Chapter 1

General Issues in Climate Change

1.1 Introduction

General: The environmental movements started in 19th century and got momentum with publication of Aldo Leopold's "A Sand Country Almanac" in 1940. He believed in a land ethic that recognized that maintaining the 'beauty, integrity, and health' of natural systems" as a moral and ethical imperative; another important book in the promotion of the environmental movement was Rachel Carson's "Silent Spring" in 1962 about declining bird populations due to DDT, an insecticide, pollution and man's attempts to control nature through use of synthetic substances. Both of these books helped bring the issues into the public eye. Rachel Carson's "Silent Spring" sold over two million copies. A book by Stan Cox's "Sick Planet: Corporate Food and Medicine", in 2008 argues that the corporate food and medicine industries are destroying environments and ruining living conditions across the world.

In 1972, the United Nations Conference on the Human Environment was held in Stockholm, and for the first time united the representatives of multiple governments in discussion relating to the state of the global environment. The [Late] Indira Gandhi then the Prime Minister of India Chaired the Session. This conference has led directly to the creation of environmental agencies by individual national governments and the United Nations Environment Program [UNEP]. This has culminated introduction of environmental Acts in India also – in 1974 Water Act and lead the establishment of a environmental ministry,

Pollution Control Boards at the Centre and in the States, in 1981 Air Act & in 1986 the Environmental Act and with this presented action plans on wide range of subjects relating to Environmental issues. Unfortunately after UN Rio Summit, the environmental issue was sidelined by "one point goal", namely "Global Warming and carbon credits" with huge money pocket to share.

Since 1970s, public awareness, environmental sciences, ecology, and technology have advanced to include modern focus points like ozone depletion, global climate change, acid rain, and the potentially harmful chemical input agriculture technology & Genetically Modified Organisms (GMOs). Now the use of IT has taken the centre stage in degrading the environment with its high energy consumption and generation of huge e-waste globally in addition creating severe human ethical & health problems.

WMO [World Meteorological Organization of United Nations]: To provide a framework for international cooperation in the development of meteorology and operational hydrology and their practical application in 1873 founded World Meteorological Organization [WMO] and established under UN in 1950. WMO became the specialized agency of the UN for meteorology (weather & climate), operational hydrology and related geophysical sciences. It has also the responsibility on the state and behavior of the Earth's atmosphere, its interaction with oceans, the climate it produces and the resulting distribution of water resources. Meteorological services of UN member states are members of WMO. It produced a manual on "Climate Change" in 1966. Authors of this manual [**WMO, 1966**] are eminent meteorologists from different National Meteorological Services. [Late] Shri. K. N. Rao from India Meteorological Department [IMD] was a co-author of this manual.

IPCC [Intergovernmental Panel on Climate Change]: IPCC was established by WMO & UNEP in 1988/89 for the assessment of climate change. This is to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts. Unfortunately, this is now serving the political perspective of climate change rather than scientific perspective of climate change. To achieve this goal, they picked up thousands of people for preparing reports. Though the title is "climate change" but in reality it is dealing primarily with "global warming and carbon

credits" by spending billions of dollars each year. IPCC and others, thus, are pursuing a political agenda and PR Campaign, not scientific inquiry.

Conference of Parties (COP): The international political response to climate change began at the Rio Earth Summit in 1992, where the 'Rio Convention' included the adoption of the UN Framework convention on Climate Change (UNFCCC). This convention set out a framework for action aimed at stabilizing atmospheric concentrations of greenhouse gases (GHGs) to avoid "dangerous anthropogenic interference with the climate system". The UNFCCC which entered into force on 21 March 1994 now has a near-universal membership of 195 parties. As part of this game, IPCC, a political body, provides the teeth to the UNFCCC.

The main objective of the annual Conference of Parties (COP) is to review the Convention's implementation. The first COP took place in Berlin in 1995 and significant meetings since then have included COP3 where the Kyoto Protocol was adopted, COP11 where the Montreal Action Plan was produced, COP15 in Copenhagen where an agreement to success Kyoto Protocol was unfortunately not realized and COP17 in Durban where the Green Climate Fund was created. That means all roads are leading to "Fund collection & distribution".

The 2015 United Nations Climate Change Conference, COP21 was held in Paris, from November 30 to December 12. The conference was attended by about **50,000 participants including around 25,000 official delegates** from government, intergovernmental organizations, UN agencies, NGOs and civil society. According to the organizing committee, the objective of the 2015 conference is to achieve, for the first time in over 20 years of UN negotiations, a binding and universal agreement on climate, from all the nations of the world. However, the New Paris Agreement of 12th December 2015 has no legally binding clause. In 1992 UNFCCC laid down broad legal structure for global cooperation to which future agreements were intended to provide more specificity. Instead the Paris Agreement introduces a new, and mainly worrisome, model of voluntary "national determined contributions" by governments in terms of emissions and finances. It included a clause on limiting global temperature rise over the pre-industrial levels as "holding the increase in the global average temperature to well below 2 ^{o}C and pursue efforts temperature

increase to 1.5 ^{o}C", but this is not associated with the anthropogenic greenhouse gases but a combination of factors which are not addressed in the agreement. COP21 Agreement diluted the main object of COP21.

Paris Agreement Document observed that "Recognizing the intrinsic relationship between climate change, poverty eradication and equitable access to sustainable development, and reaffirming responses to climate change should aim to meet the specific needs and concerns arising from the adverse impacts of response measures". They used all types of jargons: "creation of decent work and quality jobs development priorities; safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change; promoting, protecting and respecting all human rights, the right to health, and the rights of indigenous peoples, migrants, children, persons with disabilities and people in vulnerable situations and under occupation, and the right to development, in accordance with their obligations, as well as promoting gender equality and the empowerment of women, when taking action to address climate change, Noting the needs and integrity of terrestrial ecosystems, oceans and Mother Earth". Though all these refer to "climate change and pollution aspects", in reality they were not addressed in the final document. The document dealt only on global warming and emission control.

Pope Francis published an encyclical called 'Laudato Si' intended, in part, to influence the conference. The encyclical calls for action against "human-caused climate change". The International Trade Union Confederation has called for the goal to be "zero carbon, zero poverty", and the general secretary Sharan Burrow has repeated that there are "no jobs on a dead planet". This conference itself has produced substantial amount of greenhouse gases by spending huge sums for travel and stay.

In this process, Philippe Verdier, Weather Chief at France Televisions, the country's state broadcaster, has been suspended for publicly criticizing climate alarmism. Mr. Verdier claims in the book Climate Investigation that leading climatologists and political leaders have "taken the world hostage" with misleading data. He added: "We are hostage to planetary scandal over climate change – a war machine whose aim is to keep us in fear". This is the present state of atmosphere on climate change issues.

Greenpeace: Greenpeace [a pro-global warming group] Founder [now left the organization after serving 15 years] delivered a lecture on 14th October 2015 in London. He observed that "As I have stated publicly on many occasions, there is no definitive scientific proof, through real-world observation, that carbon dioxide is responsible for any of the slight warming of the global climate that has occurred during the past 300 years, since the peak of the Little Ice Age. If there were such a proof through testing and replication it would have been written down for all to see. The contention that human emissions are now the dominant influence on climate is simply a hypothesis, rather than a universally accepted scientific theory. It is therefore correct, indeed verging on compulsory in the scientific tradition, to be skeptical of those who express certainty that 'the science is settled' and 'the debate is over'. But there is certainty beyond any doubt that CO_2 is the building block for all life on the Earth and that without its presence in the global atmosphere at a sufficient concentration this would be a dead planet."

When scientists questioned them on these pro-global warming groups dubbed such scientists as agents of fuel companies, instead answering their point of views. The present book's objective is to discuss all issues relating to climate, to present the issue of climate change in right perspective.

1.2 General Issues of Climate Change

1.2.1 Weather and Climate

Weather is basically the way the atmosphere is behaving, mainly with respect to its effects upon life and human activities. Weather is not the same everywhere. Perhaps it is hot, dry and sunny today where you live, but in other parts of the world it is cloudy, raining or even snowing. Every day, weather events are recorded and predicted by meteorologists worldwide. In order to help people be prepared to face all of these, National Weather Service [NWS], in India we have "Indian Meteorological Department" [IMD], are the lead forecasting outlet for the nation's weather. They also provide Special Weather Statements and Short and long term Forecasts. NWS also issues a lot of notices concerning marine weather for boaters and others who dwell or are staying near shoreline.

Weather is the mix of events that happen each day in our atmosphere that include meteorological parameters such as temperature, humidity, precipitation, cloudiness, brightness, visibility, wind, and atmospheric pressure. There are really a lot of other components to weather, namely sunshine, radiation, evaporation, rain, cloud cover, winds, hail, snow, sleet, freezing rain, flooding, blizzards, ice storms, thunderstorms, steady rains from a cold front or warm front, excess heat, heat waves, excess cold, cold waves and more.

Climate is the average weather pattern at a place. In most places, weather can change from minute to minute, hour-to-hour, day-to-day, season-to-season and year-to-year. Climate, however, is the average of such weather over time and or space. An easy way to remember the difference is that “climate is what you expect, like a very hot summer, and weather is what you get, like a hot day with pop-up Thunderstorms”. Meteorologists record the weather every day at specific times or continuously using automatic recorders. Climate data is useful for weather forecasting and is useful to define location or region in terms of climate condition. The Earth’s climate is influenced by many factors, including solar radiation, wind, and ocean currents. But interaction among the various factors is very complex and numerous questions remain unresolved.

Weather research is concerned with the formation, movement, and prediction of the individual elements of weather, such as a particular low-pressure system and a hurricane. Climate research, on the other hand, deals with the more comprehensive totality of low pressure systems and hurricanes, and is dedicated to addressing questions such as how many mid-latitudinal storms or hurricanes will occur next year, or whether they will become more frequent or intense in the coming years. So the term “weather” refers to short-term events in the atmosphere, while “climate” relates to longer time periods.

Climate, sometimes understood as the "average weather,” is defined as the measurement of the mean and variability of relevant quantities of certain variables (such as temperature, precipitation or wind) over a period of time, ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO). Climate is the characteristic condition of the atmosphere near the Earth’s surface

at a certain place on the Earth. Two of the most important factors determining an area's climate are air temperature and precipitation. Every NMS published Climate normal books that contain averages and extremes for individual meteorological stations. IMD published normal book using 1931 to 1960 met data – this is known as "Red Book".

Table 1.1 presents the averages and extremes for widely distributed 46 Indian meteorological stations for temperature and precipitation along with their latitudes, longitude and elevation [above mean sea level (amsl)]. For the highest and the lowest rainfall, data even before 1931 was also taken in to account. Rainfall includes the annual average in mm, number of average rainy days, the highest and the lowest averages along with the year of occurrence and the maximum amount of rainfall received in 24 hours; and in the case of temperature, presented the highest maximum, the mean maximum, the mean minimum and the lowest minimum. They are highly variable with the space and the time.

Table 1.1 Climate averages and extremes for 46 locations in India [a] Station location, [b] Precipitation and [c] temperature

[a] Station location			
Station	**Latitude ° ' N**	**Longitude ° ' E**	**Elevation [amsl, m]**
Dibrugarh	27 28	94 55	106 m
Gauhati	26 11	9145	55
Shillong	25 34	91 53	1500
Cherrapunji	28 15	91 44	1313
Darjeeling	27 03	88 16	2127
Jalpaiguri	26 32	88 43	83
Assansol	23 41	86 59	126
Calcutta	22 32	88 20	6
Sambalpur	21 28	83 58	148
Gopalpur	19 16	84 53	17
Daltanganj	24 03	84 04	221
Jamshadpur	22 49	86 11	129
Patna	25 37	85 10	53
Lucknow	26 52	80 56	111
Fatehpur	25 56	80 50	114
Mussoorie	30 27	78 05	2042

Contd…

Station	Latitude ° ‘ N	Longitude ° ‘ E	Elevation [amsl, m]
Mukteswar	29 28	79 39	2311
Dehra Dun	30 19	78 02	682
Roorkee	29 51	77 53	274
Ludhiana	30 56	75 52	247
Hissar	29 10	75 44	221
New Delhi	28 35	77 12	216
Leh	34 09	77 34	3514
Srinagar	34 05	74 50	1586
Jammu	32 40	74 50	366
Barmer	25 45	71 23	194
Gwalior	26 14	76 15	207
Indore	22 43	75 48	567
Dwaraka	22 21	69 05	11
Alibag	18 38	72 52	7
Poona	1832	73 51	559
Mahabaleswar	17 56	73 40	1382
Sholapur	17 40	75 54	479
Hyderabad	17 27	78 28	545
Anantapur	14 41	77 37	350
Visakhapatnam	17 43	83 14	3
Madras	13 00	80 11	16
Coonoor	11 21	76 48	1747
Coimbatore	11 00	76 58	409
Nagapattinam	10 46	79 51	9
Tiruchirapalli	10 46	78 43	88
Kodaikanal	10 14	77 28	2343
Pamban	09 16	79 18	11
Mangalore	12 52	74 51	22
Bellary	15 09	76 51	419
Trivandrum	09 29	76 57	64

Contd…

[b] Precipitation					
Station hours	**Annual Mean [mm]**	**Rainy days**	**The Highest [mm]/year**	**The Lowest [mm]/year**	**Max. in 24 hours**
Dibrugarh	2759.4	131.7	3300.2/1954	2165.0/1905	223.5
Gauhati	1637.2	86.9	2121.1/1956	874.0/1952	232.9
Shillong	2415.3	128.1	3334.0/1946	1428.8/1958	415.5
Cherrapunji	11418.7	157.1	15706.6/1951	178.0/1908	973.0
Darjeeling	2758.4	125.1	4024.4/1890	2271.3/1907	492.8
Jalpaiguri	3352.7	103.7	4292.2/1938	1719.6/1891	390.4
Assansol	1392.2	72.5	2135.1/1922	963.7/1955	269.7
Calcutta	1581.8	83.7	2501.4/1893	909.1/1935	369.1
Sambalpur	1661.5	75.4	2307.8/1929	0934.7/1915	401.3
Gopalpur	1209.5	55.7	2040.9/1936	0655.1/1920	510.8
Daltonganj	1234.4	67.4	1856.5/1946	0622.3/1903	290.8
Jamshedpur	1391.3	75.7	1862.7/1953	0745.5/1954	214.1
Patna	1109.8	53.8	1959.4/1918	0642.4/1903	366.0
Lucknow	0992.4	47.9	1866.7/1915	0424.2/1907	311.7
Fatehpur	0885.1	48.1	1360.7/1936	0537.2/1941	191.8
Mussoorie	2368.1	94.6	3284.7/1942	1475.7/1929	302.3
Mukteswar	1359.4	80.6	2254.2/1936	0522.9/1951	254.5
Dehra Dun	2313.7	85.4	3118.9/1884	1152.4/1907	332.2
Roorkee	1164.6	51.2	2299.7/1942	0511.6/1935	266.7
Ludhiana	0704.5	37.0	1402.1/1955	0236.5/1899	254.3
Hissar	0446.0	27.2	1048.0/1917	0158.0/1938	346.7
New Delhi	0714.2	36.8	1533.1/1933	0262.9/1929	266.2
Leh	0115.0	13.5	0231.1/1894	0025.4/1881	005.3
Srinagar	0664.0	56.9	1291.6/1894	0398.5/1934	147.8
Jammu	1148.3	52.3	1964.7/1948	0646.4/1940	276.1
Barmer	0310.3	17.1	0895.3/1944	0128.8/1938	255.5
Gwalior	0900.2	44.0	1514.3/1934	0224.0/1918	316.2
Indore	1053.4	50.3	1743.2/1959	0400.1/1899	293.4
Dwaraka	0418.9	17.0	1080.0/1944	0026.2/1918	355.1
Alibag	2124.9	82.2	3396.7/1958	0720.6/1941	396.2
Poona	0714.7	50.1	1242.3/1892	0268.5/1918	149.1
Mahabaleswar	6182.3	122.7	10221.2/1896	3545.1/1899	339.9
Sholapur	0742.0	46.5	1239.5/1916	0325.4/1899	191.0
Hyderabad	0764.4	52.3	1430.8/1915	0455.2/1899	190.5
Anantapur	0562.3	34.0	0777.9/1919	0233.2/1934	145.3

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Station hours	Annual Mean [mm]	Rainy days	The Highest [mm]/year	The Lowest [mm]/year	Max. in 24 hours
Visakhapatnam	0973.6	50.1	1442.0/1910	0473.2/1925	293.3
Madras	1215.3	56.6	2134.9/1943	0522.2/1904	261.6
Coonoor	1549.2	84.3	2239.0/1960	1130.3/1950	228.6
Coimbatore	0612.2	44.5	1059.2/1924	0323.6/1938	141.5
Nagapattinam	1336.5	53.5	2196.3/1884	0603.5/1897	396.2
Tiruchirapalli	0867.6	47.8	1324.1/1939	0511.6/1914	319.0
Kodaikanal	1672.1	107.0	2354.6/1925	1184.1/1904	346.2
Pamban	0922.9	45.2	1722.2/1896	0410.5/1892	218.7
Mangalore	3467.0	122.7	4703.1/1946	2269.7/1899	360.9
Bellary	0518.1	33.6	0949.4/1933	0208.3/1884	162.3
Trivandrum	1839.3	105.2	3035.6/1933	1029.2/1894	277.9

[c] Air Temperature [^{o}C]				
Station	The Highest	Maximum	Minimum	The Lowest
Dibrugarh	36.5	27.7	18.7	6.9
Gauhati	37.0	29.5	19.7	7.8
Shillong	28.2	21.2	12.1	-0.6
Cherrapunji	27.5	20.6	14.3	4.0
Darjeeling	23.5	16.4	10.2	-0.9
Jalpaiguri	36.3	28.8	19.3	7.2
Assansol	45.1	32.0	20.8	8.0
Calcutta	41.1	31.8	22.1	9.6
Sambalpur	45.4	32.9	20.8	7.2
Gopalpur	37.0	30.3	23.0	12.7
Daltonganj	45.1	31.8	19.0	3.9
Jamshedpur	44.8	32.4	20.7	6.9
Patna	43.7	31.6	20.8	6.5
Lucknow	45.5	32.3	19.4	4.3
Fatehpur	45.9	32.4	19.5	3.8
Mussoorie	29.8	18.0	10.4	- 2.7
Mukteswar	27.8	17.6	09.5	- 3.5
Dehra Dun	40.9	27.9	15.8	2.1
Roorkee	44.1	30.2	17.0	2.2
Ludhiana	46.4	31.9	17.3	1.4
Hissar	46.3	32.8	17.4	0.8

Contd…

Station	The Highest	Maximum	Minimum	The Lowest
New Delhi	44.9	31.7	18.8	2.7
Leh	30.0	12.4	- 1.4	- 20.8
Srinagar	36.0	19.5	07.2	- 7.7
Jammu	45.2	30.0	18.7	4.4
Barmer	46.3	34.0	22.2	4.9
Gwalior	46.4	32.5	18.8	1.3
Indore	42.5	31.3	17.5	3.3
Dwaraka	37.1	29.2	22.9	11.6
Alibag	36.8	30.0	22.6	13.4
Poona	41.6	32.0	18.2	6.2
Mahabaleswar	33.4	24.1	16.1	8.4
Sholapur	43.3	33.7	20.5	10.0
Hyderabad	42.4	31.7	20.0	9.1
Anantapur	41.4	33.3	21.9	13.2
Visakhapatnam	39.6	31.0	23.5	15.2
Madras	41.5	32.9	24.3	17.3
Coonoor	27.0	21.2	12.6	3.7
Coimbatore	37.5	31.1	21.7	15.8
Nagapattinam	40.0	31.9	25.2	19.3
Tiruchirapalli	40.5	33.7	24.0	17.2
Kodaikanal	22.9	17.9	10.8	4.7
Pamban	34.1	30.6	25.7	21.5
Mangalore	34.9	30.5	23.7	18.6
Bellary	41.1	32.9	22.3	14.0
Trivandrum	34.9	30.7	23.5	19.6

1.2.2 Climate System-Climate Change Scenario

Climate System: The climate system consists of five major components [**Figure 1.1**], namely the atmosphere, the hydrosphere, the cryosphere, land surface, the biosphere. The climate system is continually changing due to the interactions between the components as well as external factors such as volcanic eruptions or solar variations and human-induced factors such as changes to the atmosphere and changes in land use. The atmosphere is not an isolated system. It interacts with other components of the Earth system – the oceans, for example. But it is also in contact with the cryosphere (ice and snow), the

biosphere (animals and plants), the pedosphere (soil) and the lithosphere (rocks). All of these elements together compose the climate system, whose individual components and processes are connected and influence each other in diverse ways.

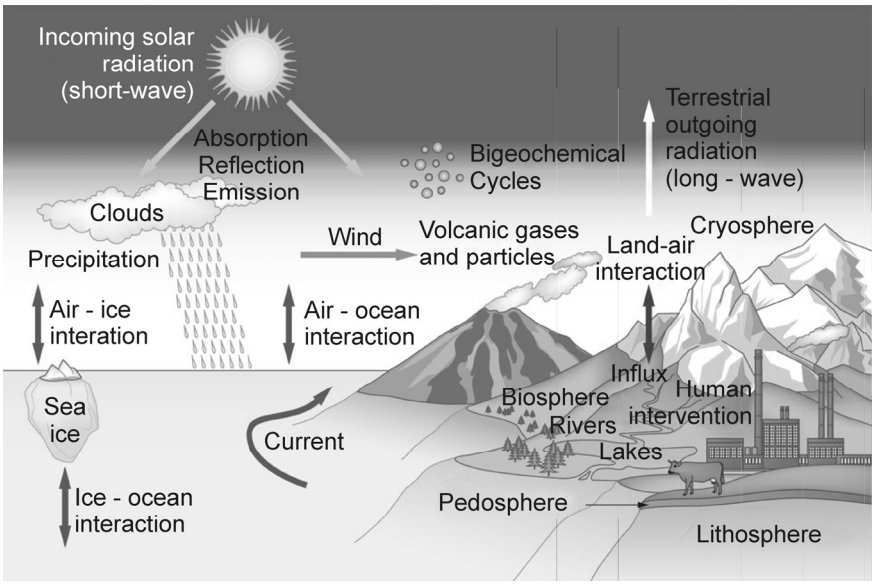


Figure 1.1 Climate System

A large continental ice mass such as the Antarctic ice sheet, as a result of climate change, presumably undergoes change over many millennia, and without counteractive measures it will gradually melt on this time scale. The predictability of climate is based on the interactions between the atmosphere and the more inert climate subsystems, particularly the oceans. Within this scheme, the various components of the climate system move at completely different rates. Low-pressure systems can drift hundreds of kilometers within days. Ocean currents, on the other hand, often creep along at a few meters per minute. In addition, the individual components possess different thermal conductivities and heat capacities. Water, for instance, stores large amounts of solar heat for long periods of time.

Climate Variability: Climate Variability is defined as variations in the mean state and other statistics of the climate on all temporal and spatial scales, beyond individual weather events. The term "Climate Variability" is often used to denote deviations of climatic

statistics over a given period of time (e.g. a month, season or year) when compared to long-term statistics for the same calendar period. Climate variability is measured by these deviations, which are usually termed anomalies. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external factors (external variability).

Climate Change: According to United Nation entities climate change has not one, but several definitions. In fact they are nothing new from what has presented in **WMO [1966]** "climate change" manual but made some twists to create confusion. Let us see two such definitions:

1. The IPCC Third Assessment Report defines climate change: "Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period [typically decades or longer]. Climate change may be due to natural internal processes or external forcings or to persistent anthropogenic changes in the composition of the atmosphere or in land use". According to the IPCC, climate change can occur naturally or from man-made causes.
2. That IPCC definition, however, goes on to read: Note that the UN Framework Convention on Climate Change [UNFCCC], in its Article 1, defines "climate change" as: "a change of climate which is attributed *directly or indirectly* to human activity that alters the composition of the *global atmosphere* and which is in addition to natural climate variability observed over comparable time periods".

The UNFCCC thus makes a distinction between "climate change" attributable to human activities altering the atmospheric composition, and "climate variability" attributable to natural causes. Under external forcings: In the first definition IPCC differentiated between anthropogenic changes in the composition of the atmosphere from land use. In the second IPCC used human activity that alters the composition of the global atmosphere.

In the first definition they used simply "atmosphere" and in the second it used "global atmosphere"; In the first they referred to "land use" and this was differentiated from anthropogenic [meaning new additions of greenhouse gas]; in the second they used "human activity" but before it, they used "directly or indirectly" may

be to differentiate greenhouse gases from land use, to create confusion. All these are clearly defined by WMO in 1966. IPCC to meet its global warming and carbon credit policy, it goes on creating confusion from one report to the other.

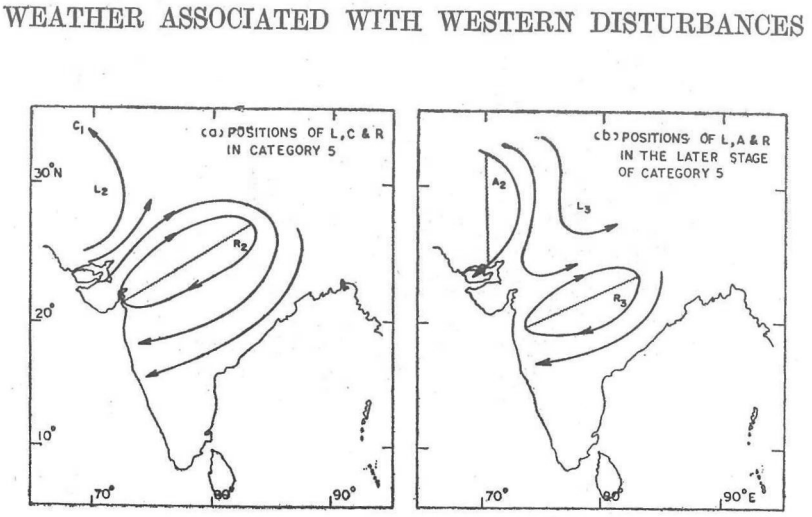
Global warming --- Earth Observatory/NASA presented an essay on Global Warming. It state that "Throughout its long history, the Earth has warmed and cooled time and again. Climate has changed when the planet received more or less sunlight due to subtle shifts in its orbit, as the atmosphere or surface changed, or when the Sun's energy varied. But in the past century, another force has started to influence the Earth's climate, namely humanity. Global warming is the unusually rapid increase in the Earth's average surface temperature over the past century "primarily due to greenhouse gases" related as people burn fossil fuels.

How does this warming compare to previous changes in the Earth's climate? How can we be certain that human-released greenhouse gases are causing the warming? How much more will the Earth warm? How will the Earth respond? Answering these questions is perhaps the most significant scientific challenge of our time.

1.2.3 Is Global Warming a Reality?

The main component of climate change is natural variability. Humans have no control over it and thus we need to adapt to them **[Reddy, 1993]**. They are location-region specific like that of "general circulation patterns". Extremes are part of natural variability. This can be seen from the climate normal data of temperature & precipitation [**Table 1.1**] wherein the current extremes have not crossed those past recorded limits up to now. Also, regional general circulation patterns over different seasons play the key role in year to year variations in extremes under natural variability. For example Western Disturbances in northwestern parts of India will influence heat and cold waves in summer and winter based on the High Pressure belt location around Nagpur– east and west and north and south shift with the passing of time in any given year -- [**Figure 1.2 --** Figure 7 a & b in **Reddy & Rao, 1978**]. The winds associated with the high pressure belt define the penetration of cold winds in winter and

warm winds in summer in to southern parts and eastern parts of India.



Note: Where L denotes the surface low associated with Western disturbance, A or C denotes the anti-cyclonic or cyclonic flow at 0.9 km and R the ridge at 850 mb level. A or C does not refer to the centre of the system but are used only to indicate anti-cyclonic or cyclonic flow

Figure 1.2 Position of L, A, C and R in category 5 [weather associated with western disturbance]

The second important component of climate change is "ecological changes" – associated with changes in land use & land cover and water use & water cover changes. They are highly location-region specific and are visible with naked eye. "**Urban-Heat-Island Effect**" and "**Rural-Cold-Island Effect**" comes under this. They are expressed in terms of trend [increasing or decreasing] while natural variability is expressed by cyclic variation or rhythmic variation or by near sine curve, called fluctuations. The trend will influence the natural rhythmic variation present in that location-region. This plays an important role in power consumption in urban areas and agriculture in rural areas.

The third is "Greenhouse Effect" related to temperature. This is a natural change. Atmosphere consists of several gases. Through hydrological cycle [**Figure 1.3**], the water vapour component changes with season and latitude, precisely with general

circulation patterns and climate system. The Sun emits radiation in different wavelength bands [**Figure 1.4**]. Some of these gases in the atmosphere interact with radiation in different wavelength bands. Similarly, the Earth re-radiates energy in long wave radiation. This also interacts with the atmospheric gases. The wavelength at which the maximum energy is concentrated depends upon the energy emitting body's temperature. The Sun radiates energy at 6000 ^{o}K and the Earth at 10 ^{o}K. According to Plank's Law, the Sun's energy is concentrated at around 0.5μ [short wave] and the Earth's energy at around 10μ [long wave]. This process of interaction, we call it as greenhouse effect. This converts the energy in to temperature. Due to man's actions certain gases like CO_2 are added to the atmosphere. The associated temperature raise is termed as "Global Warming".

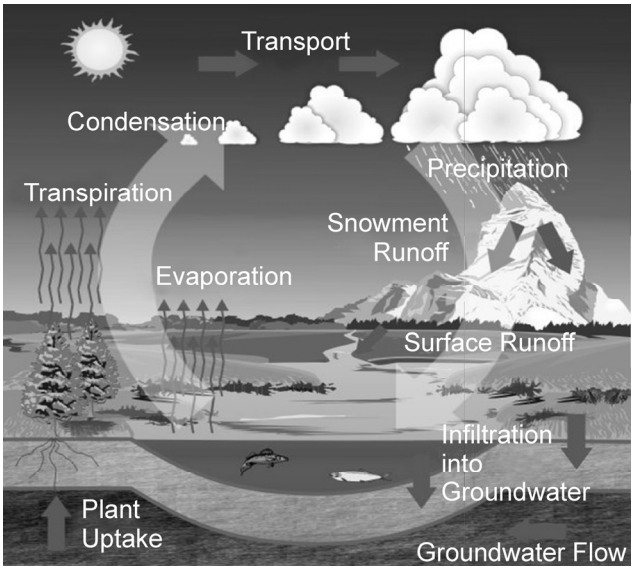


Figure 1.3 Hydrological cycle

The fourth one is associated with the atmospheric aerosols pumped in to atmosphere [troposphere and stratosphere] by several natural [volcanic eruptions, Earthquakes] and manmade [wars, dust storms, nuclear explosions, etc] activities. They both have warming and cooling effects similar to heat-island and cold-island effects. They are localized/regional factors may have short or long life depending upon the intensity of such activity. Because

of their highly intermittent in nature, it makes complications in assessing their affect in true perspective. Here we must remember one important point: while cooling, the energy available to greenhouse effect is reduced and thus warming is proportionately reduced as warming is a function of greenhouse gases present in the atmosphere and energy available at that time. Thus, the contribution to warming will be reduced.

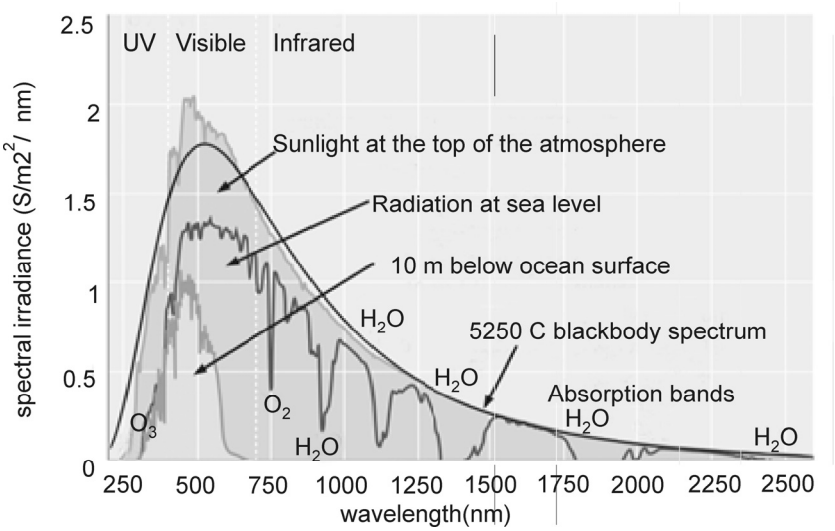


Figure 1.4 Sun's Energy spectrum under different wavelength bands

IPCC and others argued that global warming is a settled science but we feel it is not so basically because: in nature the conversion component of natural CO_2 in to temperature has reached a near saturation **[Reddy, 1995a]**. Any new addition to CO_2 due to man's actions, the increase in temperature will be insignificant. **Figure 1.5** presents the Heating Effect of CO_2 per 20 ppm increments.

Because of this, IPCC with 97% scientific support [as they claim] is using "trial and error" approach to link CO_2 raise to temperature raise. As a part of this game, IPCC goes on changing the sensitivity factor that relates CO_2 with temperature – in AR4 used 1.95 and in AR5 it reduces 1.95 to 1.55 – SAR to AR5 the sensitivity factor showed a monotonic decline. Unfortunately over this mean the range show very wide as ± 50% around the mean. In science it has no meaning. Even the model predictions show

plateau pattern even before 2100. Even it is there this will follow a tapering pattern. That is the rise in temperature gradually decreases with time for the same amount of increase in CO_2. Dbstealey [28 January 2016] noted that "But so far, no one has produced any measurements quantifying AGW. That means either: (1) global warming does not exist, or (2) global warming is too minuscule to measure. It is down in the noise. I think global warming exists [**Figure 1.5**], but that most of the effect took place within the first few dozen ppm of CO_2. This chart shows that even if CO_2 doubled, or even tripled from here, any warming due to that rise would still be too small to measure.

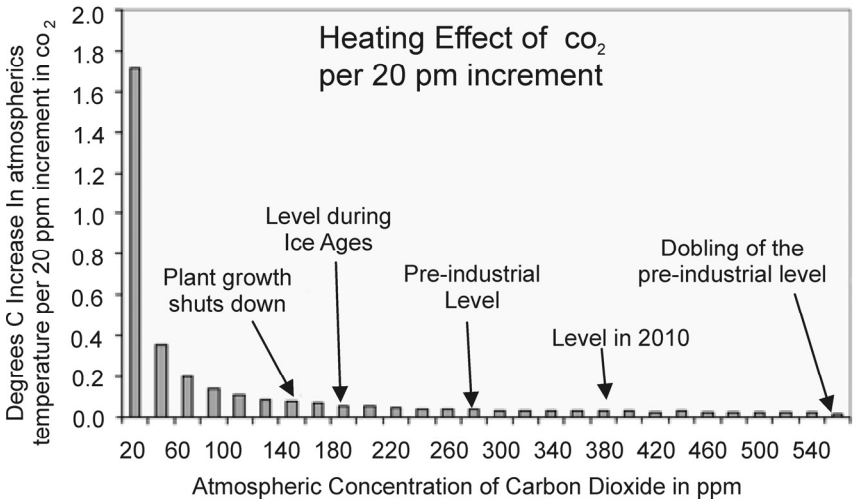


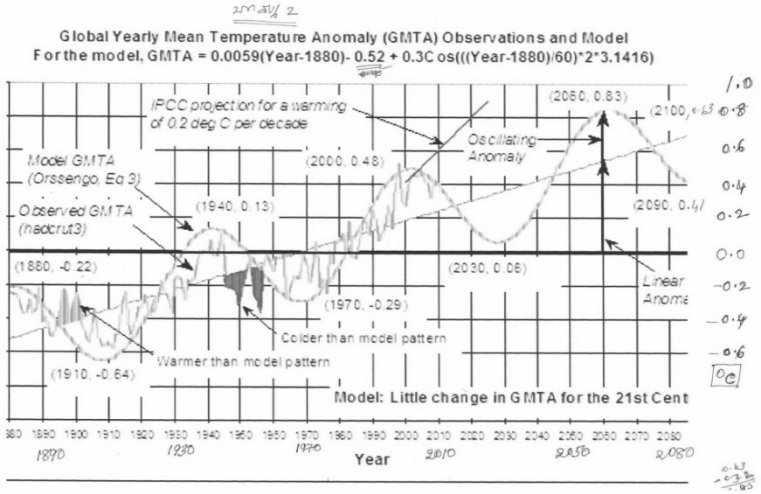
Figure 1.5 Heating effect of CO_2 per 20 ppm increments.

Some argued that at CO_2 absorption wavelengths less energy is escaping to space. They cited satellite data to prove this. However, at the same time the satellite temperature data presented small increase in global temperature anomaly since 1979 to date. This does not support the reports that "enhanced greenhouse effect" but supports opposite to this – tapering-off with the time as it is seen in **Figure 1.5**.

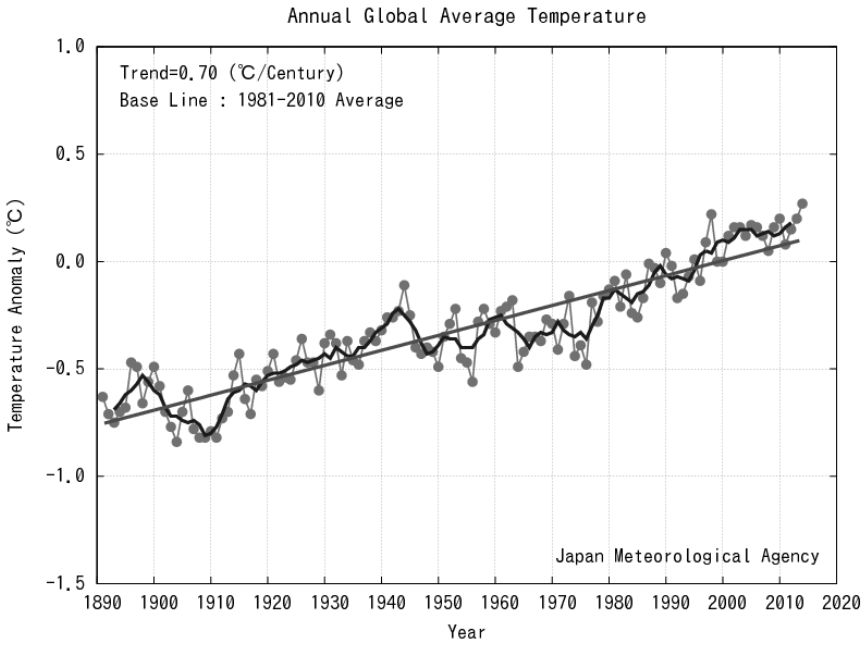
Also, IPCC now states that global warming plus other forcings is more than half of the global temperature rise [50.1% is also more than half] -- but COP21 declaration uses the global average

temperature rise over pre-industrial level [IPCC used 1951 as the starting year for global warming]. This is a subjective statement. IPCC has no valid data to verify its estimates as the global temperature curve is built on hypothetically derived data series over around 75-80% of the area through interpolations or extrapolations under grids.

When the current data series showed a hiatus for the last 19 years, three different theories were put forward – one group manipulates the data to remove hiatus, another group says temperature is hiding in deep-ocean and the third says it is a part of natural variation [Figure 1.6a]. The data refers to ground based measurements. Bob Tisdale observed that "NOAA revised their global surface temperature product in June 2015 to show more global warming during the post-1998 period. Those data manipulations supposedly ended slowdown in global warming over that period. The changes in NOAA's global ocean surface temperature product were the primarily cause of the NOAA's hiatus-disappearing Act. The new NOAA ERSST.v4 sea surface temperature data set has since been included in both the NOAA and the GISS global land + ocean surface temperature products. Because the oceans cover about 70% of the Earth's surface, the new NOAA ERSST.v4 data are critical component." More details on the data issues are presented in **Chapter 2.** **Figure 1.6b** presents the temperature trend of Japan.



[a]



Anomalies are deviation from baseline (1981-2010 Average).
The black thin line indicates surface temperature anomaly of each year.
The blue line indicates their 5-year running mean.
The red line indicates the long-term linear trend.

[b]

Figure 1.6 [a] Global temperature trend and 60-year cycle and IPCC prediction, [b] Annual global average temperature [Japan]

Let us see the temperature patterns [three surface data sets plus two satellite data sets] between 1979 and 2015. They present two distinct sets, namely prior to 1997/98 and after 1997/98 [El Nino]. "Prior part" showed a zero trend irrespective of data set and more or less all the data sets coincided. During this period volcanic eruptions were reported. As per IPCC they create cooling effect. Also the energy reaching the Earth is reduced and thus greenhouse effect component is also reduced. Thus, it presented below average condition. "After part" showed zero trends in satellite data sets but steep rise in surface data sets. Also, the five data sets patterns differed from one another. During 2014 and 2015 the anomalies respectively are ranging 0.2 to 0.7 and 0.3 to

0.9 ^{o}C [met data is shown only to the 1st place of decimal -- rounded]. The satellite data sets: 0.2 to 0.3 and 0.3 to 0.4; and surface data sets: 0.5 to 0.7 and 0.6 to 0.9 ^{o}C. In this part, however, three El Nino events influenced the temperature. With every El Nino, on either side of the peak present dip in temperature below the average condition. There is no chance that temperature anomaly presents a steep rise, which is clearly seen in satellite data series. The average from 1979 to 2015 presents in between these two zero trends – normal condition, showing a hiatus.

Figure 1.7 presents the observed and modeled estimates of global average temperature anomaly for the period 1979-2014. In this period there were about seventeen thousands of Radiosonde Balloon temperature records in 4 data sets. They closely match the two satellite data sets. The ground based data sets derived by GISS, NOAA, and USHCN don't match, nor do climate models. According to this data series, using IPCC inference, global warming component will be around 0.15 ^{o}C from 1951 to 2015, which is insignificant to influence climate or nature. Politicians don't understand these intrinsic issues and politicians and scientists only look at 100 billon dollars – Paris summit!!! US President, Pope Francis, and others used IPCC documents as gospels.

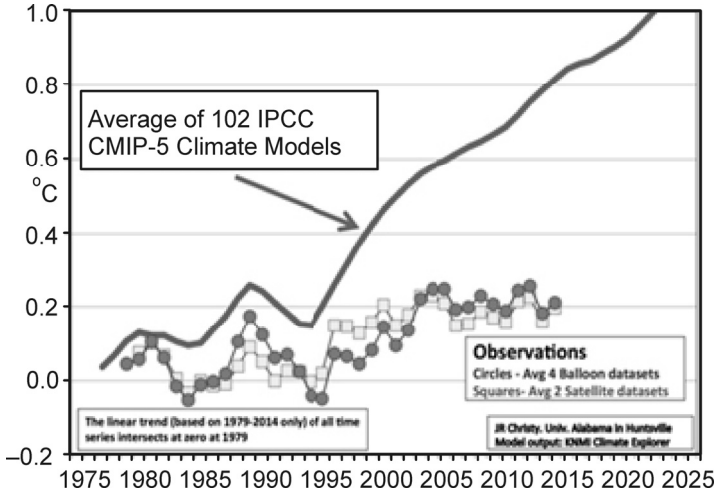


Figure 1.7 Observed and model estimates of global average temperature anomaly

Let us see the statement --- The IEA report has worrying conclusion that the world won't be able to limit warming to 2 °C even if all the pledges (INDCs) submitted in advance of Paris Summit get implemented, "The (global) emissions trajectory implies a long-term temperature increase of 2.7 °C by 2100. A major course correction is still required to achieve the world's agreed climate goal. As the largest source of global greenhouse-gas emissions, the energy sector must be at the heart of global action to tackle climate change." --- I responded as follows:

The global [land & ocean] temperature data of 1880 to 2010 following the WMO 1966 methodology separated trend from cyclic variation [**Figure 1.6a**]. From the trend line it is clear that by 2100, the global [land & water] temperature may raise to 1.30 ^{o}C from 1880. That is in 220 years the rise is 1.30 ^{o}C; this is around 0.6 ^{o}C per century, which consists of three components: One of them is emission component. Even if we take this as 50% [my suggestion was 25% only but with the time this will further reduced], then the emission component [global warming] is 0.3 ^{o}C per century. To reach 2 ^{o}C, the time taken is around six and half centuries [around 650 years]. In fact this global [land & water] temperature is over estimate. This is seen from satellite and balloon data [**Figure 1.7**]. According to balloon and satellite data to reach 2 ^{o}C it will take more than 20 centuries at the present rate of emissions. We must note the fact that the groups are talking 2 ^{o}C with reference to emission reduction only and thus 2 ^{o}C is not the global [land & ocean] temperature rise but it should refer to global warming. Also, model estimates show a reduction with the time and reaching a plateau. Thus, the 6.5 centuries or 20 century will be doubled or tripled or even more as even in model estimates after 2100 the conversion is plateau as seen in **Figure 1.5**.

All the light emitted by the surface in the strongest CO_2 bands was completely absorbed at pre-industrial levels. That is by 280 ppm. Same is also evident in **Figure 1.5.** The calculations showed by reducing 30% of carbon dioxide the temperature reduction will stand at less than 0.01 to 0.02 ^{o}C [it was around 0.003 ^{o}C for USA alone], which is obvious from **Figures 1.5**.

Our leaders say something, talk something and act something else. There is no coherence in their speeches and to real goals on which they talk of. For example they quote sufferings of one 'X' and build the story. Finally they are falling in to the trap of global

warming and CO_2. How this is going to save that 'X' from hunger-starvation is a big question. In the past activists brought out an album on Save Africa collected billions and really the amount went in to that component is not even 10% and the rest went in to the pockets of the activists. Same is the objective at Paris meet.

IT groups wanted to spread its roots in all aspects of life. This is highly power consuming sector of activity. Instead of putting a cap on such activities, power production cannot be reduced and thus CO_2. Indian PM at Silicon Valley did the same bargain and IT top group say they will dump their IT into rural India, which in turn is going to affect severely agriculture sector and health of education system. During previous PM time they wanted to spend few thousand crores on providing free cell phones to rural labour. I got it stopped on the same basis. Agriculture is the backbone to mitigate the goals UN announced and that is what US President saying and Pope Francis saying. The incoherent actions will lead nowhere except to collect 100 billion dollars and use that money to protect global warming!!!

Dr. Judith Curry's verbal testimony before the House of Representatives Committee on Science, Space and Technology hearing on the President's UN Climate Pledge observed that: "The central issue in the scientific debate on climate change is the extent to which the recent (and future) warming is caused by human-caused greenhouse gas emissions versus natural climate variability that are caused by variations from the Sun, Volcanic eruptions, and large-scale ocean circulations. Recent data and research supports the importance of natural climate variability and calls into question the conclusion that humans are the dominant cause of recent climate change. This includes [a] The slowdown in global warming since 1998; [b] Reduced estimates of the sensitivity of climate to carbon dioxide; and [c] Climate models that are predicting much more warming than has been observed so far in the 21st century.

While there are substantial uncertainties in our understanding of climate change, it is clear that humans are influencing climate in the direction of warming. However this simple truth is essentially meaningless in itself in terms of alarm, and does not mandate a particular policy response. We have made some questionable choices in defining the problem of climate change and its solution: [a] The definition of 'dangerous' climate change is ambiguous, and

hypothesized catastrophic tipping points are regarded as very or extremely unlikely in the 21st century; [b] Efforts to link dangerous impacts of extreme weather events to human-caused warming are misleading and unsupported by evidence; [c] Climate change is a 'wicked problem' and ill-suited to a 'command and control' solution; and [d] It has been estimated that the U.S. national commitments to the UN to reduce emissions by 28% will prevent three hundredths of a degree centigrade in warming by 2100.

What Judith Curry said on data series that **"**The greatest changes in the new NOAA surface temperature analysis are to the ocean temperatures since 1998? This seems rather ironic, since this is the period where there is the greatest coverage of data with the highest quality of measurements – ARGO buoys and satellites don't show a warming trend. Nevertheless, the NOAA team finds a substantial increase in the ocean surface temperature anomaly trend since 1998."

On Australian Graham Lloyd article, "Climate scientists defend data changes – see **Figures 1.8**". The Bureau of Meteorology is quoted as claiming that "statistical analysis of minimum temperatures at Rutherglen indicated jumps in the data in 1966 and 1974….. These changes were determined through comparison with 17 nearby sites". **Figure 1.9** presents an example showing data manipulation. This at last allows me to understand how they went about turning a cooling trend of -0.33 ^{o}C per 100 years into a warming trend of +1.74 ^{o}C. I checked the monthly unadjusted minimum data for Rutherglen, the adjusted data for Rutherglen, and the unadjusted data at all 17 of the listed neighbours, in the period 1951 – 1980, which according to the Bureau is the critical period containing the 1966 and 1974 break points. 30 years is a suitably long period for analysis. For the technically minded, I calculated monthly anomalies from the 1951-1980 means for each record, and then 12 month averages. This should allow us to see the problems around 1966 and 1974. The idea of "homogenizing" was to adjust the data so that it is not so different from the neighbours. That happened in 1966. They got that right, but not in 1974, where the adjustments have *increased* the difference, and have produced warming. Odd things also happen in 1952, 1954, 1957, 1969, and 1975-80. It is clear that the changes to the temperatures at Rutherglen do not "homogenize" them. They make the differences from the neighbours greater, and change a cooling trend into a warming

one. This is not unique to Rutherglen- adjustments warm the temperature trends at 66 of the 104 Australian sites, and warm the national mean temperature trend by around 47%. But what would I know- I'm just an amateur according to Professor Karoly. The raw data series for USA temperature from 1920 showed a 60-year cyclic variation. The adjusted data showed both the trend and 60 year cycle. Here the trend was introduced through manipulation of data.

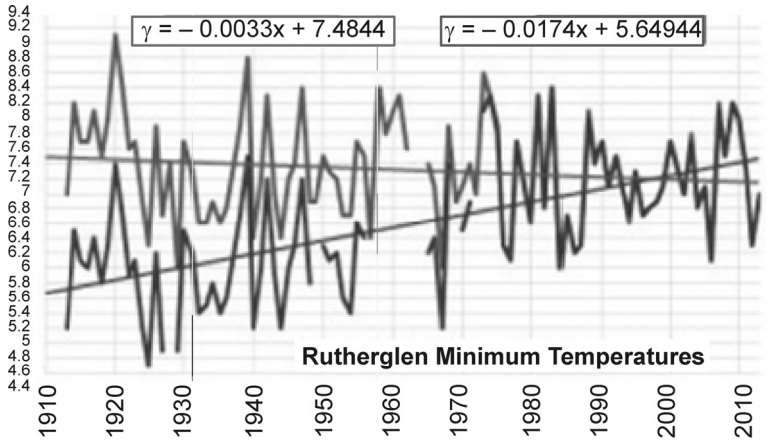


Figure 1.8 Rutherglen temperature data [1913-2013]: unadjusted vs adjusted

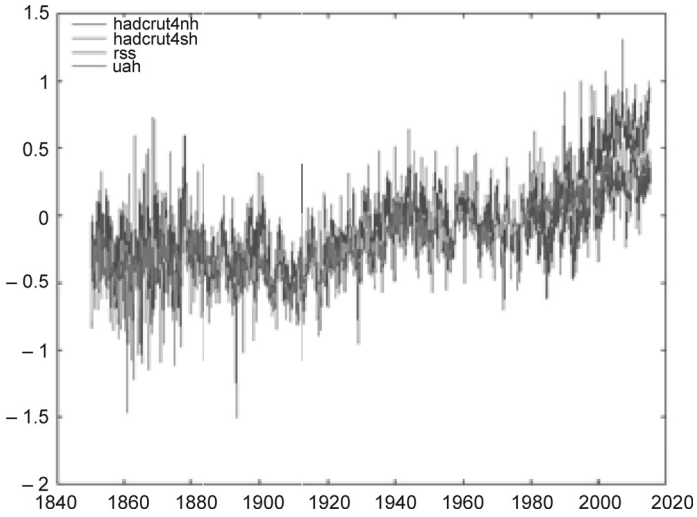


Figure 1.9 Showing the data manipulation

According to IPCC, the global warming started in 1951. The data presented in **Table 1.1** relates to the climate conditions before 1960. The data showed wide variations with time and space. Extremes in rainfall and temperature are very high. The local life – human, animal & plant – are adapted to those wider variations in temperature and rainfall. The agriculture system was adapted to those defined local climate conditions. With the chemical input mono crop agriculture system, the problems started as they are not defined clearly to the local conditions. The loses are not much prior to 1960 as at that time the population of these factors very low but now they increased several fold and thus losses for the same extreme conditions are very high.

1.3 Factors Determining Earth's Temperature

1.3.1 General

The climate system is a complex, interactive system consisting of the atmosphere, land surface including topography/topography and vegetation, snow and ice, oceans and other bodies of water, and living things. The atmospheric component of the climate system most obviously characterizes climate; climate is often defined as 'average weather'. Climate is usually described in terms of the mean and variability of temperature, precipitation and wind over a period of time, ranging from months to millions of years (the classical period is 30 years). The climate system evolves in time under the influence of its own internal dynamics and due to changes in external factors that affect climate (called 'forcings'). External forcings include natural phenomena such as volcanic eruptions and solar variations, as well as human-induced changes.

There are feedback mechanisms in the climate system that can either amplify ('positive feedback') or diminish ('negative feedback') the effects of a change in climate forcing. For example, as rising concentrations of greenhouse gases warm Earth's climate, snow and ice begin to melt. This melting reveals darker land and water surfaces that were beneath the snow and ice, and these darker surfaces absorb more of the Sun's heat, causing more warming, which causes more melting, and so on, in a self-reinforcing cycle. This feedback loop, known as the 'ice-albedo

feedback', amplifies the initial warming caused by rising levels of greenhouse gases. Detecting, understanding and accurately quantifying climate feedbacks have been the focus of a great deal of research by scientists unraveling the complexities of Earth's climate. This is hypothetical as it is not established the fact that the rising concentrations of greenhouse gases really warm Earth's climate, if so to what extent. The source of energy is the Sun. This is fixed. Greenhouse gases are there in the atmosphere. Through greenhouse effect, the Earth's temperature reached to a stable condition. Over this intra-seasonal and intra-annual, decadal changes are superposed in association with the general circulation patterns through which the climate is controlled over different parts of the globe associated with the climate system. Also, trend contains a part of long-term variations due to changes in extra-terrestrial phenomenon.

Feedbacks are an important factor in determining the sensitivity of the climate system to increased atmospheric greenhouse gas concentrations. Other factors being equal, higher climate sensitivity means that more warming will occur for a given increase in greenhouse gas forcing. Uncertainty over the effect of feedbacks is a major reason why different climate models project different magnitudes of warming for a given forcing scenario. More research is needed to understand the role of clouds and carbon cycle feedbacks in climate projections.

Weather and thus climate are represented by several meteorological parameters. Among these the principal parameters that are of importance are precipitation and temperature. They are influenced by several terrestrial and extra-terrestrial phenomena. They present high spatial and temporal variations. See **Table 1.2** for the averages and extremes in temperature and precipitation at six met stations in India. Temperature data series present high intra-seasonal and intra-annual variations. Also, it contains an anomaly around the mean. This anomaly includes both cyclic variation and trend part [**Figure 1.6a**]. The cyclic part is natural in built system and the trend part is contributed by human actions. Though this is small compared to mean, yet we need to understand this, to quantify its impacts on nature. In this Part it is tried to understand the factors contributing to the anomaly in general and trend in specific.

Table 1. 2 Temperature and precipitation means and extremes at six locations in India: As an example

Station	The Highest [°C]	Maximum [°C]	Minimum [°C]	The Lowest [°C]
Dibrugarh	36.5	27.7	18.7	6.9
Gauhati	37.0	29.5	19.7	7.8
Shillong	28.2	21.2	12.1	-0.6
Cherrapunji	27.5	20.6	14.3	4.0
Darjeeling	23.5	16.4	10.2	-0.9
Jalpaiguri	36.3	28.8	19.3	7.2

Station	Annual Mean [mm]	Rainy Days	The Highest [mm]/year	The Lowest [mm]/year	Max. in 24 hours
Dibrugarh	2759.4	131.7	3300.2/1954	2165.0/1905	223.5
Gauhati	1637.2	86.9	2121.1/1956	874.0/1952	232.9
Shillong	2415.3	128.1	3334.0/1946	1428.8/1958	415.5
Cherrapunji	11418.7	157.1	15706.6/1951	178.0/1908	973.0
Darjeeling	2758.4	125.1	4024.4/1890	2271.3/1907	492.8
Jalpaiguri	3352.7	103.7	4292.2/1938	1719.6/1891	390.4

1.3.2 Temperature Data Quality

The validity of any climate analysis depends upon the quality of data. The globe covers around 70% by oceans. That means the accuracy of ocean data play vital role at global level studies. In the starting, ships provided ocean temperatures on its route using buckets, later engine room inlet temperature and from 1990 installed buoys. That means prior to 1990 the quality of data was poor that too measurements were taken at very sparse network. IPCC noted that global warming started from 1951. That means between 1951 and 1990, we don't have quality data.

A letter dated 25th January 2016 has been sent by 300 scientists to Lamar Smith, Chairman of the house science committee stating that "We want NOAA to adhere to law of the Data Quality Act". They noted the fact that "As has been acknowledged by numerous scientists, the engine intake data are clearly contaminated by heat conduction from the structure, and as such, never intended for scientific use. Adjusting good data [buoys] upward to match bad data [engine intake] seems questionable.

This is what the NOAA did in erasing the pause observed in the global average temperature anomaly data for the last around 19 years.

This process of adjustment upwards in ocean temperature not only erases the pause but this will modify drastically and thus mislead the natural variability component of global average temperature anomaly and oscillations in different oceans. This will be a dangerous scenario. This way they manipulate to show higher trend. The New Zealand Climate Science Coalition [25th November 2009] presented temperature data for 7 New Zealand stations with longest records [starting around 1850s] before and after adjustments. The increase after adjustments at the 7 stations ranged between +0.40 and +0.89 and -0.15 ^{o}C.

On the land surface by around 17th century meteorological stations were started and instrumental measurements were started. In order to understand the cyclic and trend part in global average temperature, we needed quality temperature data as this anomaly is very small compared to the mean temperature. However, the basic problem here is the global average temperature data series were built using poor quality data series from oceans and from land surface. Before 1950 the network was sparse; and even after that the network covers only around 20 to 25% of the globe. For the rest of the Regions the data series were either interpolated and or extrapolated with grid formations.

Ocean temperature data are influenced by several factors associated with general circulation patterns, natural variability factors such as AMO, PDO, IOD, ENSO, Gulf Stream, Humboldt current, etc, etc. They are ocean specific systems. On the land surface temperature is influenced by latitude, longitude, elevation, seasons along with several other localized factors such as micro-climate, heat-island effect in urban areas, cold-island effect in rural areas, advection factor [heat & cold waves, cold & warm breezes], elevation-vegetation, deforestation-reforestation, mining-roads, precipitation [space & time], tides [cyclonic activity & phases of the Moon], filth covering land & oceans after industrialization, etc. All these factors were rarely accounted while adjusting or estimating the data at grid intervals.

The met network is concentrated around urban areas. With the passing of time the changes in land & water use and land & water cover created urban-heat-island and rural-cold-island effects.

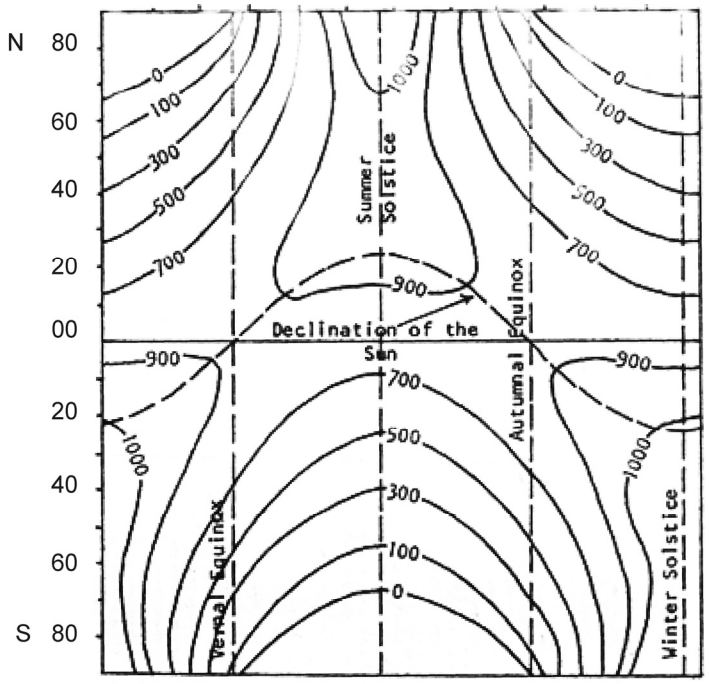
Thus, dense met network in urban areas and sparse network in rural areas created biased overestimation of global average temperature anomalies.

In temperature averaging several factors are influencing. Under climate system --natural variability and general circulation patterns over different parts -- is the bottleneck. Because of this every now and then agencies that are controlling global temperature data were manipulated to show what they want or what the half-baked models say. They lowered the past data and moved upwards the current data and thereby raised the mean trend in the anomaly to meet the model predictions [**Figures 1.9 & 2.3**]. Recently to remove hiatus in global temperature data series, the ocean temperature data was manipulated. They proposed three widely differing reasons for such corrections to data series even though they were continuously checked before putting them in to data bank. Even in the case of Satellite data, they initially released the data [this I put in my book of 2008] and later withdrew the same, as this data series trend was far below the ground based data series trend. After manipulating this data they again released. However, even with this, the current satellites and balloons data jointly show [1951 to 2014] around one-third of the global temperature pattern built by them using ground based data [**Figure 1.7**]. The satellites and balloons data took in to account the cold and warm island effects and as well other ecological changes and data gaps. This is balanced global data and yet this has two components: trend and 60-year cycle similar to the global temperature data built based on poor quality ground data. Here the 60-year cycle is natural variability. It only presents the average condition. To fit in to the erroneous ground based data series several qualitative theories were put forward to predict the future rise in the global average temperature anomaly.

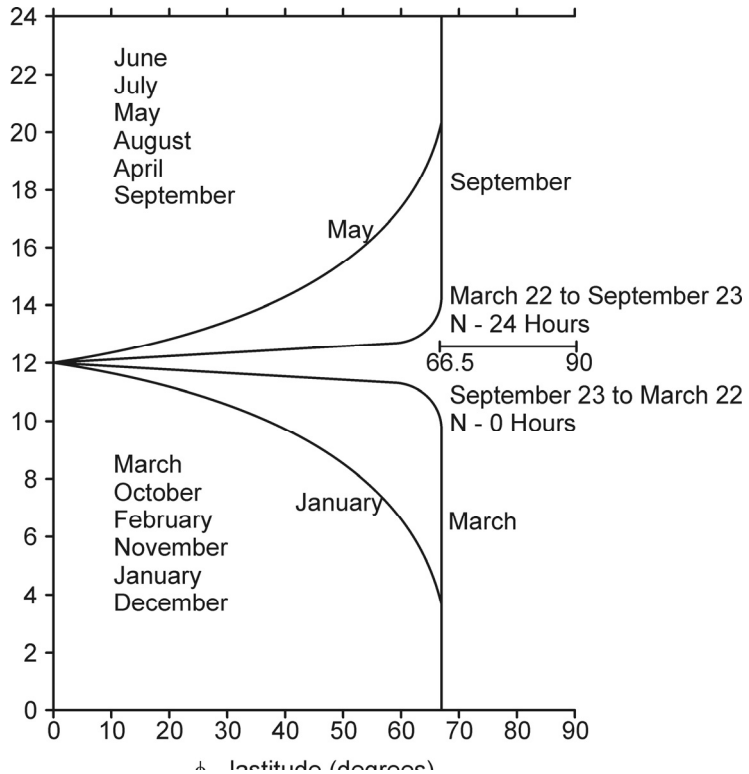
1.3.3 Sun Related Issues

*S*olar radiation powers the climate system. There are three basic fundamental ways to change the radiation balance of the Earth, namely change in incoming solar radiation from the Sun, the fraction of solar radiation that is reflected back [albedo] and altering of the long wave radiation from the Earth back towards the space. Climate, in turn, responds directly to such changes, as well as indirectly, through a variety of feedback mechanisms.

Solar radiation is a general term for the electromagnetic radiation emitted by the Sun. The Sun emits radiation [energy] in different wavelengths/bands, starting from X-rays [lower bandwidth side], γ-rays, ultra-violet, visible, infrared [higher bandwidth side] -- see **Figure 1.4.** The wave length in which maximum energy is emitted depends upon the temperature of the emitting surface. The Sun's surface temperature is around 6000 ^{o}C and the Earth's surface temperature is around 10 ^{o}C. According to Plank's law the wave length at which the maximum energy is emitted by the Sun is around 0.50μ and the Earth is around 10.0μ. The former is known as short wave radiation and the later is known as long wave radiation. On the top of the atmosphere the energy distribution and day lengths around the globe is presented in **Figures 1.10a & b** – 'a' presents the seasonal and latitudinal daily solar radiation at the top of the atmosphere both in the Northern and Southern Hemispheres; with 'b' presenting day length in a year, that varies between 0 to 24 hours.



[a]



[b]

Figure 1.10 [a] Total daily Solar Radiation at the top of the Atmosphere & [b] Day length

Note: Tampering with the surface temperature records is immediately apparent if one plots NH and SH products in, e.g. HADCRUT4:

For almost all of the record, SH and NH move in lockstep. Then, suddenly at the latest turn of the century, NH diverges from SH. SH stays true to the satellite data, independently confirming that the NH in particular has been corrupted to sustain the warming meme.

The Sun's energy while passing through the different layers of the atmosphere under goes changes and after reaching the Earth's surface, it further under goes changes. These can be seen from **Figure 1.11,** a schematic diagram of the Earth's energy balance. About 30% of the sunlight that reaches the top of the atmosphere is reflected back to space. Roughly two-thirds of this reflectivity is due to clouds and small particles in the atmosphere

known as 'aerosols'. Light-coloured areas of the Earth's surface – mainly snow, ice and deserts – reflect the remaining one-third of the sunlight. Block bodies reflects less but absorbs maximum and later also emits more while at the same time while bodies reflect more and absorbs less with less emissions.

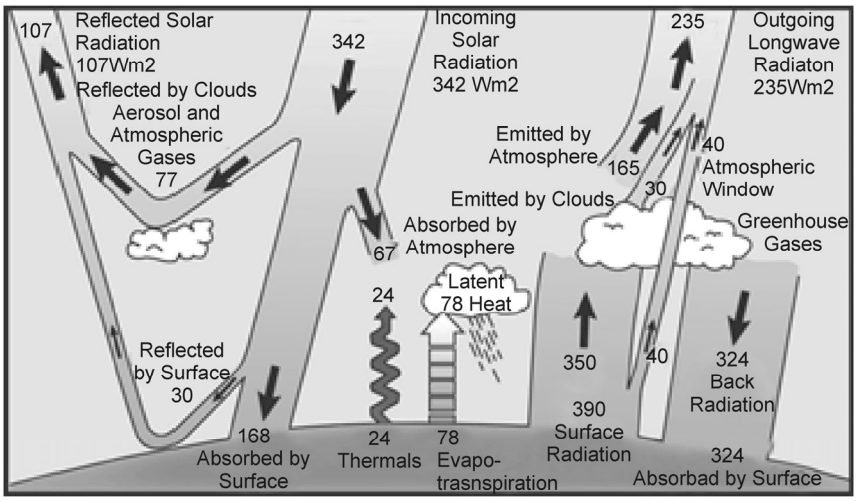


Figure 1.11 Schematic diagram of Earth's Energy Balance

The energy that is not reflected back to space is absorbed by the Earth's surface and atmosphere. To balance the incoming energy, the Earth itself radiates back some energy to space. The Earth does this by emitting long wave radiation. The reason for the Earth's surface is this warm is the presence of greenhouse gases, which act as a partial blanket for the long wave radiation coming from the surface. This blanketing is known as the natural greenhouse effect. The most important greenhouse gases are water vapour and carbon dioxide. The two most abundant constituents of the atmosphere – nitrogen and oxygen – have no such effect. Clouds, on the other hand, do exert a blanketing effect similar to that of the greenhouse gases; however, this effect is offset by their reflectivity, such that on an average, clouds tend to have a cooling effect on climate (although locally one can feel the warming effect: cloudy nights tend to remain warmer than clear nights because the clouds radiate long wave energy back down to the surface). In this process climate system plays the vital role. Thus, they define the local temperature conditions.

Global [total] solar radiation presents the energy received at the earth's surface after passing through the atmosphere, net radiation presents the balance of incoming and outgoing energy at the earth's surface and evaporation relates to the temperature component from that energy balance under a given climate system. These are measured at few locations around the world. They can also be estimated indirectly. **Reddy & Rao [1976]** presented spatial & temporal distribution of these three parameters over India. **Reddy & Neto [1984]** & **Reddy, et al. [1984a]** presented the same for northeast Brazil. The global solar radiation and the net radiation also present a natural cyclic variation.

With the population growth, urbanization after the industrial revolution, there are changes in these three parameters which are contributed by human actions. We must remember the fact that the contribution of the Sun is not part of anomaly trend but its contribution is mean condition and cyclic variation part of the anomaly. So, whether Sun's energy is increasing or decreasing is not important to evaluate the trend in global [land & ocean] temperature. Cycles of thousands of years present trend on shorter periods but it is insignificant. Under this scenario, there are two options: [1] get better quality data; and [2] start analyzing the data from single station and demarcate homogeneous zones and present the changes in real term.

Due to the rotation of the Earth, the atmospheric circulation patterns tend to be more east-west than north-south. Embedded in the mid-latitude westerly winds are large-scale weather systems that act to transport heat toward the poles. These weather systems are the familiar migrating low- and high-pressure systems and their associated cold and warm fronts. Because of land-ocean temperature contrasts and obstacles such as mountain ranges and ice sheets, the circulation system's planetary-scale atmospheric waves tend to be geographically anchored by continents and mountains although their amplitude can change with time. Because of the wave patterns, a particularly cold winter over North America may be associated with a particularly warm winter elsewhere in the Hemisphere. Changes in various aspects of the climate system, such as the size of ice sheets, the type and distribution of vegetation or topography/topography or the temperature of the atmosphere or ocean will influence the large-scale circulation features of the atmosphere and oceans.

Orbital cycles vary slowly over tens of thousands of years, and at present are in a very slow cooling trend. The variations in orbital cycles may produce a glacial period about 50,000 years from now.

Though the Sun system is the driving force behind the Earth's temperature, they are modified by different forcings created by climate system. This is the natural variations per se. However, as we change the climate system to meet our modern needs, we are creating a change in climate. The sensitivity factors of driving forces are least understood. Though its contribution to temperature regime as such is small, and yet it needs quantification. But this is plagued by several teeth-ache problems.

1.3.4 Greenhouse Effect –Global Warming

1.3.4.1 Greenhouse Effect

The greenhouse effect was discovered by Joseph Fourier in 1824 and was first investigated quantitatively by Stante Arrhenius in 1896. It is a process by which absorption and emission of infrared radiation by atmospheric gases warm a planet's lower atmosphere and surface. Existence of the greenhouse effect as such is not disputed. Without the Earth's atmosphere, the Earth's average temperature would be well below the freezing temperature of water. Thus, naturally occurring greenhouse gases have a mean warming effect, without which the Earth would be uninhabitable.

On the Earth, the major greenhouse gases are water vapour, which causes about 36 to 70% of the greenhouse effect (not including clouds); carbon dioxide (CO_2), which causes 9 to 26%; methane (CH_4), which causes 4 to 9%; and ozone, (O_3), which causes 3 to 7%. Clouds also affect the radiation balance through cloud forcings similar to greenhouse gases.

1.3.4.2 Greenhouse Gases

WMO Fact Sheet No. 4, August 1989 presented the measurements of some of the greenhouse gases in terms of starting year and number of locations these parameters started measuring. Carbon dioxide measurements started in 1959. According to this fact sheet it is clear that very few stations were measuring changing composition of the atmosphere. By that time no data in tropics and only three stations in the Southern Hemisphere. With such a meager data scientists are presenting

beautiful smooth change in carbon dioxide with the time. Some of these are discussed by **Reddy [2008].** Carbon Dioxide presents high seasonal variations. Troposphere ozone is created by chemical reactions from automobiles, power plants and other industrial and commercial source emissions in the presence of sunlight. Besides being a greenhouse gas, ground level ozone can also be a harmful air pollutant at ground level, especially for people with respiratory diseases and children and adults who are active outdoors. Stratosphere ozone depleting substances are also greenhouse gases but with the Montreal protocol these substances were replaced with non-ozone depleting substances. However, some of these are greenhouse gases, namely HFCs, PFCs, HCFCs, etc.

Human activities intensify the blanketing effect through the release of greenhouse gases. For instance, the amount of carbon dioxide in the atmosphere has increased by about 35% in the industrial era, and this increase is known to be due to human activities, primarily the combustion of fossil fuels [and removal of forests]. According to work published in 2007, the concentrations of CO_2 and methane have increased by 36% and 148% respectively since 1750. However, there is a big question on the quality of this data!!!

Emission scenarios, combined with modeling of the carbon cycle, have been used to produce estimates of how atmospheric concentrations of greenhouse gases might change in the future. Using the six IPCC SRES "marker" scenarios, models suggest that by the year 2100, the atmospheric concentration of CO_2 could range between 541 and 970 ppm. This is 90–250% above the concentration in the year 1750. The range shows very poor prediction.

CO_2 emissions are continuing to rise due to the burning of fossil fuels and land-use change [a main component of ecological changes]. Emissions can be attributed to different regions. Estimates of changes in future emission levels of greenhouse gases have been projected that depend upon certain economic, sociological, technological, and natural developments. In most scenarios, emissions continue to rise over the century, while in a

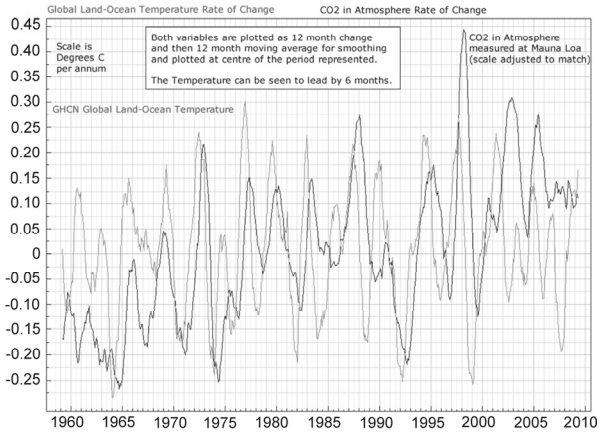
few, emissions are reduced. Fossil fuel reserves are abundant, and will not limit carbon emissions in the 21st century.

The theory is that these gases trap heat and cause the planet to warm through the process of greenhouse effect. Since 1751 have been released into the atmosphere from the burning of fossil fuels and cement production, increasing atmospheric CO_2 from the pre-industrial level of about 280 ppm (parts per million), to a high of 400 ppm in 2013 – we must remember the fact that measurements were very few prior to 1959 and thus they represent heuristic estimates through indirect methods. Methane, which is increasing in the atmosphere due to agriculture and fossil fuel production, traps 84 times as much heat as CO_2 for the first 20 years it is in the atmosphere, and is responsible for about one-fifth of global warming since 1750. Nitrous oxide, primarily released through agricultural practices, traps 300 times as much heat as CO_2. Over the 20th century, the concentrations of CO_2, CH_4, and NO_2 increased in the atmosphere. But, all these are qualitative estimates.

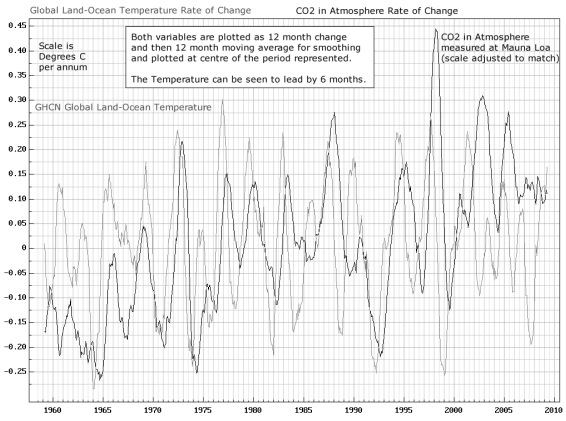
Here we are forgetting the fact that whether the natural greenhouse gases reached a saturation point to convert the energy in to heat or not. Even the computer models do show the plateau before 2100. That means from the starting point of the plateau extra greenhouse gases over and above the natural greenhouse gases in the atmosphere may not have any influence on the greenhouse effect process. The energy to be trapped and converted is not unlimited. It has a cap defined by the Sun's surface temperature through Plank' Law. Rising levels of atmospheric CO_2 do not necessarily cause global warming, which contradicts the core thesis of human-caused climate change, namely global warming.

The Earth's climate record shows that warming has preceded, not followed, a rise in CO_2 [**Figure 1.12**]. According to a 2003 study published in *Science*, measurements of ice core samples show that over the last four climactic cycles (past 240,000 years), periods of natural global warming preceded global increases in CO_2. In 2010 the *Proceedings of the National Academy of Sciences* published a study of the earth's climate 460-445 million years ago which found that an intense period of glaciations, not

warming, occurred when CO_2 levels were 5 times higher than they are today. According to ecologist and former Director of Greenpeace International Patrick Moore, Ph.D, "there is some correlation, but little evidence, to support a direct causal relationship between CO_2 and global temperature through the millennia."



[a]



[b]

Figure 1.12 Historical variation of Temperature versus Carbon Dioxide: [a] Historical pattern and [b] Current pattern

Coming back to the relationship between temperature and CO_2 in the modern era we can see that temperature has risen at a steady slow rate in Central England since 1700 while human CO_2 emissions were not relevant until 1850 and then began an

exponential rise after 1950. This is not indicative of a direct causal relationship between the two. After freezing over regularly during the Little Ice Age the River Thames froze for the last time in 1814, as the Earth moved into what might be called the Modern Warm Period.

There was a 30-year period of warming from 1910-1940, then a cooling from 1940 to 1970, just as CO_2 emissions began to rise exponentially, and then a 30-year warming from 1970-2000 that was very similar in duration and temperature rise to the rise from 1910-1940. One may then ask what caused the increase in temperature from 1910-1940 if it was not human emissions? And if it was natural factors how do we know that the same natural factors were not responsible for the rise between 1970 and 2000. You don't need to go back millions of years to find the logical fallacy in the IPCC's certainty that we are the villains in the piece.

That means, though the CO_2 was increasing at exponential rate since 1950 [IPCC used this as a starting year of global warming], prior to this and after to this there are plateaus in the global average temperature anomaly patterns. For the last 19 years plateau is the latest.

Patrick Moore noted that CO_2 is the currency of life and the most important building block for all life on the Earth. All life is carbon-based, including our own. Surely the carbon cycle and its central role in the creation of life should be taught to our children rather than the demonization of CO_2, that carbon is a pollutant that threatens the continuation of life. We know for a fact that CO_2 is essential for life and that it must be at a certain level in the atmosphere for the survival of plants, which are the primary food for all the other species alive today.

Human-produced CO_2 is re-absorbed by oceans, forests, and other "carbon sinks," negating any climate changes. According to a 2011 study published in the *Asia-Pacific Journal of Atmospheric Science*, many climate models that predict additional global warming to occur from CO_2 emissions "exaggerate positive feedbacks and even show positive feedbacks when actual feedbacks are negative." About 50% of the CO_2 released by the burning of fossil fuels and other human activities has already been re-absorbed by the earth's carbon sinks. From 2002-2011, 26% of human-caused CO_2 emissions were absorbed specifically by the world's oceans. A 2010 study published in the *Proceedings of the*

National Academy of Sciences found evidence that forests are increasing their growth rates in response to elevated levels of CO_2, which will in turn, lower atmospheric CO_2 levels in a negative feedback. According to an August 2012 study in *Nature*, the rate of global carbon uptake by the earth's carbon sinks, such as its forests and oceans, doubled from 1960-2010 and continues to increase.

CO_2 is already saturated in earth's atmosphere, and more CO_2, manmade or natural, will have little impact on climate. As CO_2 levels in the atmosphere rise, the amount of additional warming caused by the increased concentration becomes less and less pronounced. According to Senate testimony by William Happer, PhD, Professor of Physics at Princeton University, "additional increments of CO_2 will cause relatively less direct warming because we already have so much CO_2 in the atmosphere that it has blocked most of the infrared radiation that it can. The technical jargon for this is that the CO_2 absorption band is nearly 'saturated' at current CO_2 levels." According to the Heartland Institute's 2013 Nongovernmental International Panel on Climate Change (NIPCC) report, "it is likely rising atmospheric CO_2 concentrations will have little impact on future climate."

In nature, there is a limit for everything. For example, seed has a limit for production under certain inputs conditions. By adding more and more inputs there will be no increase in productivity and thus present a plateau with any further increasing levels of inputs. CO_2 in nature is variable with the time and even under this variability it optimizes the use of energy in its wavelength bands. By increasing anthropogenic greenhouse gases has little impact as the energy emitted by the Sun as it has a cap.

Though water vapour component of greenhouse gases might have been come down with deforestation during the hunter to domestication process, this was more than enough was compensated with development of water resources and irrigated agriculture. However, seasonal and annual variations along with the natural variability the greenhouse effect changes and so also temperature and other meteorological parameters.

Under these scenarios, UN must look at reducing pollution through proper technology changes rather than on harping on anthropogenic greenhouse gases emission reduction.

1.3.4.3 Aerosols

The most dramatic change in aerosol-produced reflectivity comes when major volcanic eruptions eject material very high into the atmosphere. Rain typically clears aerosols out of the atmosphere in a week or two [only if there is a rain, otherwise it will stay in the atmosphere for more time], but when material from a violent volcanic eruption is projected far above the highest cloud, these aerosols typically influence the climate for about a year or two before falling into the troposphere and being carried to the surface by precipitation. Major volcanic eruptions can thus cause a drop in mean global surface temperature of about half a degree Celsius that can last for months or even years. Some man-made aerosols also significantly reflect sunlight. All these, however, are too generalized inferences as there are several complications are involved at a given place and in a given time of the season.

A gradual reduction in the amount of global direct irradiance at the Earth's surface was observed from 1961 until at least 1990. This is known as dimming effect. Solid and liquid particles known as *aerosols*, produced by volcanoes and human-made pollutants, are thought to be the main cause of this dimming. They exert a cooling effect by increasing the reflection of incoming sunlight. Radiative forcing due to aerosols is temporally limited due to the processes that remove aerosols from the atmosphere. Removal of aerosols by clouds and precipitation gives the Troposphere aerosols an atmospheric life time of only about a week, while the Stratosphere aerosols can remain for a few years.

In addition to their direct effect by scattering and absorbing solar radiation, aerosols have indirect effects on the Earth’s radiation budget. Sulfate aerosols act as cloud condensation nuclei and thus lead to clouds that have more and smaller cloud droplets. These clouds reflect solar radiation more efficiently than clouds with fewer and larger droplets, a phenomenon known as the Tworney effect. This effect also causes droplets to be of more uniform size, which reduces growth of raindrops and makes the cloud more reflective to incoming sunlight, known as the Albrecht effect. Indirect effects are most noticeable in marine Stratiform Clouds, and have very little radiative effect on convective clouds. Indirect effects of aerosols represent the largest uncertainty in radiative forcing.

Soot may either cool or warm the Earth's climate system, depending on whether it is airborne or deposited. Atmospheric soot directly absorbs solar radiation, which heats the atmosphere and cools the surface. When deposited, especially on glaciers or on ice in arctic regions, the lower surface albedo can also directly heat the surface. The influences of atmospheric particles, including black carbon, are most pronounced in the tropics and sub-tropics, particularly in Asia.

Variations of Volcanic aerosols and possibly solar luminosity appear to be primarily causes of observed fluctuations about the mean trend of increasing temperature. Volcanoes aerosol impact is not new. This not only creating cooling effect but it reduces the energy reaching the Earth and thus energy available for greenhouse effect for global warming. To create greenhouse effect, we need energy also, and if this energy is reduced drastically then the global warming is automatically comes down.

Reports suggest that the violent volcanic eruptions would cause some warming for the first few months, and then, when the larger particles have settled, larger global cooling by 1 – 2 ^{o}K. The degree of this change depends upon the season in which this has occurred. For example: Eruption of Mt Pinatubo in the Philippines in June 1991, there was a slight global warming for the first 3 months after the eruption, possible due to the coincident appearance of an of El Niño event. After the removal the effect of El Niño Southern Oscillation, a fall of global surface temperatures by about 1.0 ^{o}K in the first year was observed. The anomaly fell to about 0.5 ^{o}K after 16 months, and erratically returned to normal over the next three years. However, the lower stratospheric temperature in the Tropics rose by over 1.5 ^{o}K within 3 months after the eruption, as a result of the dust's absorption of solar radiation. Then the temperature there fell back to normal over the following 18 months, as the dust settled out. So, they are also season and region specific depending up on where they occur. Similarly earthquakes, wars, nuclear tests/nuclear dust, forest fires, etc also contribute to changes in weather, a short term change. However, ecological changes component will not be affected significantly by these processes.

So this is short lived change. This comes under irregular variation component of systematic variation. They form part of intra-seasonal and intra-annual variability of weather. **Reddy,**

et al. [1976] studied the Power spectral analysis of Lower Stratospheric Meteorological data of H, T, u & v" for 11 stations between 1 to 13 degrees latitude belt and 2 to 103 degrees longitude belt for 100, 50, 30 mb levels in India. The inferences concurs those findings wherein the cycles varied between 6 months to 36 months.

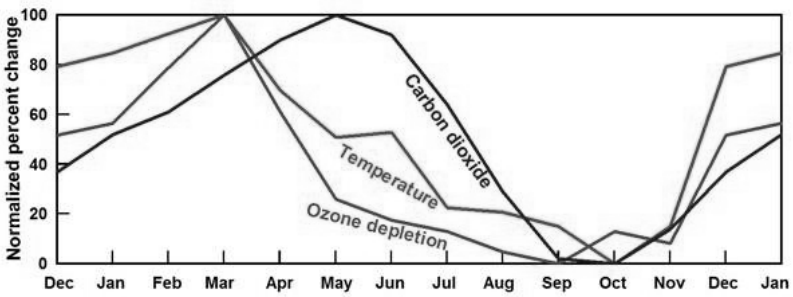
Here the most important point we are missing is the reduction in relative energy available to greenhouse effect and thus lowering the global warming component automatically without affecting the ecological changes component.

1.3.4.4 Ozone Versus Carbon Dioxide

Figures 1.12a & b presents the relationship between carbon dioxide with temperature: [a] presents the Historical pattern & [b] presents the Current pattern. This is an anti-thesis of global warming phenomenon. Here the carbon dioxide is the after effect with the temperature. *In a book:* "What Really Causes Global Warming?" and "Greenhouse Gases or Ozone Depletion?" Peter Langdon Ward observed that "t*wo different styles of volcanic eruption appear to have been the principal determinants of climate change throughout geologic time.* In brief, we find that major temperature changes throughout Phanerozoic time can be fully explained with two different styles of volcanic eruptions: explosive volcanism causing global cooling and effusive volcanism causing global warming. It is well-known that aerosols from explosive volcanoes, such as the 1991 eruption of Pinatubo, reflect and scatter sunlight, causing global cooling. What we found is that all volcanoes emit chlorine and bromine, which are observed to deplete the ozone layer, allowing increased irradiance of Earth by solar UV-B radiation, causing global warming. UV-B is 48 times more energy-rich than Earth's IR radiation absorbed by carbon dioxide. Under conditions normal before 1965, ultraviolet-C (UV-C) warmed the upper atmosphere, UV-B primarily warmed the ozone layer, UV-A and visible light warmed Earth. CFCs, when they rise to the level of very cold polar stratospheric clouds (PSCs), release chlorine that depletes ozone, causing more UV-B than usual to reach Earth's surface, thus cooling the ozone layer and warming Earth. Effusive volcanoes emit chlorine and bromine, which deplete ozone, leading to global warming. Explosive volcanoes similarly deplete ozone, but also eject megatons of water and sulfur dioxide into the lower stratosphere, forming globe-encircling

aerosols whose molecules soon grow large enough to reflect and scatter sunlight, causing net global cooling. These are explained in **Figures 1.13 & 1.14**.

Figure 1.13 presents a seasonal march of temperature with carbon dioxide and ozone. The figure presents the mean monthly values of northern hemisphere temperature anomalies and ozone depletion anomalies for the period 1975 to 1998 and of atmospheric carbon dioxide concentrations at Mauna Loa, Hawaii, since 1961, normalized as percentages. Carbon dioxide values, peaking in May, show only a minor effect on temperature anomalies, but coincidence of the peaks in ozone depletion and temperature in March suggest a possible causal relationship.



The relationship of Ozone Depletion to Temperature

Figure 1.13 The relationship of Ozone Depletion & Carbon Dioxide to Temperature

Figure I.14 presents the trends in Temperature, Troposphere chlorine and ozone depletion over the past 70 years are distinctly different from trends in concentrations of greenhouse gases such as carbon dioxide. Ocean heat content increased with increasing ozone depletion and continues to increase while ozone depletion remains greater than levels prior to 1970. Carbon dioxide levels appear related to ocean heat content through the solubility of CO_2 as a function of water temperature.

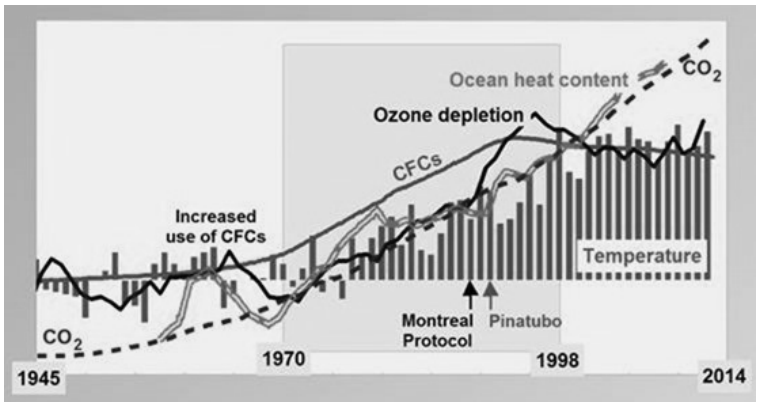


Figure 1.14 Trends in temperature versus Ozone and Carbon Dioxide

1.3.4.5 Oceans Covered by Filth

Earth's surface is being noticeably altered by the production of long-lasting man-made materials, resulting in us entering an 'age of plastics'. Over planet's oceans and lands will be buried by increasing layers of plastic waste. They are inert and hard to degrade.

Though there is no scientifically sound estimates exists for the size or mass of the filth entering the Oceans & water bodies, atmosphere & land areas but these significantly influence the incoming and outgoing radiation and thus temperature regime. This will go on increasing with the growth of population. **Figures 1.15a & b** present Great Pacific garbage patches of plastics.

[a]

[b]

Figure 1.15a & b Garbage patches in Great Pacific

On Oceans, cruise ships generate an astonishing amount of pollution: up to around 25,000 gallons of sewage from toilets and 143,000 gallons of sewage from sinks, galleys and showers each day. Coastal environment and marine life are at risk from the threats of bacteria, pathogens and heavy metals generated in these waste streams. Ships generate 15 to 30% of the World's smog-forming emissions. Bunker fuel burned by ships is 1,000 times dirtier than highly diesel used by trucks and buses. The shipping industry burns 300 million tons of bunker fuel per year. A single ship coming in to harbor produces the smog-forming emissions of 350,000 new cars. Ships also generate huge amounts of solid waste. Ocean waters are also affected by oil spills. Polluted waters are also entering oceans/rivers from agriculture rain water runoffs, domestic sewages, etc.

Also with the plastic became part of the life, are covering every bit of open land in and around urban areas and now it is also spread to rural villages. Air traffic emissions also covered upper atmosphere that significantly influencing the radiation balance and thus changes in temperature and other met parameters.

We are not accounting all these factors that significantly influencing the radiation balance and thus influencing the temperature and other met parameters. With the spread of filth over sea/ocean waters, the Sun's energy absorbed and reflected by water and in-turn energy emitted by water will be changing with the increasing levels of filth over the water. It may impact the

general circulation in sea/ocean waters. Commercial jet aircrafts also fill the atmosphere with certain other types of filth.

Urban Filth: At present around 30% of the population are living in urban areas under unhygienic conditions in several parts of the globe. The population may reach 50 to 60% of the total by 2050. They generate huge quality of filth as the sustainable management of solid water management in developing countries is a myth. There are several types of wastes, namely industrial, biomedical, E-waste, plastic waste, batteries waste, mining/construction waste and municipal solid waste, etc. Solid waste management is given a very low priority in developing countries. Dumping them indiscriminately and burning them are the primary factors that affect local weather conditions in terms of temperature. We rarely take in to account these factors which in fact will increase with the time covering wide areas on the ground like urban concrete jungle.

1.3.4.6 Global Warming

From the definition of IPCC that the increased global average temperature anomaly since 1951 has two parts, namely (1) one caused by the greenhouse effect and (2) the other caused by non-greenhouse effect. The former's contribution to the global average temperature since 1951 is extremely likely that more than half; and thus the latter's contribution is less than half. Also, at the same time the anthropogenic greenhouse effect component has two components, namely (1a) the anthropogenic increase in greenhouse gas concentrations and (1b) the other anthropogenic forcings. However, IPCC is not sure of the quantitative contribution of these three groups on the global temperature.

Sophie Lewis, from the Australian Research Council's Centre for Excellence in climate science, dissecting statements about climate change records made by the former Prime Minister of Australia, Tony Abbott in 2013, observed [22nd January 2016] that "To test if that might be the case, Lewis ran a series of climate models in which the greenhouse effect was removed – so all that was left was natural variability. Unsurprisingly, in those models, high temperature records were less common than they are in reality. In other words, the record-breaking that we have seen cannot be explained by natural variation." -- [1] IPCC noted more than the half of global average temperature anomaly is associated with the greenhouse effect component [this includes human component namely global warming and non-human component

related to volcanoes and other aerosols component] and the rest to non-greenhouse component [mainly human induced component]. That means even after removing the global warming component, still the other two components along with the systematic variations components [fluctuations & irregular variations]. The so called models in fact haven't taken these in to account. The difference between 2014 and 2015 is 0.18 ^{o}C [but they are different under different data sets and under satellite data sets]. The predicted rise associated El Nino is about 3 ^{o}C. With every peak of El Nino, on either side two depressions will occur and with this 2016/17 will automatically follow the hiatus.

Unless these three parts are quantified, we cannot say it is settled science as in the three parts, (2) and 1(b) are not global in nature or character; but they are only either local and or regional in nature or character. Thus, this has no role at global scale except going in to the global averaging of temperature. With such qualitative groupings how can, IPCC argues it is a settled science, a big question?

IPCC is arguing on 2 ^{o}C by the end of the century. The question is, is this relates to all the three parts or only one part that relates to the anthropogenic greenhouse gases concentration [1(a)]? IPCC needs to clarify this before asking individual governments to bring down anthropogenic greenhouse gases or before some governments imposing taxes on emissions. Also, unless this is clarified by IPCC, how can we quantify its impacts on nature? First let us get clear idea on the subject. IPCC was cautious not to refer '1a' as global warming and instead uses climate change!!!

There are few other issues that need to be considered like filth covering the oceans, filling the atmosphere with filth generated by commercial jet aircrafts other than volcanic aerosols, etc.

Whether we get an answer to such issues or not, India must look into the components of climate change that are local or regional in nature that directly influence the agriculture and water resources, instead of running after emissions and $100 billion dollars.

Sensitivity factor: Volumes and volumes were written by thousands of people on Radiative Forcings [RF]; but nobody gave quantitative figures for anthropogenic greenhouse effect part, which we term it as global warming. Even IPCC made qualitative

statements like tossing a coin: you may get head or tail only. Now, let us come to IPCC – they monotonically reduced the sensitivity factor in carbon dioxide forcing from SER to AR5 [in AR4 it was 1.95 and in AR5 it was 1.55]. Also, in AR5 they qualitatively divided global temperature in to two parts, namely *more than half of the observed increase in global average* surface temperature from 1951 to 2010 was caused by the *anthropogenic increase in greenhouse gas concentrations* and other *anthropogenic forcings* together. This relates to the trend component only. Cyclic variation component is form part of systematic variation [60-year cycle – presented in my 2008 book from my earlier analysis] superposed on the trend. Anthropogenic component has two parts, namely one is associated with greenhouse effect and the other is non-greenhouse effect component. If we divide the 50% [though IPCC said more than 50%, even 50.1% is more than 50% only] equally in to these two components, the greenhouse effect component [global warming component] is around 25%. This is the component associated with anthropogenic greenhouse gases [carbon dioxide] increase in the atmosphere. The second 25% component is not associated with carbon dioxide increase in the atmosphere but relates to non-human factors. The remaining around 50% of the global temperature raise is due to non-anthropogenic component. The net, non-anthropogenic greenhouse gases component is around 75%. This part not only contributes to the changes in temperature but also to the changes in other meteorological parameters directly and indirectly. This is a local and regional phenomenon will not contribute to global phenomena. According to this, if the global temperature raise for example is 1.0 ^{o}C, the global warming component is 0.25 ^{o}C. If we take the satellite and balloon data, 1.0 ^{o}C is replaced by 0.35 ^{o}C only. Here, the major advection factor was not taken in to account at local/regional level. IPCC must come up with the quantitative percent – 25% or less or more then only there will be sense in it.

According to NASA/Goddard Space Flight Centre new study published December 14, 2015 in the Journal “Nature Climate Change”, to understand climate change, researchers need to know the Transient Climate Response (TCR) and Equilibrium Climate Sensitivity (ECS) of Earth. Both values are projected global mean surface temperature changes in response to doubled atmospheric carbon dioxide concentrations but on different time scales. TCR is

characteristic of short-term predictions, up to a century out, while ECS looks centuries further in to future, when the entire climate system has reached equilibrium and temperature have stabilized.

There have been many attempts to determine TCR and ECS values as the history of temperature changes over the last 150 years and the measurements of important climate drivers such as carbon dioxide. As part of that calculation, researchers have relied on simplifying assumptions when accounting for temperature impacts of climate drivers other than carbon dioxide, such as tiny particles in the atmosphere known as aerosols such as those emitted in volcanic eruptions act to cool Earth, at least temporarily, by reflecting solar radiation away from the planet. In a similar fashion, land use changes such as deforestation in Northern Latitudes result in bare land that increases reflected sunlight. But the assumptions made to account for these drivers are too simplistic and result in inaccurate estimates of TCR and ECS, said Gavin Schmidt, co-author of the study. He further said that "The problem with that approach is that it falls way short of capturing individual regional impacts of each of those variables".

This means that Earth's climate sensitivity to carbon dioxide or atmospheric carbon dioxide's capacity to affect temperature change – has been underestimated. The result dovetails with a GISS study published last year that puts the TCR value at 1.7 ^{o}C; the IPCC, which draws its TCR estimate from earlier research, places the estimate at 1.0 ^{o}C. Schmidt said that "If you have got a systematic understanding of what the greenhouse gases driven change would be, then you systematically understand what's going to happen in the future when greenhouse gases are by far the dominant climate driver". However, this news release and the abstract do not say what their new climate sensitivity estimates are. The supplemented [http://www.nature.com/nclimate/journal /vaop/ncurrent/nclimate2888-s1.pdf] says TCR is 1.4 ^{o}C and ECS is 2.3 ^{o}C.

The authors talked of aerosols of volcanic activity but there are several types of aerosols for the last centuries related to wars, dust storms, mining activities, building activities, etc. Where carbon dioxide is not uniformly spread throughout the globe, how you can expect it produce uniform response? But some argue that even with 1000 ppmv for the first 1000 m the net effect would be no

more than 0.1 ^{o}C extra warming. How, they arrived at this value is surprising. If they are claiming 1.7 ^{o}C now, how in they have been trying to hang on to 3-4 ^{o}C is another big question – though some argued that this is ECS. Also, the natural climate response to a change in any one of the components of the water cycle is not a part of the estimate and yet Trenberth insists the missing heat is hiding in the ocean and Karl insists the pause is due to underestimating of SST. They argued greenhouse gases by far the dominant climate driver, how can it be possible be known now that this will be the case at some point in future? Or what evidence? In fact several studies put the carbon dioxide contribution only 12-14% of the temperature effect then how it becomes dominant factor, is a big question.

In order to test their theories, we have to have accurate measurements of average global temperature anomalies???

1.3.5 Non-Greenhouse Effect – Ecological Changes

The main component of human activity is ecological changes, not associated with greenhouse effect [more details can be seen from **Reddy, 2008**]. Ecological changes are associated with changes in land use & land cover and water use & water cover. They include urban-heat-island effects and rural-cold-island effects. Urbanization, deforestation, mining, etc cause the heat island effect. This component is a part of global temperature raise. The quantum relates to the location of met stations. We must remember one thing here, majority of met stations were/are located in urban areas by revenue department for convenience. Because of this urban-heat-island effect dominates the average temperature. Changes in agriculture [dry-land to wetland], water resources development, reforestation, etc will bring down the global temperature if it is added; but in reality the met network was and is sparse in such areas and thus the effect is under reported in averaging of temperature. This is clearly evident from the differences in Northern Hemisphere and Southern Hemisphere temperature patterns [**Figures 2.1 & 2.2**]. However, satellites and balloons data takes these in to account.

1.4 Concluding Remarks

Climate is what you expect; weather is what you get. Weather refers to short-term events in the atmosphere, while climate relates

to longer time period events in the atmosphere. Every National Meteorological Services [NMS] have published Climate normal books that contain averages and extremes for individual meteorological parameters and meteorological stations. The period used was for 30 years. The current extremes in weather haven't crossed the limits in the normal books world over.

The atmosphere is not an isolated system. It interacts with other components of the Earth system – the Oceans, for example. But it is also in contact with the Cryosphere (ice and snow), the Biosphere (animals and plants), the Pedosphere (soil) and the Lithosphere (rocks). All of these elements together compose the climate system, whose individual components and processes are connected and influence each other in diverse ways. These are further modified by the general circulation systems that include wind & pressure that vary with region to region. It also changes with the climate system.

Climate refers to all meteorological parameters. The met parameters interacts each other in different ways over different parts of the globe within climate system and general circulation patterns. Climate change is, thus, a local-regional specific change and not a change at global scale. Global warming associated with only temperature. There is no warming at global scale but it is a sum and total of positive and negative variations over different locations-regions of the globe.

Climate change consists of systematic variations in which Irregular variations consisting of intra-seasonal, intra-annual variations and fluctuations, known as rhythmic or cyclic variations are part and are also location-region specific; and man-induced variations or associated with human activity in which ecological changes associated with the changes in land & water use and land & water cover changes which is a location-region specific; global warming associated with the anthropogenic greenhouse gases; though greenhouse gases composition is location-region specific but considered it as global factor; and other causes associated with natural and human actions but they are intermittent in nature. Climate change is broader subject relating to met parameters within which global warming is only one component related to temperature only.

The basic problem is people shy of using the word global warming as they are not sure on its magnitude of contribution to global average temperature anomaly and thus instead they use the words such as climate change. While changing the definition of climate change IPCC and UN agencies played game with ecological changes component of human induced changes, which is the major component that is causing the trend in global average temperature. To avoid any ambiguity, it is better to use global warming to refer to change in temperature associated with the increased levels of anthropogenic or human-induced greenhouse gases through greenhouse effect. However, the basic question is, whether this additional greenhouse gases are really converting in to raise the temperature as the amount of greenhouse gases in the nature is more than sufficient to convert energy in to temperature. In nature zero to infinity is not a reality but they are bounded with plateau on either side.

All the light emitted by the surface in the strongest CO_2 bands was completely absorbed at pre-industrial levels. That is below 280 ppm. Therefore, the additional CO_2 added to the atmosphere through human actions or through any other process may have little contribution. Because of this, to show there is an accelerated increase in global average temperature anomaly, data managers started adjusting the basic temperature data by lowering the past data series and raising the current data series, though contrary is evident in satellite & balloon data series. While adjusting, they forgot the fact that global average temperature anomaly is not contributed by the global warming component alone but it is contributed by several factors, such as human and non-human factors. This process of adjustments upward in ocean temperatures, not only it erased the pause for the last 19 years but also will modify drastically that mislead the natural variability component of global average temperature anomaly and oscillations in different oceans. This will be a dangerous scenario.

Global average temperature is a function of Sun's energy and climate system at any given place. This has intra-annual and intra-seasonal variations. Also they contain both long term and short term decadal oscillations. Over the mean, the anomaly that varies with the time consists of cyclic variation and trend. That is, the global average temperature anomaly consists of natural fluctuation component and natural & human induced trend. Sunspots and

global solar radiation and net radiation/radiation balance at the Earth's surface present 11-year cycle and its multiples.

Volcanic activities contribute to natural trend part. The human induced trend part consisting of four components; and is associated with aerosols other than those from volcanic activity, filth over sea/ocean water, greenhouse effect and non-greenhouse effect. There are no quantitative estimates for the four types of components as the world changing with the passing of time; and thus % contributions by these four differ with the time. IPCC has only qualitative estimates for some of these components.

Globally, the temperatures are showing high variations in trend and in average anomalies with country to country, region to region within a country, land to ocean, SH to NH, etc. Also, measuring equipment & met stations location are themselves creating large variations. There is no exception to even the satellites data as manipulation of data becomes a common factor to justify global warming and its impacts. So, we are trying to build castles, known as global warming, based on false foundations. However climate change is a reality.

It is quite surprising to note that the Papel 'Laudato Si' encyclical on global warming has become a source of division and prompted heated exchanges between senior Church figures at a top level meeting in Rome in December 2015. Even Pope Francis in his address on Christmas-eve on 25th December, did not mention a word on the climate change.