Climatic change and its overwhelming influences in last decade in Cooch Behar district

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Abstract: The characteristic of climate of the district Cooch Behar is modified by tropical monsoon. Basically, it is damp malarious and some extent enervating. Mainly two well defined seasons in district Cooch Behar namely, winter and summer. Of the twelve months of the year, five marked the cold weather and five the hot weather, remaining two indicating a weather of mild form. In essence, winter sets in fairly early in November and summer in April, the months of March and October marking the flag- ends of the two seasons. On the other hand, cold begins to die out in February and that of heat in September. Beginning from the middle of March, temperature rises steadily and continues up to April, May and early parts of June. During summer Kalbaisakhi (Nor'wester) is the common phenomena and it occurs in the afternoon. Last two decades, the climatic pattern of this district has been changed owing to huge urbanization, deforestation, and industrialization. Due to rapid change of climate actual amount of rainfall, precious medicinal plants, and cover of natural resources are abolished from the nature. Even, various types of flora and fauna are presently endangered in this district.

Keywords: urbanization**,** industrialization, deforestation, climate change, endangered flora and fauna, ecological damage.

INTRODUCTION: The district Cooch Behar is one of the vital districts of the West Bengal. This area is a foot hill zone of Sub-Himalaya where all younger deposits are observed. It is a part of Extra-Peninsula of India where all the age of rocks ranging from Precambrian to Quaternary in different part of Himalayan foot hills and the Ganga-Brahmaputra plains are noticed. This area is extended from central Himalayan zone in Nepal up to 20 km. east of the river Tista which is occupied by the Migmatites, Calcgranulites, Augen gneiss, Banded gneiss, marble of Chung-Thang formation, Cenozoic biotite and tourmaline granite massif to the lower flood plain of North Bengal which has been built up by the deposition of sediments originating by the denudation processes from the older rock formations.

CLIMATIC SCENARIO: The district Cooch Behar is very famous of its own panoramic beauties. According to climatic condition this district is unparallel from others districts of Bengal. The nature of climate of this district is modified by tropical monsoon. It is damp malarious and some extent enervating. Namely, two seasons are observed here winter and summer throughout the year. Of the twelve months of the year, five marked the cold weather and five the hot weather, remaining two indicating a weather of mild form. But if, we see the last two decades nature of climate of this district has been changed owing to huge urbanization, deforestation, and industrialization. Due to rapid change of climate, the actual amount of rainfall has decreased and temperature gradually increasing day by day. Even various species of precious medicinal plants, fodder, flora and fauna are damaging from the nature. So, the coming decades will be painful if this devastating process continues.

TRENDS OF RAINFALL: The rains of Cooch Behar are proverbially long and persistent. The average annual rainfall of the district for the last 10 years are approximately (133.53) inches. The highest rain fall took place in the year 1878-2 79, 1890-91 and 1892-93 the quantity registered amount of 194.13, 187.41 and 179.17 inches respectively. The rainfall generally increases from the South-West to the North-East. Near about 70 percent of the annual rainfall is received during the South-West monsoon season, June being the rainiest month. The variation in the rainfall from year to year is not considerable. As per report of the Central Meteorological Department the amount of rainfalls were 85.393 inches in the year of 2006 which was very poor than the previous years. The climatic pattern of this district has been changing owing to huge urbanization, deforestation and unscientific activities of the people.

TEMPERATURE VARIATIONS: The temperature of this district cannot be said mild. During the summer time the temperature rises up to 92ºF to 93ºF.The beginning of March and April are the hottest months in which the mean daily maximum temperature is 32.5ÚC (90.5ÚF), and the mean daily minimum temperature is 20.2ÚC (68.4ÚF).The highest maximum temperature recorded at Cooch Behar was 39.9ÚC (103.8ÚF) in May, 1960 and the lowest minimum temperature was 3.9ÚC (39.0ÚF) on 1st January, 1955. Nowadays, the characteristics of temperature are gradually increasing due to huge urbanization and deforestation. Yet, during the winter seasons the maximum temperature is varying from 75ÚF to 85ÚF.The difference between the maximum and minimum temperature

and the range of temperature vary from 23ÚF to 30ÚF. Recently, the temperature pattern of the district exhibits erratic condition. If, we see the last decades, the temperature variations have gradually increased.

YEAR WISE (1991-2006) RAINFALL VARIATIONS IN COOCH BEHAR DISTRICT

YEAR	NAME OF THE MONTHS (ACTUAL RAINFALL IN MM)												TOTAL RAINFALL IN MM.
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP.	OCT	NOV	DEC	
2006	0	11	3	62	355	551	529	113	382	135	18	10	2169
2005	26	8	59	163	253	747	638	622	288	470	0	0	3274
2004	7	2	5	164	355	500	990	227	646	165	6	0	3067
2003	8	37	163	240	268	817	795	319	296	248	0	27	3218
2002	28	1	86	295	109	560	975	274	414	42	2	0	2786
2001	0	2	31	77	402	504	338	390	419	358	5	0	2526
2000	0	15	4	145	323	839	697	458	366	104	10	0	2961
1999	0	0	5	174	311	523	746	876	246	297	04	0	3182
1998	0	2	88	163	311	715	935	855	789	283	0	0	4141
1997	7	11	45	90	147	766	576	399	404	31	11	43	2530
1996	17	6	1	82	493	314	1152	510	234	74	0	0	2883
1995	3	16	23	70	261	624	764	694	591	53	58	2	3159
1994	35	34	54	134	357	417	305	406	177	52	0	1	1972
1993	46	11	31	202	336	452	1189	415	302	269	1	0	3254
1992	2	16	1	108	296	354	756	451	243	134	1	8	2370
1991	44	10	24	83	192	811	585	471	778	49	0	17	3064

** Source: Meteorological Department, Govt. of India (2007).*

YEAR WISE (1991-2006) TEMPERATURE VARIATIONS IN COOCH BEHAR DISTRICT

MONTHS	NAME OF THE MONTHS (TEMPERATURE IN ˚C)																								MAX. & MIN. TEMPERATURE	
	JAN		FEB		MAR		APR		MA		JUN		JUL		AU		SEP.		OCT		NOV		DEC			
YEAR	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
2006	28	9	30	12	35	14	36	17	37	20	35	22	36	24	38	24	35	23	34	17	31	13	28	10	38	09
2005	26	9	31	12	34	15	33	17	35	20	35	23	35	20	35	24	36	24	33	17	31	14	28	10	36	09
2004	26	6	30	6	36	13	34	17	35	19	35	20	34	21	35	22	33	21	33	15	31	10	29	7	36	6
2003	27	5	29	10	33	8	34	18	36	19	36	21	37	33	36	21	34	22	33	19	32	13	9	29	35	5
2002	26	8	30	7	34	12	33	15	35	19	34	21	35	22	35	22	35	22	33	17	32	13	30	9	35	7
2001	27	7	30	8	35	11	36	17	35	19	35	22	36	23	35	23	34	21	36	16	31	9	27	7	36	7
2000	27	7	28	8	35	11	36	17	37	20	36	22	35	23	36	22	35	20	34	15	32	12	28	8	37	7
1999	28	8	32	9	35	10	37	18	34	21	36	21	35	24	36	23	34	21	33	19	32	13	29	10	37	8
1998	26	8	29	8	32	11	35	16	37	21	39	14	34	25	34	23	36	23	35	19	31	15	30	9	39	8
1997	26	7	29	9	33	13	32	17	34	19	35	22	35	24	36	23	36	20	34	16	32	13	28	9	36	7
1996	26	8	29	11	35	14	38	12	34	19	37	19	36	22	35	23	36	21	34	18	32	12	29	9	38	8
1995	26	6	28	9	36	11	38	13	36	21	36	22	34	23	35	23	35	21	33	17	31	13	28	10	38	6
1994	27	8	29	9	32	12	35	18	37	17	35	22	37	23	35	24	35	22	34	16	22	12	32	8	37	8
1993	25	4	29	9	33	11	33	14	35	17	33	20	36	21	35	21	35	--	31	--	31	19	29	--	36	4
1992	28	4	28	7	38	12	39	18	33	18	35	22	35	24	36	24	36	20	33	14	32	11	27	6	39	4
1991	27	6	29	10	36	13	34	17	35	18	34	19	36	21	35	20	34	20	33	14	31	8	27	4	36	4

NOTE: The number given (as in vertical way) in the columns should be read in the horizontal ways. * Source: Meteorological Department, Govt. of India (2007).

ANALYSIS OF TEMPERATURE VARIATIONS OF LAST DECADE BETWEEN THE YEARS OF (1997 & 2006)

TEMPERATURE IN (^{0}C)

NAME OF THE MONTHS	YEAR-1997 TEMPERATURE			YEAR-2006 TEMPERATURE			DIFFERENCE BETWEEN 1997 & 2006 TEMPERATURE		
	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG
JAN	26	07	16.5	28	09	18.5	+2	+2	+2
FEB	29	09	19	30	12	21	+1	+3	+2
MAR	33	13	23	35	14	24.5	+2	+1	+1.5
APL	32	17	24.5	36	17	26.5	+4	--	+2
MAY	34	19	26.5	37	20	28.5	+3	+1	+2
JUN	35	22	28.5	35	22	28.5	--	--	--
JULY	35	24	29.5	36	24	30	+1	--	+.5
AUG	36	23	29.5	38	24	31	+2	+1	+1.5
SEPT	36	20	28	35	23	29	-1	+3	+1
OCT	34	16	25	34	17	25.5	--	+1	+.5
NOV	32	13	22.5	31	13	22	-1	--	-.5
DEC	28	09	18.5	28	10	19	--	+1	+.5

*** Source: Meteorological Department, Govt. of India (2007)**

CAUSES OF CLIMATIC CHANGES IN LAST DECADE:

- Enormous pressure of population destroys the harmony of nature and change the scenario of climate of this district.
- Last few years urbanization processes are rapidly increased and also changed the nature of rural settlements to urban settlements.
- Owing to rapid growth of population the maximum forest cover abolished from the nature. Even the natures of forest villages could not identify at present.
- Presently, few small scale industries have grown-up here. All those small scale industries are taking an important role for increasing temperature of this area.
- Water bodies and wetlands are filling with residual materials or garbage for constructing of settlements. As a result the ecological balance is hampering and temperature increasing.

- During the time of king of Cooch Behar all settlements were semi-Pacca type with tin shed but at present all those settlements are very rare and change to multistoried buildings.
- Latest flat culture is adopting by the local people and out sides, as a result no space remaining at CBD zone in Cooch Behar town. A large number of covetous promoters are engaged by this business. So, natural environment is damaging day to day and climatic patterns are also changing.
- This district is highlighting enormous brick fields which are located near the subdivision of Tufangunj. Every day huge amounts of noxious particles like; carbon dioxide, carbon monoxide, sulpher dioxide, carbon particles, and others poisonous gases are emitting from the chimneys of the brick fields.
- Maximum use of fossil fuels no alternative energy options in this district.
- Human activities and technological innovations are caused of multifarious changes in the environment, etc.

EFFECTS OF CLIMATE CHANGING:

- Due to climatic changes this district has increased approximate 2 C average temperature and rain fall has decreased approximate 1000 mm. in last decade.
- Loss of different valuable species of plants and animals from the nature.
- Accentuating the occurrence of natural hazards and disasters, like; flood, cyclone, landslides, etc.
- Owing to the thermal expansion huge amount of ice melt water is flowing through the perennial rives of North Bengal. Even, it is predicted by CSIRO scientists that the sea level will be rise by 9 to 88 centimeters by 2100.
- Recently, droughts are enhancing and its duration and effectiveness are expanding day by day.
- This district is very famous for the fertile alluvial soils but these fertile alluvial soils become infertile and its productive capacity gradually decreasing in last decade.
- The depth of ground water table goes down. As a result scarcity of drinking water will be prominent in coming decades.
- Loss of different types of medicinal plants, herbs, nutritional vegetables, important flowers and fruits. Even, decreasing the possibility of new drug manufacture.
- Erratic monsoon with serious effects on rain-fed agriculture, peninsular rivers, water and power supply. If, we see that than previous years presently, production of rice, wheat, tobacco, even oil seeds, pulses and other food grains have been decreased.
- During the winter season immense number of migratory birds would come to Rasik Bill, Rasomati, Sagar Dighi, Rajmata Dighi, Hanskhawa and others important wetlands in this district for searching foods. Very recent (NAS) group has published a report where they express their opinion that, presently numbers of birds have gradually decreased due to climatic changes, etc.

FEW STEPS FOR MITIGATION AND DEVELOPMENT

- At first afforestation processes will be continued at deforested areas. Even public awareness is very necessary to increase forest cover. Forest can minimize the temperature increasing.
- Many natural processes are hazardous to living beings but to maintain ecological balance these hazardous processes should not only be recognised and the resultant hazards at least be minimised but also if possible the occurrences of these hazards should be avoided.
- To minimize the emission of $Co_{2,}$ methane, CO and various heat trapping green house gases for protecting temperature increasing.
- We have to minimize use of nitrogen-rich fertilizers, because, the high rate of application of nitrogen-rich fertilizers effect on the heat storage of croplands.
- Encourage the people for using substitute energy of coal, petroleum and others fuel burning energy. If, the people commonly use the solar energy, wind energy, bio-energy then the level of pollution must be reduced.

- To minimize the illegal constructions which have been practicing by the local promoters.
- The district administration should take necessary steps for protecting water bodies and wet lands because; water bodies can reduce temperature increasing.
- Most of the unauthorized brick fields should be banned immediately.
- Environmental problems - their understanding and solution need a multi-disciplinary approach.
- Safeguard and control measures proposed to prevent or mitigate the adverse environmental impacts on the area.
- We have to emphasis on river valley projects including hydal power, major irrigation and their combination can mitigate the flood over the area.
- To build a positive environmental perspective for the present century collaboration between people, law makers, scientists and technologists is the prime need for this district.
- Establishment of Bio-village is another mentionable environmental perspective. Because, Bio-village is human centred, pro-nature, pro-poor, pro-women, pro-employment oriented to technology development and propagation which is essential for this area.
- Integrated Rural development shall be another perspective of environment as the vast rural sectors need development.
- Appropriate area and culture specific development is needed, and without rural development environmental balance cannot be achieved today.
- After all public awareness and manpower development to tackle environmental problems and temperature increasing. It is another key perspective of environment in the 21st century.

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