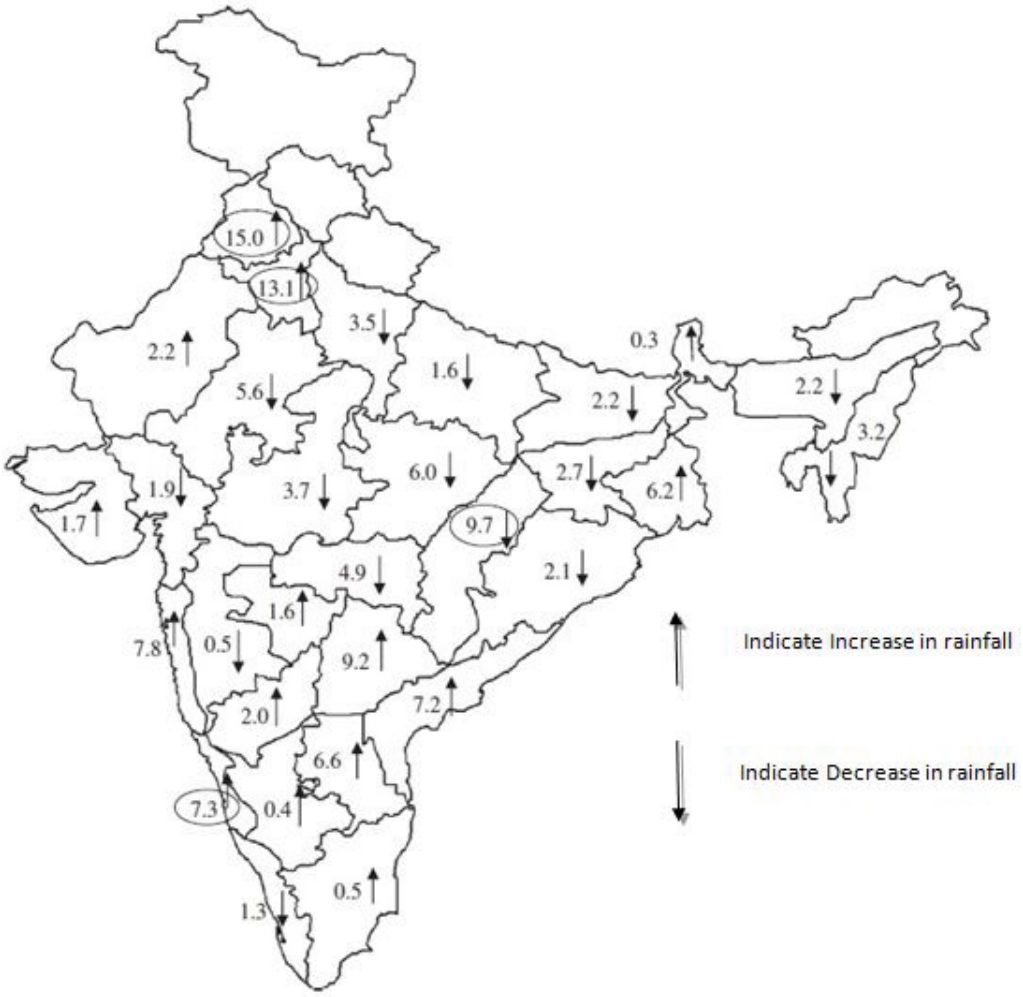
Regional variation in climatic conditions and its consequences

The rainfall variation in India has indicated that the majority of the state regions of India have increasing trends in temperature. West coast regions experienced maximum temperature increase of 1.2 °C followed by north east by 1.0 °C,Western Himalaya by 0.9 °C, North Central 0.8 °C, North West 0.6 °C, East Coast 0.6 °C, Interior Peninsula 0.5 °C, during the period 1901-2003 [9]. The rainfall pattern of India has shown decreasing rainfall in most of the central, eastern, and north eastern region have experienced low rainfall conditions leading to drought. The drought condition affected agriculture in term of scarcity of water in this region. The primary economic activity of poor farmer is agricultural is dependent on rain water for irrigation. The adaptive capacity of poor farmer is limited because of lack of education [10]. Indian agriculture mostly effects of climate change.

Annual rainfall map of India

Figure 1: Trends and magnitude of annual rainfall (% of mean 100/year) for different region in India *Vijay Kumar et al* (2007) [9]

Annual rainfall map of different region in India



In above given map show that increase and decrease pattern of rainfall in different state of India. The arrow upright its show this region has increases rainfall while arrow inverted its shows that decreases rainfall.

Figure 2: Trend and magnitude of changes in annual rainfall (% of mean/100 year) for different region in India *Vijay Kumar et al* (2007) [9]

Sub-division/Region	Annual	Pre-Monsoon	Monsoon	Post-Monsoon	Winter
Sub-division/Region					
Assam & Meghalaya	-0.53	-0.19	-0.64	**0.34**	-0.02
Nagaland, Manipur, Mizoram & Tripura	-0.63	0.13	**-1**	0.16	-0.07
Sub-Himalayan West Bengal & Sikkim	0.07	0.15	-0.58	**0.4**	0.02
Gangetic West Bengal	0.95	0.09	0.58	0.26	0.03
Orissa	-0.31	0.07	-0.45	-0.08	0.04
Jharkhand	-0.37	-0.01	-0.44	0.13	0.01
Bihar	-0.27	0.13	-0.52	0.1	0.03
East Uttar Pradesh	-0.17	0.03	-0.13	0.05	0.02
West Uttar Pradesh	-0.3	0.06	-0.39	**0.07**	-0.03
Haryana	**0.73**	0.06	0.57	0.02	-0.01
Punjab	**0.96**	0.1	**0.85**	**0.03**	0
West Rajasthan	0.06	0.03	-0.03	0	-0.01
East Rajasthan	-0.39	0.01	-0.54	0.02	-0.03
West Madhya Pradesh	-0.35	0.02	-0.49	0.06	0
East Madhya Pradesh	-0.76	0.02	-0.89	0.01	0.07
Gujarat	-0.17	-0.01	-0.28	0.02	0
Saurashtra, Kutch & Diu	0.08	0	-0.05	0.01	0

Konkan & Goa	1.97	0.03	1.56	0.21	0
Madhya Maharashtra	-0.04	-0.01	0	0.05	-0.01
Marathwada	0.14	0.03	-0.21	**0.3**	0
Vidarbha	-0.53	0.02	-0.58	0.11	0.07
Chattisgarh	**-1.33**	0	**-1.29**	-0.02	0.01
Coastal Andhra Pradesh	0.7	0	0.37	0	0.06
Telangana	0.82	0.09	0.3	**0.28**	0.05
Rayalaseema	0.47	0.11	0.21	0.03	-0.02
Tamil Nadu & Pondicherry	0.05	-0.07	-0.02	-0.05	0.08
Costal Karnataka	2.37	0.25	1.81	0.14	0
North Interior Karnataka	0.16	0.1	-0.06	0.03	0
South Interior Karnataka	0.03	-0.11	0.18	0.01	0
Kerala	-0.37	0.21	-1.28	**0.66**	0.07
Regions					
North East India	-0.1	0.03	-0.48	0.33	-0.01
Central North East India	-0.1	0.06	-0.3	0.04	0.01
North West India	0.08	0.04	-0.07	0.02	-0.01
West Central India	-0.3	0.04	-0.43	0.11	0.02
Peninsular India	0.22	0.01	0.08	0.09	0.05
Whole study area	-0.03	0.04	-0.25	0.12	0.02

*Bold values indicate statistical significance at 95% confidence level as per Mann-Kendall test (+ for increasing and – for Decreasing).
Table 1: Sen estimator of slope (mm/year) for annual and seasonal rainfall Source (*Vijay Kumar et al* 2007)[9]

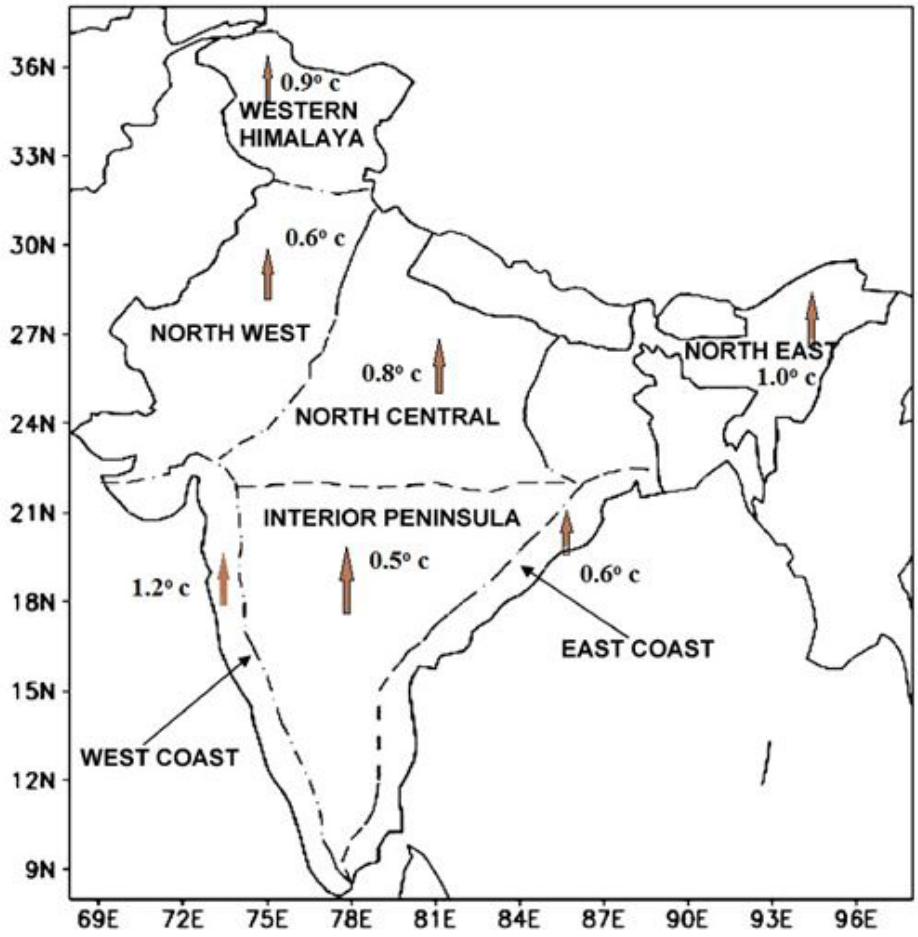


Figure 3: Map of seven homogenous region of India (source IITM) used for examine temperature trend in India *Dash S K et al* (2007)[9]

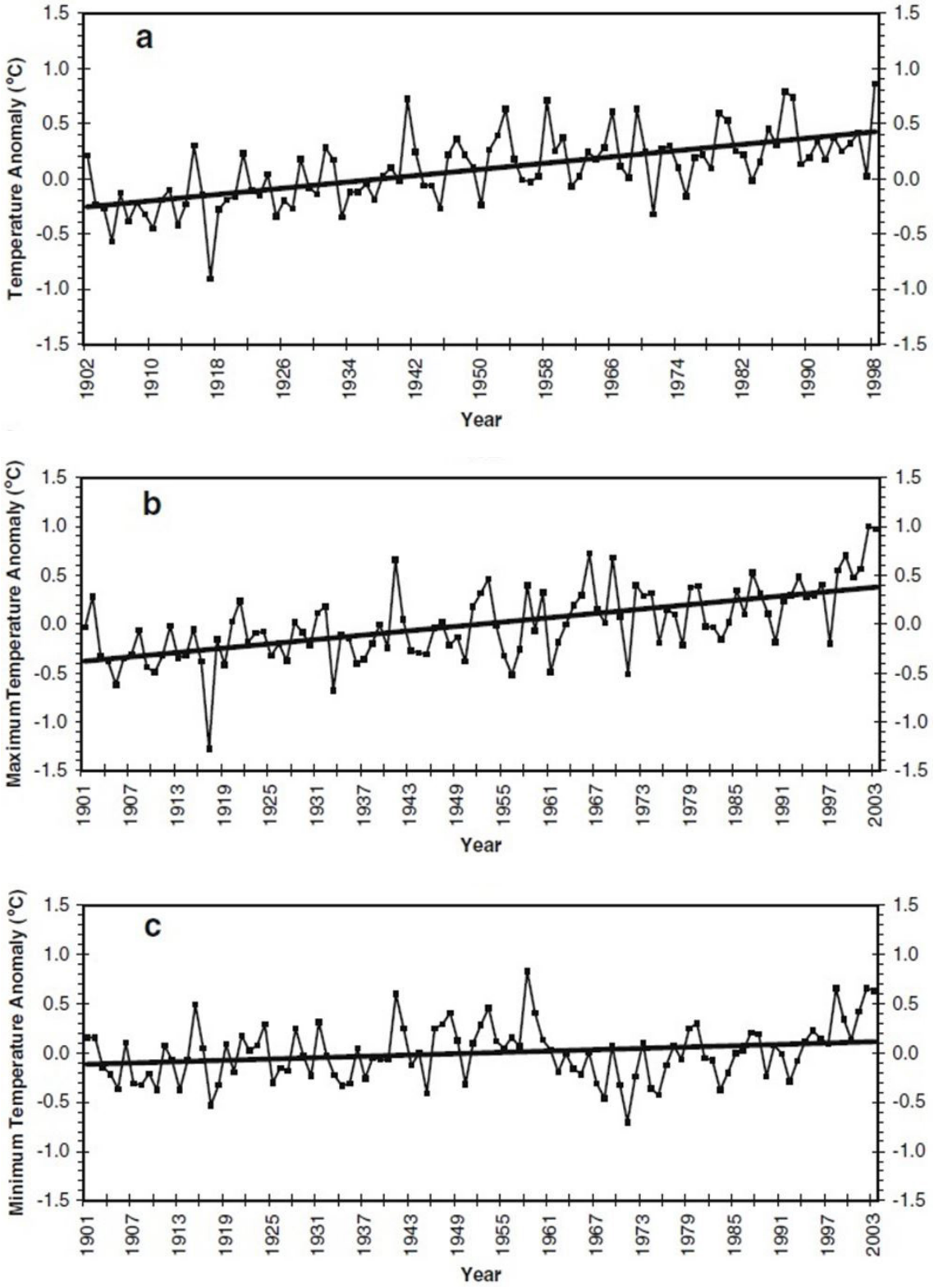


Figure 4: MTime series of annual anomalies (°C) over India an average b maximum c minimum *Dash S K et al* (2007) [9]

Consequences of climate change

The increasing temperature in the western Himalayas and North West regions has serious implications of floods both in Himalayan regions and Gangetic basin due to melting of ice sheet and the drainage systems run off in major river basins. The most serious problem is in drainage systems of river Gangetic basin in which most of the rivers bring flood waters from Yamuna, Gandak, kosi, river systems affecting a very large geographical area [11]. Nevertheless, the Gangetic basins region in UP and Bihar are experiencing low rainfall and drought condition during kharif seasons

The drought pattern in India indicate the drought prone areas have spread in Uttarakhand, UttarPradesh, Bihar, Jharkhand, West Bengal, Maharashtra, Gujarat, Karnataka, Andhra Pradesh, Telangana, Orissa, and Tamil Nadu. There are two types of pattern of spread of drought prone areas. The regions where mining has continued since colonial period are experiencing drought problems and their adjoining regions, on the other hand due to deforestation and quarrying activities have led to increasing temperature due to serious changes in land cover and land use pattern change even in flood prone areas [12]. The problem has further increased due to privatization of mining in many of the area's leading to geo-ecological and environmental imbalance [11].

The increasing temperature in India has serious repercussions of monsoon pattern because the decreasing temperature difference in Arabian region and Indian subcontinent is reducing cloud formation and reduced rainfall [10].

Concluding Remarks

The regional pattern of variation of climate changes indicates geographical variation in relationship of temperature and rainfall in India whereas, the north western India has resulted in increased melting of glaciers and increased rainfall due to climate change causing floods in the Himalayan regions and the river basins, on the other, arid and plateau regions are experiencing drought condition due to climate change. There is also the spread drought and flood prone areas have spread effects due to convection and fluvial processes impacting larger areas. It is necessary to reduce the cause for preventing effects of drought and floods as found in India resulting from large scale mining and quarrying since colonial period. The relationship of deforestation and soil erosion on climate sensitivity is established and therefore both in drought and flood prone areas large scale of forestation would help in stabilizing the environmental elements and help as thermostat [13]. Along with these measures, integrated regional plans for sustainable environment and development can be initiated by scoping in regional and temporal dimensions. The program has been made about climate change consequence towards the adaptation and mitigation of problem face by national [14]. Save livelihood and ensure food security of affect region through flood and drought conditions. The most affect or vulnerable to climate change are the poor in India.

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