Impact of Climate Change on Insurance Industry

*Dr. Som Majumdar**

Abstract

Human emissions of greenhouse gases are already changing our climate. This paper provides an overview of the relation between climate change and weather extremes, and examines how the climate change leading to global warming caused weather perils in form of natural disasters around the world. The captioned article attempts to demonstrate how the surface temperature of the earth is continuously heated primarily caused by human intervention generating huge amount of Green House Gases (GHG) that led to rise in sea level in an alarming range posing a great threat of inundation of many low lying nations around the world. In the course of analysis of impact of global warming on insurance industry, citation of various statistics has been incorporated. The paper attempts to explain by reference to Paris Accord how the protocol endorsed by 194 nations could assist in stabilisation of green house gas concentration in the atmosphere in an attempt to in an attempt to limit the global temperature increase by 2100 to less than 2 degree Celsius.

Key words: climate change, global warming, green house gas, Paris Accord, natural disaster

("if we don't take action, the collapse of our civilisations and the extinction of much of the natural world is on the horizon"., Sir David Attenborough at UN Climate Summit Poland, Dec 2018)

Prelude

Insurance industry is now besieged with increasing amount of losses emanated from natural disasters like flood, windstorm, hurricane, drought, hailstorm etc that are now linked to climate change. According to the Study made by the *"Environmental Change Institute" at the University of Oxford,* the term "climate change" refers specifically to anthropogenic climate change (also known as global warming), which is caused by human activity, as opposed to changes in climate that may have resulted as part of Earth's natural process. The latest report of United Nations' "Intergovernmental Panel for Climate Change (IPCC)" reveals that the Earth is just 12 years

* *Justice of Peace NSW Australia. E-mail: smajumdar@bigpond.com*

away from the danger zone of destruction. Prior to signing of Parris Agreement, the scientists were of the view that the surface temperature of earth lies within a safe zone if the temperature does not increase by more than 2 degree Celsius. Unfortunately, they discovered that the way the rate of CO2 is emitted; the surface temperature will increase by 3 to 4 degree Celsius in near future. The Report says that overall, the average surface temperature of earth for last 150 years has already surpassed the current temperature and unless it is tied down to 1.5 degree Celsius, the sea level will rise significantly enough to sink many low lying nations around the globe. (source: Indian Daily, "The Anandabazar Patrika,", Calcutta 9 Oct 2018)

What is Climate Change

Australian Academy of Science in Canberra defines climate change as a change in pattern of weather related changes in oceans, land surfaces and ice sheets, occurring over timescales of decades or longer. Weather is the state of atmosphere - its temperature, humidity, wind, rainfall and so on - over hours to weeks. It is influenced by the oceans, land surfaces and the ice sheets, which together with the atmosphere forms "the climate system". Climate change is the change in the statistical properties for several decades or longer - usually at least 30 years. These statistical properties include average variability and extremes. Climate changes may be due to natural process, such as change in the Sun's radiation, volcanoes or the internal variability in the climate system. It may also be due to human influence such as use of fossil fuels, deforestation or growth of urbanisation *(Source: Australian Academy of Science, ACT, Canberra)*. Climate differs from weather, in that weather only describes the short-term conditions of these variables in a given region.

Global Warming

Global warming is a long term rise in the average temperature of the Earth's climate system. The term commonly refers to the human-caused observed warming since pre-industrial times and its projected continuation, though there were also much earlier periods of global warming. In the modern context, the terms global warming and climate change are commonly used interchangeably, but climate change includes both global warming and its effects, such as changes to precipitation and impacts that differ by region. According to Wikipedia, global warming is projected to have a number of effects on the oceans. Ongoing effects include rise in sea levels due to thermal expansion and melting of glaciers and ice sheets, and warming of the ocean surface, leading to increased temperature stratification *(Source: Wikipedia)*.

There is a proven correlation between existence of life on earth and atmospheric "greenhouse". This nothing but a layer of gases, primarily water vapour, in the lower atmosphere, that trap heat from the sun. When it is as it is reflected back from the earth, it radiates back to keep our planet at a temperature capable of supporting life. Human activity is currently generating huge amount of greenhouse gases in form of carbon dioxide, methane and nitrous oxide etc. that unlike water vapour does not dissipate in response to rise in temperature, resulting in continuing build-up of

heat. Use of fossil fuels increases carbon dioxide (CO2), and deforestation reduces the amount of plant life available to turn CO2 into Oxygen. According to the WMO, the build-up of greenhouse gases in the atmosphere alters the radiative balance of the atmosphere. The net effect is to warm the Earth's surface and the lower atmosphere because greenhouse gases absorb some of the Earth's outgoing heat radiation and reradiate it back towards the surface. *(**Source**: United Nations Framework Convention on Climate Change (UNFCCC)*

The year 2018 was likely to be the fourth warmest year on record since 1880. Besides the heat wave, the year 2018 also witnessed numerous climate related extremes, including devastating storms, flood, heatwave and droughts causing many thousands of casualties and huge economic loss for many nations around the world. The IPCC report of 2018 details how climate variability and extreme events will escalate with increased global temperatures. It further stresses the fact that many impacts will be irreversible even if temperatures decrease again in the long run. The Panel report bluntly said in October 2018 that the world has at most 12 years to make the drastic and unprecedented changes needed to prevent average global temperatures from rising beyond the set target of 1.5 degree Celsius. The accelerating pace of biodiversity loss is a particular concern as it greatly affects ecosystems such as ocean and forest rendering them incapable of absorbing carbon emissions to a satisfying range. Global carbon emission reached a record high in 2018, rising by an estimated 3.4 per cent in the U.S. alone. A Colombia Engineering Study, published in journal, "Nature" confirms the urgency to tackle climate change. *(Source: Colombia University School of Engineering and Applied Science, Study published Jan23, 2019)*. As United Nations Secretary General Antonio Guterres said at the opening of the 24th annual U.N. Climate conference on December 3, 2018, *"we are in deep trouble with climate change"*.

The current "Nationally Determined Contributions (NDC)"of major developed nations to generate high energy emission looks very alarming as is evident from the Exhibit 1 that outlines the number of countries in the world who would contribute to 60% of the total green house gas emission by 2030..The above report conclusively demonstrates the vulnerability of earth's ecosystems as the number of countries that have peaked in their emission is likely to increase from 19 nations in 1990 to as high as 57 by 2030. These 57 countries are reported to be contributing to 60% of global emission in the atmosphere and unless this trend is reversed, one can easily gauge how difficult would it be to save the world from the current phenomenon. The Exhibit 2 will provide a detailed comparison of estimated emissions under current policies of some major industrialized countries signifying the amount of contribution by the each such country to the total global Green House Gas (GHG) produced at the end of 2017.

Effects of Climate Change

A study published on 24 May 2016 in scientific journal, "Nature Climate Change", London, UK, (as reported by the climate editor in the Sydney Morning Herald) found impacts that were "considerably larger" than previously indicated. For instance, by 2300, global temperature would range from 6.4 to 9.5 degrees warmer than pre-industrial times with a mean warming of 8.2

degrees. Arctic regions would warm by as much as 19.5 degrees, researchers observed. Such climate changes, if materialised, would have extremely profound impacts on ecosystems, human health, agriculture, economies and other sectors", the Paper further added. (Source Sydney Morning Herald, 26 May 2016, climate editor: Peter Hannam).

UN Office for Disaster Risk Reduction (UNISDR) said in its latest report that economic losses caused by climate-related disasters have soared by about two and a half times in the last 20 years. From 1988 to 2017, direct losses from all disasters totalled US$2.9 trillion, of which 77 per cent was due to extreme weather that is intensifying as the world warms. Integovernmentall Panel on Climate Change (IPCC) has recently reconfirmed that human-induced global warming is gathering pace and is affecting many critical aspects of life including food, water, and energy and livelihood security. The reason for climate change and increasing concentrations of greenhouse gases, mainly carbon dioxide, due to fossil fuel use - are also scientifically well established by now. Countries closer to equator - including India - are already facing more impacts of climate change than countries in temperate regions. Scientific studies show that this trend is likely to accelerate over time. *(Source: "India Climate Dialogue")* The White house also released their latest report on ***National Climate Assessment***, a mandated document to be published every four years by law. The Report, endorsed by NASA and 12 other scientific agencies of US Government concludes that the earth's climate is now changing faster than at any point in the history of modern civilization, primarily as a result of human activities. This is what is known as "Green House Gas Emission" causing "Global Warming". The planet earth contains 3/4th of water with 1/4th of land mass. By 2100, the whole planet will go down under the sea, said the latest UN Report. The burning of fossil fuel, coal and wanton deforestation alarmingly pumped harmful green house gas (GHG) in form of carbon monoxide, carbon dioxide (CO2). Methane, nitrous oxide in the atmosphere.

Temperatures are rising in the Arctic, the polar region of the planet, causing world's glaciers to melt faster than new snow and ice can replenish them. Another manifestation of global warming is "melt 'caused by increased reduction of arctic ice and gradual retreat of glaciers. The "melt "means there is less thick sea-ice that persists for multiple years. In general, as ice melts, sea level rises. The researchers found that some glaciers retreated up to 15 times as much as they would have without global warming. WMO reveals in its report that unless GHG is curbed immediately, the global sea level could rise by 3 feet by 2100 causing rapid inundation of low lying nations in the world. The World Economic Forum's Global Risk Report 2019 shows that around 90% of all coastal areas will be affected to varying degrees. Some cities will experience sea level rise as high as 30% above the global mean. But coastal living would be a liability to the countries as cost of sea level rise could rise many billions of dollars over the period.

The "Global Warming Science Canberra" study of Australia warns that

- The Earth is at a risk of entering an irreversible "hothouse" climate
- Many parts of the planet could become uninhabitable

- The Earth is already more than halfway towards the point of no return

The UN Report further revealed that if global warming is raised by another 2 degree Celsius, then by 2100, the uncontrolled warming effect will raise the sea level by 16 feet in one jump. However, Paris Accord of 2005 endorsed by 194 nations has set a limit of global warming so as not to increase by more than 2 degree Celsius. It is doubtful if the world's first series of nations like USA, China would be able to reach that target by 2030 because of America's decision to abandon the UN process, the newspaper report revealed.

Climate Change and Insurance Loss

Extreme weather caused fourth highest number of insured losses during 2018 (Swiss Re Report, Natural Hazards 2018). According to Munich Re's Geo Risk Research Centre, insurance losses from weather related events occurring due to effects of climate change, are mounting progressively over the period. In North America alone, the losses have risen fivefold accounting for half the US$1 trillion in worldwide weather catastrophes between 1980 and 2011, as observed by Munich Re in their report. As documented in the latest Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), the vast majority of scientists expect an increase in the number of weather related natural disasters as a result of climate change. The consequences of climate change are diverse and are affecting the insurance industry. Extreme weather events are also due to climate change. *Dr Eberhard Faust and Peter Hoppe of Munich Re remarked that "scientific opinion is almost unanimous that climate change is predominantly caused by human activity and that it influences weather extremes like windstorms, hail, torrential rain and heatwaves" (Source: Munich Re Report 2018).*

The costliest back to back for years 2017-2018 for weather disasters globally on record, were estimated at US$6,536 billion emanated from 394 individual events. Worldwide, year 2018 alone, experienced economic loss of natural disaster for an amount of US$225 billion (weather related loss: US$215 billion), of which insurance related losses were in the range of US$90 billion (**Source**: *AoN Australia, Annual Report 2018).* Within this context, it may be pertinent to refer to to the Exhibit - 3 that will demonstrate the scenario of economic losses and the relevant share of insured losses during last 20 years caused by natural disasters as a result of global warming.

In the context of increasing trend of insurance losses emanating from natural disaster, most of which may be caused due to climate change and resultant global warming, there is a growing trend across the world that reveals that climate change disclosures may result in significant number of claims under Directors & Officers (D & O) liability policies. Of late, there has been an increased tendency to initiate law suit seeking to establish Directors & Officers liable of being" negligent to climate risk associated with their corporate entities. Climate change is therefore no longer an environmental issue or a compliance risk issue. It is a corporate issue". (**Source**: Australian Law Bulletin, Sept 2009). As such the insurance industry becomes vulnerable to the future risk of liability claims linked to climate change. Directors and officers may face a different

kind of exposure. They have a duty of care to assess the impact of climate change and transition risk in their corporate balance sheet..Breach of these duties may well result in significant D&O liability claims. (**Source:** *"The rising tide of climate change liability", article by Clyde & Co 6 Sept 2018, ANZIIF Journal Australia*) .Regulatory pressures have long been building constant pressure on the companies involved in the activities that could be exacerbating global warming and its resultant weather-related natural catastrophes. For instance, Australian Prudential Regulatory Authority (APRA) revealed that it views climate change as a "material" risk, and that it will be monitoring and watching very closely on the financial risks created by global warming and also how the financial system may be affected by a move away from carbon intensive energy. (**Source:** *Geoff Summerhayes, Executive Board Member, APRA on a Paper presented to Insurance Council of Australia Annual Frum,17 Feb 2017*).

Indian Scenario

The published report of American Meteorological Society shows that recent extreme weather could not have happened without warming unless it was caused by human-induced climate change. A study released by the UN Office for Disaster Risk Reduction (UNISDR) said India suffered economic losses of US$80 billion during 20-years period of 1988-2017. India has been ranked among world's top five countries in terms of absolute economic losses. Globally, disaster losses during this period have been estimated at US$3 trillion (**Source:** *Times of India dated 11 Oct 2018*). Many of the natural disasters in India are related to the effect of climate change. Droughts flash floods, cyclones, landslides bought by torrential rains, and snowstorms pose the greatest threats. Devastating flood in South Indian state Kerala during August 2018 is the case in point. An epitome of scenic beauty was devastated by natural calamity reported to be largely caused by human intervention. It was a calamity that happened one in 100 years. (**Source**: *Wikipedia*) No one had ever predicted the magnitude of this event. Extremely heavy rainfall in a short space of time also triggered landslides that killed many people. NASA observed that cloud banding around Western Ghats in Kerala region has caused this unprecedented rain leading to "Flash Flood". An initial Govt. estimate has put the financial loss from this flood at Rupees 185 billion (A$3.75 billion that caused death to 350 people displacing another one million. Kaldor Committee report as initiated by the Govt. of India stressed that *"increased deforestation, rapid construction of reservoirs and building close to the rivers without caring the capacity of sustainability of underground soil, unregulated encroachment of land and excessive quarrying etc.* have all aggravated the situation in an ecologically fragile Western Ghats region of Kerala. The Exhibit 4, by contrast, characteristically portrays the Indian scenario of natural disasters illustrating the significant impact of weather related events predominantly caused by effects of climate change. Typical feature of "Under Insurance or Non-insurance of properties" in India establishes the reasons for wide disparity between economic losses and the losses paid by the insurance companies.

According to International Disaster Database (IDB), as per historical records (1947-2017), India

stands third in terms of economic loss suffered due to natural disasters among the countries with a comparable area or population. Among th BRICS countries, India stands at the second position in terms of losses suffered (Source: www.moneycontrol.com, Dec 07, 2017).

Causa Proxima Relationship

Insurance contract is governed by 5 cardinal principles, one of which is the proven record of "causa proxima relationship" between cause and effect. The cause producing the effect should be primary in nature in an unbroken chain of events. If the primary cause is the insured peril, then the loss is payable. For instance, when the coastal town is flooded and produce extensive damages to property and cause a loss of many lives, it is prudent to establish the root cause which is predominant to establish the "causa-proxima relationship "from cause to event. In the instant case, rise in sea water beyond acceptable range is caused by ongoing effects of global warming on the oceans due to thermal expansion and melting of glaciers and ice sheets and warming of the ocean surface, leading to increased temperature stratification. This warming process of oceans begins with "anthropogenic climate change" which is caused by human intervention causing global warming. (**Source:** *Australian Academy of Science, ACT, Canberra*). Likewise, the bleaching of coral reef in Gold Barriers Reef, Queensland Australia is proved to have been caused by deoxygenating effect on ocean near the reef because warmer oceans cause deoxygenation since oxygen is less soluble in warmer water. Scientists have just detected a major change to the earth's oceans linked to a warmer climate and noted that 90 percent of global warming actually ends up in ocean. In a paper produced by Prof. Chris Mooney of Macquarie University Australia said, *"When the ocean warms up, they expand, because that's what warm water does. This raises our sea levels and reduces the amount of oxygen dissolved in the water. He further said that if surface water is warmer, it does not mix down as much into the ocean depths any longer. It is less dense and so incapable of doing that (Source: Prof Chris Mooney, the Washington Post February 25, 2017).* Similar instance may be a case in point in the field of Aqua Culture as reported in National Geographic. The researchers discovered that rising temperatures around Pacific Ocean causing oceans warmer can turn sea turtles populations female. Since the sex life is determined by the heat of the sand incubating their eggs, scientists have suspected that climate change, after all, has driven air and sea temperature higher, which, in these creatures favours female offspring and they found that most important green sea turtles from the Pacific Ocean now outnumber males by 116 to 1. *(Source: National Geographic, article by Craig Welch, 09 Jan 2018)*. This is also corroborated by an article published at *"www.thenewdailey.com.au"* dated 6 Jan 2019 *by John Elder when he said that "at higher temperatures, green turtle embryos become female. At cooler temperature, they turn into males".* Therefore, the principles of "Causa-Proxima" relationship could be established in the field of Aqua Culture insurance to determine the admissibility of claim in question (**Source:** *www.thenewdailey.com.au, 6 Jan 2019*).

Climate Control Process Via Paris Accord

According to scientist, the mankind now stands at the threshold of 'Climate Emergency".

Australia's chief scientist, Prof. Alan Finkel, while giving his interview to ABC TV at their "Q & A Session" on March 14, 2016 observed that *"what we are doing with solar, wind. Changing practice, behavioural practices and things like that, we are not winning the battle"*. UN Framework Convention on Climate Change (UFCCC) initiated formation of "Kyoto Protocol" in Dec 1997 primarily to encourage member nations to facilitate stabilisation of greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic (human) interference with the climate system. As on 2017, top 4 countries in the world accounted for 56 per cent of total Green House Gas (GHG) emission in the atmosphere. The global leaders, sensing the urgency to address the burning issue of climate change, decided to adopt "the Kyoto Protocol" in December 1997 under UN Framework Convention on Climate Change (UNFCCC) which was ratified by 197 nations. This was subsequently operationalised on February 16, 2005 by setting a national pledge by the member nations to reduce the GHG emission. In order to give a national pledge to commit to a set target, the Paris Agreement (French: Paris de Accord) was established at Kotowice, Poland known as COP24. That changed the paradigm of climate diplomacy. A key element of the Paris Agreement is the global stock take - a five-yearly assessment of whether member countries are collectively on track to meet the Paris Agreement's goal to limit the global temperature increase by 2100 to less than 2C and as close as possible to 1.5C. **(Source:** *Emission Gas Report, 2018, UN Environment Program)*. Under the Convention, the countries were encouraged to undertake a climate control process through enhanced "Nationally Intended Contribution" (NDC) reflecting increased mitigation ambition. The secretary-general of the UN has warned that the world is facing "a direct existential threat" and must rapidly shift from dependence on fossil fuels by 2020 to prevent "runaway climate change".

Conclusion

The Paris Agreement delivered the blue print for a global response to climate change. National pledges were taken by the member countries to reduce their degree of GHG emissions in the atmosphere. However, addressing the climate problems might subvert the quest for endless growth. We can only hope that wise counsel would prevail. The Paris Agreement succeeded by changing the paradigm of climate diplomacy. The rulebook can help turn it into a reality from the anticipation provided it stays faithful to the Accord. When 190 nations signed the 2015 Paris Accord on climate change, they agreed to limit the global temperature increase by 2100 to less than 2C and as close as possible to 1.5C, since industrial age. Unfortunately, the global consensus is now facing some degree of uncertainty by the announcement from President Trump's administration that US would leave the pact; and now Washington has formally communicated this to the UN (**Source:** *ABC News Australia, 4 Aug 2017*). In the end, the Quote from Sir David Attenborough is very heart warming when he concluded his speech in Davos WEF saying: *"Over the next 2 years there will be United Nations decisions on Climate Change, Sustainable Development and a New Deal for Nature. Together these will form our species' plan for a route through the Anthropocene. What we do in the next few years will profoundly affect the next few thousand years"*.

References

- *AoN Australia, "Weather, Climate and Catastrophe Insight", Annual Report 2018*
- *ABC News Australia, 4 Aug 2017, www.abc.net.au*
- *ANZIIF Journal Australia, "The rising tide of climate change liability", article by Clyde & Co, 6 Sept 2018*
- *Australian Prudential Regulatory Authority (APRA), Mr Geoff Summerhayes, Executive Member of the Board, Speech delivered to Insurance Council of Australia Annual Forum, Sydney 17 Feb 2017*
- *Academy of Science, Grafton ACT 2601, Canberra, www.science.org.au, "The Science of Climate Change: Questions & Answers"*
- *The Anandabazar Patrika, Indian Daily Calcutta, Editorial :Anjan Bandopadhaya, 10 Oct 2018*
- *Colombia University School of Engineering and Applied Science, Study published, Jan 23, 2019) :"Climate change tipping point could be coming sooner than we think" Jan 23 2019, By Holly Evarts.*
- *Emissions Gas Report, 27 Nov 2018, United Nations Environment Programme (ISBN: 978-92-807-3726-4)*
- *Global Risks Report (Global Risk Perception Survey - GRPS), World Economic Forum 2019, 14th ed.*
- *"Global warming and massive heatwaves", Prof. Chris Mooney, The Washington Post, February 25, 2017*
- *India Climate Dialogue, www.indiaclimatedialogue.net*
- *Munich Re, "Climate Risk & Natural Hazard", Dr Eberhard Faust (Head of Research) & Peter Hoppe, 14 March 2018*
- *"Natural Catastrophe and Climate change", Swiss Re, Report, 2018*
- *"Rising Temperatures cause sea turtles to turn female" By Craig Welch, National Geographic 8 January 2018*
- *Sir David Attenborough, "The Garden of Eden is no more", Speech delivered at Davos, WEF, Dec 2018*
- *Sydney Morning Herald Australia 26 May 2016*
- *Times of India, 11 Oct 2018*
- *United Nations Framework Convention on Climate Change (UNFCCC), The Paris Agreement, 22 Oct 2018*
- *Washington Post, 25 February 2017*

Exhibit 1:

No. of countries that have peaked or are committed to peaking in their emissions by decade (aggregate) and percentage of global emission covered (aggregate)

Range of Period	No. of Countries Peaked	%-of global emission covered
By 1990	19	21%
By 2000	33	18%
By 2010	49	36%
By 2020	53	53%
By 2030	57	60%

Source: Emission Gas Report 2018, UN Environment Programme - Executive Summary

Exhibit 2:

Level of world Green House Gas (GHG) Contribution by major Countries

CHINA	26.80%
USA	13.90%
EU NATIONS	9%
INDIA	7%
RUSSIA	4%
JAPAN	3%
BRAZIL	2.30%
INDONESIA	1.70%
CANADA & KOREA	1.60%

Source: Advisory Committee's Report on UN Environment, UNEP, Page 112, Nov 2018

Exhibit 3 :

Aggregate Economic Loss by Peril since year 2000 (in US$ Million)

Type of Peril	Economic Loss	Insured Loss	No. of Events
EU Windstorm	74	43	10
Wild Fire	149	55	10
Winter Weather	164	58	26
Droughts	372	74	9
Severe Weather	514	315	106
Earthquake	757	100	58
Flooding	914	165	114
Tropical Cyclones	1,253	408	52
Other Losses	15	1	9
20-Years Total:	4,212	1,219	394

Source: AoN Australia, "Weather Climate and Catastrophe Insight" 2018 Annual Report (Page 4)

Exhibit 4:

Indian Scenario of Experience of Natural Disasters INDIA, Year 2018

Type of Event	Duration Period	Fatality	Economic Loss (US$ Million)
Severe Weather	16-28 February	0	47
Severe Weather	11-Apr	42	100
Severe Weather	17-Apr	18	100
Severe Weather	2-3 May	143	24
Seere Weather	6-9 May	32	50
Flooding	17-20 May	6	10
Severe Weather	28-29 May	54	25
Flooding	1 June-20 Aug	1,100	700
Severe Weather	6 Aug-12 Dec	61	50
Cyclone Titli	11-13 Oct	85	920
Cyclone Gaja	16-18 Nov	63	775

Source: AoN Australia, Weather Climate and Catasrophe Insight, Annual Report 2018 (Page 66)