

SOCIAL PERCEPTIONS OF CLIMATE CHANGE IN RAJASTHAN STATE, INDIA

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India's climate is both diverse and changing. The south experiences tropical climate, through to more temperature conditions to the alpine regions of the north where elevated areas receives sustained winter snowfall. India is faced with the challenge of sustaining its rapid economic growth while dealing with the global threat of climate change. This threat emanates from accumulated greenhouse gas emissions in the atmosphere, anthropogenically generated through long-term and intensive industrial growth and high consumption lifestyles in developed countries. While engaged with the international community to collectively and cooperatively deal with this threat, India needs a national strategy to firstly, adapt to climate change and secondly, to further enhance the ecological sustainability of India's development path. Climate change may alter the distribution and quality of India's natural resources and adversely affect the livelihood of its people. With an economy closely tied to its natural resource base and climate-sensitive sectors such as agriculture, water and forestry, India may face a major threat because of the projected changes in climate.

India's development path is based on its unique resource endowments, the overriding priority of economic and social development and poverty eradication, and its adherence to its civilization legacy that places a high value on the environment and the maintenance of ecological balance. In charting out a developmental pathway which is ecologically sustainable, India has a wider spectrum of choices precisely because it is at an early stage of development. Our vision is to create a prosperous, but not wasteful society, an economy that is self-sustaining in terms of its ability to unleash the creative energies of our people and is mindful of our responsibilities to both present and future generations. Recognizing that climate change is a global challenge, India will engage actively in multilateral negotiations in the UN Framework Convention on Climate Change, in a positive, constructive and forward-looking manner. Our objective will be to establish an effective, cooperative and equitable global approach based on the principle of common but differentiated responsibilities and respective capabilities, enshrined in the United Nations Framework Convention on Climate Change (UNFCCC). Such an approach must be based on a global vision inspired by Mahatma Gandhi's wise dictum—the earth has enough resources to meet people's needs, but will never have enough to satisfy people's greed. Thus we must not only promote sustainable production processes, but equally, sustainable lifestyles across the globe.

Our approach must also be compatible with our role as a responsible and enlightened member of the international community, ready to make our contribution to the solution of a global challenge, which impacts on humanity as a whole. The success of our national efforts would be significantly enhanced provided the developed countries affirm their responsibility for accumulated greenhouse gas emissions and fulfill their commitments under the UNFCCC, to transfer new and additional financial resources and climate friendly technologies to support both adaptation and mitigation in developing

countries. We are convinced that the principle of equity that must underlie the global approach must allow each inhabitant of the earth an equal entitlement to the global atmospheric resource.

The State of Rajasthan is situated in the western part of India. The state comprises of 33 districts, 39,753 inhabited villages, 249 Panchayat Samities and 9168 Gram Panchayats. Geographically, deserts in the State constitute a large share of landmass. The forest cover of the State contributes 4.19 percent to the national forest cover with 10.4 percent of the country's area and 5.5 percent of its population. Climate change may alter the distribution and quality of India's natural resources and adversely affect the livelihood of its people. With an economy closely tied to its natural resource base and climate-sensitive sectors such as agriculture, water and forestry, India may face a major threat because of the projected changes in climate. In developing countries like India, climate change is an additional burden because ecological and socio-economic systems are already facing pressures from rapid population, industrialization and economic development. It is difficult to detect global warming directly because most people experience changes only in local weather patterns, which are highly variable and may not reflect long-term global climate trends. However, local climate-change experience may play an important role in adaptation and mitigation behaviour and policy support. Here in this paper, I examine the extent to which respondents in Rajasthan State detect recent changes in average local temperatures. These findings also suggest that public opinion of climate change may shift, at least in part, in response to the personal experience of climate change.

Since the beginning of industrial revolution, human activities have led to unprecedented changes in the chemical composition of Earth's atmosphere. There is now credible evidence to show that such changes carry significant potential to influence Earth's climate (Houghton et al., 2001). However, owing to complex interactions within the climate system it is difficult to differentiate the characteristics of climate change associated with natural and anthropogenic forcing. From a pre-industrial value of about 280 parts per million (ppm), the global atmospheric concentration of carbon dioxide (a greenhouse gas—GHG) has increased to 379 ppm in 2005. Similarly, concentrations of other potent GHGs like methane and nitrous oxide have also increased considerably on a global scale. According to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (IPCC, 2007), majority of the increase in the observed global average temperatures since the mid twentieth century is very likely linked to the observed increase in anthropogenic greenhouse gas concentrations. The AR4 concludes that discernible human influences have now extended to other aspects of climate, including ocean warming, continental-average temperatures, temperature extremes and wind patterns. Projected scenarios have also indicated rise in global mean temperatures in the range of 1.1 to 6.4 degree centigrade by 2100 (IPCC, 2007). The analysis from global instrumental records of over one and half century have revealed that the earth has warmed by 0.74 (0.56 to 0.92 degree centigrade) during the last 100 years, with 12 of the last 13 years being the warmest. According to IPCC AR4, the rise in temperature by the end of the century with respect to 1980–1999 levels would range from 0.6 degree centigrade to 4.0 degree centigrade. It is difficult to detect global warming directly because most people experience changes only in local weather patterns, which are highly variable and may not reflect long-term global climate trends. Available data show that air temperature near the earth surface rose by 0.74°C from 1906 to 2005 and scientists estimated it could be increased as much as 6.4°C on average during the 21st century (Synthesis Report, IPCC, 2007).

Objectives

- ▶ To understand the local peoples' perceptions towards local climate change.
- ▶ To find out the major impacts of climate change in local peoples' view.

Data Collection

- ▶ In this research, total of 400 peoples were selected. These respondents were selected from each category of people including all gender, education, economic class and different age group.
- ▶ Interviews and structured questionnaire survey were executed in the research.

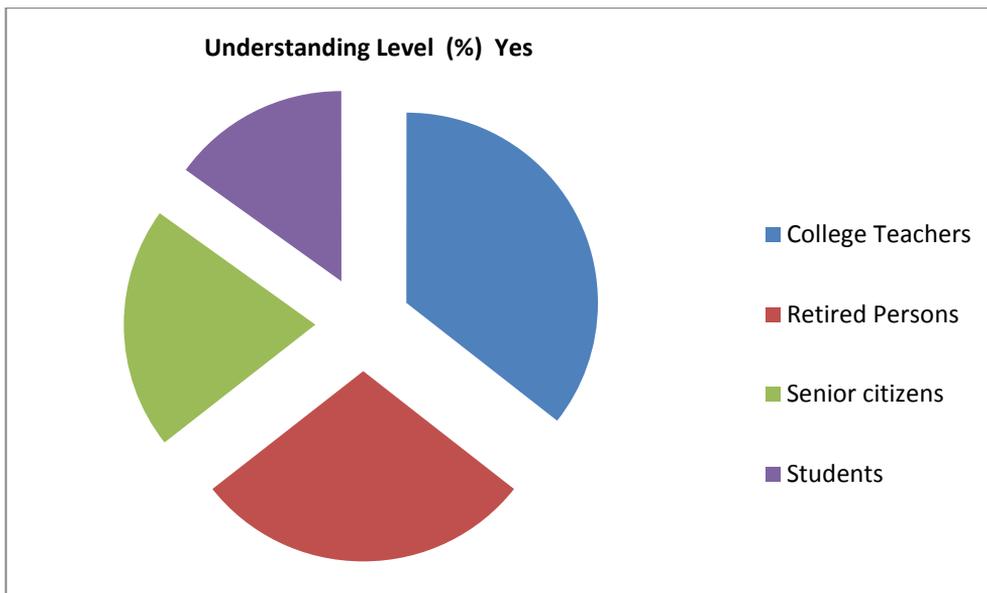
Understanding Term "Perception of Local Temperature"

The term perception of local temperature is very familiar with the people. About 73 percent respondents knew its meaning at local and global level. Only 18 percent respondents were don't know about the term and its meaning. Whereas 9 percent said that they never heard about this. The following table shows the details.

Table 1: Understanding Term "Perception of Local Temperature"

Category	Understanding Level (%)		
	Yes	No	Don't know
College Teachers	26	02	01
Retired Persons	21	05	02
Senior citizens	15	04	02
Students	11	07	04
Total	73	18	09

Source: Based on Field Survey-2013



Local Temperature Changing or Not

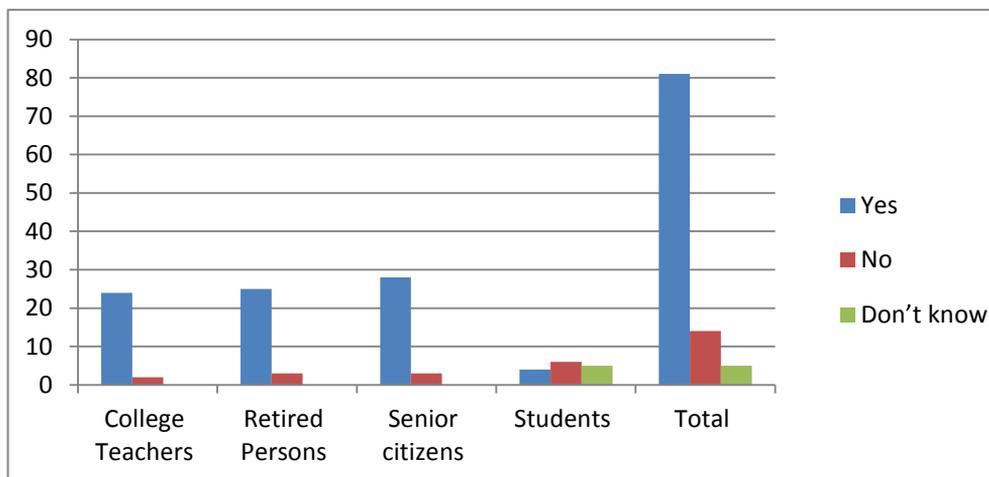
This is very interesting that most of respondents accepted that local temperature is changing very slowly. About 81 percent respondents from all category said that local climatic condition is changing. The specific mentioned that local average temperature is increasing slowly year by year. This change may be due to green house effect or may some other reason. But they sure temperature condition is not same as before. On the contrary 14 respondents said that temperature is not changing. The following table shows the details.

Table 2: Local Temperature Changing or Not

Category	Understanding Level (%)		
	Yes	No	Don't know
College Teachers	24	02	0
Retired Persons	25	03	0
Senior citizens	28	03	0
Students	04	06	05
Total	81	14	05

Source: Based on Field Survey-2013

Local Temperature Changing



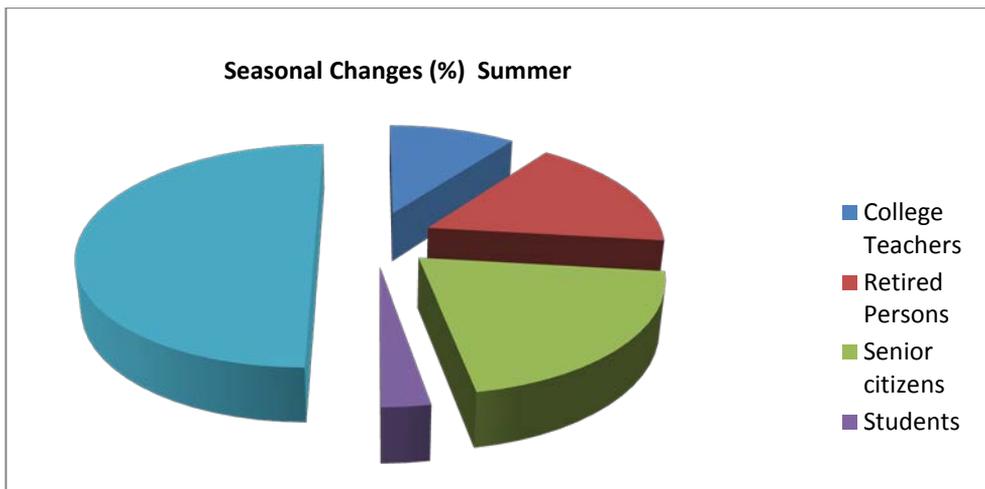
Seasonal Change

Changing of season timing is very important. The observations of respondents are very important in these phenomena. Though measurement of changing of seasonal variation is very scientific but this is based on experience and personal feeling of a person in his or her life span. These phenomena are important in the study of climate change and its impact. About 54 percent respondents observed that summer seasonal timing is changing slowly. Whereas 32 percent said that winter timing is also changing. It means 86 percent respondents accepted that seasonal behavior is changing. This situation is very alarming and needs to conduct a more scientific research.

Table 3: Seasonal Change

Category	Seasonal Changes (%)		
	Summer	Winter	Don't know
College Teachers	11	09	02
Retired Persons	18	11	03
Senior citizens	22	11	02
Students	03	01	07
Total	54	32	14

Source: Based on Field Survey-2013



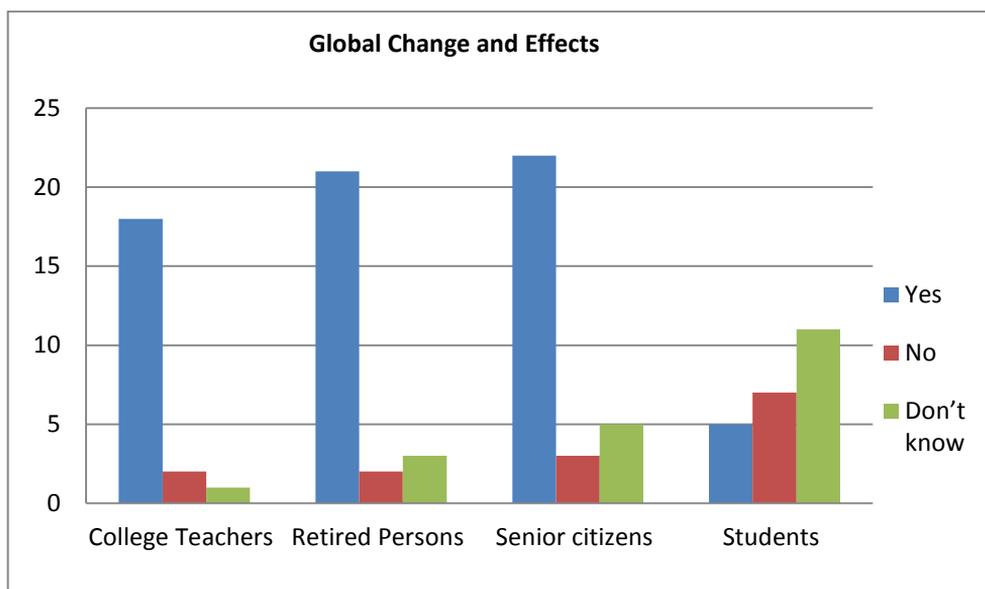
Global Change and effects

Climate change is one of the most important global environmental challenges, with implications for food production, water supply, health, energy, etc. Addressing climate change requires a good scientific understanding as well as coordinated action at national and global level. The people of the study area are confirmed that global climate is changing very fast due to mismanagement industrial development and human greed. About 66 percent respondents were said that global climate is changing. We are facing numbers of problems due to its change. Some effects are not seen directly but its long term effects will be more dangerous than others. About 14 percent respondents are not in the favour of global climate change. But 20 percent respondents till not aware about any change. The following table shows the details.

Table 4: Global Change and effects

Category	Global Change and effects (%)		
	Yes	No	Don't know
College Teachers	18	02	01
Retired Persons	21	02	03
Senior citizens	22	03	05
Students	05	07	11
Total	66	14	20

Source: Based on Field Survey-2013



Impact on Health

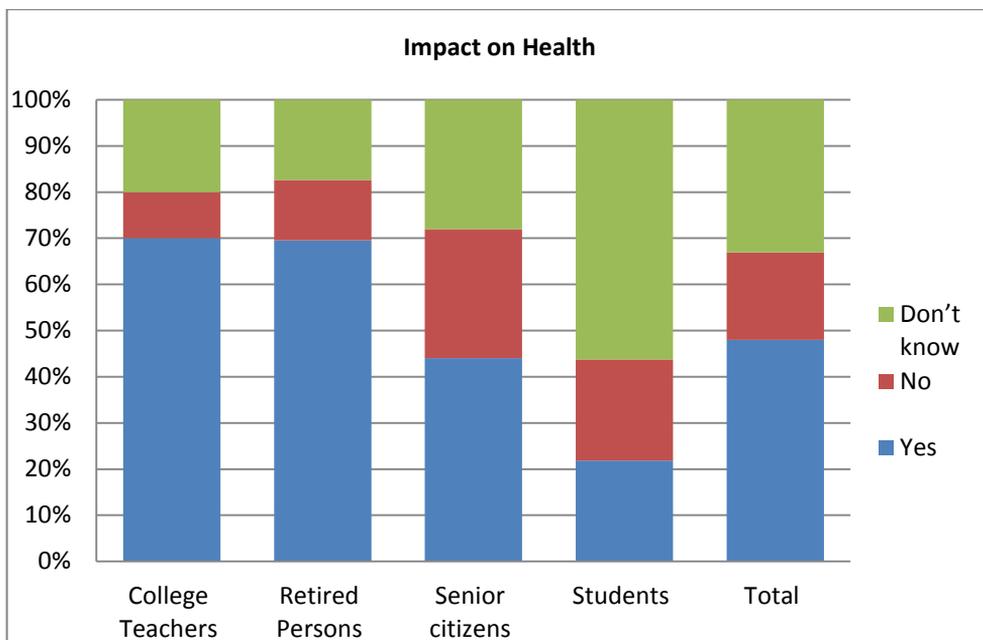
Climate change is expected to adversely impact human health by increasing the risk of exposure to vector, water- and food-borne diseases, aggravating malnutrition and increasing injuries and deaths from extreme rainfall events and thermal stresses. However, a number of non-climate factors such as population growth and demographic change, access to clean water, adequate nutrition and sanitation facilities, improvements in healthcare, and disease prevention and control programs have tremendous influence on either reducing or aggravating these climate induced impacts. However, very few studies have been carried out in the Indian context to study the impacts that climatic changes may have on population health. However, more recently interest in this field is increasing and more evidence is being generated. The following table shows that 48 percent respondents were accepted its impact on health, while only 19 percent said there is no any negative impact on health. But this is very important to say that 33 percent respondents still don't know about these phenomena.

Table 5: Impact on Health

Category	Impact on Health (%)		
	Yes	No	Don't know
College Teachers	14	02	04
Retired Persons	16	03	04
Senior citizens	11	07	07

Students	07	07	18
Total	48	19	33

Source: Based on Field Survey-2013



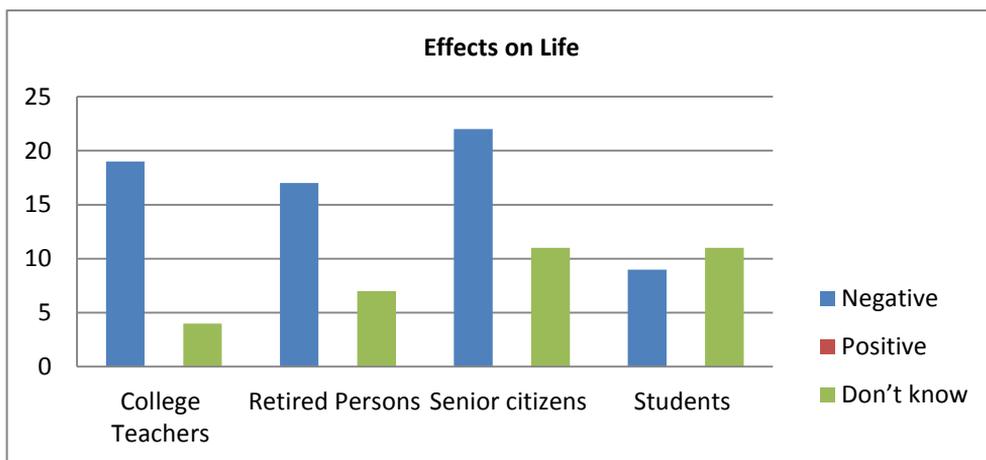
Impact on Life

Climate change is one of the most important global environmental challenges facing humanity with implications for food production, natural ecosystems, freshwater supply, health, etc. According to the latest scientific assessment, the earth's climate system has demonstrably changed on both global and regional scales since the preindustrial era. About 67 percent respondents accepted the negative impact of life due to climate change, which may in any term like health, mental and even their body structure. About 33 percent respondents don't know about its negative or positive impact. The details are given in the following table.

Table 6: Impact on Life

Category	Impact on Life (%)		
	Negative	Positive	Don't know
College Teachers	19	0	04
Retired Persons	17	0	07
Senior citizens	22	0	11
Students	09	0	11
Total	67	0	33

Source: Based on Field Survey-2013



Effects on Agriculture

Rajasthan is currently the largest State of India covering nearly 10.4 percent of total geographical area of the country. Nearly 65 percent of its population (56.5 million) is dependent on agriculture. The State is presently divided into 33 administrative districts and has 10 agro-climatic zones. Agriculture in Rajasthan is primarily rainfed covering country's 13.27 percent of available land. Groundwater is getting depleted as well as polluted. In general, every third year is a drought year. The State is also rich in its agro-biodiversity and

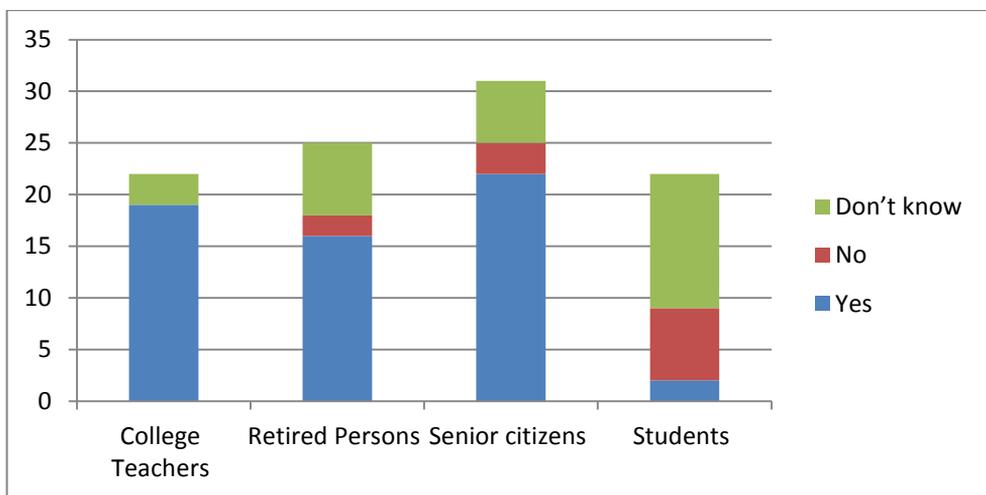
possesses some unique medicinal and aromatic plants as well as seed spices and legumes. Desert trees and shrubs like khejadi, rohida, phog, ker, ber etc. are indigenous to Rajasthan. The State has specialty crops and breeds that are almost exclusive or predominantly belong to Rajasthan. The present study shows that negative impact on agriculture will be effect the productivity. The following table shows that 59 percent respondents said that climate change will affects the agriculture of the state. About 29 percent don't know it's any effect. The details are given below.

Table 7: Effects on Agriculture

Category	Effects on Agriculture (%)		
	Yes	No	Don't know
College Teachers	19	00	03
Retired Persons	16	02	07
Senior citizens	22	03	06
Students	02	07	13
Total	59	12	29

Source: Based on Field Survey-2013

Effects on Agriculture



Conclusions

- ▶ Peoples' perceptions of local temperature are able to recognize that temperatures have increased and there has been a reduction in the volume of rainfall. Peoples with access to extension services are likely to perceive changes in the climate because extension services provide information about climate and weather.
- ▶ Many impacts can be reduced, delayed or avoided by mitigation. Mitigation efforts and investments over the next two to three decades will have a large impact on increasing temperature.
- ▶ There is urgent need to undertake the steps towards awareness increasing programs regarding future unavoidable impacts of climate change and strategies to cope with it.
- ▶ Local knowledge, practices and innovations are important elements for community-based coping and adaptation mechanisms. There were few examples of adaptation strategies in agriculture such as change in cropping patterns, choice of crops, and improvement in the system.
- ▶ There is an urgent need to expand the existing meteorological facilities especially in the desert and hilly areas.

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SAŽETAK

SOCIJALNE PERCEPCIJE KLIMATSKIH PROMJENA U DRŽAVI RAĐASTAN, INDIJA

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Klima Indije je raznovrsna. Na jugu vladaju tropske klime, koje se odlikuju višim temperaturama za razliku od alpske klime na sjeveru, gdje se nalaze velike površine prekrivene snijegom, koji pada tokom hladnijeg perioda godine, a najviši planinski vrhovi su zasniježeni tokom cijele godine. Indija se suočava sa izazovom brzog ekonomskog rasta,

zbog čega joj prijete globalne klimatske promjene. Ova prijetnja proizlazi iz akumulirane emisije stakleničkih plinova u atmosferi, koji su antropogeno generirani intenzivnim industrijskim rastom, visokom potrošnjom i načinom života. Dok se međunarodna zajednica aktivno bavi ovim pitanjima nacionalna strategija Indije mora se prilagođavati klimatskim promjenama radi poboljšanja njenog ekološki održivog razvojnog puta.

Razvojni put Indije temelji se na očuvanju najvažnijih prirodnih resursa, ekonomskom i društvenom razvoju i iskorjenjivanju siromaštva, kao i zaštiti civilizacijskih tekovina i održavanju ekološke ravnoteže. Privredni razvojni put Indije još uvijek je ekološki održiv iz razloga što se ona nalazi u početnoj fazi privrednog razvoja.

Priznajući da su klimatske promjene globalni izazov, Indija će se aktivno uključiti u multilateralne pregovore Okvirne konvencije UN-a o klimatskim promjenama u pozitivnom i konstruktivnom načinu djelovanja. Naš cilj je formiranje efikasne baze podataka radi zauzimanja opravdanog stava i preuzimanja odgovornosti sadržanih u Okvirnoj konvenciji Ujedinjenih naroda o klimatskim promjenama (UNFCCC). Takav pristup mora biti zasnovan na globalnoj viziji inspirisanoj izrekom Mahatme Gandija da na Zemlji ima dovoljno blagodeti da ispuni ljudske potrebe, ali nikada neće biti dovoljno da zadovolji ljudske pohlepe.

Država Rajasthan je smještena u zapadnom dijelu Indije. Sastoji od 33 okruga, 39.753 naseljena sela, 249 Panchayat Samiti-ja i 9.168 Gram Panchayat-ija. Pustinje u državi zauzimaju veliki dio površine kopna. Ekonomski razvoj je povezan sa bazom prirodnih resursa, od kojih klima ima odlučujući značaj za osjetljive primarne privredne sektore kao što su: poljoprivreda, vodoprivreda i šumarstvo. Zbog toga se Indija može suočiti sa velikim prijetnjama zbog projektovanih klimatskih promjena. Zemljama u razvoju, poput Indije, klimatske promjene su dodatni teret njenim ekološkim i socio-ekonomskim sistema, koji već djeluju na stanovništvo, industrijalizaciju i ukupni ekonomski razvoj. Teško je izravno otkriti globalno zagrijavanje, jer većina ljudi doživljava promjene samo u lokalnim vremenskim obrascima, koji su vrlo varijabilni i ne mogu se tretirati dugoročnim globalnim klimatskim trendovima.

U radu su tretirani uticaji promjena lokalnih temperatura na ispitanike Rajasthan-a, kako bi se definisale prosječne termičke promjene. Od početka industrijske revolucije, ljudske aktivnosti dovele su do neslučenih promjena hemijskog sastava atmosfere. O tome postoje vjerodostojni dokazi koji pokazuju da takve promjene nose značajan potencijal i utiču na Zemljinu klimu (Houghton et al., 2001). Međutim, zahvaljujući složenim interakcijama teško je u klimatskom sistemu razlikovati elemente klimatskih promjena povezanih sa prirodnim pojavama i procesima i one izazvane antropogenim djelovanjima. Od predindustrijskog razdoblja, kada je vrijednost globalne atmosferske koncentracije ugljičnog dioksida (stakleničkog plina - GHG), iznosila oko 280 ppm u 2005.god.ova vrijednost je porasla na 379 ppm. Slično tome, koncentracije drugih potencijalnih GHG, poput metana i azotnog oksida, su također znatno povećanje na globalnoj razini.

Promjena globalne klime je danas proširena na neke druge aspekte, uključujući zagrijavanje okeana, praćenje prosječnih i ekstremnih temperatura na kopnu i praćenje atmosferske cirkulacije. Međunarodni plenarni razgovori o klimatskim promjenama potenciraju podatak da će do 2100 god. prosječna planetarna temperatura porasti u rasponu od 1,1-6,4°C (IPCC, 2007).

Analize globalne instrumentalne evidencije, koje traju više od jednog i po stoljeća otkrile su da je Zemlja prosječno zagrijanija za 0,74°C (0,56°C - 0,92°C), a da je u posljednjoj deceniji (12-13 godina) bila najtoplija. Prema IPCC AR4, do kraja stoljeća

prognozira se porast temperature za čak 4,0°C, u odnosu na razdoblje 1980-1999.god., kada je porast bilježen u rasponu od 0,6°C.

Teško je direktno otkriti globalno zagrijavanje, jer ga većina ljudi doživljava samo u lokalnim vremenskim obrazcima. Dostupni podaci pokazuju da je temperatura zraka od 1906-2005. u blizini površine zemlje porasla za 0,74°C, a naučne procjene govore da će kroz period 21.st. porasti u prosjeku za 6,4 C (Synthesis Report, IPCC, 2007).

Ciljevi rada se odnose na razumijevanje lokalnih klimatskih promjena. U prikupljanju podataka o klimatskim promjenama izvršena je obrada iskaza ukupno 400 stanovnika različitog spola, obrazovanja, starosne dobi i različite ekonomske strukture. Istraživanje je obavljeno intervjuom i anketnim upitnikom.

Provedena istraživanja pokazuju da:

- Stanovništvo percipira porast temperatura i smanjenja količine padavina. Percepcija o promjeni klime zasniva se i na proširenju informacija o klimi i vremenu, koje se dobivaju uslugama stručnih službi, a koje rade na praćenju istih.
- I pored velikih ulaganja i napora na ublažavanju klimatskih uticaja, isti neće imati veći značaj i uticaj na trend porasta temperature u naredne dvije do tri decenije.
- Evidentna je potreba za poduzimanje mjera u cilju povećanja svijesti o budućim utjecajima klimatskih promjena koji se reflektiraju na stretegiju razvoja.
- Lokalna znanja, praksa i inovacije su važni elementi za osmišljavanje mehanizama preživljavanja i adaptacije zajednice u novonastalim uvjetima. Postoji nekoliko primjera strategija adaptacije na klimatske promjene u poljoprivredi kao što su izbor usjeva, poboljšanje sistema navodnjavanja i sl.
- Evidentna je potreba za proširivanjem postojećeg meteorološkog monitoriga, posebno u pustinji i planinskim područjima.

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