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CLIMATIC SEVERITY VICTIMS OF UPSTREAM WATER PIRACY STRONGLY EVIDENCING INLAND WATER DEPLETION-CAUSED GLOBAL WARMING VIS-A-VIS COOLING

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ABSTRACT

Since the 80's, the northwestern and the southwestern parts of the tropical Bangladesh located in the downstream Ganges basin have been having summer temperature above 109°F and winter temperature as low as 37°F. Every year people, particularly, the infants die from heat-and cold-related diseases and hospitals become packed-up with the victims of severe climatic condition. The objective of this research is to find the reason for the appearances of the extreme climate in certain parts of the country. Water bodies being reservoirs of heat, the condition of the rivers and other surface water resources has been examined. It is found that the continued water piracy at the upstream from the downstream Bangladesh Ganges discharge, the major source of water for the northwestern and southwestern parts, has depleted surface water resources and sunken the down the groundwater table. About 60% evaporation of the massively extracted groundwater to make up for the surface water shortage goes to merely increase the relative humidity without causing rainfall. Summer time lingering high temperature and high humidity cause the severity of summer weather. In the absence of the virgin surface water bodies, there is little room for storing heat for wintertime warming. The entire Ganges basin loses at least 10 times the heat it used to store in the water-abundant days. Summertime maximum temperature, HDDs and CDDs are negatively and wintertime minimum temperature is positive correlated with the decline of the Ganges's discharge. Indian Government has to decommission her dams and barrages to mitigate the sufferings of the downstream people in Bangladesh. The greatest implication of this research is the accountability of the anthropogenic actions-caused depleting inland water bodies through storing, distribution via multi-channeling, irrigation, industrial and domestic use, for the occurrences of global heating vis-à-vis cooling and not CO_2 and other greenhouse gases accumulation in space. Immediate international actions are needed to end the episode.

Keywords: Climatic Severity, Water Depletion, Global Warming

1. INTRODUCTION

Bangladesh (**Fig. 1**) is located between the latitude range of 20°34 N to 26°38 N and longitude range of 88°01 E to 92°41 E. Although located in the tropics, her tropical climatic trend has changed for the northwest and southwest parts of the country. **Figure 1** shows districts of Rajshahi, Nawabganj, Rangpur, Dinajpur, Qurigram, Panchgarh, Syedpur, Jaypurhat, Bogra, Pabna, Ishwardi, form the northwest and the districts of Jessore, Kustia,

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Khulna, Bagerhat, Chuadanga, Jhenaidah, Masgura, form the southwest parts of the country. Dhaka has fallen in the central part. In the past few decades, climate-related sufferings of people and animals in these parts have increased causing even fatalities.

Sketches of the reports on fatalities and morbidities due to severe climate in the northwest and southwest parts of the country are available in electronic media with due references to the print media. The left side of **Fig. 2** shows a typical clinic picture with summer diarrhea patients, the middle inset shows how people try to comfort having ready-made cold drinks and the right side inset shows a typical hospital room overcrowded with winter diarrhea patients. The available sources for the information on the number of hospitalization cases and the loss of lives from about the post-80's up to the current year are available in the country's and overseas print and electronic media most April through June issues of which reported summer time sufferings and most late November through February issues of which reported winter time sufferings.

Fig. 1. Political map of Bangladesh that show six divisions within which there are 64 districts (SeedQuest, 0000)

Fig. 2. Diarrheal patients in a health treatment center April 23, 2009 (NTD Television, 2009), a typical summer drink sale July 2011 (Hot, 2011), diarrheal patients in Rangpur Medical College Hospital in December 28, 2013 (RC, 2013)

Table 1 provides a partial picture of these recurrent sufferings in the recent decade with the names of districts being mentioned where these were available.

The diseases that people suffer from due to weather severity are heat exhaustion, heatstroke, diarrhea, during the summer and hypothermia, pneumonia, upper respiratory infection, bronchitis, cold, fever, diarrhea during the winter time.

Out of these, heat exhaustion occurs under severe heat. Temperature and humidity together brings physical discomfort. Under intense heat, our body cools down through evaporation of our sweating. Sweating dries out quickly at low humidity. Air current also helps to dry out. There is a high temperature limit when the body cannot produce sweating at the same rate it dries out. Our body can absorb heat from a warmer environment. Heat exhaustion symptoms are excessive sweating, tiredness, nausea, headache, lightheadedness, mental derangement and muscle cramps. The patient can fall under the risk of stroke when the body's temperature regulation fails. Also seizure may appear and the body temperature may exceed 106°F (Wedro, 2013).

Heat stroke happens rarely and is more dangerous than heat exhaustion condition. Physical cooling process strops in a heat stroke patient. Skin feels dry and the temperature rises in the body. Physical burning and feverish feelings appear. A kind of discomfort feeling and headache may appear. The patient may have mental derangement. In the absence of medical treatment, the patient's body temperature continues to rise and the patient may lose sense. Death may occur (Stopler, 2013).

In the development of hypothermia, the temperature drops to lower than the normal temperature. The first symptom may appear at 95°F. The patient's appearance become pale. The patient feels sleepy and suffers from the lack of concentration. Brain does not function well. Armpits and the abdomen feel cold.

Table 1. A partial picture of summer and winter fatalities and morbidities

Year	Max/Min °F	Region	District	Fatalities	Morbidities
2002 (Bushfires, 2003)	106.5	NW		42	
2004 (3) News24 Archives, (2004)	105.8	NW	Rajshahi	47	
BNA (2005)	109.4	NW	Rajshahi	35	
AHW (2007)	104	NW		at least 26	200
AFP (2009)	108	Central	Dhaka	at least 16	40,000
2009 Kader and Tribune (0000)	108	NW, SW	Rangpur, Rajshahi, Jessore, adj.	at least 8	
Tong (2011)	96.8	Central	Dhaka		
	100.4	SW	Jessore		
SC, 2013	106.7	SW	Chuadanga		
	106.7	NW	Rajshahi		
	98.6	Central	Dhaka		
LAT (1995)	39	NW		102	
Adel (1999a; 2000)	NW,SW				hundreds
Reporter (1998)	NW,SW				2,000
UCA (2003; 2003) Clarke (1972)	NW,Cntrl, SW			750	300/day
2006 (AP, 2003)	46.4	NW	Dinajpur, Ishwardi	40	
BDREFB (2007)	47.5	NW	Risjhahi	141	2×10^6
DREF (2010)	39.2	NW, SW		135	
Jan,'11 (Asiaone, 2001; Reliefweb, 0000; DREF, 2011)	37.4	NW	Syedpur, Qurigram	11	Thousands
Kelley (2012)	NW		Panchgarh, Qurigram	10	Hospital-full
ABC (2013)	37.4	NW	Dinajpur, Syedpur	80	
RC, 2013	53.6 14	NW	Rangpur		

The shivering of the body may increase the temperature four-fold. At 93°F, the body loses its power to make movements and it becomes stiff (http://www.webmd.com/a-to-z-guides/what-is-hypothermia).

Pneumonia is a diseases of lung infected by bacteria, viruses, fungi or parasites. Inflammation of lungs alveoli occurs. Under serious conditions, pneumonia can be life threatening. Elderly people, infants and people weak immune system are vulnerable to this diseases (http://www.medicalnewstoday.com/articles/151632.php).

Infection in any of the sinuses, nasal passes, pharynx and larynx falls in the category of the upper respiratory infection. It is very common in the winter. Depending on which part in inflamed, it is called rhinitis, sinus infection, common cold, laryngitis and tracheitis *(*http://www.medicinenet.com/upper_respiratory_infection/article.htm).

In developing countries, poor sanitation can cause outbreaks of diarrhea when crops or drinking water is contaminated by intestinal bacteria or parasites. Gastroenteritis is the more general term for this diseases. Major symptoms of this disease are nausea and vomiting, diarrhea and abdominal cramps. Sometimes, favor may accompany these symptoms. Complication may arise for elderly and infants (http://kidshealth.org/parent/infections/common/diarrhea. html).

In winter mornings, people kindle fire with straws and leaves to comfort themselves. Domestic and zoo animals suffer from the biting cold (**Fig. 3**). Paddy and winter crops like potatoes may be attacked with fungal diseases and mustard may be devastated by Aphid in the wintry and foggy weather (Chowdhury, 2012). Due to the dense fog, visibility reduces to the lowest one. All means of public transportations become paralyzed for hours and passenger-full buses, in the middle of their trips, remain parked at the ferry ghat because of the stalled ferry and launches services. Further, on the land train trips and flights in the air are delayed adding sufferings to thousands of the passengers. Transportation of goods are also hampered (**Fig. 4**).

For comparison of the intensity of winter cold, it may be mentioned that during the entire winter seasons before the sixties when the principal author was an elementary school kid in Bhitorbhag Primary School, would get up at dawn to walk on wooden sandals without socks in his village and outside it in the open field to climb up about a dozen or two 5 to 15 m tall date trees to put pots for collection of the daytime juice (**Fig. 5**). Winter cold was not that intolerable at that time.

Apart from the media reports, there have been a few reports on the climate related deaths by (Wojtyniak *et al*., 1991; Hashizume *et al*., 2009a; Lindeboom *et al*., 2012).

Fig. 3. From the left: People use layerd cloths and kindle fire with straws and leaves to comfort themselves (GENE, 2013), shivering people walking in the foggy morning, zoo monkeys are huddled together; sack-covered domestic animals (Daily Starr, 2010)

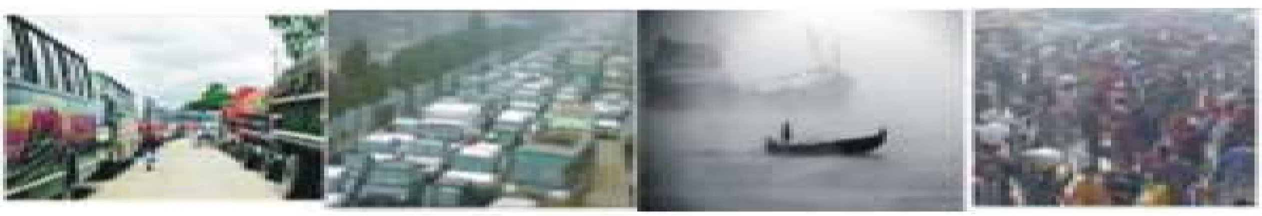

Fig. 4. Traffic jam for crossing the fog-covered water way, kilometers-long rows of parked vehicles, foggy water course with a ferry in its middle, launch and ferry ghat over crowded with travelling people WebCrawller, 2013 (DS, 2009)

Fig. 5. Date tree juice collection for preparing delicious molasses Photoghar, 2008

One of these works dealt with data pertaining to 1994-2002 and belonging to the surroundings of a research center site in southwestern part, reported association of every 1°C decrease in mean temperature with a 3.2% increase in all-cause mortality (Hashizume *et al*., 2009b).

The study of these authors parallels the study of other authors elsewhere due to the generation of occasional heat and cold islands or their fronts (Basu and Samet, 2002; Hajat *et al*., 2005; 2007; Clarke, 1972; Jones *et al*., 1982; Kilbourne *et al*., 1982; Braga *et al*., 2001; Semenza *et al*., 1996; McGeehin and Mirabelli, 2001; Curriero *et al*., 2002; Pattenden *et al*., 2003; Gouveia *et al*., 2003; Sheridan and Dolney, 2003; Armstrong, 2006; Medina-Ramon and Schwartz, 2007; McMichael *et al*., 2008). However, nobody has taken any interests in investigating why the northwest and southwest parts of Bangladesh, the only country on the globe to have her natural resource water outsourced by neighboring India through upstream water piracy (upstream water use causing any degree damage to the downstream ecosystem) be the global hotspot of such regular climatic severity both in the summer and in the winter. The observation of the extreme climate in this part of Bangladesh reflects excess of heat generation during the summertime and shortage of heat storage during the wintertime and is thus reasonably found tied to its loss of heat retention sources which are the water bodies. This article investigates the generation of climatic severity indicated by the morbidities and fatalities in both the summer and winter seasons in the context of inland water (surface water + groundwater) shortage in the post-piracy periods in the northern and southwestern regions of Bangladesh.

2. MATERIALS AND METHODS

In the absence of any available compiled accounts of the countrywide heat wave-and cold wave-related victims, electronic and print media were consulted to get the information of such fatalities. Scattered pieces of reports have not represented the fatalities and morbidities exhaustively. Also, the information on the country's summertime annual highest and the wintertime annual lowest temperatures mentioned in **Table 1** was obtained from the news media which remain very alert on the weather news because of public interests and collect the weather information from the country's climate offices. Data on stream discharges were obtained from published materials. Contemporary Ganges discharge data and the climate data pertaining to the pre-piracy and on-going piracy periods were obtained from the published reports and the related government offices. A correlation study was made of the Ganges's declined discharge, the key source of the elixir water, with rise of summer temperature and drop of winter temperature. Photographs of stream conditions were obtained from relevant websites. Also, some were taken during onsite visitations.

Pre-and on-going piracy days' climate data for the northwestern part were analyzed to find the onset of the extreme temperature in the post-1975 years. Different kinds of physical feelings among the people in different temperature and humidity ranges were tabulated from published works and compared with the observed temperature and humidity values in the project site to understand the reasons for the occurrences of their sufferings.

Since the water medium is the best in heat absorption and retention in nature, picturesque information of rivers and other surface water resources has been provided both for the water-abundant and water-shortage days. An estimation of the heat absorbed and retained in the water-abundant days and the heat lost in the waterless days has been made using the input solar radiation and the water-uncovered land areas.

3. RESULTS

3.1. The Lost Water Abundance

3.1.1. Northwestern Part

The Ganges and its many primary, secondary, tertiary, quaternary and further downward streams that form the northwestern and southwestern riverine parts of Bangladesh are shown in **Fig. 6 and 7**. Some of these rivers are the Baral, the Musa Khan, the Mahananda, the Tista, the Punarbhaba, the Talma, the Tangon, the Karatoa, the Bangali, the Ghaghat, the Dhepa. These streams supplied the founding and sustaining lifeblood of the wetland ecosystem of northwestern Bangladesh up to 1975 when India started to pirate the water of the Bangladesh Gangetic ecosystem by constructing the Farakka Barrage across the Ganges and many tricks the details of which have appeared in the previous works (Adel, 1999b; 1999d; 2001; 2002; 2003; 2004a; 2004b; 2005; 2007; 2008a; 2008b; 2008c; Adel and Husain, 2008; Adel, 2009; 2010; 2012a; 2012b; 2012c; 2012d; 2012e; 2013a; 2013b; 2013c; 2013d; 2013f; 2013g; 2013h; 2014a; 2014d; 2014c; Miah, 1996a; 1996b; 1996c Miah, 1995; 1989).

The Great Ring of Dams and Barrages built by India at the upstream of more than 50% of the international rivers is shown in **Fig. 8**. The Farakka Barrage across the Ganges is numbered 6 near the left hand top part in the illustration. **Figure 9** through 12 provide a description of the pre-piracy period water abundance and the current piracy period water shortage.

In **Fig. 9**, counted from the top left, the artificially established perennial feeder canal courtesy of Prasad, 2007 from the upstream of the Farakka Barrage that form about 30-km long from Farakka to downstream part of the Indian National Water Way # 1 (IWWAI, 2014) and the Farakka Barrage on the Ganges and the beginning of the feeder canal (courtesy of Google). The middle two insets (Katz, 2008) refelect the condition of the main Ganges as water piracy continues since 1975 (**Fig. 18** below). The bottom inset is the Indian National Water Way #1.

The first three insets-the Baral bed near its head, the huge shoal at the Baral's head (pictured by the authors), the Baral's mid-course site (*courtesy of the Amar Desh*)-in **Fig. 10** shows at a glance the Baral River condition in the piracy period. It is the first distributary of the Ganges in Bangladesh and was the main source of water of that region. The perennial Baral is about 80 km long and would maintain about 2,000 cu m/s discharge during July through November. It has shrunken to ¼ of its original width and depth. The rest of the insets in **Fig. 10**, counted from the left-a boating scene in the river (ABS, 2004), a yacht racing (AYRS, 2008), frolicsome boys' jumping in water (courtesy of the photographer), a rice field marsh (http://www.panoramio.con/user/4990228), a fishing scene in a dtch in flooplain area, an experience shared by the principal author (http://www.travelsradiate.com/asia/peoples-republic-of-bangladesh/khulna-division/1212317-atharabanki-river.html), a waterfull ditch SWD, 2010, jute retting and cleaning services available in a ditch (http://www.bing.com/images/search?q=Images+of+Juteretting&id=E8E7C0173A74D79CAF1CB2DAABF0F2C4FA6D8EA4&FORM=IQFRBA#view=detail&id=E8E7C0173A74D79CAF1CB2DAABF0F2C4FA6D8EA4&selectedIndex=0), a domestic duck in a canal or ditch full of water (courtesy of Panorama Bangladesh), a frog nest floating on a ditch water (courtesy of the Times)-show some basin scenariers that existed during the pre-piracy period.

The principal author had the experiences of travelling by boat on the Baral, hand-catching fishes in a ditch, separating and cleaning jute fibers in a ditch water and playing with frog nets in his boyhood days. Nests would be built by frogs overnight as soon as they had enough water in the ditch and frogs would sing in chorus. All insets except the first three in the first row belong to elsewhere and are shown here to guess the water resources looted by India.

Figure 11 shows the Musa Khan basin, a distributary of the Baral. Counted from the left, insets appear in the order of the Baral and the Musa Khan distributary basins of the Ganges (courtesy of Googles), the Musa Khan hydrograph (Adel, 2001), an angling scene in a ditch by an elderly person (courtesy of the photographer), a fishing scene in a canal filled with flood water (courtesy of the photographer), a fishing scene in a shallow rice field during the flood season, an experience of the principal author (courtesy of the photographers), a fishing scene in a deep flood plain (courtesy of the photographer), a fishing scene in a floodplain in April when its water level has gone down (courtesy of the photographers), the Musa Khan River's clogged head, the Musa Khan bed in its mid-course and one of a few dozens of dry canals to discharge Musa Khan's flood water inland (the last three were pictured by the authors). All the insets in the middle have been taken from elsewhere to show the loss of the wetland ecology. The whole story sounds like legends to the current generations in the water piracy period.

The top row in **Fig. 12** shows massive withdrawals of groundwater for cultivation to make up for the pirated surface water. The bottom row shows from the left a fissured rice field for lack of water and two dry ponds the middle one being shallow and the right side one about 30-ft deep the principal author's family pond that dried out following the absence of the Musa Khan's water availability and the shortage of rainfall in 2010. Rice was planted at the bottom of the pond.

Massive extraction of groundwater in the presence of little or no recharge depletes the groundwater table as shown in **Fig. 13**.

3.2. Other Dead Rivers in the Northwestern Part

After touching upon some of the far-reaching effects of water piracy upon the surface and groundwater bodies, only a partial listing of dead rivers in the northwest part of the Ganges basin is shown in **Fig. 14**.

India pirates about 43 cubic meter of water in one second from the Tista River in the dry season which has obstructed discharges in 15 rivers in the greater districts of Rangpur and Dinajpur (**Fig. 1**). These rivers are the Mahananda, the Korotoa, the Teesta, the Bhaluka, the Ranachandi, the Talma, the Ghoramara, the Buriteesta, the Bhersa, the Chilak, the Balam, the Pisla, the Dahuk, the Chowai and the Kurum. The river beds that should be containing water are full of sediments favored by weakening the downstream flow by upstream piracy. Each of these rivers fed hundreds of square kilometers of floodplains, dozens of canals, hundreds of ponds and ditches and depressions all of which would retain water throughout the winter months.

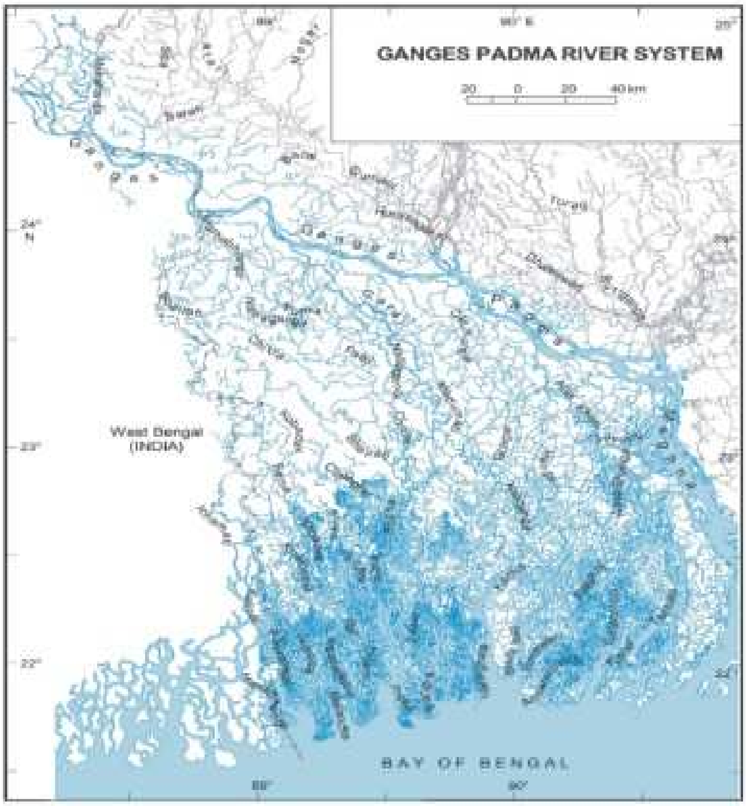

Fig. 6. The downstram Ganges basin in Bangladesh (AHW, 2007)

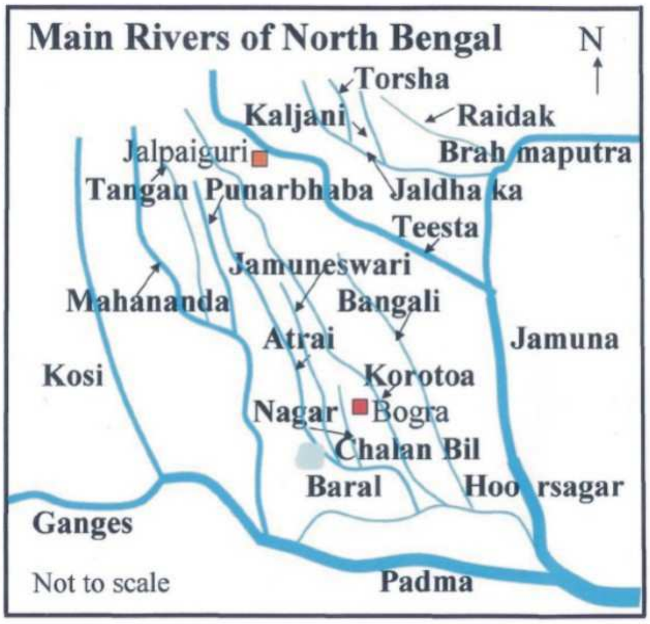

Fig. 7. Rivers of northwestern Bangladesh (http://upload.wikimedia.org/wikipedia/commons/e/ea/BD_Map_Rivers_of_North_Bengal2.jpg)

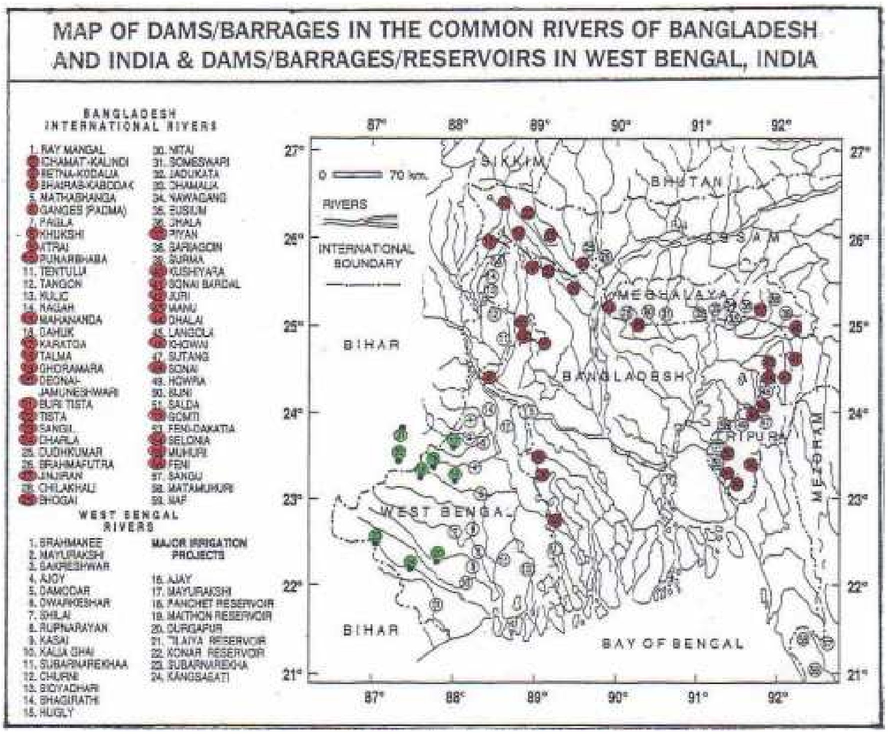

Fig. 8. The great ring of dams and barrages built by India at the upstream of the International Rivers through India and Bangladesh for upstream water piracy (Adel, 2001)

Fig. 9. The artificially established perennial feeder canal (top left) that forms the part of the Indian National Water Way # 1 (bottom inset) courtesy of Souvik Prasad, 2007; the feeder canal branching from the Ganges upstream of the Farakka Barrage (top right); the condition of the main Ganges by the City of Rajshahi in Bangladesh (middle two insets) (http://promotebangla.blogspot.com/2011/03/save-ganga.html#.Ur7ocdJDsfU). The bottom inset represents the Indian National Water Way # 1

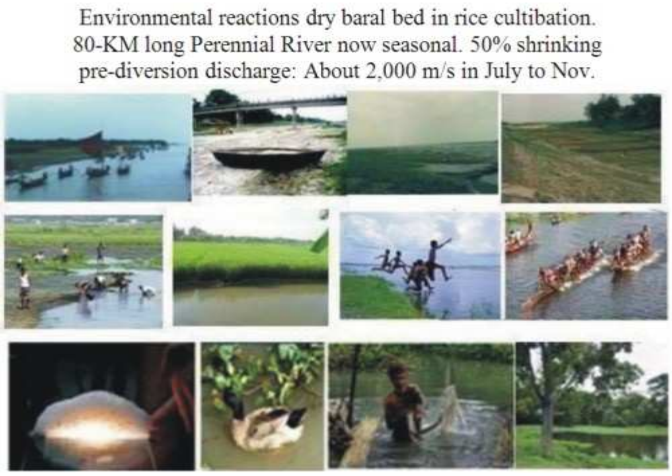

Fig. 10. The dead Baral River and the gone-by similar ecosystem that it supported

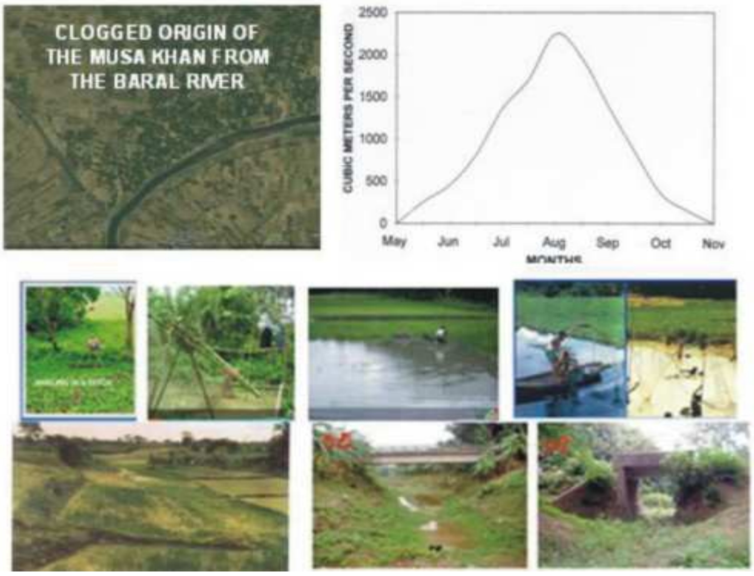

Fig. 11. The depleted Musa Khan wetland ecology

Fig. 12. The Musa Khan river basin's floodplain and ponds conditions (courtesy of the photographers; authors pictured the first one and the last two)

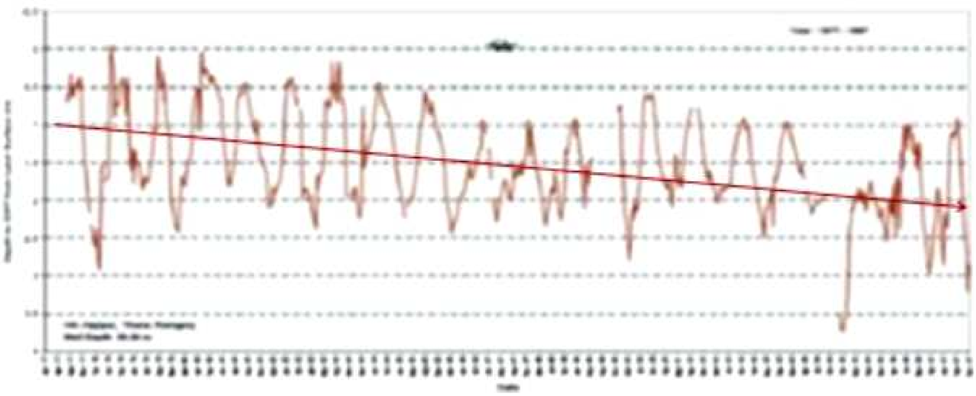

Fig. 13. The sinking groundwater table (Husain and Adel, 2013)

Fig. 14. Top row from the left: The Tista, the Mahananda (courtesy of the *Amar Desh*, the Punarbhaba, the Talma river in Panchgarh, the dry Tangon River (http://www.panoramio.com/photo/67436033); the dry Korotoya River near Panchgarh town, a truck loaded with sand from the dry bed of the Bangali River, the Ghaghat River in Rangpur (http://archive.thedailystar.net/beta2/news/sand-lifting-from-ghaghat-river-in-rangpur-threatens-erosion/) the Dhepa River in Dinajpur (http://icwow.blogspot.com/2010/06/dinajpur-river-dhepa.html), the once-deep and vast 26 sq km Chalan Bil of Natore dries up in summer (http://bd.geoview.info/chalan_beel_drying_up_in_winter_natore,82913631p)

Fig. 15. The Buriganga River by Dhaka City. A dirty water body's heat retention is not as effective as of a clear one

3.3. Central Bangladesh

The city of Dhaka stands by the the Buriganga River (**Fig. 15**) which branches off the Dhaleshwari river at the northwest of the city. The main contribution to the Buriganga's discharge comes from the Turag River to which the Buriganga joins at the southwest. The head of the Buriganga is clogged and opens during the flood season. Its average depth is 10 m and width 400 m. Siltation has diminished its length by about 9 to 18 km (http://www.burigangariverkeeper.com/index.php?option=com_content&view=article&id=60&Itemid=69) A few more dwindling rivers flowing on the outskirts of Dhaka are pictured **Fig. 16**.

3.4. South-Western River Conditions

The rivers in this part are the Garai, the Arial Khan, the Bhairab, the Mathabhanga, the Nabaganga, the Kumar, the Kabodack, the Betna, the Ghagar, the Ichamati, the Chitra, the Falki, the Hunda, as are pictured in **Fig. 17** The 386-km long Garai had been the largest perennial distributary of the Ganges in the pre-piracy period and the main source of freshwater in southwestern Bangladesh. Its flow has been diminished by more than 60%. It has a huge shoat near its head. The dry season flow in the Garai stopped in 1988. The 386-km long Garai River was the feeder river of fiften distributaries one-half of which are dead. Some of its dead distributaries ones are the Hisna, the Kaliganga, the Kumar, the Hamkumra, the Harihar and the Chitra. One of the dead distributaries, the Hamkura is pictured below in **Fig. 17** among other affected rivers.

3.5. Navigability Problem

The **Table 2** below, slightly modified after Bangladesh Inland Water Transport Authority's data by including two rivers from the northwest, shows at a glance the major obstructed inland water routes. However, hundreds of kilometers of seasonal and perennial ones of the northern part are not reflected in the table. Only the affected southwestern river ways have been mentioned. The northwestern part has been the driest parts because of the deaths of the feeding rivers.

In the pre-piracy period, the perenniality of these rivers made them as well as the numerous large and small water bodies fed by them absorb the summer heat, store it and retain for the winter. Now these dry river beds like dry floodplains, ponds and canals reflect heat increasing the summer warmth. India bult the nation's No. 1 Water Way at the cost of Bangladesh's losing water ways. The lost water way account is given in **Table 3**.

3.6. Climatic Changes

The investigation on the increasing summer warming and winter cooling was done with 25 years of data spanned over 1971 to 1995. It was found that the annual summer highest and winter coldest temperatures were below and above, repectively, their on-going piracy period counter parts. These are shown in **Fig. 18 and 19**. The nature started to react in the post-1975 years as the water bodies were drying out. The annual Heating Degree Days (HDD) were calculated by cumulatively adding the differences of the daily temperatures (>86°F) of March through November and 86°F (assumed to be tolerable at outdoor as well as indoor open-windowed houses). **Figure 20** illustrates the HDD for the project site and the central part. The HDD rise in the project site is more prominent than for the central part. The annual Cooling Dengree Days (CDD) were calculated by adding cumulatively the differences between 59°F (assumed tolerable) and the daily average temperatures lower than 59°F for 1971 through 1995. The CDD have been plotted in **Fig. 21**. While the CDD rises for the project site, it decreases for the central part of the country.

As to the relative humidity, both the lowest reltive humidity and its frequency surpassed their counter parts in the pre-piracy period. In the on-going piracy period, the increase in the relative humidity is observed in the beginning of the year and it continues toward the end of the year making a longer lasting.

The correlation coefficients of the maximum and minimum temperatures of the project site with the Ganses's declined flow and that of the HDDs and CDDs for the project site and for the central part are mentioned in **Table 4**. The correlation of the summertime maximum and wintertime minimum temperatures have good moderate correlation with the declined river discharge. Also, moderate correlation exists between the HDD and CDD of the project site. These correlations would be much pronounced if the water deprivation would be condected under termal insulation of sites. The central part's HDD and CDD are very weakly correlated with the water lessness of the northwestern and southwestern parts. The central part's CDD shows weak positive correlation as opposed to the moderate negative correlation of the project site CDD. The central part lies, so to say, on the outskirts of the parts of the Ganges basin under consideration in this styudy. As such, it will not generally be under the Gangetic climatic severity.

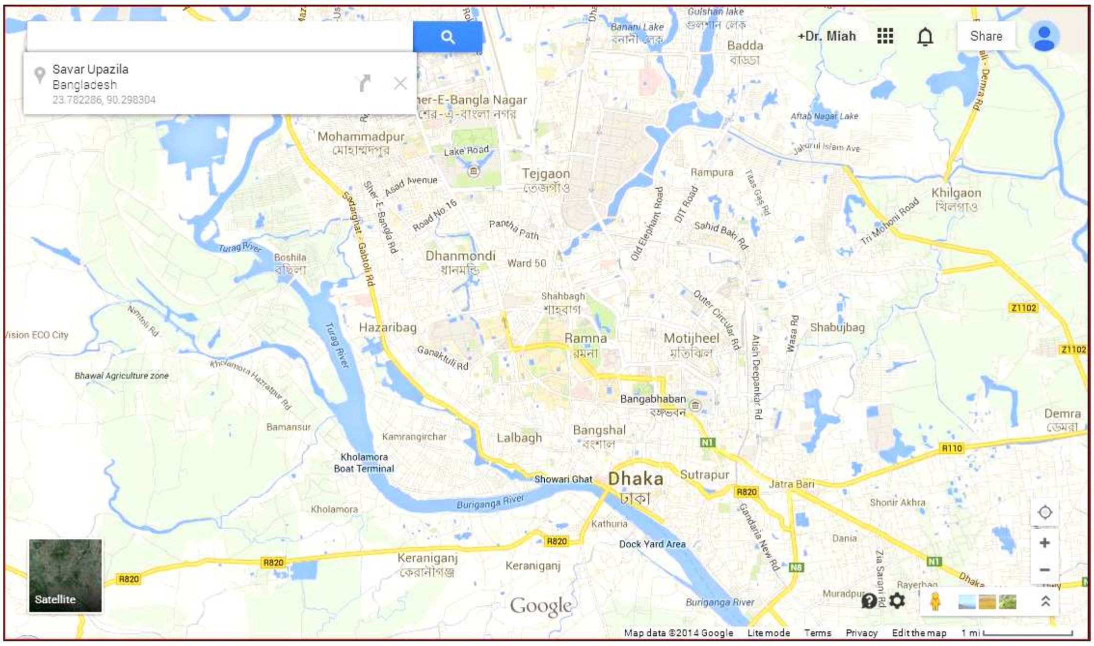

Fig. 16. The central part Dhaka and the dwindling streams around it

Fig. 17. Counted from the left: The Bangshi River on the outskirts of Dhaka (http://archive.thedailystar.net/newDesign/news-details.php?nid=87142; http://www.panoramio.com/photo/40378727), the shallow and heavily silted Garai (http://www.bridgemanart.com/en-GB/asset/795532), the Garai's dead distributary the Hamkura river (http://riversandcommunities.wordpress.com/category/hamkura-river/), the Kaliganga River, the Ichamati river near Rangunia (http://www.panoramio.com/photo/67678773), the Bhadra River (https://dcommunities.wordpress.com/category/bhadra-river/), the Betna river (http://www.panoramio.com/photo/32047294), the Mathebhanga River (http://www.flickr.com/photos/27035093@N00/311870864), Kacha Matia River in the winter, the Bhairab river (http://bd.geoview.info/,64207329p), Arial Khan River, the green bed of the Nabaganga, the Madhumati River the Dry Kumar River (http://www.sos-arsenic.net/english/kumerriver.html), the Dhaleshwari River (http://www.panoramio.com/photo/40378727) and the Turag River on the outskirts of Dhaka

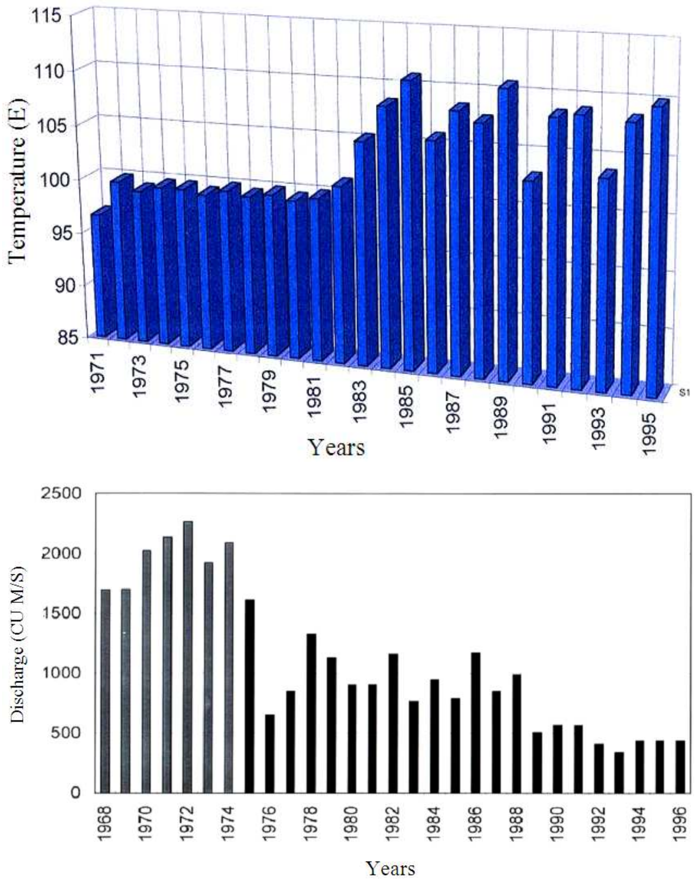

Fig. 18. Top: Summer time highest temperature during the pre-and on-going piracy periods of water. Bottom: The Ganges's discharge during the pre-and post-piracy (from 1975) periods (Hebblethwaite, 1997)

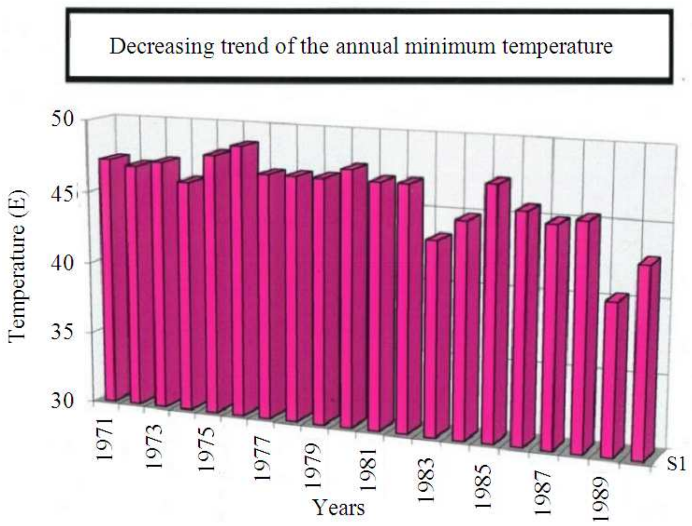

Fig. 19. Wintertime decreasing minimum temperatures in the on-gong water piracy period

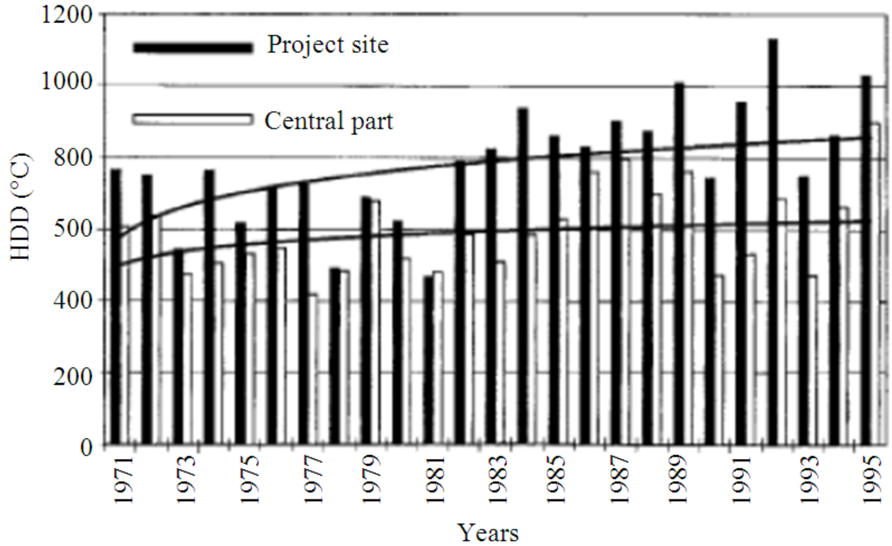

Fig. 20. The HDD plot for the Ganges basin region and the central part of the country

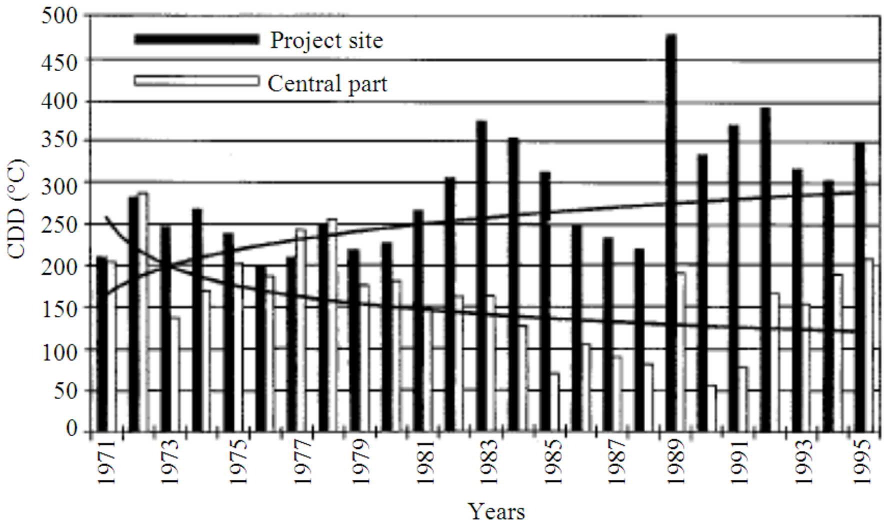

Fig. 21. CDDs for the Ganges basin and the central region

In the rainfall pattern, it was observed that more rainfalls would occur in the months of June, July and September during the pre-piracy period and the frequencies of the current piracy period of 20 mm, 35 mmm, 40 mm and 45 to 220 mm rainfalls were lower than the pre-piracy period. And even, some of the heavy rainfall frequencies in the on-going piracy period is zero. The recharging of groundwater occurs efficiently if the soil remains wet and the rainfall is not heavy. In the on-going piracy years, there are no occurrences of week-long rainy days which favor efficient recharge of groundwater. In Rajshahi (**Fig. 1**), the maximum rainfalls of 2004, 2007 and in 2011 were of successively in decreasing order. Also, 2007 was followed by lesser and lesser rainfalls until the least rainfall occurred in 2010 when the deepest surface water bodies dried out. The pre-and on-going piracy period climatic features have been compared in **Table 5**.

Table 2. The depleted water ways in the Bangladesh Ganges basin (Adel, 2001; BIWTA, 2014)

River name	Destinations	Distance (km)	Dry season depth (m)
Ganges (Padma)	Godagari to Aricha	209	1.75
Ganges (Padma)	Aricha to Chandpur	130	2.50
Baral	Origin to confluence	>100	Partly dry & water-logged
Musa Khan	Origin to confluence	About 30	Dry
Garai	Talbaria to Kamarkhali	70	Dry
Madhumati	Kamarkhali to Halurhat	160	Dry
Atharabanki	Manikdaha to Rajapur	40	Dry
Kaliganga	Kustia to Sailkupa	40	Dry
Kumar	Sailkupa to Alamdanga	65	Dry
Nabaganga	Jhenidha to Bardia	100	Dry
Mathabhanga	Gangni to Jhenidha	70	Dry
Old Kumar	Ambikapul to Char Magura	100	Dry
Kumar	Ambikapul to Manikdaha	105	Dry
Chitra	Narail to Gazirhat	28	Dry
Arialkhan	Chowdhurihar to Saheberhat	95	1.50 to 1.00
Bhairab	Khulna to Noapara	35	1.75
Bhairab	Noapara to Raita	295	Dry
Atai	Khulna to Narail	25	1.00
Bil	Route Sindiaghat to Gopalganj	45	1.00
Arialkhan	Sindiaghat to Jajira	35	1.00
Kabodak	Taherpur to Paikgasa	70	Dry
Bhadra	Monirampur to Chalna	32	Dry

Courtesy: BIWTA- Bangladesh Inland Water Transport Authority (slightly modified)

Table 3. Lost Waterways in the Downstream (BIWTA, 2014)

Year	Wet season length (km)	Dry season length (km)	Total length (km)
1971	------	-------	24,000
1984	8,400	5,200	13,600
2010	6,000	3,800	9,800
	Lost		15,600
	Risky		3,300

Source: (BIWTA)

Table 4. Correlation Coefficients

Project T_{max}	Project T_{min}	Project HDD	Central HDD	Project CDD	Central CDD
-0.6	0.55	-0.47	-0.22	-0.49	0.29

Table 5. Water piracy-based climate change indications

	Pre-baseline	Post-baseline
Ganges flow	1932±228 m^3/s	769.5±284.5 m^3/s
Flood plain water	------	<50% of the pre-base-line level
Pond water level	------	< 50% of the pre-baseline level
Groundwater	------	sinking by at least 0.50 m/yr
Highest maximum temperature	98.6°F	109.4 °F
Median	77.9°F	83.3°F
Mode	87.8°F	89.6°F
Average	85.6°F	87.4°F
Annual average heating degree days	HDD	1.33 times more than HDD
Highest minimum temperature	44 °F	<41°F
Median	63.5 °F	62.6°F
Mode	78.8°F	77°F
Average	68.5 °F	67.6°F
Annual average cooling degree days	CDD	1.44 times CDD
Frequency of the highest RH	1635	2957
Average maximum	90.21%	92.54%
Median	72.5%	72.5%
Mode	95.0%	95.0%
Average minimum	55.20%	52.90%
Median	52.50%	52.50%
Mode	65%	70%
Light rainfall	les occurrences	more occurrences
Heavy rainfall	≥100 mm	50% less occurrences

4. DISCUSSION

4.1. River Bed Silting

A dam on a river for upstream water piracy weakens its downstream flow making a quicker deposition of sediment by the gravity's pull. The distributaries of the dammed river have even weaker flows at their heads because of the change of direction of discharges in them and wider flow paths which diminishes the original flow approximately by the square of the ratio of the mother river width to the mother + distributary river widths, so to say. This further favors in the downstream siltation. The navigability of the river falls in a risky condition. In the siltation process, the first thing happens is the quick clogging of the heads of the remotest distributaries in rank. The Ganges had a tertiary distributary called the Hoja River that became victim of the upstream water piracy and became extinct a long time back. In the rainy season river discharges about 1.5 million cu m/s carrying a silt load of about 2.4 billion tons which is almost 20% of the worldwide silt accumulation (PNS, 2012). India's water piracy through river damming puts the rivers in dwindling conditions accumulating about 361 million tons of silt in the Ganges basin and carrying only 40 million tons on Bangladesh coast whereas India receives 65 million tons inland and 361 million tons on the coast for coast building (Adel *et al*., 2012d).

4.2. Morbidities and Fatalities Under Extreme climatic Conditions

There are reports that under extreme climatic conditions, occurrences of hypertension, apoplexy become common (Hays and Hussain, 1995; Hussain and Hays, 1993; Hussain and Hays, 1997; Rogot, 1973; Rogot and Padgett, 1976). Kalkstein and Valimont (1987) gave many examples of mortality and morbidity due to high temperature. Brown (1991) reported of about 5 degree summertime rise and about 2° wintertime drop in the temperature in the town of Kungrad about 113 km south of the dying Aral Sea due to the diversion of water from its feeding rivers-the Amu Darya and the Sir Darya for cotton cultivation by the former Soviet Union. Although no heat or cold-related deaths were reported, high infant mortality was reported because of water pollution with carcinogenic chemicals used in cotton production. Miah (1999) gave a partial picture of the diarrhea, hypertension, asthma and strokes cases for the northwestern region. New surveys are required to get a current picture of fatalities and morbidities under the worsened climatic extremes. The best source of the data will be the country's print and electronic media.

4.3. Summer Discomfort

The above illustration in **Fig. 22** shows the limits of human feelings comforts and discomforts within the temperature range of 59°F (15°C) and 112°F (50°C) and at 020, 40, 60, 80 and 100% relative humidities. The summer time highest temperature during the pre-piracy period was 98.6°F which turned out to be 109.5°F in the on-going piracy period. During the pre-piracy period, in the highest temperature 50% people would feel discomfort in the relative humidity range of 0 to 20%, everybody would feel discomfort in the relative humidity range of 20 to 40%, distinct stress in the relative humidity range of 40 to 80% and great discomfort and heatstroke risk in the relative humidity range of 80 to 100%. And in the on-going piracy period, everybody feels discomforts in 0 to 18%, distict stress in 18% to 48%, great discomfort and heatstroke in 48 to 80%. In the on-going piracy period, in the highest summertime temperature and in 70% relative humidity, people feel great discomfort and are under the risk of heat stroke.

During the on-going piracy period, in the modal temperature of 90°F and in the lowest relative humidity of 70%, people often feel distinct stress. During the pre-piracy period, in the modal temperature of 87.8°F and in 65% lowest relative humidity, people would often feel discomfort. Distict stress is a higher discomfort than simply discomfort.

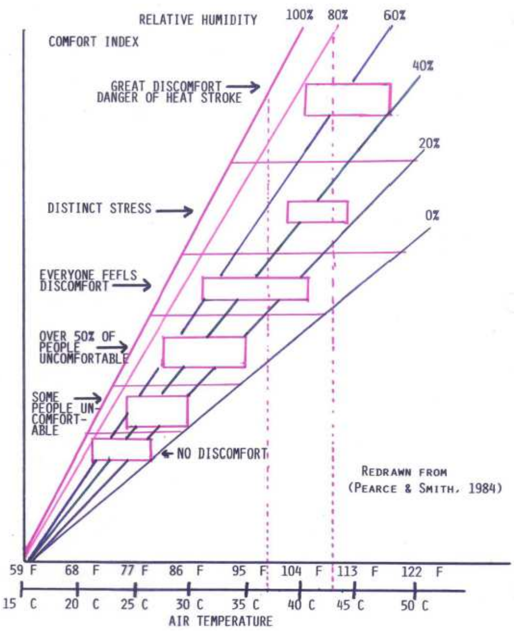

Fig. 22. Comfort index. Physical discomfort is the result of the combined effects of temperature and humidity (Pierce and Smith, 1980)

During the pre-piracy period, in the highest temperature and in 65% lowest relative humidity people woul feel distinct stress. During the on-going piracy period , the occurrences of the highest relative humidity is almost two times (1.8 times) that the of the pre-piracy period. This explains why people feel so discomfort in the on-going piracy summers. **Table 6** records people's summer time feelings under different temperature and humidity conditions.

It is observed that in the pre-piracy years risks for both the heatstroke and stress existed at the highest temperature, whereas in the on-going piracy years the heatstroke risk exists continuously. The trouble has been aggravated due to the twice as much lingering of the highest relative humidity in the current piracy years than in the pre-piracy years. In the pre-piracy years, mere discomfort feeling existed among 50-100% people in the lowest temperature and relative humidity. In the current piracy years, people feel the higher degree discomfort from distinct stress under the same conditions. Besides, the lowest modal humidity occurred 84 times more in the on-going piracy years than in the pre-piracy years.

Table 7 provides people's humidity-based feelings for both the pre-and on-going piracy periods.

It is evident that the on-going piracy period has become severely unbearable than the on-going piracy period. It has been aggravated by the occurrences of the highest modal temperature 414 times more during the later years than in the pre-piracy years.

4.4. Winter Biting Cold

Our body loses heat through convection, evaporation, conduction and radiation. In convection, the heat loss from our body depends on how fast the wind blows over our skin. Our body forms a layer of warm air around it. This layer is a nonconductor of heat and resist in the loss of heat from the body. The blowing wind breaks this layer and brings in contact with the body fresh air. Consequently, the faster the wind blows the quicker the skin gets cold. Animal bodies tries to retain heat within a telerable limit.

The cold experienced by the bare skin is called the wind chill. Wind chill can be life threatening for humans and animals. The wind chill index has been plotted in **Fig. 23**. The facts are broken down in **Table 8**. The figures and ranges given are approximate. There is over-lapping in feelings and the ranges of the wind chill index, temperature and wind speeds.

That the upstream water piracy makes Ganges basin people suffer from malnutrition, arsenic epidemic are additional causes for winter vulnerability (Adel, 1999b; 2000b; 2005; 2013a; 2013d).

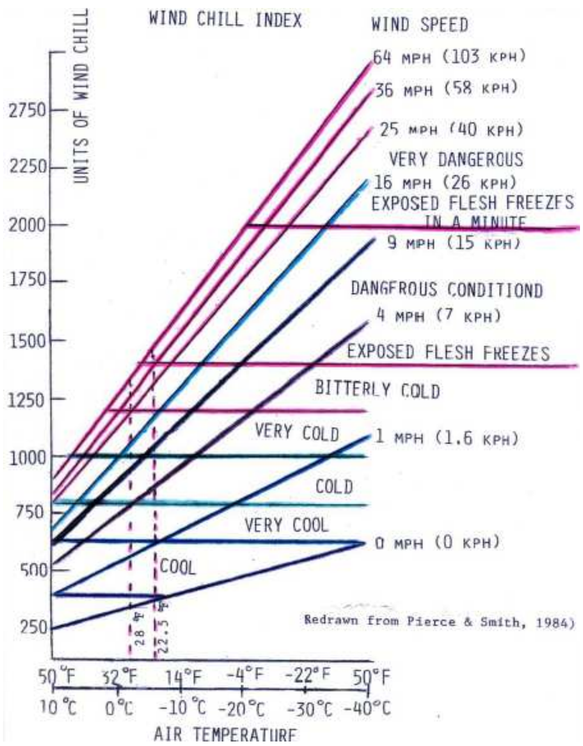

Fig. 23. Wind chill index (Pierce and Smith, 1980)

4.5. Climatic Severity Under Water Scarcity

The episode has arisen from the changes in land cover. Salalt and Vose (1984; Bouwman, 1980) reported climatic changes under land surface feature changes. In the project site, most of the water covered soils of about four decades ago do not covered by water any more. In the ecosystem, water has the highest thermal capacity. In the presence of its inordinate amount of decrease, latent heat sources have been converted to sensible heat sources. Adel estimated the the albedo increase by a factor of 2 from the pre-piracy period of 0.18 to 0.36 in the post piracy period (Adel, 2002). Other than the reflectivity, the emissivity from the surface features can contribute uncomfortable feeling. This mostly agricultural land has a high emissivity of 0.90 to 0.99 for agricultural crops. For deciduous and coniferous trees this value is 0.97 and 0.98 respectively (Oke, 1978). For wet and dry soil, emissivity lies in the range of 0.02 to 0.04 (TBHFM, 1986).

One kilogram of water takes 1,000 calories of heat to raise its temperature by 1°C. It releases the same amount of heat by the same interval drop of temperature. Abundant quantity of widespread water can abosrb a huge amount of heat incident from the sun.

Table 6. People's feelings under different temperature and humidity

Time	Temperature	Humidity	Feeling
pre-piracy	highest 98.6°F	modal 95%	heat stroke risk
		highest average 90.21%	eatstroke risk
		lowest modal 65%	distinct stress
		lowest average 55.2%	distinct stress
pre-piracy	lowest 87.8°F	highest modal 90%	everyone's discomfort
		highest average 90.21%	discomfort
		lowest modal 65%	50-100% discomfort
		lowest average 55.2%>50%	discomfort
post-piracy highest	109.5°F	highest modal 95%	heatstroke risk
		average highest 92.5%	heatstroke risk
		lowest modal 70%	heatstroke risk
		lowest average 52.92%	heatstroke risk
lowest 90°F	highest modal	95%	distinct stress
		highest average 92.5%	distinct stress
		lowest modal 70%	distinct stress
		lowest average 52.92%	distinct stress

Table 7. People's feelings in pre-and on-going piracy periods of increased humidity

Time	Temperature	Humidity	Feelings
Pre-piracy	Highest modal 87.8°F	Highest modal 95%	Everyone's discomfort
	Highest average	90.21%	,, ,,
		Lowest modal 65%	>50%'s discomfort
		Lowest average 55.2%>50%	s discomfort
Post-piracy	Highest modal 89.6°F	Highest modal 95%	Distinct stress
		Highest average 92.5%	Distinct stress
		Lowest modal 70%	Distinct stress
		Lowest average 52.92%	Everyone's discomfort

Table 8. Wind chill index

Wind chill	Feeling	Temperature (°C)	Wind speed (mph)
375-625	Cool	-8 to 10	1 to 0
625-800	Very cool	-25 to 10	9 to 0.5
800-1000	Cold	-4 to 10	25 to 1
1000-1180	Very cold	-25 to 7	1 to 64
1180-1410	Bitter cold	3C to-35	64 to
	Flesh freezing, Dangerous	-5o to-35	64 to 4
Δ 2000	Flesh freezing, Very dangerous	-22.5 to-50	64 to 9

It slowly warms up and slowly cools down. During a night following a sunny day, the land can cool down but not the water bodies. In the entire summer season, water bodies thus store heat.

From the consideration of pre-and on-going piracy periods of water submerged areas and surface water resources, a rough estimate shows that the loss heat in the Ganges basin is proportional to the current waterlessness and about 75% of the summertime heat does not meet water bodies to be aborbed and stored. Consequently, wintertime face the same shortage of heat. Basically, it has been the product of the lost water covered areas, solar insolation of 5.66×10^{14} calories/sq km (Boxwell, 2013) over a period of 5 months and absorptivity of solar radiation as estimated below.

To find the reason for the increasingly severe winter and summer weather, attempts will be made to compare the pre-piracy period water abundance with the post-piracy period water shortage. Bangladesh being mainly rural, consideration will be made of her rural areas. The following steps are used in the heat budget estimation:

- In the pre-piracy period, rivers, streams, canals, floodplains, dighis (huge ponds), ponds, ditches, had their virgin depths and would have water in them

- Floodplains are sandwiched between villages. The can appear on two to four sides of the villages
- Depending on the size and location, a village would have up to 10 ponds with water all the year round
- Almost every family would own a small and shallow pond called the ditch that would have water July through February. A village would have about 20 ditches
- A village would have 1 to 2 very large and deep ponds
- River side villages would have as many as three canals passing across them and almost every interior village would have a canal passing across it
- Villages are generally located on highlands. The entire Bangladesh has 87316 villages (Available at http://www.kabirhat.com/village/). The Ganges basin is one-third of Bangladesh. The number of villages in one-third of Bangladesh is 29,105. Out of this, 29, 000 will be a good number. It is assumed that the number of the affected villages is, at least, $N_V = 28,000$ (Adel *et al*., 2000)
- The average area of a village is at least, $A_V = 0.07$ sq km
- The area of these surface water resources-canals, dighis, ponds and ditches-is at least $A_{CDPD} = 0.027$ sq km per village
- The area of 28,000 villages is $N_V A_V = 8,000\times0.07 = 1,960$ sq km
- The area of the surface water resources in the village is $N_V A_{CDPD} = 28,000\times0.027 = 756$ sq km
- The total village homestead area is $A_{HS} = N_V A_V - N_V A_{CDPD} = 1,960$ sq km-756 sq km = 1,204 sq km
- The area of the Ganges basin is $A_{GB} = 46,080$ sq km
- The floodplain area is $A_{FP} = A_{GB} - A_{HS} = 46,080$ sq km-1,204 sq km = 44,876 sq km
- The least average floodplain area per village = $A_{FP}/N_V = 44,876$ sq km/28,000 = 1.60 sq km
- For at least five months July to November, $A_{FP} = 44876$ sq km floodplains and $N_V A_{CDPD} = 756$ sq km of rural surface water resources would be under water
- Evaporation from the water bodies would increase from November and the shallow ones would dry out toward the end of March. Soil would still remain wet
- The solar insolation in the Ganges basin is, at least, SInso = 4.35kwh/m^2/day for the five months-mid-June to mid-November (Boxwell, 2013). Over 1 sq km, it will be 4.35×10^6 kwh/km^2/day = 1.566×10^{13} Joules/km^2/day (since 1 kwh = 3.6×10^6 Joules) = 2.349×10^{15} Joules/km^2 for five months, $S_{InsoTotal}$ = = 5.611×10^{14} calories/km^2
- Incident radiation on water-filled floodplains $H_{FP} = A_{FP} \text{ x } S_{InsoTotal} = 2.518\times10^{19}$ calories and that on the village surface water bodies $H_{VSW} = N_V A_{CDPD} \text{ x } S_{InsoTotal} = 4.242\times10^{17}$ calories

Figure 24 shows the the division of solar heat into refelection and absorption at different heights in the atmosphere and on the ground. **Figure 25** shows the etntrance of the different colors of sunlight to different depths in water. **Figure 26** shows the degree of absorption of different colors of the sunlight by leaves of trees which outnumbered current ones by several times in the piracy period and beyond.

4.6. Corrections

Floodplains would be used for rice cultivation. There would be rice plants in the floodplains and after harvest, there would be rice straws. The following features of water should be noted:

- Clear water bodies reflects 10% and absorbs 90% of the incident solar radiation (Mirinova, 1973). Rural surface water bodies would have clear water
- Wet soils reflect at most 20% of the incident solar radiation (Tucker and Miller, 1977)
- Rice straws reflect more than 40% and absorb less than 60% of the incident solar radiation
- And green crops reflects 30% of the incident solar radiation (Tucker and Miller, 1977)

For the calculation of the least amount of heat absorbed, we take 30% reflection and 70% absorption for both the rural surface water bodies as well as the floodplain water. This yields $H_{Absorbed} = 0.7 \text{ x } (H_{FP}+H_{VSW}) = 1.792\times10^{19}$ calories (= 17.92 million trillion calories of heat) which is about 18 million trillion calories. Water would absorb and retain this heat in the pre-piracy period. In the winter season, when the environmental temperature would drop, water bodies would radiate this heat in to the environment. As consequence, people would not suffer. As to the summer heating, having lost the founding and sustaining water resources for the ecosystem, heat reservoirs have been depleted. Today's land absorbs, reflect and emit heat radiation during the summer warming up the environment. The increased humidity adds fuel to the fire.

We can make a rough estimate of the heat energy stored in the environment. During the pre-piracy period, the least number of months for holding water in water bodies was taken to be 5.

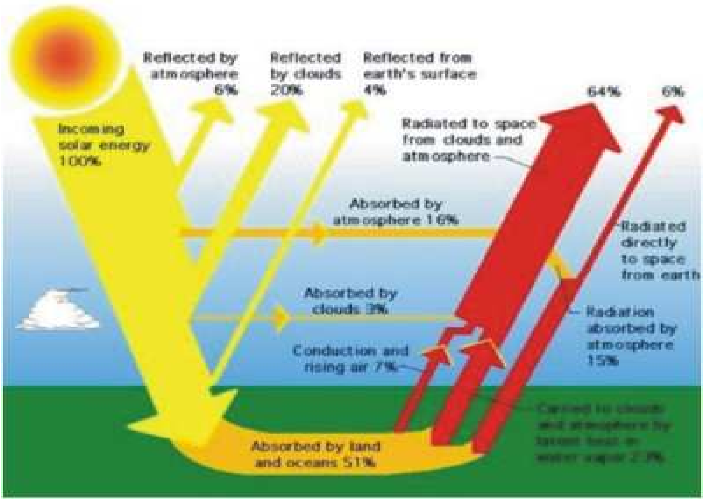

Fig. 24. Refelection and absorption of sunlight in the atmosphere and on the ground

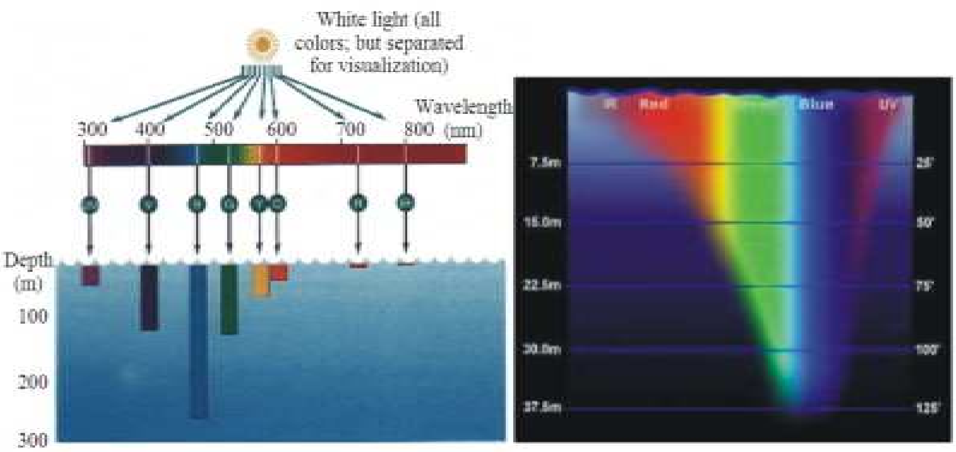

Fig. 25. Not all colors of sunlight have equal depths of penetration in water. Blue color has the highest penetrability. Next to blue color is the green color

In the post-piracy period, neither all the surface water bodies receive water nor even some of them receive the virgin amount of water. With the death of a river, at least its length squared size area is deprived of the contribution of the major water source. At least 50% of the pre-piracy period water bodies are now extinct. The remaining ones are not in the virgin state and do not hold water for the same number of months. On top of this, some year's drought make them have no water accumulation. On average, a maximum of two and a half month's retention of water in the remaining water bodies would be a reasonable estimate. This leads us to assume at most one-quarter of the pre-piracy period's heat accumulation in the post-piracy period which is barely 4.5 million billion cal. Thus, it is seen that the lost water resources is the principal reason of climatic severity in the downstream Ganges basin.

The case study above does shed some light not on monotonously global heating but on both the global warming and cooling which is what is observed. It is thus the water resources whose exploitation can turn the global climate desert-like.

Table 9 records these estimates. The downstream Ganges basin would not survive had it been a thermally insulated area. Also, there is contribution of the current population figure since a human body measuring 2 sq m at 34°C (93.2°F) emits 239 calories per second.

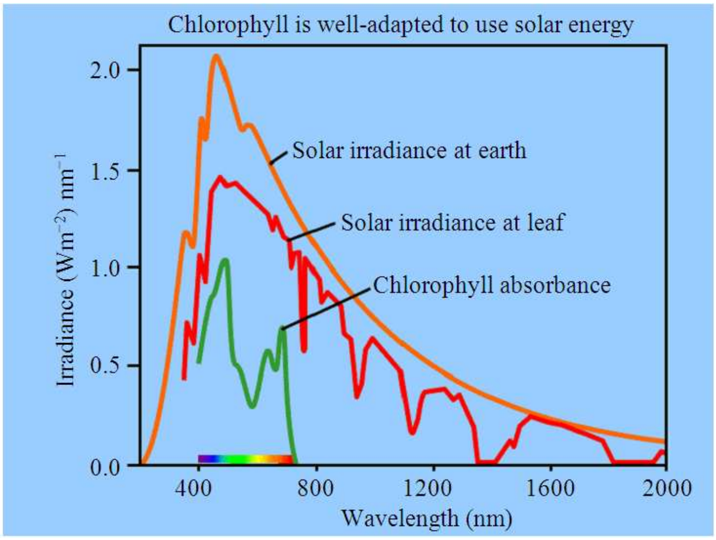

Fig. 26. Some colors of light get maximum absorption by the chlorophyll in tree leaves (Koning, (1994) Light Plant Physiology Information Website http://plantphys.info/plant_physiology/light (3-12-2014)

Table 9. The lost heat resources (Adel, 2013e)

	Pre-piracy period		Post-piracy period	
	Water (Sq km)	Heat (Cal)	Water (Sq km)	Heat (Cal)
Village surface water bodies	2.70E-2	1.06E13	6.75E-3	2.65E12
Least surrounding fldpln.	1.51	5.93E14	3.8E-1	1.49E14
Entire Ganges basin srfc water	786	3.09E17	197	7.74E16
Entire Ganges basin fldpln.	44,043	1.73E19	11,011	4.32E18

5. MAJOR IMPLICATION

5.1. Inland H_2O Depletion and not CO_2 Accumulation to Account for Global Warming vis-à-vis Cooling

The implication of this study is global. The work shows both heating and cooling effects. Climate scientists blame the greenhouse gases for global warming. The greenhouse gases, by their properties, cannot lead to global cooling as we are experiencing now. It seems that the greenhouse warming is very short-lived i.e., for the summertime only. The second planet of the solar system Venus is warmer than the first planet Mercury because of its trapped greenhouse gas. Its greenhouse gas does not let its temperature to swing. The question arises why not the increasing greenhouse gases trapped in the earth's atmosphere warm it up and protect us from the winter cold. The planet Mercury on the other hand has a huge day-night temperature swings because of not having any greenhouse gas blanketing.

In a waterless environment, desert-like climate can develop for the loss of heat that could be stored. The case study of the Ganges basin hints at the anthropogenic activities of unregulated exploitation of global natural water resources as the cause of the occurrences of global warming vis-à-vis global cooling. The natural threshold of the global thermal balance has been broken down by the human activities. The Aral Sea has been made dry. The Ganges basin has lost more the 60% of its founding and sustaining water. Mexico has been deprived of the Colorado River water. The downstream riparian countries of the Mekong basin suffer from upstream water piracy. There had been deaths of countless small streams the surface water bodies that depended on them. Gradual extinction of these water bodies happened within our limits of tolerance and then it reached off-limit. Anthropogenic activities cause water loss in the process of its exploitation via storage, transfer, diversion, redistribution, piracy, groundwater extraction for flooding and spraying in agricultural fields and industrial and other uses. Millions of kilometers of canals have been set that has significantly increased of surfac areas of water bodies favoring evaporation. In the Indian grand river networking, Adel mentions that just 9 out of the 33 link canal lose of 2,768 cu meter of water (2013h, 2014d and the references in 2013h). Upstreram water piracy causes some downstream sites' surface water to be recharged by groundwater. Human intervention has broken down the naturally established pattern of evapotranspiration in space and time. On top of these, there are occurrences of droughts somewhere on the globe. Some region do not receive summer precipitation and gets enough in and asround the winter. Stray evaporation from these artificially made sources does not contribute to the regular pattern of rainfall which would happen with virgin water bodies. Adel (2002) provides a detailed mathematical discussion on this.

Figure 27 shows CO_2 increase in the last five decades in the amount of parts per million (ppm). However, H_2O vapor is added in tens of thousand time stronger rate than CO_2 and its content is expressed in percents. Yet, its contribution in the global warming and cooling effect does not receive due attention.

For studying global warming vis-à-vis cooling, an international initiative is to be taken. A baseline year prior to 1950 may be selected. Each nation/geographic area has to prepare an inventory list of the lost water bodies, water abundance, flooded area and their gradual drop.

It is an important fact to bear in mind that in the absence of thermal energy balance, our physical environment becomes shaky and the self-immunity weakens yielding to polar vortices and others that can easily get over us. And the project site instead of being protected by the Himalayas during the winter, receives winter blasts from it. This Ganges basin study along with the study of the Aral basin should be convincing to us that it is not CO_2 accumulation but inland H2O depletion that alone can explain global warming vis-à-vis cooling. Since the surface as well as the ground water are depleting, inland water resources well incorporate both. The upstream riparian countries, in general, should take a lesson on the global consequences of depriving the downstream countries of their due share of water and abandon such plans as the grand-river networking (Adel, 2013h; PNS, 2012) in the interest of the surviving human civilization.

About the exaggeration of profits from dams and barrages, it may be mentioned that Jhunjhunwalla (2009) analyzed the losses and profits figures for dams on 21 points. He found little benefits out of these hydroelectric dams.

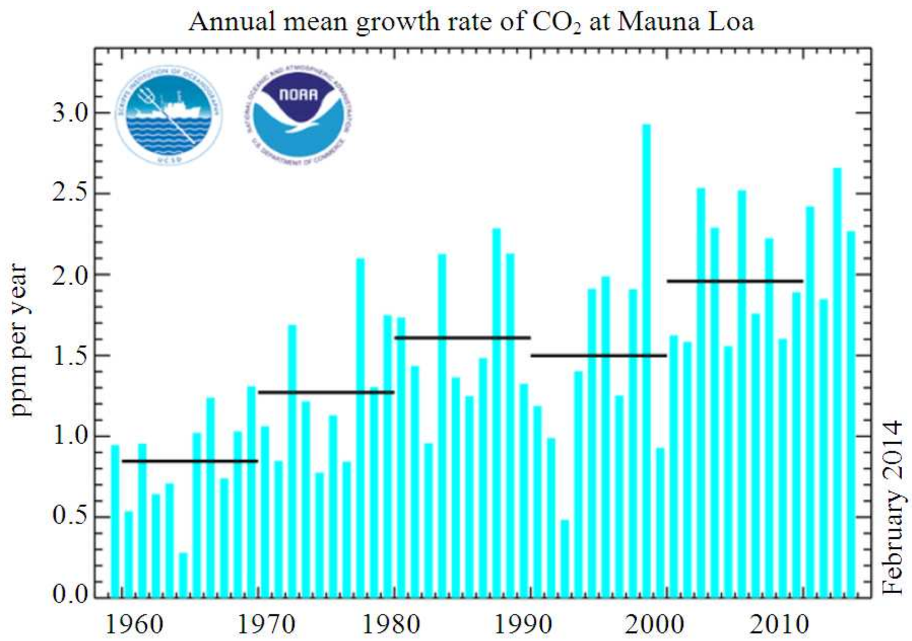

Fig. 27. Annual rate of incresase of CO_2 (NOAA, 2009)

He concludes exageration on the the benefits of the production of hydroelectricty and underestimation on the production cost. Hydroelectric station will prove unprifitable if all his 21 points are considered. The analysis of the exact profit and loss becomes difficult because of lobbying of the power ministry, contractors and influencial customers. The lobbying power wants to have it even risking the national profit.

India is working on a grand plan to network the rivers flowing through her (Adel, 2014d). It will further aggravate the condition of Bangladesh. This casde study lesson should be an eye-opening for the Indian government.

6. CONCLUSION

The downstream Ganges basin in Bangladesh has lost its heat reservoirs with loss of her foundiing and sustaining water resources. The highest specific heat of water makes it absorb heat during the summer and store it for the winter when it can release it to the environment with the dropping of temperature. The situation has peaked in the northern and northwestern Bangladesh because of the deaths of many surface water resources-feeding rivers due to upstream water piracy. The temperature rise in summer and drop in winter as well as the HDD and CDD have moderate correlation with the declined Ganges discharge. Increased humidity, thought to be due to the evaporation of withdrawn groundwater, puts people's life to extreme discomfort. There being no heat insulating partition between the northwestern and southwestern Bangladesh and the rest of the country, it is likely to spread the severe heating and cooling effect elsewhere in the country and beyond. It is of utmost importance for the Indian Government to take lesson from this study to decommission her dams and barrages around Bangladesh border and take necessary steps to mitigate the plight of the downstream Bangladeshis. The case study of the downstream Ganges basin warns us of the broader anthropogenic activities of tampering water resources that is causing the current global heating vis-a-vis global cooling. And India deserves the credit for facilitating it by cornering her small neighbor. If the world bodies like the UNO take the necessary steps like the introduction of sanctions against the upstream water piracy, the downstream riparian people may be saved from climatic severity-related sufferings and at the same time the world may be saved from climatic irregularities.

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