Pollution and Environmental hazards vis-à-vis maritime crime and security in the context of climate change fantasy in the Bay of Bengal

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Key words
Environmental hazards; pollution; ocean health; climate change; Bay of Bengal.

Abstract

Mechanism of maritime security cannot evolve if climate change issue is taken into consideration. Holistic maritime security largely depends on the prevention of pollution and management of both environmental and anthropogenic hazards. The purpose of this study is to focus reality of global pollution and hazards which is threatening greatly maritime security rather than bringing climate change fallacy that would jeopardy the whole objectives. Managing pollution and hazards are the demand of the time that would never be achieved in the context of climate change fantasy. Paper embodies analogies on maritime crime and security associated with pollution and both environmental and anthropogenic hazards and not with the climate change. Pollution and hazards are the major forcing agents against the holistic security in the maritime sector. Natural including geological events can cause severe environmental hazards largely due to cyclone, storm surge, flood, saline water encroachment, volcanic activities, mud diapirism, mud volcanism, slope failure, submarine landslide, turbidites, shallow gas, active fluid seepage, seafloor pockmark formation, seismicity and seismicity induced trans-oceanic tsunami, and local tsunami. Anthropogenic processes and activities of continuous emergence of urbanization and increased population along the coastal belt of the maritime nations with very little and no proper management pose serious threats to the blue economy, ocean health and biodiversity.

Climate change is an idea circulating anxiously in the domains of domestic politics and international diplomacy. It is an idea circulating to mobilize forces in the sectors of business, law and international trade. Without proper differentiation of relations of climate change, weather, environment and pollution, the holistic security of maritime sector and the sustainable development of model of climate change and environment will not be achieved. Security in friendly environment and pollution free earth are the key to every national security, comprising the dynamics and interconnections among the natural resource base, the social fabric of the state, and the economic engine for local and regional stability. Further, global climate change only oscillates between glacial and inter-glacial period of thousand to millions of years having marked variations within each period. In fact, there is no real impact of climate change on maritime security. Mixing of climate and climate change with pollution and environmental hazards in the perspective of security and sustainability is an unscientific way forward and a flawed approach.

Introduction

"We ‘ve arranged a civilization in which most crucial elements profoundly depend on science and technology. We have also arranged things so that almost no one understands science and technology. This is a prescription for disaster. We might get away with it for a while, but sooner or later this combustible mixture of ignorance and power is going to blow up in our faces" (Sagan, 1995: 25-26; quoted in Mooney and Kirshenbaum, 2009). Climate and climate change can principally occur due to the solar, geological and natural events and cannot be predicted in the human and anthropogenic time frame. It is the weather pattern that fluctuates in decadal to millennium time frame. The minuscule Earth, immersed in the solar sphere of influence, cannot simply escape its impact. Maritime security needs to examine threats posed by the environmental and pollution events

and its trend to individuals, communities and nations. "Climate change" is not a problem waiting for solution, it is the "environment" which is being polluted severely to cause disaster. The climate system, as defined in the third IPCC Working Group I Assessment Report (Stocker et al., 2013) is an interactive system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the land surface and the biosphere, forced or influenced by various external forcing agents, the most important of which is the Sun. At present the Earth is passing through the interglacial period that continues for the last approximately 12,000 years (Fig. 1A). Global climate change is a change in the statistical distribution of weather pattern over the periods of time that range from thousands to hundred thousand of years. Climatic change has occurred in several geologic time periods by the natural process and it is not anthropogenic.

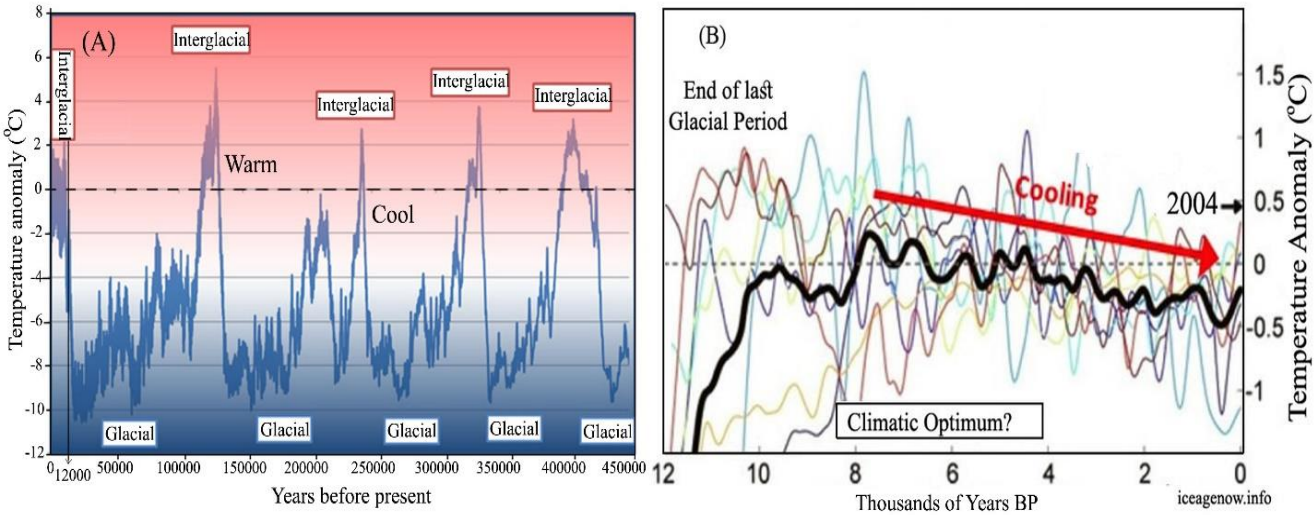


Figure 1: (A) Glacial – Interglacial cycle of climate change. (B) Global cooling trend for 8000 years BP.

The Köppen climate classification divides climate into five main climate groups viz., tropical, dry, temperate, continental, and polar with each group is divided based on seasonal precipitation and temperature patterns (Köppen, 1884). Global climatic change due to the factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics, and volcanic eruptions for long time will occur. Atmospheric processes affected by ocean acidification, toxic metal poisoning, acid rain, and ozone damage and consequent increased UV-B radiation, volcanic darkness, cooling and photosynthetic shutdown, each of which are the crucial in driving global extinctions (Bond and Grasby, 2017). Present global warming trend has in fact a downward trend indicating for another 'Little Ice Age' in future (Fig. 1B). However, global warming is an event and climate change is a phenomenon. We do not judge climate against any fixed or universal morality. Neither can climate be measured directly by our instruments nor can it be defined literally. We can measure the temperature of a specific place at a given time, but no-one can directly measure the climate of Paris or the temperature of the planet. According to Hulme (2009), climate is an idea that carries a much richer tradition of meaning than is captured by the unimaginative convention that defines climate as being the average course or condition of the weather at a place usually over a period of years as exhibited by temperature, wind velocity and precipitation.

The most general definition of climate change is a change in the statistical properties (principally its mean and spread) of the climate system (Hulme, 2016) when considered over long periods of time, regardless of cause (Petit et al., 1999). Accordingly, fluctuation over the period such as El Niño, do not represent climate change. Global warming cannot be attributed to global climate change especially in the context of environmental policy. Global warming cannot change climatic

condition alone. Within scientific journals, global warming refers to surface temperature increase while climate change includes when polar climate changes to tropical climatic condition, or desert climate changes to tropical one. Factors that can shape climate are called climate forcing or "forcing mechanisms" (Broecker, 1975). These include processes such as variations in solar radiation, variations in the Earth's orbit, variations in the albedo or reflectivity of the continents, atmosphere, and oceans, mountain-building and continental drift and changes in greenhouse gas concentrations. Industrial emissions of tiny airborne particles called aerosols might cause cooling, while greenhouse gas emissions would cause warming. Which effect would dominate?

Pollution in the sea can occur due to the natural processes like volcanic eruption, earthquake induced submarine landslides, tsunami and so-called sea level rise. Pollution can change an environment but cannot change climate. Important offshore hazards include mud diapirism, mud volcanism, slope instability, submarine landslide, turbulence and turbidites, shallow gas, active fluid seepage, seafloor pockmark formation those may have adverse impact on coastal ecological system. Security of the ocean largely depends on the maintaining environmentally friendly health which is a major challenge. The actual data are easy for anyone to find – they are posted and regularly updated, freely, on public websites around the world. The most consistent, highly respected, and regularly analyzed and updated data on global surface temperatures are available from NASA's Goddard Institute for Space Sciences, NOAA's National Climate Data Center, and the United Kingdom's Met Office Hadley Center. The present paper aims at to project global warming and global climate change as the paradoxical issue and not related to environmental safety and security of the maritime sector.

Global Warming

Global warming is the slow increase in the average temperature of the earth's atmosphere because an increased amount of the energy (heat) striking the earth from the sun is being trapped in the atmosphere and not radiated out into space. Global warming is the phenomenon of increasing average air temperature of certain time period in comparison to the previous average temperature of the same time period. According to IPCC (2013) the interval between 1880 and 2013 saw an increase in global average surface temperature of approximately 0.8°C. It predicted that by the end of the 21st century the global mean surface temperature would increase by 0.3 to 5.4 °C. According to Nobel Laureate of Physics Ivar Giaever, it is not possible to measure global average temperature rise of 0.8°C. This temperature rises of 0.8°C if measured has occurred between 1880 and 2013 in 133 years which is only 0.3% signifying the Earth that maintained a very stable temperature. On the other hand, as claimed CO_2 in the atmosphere has increased from 280 ppm to 380 ppm justifying average global temperature rise is due to increased CO_2 emission. Is there a cause and effect? However, this positive correlation is bearing a negative correlation means whatever temperature rise, it is not due to increased CO2 emission. Over the last 100 years, the average temperature of the air near the Earth's surface has risen a little less than 1° Celsius (0.74 ± 0.18°C). This rise in temperature may be responsible for the conspicuous increase in storms, floods and raging forest fires. Reference from a special report by the IPCC, which states that "global warming is likely to reach 1.5°C between 2030 and 2052 if it continues to increase at the current rate." The report concludes that risks of long-lasting or irreversible impact on the earth's ecosystems are higher if warming breaches the 1.5-degree mark by 2030.

A rapid temperature rise over the last 30 years is anomalous for the climate scientists. Moreover, normally the Earth should now be in a cool-down period, according to natural effects like solar cycles and volcano activity, not in a heating up phase.

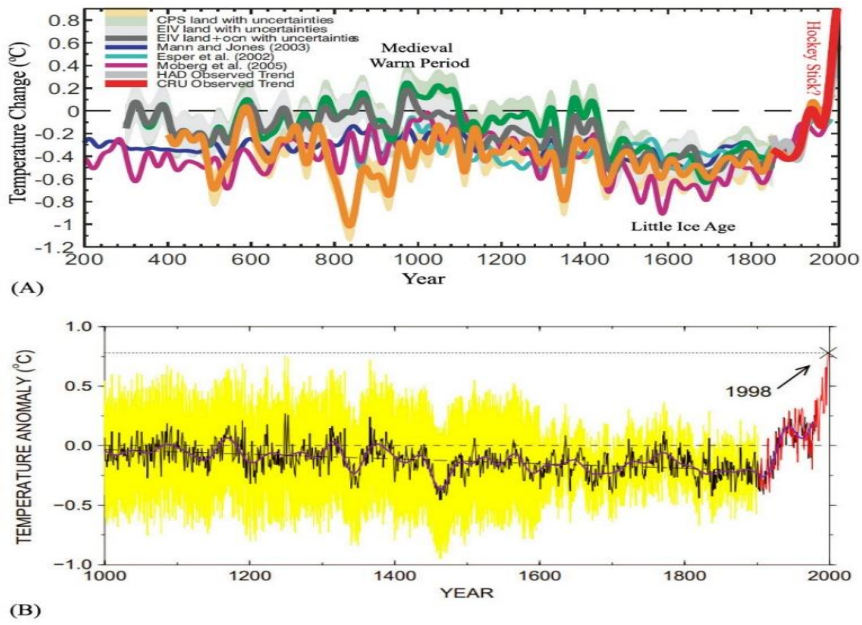


Figure 2: (A) Actual Medieval Warm Period (MWP) and Little Ice Age (LIA). (B) Both MWP & LIA are deleted to show typical "hockey Stick" curve of temperature rise.

Present world is passing through the interglacial period that represent for approximately 12,000 years. The Last Glacial Maximum (LGM) ended around 22,000 BP. Records of the last 450,000 years clearly show that 'global climate change' occurred is limited within the cycle of glacial and inter-glacial phases and these changes occurred almost in symmetrical interval with exception of 175,000 to 200,000 years BP (Fig. 1A). The climatic group of Köppen (1884) is continuing since at least Last Glacial Maxima (LGM) having concurrent timing of 22.1±4.3 ka and 8±3.2 ka in the Northern Hemisphere and 22.3±3.6 ka and 7.4±3.7 ka in the Southern Hemispheres that matches with Earth's wobble happens over two cycles of 19000 and 23000 years. Further, temperature has been relatively stable over the last two thousand years before 1850, with regionally varying fluctuations such as the 'Medieval Warm Period' and the 'Little Ice Age' (Figure 2A). There are two aspects of the curves in the figure 2A, first, the fake 'hockey stick' graph of abrupt rise in temperature after 1960 that erased accepted global temperature history; and second, the removal of global temperature record representing 'Medieval Warm Period' and 'Little Ice Age' in the last about 2000 years of the present inter-glacial period (Fig. 2B).

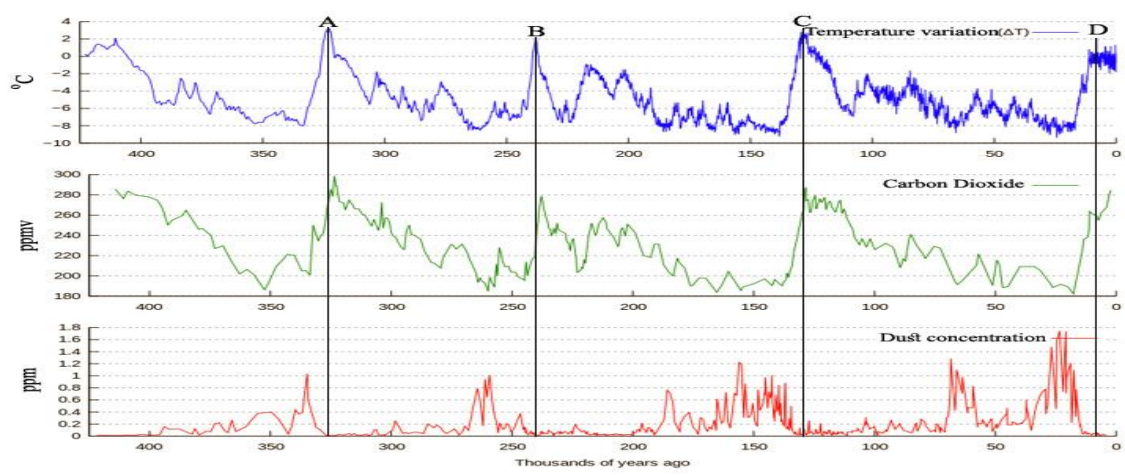
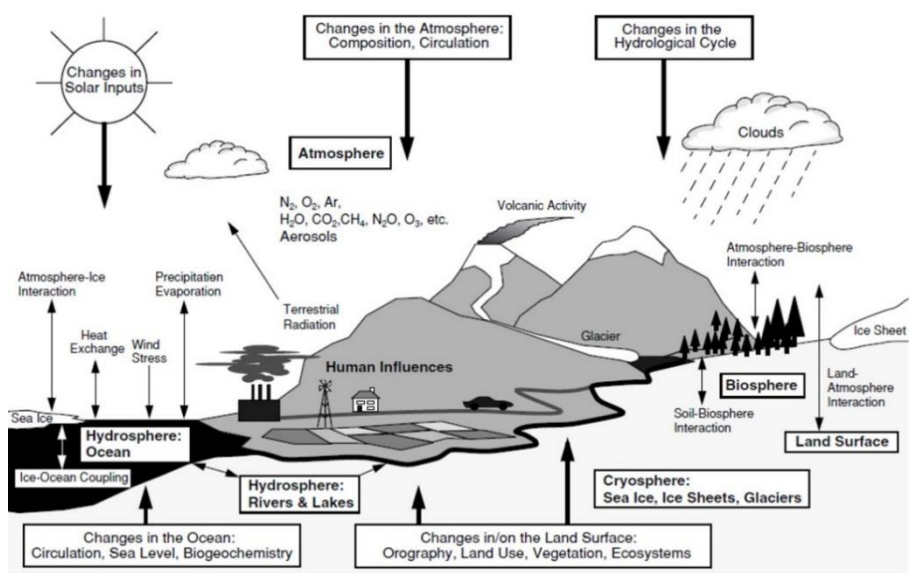


Figure 3: for the last 400,000 years peak CO_2 concentration in the atmosphere attains much later of the peak of temperature rise.

The most authentic climate events of the last deglaciation are well defined in ice core records from polar region of both the hemispheres. This indicates relatively concurrent timing of the Last Glacial Maximum (LGM; peak glacial conditions) and the Altithermal (peak interglacial conditions) in the Northern hemisphere at 22.1±4.3 ka and 8.0±3.2 ka respectively and in the Southern hemisphere at 22.3±3.6 ka and 7.4±3.7 ka respectively (Shakun and Carlson, 2010). The magnitude of the glacial–interglacial temperature change increases with latitude, reflecting the polar amplification of climate change. The short-term zig zag of temperatures over the past 100 years have been either cold or hot not just one way. For example, in the 1930s temperature was high to cause world record draughts and then in the 1960s temperatures became record cold. The predicted rise in temperature was based on a range of possible scenarios that accounted for future greenhouse gas emissions since greenhouse gases are considered as heat trapper for global warming. But, studies of Antarctic ice core by Petit et al (1999) and Kawamura et al (2007) reveals that for the last 400,000 years peak CO_2 concentration in the atmosphere attains much later of the peak of temperature rise signifying no CO_2 contribution for temperature rise. On the other hand, dust concentration in the atmosphere attained much earlier than the peak of temperature rises signifying causes of volcanic activities for enhanced CO_2 concentration in the atmosphere (Fig. 3). However, sources of greenhouse gas emission in the atmosphere are widespread (Fig. 4). The major greenhouse gases are water vapor, which causes about 36–70 percent of the greenhouse effect; carbon dioxide (CO_2), which causes 9–26 percent; methane (CH_4), which causes 4–9 percent; and ozone (O_3), which causes 3–7 percent. Anthropogenic Greenhouse Gas (CO_2) emissions vis-à-vis global warming, the two attributes are blamed for future climate change. The future projection of global warming by IPCC opined that continued anthropogenic greenhouse gas emissions at or above current rates would cause further warming by 1.8°C (low scenario) to 4.0°C (high scenario) and shall induce many changes in the global climate system during the 21st century. But increased CO_2 concentration in the atmosphere is not accountable for the global warming.

Figure 4: Sources of "greenhouse gas".



Global temperature variation occurs ahead of CO_2 concentration signifying some other causes for global warming and not the CO_2 emission. Over the last 12000 years the Earth has witnessed frequent oscillation between cold and warm phases after the beginning of the interglacial period (Holocene Climate Optimum) (Fig. 5). Average near surface temperatures of the northern hemisphere during the last 11000 years (Dansgaard et al., 1969) exhibit several warm and cold phases including the present warm phase (Fig. 6A). However, despite the dominance of warm phase, expanded record of temperatures since the end of the last glacial period reveals that global

temperatures have been falling for the past 8000 years and we are probably heading towards another little ice age (Fig. 6B) (iceagenow.info).

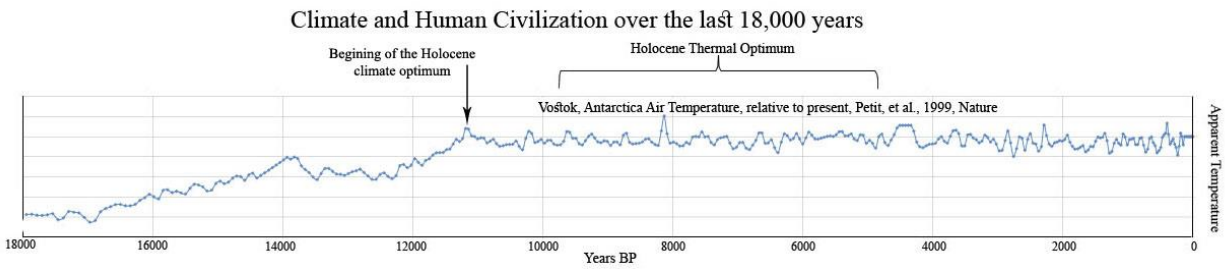


Figure 5: Since beginning of the Holocene climate optimum rise and fall of temperature is very frequent.

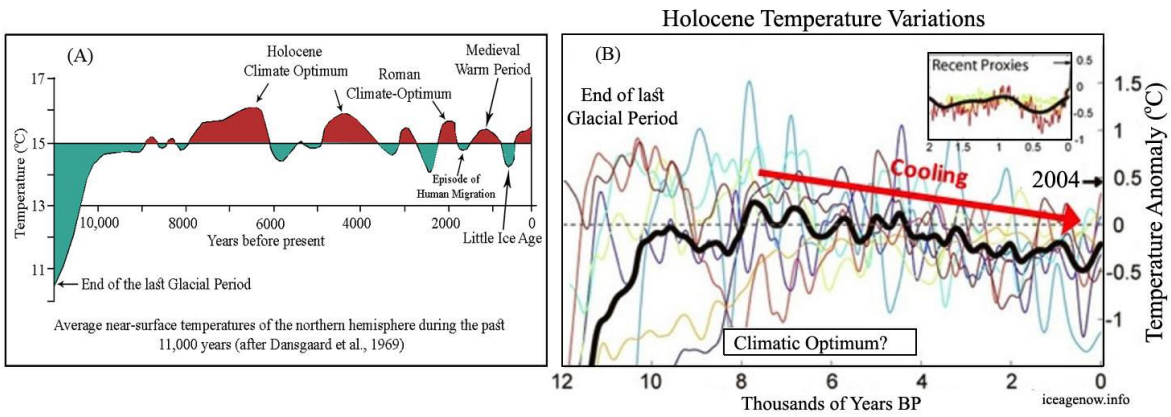


Figure 6: (A) Warm phase coincides with civilization. (B) Possible next Little Ice Age.

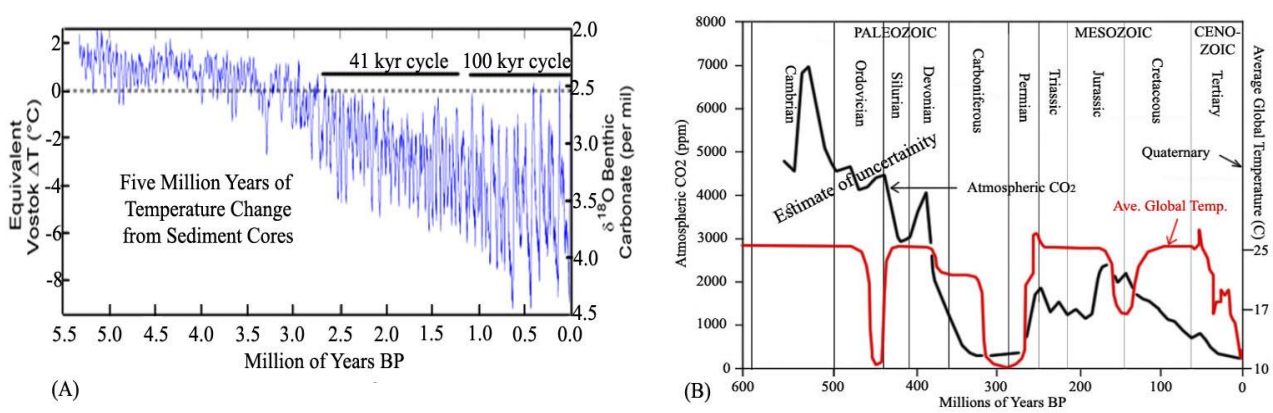
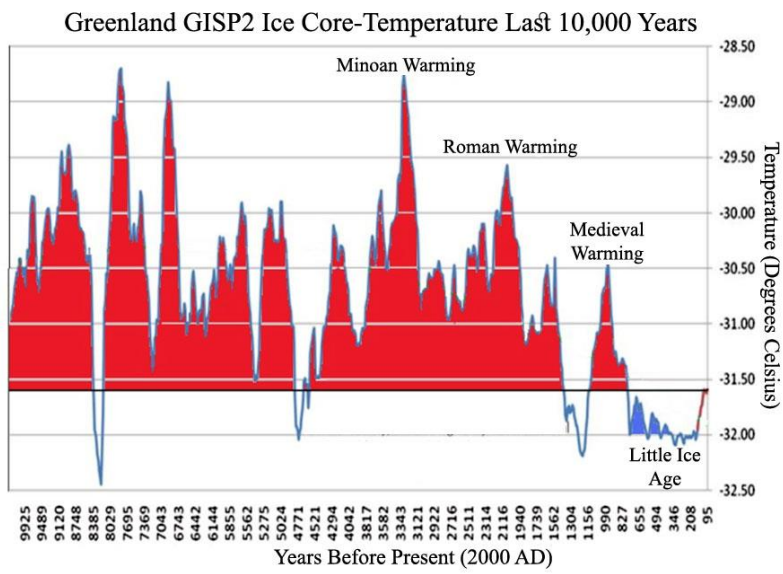


Figure 7: (A) Oxygen isotope fractionation of benthic $\delta^{18}O$ records in deep sea sediment and temperature derived from Vostok ice cores has a decreasing trend. (B) global temperature and CO_2 have no correlation.

Reconstruction of the past 5 million years climate history based on oxygen isotope fractionation of benthic $\delta^{18}O$ records in deep sea sediment cores fitted to a model of orbital forcing (Lisiecki and Raymo, 2005) from 57 globally distributed sites reveals that the temperature derived from Vostok ice cores following Petit et al. (1999) has a decreasing trend since 3 million years BP both

for 41 thousand years cycle and 100 thousand years cycle. Variations in temperature anomaly, however, is relatively larger in 100 thousand years cycle than in 41 thousand years cycle (Fig. 7A). This finding may indicate that global climate change interval between glacial and interglacial period is approximately 100 thousand years. Data on global temperature and atmospheric CO_2 over geologic time (550 Ma) show a similar overall pattern: very high CO_2 values during the early Paleozoic, a large drop during the Devonian and Carboniferous, high values during the early Mesozoic, and a gradual decrease from about 170 Ma to low values during the Cenozoic (Berner and Kothavala, 2001). This reveals that global temperature and CO_2 concentration in the atmosphere are the independent variables and the anthropogenic greenhouse gas has no relation to the global temperature variations (Fig. 7B). According to Alley (2000) temperature of last 10000 years from Greenland GISP2 ice core global temperature was more than 2°C above present-day temperature for all time during Minoan, Roman and Medieval periods when there was no anthropogenic greenhouse gas emission in the atmosphere (Fig. 8).

Figure 8: Greenland GISP2 Ice Core Temperature last 10000 years was more than 2°C above present day temperature.



From scores of publications it is further evident that global warming can occur due to solar activities. However, contribution of greenhouse gases in the global warming may be attributed to water vapor that plays the most dominant role as catalyst amongst all the greenhouse gases (Fig. 9). Further, an increase of global temperature can warm ocean surface-water producing water vapor forming cloud in the atmosphere and can entrap radiated heat. Gray (2008) opines that the two main scientific claims of the IPCC, (a) "the globe is warming" and (b) "increases in carbon dioxide emissions are responsible".

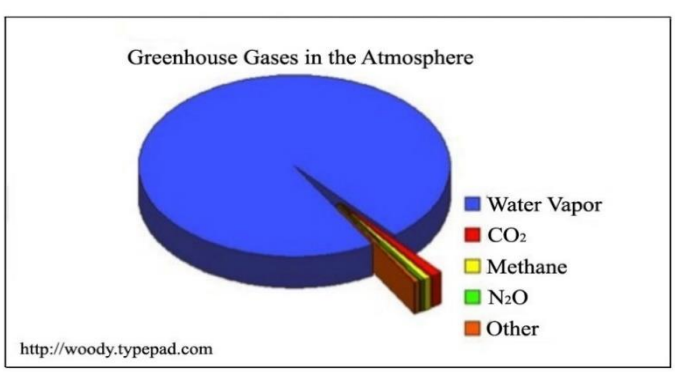


Figure 9: Water vapor is the most dominant of all the greenhouse gases.

Evidences for both claims are fatally flawed. Solar experts believe that the Earth could be heading towards a 'grand solar minimum', a reduction in solar output like Little Ice Age once saw ice fairs on the Thames (Fig. 10A & 10C). Solar activity has repeatedly fluctuated between

high and low during the past 10,000 years. In recent years, the Earth has unfortunately left a period of very high solar activity, the Modern Grand Maximum.

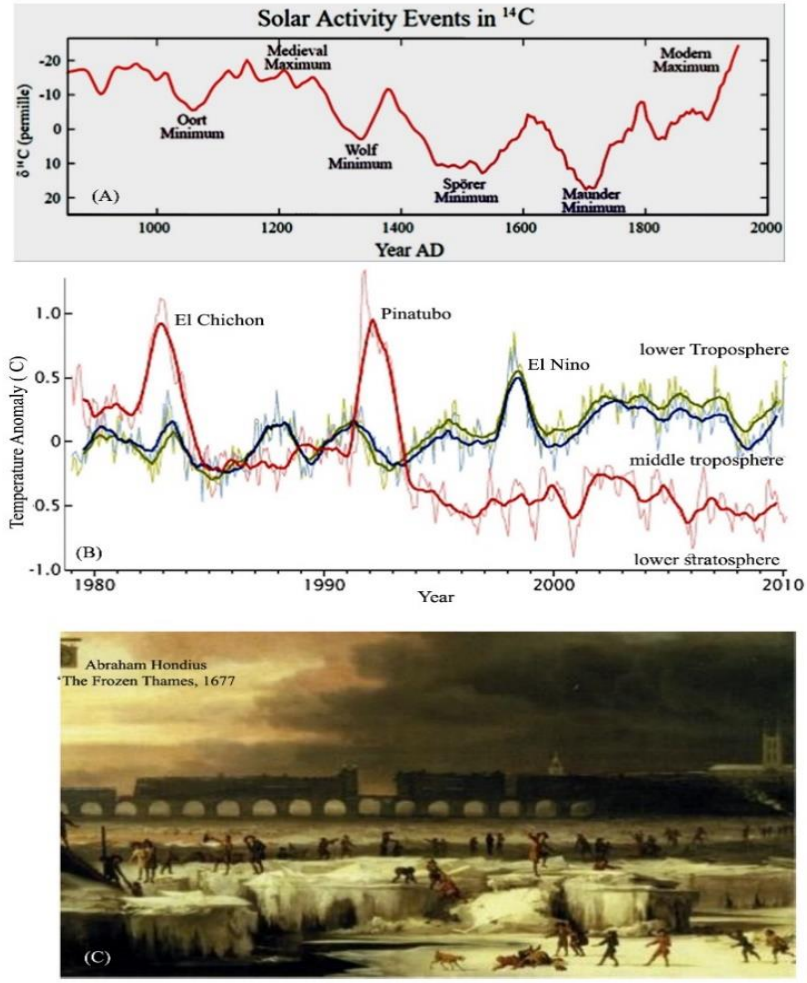


Figure 10: (A) Solar activities and temperature variation. (B) Volcanic activities and temperature rise. (C) The frozen Thames in 1677.

Periods of high solar activity correspond to multi-decadal- to centennial-scale warming. The cause of the Little Ice Age is not known but climatologists contend that reduced solar output, changes in 'atmospheric circulation, and explosive volcanism might have played roles. When Mount Pinatubo erupted in the Philippines June 15, 1991, an estimated 20 million tons of sulfur dioxide and ash particles blasted more than 20 km high into the atmosphere (Fig. 10B). The eruption caused widespread destruction and loss of human life. Gases and solids injected into the stratosphere circled the globe for three weeks. Volcanic eruptions of this magnitude can impact global climate, reducing the amount of solar radiation reaching the Earth's surface, lowering temperatures in the troposphere, and changing atmospheric circulation patterns. Large-scale volcanic activity may last only a few days, but the massive outpouring of gases and ash can influence weather pattern for years. Sulfuric gases convert to sulfate aerosols, sub-micron droplets containing about 75 percent sulfuric acid. Following eruptions, these aerosol particles can linger if three to four years in the stratosphere (Kirchner et al., 1999; Stenchikov et al., 1998). A long-term average, volcanism produces about $5x10^{11}$ kg of CO_2 per year; that production, along with oceanic and terrestrial biomass cycling maintained a carbon dioxide reservoir in the atmosphere of about $2.2x10^{15}$ kg. Current fossil fuel and land use

practices now introduce about a (net) 17.6×10^{12} kg of CO_2 into the atmosphere and has resulted in a progressively increasing atmospheric reservoir of 2.69×10^{15} kg of CO_2.

Sea Level Rise

"Sea level rise" is the most legitimate concern of global warming. If global warming occurs, polar ice could melt, and thermal expansion of ocean water would have its volumetric expansion to sea level rise. But no evidence exists that can proof that sea level is continuously rising and by 2100 AD it will exceed 1.5 m or 2 m mark. According to (Khan, 2019) equatorial bulge, polar flattening, elevation difference of the spheroidal surface between equator and pole with lower in the pole, strong gravity attraction in the polar region and week gravity attraction in the equatorial region, all these phenomena play dominant role that prevents from sea level rise. Further global sea level rise and fall would occur due to crustal subsidence and uplift respectively only. When Earth warms, two things can happen viz., ice melting and thermal expansion of the sea surface. Ice melting does not contribute to sea level rise due to very simple scientific reasons, neither do thermal expansion of the ocean water because ocean water gets evaporated as the surface of the ocean gets heated. Evaporation ultimately can form cloud in the atmosphere where it acts as the heat-trapper. Sea surface height (SSH) may rise due to volumetric expansion of the entire water column otherwise there would form ocean circulation due to density difference. Height of the ocean surface at any given location, or sea level, is measured either with respect to the surface of the solid Earth i.e., relative sea level (RSL)) or a eustatic sea level (ESL) in reference to the centre of the Earth (Fig. 11A). Relative sea level (RSL) change can differ significantly from global mean sea level (GMSL) because of spatial variability in changes of the sea surface and ocean floor height. RSL change over the ocean surface area gives the change in ocean water volume, which is directly related to the sea level change.

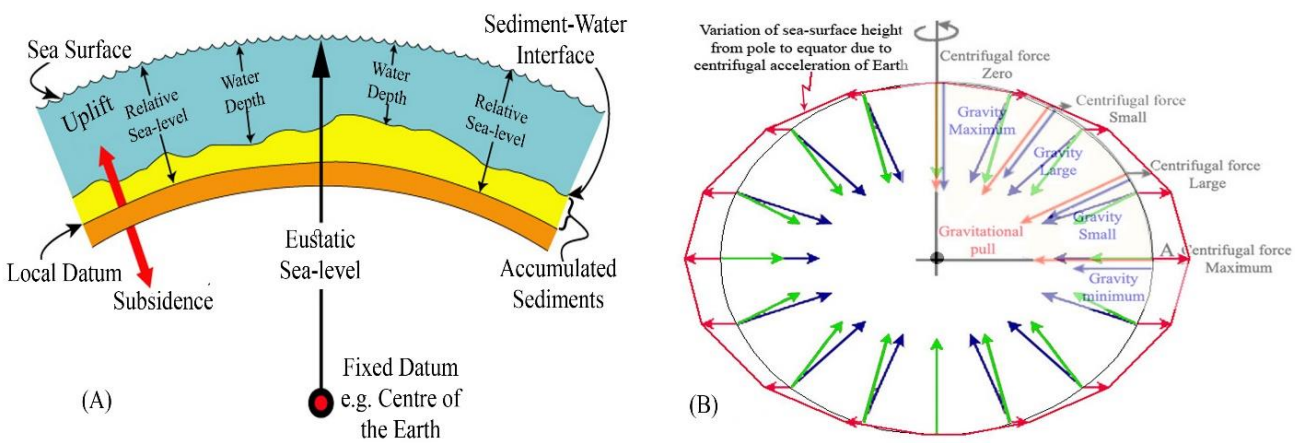


Figure 11: (A) Eustatic and Relative sea level. (B) Equatorial bulge and polar flattened with elevation difference of 21 km along with gravity attraction and centrifugal force can prevent any visible sea level rise.

Sea level changes can be driven either by variations in the masses or volume of the oceans, or by changes of the land with respect to the sea surface. In the first case, a sea level change is defined 'eustatic'; otherwise, it is defined 'relative' (Rovere et al., 2016). Variations in the masses or volume both can affect largely the gravity field of the Earth and in turn can affect geoid surface. If geoid surface varies, then the measurement of "sea surface height anomaly" (ΔSSH) would be wrong. Hence, it is certain that a prediction and measurements of global sea level rise to the extent of millimeter scale with respect to global mean sea level is not possible. According to Kemp et al (2015) land uplift or subsidence can result in, respectively, a fall or rise in sea level that cannot be considered eustatic as the volume or mass of water does not change. Any sea level change that is observed with respect to a land-based reference frame is defined a relative sea level (RSL) change.

Eustatic Sea Level (ESL) changes also occur when the volume of the ocean basins changes due to tectonic seafloor spreading or sedimentation in the ocean basin or closure of the ocean basin. These processes can occur only geologically for millions of years. Changes in sea level can be observed at very different time scales and with different techniques. Regardless of the technique used, no observation allows to record purely eustatic sea level changes. At multi-decadal time scales, sea level reconstructions are based on satellite altimetry/gravimetry and landbased tide gauges (Cabanes et al., 2001). At longer time scales (few hundreds, thousands to millions of years), the measurement of sea level changes relies on a wide range of sea level indicators (Rovere et al., 2016a; Shennan and Horton, 2002; Vacchi et al., 2016). One of the most common methods to observe sea level changes at multi-decadal time scales is the tide gauges. Modern tide gauges are associated with a GPS station that records land movements. However, tide gauges have three main disadvantages: (i) they are unevenly distributed around the world (Julia Pfeffer and Allemand, 2015); (ii) the sea level signal they record is often characterized by missing data (Hay et al., 2015); and (iii) accounting for ocean dynamic changes and land movements might prove difficult in the absence of independent datasets (Rovere et al., 2016). Since 1992, tide gauge data are complemented by satellite altimetry datasets (Cazenave et al., 2002). The altitude of the satellite is established with respect to an ellipsoid, which is an arbitrary and fixed surface that approximates the shape of the Earth. The difference between the altitude of the satellite and the range is defined as the sea surface height (SSH). Subtracting from the measured SSH a reference mean sea surface (e.g. the geoid), one can obtain a 'SSH anomaly'. Here, the measure of 'SSH anomaly' is a controversial one because geoid differs from MSL (mean sea level) by several meters. The shape of the geoid is crucial for deriving accurate measurements of seasonal sea level variations (Chambers 2006). According to Rovere et al (2016) measurements of paleo eustatic sea level (ESL) changes bear considerable uncertainty. Further, sea level changes on Earth that cannot be treated as a rigid container although eustasy is defined in view of Earth as a rigid container.

Internal and external processes of the earth such as tectonics, dynamic topography, sediment compaction and melting ice all trigger variations of the container and these ultimately affect any sea level observation. Further, sea level is largely dependent on the centrifugal force and Earth's gravity (Fig. 11B) that shape the Earth as spheroidal with equatorial bulge and polar flattening. Difference in height between equatorial bulge axis and polar flattening axis is about 21km. Polar melt water will not move up the hill from pole to equator, neither it will move due to high gravity at pole and low gravity at equator. An estimated, observed, and possible future amounts of global sea level rise from 1800 to 2100, relative to the year 2000 has been proposed by Melillo et al (2014) based on the works of Kemp et al (2011); Church and White (2011); Parris et al (2012)(Fig. 12).

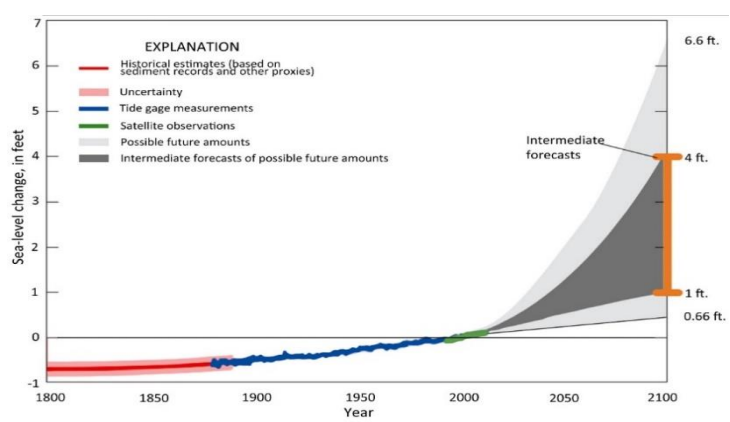


Figure 12: Estimated, observed, and predicted global sea level rise from 1800 to 2100. Estimates from proxy data are shown in red between 1800 and 1890, pink band shows uncertainty. Tide gauge data is shown in blue for 1880-2009. Satellite observations are shown in green from 1993 to 2012. The future scenarios range from 0.66 feet to 6.6 feet in 2100 (Redrawn from Melillo et al., 2014).

The main concern of such prediction of future global sea level rise shown in Melillo et al (2014) is the forecast beyond 2012 upto 2100. Although sea level rise is shown by 0.89 ft in 209 years

(between 1800 and 2009) at the rate of 0.0043 ft/yr, the prediction of 4 to 6 ft at the rate of 0.044 ft/yr and 0.066 ft/yr respectively in 91 years between 2009-2100) is highly questionable. An abrupt jump in the sea level rise after 2009 is a conjecture.

Climate Change

Climate threat investigators revealed that atmosphere–ocean modeling is an imperfect representation, paleo-data consist of proxy climate information with ambiguities, and modern observations are limited in scope and accuracy (Khan, 2019). An understanding of climate requires an amalgamation of astronomy, solar physics, geology, geochronology, geochemistry, sedimentology, tectonics, palaeontology, palaeoecology, glaciology, climatology, meteorology, oceanography, ecology, archeology and history. Earth's climate system is unfathomably complex. It is affected by innumerable interacting variables, atmospheric CO_2 levels being just one. The more variables there are in any system or train of events, the lower the probability of all of them coming to pass. The list of variables that shape climate includes cloud formation, topography, altitude, proximity to the equator, plate tectonics, sunspot cycles, volcanic activity, expansion or contraction of sea ice, conversion of land to agriculture, deforestation, reforestation, direction of winds, soil quality, El Niño and La Niña ocean cycles, prevalence of aerosols (airborne soot, dust, and salt) — and, of course, atmospheric greenhouse gases, both natural and manmade. However, about Seven million people in Bangladesh displaced in the last one decade due to flood, river-bank erosion, storm surge, cyclone and other natural calamities are not the climate migrants nor the victims of climate change. Present variations in the seasonal precipitation, temperature and associated weather extremes being the fundamental elements of climate system, shall not lead to climate change as predicted. Climate change is attributed to the changes from glacial to interglacial and vise-versa. Climate and climate change can principally occur due to the solar, geological and natural events and cannot be predicted in human and anthropogenic time frame. Studies of the Earth's atmosphere alone tell us nothing about future climate and climate change. Climate has a profound influence on life on Earth. It is part of the daily experience of human beings and are essential for health, food production and well-being. Many consider the prospect of human-induced climate change as a matter of concern. "Climate" refers to the average weather in terms of the mean and its variability over a certain timespan and a certain area.

Classical climatology provides a classification and description of the various climate regimes found on Earth. Statistically significant variations of the mean state of the climate or of its variability, typically persisting for thousand years and longer, are referred to as "climate change". Climate scientists have gathered detailed observations on various weather phenomena such as temperatures, precipitation, storms etc; and related influences on ocean currents and the atmosphere's chemical composition since the mid-20th century. These data indicate that the influence of human activities since at least the beginning of the Industrial Revolution has been over emphasized into the very fabric of climate change. Climate is determined by the atmospheric circulation and by its interactions with the large-scale ocean currents. Climate of the Earth depends on factors that influence the radiative balance, such as, the atmospheric composition, solar radiation and volcanic eruptions. The climate system consists of various components, including the dynamics and composition of the atmosphere, the ocean, the ice and snow cover, the land surface and its features. Large variety of physical, chemical and biological processes are taking place in and among these components wherein, cosmological and solar activities / processes play dominant role in the global climate change phenomenon (Fig.4).

Natural Forcing of the Climate System

The ultimate source of energy that drives the climate system is radiation from the Sun. The atmosphere contains several trace gases which absorb and emit infrared radiation. These so-called greenhouse gases absorb infrared radiation, emitted by the Earth's surface, the atmosphere and clouds. In an equilibrium climate state, the average net radiation at the top of the atmosphere is zero.

A change in either the solar radiation or the infrared radiation changes the net radiation. Climate variations, both in the mean state and in the occurrence of extreme events, may result from radiative forcing, but also from internal interactions between components of the climate system. A distinction can therefore be made between externally and internally induced natural climate variability and change. The response of the climate to the internal variability of the climate system and to external forcing is further complicated by feedbacks and non-linear responses of the components. An important example of a positive feedback is the water vapor feedback in which the amount of water vapor in the atmosphere increases as the Earth warms. This increase in turn may amplify the warming because water vapor is a strong greenhouse gas. An example of a physical feedback is the complicated interaction between clouds and the radiative balance. An important example of a biogeochemical feedback is the interaction between the atmospheric CO_2 concentration and the carbon uptake by the land surface and the oceans. Understanding this feedback is essential for an understanding of the carbon cycle (Fig. 13).

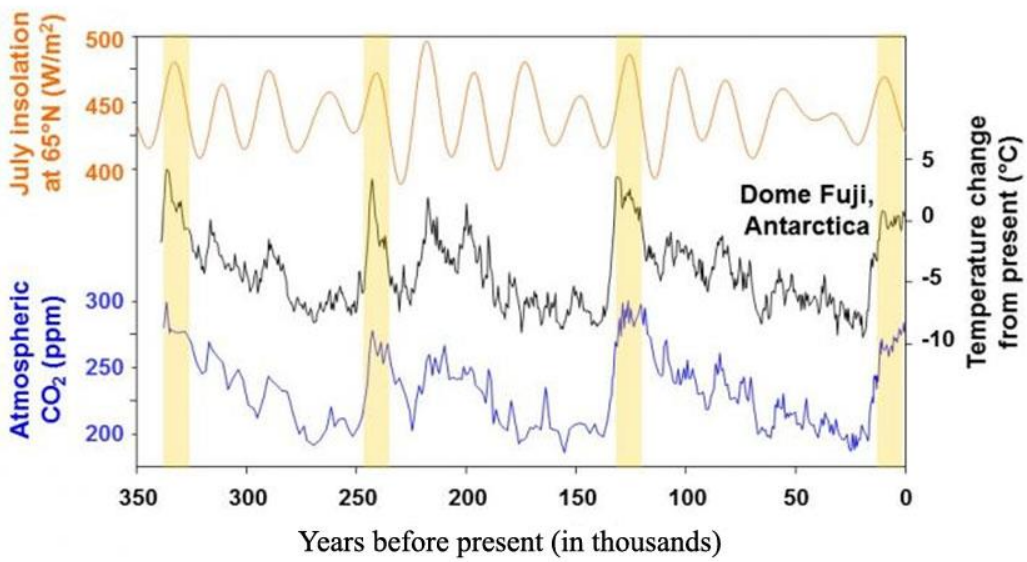


Figure 13: Based on Antarctic ice cores four full glacial cycles during the last 350,000 years is found.

Global and hemispheric variability of climate system

Climate may vary naturally on all timescales. During the last million years or so, glacial and interglacial periods have alternated as a result of variations in the Earth's orbital parameters. Based on Antarctic ice cores, more detailed information is available now about the four full glacial cycles during the last 350,000 years (Fig. 13).

In recent years it was discovered that during the last glacial period large and very rapid temperature variations took place over large parts of the globe, in the higher latitudes of the Northern Hemisphere. These abrupt events saw temperature changes of many degrees within a human lifetime. In contrast, the last 10,000 years appear to have been relatively more stable, though locally quite large changes have occurred. Solar activity has repeatedly fluctuated between high and low during the past 10,000 years. In recent years, the Earth has unfortunately left a period of very high solar activity, the Modern Grand Maximum. Periods of high solar activity correspond to multi-decadal- to centennial-scale warming. Recent analyses suggest that the Northern Hemisphere climate of the past 1,000 years was characterized by an irregular but steady cooling, followed by a strong warming during the 20th century. Temperatures were relatively warm during the 11th to 13th centuries and relatively cool during the 16th to 19th centuries. These periods coincide with what are traditionally known as the medieval Climate Optimum and the Little Ice Age. These anomalies appear to have been most distinct only in and around the North Atlantic region.

Climate Emergency

Climate models have many shortcomings and cannot be policy tools to safeguard the Earth. The general-circulation models of climate on which international policy is at present founded are not true for the purpose. Current climate policies pointlessly and grievously undermine the economic system, putting lives at risk in countries denied access to affordable and reliable energy resource for economic development and quality life. The reality of the present climatic condition is that the world has warmed (if the measured global average temperature is correct) at less than half the originally predicted rate, and at less than half the rate to be expected on the basis of net anthropogenic forcing and radiative imbalance. Sea level rise prediction has been miserably failed in establishing the impact of global warming and polar ice melts. Climate model tells us nothing but that we are far from understanding climate change. The climate model exaggerates the effect of greenhouse gases such as CO_2 ignoring the fact that the atmosphere enriched with CO_2 is beneficial. Anthropogenic greenhouse gas (CO_2) and global warming the two attributes are blamed for climate change. Prediction of extinction of civilization and ecosystem due to polar ice melt and sea level rise is in the forefront of scientific debate. Geological records of the last 450 thousand years suggest that global temperature rise has occurred few hundred years ahead of CO_2 concentration in the atmosphere and is not responsible for the global warming.

On the otherhand dust concentration in the atmosphere has increased much earlier than global temperature rise signifying the impact of volcanic activities for the increase of greenhouse gas in the atmosphere as a heat trapper. Further, 550 million years reconstruction indicates that global temperature and CO_2 concentration are the independent variables and bear negative correlation between them. Climate changes causing biotic extinction can occur in glacial-interglacial cycle at approximately 100 thousand years interval. Each glacial and interglacial period again fluctuates between warm and cold phases. Currently the Earth is passing through modern maximum of the interglacial period which occurs for the last 12000 years. However, after 1998 the trend in global warming is downward signifying another mini-ice age in near future. Fossil fuel burning is not the reason for whatever increment of CO_2 in the atmosphere and temperature increase. It is the acute denial of humanity for the last 2000 years is the reason for "Little Ice Age" and another expected future "Little Ice Age" (Fig. 7). Mass imbalance of the Earth will affect the centrifugal force and angular momentum of the Earth and will cause all types of natural and geological disasters. Mass imbalance of the Earth will also occur due to all adverse anthropogenic factors like all evil acts, exploitation, hypocrisy, power, wealth, war and denial of humanity, in addition to the geological factors. Hence, it is not the climate change hoax, rather all kinds of pollution (both air and water) and environmental disaster need to be addressed as crisis and emergency in achieving holistic safety and security from all kind of criminal acts.

Pollution and Environment

Global pollution and environmental degradation have started since the beginning of industrial age around 1760 and got intensified since the World War I. According to the IPCC, global temperature increased 0.8^{o}C from 1880 to 2013 which is only 0.3% and declared as a climate emergency. But during the same period world population has increased from 1.5 billion to 7 billion, supremacy, power and money has led to deny humanity, and around 40 million people have died during World War I and during World War II more than 75 million alone. Pollution due to these wars and the war currently going on, we can say what amount of pollution of air and water has occurred and will occur. In addition to the societal pollution, the natural pollution caused by the Toba super-eruption about 70000 years back that had veil almost entire equatorial and Indian Ocean region of the eastern hemisphere of the earth for long time causing global volcanic glacial climatic condition. Volcanic ash and dust in the atmosphere prevented solar radiation from entering to the earth dropping temperature to such an extent that led to the last glacial age ended around 11000 years back (Fig. 7A). Global mean surface temperature dropped by 3–5°C. Evidence from Greenland

ice cores indicates a 1,000-year period of low $\delta^{18}O$ and increased dust deposition immediately following the eruption. The volcanic ash (known as Toba ash deposited in the Quaternary geological layers) and the dust that polluted ocean water of the region and contaminated with elevated arsenic concentration. Mid-Holocene marine transgression (Khan et al., 2000) around 8000 years back led to contaminate the aquifer system of all the deltas in the region including Ganges-Brahmaputra Delta, Mekong delta in Vietnam, Indus Delta in Pakistan and other small deltas of the East Asia with arsenic. This contamination today has caused acute arsenic slow poisoning to the millions of people in the region. Pollution due to polythene, garbage and other industrial waste disposal increasing in geometric progression. But it seems we are not much concern about such danger. But fossil fuel burning, and CO_2 emission have been blamed for 0.3% increase of global average temperature which strongly support for very stable temperature the Earth is maintaining.

Current climate policies pointlessly and grievously undermine the economic system, putting lives at risk in countries denied access to affordable and reliable energy resource for economic development and quality life. Pollution and environmental hazards are the major threat to the security of blue economy not only in the maritime sector but also in the continental part. Anthropogenic pollution will destroy biotic and ecosystem in the maritime sector and human system in the continental part. It is very likely that "combustible mixture of ignorance and power is going to blow up our civilization". Pollution and environmental hazards due to anthropogenic and natural causes are the major threat to the society and ecosystem. The anthropogenic pollution includes all industrial waste, all warheads (explosive/toxic material), all nuclear waste those continuously polluting both our surface and subsurface environment (Fig. 14). Under the framework of humanity, the societal non-exploiting attitude, dedication and trans-regional integrated model of friendship, trust and honesty need to be achieved for sustainability of energy, water and friendly environment. All kinds of physical, chemical and biological pollutions are the major threat to the security and sustainability of blue economy of the maritime sector.

Pollution in the Bay of Bengal

Pollution in the Bay of Bengal is the major concern for the South Asia region that threatens the holistic safety and security measures against all sorts of crime in the region. Major river systems like Hoogly, Damodar, Mahanadi, Godavari in India, Ganges-Brahmaputra-Meghna in Bangladesh, Naf, Irrawaddi in Mayanmar are continuously discharging pollutants including the pollutants of the coastal belt into the Bay of Bengal. All the estuaries are the major depo-centers of all kinds of pollutants.

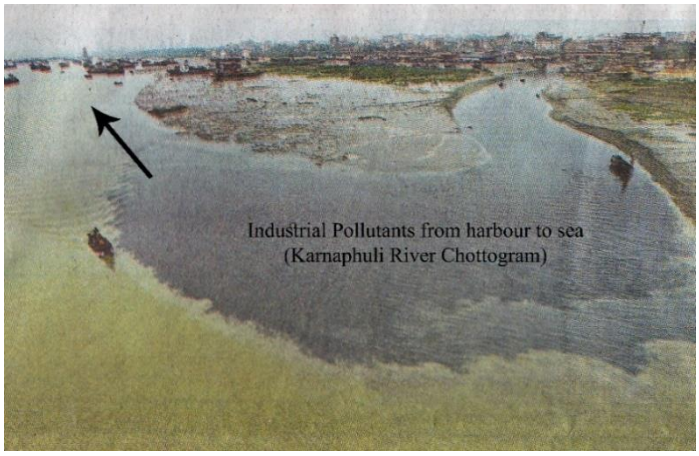


Figure 14: Industrial pollution from harbor at Chottogram to the Bay of Bengal.

Plastic debris in the marine environment has serious negative impacts on marine resources, fisheries as well as on the use of coastal areas for tourism. It is also a threat to our precious Blue Economy. Globally, one million plastic bottles are purchased every minute. Around 8 million metric tons of plastics go into the oceans every year (Fig. 15). Over 46,000 pieces of plastics are found in one

square mile of ocean. The global production and consumption of plastics have continued to rise, and it is estimated that by 2050, there will be more plastics than fishes in the world's oceans. Every year about 2 lakh tons of plastics enter in the Bay of Bengal from Bangladesh. Every year, 60-65 ships are broken in Chattogram and Khulna. Population pressure, poor waste management practices and shipbreaking are the mostly responsible for such pollution.

Figure 15: Pollutants on the way to Bay of Bengal.

Figure 16: Facts about ongoing global pollution scenario.

Plastic is found in the stomach of fish and large mammals in different parts of the world. For instance, a dead whale found in Thailand had 80 plastic bags in its stomach. Fishes of the Pacific

coast are estimated to consume over 2,200 tons of plastic in a year. Microplastics, which are tiny pieces of plastic or fibres smaller than 5 mm, are even a more dangerous form of marine debris/litter. About 80 percent of marine litter is microplastics. Face wash, toothpaste, scrubs and anti-ageing creams contain thousands of microplastics per product. A single shower can result in 100,000 plastic particles entering the ocean. Microplastics (also known as microbeads) are too small to be retained by the filters used at sewage treatment plants. Fish and shellfish ingest microplastics, hence what goes in the sea goes inside us (Fig. 16). In Chennai, contaminated water in a rubbish dump where water polluted by chemicals from plastics and by sewage find its way into the Bay of Bengal. In India, 6,000 tonnes of plastic waste lies uncollected every day. Some of this pollutes and contaminates the food and water along the Bay of Bengal coast. Marine plastic pollution costs the world up to $2.5tn a year. Social and economic price of plastic waste to global society has been underestimated.

Conclusion

Climate change is an idea circulating anxiously in the domains of domestic politics and international diplomacy. Eradication and protection from crime and pollution, and restoration of security for sustainable development of blue economy of maritime states do not depend on climate change hoax. Climate and climate change can principally occur due to the solar, geological and natural events and cannot be predicted by human and anthropogenic time frame. Fossil fuel burning is not the reason for whatever increment of CO_2 in the atmosphere and temperature increase. Climate can change only between glacial and interglacial conditions. The Earth is passing through inter-glacial period with several fluctuations of cold and warm phases. Hence the next climate change can occur as glacial period. Despite the dominance of warm phase in the present interglacial period, expanded record of temperatures since the end of the last glacial period reveals that global temperatures have been falling for the past 8000 years. Global temperature and CO_2 concentration in the atmosphere are the two independent variables and the anthropogenic greenhouse gas has no relation to the global temperature variations. Sea level rise is the most legitimate concern of global warming and polar ice melt. But sea level will not rise due to global warming and polar ice melt. It is the weather pattern that can fluctuates with temperature and precipitation in each glacial and interglacial condition. Temperature and precipitation are the only two parameters that divides the Earth into five climatic zones viz., polar, continental, temperate, dry and tropical. Current climate policies pointlessly and grievously undermine the economic system, putting lives at risk in countries denied access to affordable and reliable energy resource for economic development and quality life. Climate model tells us nothing but that we are far from understanding climate change. Large-scale volcanic activity may last only a few days, but the massive outpouring of gases and ash can influence weather pattern for years.

It is not the climate change hoax, rather all kinds of pollution (both air and water) and environmental disaster need to be addressed as crisis and emergency in achieving holistic safety and security from all kind of criminal acts in the maritime sector. All kinds of physical, chemical and biological pollutions are the major threat to the security and sustainability of blue economy of the maritime sector. Pollution and environmental hazards due to natural and anthropogenic reasons, are the major forcing agents against the holistic security in the maritime sector. Natural including geological events can cause severe environmental hazards through cyclone, storm surge, flood, saline water encroachment, volcanic activities, mud diapirism, mud volcanism, slope failure, submarine landslide, turbidites, shallow gas, natural gas hydrates, shallow water flows, active fluid seepage, seafloor pockmark formation, seismicity and seismicity induced trans-oceanic tsunami, and local tsunami. Anthropogenic processes and activities due to continuous emergence of urbanization and increased population along the coastal belt of the maritime nations pose serious threats to the blue economy, ocean health and biodiversity. Global warming and climate change are the paradoxical issues and not related to environmental safety and security of the Earth.

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https://www.youtube.com/watch?v=SXxHfb66ZgM&t=273s&authuser=0