Volume 1. No. 2

ECONOMY POLITY ENVIRONMENT

An International Peer-reviewed Journal of Social Studies

Managing the Environment and Future Sustainability of the Earth: A Synoptic Review

Sovik Mukherjee[1]

Abstract

We all know that through the actions of the IMF, WTO and its precursor GATT, the World economy entered a period aptly described as the post-war economic boom. With the advent of this economic boom also came the explosion of productions; on its heels flourished the wave of consumerism, with little regard for the environmental consequences. The paper, however, is an attempt to provide fresh perspective on global warming and climate change. It essentially forwards some points. First, that especially due to momentum in economic and demographic processes, it is sure that there will be a major rise in atmospheric CO2 during the 21 st century. Second, that the coming rise in global temperatures will be faster than anything that human populations have experienced ever. Finally, the agricultural, political, economic, demographic, social and other consequences of future climate change could be very considerable. In a more and more populous world of eight to ten billion people, adverse development could well occur on several fronts simultaneously, and to cumulative adverse effect. Notice that in 2000 the world's population of 6.09 billion was releasing about23.2 billion tons of CO_2 through the combustion of fossil fuels – implying an average annual per capita emissions figure of about 3.8 metric tons. The two very poor regions like the sub- Saharan Africa and that of South-central Asia (which includes India, Pakistan, and Bangladesh) taken together, during the period 2000-2050, to account for about two-thirds of the growth in world population over this time period. And for the developed regions too demographic growth produces a 16% rise in total emissions (i.e. from 12.8 to 14.8 billion tons.) In this context it is worth noting that projections made by the International Energy Agency (2005) suggest that between 2005 and 2030 energy –related CO_2 emissions may rise by 52%-- implying an annual growth rate of 1.7%.

In the above backdrop, the present paper discusses in Section II the impacts of anthropogenic actions on the environment. Aim of this section is to introduce different types of pollution effecting the environment and living organisms. Issues such as global warming, ozone depletion, acid rain and air, water and soil pollution are reviewed. If the eco-systems are damaged or polluted, we ourselves as human beings still being a single species living within a series of these eco-systems linked at a global level are affected lock, stock and barrel. This section also has focused on the mechanism of pollution and the key issues related to them. Section III is a review of different protocols that have been proposed by national regulators in a world-wide effort to preserve and protect the planet for present and future generations. The protocols like the Montreal Protocol 1987 and the Kyoto Protocol 1997, and the convention like the Vienna Convention, the Rio declaration on environment and development clearly show that governments have become more and more environmentally conscious and decided for an improvement in environment which is a must. . Also, the focus is on why these major protocols had to be enacted. This section also gives some viewpoints of the opponents who rejected these treaties as a 'deeply flawed agreement'. Finally conclusions offer brief thoughts on the future of the environment and its sustainability.

Keywords: *Consumption expenditure, Economic reforms*

Received on August05, 2018; Revision received: November 26, 2018, Accepted: December 15, 2018

Introduction

We all know that through the actions of the IMF, WTO and its precursor GATT, the World economy entered a period aptly described as the post-war economic boom. With the advent of this economic boom also came the explosion of productions; on its heels flourished the wave of consumerism, with little regard for the environmental consequences.

[1] Assistant Professor, Department of Economic, St. Xavier's University, Kolkata, India
Corresponding Author Email: sovik1992@gmail.com

To meet the demand of increasing production as well as consumerism, a clear picture of harms they have breathed is also noticeable. Noticeable is the concentration of Greenhouse Gas Emissions and other environmental hazards that have increased over the years owing to human activities. Scientific evidence suggests that a continued increase of that gas concentration and other types of pollutions are likely to have significant effects on the climate. The age of environmental activism was thus born. Environmental and social costs of the progress of consumerism that is accelerating on a global scale with the advent of sophisticated products and services, economic growth being the paramount driver in this context, are being questioned and challenged. It is unquestionable that modern economic growth has raised levels of atmospheric CO_2—leading to a rise in the Earth's surface temperature and the threat of climate change inviting disparities in energy use, CO_2 emissions, and living standards between rich and poor. Thus the central dichotomy that every country is facing today is how to maintain economic growth and progress while protecting and enhancing the environment. The growing demands for conservation of nature and its sustainability have driven country after country to deliver solutions using rules, regulations and legislations.

The paper, however, is an attempt to provide fresh perspective on global warming and climate change. It essentially forwards some points. First, that especially due to momentum in economic and demographic processes, it is sure that there will be a major rise in atmospheric CO2 during the 21st century. Second, that the coming rise in global temperatures will be faster than anything that human populations have experienced ever. Finally, the agricultural, political, economic, demographic, social and other consequences of future climate change could be very considerable .In a more and more populous world of eight to ten billion people, adverse development could well occur on several fronts simultaneously, and to cumulative adverse effect. Notice that in 2000 the world's population of 6.09 billion was releasing about23.2 billion tons of CO_2 through the combustion of fossil fuels – implying an average annual per capita emissions figure of about 3.8 metric tons. The two very poor regions like the sub- Saharan Africa and that of South-central Asia (which includes India, Pakistan, and Bangladesh) taken together, during the period 2000-2050, to account for about two-thirds of the growth in world population over this time period. And for the developed regions too demographic growth produces a 16% rise in total emissions (i.e. from 12.8 to 14.8 billion tons.) In this context it is worth noting that projections made by the International Energy Agency (2005) suggest that between 2005 and 2030 energy –related CO_2 emissions may rise by 52%-- implying an annual growth rate of 1.7%.

In the above backdrop, the present paper discusses in Section II the impacts of anthropogenic actions on the environment. Aim of this section is to introduce different types of pollution effecting the environment and living organisms. Issues such as global warming, ozone depletion, acid rain and air, water and soil pollution are reviewed. If the eco-systems are damaged or polluted, we ourselves as human beings still being a single species living within a series of these eco-systems linked at a global level are affected lock, stock and barrel. This section also has focused on the mechanism of pollution and the key issues related to them. Section III is a review of different protocols that have been proposed by national regulators in a world-wide effort to preserve and protect the planet for present and future generations. The protocols like the Montreal Protocol 1987 and the Kyoto Protocol 1997, and the convention like the Vienna Convention, the Rio declaration on environment and development clearly show that governments have become more and more environmentally conscious and decided

for an improvement in environment which is a must. Also, the focus is on why these major protocols had to be enacted. This section also gives some viewpoints of the opponents who rejected these treaties as a 'deeply flawed agreement'. Finally conclusions offer brief thoughts on the future of the environment and its sustainability.

II. The Main Concern of Climate Change

The main concern of climate change centers on the global warming effect. The predicted warming is called greenhouse effect which is directly associated with human industrial activities, particularly the burning of fossil fuels such as oil, coal and natural gas. The earth's global average temperature during the last two centuries has risen by between 0.4-0.8^{0}C. The primary cause is the release of large quantities of greenhouse gases in the atmosphere.

The main gas of concern is carbon dioxide (CO_2), a product of the burning of fossil fuels and non-renewable biomass. Carbon dioxide plays an important role within the atmosphere providing a means of transferring carbon within ecosystems, allowing photosynthesis to take and allowing human to breathe..

CO_2 is not alone in creating a warming effect; methane (CH_4), Nitrous Oxide (N_2O), Ozone and CFC gases all create, to a larger or smaller extent, the same result. Most of these gases exist naturally in the atmosphere and are responsible for making the planet habitable .Without greenhouse gases, the Earth would be 33^{0}C colder and the diversity of life would not have developed. At the other end, large amount of these gases trap heat and increase the Earth's temperature.

II. 1 The Greenhouse Effect

The greenhouse effect is a relatively simple and well understood natural phenomenon. It was originally described in 1827 by the physicist-mathematician Jean Baptiste Fourier. The effect takes its name from its resemblance to a garden greenhouse, where glass panels let in visible radiation and hinder the exit of long wave thermal radiation. This increases the indoor temperature. The Earth receives a relatively constant amount of energy in the form of 'incoming' radiation. Light consists of visible spectrum, ultra violet and infrared. Some of this energy is reflected directly back out to space by the atmosphere and the surface, but approximately 70 per cent is absorbed. This absorption raises the temperature of the Earth's surface and consequently that of the atmosphere. The same amount of energy is emitted back into space as thermal or 'outgoing' radiation. This balance between incoming and outgoing energy is necessary to maintain average temperature levels of approximately 15^{0}C .

Concern about the greenhouse effect generally focuses on the increase in the concentration of greenhouse gases from anthropogenic process. When greenhouse gas concentration increases, more heat is captured causing an increase in Earth's average temperature and that will raise sea levels through melting of the polar ice and thermal expansion of the oceans thus having disastrous consequences for people living in low-lying countries or coastal regions.

Were the rate of temperature increase to be rapid, organisms would not be able to adapt quickly enough, jeopardizing the survival of numerous spices.

Approximately 80 per cent of the extra CO_2 originates from fuel combustion such oil, coal and gas. The remaining 20 per cent is emitted from 'slash and burn' deforestation methods, natural forest fires, volcanic activity and other changes in the tropics. About 55 per cent of the CO_2 is absorbed by the oceans, by northern hemisphere forest and more generally by plant growth. Overall, the concentration of CO_2 has increased since pre-industrial revolution times by 33 per cent (*Lomborg* 2001).

Since 1751 approximately 305 billion tons of carbon have been released into the atmosphere from the consumption of fossil fuels and cement production. Half of these emissions have occurred since the mid-1970s. The 2003 global fossil-fuel CO_2 emission estimate, 7303 million metric tons of carbon, represents an all-time high and a 4.5 per cent increase from 2002.

Greenhouse gases affect global temperatures both directly and indirectly. Direct effects happen because the gas itself is a greenhouse gas and indirectly because the climate acts as a natural chemistry set. The atmospheric transformation processes that break the gases into less harmful compounds can produce other greenhouse gases.

Although different scenarios have been published regarding global warming and temperature rises, it is difficult to make accurate predictions. Some scenarios are more dramatic; others are more optimistic. These perspectives stem from differences with respect to predicted CO_2 levels. The Inter-governmental Panel on Climate Change (IPCC) prediction of an increase of $1.5\text{-}4.5^0$C in global temperature has remained constant since 1970. No predictions over the last 25 years have suggested that conditions will improve, rather they confirm an even more pessimistic view of future temperature change (Henckens et al., 2019).

II. 2 The Ozone Hole

The catalytic destruction of ozone from depleting compounds (ODCs) in the stratosphere originally was theorized and proposed in 1974 by Mario Molina and Sherwood Rowland. The ozone hole above Antarctica was first confirmed in 1982 by the British Antarctic Survey Team and was brought to light in the British Science Journal '*Nature*' in 1985. Since then, research on the principles of ozone depletion have made significant advances and helped to create a global environmental awareness and consensus for action. Within two years of its publication in '*Nature*', the Montreal Protocol in 1987 took steps to ban ODCs such as CFCs.

II.2.1 Significance of Ozone

Ozone, derived from the Greek 'azein' ('to smell'), is a natural gas in the earth's atmosphere. It is considered to be a trace gas, naturally existing in extremely small amounts. Ozone is a

'Janus faced' molecule. In the lower atmosphere it is a toxic oxidizing agent that causes lung irritation. In the upper atmosphere it is transformed into a guardian of life on the earth. Approximately 90 per cent of ozone lies within the stratosphere. Maximum ozone concentration occurs in the middle of the stratosphere in the so-called ozone layer.

Sunlight consists of radiation of various wavelengths that can be harmful to humans, such as ultraviolet. One of the impacts of the increased Ultraviolet-B radiation is an increased susceptibility of the immune system, reducing natural defenses against infectious and fungal diseases (Martens, 2013). The World Health Organisation claims a 10% decrease in stratospheric ozone would cause an additional 300,000 non-melanoma and 4,500 melanoma skin cancers and between 1.6 and 1.75 million more cases of cataract each year. This is nothing but the ozone hole effect on health.

II.2.2 Homogeneous Ozone Depletion

Human activities are causing an imbalance between natural production and destruction of stratospheric ozone. Nitrous oxide from increased fertilizer usage results in an estimated 0.28 per cent increase in NO_2 concentrations every year. The production of foam and refrigerant coolant relied heavily on compounds that containing the ozone depleting chemicals chlorine (Cl_2) and bromine (Br_2). When emitted into the atmosphere, these compounds migrate from the troposphere through the tropopause and accumulate in the stratosphere. Here they are broken down by ultraviolet radiation.

It takes many years for the ODCs to reach the stratosphere and undergo destruction. Despite the abandonment of these materials by the older industrialized nations, this long life cycle allows the release of chlorine to continue for many decades.

Another mechanism for ozone depletion involves hydrogen chloride (HCl). HCl is formed by reactions with methane, a gas created from varied sources such as natural gas emissions, cattle, coal mining and oil extraction and refining. Besides there are Heterogeneous Ozone Depletions phenomena likely to occur in the polar regions and over middle latitudes. The theories suggest that the total concentration of all chlorine containing compounds can deplete ozone considerably more under certain conditions like those that prevail in the Arctic during winter and summer. These conditions can make HCl and ClONO2 become very active Cl and ClO as they react to aerosol surfaces and therefore increase ozone depletion. It is to be noted that the scale of the ozone hole and its proximity to Australia, South Africa, Chile and Argentina. Weather systems drive the boundary gaseous areas out and mix low ozone and high ozone concentrations. This makes it very important for humans to protect against high ultraviolet (UV) radiation.

Effect of Ozone Depletion

Depletion of the ozone allows greater amounts of radiation to reach the Earth's surface. But not all radiation has the same effect on living organisms. Partial exposures to UV radiation are necessary for the formation of Vitamin D in humans. There are three classes of UV

radiation: UV-A (wavelength above 320 nanometres), UV-B (290-320 nm.) and UV-C (40-290 nm.). The latter two can be extremely harmful and cause severe biological injury.

UV-B radiation

UV-B radiation is responsible for DNA damage. The main effects on human are skin cancer, cataracts and immuno-suppression. Cataracts and cataract-related blindness is related to long-term and cumulative exposure to UV-B. Acute exposure can cause 'snow-blindness.

II.2.3 The Other Off-Shoots

Air Pollution

Of all the different types of pollution, air contaminants are the most significant. However, since the industrial Revolution, air pollution has increased dramatically.

The principal air pollutants are:

- particles (smoke and soot from industrial plants, diesel engines and volcanic ash);
- sulphur dioxide (SO_2) that creates acid rain;
- ozone (O_3);
- lead;
- nitrogen oxides (NO and NO_2, NO_3);
- carbon monoxide (CO)

The main sources of these pollutants are transportation (cars, trucks and motorcycles), aviation and industry. This type of pollution can be seen in all major modern cities and has been cited as a key factor in the growing incidence of pulmonary disorders, particularly amongst children.

Climatologists are stressing that the roots of both global dimming causing pollutants and global warming causing greenhouse gases have to be dealt with together and soon.

Acid Rain

Acid rain occurs when sulphur dioxide (SO_2) and nitrogen oxides (NO_x) react with water, oxygen and other chemicals in the atmosphere to form acidic compounds such as sulphuric or nitric acid. The main source of SO_2 and NO_x is fossil fuel combustion. The phenomenon of acid rain becomes noticeable in different parts of the globe.

River Pollution

Apart from soil pollution (created by the metallurgical industries in the 20th Century, happened in Europe, Eastern North America, Ex-Soviet Union States, Japan and Love Canal areas located in Niagara Falls region of New York State, the last being the most widely reported case of the chemical pollution), water pollution, oil pollution in the Seas and

Oceans, pollution in seas and oceans itself, pollution in rivers is of major concern because they form the major source of water for drinking, agriculture irrigation, and everyday use for human activities. In order for water to be suitable for use there are some certain criteria. Water must not contain E-coli bacteria or any other water-borne enzymes and viruses. There is some correlation between the wealth of a country and how polluted its rivers are. This is due to the fact that poorer countries have not invested in the technologies required to treat waste and hence dump them untreated directly into rivers.

Chemicals are another issue concerning river pollution. Fertilizers used in agriculture illustrate these concerns. A principle constituent of these products is Nitrogen which if allowed to accumulate in drinking water leads to health problems such as stomach cancer.

III. Global Environmental Initiatives

The last two decades, in fact, have been marked by the endeavours of the United Nations and European Union to produce legislation that would help the conservation of the environment at a global scale. Although the first step towards a sustainable environment and future were done back in the 1970s, the efforts were only isolated in countries holding International meetings and mainly discussing environmental stewardship. The decade of 1980swas marked with a serious approach to look into environmental issues. Events such as the discovery of the ozone zone hole over Antarctica, made people realize that if certain measures were not introduced, the Earth could become a much more hostile home. The United Nations Environment Programme (UNEP) and the United Nations Framework Convention on Climate Change (UNFCC) produced a series of protocols, such as the Montreal and Kyoto Protocols, which are considered to be the most significant. These can be seen as the most systematic efforts of world governments to create a sustainable future. Parallel to this endeavour the EU has created its own set of directives which attempt to minimize the anthropogenic impact on the environment and promote sustainability (Dynar, 2006).

Viennna Convention

In 1985, the UNEP Governing Council set up a working group with the objective to create a Protocol for the Protection of Ozone Layer. The Protocol was signed in Vienna by 20 nations.

Table: Estimates of regional and globalization and global emissions of CO_2 produced by the combustion of fossil fuels for around the year 2000 with projected calculation for 2050

Region	Population(millions) 2000	Per capita CO_2 emissions (metric tons) 2000	Total CO_2 emissions (millions metric tons) 2000	Projected Population (millions) 2050	Totals CO_2 emissions (million metric tons) 2050

	(i)	(ii)	(iii)	(iv)	(v)
Developing Regions					
Sub-Saharan Africa	670	0.9	613.8	1692	1,550.1
North Africa/West Asia	335	4.3	1,430.8	628	2,682.2
Eastern Asia	1479	3.4	5,044.6	1587	5,412.9
South-central Asia	1485	0.9	1,368.2	2495	2,298.8
South-eastern Asia	519	1.3	696.1	752	1,008.6
Central America and Caribbean	174	2.8	481.2	256	707.9
South America	349	2.2	771.9	527	1,165.6
Subtotal	5011	2.1	10,406.6	7937	14,826.2
Developing Regions					
Europe	729	8.4	6,106.2	653	5,469.6
North America	315	20.0	6,294.5	438	8,752.3
Oceania	31	11.8	365.0	48	5,65.1
Subtotal	1075	11.9	12,765.7	1139	14,787.0
World	6086	3.8	23,172.2	9076	29,613.2

Data sources: World Resources Institute (2003: 258-259); United Nations (2005)

The Vienna Convention provided the foundations for the Montreal Protocol in 1987. For the first time nations agreed in principle to tackle a global environmental problem before its effects were felt or even scientifically proven (UNFCC 2002). Later on, in the journal '*Nature*." Dr. Joe Farman, a British scientist, wrote about severe ozone depletion in the

Antarctic and his findings would be confirmed by American satellite observations. This resulted in governments taking dramatic, transnational, measures in the form of the Montreal Protocol—a Protocol for reductions of ozone depleting substances agreed in Montreal in 1987, subsequently revised in the London 1990, Copenhagen 1992, Montreal 1997 and Beijing, 1999 amendments, adding more chemicals to the list of controlled substances. Following the amendments, the developing countries were allowed to produce up to 10 per cent of their calculated level of emissions for domestic and essential use.

Montreal Protocol

Ozone depletion was no longer a theory but a real phenomenon that could not be dismissed and which posed a significant threat to the environment. Within a year of the ozone hole's discovery, the Vienna Convention took place, taking the first steps towards relating ozone depletion to human health.

Within the next two years, governments from all over the globe were called to take drastic measures to control and minimize the effect of ozone depletion layer resulting from human activities. On 1 January 1989 the protocol came into force. All the parties agreed to freeze production and consumption of CFCs and halons.

Rio Declaration on Environment and Development

The United Nations Conference on Environment and Development also known as the 'Earth Summit' took place in Rio de Janeiro between 3 and 14 June 1992. This was the largest-ever meeting of world's leaders who came from 179 countries to discuss and take action on the environment. The Summit essentially reaffirmed the UNCED Declaration adopted at Stockholm on 16 June 1972 and sought to build on it (UNEP, http://www.unep.org/). Concern had been growing over the previous two decades about the huge discrepancy between the North and the South. This inequality was seen as symptomatic of a degrading global relationship between environmental stakeholders which could not be sustained for the long term without radical realignment. The challenge in this concept is how to make more people more aware of environmental issues and at the same time move towards sustainable forms of development and lifestyles.

The goal of the Rio Declaration was to 'establish a new equitable global partnership through the creation of new levels of cooperation among States, key sectors of societies and people', in order to 'work towards international agreements which respect the interests of all and protect the integrity of the global environmental and developmental system, recognizing the integral and interdependent nature of the Earth our home' (UNEP 1992).

The Declaration consisted several principles of which one important one was that all countries would have the right to exploit their resources without causing damage to the environment outside their borders and they should create international laws that should compensate those countries whose environment had been damaged because of their negligence.

Another was that, in order to achieve sustainable development, environmental protection should be an integral part of the development process. This development process should be aiming for the eradication of poverty.. Therefore, public awareness of the environment was to be encouraged by government and people should put pressure on societies to pursue sustainable development Hence, nations should create national laws that would protect the environment from pollution and the polluter should bear the cost of pollution. Cooperation between nations should be part and parcell to create an open international economic system to support economic growth and sustainable development in all countries. These environmental policies should not create barriers to international trade and countries should exchange technological knowledge to achieve sustainability. Finally, respecting international laws by all nations, development and environmental protection should be independent.

Kyoto Protocol

On 11 December 1997, with an important meeting of the Climate Convention looming in Kyoto, Japan, with targets and timetables for reducing emissions of greenhouse gases, most notably CO2 from fossil-fuel combustion ,on its agenda, stalling move were being set in motion by a resolution in the US Congress. In short, building on the UN Framework of the Convention Climate Change the Kyoto Protocol 'broke new ground with its legally-binding constraints on greenhouse gas emissions and its innovative "mechanisms" aimed at cutting the cost of curbing emissions.' The Protocol has set out a list of policies.

These policies are:

- enhancing energy efficiency;
- protecting and enhancing greenhouse gas sinks;
- promote sustainable agriculture;
- promoting renewable energy, carbon sequestration and other environmentally-friendly technologies;
- removing subsidies and other market imperfections for environmentally-damaging activities;
- encouraging reforms in relevant sectors to promote emission reductions;
- tackling transport sector emissions;
- controlling methane emissions through recovery and use in waste management (UNFCC 2002).

However, the Treaty is limited in both in its effect on global warming and the coverage it gives to carbon emission. The Treaty includes not the international transport. Besides, countries like China and India claim that climate change was just a scare, a plot of the wealthy countries to keep them poor. On the other hand they made it clear that they themselves would accept no cuts unless similar cuts were imposed on developing nations as well.

When the US and Canada insisted upon Majority World countries pledging reductions, Zhong Shukong, the Chinese delegation leader – replied: "In the developed world only two people ride in a car and you want us to give up riding the bus!' He was right: at that time Los Angeles alone had more cars than the whole of China.

In addition to the above criticisms, antagonists of the Kyoto Protocol conclude that the Kyoto Protocol is an impractical policy focused on achieving an unrealistic and inappropriate goal. An incomplete list of key arguments against the Kyoto structure includes the following:

i) The Kyoto Protocol is defective on both efficiency criteria because it omits a substantial fraction of emissions and has no plans beyond the first period;

ii) The most fundamental defect of the Kyoto Protocol is that the policy lacks any connection to ultimate economic or environmental policy objectives;

iii) International permit runs the risk of being highly inefficient, given uncertainties in the marginal cost of abating greenhouse gas emissions … it would probably generate large transfers of wealth between countries; and

iv) The Kyoto Protocol can only work if it includes an elaborate and expensive international mechanism for monitoring and enforcement.

Starting with the Vienna Convention, the global world with 27 principles in the Earth Summit of 1992 but Kyoto Protocol was one of its kind which supported issues related to reduction of green house gas emissions and climate change. Despite its ambition, the Treaty can only be seen as a first step in the confrontation of global warming. The Protocol does not consider emissions of oxides of nitrogen and water vapour which, at high altitude, can cause more damage to the atmosphere than carbon dioxide (WRI, 2002). Despite these limitations the Kyoto protocol finally came into operation in 16 February 2005 (see Table 1 for the details on the list of Environmental Agreements across the globe).

Table 1 : List of International Environmental Agreements

- Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, Aarhus, 1998
- Agreement on the Conservation of African-Eurasian Migratory Waterbirds
- Alpine Convention together with its nine protocols

- Anti-Ballistic Missile Treaty (ABM Treaty) (ABMT)
- ASEAN Agreement on Transboundary Haze Pollution
- Asia-Pacific Partnership on Clean Development and Climate
- Barcelona Convention for Protection against Pollution in the Mediterranean Sea, 1976
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Basel, 1989
- Biological Weapons Convention (Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological [Biological] and Toxin Weapons and on their Destruction) (BWC)
- Bonn Agreement
- Carpathian Convention Framework Convention on the Protection and Sustainable Development of the Carpathians
- Cartagena Protocol on Biosafety
- Chemical Weapons Convention
- China Australia Migratory Bird Agreement
- Comprehensive Test Ban Treaty (CTBT), 1996
- Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR), Canberra, 1980
    - Agreed Measures for the Conservation of Antarctic Fauna and Flora
    - Convention for the Conservation of Antarctic Marine Living Resources
    - Convention for the Conservation of Antarctic Seals
    - Protocol on Environmental Protection to the Antarctic Treaty
- Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region, Abidjan, 1981
- Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, Cartagena de Indias, 1983
- Convention of the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region, Nairobi, 1985
- Convention for the Protection of the Marine Environment and Coastal Area of the South-east Pacific, Lima, 1981
- Convention for the Protection of the Marine Environment of the North-east Atlantic(OSPAR Convention), Paris, 1992
- Convention for the Protection of the Natural Resources and Environment of the South Pacific Region, Nouméa, 1986

- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention), Vienna, 1986
- Convention on the Ban of the Import into Africa and the Control of Transboundary Movements and Management of Hazardous Wastes within Africa, Bamako, 1991
- Convention on Biological Diversity (CBD), Nairobi, 1992
- Convention on Certain Conventional Weapons
- Convention on Civil Liability for Damage Caused during Carriage of Dangerous Goods by Road, Rail, and Inland Navigation Vessels (CRTD), Geneva, 1989
- Convention on Cluster Munitions
- Convention on the Conservation of European Wildlife and Natural Habitats
- Convention on the Conservation of Migratory Species of Wild Animals (CMS), Bonn, 1979
- Convention on Early Notification of a Nuclear Accident (Notification Convention), Vienna, 1986
- Convention on Fishing and Conservation of Living Resources of the High Seas
- Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES), Washington DC, 1973
- Convention on Long-Range Transboundary Air Pollution
- Convention on Nature Protection and Wild Life Preservation in the Western Hemisphere, Washington DC, 1940
- Convention on Nuclear Safety, Vienna, 1994
    - EMEP Protocol
    - Heavy Metals Protocol
    - Multi-effect Protocol (Gothenburg protocol)
    - Nitrogen Oxide Protocol
    - POP Air Pollution Protocol
    - Sulphur Emissions Reduction Protocols 1985 and 1994
    - Volatile Organic Compounds Protocol
- Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter
- Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques
- Convention on the Protection and Use of Transboundary Watercourses and International Lakes (ECE Water Convention), Helsinki, 1992

- Convention on the Protection of the Black Sea against Pollution, Bucharest, 1992
- Convention on the Protection of the Marine Environment of the Baltic Sea Area 1992 Helsinki Convention, Helsinki, 1992
- Convention on the Transboundary Effects of Industrial Accidents, Helsinki, 1992
- Convention on Wetlands of International Importance Especially As Waterfowl Habitat(notably not a Multilateral Environmental Agreement)
- Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region, Waigani, 1995
- Convention to Combat Desertification (CCD), Paris, 1994
- Conventions within the UNEP Regional Seas Programme
- Directive on the legal protection of biotechnological inventions
- Energy Community (Energy Community South East Europe Treaty) (ECSEE)
- Espoo Convention Convention on Environmental Impact Assessment in a Transboundary Context, Espoo, 1991
- European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (AND), Geneva, 2000
- European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR), Geneva, 1957
- FAO International Code of Conduct on the Distribution and Use of Pesticides, Rome, 1985
- FAO International Undertaking on Plant Genetic Resources, Rome, 1983
- Framework Convention for the Protection of the Marine Environment of the Caspian Sea
- Framework Convention on Climate Change (UNFCCC), New York, 1992
- Geneva Protocol (Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases, and of Bacteriological Methods of Warfare)
- International Convention for the Conservation of Atlantic Tunas (ICCAT), Rio de Janeiro, 1966
- International Convention for the Prevention of Pollution from Ships
- International Convention for the Prevention of Pollution of the Sea by Oil, London, 1954, 1962, 1969
- International Convention for the Regulation of Whaling (ICRW), Washington, 1946
- International Treaty on Plant Genetic Resources for Food and Agriculture
- International Tropical Timber Agreement (expired), 1983

- International Tropical Timber Agreement (ITTA), Geneva, 1994
- Kuwait Regional Convention for Co-operation on the Protection of the Marine Environment from Pollution, Kuwait, 1978
- Kyoto Protocol - greenhouse gas emission reductions
- Migratory Bird Treaty Act of 1918
- Minamata Convention on Mercury, 2013
- Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1989
- North American Agreement on Environmental Cooperation
- Protocol on Environmental Protection to the Antarctic Treaty
- Putrajaya Declaration of Regional Cooperation for the Sustainable Development of the Seas of East Asia, Malaysia, 2003
- Ramsar Convention Convention on Wetlands of International Importance, especially as Waterfowl Habitat, Ramsar, 1971
- Regional Convention for the Conservation of the Red Sea and the Gulf of Aden Environment, Jeddah, 1982
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Rotterdam, 1998
- Stockholm Convention Stockholm Convention on Persistent Organic PollutantsStockholm, 2001
- Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space, and Under Water
- United Nations Convention on the Law of the Sea
- United Nations Convention to Combat Desertification
- United Nations Framework Convention on Climate Change
- Vienna Convention for the Protection of the Ozone Layer, Vienna, 1985, including the Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal 1987
- Vienna Convention on Civil Liability for Nuclear Damage, Vienna, 1963
- Western Regional Climate Action Initiative
- Working Environment (Air Pollution, Noise and Vibration) Convention, 1977

Source : Compiled by the author

IV. Concluding Remarks

The twenty first century is experiencing changes in different fronts. It seems that the Indian economy is adjusting to this transition in a very commendable manner. So, at this juncture, it would be very timely to examine the sustainability of the process. For an eco-system to be sustainable in the long run it should have the ability to accommodate all sorts of diversity, natural, socio-economic, cultural and so on as the tolerance for diversity enhances resilience, the ability to withstand the change in environment.

In what follows is that the environmental future of the Earth is bleak if we do not properly manage it. As time progresses, the negative impact of environment will come to dominate all regions, both rich and the poor. The irony is that the earliest and the heaviest burdens will fall on the poorer countries that are, in no way, held responsible for the problems cited above. The challenge of climate change, if not abated and mitigated, will magnify the distress of humanity with deprivation, drought, flood, sickness and other health hazards. Only by coming onto a common pedestal of cosmopolitan understanding that our beloved Earth is in danger through rapid environmental changes and also by understanding the network of invisible forces and directing them can we move forward towards true environmental management, where markets flooded with the wave of consumerism and the nations upon which the nature is 'red with tooth and claws', can be balanced.

References

Chatterjee, Biswajit (2011). *Climate Change, Trade & Natural Disasters*, Deep & Deep Publications, New Delhi.

Godrej, Dynar (2006). *The No-Nonsence Guide to Climate Change*, New Internationalist Publications Ltd., Oxford.

Henckens, M. L. C. M., Biermann, F. H. B., & Driessen, P. P. J. (2019). Mineral resources governance : A call for the establishment of an International Competence Center on Mineral Resources Management. *Resources, Conservation and Recycling*, *141*, 255-263.

Martens, P. (2013). *Health and climate change: modelling the impacts of global warming and ozone depletion*. Routledge.